Q-Series

Global Sustainability

How do we unwrap the plastic problem?

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The plastic conundrum

In isolation, plastic is a valuable material with many advantages. However, the durability for which it is so prized, combined with overwhelming quantity produced and discarded (only 15% pa gets recycled; the rest gets dumped, landfilled or incinerated), have created a real environmental challenge. Plastic pollution is front page news; pressure on companies from consumers, regulators and campaign groups is growing.

Solutions: reduce, reuse, recycle (and sort out waste management systems)

We investigate plastic from feedstock through to microplastics in the ocean; we highlight a fragmented industry with multiple producers, types and uses. We also address the complicated nature of any solutions, including that materials commonly used to replace plastic can often have a significantly worse environmental footprint. Embracing the "three Rs" – Reduce, Reuse, Recycle – especially reduction (not substitution for another material) is absolutely crucial to addressing the problem.

Companies are already responding

Companies are reacting to the plastic problem: profit warnings, R&D in product innovations (Nestlé, Danone, Neste, chemicals and oil & gas companies globally), discontinuing entire product lines (IHG, Marriott single-use toiletries), positive substitution effect (increase in aluminium can, paper bag demand). This is in addition to nearly universal messaging from companies exposed to plastic working towards various plastic-related sustainability initiatives and disclosure.

Investment impact

We examine analogous examples of ESG-relevant issues with similar characteristics to the plastic problem. We assume a 10-20% demand decline in low value, high volume plastic over a 3-5 year period. 22 UBS analysts in the US, Europe and Asia Pacific review 48 stocks across 14 countries to assess the investment implications of that decline. We highlight stocks most and least favourably positioned with regard to the thematic on P17. Among potential beneficiaries we list certain packaging and capital goods companies who are already seeing positive substitution effect. Sectors at risk of disruption include consumer, packaging, chemicals, and oil & gas.

Contents

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Executive summary

Plastic, when it first became widely commercially available, was seen as a miracle material with near-magical qualities that included flexibility, durability, strength, and corrosion and water resistance. Plastic is convenient, cheap, has incredible product design applications, and also has the potential to save lives. Certain pharmaceutical applications, bicycle helmets and infant car seats for example all contain plastic; finding alternatives is not a straightforward exercise.

Companies exposed to plastic are acting now to address the problem

However, plastic's ubiquity and **quantity** (there is far too much of it), **durability** (takes centuries to degrade), plus **waste management systems** that are ill-equipped to cope (significant leakage of plastic into the open environment) have combined to create a real environmental challenge. Companies are facing growing pressure from a combination of campaign groups, consumers and regulators to address plastic, and are already seeing impacts ranging from issuing profit warnings to investments in product or systems innovation (Nestlé, Danone, Neste, chemicals and oil & gas companies), discontinuing of entire product lines (IHG and Marriot eliminating certain single-use toiletries from hotel rooms), and positive substitution effect (higher beverage can and paper bag demand). This is in addition to widespread public messaging from companies exposed to plastic on their efforts in working towards various plastic-related sustainability initiatives and disclosure.

Figure 1: Key statistics

8 billion tons of plastic have been produced over time

99% of plastic is produced from **fossil fuel** feedstocks

Plastic produced in 2015, **>400 million tons**

Only **14-18%** of plastic is recycled annually; much of the rest is discarded

95% by value of plastic packaging discarded after a single use

242 million tons of plastic waste generated in 2016

After Blue Planet II episode, plastic-related questions to customer service **+800%**

8 million tons of plastic enter the ocean annually

Plastic takes **centuries** to degrade in a marine environment

The majority of plastic in the ocean is **subsurface**

Source: UBS, others as cited throughout the report. **Note: figures are approximate**.

There is no one-size-fits-all, easily identifiable solution to the plastics problem

Solutions to the problem are complex, likely requiring comprehensive redesign of entire systems, from product to packaging to waste management globally. Embracing the "three Rs" – Reduce, Reuse, Recycle – is a key starting point. Reduction in use, in particular, is, in our opinion, absolutely crucial to addressing the overall issue. We discuss this in detail here. This report assumes a fall in demand for and use of low value, high volume plastic that is most commonly associated with plastic packaging. Our key investment question is to address the impact of that decline.

To be truly effective, resolutions need to be globally coordinated and comprehensive, for example circular economy initiatives. Some, particularly waste management, could be costly.[1] Regulations are being put in place to address plastics use, but vary widely in scope and in our opinion, effectiveness. In many cases (for example plastic bag or straw bans), regulations only affect a small part of the overall plastics market and are unlikely to have a meaningful impact overall, globally.

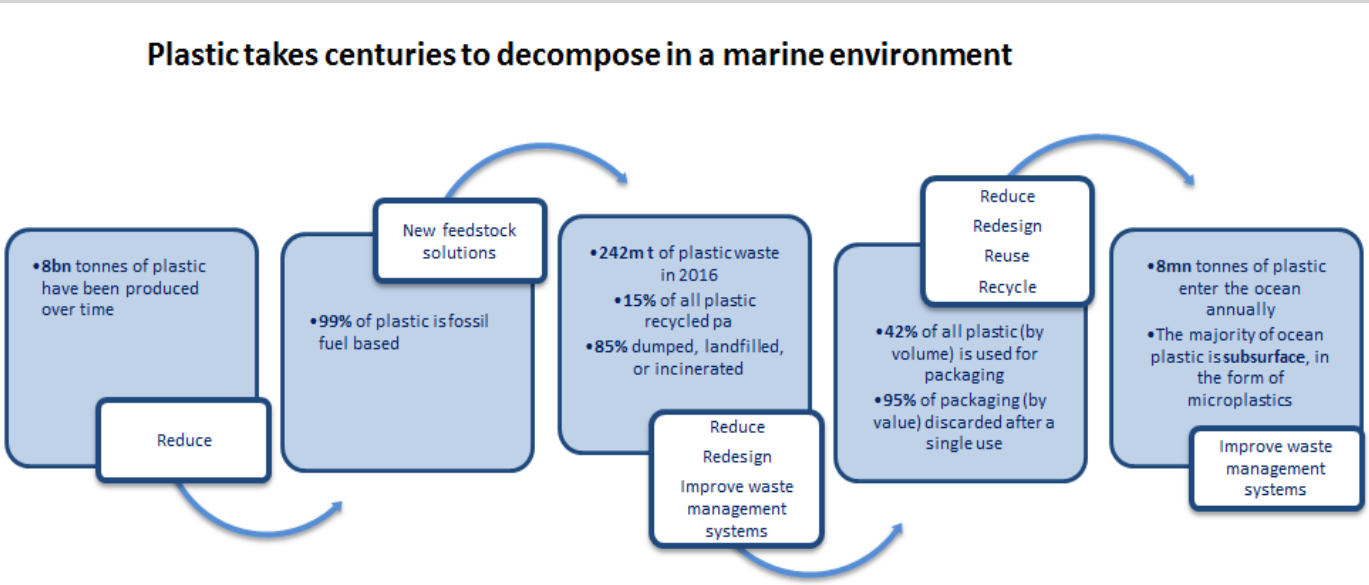
Regulations are being put in place but vary widely in scope and effectiveness

Individual behavioural changes, while potentially significant in certain markets and to certain products over time, are similarly unlikely to have a meaningful impact given the size and complexity of the plastics market. It is our opinion that a key driver in reducing use globally will be **changes in business practices,** which could be even more impactful if combined with meaningful and coordinated public policy approaches.

Reductions in use, if achieved, will obviously have investment implications. It is our belief that environmental issues are impacting operating models faster than they have done in the past. ESG issues historically were often long-tail, and outside a typical investment horizon. In our opinion this is no longer the case. Our key aim in this report is to assess the impact of a decline in demand for and use of high volume, low value plastics that are heavily represented in the waste stream.

ESG issues, in our opinion, are impacting businesses faster than they have done in the past

Figure 2: Scope of the plastic problem, and possible solutions

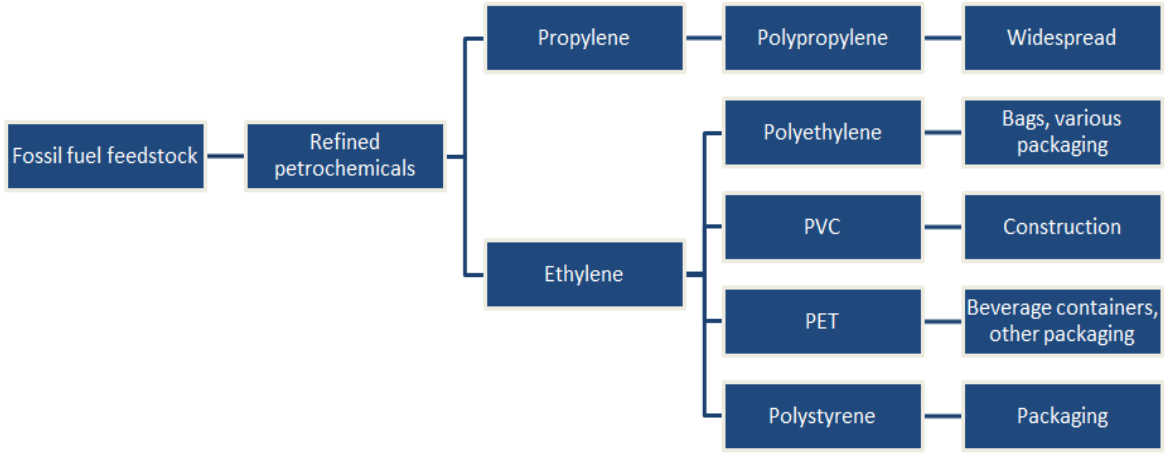


Source: UBS, others as cited throughout the report. **Note: figures are approximate.**

[1] Kaza, Silpa; Yao, Lisa C.; Bhada-Tata, Perinaz; Van Woerden, Frank. 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Urban Development;. Washington, DC: World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/30317 License: CC BY 3.0 IGO, P1.

Five types of plastic represent 90%[2] by weight of all plastics ever produced, and are largely derived from two source chemicals: ethylene (critical feedstock for PE, PVC, PET, PS which are 65%[3] of total plastics production by weight) and propylene (second-largest volume chemical produced globally[4]). **Both ethylene and propylene are heavily represented in plastic packaging.**[5]

Figure 3: Plastic chain – five key types of plastic and selected end uses (simplified)



Source: UBS

Plastic is not altogether "bad"

Plastic is not in and of itself inherently problematic, or at least not measurably more so than other materials. In fact, plastic can be *less* problematic from an environmental perspective than materials commonly used to replace it (see further discussion here). Plastic has a nearly endless list of positive attributes, and innumerable end uses to which it is perfectly suited: among other beneficial characteristics it is lightweight, durable, strong, keeps food fresh (mitigating food waste), is convenient, and keeps things sterile. However, at the lower end of the value chain (i.e. plastic packaging), it is incredibly cheap, disposed of quickly, and in quantities that waste systems globally cannot keep up with.

"Plastic" isn't necessarily the problem. The problem is plastic *durability* plus *quantity produced* (and disposed of) plus an *overwhelmed waste stream*

[2] Fossils, Plastics, & Petrochemical Feedstocks, Fueling Plastics, Center for International Environmental Law, P2, reproduced with permission.
[3] Fossils, Plastics, & Petrochemical Feedstocks, Fueling Plastics, Center for International Environmental Law, P2, reproduced with permission.
[4] IHS Markit, Chemical Economics Handbook: Propylene, 9 October 2017, P5
[5] Fossils, Plastics, & Petrochemical Feedstocks, Fueling Plastics, Center for International Environmental Law, P2, reproduced with permission.

Figure 4: Not all plastic is "bad," and not all plastics have suitable substitutes

Type	Category	Benefits	Negatives	Substitute?
"Good" Plastic	Automobile and aerospace components	Typically long life cycle (aircraft, >20 years), corrosion-resistant, durability, strength, light weight compared to other materials	Carbon emissions in production, aircraft composite components not currently easily recyclable	Metals, e.g. aluminum, though at higher cost vs. plastic; sandwich foams
	Construction plastic	Typically very long lifecycle, versatile, high strength-to-weight ratio, corrosion-resistant	Carbon emissions in production	Typically ceramic, metals
	Electronic goods (including household appliances) plastic	Varied lifecycle length, electrical & heat insulation, lightweight	Carbon emissions in production, recycling can be sporadic	Currently difficult, scope to innovate
	Miscellaneous safety equipment, e.g. child safety seats, bicycle helmets	Potentially lifesaving, varied lifecycle length	Carbon emissions in production, recycling can be sporadic	Currently difficult, scope to innovate
"Bad" Plastic	Single-use fresh food packaging	Keeps food fresh (avoiding waste) and can minimise contamination	Short lifecycle, quantity, potential for plastic chemicals or additives to leach into food	Currently difficult, scope to innovate
	Single-use medical applications	Potentially life-saving or medically necessary, keeps products sterile	Short lifecycle, quantity	Currently difficult, scope to innovate
	Consumer packaging	Lightweight (reduces emissions in transport vs. other heavier materials), durability, nonreactive nature particularly suited to certain chemicals or food ingredients	Short lifecycle, quantity	Aluminium cans, glass bottles, paper cartons/packaging

Source: UBS

The durability for which plastic is so prized then becomes a serious environmental issue as plastic waste builds up in landfills or the open environment, including marine environments. Both the quantity of material and the inadequacies of the waste stream have created an "image problem" for plastic, to the extent that in some jurisdictions regulators are acting to ban certain types of single-use plastic, and customers are actively shunning (or at least trying to, where practicable) plastic.

Figure 5: Polluted urban river, Philippines

Source: istock/Getty Images International[6]

[6] iStock by Getty Images, Credit: tonyoquias

How could this play out?

In this report, we have largely focused on four sectors (see sector sections for further detail which refer to potential opportunities as well as risk):

- **Consumer** – while we view the entire plastic usage chain as at risk over time, we note that the consumer sector has a significantly more visible *and identifiable* pollution impact. We refer to examples of NGO campaigns, noting emotive language specifically mentioning plastic pollution by brand (see P78), and extensive efforts that consumer companies are making that include product reformulation and disclosure (see P63, P78).
- **Packaging** – certain plastic packaging manufacturers are already discussing downside from plastic-related concerns; other substrate manufacturers are seeing positive substitution potential.
- **Chemicals** – provide plastic's "building blocks." Market shares are often fragmented. Large North American, Asian and Middle Eastern companies are more exposed to low value plastic, Europeans less so. We examine the potential impact to the Asian petrochemicals sector given relatively high exposure vs the sector to commodity petrochemicals used in plastic manufacture.
- **Oil & Gas** – are key plastic feedstocks, however UBS's oil & gas analysts estimate that total plastic represents c.8-9% of total Global Majors oil demand, and of that 8-9%, around one-third is single-use plastic. Plastics as a component of oil demand is higher in Asia vs the US or Europe given relatively lower penetration of transport fuels (per capita based) in non-OECD countries like China, India and Indonesia, and that Asia is producing goods for OECD markets. While a cut to single-use plastics demand could have an impact on incremental oil demand growth, in absolute terms it is less meaningful because transport fuels are the major driver making up around two-thirds of global demand for oil. Furthermore, the oil companies generally seek to participate in more value-added portions of the value chain and hence this should have little direct impact on their petrochemicals business.

Plastic represents only 8-9% of Global Major oil demand

"Plastic" is not a single, easily categorised product. Parts of the chain are opaque and difficult to assess. We think current (and future) regulation, as well as consumer behavioural shifts, are more likely to disproportionately impact plastic packaging rather than *all* plastics. In addition, leakage of the problem into other areas complicates any analysis. For example, single-use plastic bag levies in the UK have possibly resulted in total plastic volume used in shopping carrier bags *increasing* as customers buy more (thicker, and therefore with greater volume of plastic required) plastic "bag for life" type products (further discussion here). We think it entirely possible that certain segments of the total global plastic market continue to increase.

We see greater impact to packaging, and think it possible that other segments of the total global plastic market continue to increase

A scenario analysis: attempting to quantify downside

In an attempt to quantify a potential drop in plastic packaging consumption, we have reviewed historical examples of ESG relevant issues with, in our opinion, similar characteristics to the current plastic problem. We have looked for a combination of regulatory or public policy approaches, together with education campaigns aimed at greater consumer awareness about the potential harm or damage caused by the issue. In our view, public pressure campaigns can result in

the spread of increasingly strong feelings (or embarrassment in the context of public opinion) resulting in a complete change of habits[7]. These changes in habits have, in some cases, happened extremely quickly. We think greater visibility provided by social media will likely only amplify this effect.

We arrive at a base case scenario using the examples listed in Figure 6. Readers should note the wide range reflective of uncertainty in complex markets such as plastic. We assume that a combination of the following conditions – *if applied globally and all else remaining equal…*

- Regulation (bans, fines, taxes)
- A continuation of various educational, marketing and pressure campaigns aimed at consumers
- Continued pressure campaigns aimed at companies
- Recognition of potential benefits to companies or public bodies (e.g. local governments with regard to waste management) in certain situations (e.g. hotel energy saving campaigns)
- Companies prompted to *innovate* (see examples here)

…could result in an estimated 10-20% decline over a 3-5 year period in the **plastics packaging market** which represents approximately 42%[8] of all plastics production. We will revisit these assumptions as events unfold.

[7] See chapter 11, "Frugality vs. Conspicuous Consumption" in *Narrative Economics: How Stories Go Viral & Drive Major Economic Events*, by Robert J Shiller (Princeton University Press, 2019).
[8] P53. Can We Cut Plastics Without Cutting Profits? How the Detergent Market is Working Towards a Clean Sweep, MIT Center for Transportation & Logistics. This statistic is consistent with other sources.

Figure 6: Event examples – previous catalysts for change

Event	Location	Catalyst	Event	Impact	Timeframe
Plastic bag bans	UK	Environmental concerns, regulatory response (bans or charges)	5p charge for single use bags, introduced Oct 2015	2018-2019 vs 2016-2017, all UK retailers: **1.** 48% reduction in single use bags, to 1.11bn. **2.** Bags per person -47%, to 20.	c4 years
Mandatory GHG emissions disclosures	UK	Regulation	Introduction of firm-level carbon disclosure law, 2018	UK firms reduced absolute GHG emissions by 16% vs. European firms (control group without same disclosure law)	1 year
Soft drinks sugar tax	Mexico	Regulation, cultural/behavioural shifts	1peso/litre (equivalent to 10% price increase) on sugar sweetened beverages as of Jan, 2014	Average 7.6% decline in purchases of sugar sweetened beverages in 2014 and 2015	c1 year
Hotel environmental "nudges"	Worldwide	Behavioural/cultural shifts	Guest participation in "green practices"	TripAdvisor survey 2014 vs 2012, % of guests willing to turn of lights when not in the room 96% (was 88%), participate in towel/linen re-use program 90% (was 80%), recycle in the hotel 81% (was 57%).	2 years
Smoking prevention campaigns	UK	Regulation and pricing changes, behavioural/cultural shifts	1. Smoking ban in enclosed public places (2007) 2. Changes to taxation 3. Education campaigns 4. Changes to packaging	In England: 2011-2018, cigarette consumption declined 24% (117-118m fewer cigarettes consumed per month). Overall cigarette sales have declined by nearly 25% since 2011 (1bn fewer cigarettes smoked per year).	12 years (study period)
Mandatory wearing of seatbelts	UK	Regulation (including fines), educational efforts cultural/behavioural shifts	31 Jan 1983, legal requirement for vehicle front seat occupants to wear seatbelts	40% of front seat car occupants wearing seat belts prior to legislation, but 95% as of February 1983	1 month
Mandatory wearing of seatbelts	US	Regulation (including fines), educational efforts cultural/behavioural shifts	Mandatory seatbelt laws	Secondary enforcement increases seatbelt usage by 11%, mandatory seatbelt law with support from primary enforcement increases usage by 22%	14 years (study period)

Source: UBS, various academic bodies and government releases. See Appendix for full source list.

Indicative Scenario Analyses

APAC commodity petrochemical, Tim Bush

In order to frame the impact of government regulation and shifting consumer preferences on global plastic demand, we have incorporated our view of an "estimated 10-20% decline over 3-5 years in the plastics packaging market which represents 42% of all plastics production" into our global commodity petrochemical supply demand model.

Headline news momentum continues to build with new MNC corporate commitments on plastic consumption reduction seeming to come almost every week. However, almost all global incremental petrochemical demand growth is coming from developing markets. We estimate that China alone accounts for almost half of global incremental demand growth. The structural drivers for rising per capita consumption in these markets remain. Mainly, the shift from wet market bulk shopping to organised trade in plastic packaging intensive supermarkets. Additionally, in both developed and developing markets, new demand drivers such as online shopping and on-demand take-out continue to emerge.

We note that most corporate commitments for plastic consumption reduction are 2025-2030. However, we do believe that shifting consumer preferences towards more sustainable plastics consumption should manifest itself in slowing demand by 2022.

The five types of commodity plastics that we believe are most vulnerable to reduced consumption are PE, PP, PET, PS and PVC. All five of these plastics are used in various types of disposable consumer packaging. We estimate that approximately 42% of these plastics are being consumed in consumer packaging applications. We thus separate the demand growth for these five plastics into packaging and non-packaging demand. For non-packaging demand, we leave our existing forecasts unchanged. For packaging demand, we stress-test two scenarios to analyse the potential impact of slowing global demand to industry utilisation and profitability. In scenario 1 we assume that packaging demand growth is 10% lower than our base case and in scenario 2 we assume packaging demand is 20% lower than our base case.

APAC chemical companies are largely undiversified with at least half of earnings coming from the plastics that we believe could be impacted

The end result of either scenario 1 or 2 is a mismatch between supply growth and demand growth from 2022-2027. The five-year mismatch largely owes to the five-year period between final investment decision and commercial operation for large-scale petrochemical facilities. This mismatch will likely result in a double-dip prolonged downcycle for almost all of the petrochemicals we analysed. We believe this sustained period of depressed profitability has the potential to cause global high cost producers to close facilities. On purely market forces, we would expect these closures to come from sub-scale oil base petrochemical facilities in Japan and Europe. We also see the potential for closures from China's unconventional coal-based producers. However, the economics of these projects have always been questionable, and we believe that central government policy would be the deciding factor on curtailments.

Two scenarios: both result in a mismatch between supply and demand growth 2022-2027E

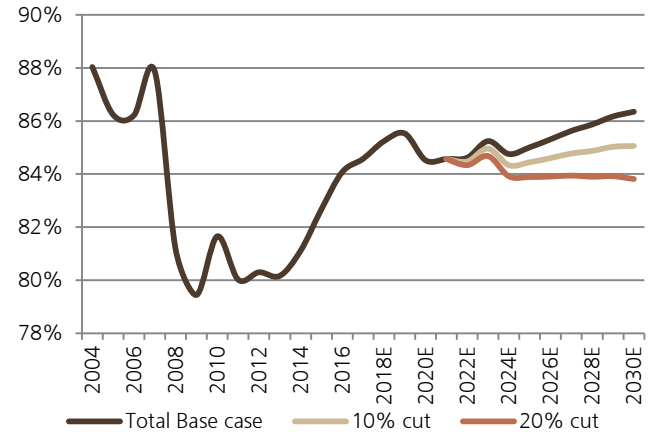
Ultimately, we expect the industry to adapt to structurally lower demand growth and to appropriately size supply growth to keep the market balanced. Consequently, we expect the cyclicality of the industry to remain.

Figure 7: Spread summary table

Plastic	Demand growth	2022-30 utilization	Avg spread (US$)
PE			
Base	3.9%	83.8%	457
Scenario 1	3.7%	83.2%	422
Scenario 2	3.6%	82.5%	397
PP			
Base	5.0%	88.7%	508
Scenario 1	4.8%	87.8%	436
Scenario 2	4.6%	87.0%	411
PET			
Base	5.4%	85.8%	217
Scenario 1	5.2%	84.9%	214
Scenario 2	5.0%	84.0%	211
PS			
Base	0.133%	71.1%	219
Scenario 1	0.128%	71.1%	201
Scenario 2	0.122%	71.1%	176
PVC			
Base	3.2%	86.9%	633
Scenario 1	3.1%	86.3%	631
Scenario 2	3.0%	85.7%	628

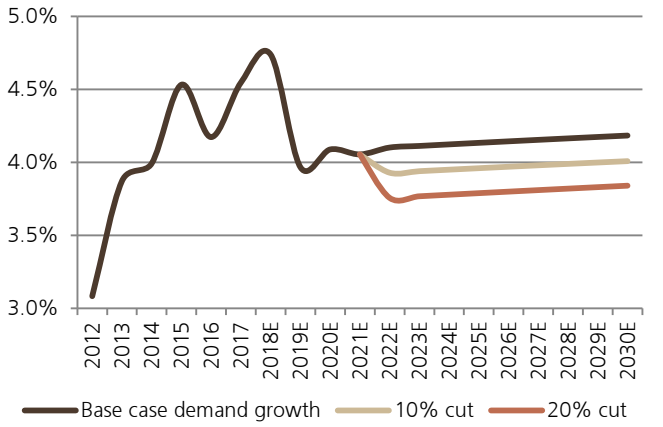
Source: UBS estimates

Figure 8: Global utilisation – base and downside scenario



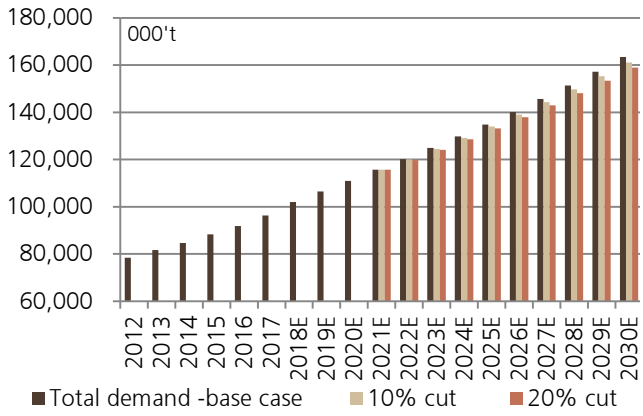
Source: IHS, PCI, UBSe Note: based on aggregate data of PE, PP, PET, PS & PVC

Figure 9: Global demand growth – base and downside scenario



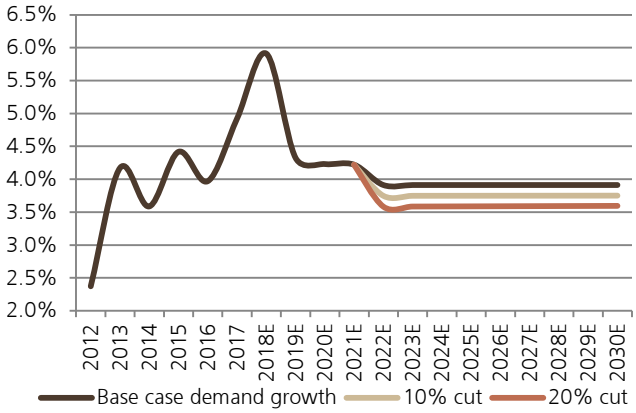
Source: IHS, PCI, UBSe Note: based on aggregate data of PE, PP, PET, PS & PVC

Figure 10: PE global demand



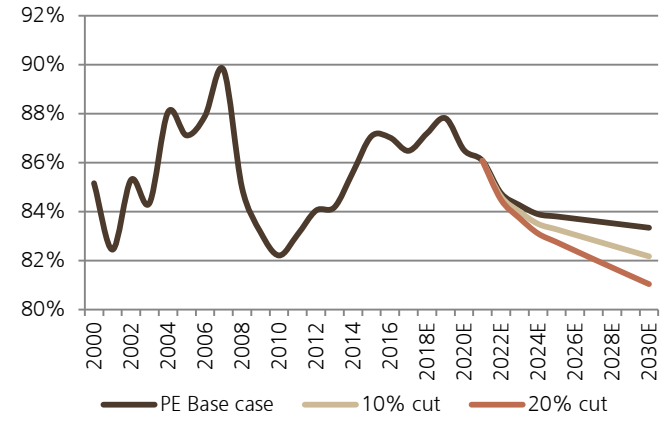
Source: IHS, UBSe

Figure 11: PE global demand growth



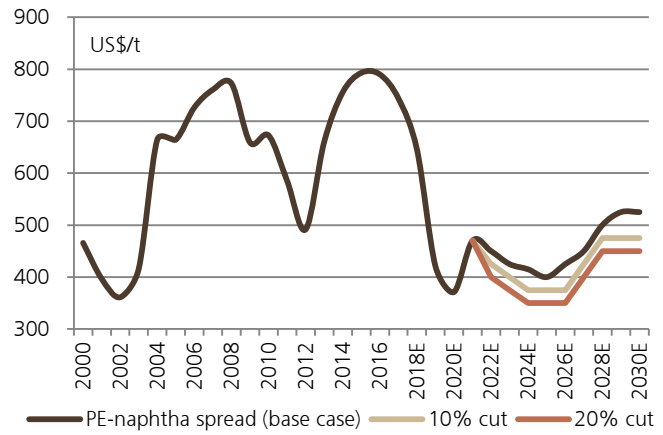
Source: IHS, UBSe

Figure 12: PE global utilisation



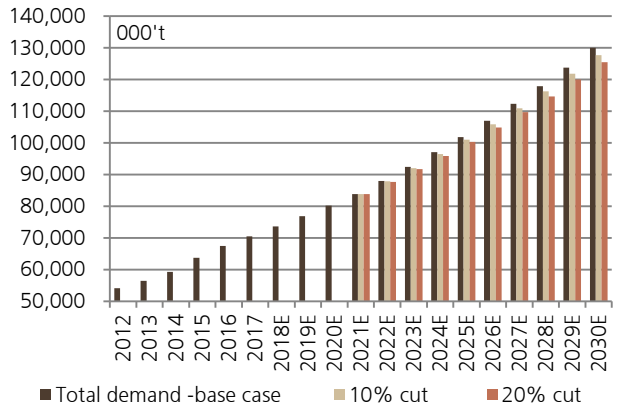
Source: IHS, UBSe

Figure 13: PE – naphtha spread



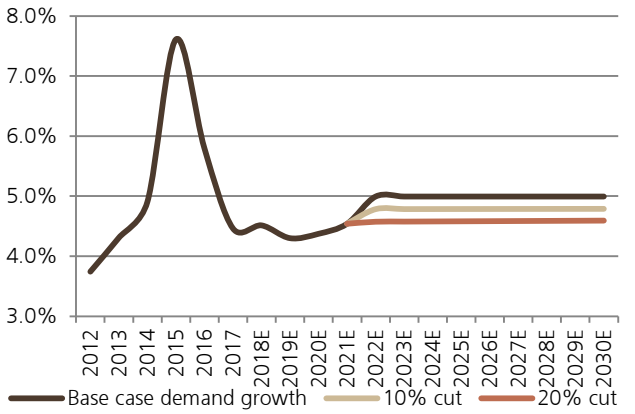
Source: IHS, UBSe

Figure 14: PP global demand



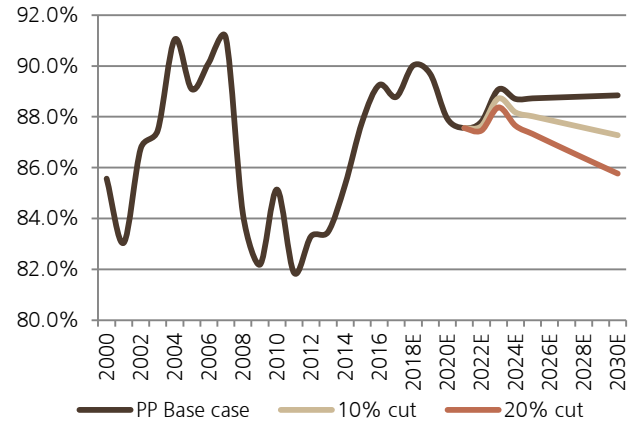
Source: IHS, UBSe

Figure 15: PP global demand growth



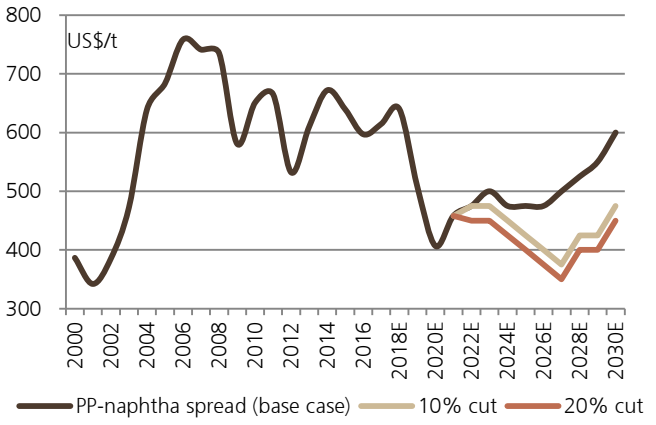
Source: IHS, UBSe

Figure 16: PP global utilisation



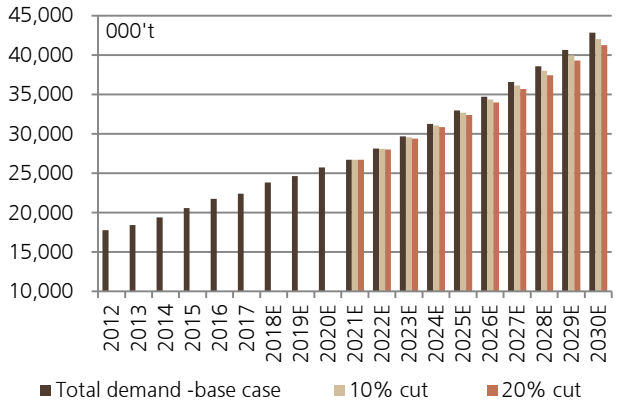
Source: IHS, UBSe

Figure 17: PP – naphtha spread



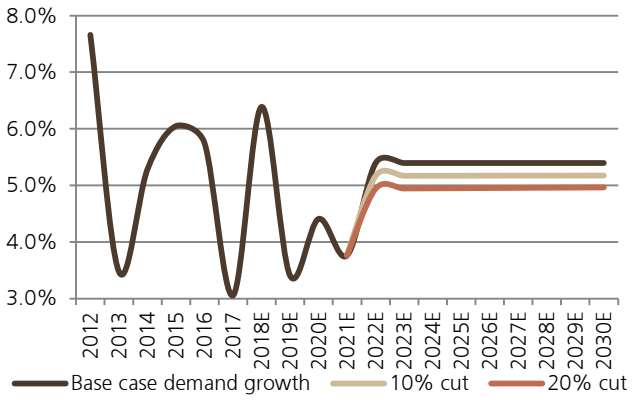
Source: IHS, UBSe

Figure 18: PET global demand



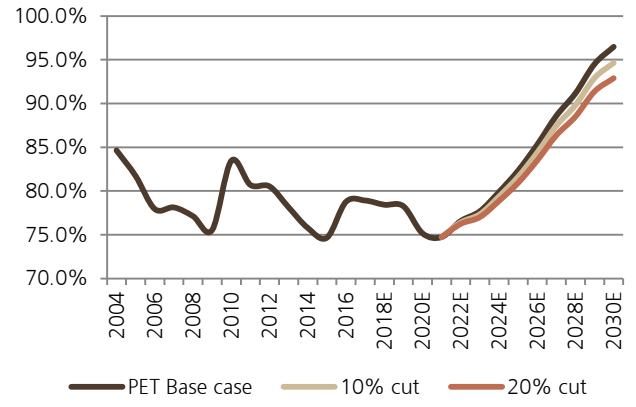
Source: PCI, UBSe

Figure 19: PET global demand growth



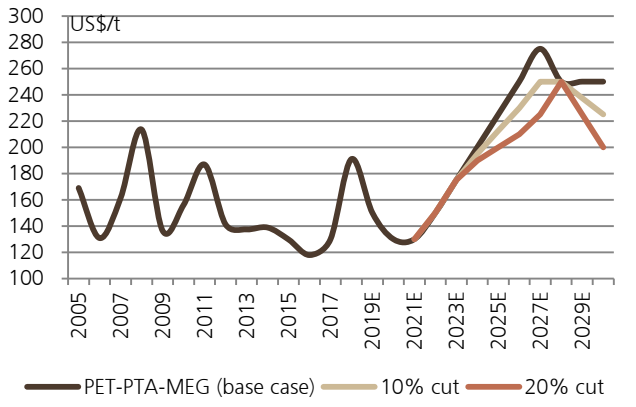
Source: PCI, UBSe

Figure 20: PET global utilisation



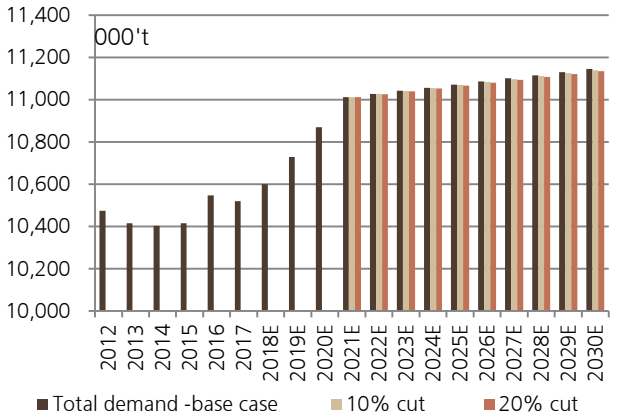
Source: PCI, UBSe

Figure 21: PET-PTA-MEG spread



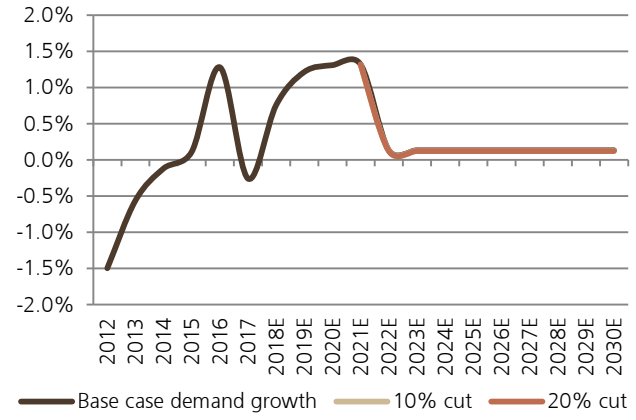
Source: PCI, UBSe

Figure 22: PS global demand



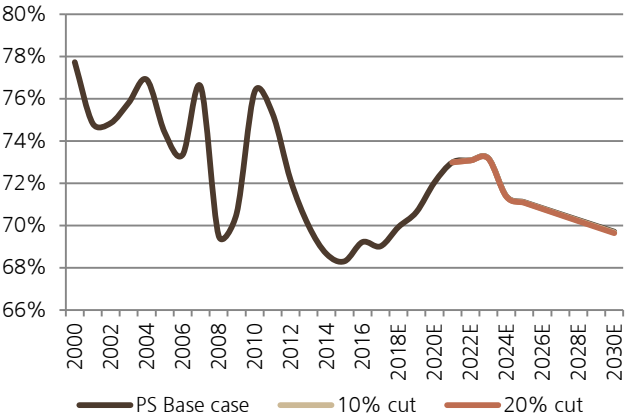
Source: IHS, UBSe

Figure 23: PS global demand growth



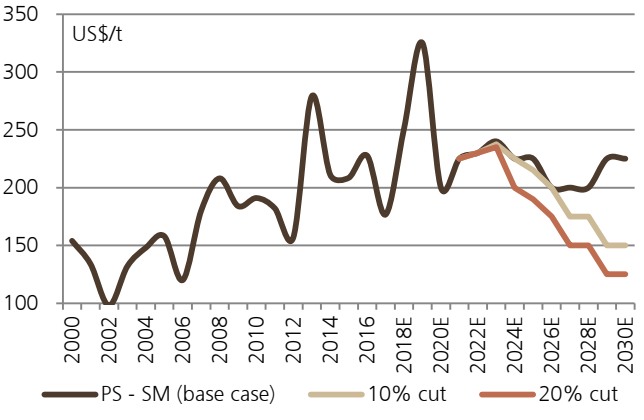
Source: IHS, UBSe

Figure 24: PS global utilisation



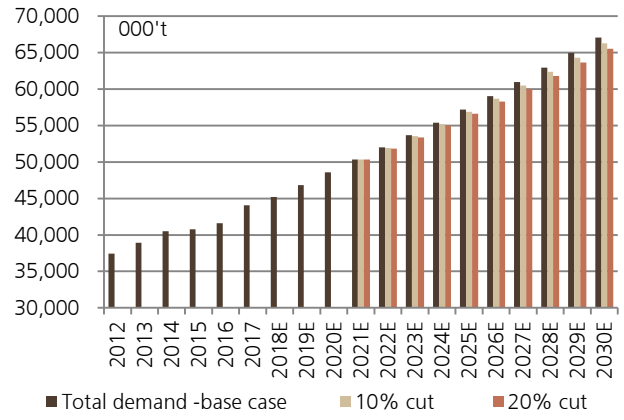
Source: IHS, UBSe

Figure 25: PS – SM spread



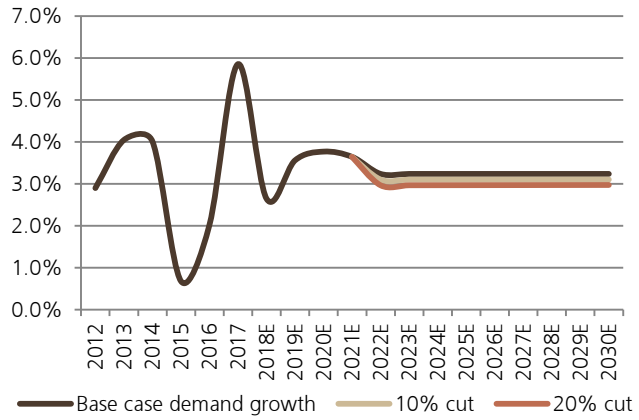
Source: IHS, UBSe

Figure 26: PVC global demand



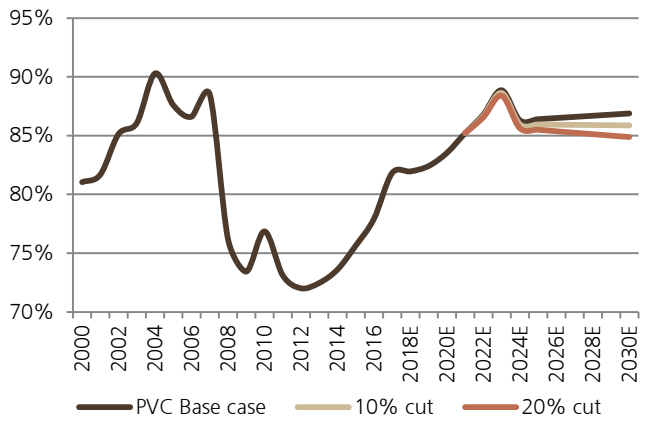
Source: IHS, UBSe

Figure 27: PVC global demand growth



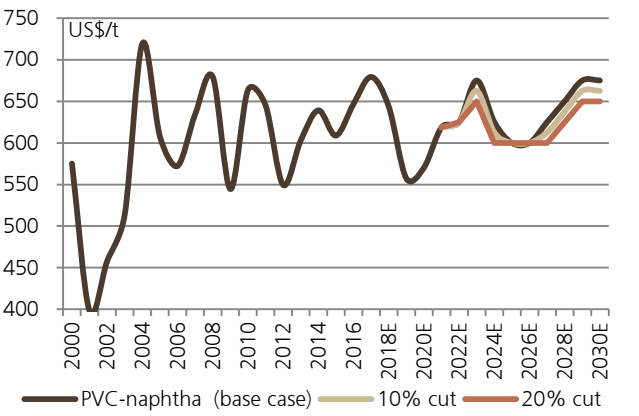
Source: IHS, UBSe

Figure 28: PVC global utilisation



Source: IHS, UBSe

Figure 29: PVC – naphtha spread



Source: IHS, UBSe

In the sector scenarios below, UBS analysts have considered specific assumptions on product lines or materials, for example PET beverage bottling, and examined how this would most likely play out.

US Beverages, Sean King

PEP recently announced measures to cut 8,000 metric tons of virgin plastics by 2020 through a number of measures: a) transitioning LIFEWTR packaging to 100% recycled PET, b) rolling out Aquafina water brand in aluminium packaging in US food outlets while extending trials into retail markets, and c) Bubly sparkling water will only be available in aluminium cans.

In order to understand the financial implications of reducing reliance on virgin PET, we laid out two plausible but hypothetical scenarios. Under Scenario 1 we developed a framework to measure the increasing use of recycled PET in the production of PET bottles. Based on US Nielsen tracked channel data, we estimate the normalised consumption to be roughly 12.5B PET packages over the latest 52-week period ending 9/7/19. From that, we assume that 10B packages or 80% mix

is from virgin PET. According to IHS Markit, total PET consumption was 21m tons in 2017.[9]

Scenario 1: Assuming PEP's US Beverages business (NAB) shifts 20% of packaging from virgin PET to recycled PET at 50% incremental cost relative to virgin PET, this would lead to -1.2% decline in FY20 EPS. Such an effort would eliminate roughly ~50,000 tons of virgin PET.

Shifting 20% of PET packaging to recycled = 1.2% decline in FY20 EPS

Scenario 2: We assume that PET bottles of all sizes are homogeneously replaced by aluminium cans (12oz). If PEP NAB segment shifts 20% of PET portfolio into aluminium, this would lead to an EPS decline of -4.4% after factoring in cost of additional units of cans required to replace large PET while assuming no changes in other costs of production. This approach suggests a ~50,000 ton decline in PET exposure at every 20% shift in portfolio leading to 2.5B fewer PET bottles, while adding 62,000 tons of aluminium exposure.

Shifting 20% of PET into cans = 4.4% EPS decline

Figure 30: A sensitivity analysis on PEP's North American Beverages segment suggests that increasing use of recycled PET as well as a shift to aluminium cans would lead to a decline in overall profitability, all else being equal

Scenario 1

Virgin PET to Fully Recycled PET

EPS % Impact on FY20 PEP		Virgin PET as % of Total PET				
		80%	60%	40%	20%	0%
% Chg in cost/bottle	30%	0.0%	-0.7%	-1.4%	-2.1%	-2.9%
	40%	0.0%	-1.0%	-1.9%	-2.9%	-3.8%
	50%	0.0%	-1.2%	-2.4%	-3.6%	-4.8%
	60%	0.0%	-1.4%	-2.9%	-4.3%	-5.7%
	70%	0.0%	-1.7%	-3.3%	-5.0%	-6.7%
Virgin PET Bottles Removed (bln)		-	2.5	5.0	7.5	10.0
Virgin PET removed ('000 tons)		-	50	100	150	199
Aluminum added ('000 tons)		-	-	-	-	-

Scenario 2

Virgin PET to Aluminum Cans

EPS % Impact on FY20 PEP		Virgin PET as % of Total PET				
		80%	60%	40%	20%	0%
% Chg in cost/can	-20%	0.0%	-5.1%	-10.3%	-15.4%	-20.6%
	-10%	0.0%	-4.7%	-9.5%	-14.2%	-19.0%
	0%	0.0%	-4.4%	-8.7%	-13.1%	-17.4%
	10%	0.0%	-4.0%	-7.9%	-11.9%	-15.8%
	20%	0.0%	-3.6%	-7.1%	-10.7%	-14.2%
Virgin PET Bottles Removed (bln)		-	2.5	5.0	7.5	10.0
Virgin PET removed ('000 tons)		-	50	100	150	199
Aluminum added ('000 tons)		-	62	125	187	249

Source: Nielsen, UBS

[9] IHS Markit, Chemical Economics Handbook: Polyethylene Terephthalate (PET) Solid-State Resins, 29 March 2018, P5.

Global Commodities/Metals & Mining, Daniel Major

According to Ball Corp[10]; a 1% global shift from PET carbonated soft drinks into cans would represent 5B cans and a similar 1% shift in water/still beverages from PET to cans would represent 13B cans. The current global beverage can market is approximately 330B units and we estimate the sector consumes ~4.7mt of aluminium per year, equivalent to ~5% of global consumption (primary + recycled). The scenario above highlights that a 1% shift from PET to cans for carbonated soft drinks & water bottles (combined) would represent 18B beverage cans; assuming stable aluminium content per can we estimate that this would add ~250kt to global aluminium demand or less than 0.5% impact on the total market.

Plastic substitution is unlikely to have a material impact on the aluminium price outlook

Over the past 10 years global demand for aluminium from the packaging sector (including beverage cans) has grown at a slower rate than global aluminium demand (CAGR 4.5% vs 6.5%). Looking forward, we believe substitution from PET to aluminium cans should support accelerating aluminium demand growth from the packaging sector; however, given the relatively low starting market share of beverage cans (~5% of demand), we think it is unlikely to have a material impact on the aluminium price outlook. In our view, a recovery in demand from the global auto sector (supported by ongoing light-weighting of vehicles), outlook for the Chinese construction sector and China supply outlook are likely to remain the key drivers of the aluminium price in the coming years.

Capital Goods, Sven Weier

We think the impact on the capital goods sector growth would be neutral overall if the use of PET as a bottling packaging material were to fall materially as a result of tougher regulation or consumer preferences – or both. This is because if demand for PET bottling lines were to fall, it would likely increase for glass, can or carton bottling lines. As we think the value-added of a PET bottling line is higher than for a non-PET bottling line due to the additional element of a stretch-blow moulding machine in a line, the margin impact would likely be negative for suppliers such as Krones. More specifically, Krones generates low triple digit €m in standalone stretch-blow moulding equipment revenues (below 5% of group sales) that carry a 2-3% higher gross margin than the average.

[10] Ball Corporation, transcript

Figure 31: How to position on the back of our analysis

Impacted.....	Most Favorably	Least Favorably
Sector	**Stock**	**Stock**
Consumer Staples	Anheuser Busch Inbev	Beiersdorf
	Dabur	Church & Dwight
	Hindustan Unilever	Clorox
	Nestle India	Coca Cola
		Coca Cola Hellenic Bottling Company
		Colgate India
		FP Corp
		Pepsico Inc
		Seven & I Holdings
		Unilever
Paper & Packaging	DS Smith Plc	Amcor Limited
	Mondi	
	Orora Limited	
	Smurfit Kappa Group Plc	
Capital Goods	Alfa Laval	GEA Group
	Valmet	Krones
Chemicals		Dow Inc.
		Formosa Petrochemical Corporation
		Formosa Chemicals & Fibre
		Lotte Chemical
		LyondellBasell Industries
		Westlake Chemical Corp
Oil & Gas	Neste	Sasol

Source: UBS. This list of securities contains stocks that may be impacted by a specific scenario. The scenario described herein may play out over a 3-5 year period whereas the base-case view of UBS equity analysts is based on the next 12 months. Any reference to current rating is to the rating given in the latest published UBS research report relating to the relevant company. Such reports are available on UBS Neo. See Figures 32-34 for fundamental analyst rating and price target.

1. Sector sections

This list of securities in section 1 (sector sections) may be impacted by a specific scenario. The scenario described herein may play out over a 3-5 year period whereas the base-case view of UBS equity analysts is based on the next 12 months. Any reference to current rating is to the rating given in the latest published UBS research report relating to the relevant company. Such reports are available on UBS Neo.

Summary tables

Figure 32: Stocks most favourably positioned with regards to the theme

Sector	Stock	Rating	PT	Comments
Consumer Staples	Anheuser Busch Inbev	Neutral	89EUR	Strong presence in returnable glass formats, investing in environmentally friendly pack formats.
	Dabur	Buy	535INR	Partnering with government agencies to help collect and recycle multi-layered plastic covering eight states in India.
	Hindustan Unilever	Neutral	2150INR	Committed to make all its plastic packaging fully reusable, recyclable or compostable by 2025.
	Nestle India	Buy	16000INR	Nestle India aims for 100% recyclable or reusable packaging by 2025.
Paper & Packaging	DS Smith Plc	Neutral	358GBX	Second largest corrugated box producer in Europe, potential positive substitution effect.
	Mondi	Buy	1850GBX	Largest sack kraft paper producer globally, potential positive substitution effect.
	Orora Limited	Neutral	3.05AUD	Fibre-based packaging, aluminium cans and glass bottles. Products are typically manufactured with relatively high levels of recycled content, partly underpinned by its own recycled paper mill.
	Smurfit Kappa Group Plc	Buy	33EUR	Largest corrugated box producer in Europe, potential positive substitution effect.
Capital Goods	Alfa Laval	Neutral	203SEK	Skew to carton packaging (substitution effect).
	Valmet	Neutral	19EUR	Paper packaging machinery maker (substitution effect).
Oil & Gas	Neste	Neutral	31EUR	Leader in the bio-plastics solutions made from renewable feedstocks.

Source: UBS, Price date is the closing price of 16 October 2019. This list of securities contains stocks that may be impacted by a specific scenario. The scenario described herein may play out over a 3-5 year period whereas the base-case view of UBS equity analysts is based on the next 12 months. Any reference to current rating is to the rating given in the latest published UBS research report relating to the relevant company. Such reports are available on UBS Neo.

Figure 33: Stocks least favourably positioned with regards to the theme

Sector	Stock	Rating	PT	Comments
Consumer Staples	Beiersdorf	Sell	96EUR	In our view, the company is lagging its peers in responding to the change.
	Church & Dwight	Neutral	75USD	High plastic exposure as a % of sales given its packaged product costs.
	Clorox	Sell	125USD	Plastics as a % of COGS are ~15% (UBSe) with limited commentary connected to recycled products.
	Coca-Cola	Neutral	55USD	Increasing use of recyclable PET but majority of portfolio is still sold in PET bottles.
	Coca-Cola Hellenic Bottling Company SA	Buy	3050GBX	Rising costs (PET is the third largest part of COGS) and reputational pressure. We do not expect a material impact on the stock for the next 12 months.
	Colgate India	Neutral	1600INR	High packaging cost as a proportion of raw material costs. Therefore increase in packaging costs would likely require significant increase in consumer prices.
	FP Corp	Neutral	6500JPY	FP Corporation is working to make plastic packaging lighter and the company collects and recycles PET bottles, but trends that reduce demand for plastics are negative for FP.
	Pepsico Inc	Neutral	139USD	US portfolio most exposed to plastics among US Beverage peers.
	Seven & I Holdings	Buy	4500JPY	Heavy plastic packaging and plastic shopping bag use. Has plans in place to address more environmentally sensitive options.
	Unilever NV	Neutral	54EUR	Packaging exposure. Efforts to mitigate: investment in new packaging formats; management compensation linked to ESG factors.
	Unilever Plc	Neutral	4850GBX	Packaging exposure. Efforts to mitigate: investment in new packaging formats; management compensation linked to ESG factors.
Paper & Packaging	Amcor Limited	Neutral	15.55AUD	Amcor is one of the world's largest PET-based packaging companies. Key end markets include food (45% of sales), beverage (22%), healthcare (12%), home/ personal products (5%). Amcor has pledged to have 100% of its products capable of being recyclable by 2025. In fact, nearly all of its rigid beverage packaging already meets this target. The company is currently working with global brand owners to increase the recyclability of its flexible packaging food product range, where the trade-off may be lower product shelf-life given reduced packaging barrier properties.
Capital Goods	GEA Group	Neutral	24.2EUR	Skew to plastic – no paper packaging.
	Krones	Neutral	53EUR	Skew to plastic – no paper packaging.
Chemicals	Dow Inc.	Buy	56USD	Revenue exposures: ~60% silicones, polyurethane formulations & ingredients, and ethoxylates, with the remaining ~40% polyethylene plastics/films. We do not expect a material impact on the stock for the next 12 months.
	Formosa Petrochemical Corporation	Sell	90.5TWD	Upstream petrochemical producer and oil refiner.
	Formosa Chemicals & Fibre	Sell	78TWD	Polyester intermediate producer.
	Lotte Chemical	Buy	287000KRW	Pure play commodity petrochemical producer. We do not expect a material impact on the stock for the next 12 months.
	LyondellBasell Industries	Neutral	93USD	Revenue exposures: ~65% polyethylene & polypropylene.
	Westlake Chemical Corp	Sell	50USD	Revenue exposures: ~20% polyethylene and ~80% vinyls (& chlorine co-product caustic).
Oil & Gas	Sasol	Neutral	32000ZAX	The most heavily geared to chemicals and plastics in our coverage.

Source: UBS, Price date is the closing price of 16 October 2019. This list of securities contains stocks that may be impacted by a specific scenario. The scenario described herein may play out over a 3-5 year period whereas the base-case view of UBS equity analysts is based on the next 12 months. Any reference to current rating is to the rating given in the latest published UBS research report relating to the relevant company. Such reports are available on UBS Neo.

Figure 34: Stocks potentially unlikely to be impacted by the theme

Sector	Stock	Rating	PT	Comments
Consumer Staples	Brown-Forman Corp.	Neutral	60USD	Least exposed to plastic.
	Constellation Brands Inc.	Neutral	206USD	Plastic is a relatively small portion of packaging but making good progress reducing it further.
	Diageo	Buy	3750GBX	Plastic is a relatively small portion of COGS but making good progress reducing it further.
	Kao	Buy	10200JPY	Kao has established a team under the company president to address ESG issues, and set numerical targets for lowering environmental impact. The company clearly discloses measures aimed at achieving goals and information about progress towards meeting them.
	Kirin Holdings	Buy	2900JPY	Biggest segment is beer (typically in glass bottles or cans); soft drinks business is third largest segment, and 4th/5th market share in Japan.
	Molson Coors Brewing Company	Buy	71USD	Introduced new plastics strategy in 2019. Targets 100% of packaging will be either reusable, recyclable, compostable or biodegradable while using at least 30% of recycled content in plastics packaging by 2025.
	Mondelez	Buy	62USD	Resins are a lower % of COGS mix vs HPC group.
	Monster Beverage	Sell	52USD	Limited exposure to plastic – actively reducing plastic volume in Hydro bottles.
	Nomad	Buy	25USD	More exposed to corrugate than resins.
Paper & Packaging	UPM-Kymmene OYJ	Buy	29.5EUR	Limited exposure to packaging.
Chemicals	Kuraray	Buy	1600JPY	Some exposure to packaging, but the sales growth of its biomass-derived biodegradable plastic should offset it. Company expects PLANTIC (biomass-derived biodegradable plastic) sales topping $100m in 2026 and aims for a 20% OP margin in the business.
	LG Chemical	Buy	427000KRW	Relatively, one of the better positioned commodity petrochemicals businesses in Asia and diversified into other business lines. A top 3 global EV battery producer reaching an earning inflection point.
	SK Innovation	Buy	225000KRW	Relatively, one of the better positioned commodity petrochemicals businesses in Asia and diversified into other business lines. Established EV battery materials producer aggressively moving into EV battery.
Oil & Gas	GAIL	Sell	140INR	Minimal plastics exposure as % to earnings.
	Indian Oil	Buy	200INR	Limited plastics exposure (PE and PP are 3% of total refining capacity).
	Mangalore Refinery & Petrochemical	Neutral	68INR	Limited plastics exposure (PE and PP are 3% of total refining capacity).
	Reliance Industries	Buy	1500INR	Limited plastics exposure (PE and PP are 8% of total refining capacity).

Source: UBS, Price date is the closing price of 16 October 2019. This list of securities contains stocks that may be impacted by a specific scenario. The scenario described herein may play out over a 3-5 year period whereas the base-case view of UBS equity analysts is based on the next 12 months. Any reference to current rating is to the rating given in the latest published UBS research report relating to the relevant company. Such reports are available on UBS Neo.

European Consumer Staples

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

It is likely to be materially negative if plastics were banned outright and quickly; but more manageable if regulations were tightened gradually and focused on a 'circular economy' rather than an outright ban. The industry is making progress on switching into a 'circular economy' where the emphasis is on using recycled and recyclable materials. In some cases, alternative materials or reusable packaging is also being explored. This is opening up new competitive advantages to companies that invest in sustainability.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

Growth: We think a focus on sustainability will drive differentiation in sales growth rates, with companies that lead on sustainable packaging outperforming the laggards. For instance, consumers might reduce their consumption of some products (e.g. bottled water) or switch into more sustainable alternatives (e.g. products with refillable bottles). Companies that provide solutions are likely to win market share.

Margins: The sector is already increasing its investment into new forms of packaging, but a gradual shift is allowing them to manage the costs associated with this investment. However, a complete ban on single-use plastics and/or the enforcement of a quick switch could put significant pressure on margins. We also note that even in the event of a phased introduction, there could be some pressure for categories such as beverages where margins are typically higher on smaller single-serve bottles than larger pack formats.

We estimate that plastic packaging accounts for 10-20% of our companies' COGS.

ROIC: Investment into facilities that can handle new forms of packaging is likely to have a negative impact on ROIC short term. If this investment results in market share gains, then it might be beneficial for long-term returns.

Valuation: Investors' focus on ESG is increasing; and consumer preferences are shifting. As such, we think companies that are not doing enough to address the plastics issue will be adversely affected.

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

The industry's focus so far has been on establishing a circular economy: using more recycled and recyclable plastics. Some companies are also increasing R&D in the development of alternative materials (e.g. Nestlé Institute of Packaging Science); promoting the usage of refillable containers (e.g. Unilever, Nestlé); in-home water systems to replace single-use water bottles (e.g. Danone, Nestlé); and including sustainability targets in management compensation plans.

STOCK IMPACT

Q: Which stocks are better/less favorably positioned in this scenario?

We think Nestlé and Danone look more exposed in a complete-ban scenario owing to their bottled water businesses (plus their significant exposure to other single-use packaging, which is not always recyclable due to food contamination). But in a scenario where the shift is more gradual (probably more realistic), we think they screen more favourably vs peers considering their significant investment in recent years.

STOCKS MOST FAVOURED BY THE THEME

Stock	UBS rating	Comment
Anheuser Busch Inbev	Neutral	Strong presence in returnable glass formats, investing in environmentally friendly pack formats.

STOCKS LEAST FAVOURED BY THE THEME

Stock	UBS rating	Comment
Beiersdorf	Sell	In our view, the company is lagging its peers in responding to the change.
Coca-Cola Hellenic	Buy	Rising costs (PET is the third-largest part of COGS) and reputational pressure. We do not expect a material impact for the next 12 months.
Unilever	Neutral	Investment in new packaging formats; Management compensation linked to ESG.

STOCKS UNLIKELY TO BE IMPACTED BY THE THEME

Stock	UBS rating	Comment
Diageo	Buy	Plastic is a relatively small portion of COGS but making good progress reducing it further.

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U.S. Consumer Staples

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

It is likely to be a negative cost headwind near term, especially if the decline in usage were from an outright ban vs a slower-adoption phase-in. Broadly, US Staples companies are taking proactive measures to shift packaging to recycled or recyclable materials. That said, present day, the majority of Staples companies rely on plastics for packaging. We estimate that resins and plastics account for ~10% of our average HPC companies' cost of goods.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

Growth: With US consumers focused on sustainability and purpose-driven brands, a phase-out of plastics could be a differentiator for first-wave adopters. HPC companies with limited plastics usage could benefit from improved customer perception.

Margins: A quick ban or consumer shift could signify significant supply chain disruption, research & testing costs for replacement product options, and/or higher potential replacement costs. In the event of a sudden, complete-ban scenario, this would negatively impact margins, ROIC, and Staples companies' valuations, at least short term. We note that even in the event of a phased introduction there could be some pressure for categories such as beverages where margins are typically higher on single-serve formats than large pack formats.

ROIC: Investment into facilities that can handle new forms of packaging is likely to have a negative impact on ROIC short term. If this investment results in market share gains, then it might be beneficial for long-term returns.

Valuation: Investors' focus on ESG is increasing; and consumer preferences are shifting. As such, we think companies that are not doing enough to address the plastics issue will be adversely affected.

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

US Staples companies have talked about this trend in the context of increasing the percentage of recycled materials used in packaging. Unlike some of the European Staples companies, the US ones have not discussed increasing R&D in the development of alternative materials. We think these are initiatives that could be to come.

STOCK IMPACT

Q: Which stocks are better/less favourably positioned in this scenario?

Companies with the most plastics as a % of sales include Clorox, Church & Dwight, Procter & Gamble, and Colgate. The least exposed are US Food companies, which are exposed to resin inputs on a lower relative basis.

	Stock	UBS rating	Comment
STOCKS MOST FAVOURED BY THE THEME	NA.		

	Stock	UBS rating	Comment
STOCKS LEAST FAVOURED BY THE THEME	Church & Dwight	Neutral	High plastics exposure as a % of sales given its packaged product costs.
	Clorox	Sell	Plastics as a % of COGS are ~15% (UBSe) with limited commentary connected to recycled products.

	Stock	UBS rating	Comment
STOCKS UNLIKELY TO BE IMPACTED BY THE THEME	Mondelez	Buy	Pure-play in global Snacks. Resins are a lower % of COGS mix vs HPC group.
	Nomad	Buy	Pure-play Frozen Foods company; more exposed to corrugate than resins.

Steven Strycula, Analyst steven.strycula@ubs.com +1 212 713 1428

U.S. Beverages

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

Shift to aluminium packaging will likely accelerate in markets like the US where there is not the same level of municipal infrastructure found in developed European markets. We believe significant changes to plastics regulation would likely have negative implications for US Beverage company supply chains. Relative to US soft drinks companies, we see US alcohol companies as less exposed to incremental plastics regulation. Many US Beverage companies are aggressively working towards increasing recyclability of plastics as well as improving recollection infrastructure across markets.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

Growth: The increasing number of consumers turning to environmentally sustainable products should drive incremental investments in new packaging capabilities. Companies should be inclined to launch new products in sustainable packaging while traditional packaging faces a natural deceleration. Within beverages, we see a relatively higher rate of growth in aluminium packaging over PET, especially in markets like the US.

Margins: Implementation of plastics regulations would be a net hit to margins. That said, a gradual rollout of regulations could provide companies with flexibility to adjust to sustainable practices mitigating full absorption of added costs. Moderating aluminium prices should accelerate the shift away from PET. Emphasis on transaction-led growth is driving a change in packaging mix already. Increasing use of small bottles/cans in the overall portfolio mix is likely positive to margin mix given relative higher price point more than offsets packaging cost.

ROIC: Small cans are growing at a significantly higher rate than other packages which is driving incremental investments in packaging infrastructure – large PET packs are in decline. We think companies are likely to continue to adjust supply chains leading to lower ROIC in the short/medium term. The key profitability implications likely come down to the capacity constraints in aluminium canning given increased demand and the relative pricing between cans and PET formats. We are of the view that the relative price gaps will narrow as consumers become more willing to pay a premium for packaging perceived to be more sustainable.

Valuation: Investor focus on ESG is increasing while consumer preferences are shifting. As such, we believe companies that fail to proactively address the plastics issue will be adversely affected.

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

US companies are increasingly moving towards sustainable packaging with the aim to increase use of recyclable plastics. KO and PEP outlined long-term targets to increase usage of recyclable packaging. Companies are partnering to share technology to reduce reliance on petroleum-based PET.

STOCK IMPACT

Q: Which stocks are better/less favorably positioned in this scenario?

We see KO and PEP as most exposed to changing plastics regulations. In the US, PEP is most exposed with ~75% of total beverage portfolio in PET form followed by KO (63%) and KDP (59%).

STOCKS MOST FAVOURED BY THE THEME

Stock	UBS rating	Comment
NA		

STOCKS LEAST FAVOURED BY THE THEME

Stock	UBS rating	Comment
Coca-Cola	Neutral	Increasing use of recyclable PET but majority of portfolio is still sold in PET bottles.
Pepsico Inc.	Neutral	US portfolio most exposed to plastics among US Beverage peers.

STOCKS UNLIKELY TO BE IMPACTED BY THE THEME

Stock	UBS rating	Comment
Brown-Forman Corp.	Neutral	Least exposed to plastic.
Constellation Brands Inc.	Neutral	Plastic is a relatively small portion of COGS but making good progress reducing it further.
Molson Coors Brewing Company	Buy	Introduced new plastics strategy in 2019. Targets 100% of packaging will be either reusable, recyclable, compostable or biodegradable while using at least 30% of recycled content in plastics packaging by 2025.
Monster Beverage	Sell	Limited exposure to plastic – actively reducing plastic volume in Hydro bottles.

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Japan Consumer (Retail, Food, Toiletries and Small cap)

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

Following inclusion of the Osaka Blue Ocean Vision in the summit declaration of the 2019 G20 meeting, which calls for an end to all new plastic pollution in the oceans by 2050, regulations banning free distribution of plastic bags at cash registers in Japan are now being discussed. We expect Japan's consumer-oriented industries to pursue a rethinking of use of plastic packaging such as plastic shopping bags and PET bottles.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

For Japan's consumer industries, reducing use of plastics could increase costs, but we expect the impact on profits to be limited if companies can proceed in line with technological advances and customer needs.

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

Retail: Japan's major retailers are becoming increasingly aware of sustainable development goals and they have begun to respond to calls for a reduction in plastics use. Small and medium-sized retailers may not necessarily have responded, however, which could cause differences of perception between consumers and the equity markets.

Foods: Japan's food and beverage makers have responded by promoting PET bottle recycling, reducing use of one-way plastics or switching to alternatives, and making lighter-weight PET bottles. Companies are also considering introduction of PET resins made from non-edible plant sources for bottles.

Toiletries: In the toiletries industry, awareness of the need to reduce packaging is increasing and the number of companies announcing concrete measures to investors is growing. Efforts to achieve sustainable development goals and progress towards those goals are increasingly being discussed when companies announce quarterly results. Toiletries companies appear to have more room to improve than cosmetics makers when it comes to lessening environmental impact. We will continue to monitor their contributions.

Food packaging: Among Japan's food container makers, FP Corporation is developing new plastic containers that are lighter and thinner in an attempt to reduce plastics consumption. The company also recovers PET bottles and recycles these at its own plants.

STOCK IMPACT

Q: Which stocks are better/less favorably positioned in this scenario?

Retail: Seven & I Holdings (3382JP), Japan's largest retailer, is highly exposed to food retailing, mainly through its CVS operations, consuming large quantities of plastic packaging and shopping bags, but the company is sensitive to environmental protection issues. The company is working to reduce its plastics consumption and has set itself long-term goals for 2030 and 2050. Since 2012, the company has placed automated PET bottle collection machines in its stores as part of a customer participation-based circular economy practice. Fast Retailing (9983JP) and other important specialist retailers increasingly have stopped providing plastic shopping bags or started charging for them.

Foods: In Japan's food and beverage industry, Kirin Holdings (2503JP) and Asahi Group Holdings (2502JP) and others are actively trying to use plastics less and to participate in resource recycling.

Toiletries: In a packaging declaration, Kao (4452JP) annually reports on the progress of efforts that draw on the company's materials technologies and its container design technologies to develop new containers and decrease plastics use. The company has announced a goal of 300m rolls of a revolutionary new food packaging film annually by 2030. Lion (4912JP) has announced new environmental goals including a doubling of its use of recycled plastics or biomass plastics from 2017 levels by 2050.

Food packaging: Efforts in the retail and foods industries to reduce use of plastic packaging and to develop and foster use of alternative materials for packaging is likely to be negative for FP Corporation.

STOCKS MOST FAVOURED BY THE THEME

Stock	UBS rating	Comment
NA		

STOCKS LEAST FAVOURED BY THE THEME

Stock	UBS rating	Comment
FP Corp	Neutral	FP Corporation is working to make plastic packaging lighter and the company collects and recycles PET bottles, but trends that reduce demand for plastics are negative for FP.
Seven & I Holdings	Buy	The company uses a lot of plastic packaging and plastic shopping bags, mainly in its CVS operations, but is at the same time sensitive to environmental protection issues. The company has set long-term goals and is working towards those goals.

	Stock	UBS rating	Comment
STOCKS UNLIKELY TO BE IMPACTED BY THE THEME	Kao	Buy	Kao has established a specialised organisation focused on environmental, social, and governance issues directly under the company president and set numerical targets for lowering environmental impact. The company clearly discloses measures aimed at achieving goals and information about progress towards meeting them.
	Kirin Holdings	Buy	In addition to active efforts to reduce plastics use and to promote resource recycling, the company has taken a proactive stance with investors, for example by hosting seminars on subjects such as CSV-based growth strategies.

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Indian Consumer

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

Plastic is used primarily for packaging in the Indian consumer sector. Therefore, any changes in plastic usage norms would need companies to relook at how they present themselves to consumers. We believe the first step in this regard would be to reduce the quantity of plastic used in packaging and use higher quality recyclable materials.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

Consumer companies in India have high bargaining power with suppliers given the relative sizes of the two entities. Therefore any incremental capital expenses that would need to be made would be borne by the suppliers. However, this could mean inflation in cost of materials used. If plastic usage is restricted in a phased manner, we believe the companies should be able to pass on such increased costs to the consumers.

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

The readiness of the industry will depend on the timing and severity of the disruption. If the disruption happens in a phased manner with clear guidelines on standards and timelines for adhering to them, we believe most of the industry participants would be able adapt to it. However, if there is a sudden disruption due to regulatory or other reasons, we could see significantly different readiness for different industry players.

STOCK IMPACT

Q: Which stocks are better/less favourably positioned in this scenario?

We believe the larger companies with more bargaining power with suppliers and large premium portfolios which are relatively less sensitive to consumer price increases are more favourably positioned in this scenario. Therefore we see Nestle India, HUL and Dabur as best positioned to navigate any disruption. Interestingly these three companies have already started committing to this cause as seen below.

STOCKS MOST FAVOURED BY THE THEME

Stock	UBS rating	Comment
Dabur	Buy	Partnering with government agencies to help collect and recycle multi-layered plastic covering eight states in India.
Hindustan Unilever	Neutral	Committed to make all its plastic packaging fully reusable, recyclable or compostable by 2025.
Nestle India	Buy	Nestle India aims for 100% recyclable or reusable packaging by 2025.

STOCKS LEAST FAVOURED BY THE THEME

Stock	UBS rating	Comment
Colgate India	Neutral	High packaging cost as a proportion of raw material costs. Therefore an increase in packaging costs would likely require a significant increase in consumer prices.

STOCKS UNLIKELY TO BE IMPACTED BY THE THEME

Stock	UBS rating	Comment
NA		

Q: Further information

Steps being taken by various consumer companies to prepare for a 'less plastic' future:

Nestle India: Nestle India is moving to mono-material packaging (easier to recycle) from multi-layered packaging previously. Also collecting and recycling 6,000 tonnes of plastic and running an integrated media campaign in the northern hill-stations around waste management.

HUL: In FY19, HUL processed approximately 15,000 tonnes of plastic waste and converted it into electricity. Additionally, approximately 5,000 tonnes of post-consumer use plastic waste was collected by HUL with the help of NGOs and EPR partners and sent for energy recovery.

Dabur: In FY19, Dabur has collected and recycled/processed nearly 4,000 MT of post-consumer plastic waste, which is around 20% of its plastic waste generation. This initiative, which was rolled out in six states in FY19, is now being extended to cover 25 states across India.

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European Paper & Packaging

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

In order to respond to the demand pull, we think the industry would need to invest in new production capacity as well as R&D resources in order to intensify the development of plastic-free products (e.g. coffee cups without a plastic barrier). We note that changing legislation, building new machines (switching from plastic to paper) and investing in new paper capacity will take time and that any meaningful impact on growth and earnings is still many years out, in our view. Nevertheless, we do believe this could be a trend that should support paper-based packaging producers' future growth, and we are already seeing signs of brand owners investigating substitution opportunities (e.g. within fresh food packaging). In our view, there are many different areas of potential substitution, including coffee cups, food trays, shopping bags, clothing packaging in e-commerce, food packaging in general as well as PET bottles, to name a few.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

Following capacity investments, volume growth should pick up significantly, although margins and capital returns might not necessarily change that much. Also, once this becomes evident in the figures, we believe valuations of the shares should increase due to improved longer-term growth profile.

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

The companies are talking about this trend and are developing new products, although not yet investing in the operations to any significant extent. One area where this trend has already become evident is for shopping bags (e.g. plastic bags in grocery being banned), where Mondi is enjoying strong growth and also investing in more capacity to feed the increased demand. In general, we believe companies in the paper packaging sector are pushing for the substitution but still awaiting brand owner decisions/changes in legislation before going ahead with their own investments.

STOCK IMPACT

Q: Which stocks are better/less favourably positioned in this scenario?

In terms of exposures, we note that Mondi is the global leader in sack kraft papers, which are used to produce shopping bags. Smurfit Kappa Group (SKG) and DS Smith are the largest corrugated box producers in Europe (e.g. food packaging, e-commerce) while Metsa Board and Stora Enso are both large in carton board (coffee cups, food trays and food packaging). The pecking order below is in relation to positioning to the plastics substitution theme and is not representative of our sector view as a whole.

STOCKS MOST FAVOURED BY THE THEME	Stock	UBS rating	Comment
	DS Smith	Neutral	Second-largest corrugated box producer in Europe.
	Mondi	Buy	Largest sack kraft paper producer globally.
	Smurfit Kappa Group	Buy	Largest corrugated box producer in Europe.

STOCKS LEAST FAVOURED BY THE THEME	Stock	UBS rating	Comment
	NA		

STOCKS UNLIKELY TO BE IMPACTED BY THE THEME	Stock	UBS rating	Comment
	UPM-Kymmene	Buy	Limited exposure to packaging.

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Australian Industrial Materials

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

The Australian packaging sector includes Amcor (AMC.AX) and Orora (ORA.AX). Amcor is one of the world's leading PET packaging converters with exposure to both rigid and flexible packaging products across the food, beverage, home products and health care sectors. Orora is primarily exposed to the Australasian beverage market where it is a leading player in the glass/can packaging market.

We think one possible outcome of the community focus on plastic waste could be an increase in regional regulation around extended producer responsibility schemes. We see these schemes as a means by which PET products are subject to a "tax" that could subsidise increased investment in PET recycling infrastructure stimulating increased rates of PET recycling and community awareness campaigns around recycling/litter/marine waste. We note that it is likely any such additional cost per unit would be passed through to the end consumer.

We also expect the global PET producers and converters to continue to play an active role in R&D initiatives aimed at supporting brand owners and their sustainability targets around increasing the levels of rPET in packaging products. As it stands, a significant proportion of Amcor's PET rigids/flexibles PET product range is already recyclable, however reliable supply of rPET is still an issue that needs to be resolved with further investment in global recycling industries.

In the near term, we see beverage PET to glass/can substitution as an ongoing theme given current shifts in consumer preferences. However, we note this sustainability focus may not fully consider the relative carbon footprints attached to the production/transportation of glass bottles and aluminium cans relative to light-weight PET packaging.

In order to respond to increased demand for glass/can/fibre packaging, the global packaging industry would need to invest in new production capacity as well as R&D to accelerate the development of plastic-free products (e.g. compostable bio-packaging). We think that changing legislation, building new machines (switching from plastic to paper/cans) and investing in new paper/can capacity will take time and that any meaningful impact on growth and earnings is still many years out.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

Food (~50%) and beverage (~20%) account for the majority of plastic packaging. Plastic became popular because of its characteristics: lightweight (lower transportation costs and lower carbon footprint), strength (doesn't break/shatter), versatility (can be modelled into different shapes and sizes), reduces food waste (extends shelf life). Product responsibility in addressing the issue of plastic waste and environmental impact of plastics could be key in driving investor sentiment for many of the packaging companies. Sustainability has become one of the most discussed topics in the Paper & Packaging sector over the past year. The aluminium (can) is viewed as the most likely beneficiary of this trend.

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

While the aluminium can is viewed as the likely prime beneficiary of any shift away from plastics, the BevCan industry is probably not positioned to accommodate a large shift to cans in the near term given current industry capacity utilisation. Growth has recently accelerated as additional beverage lines/brands are introduced in cans. While it is widely accepted that the food end-market will be less impacted because of the role of plastic-based packaging in preventing food waste, the beverage market seems to present a wider range of opportunities and threats. PET water bottles are one of the largest PET product categories and this is an area primed for competition from cans (particularly sparkling) in our view. The global beverage can market is fairly tight right now and producers are expanding capacity in order to meet existing growing demand. This doesn't include a shift from PET water bottles to cans, so any small shift in water substrate substitution would likely be significant for the can industry and would require substantial investments by producers.

STOCK IMPACT

Q: Which stocks are better/less favorably positioned in this scenario?

Aluminium can producers are viewed as the likely prime beneficiaries of the potential decline in plastic use. The prevailing view is that this trend is most positive for aluminium beverage can makers (ORA.AX) followed by paper-based producers (ORA.AX) at the expense of plastic packagers (AMC.AX) because plastic is not viewed as environmentally-friendly due to its low level of recycling rates.

STOCKS MOST FAVOURED BY THE THEME

Stock	UBS rating	Comment
Orora Limited	Neutral	Orora is an Australian manufacturer of fibre-based packaging as well as aluminium cans and glass bottles. The company's packaging products are typically manufactured with relatively high levels of recycled content, partly underpinned by its own recycled paper mill.

STOCKS LEAST FAVOURED BY THE THEME

Stock	UBS rating	Comment
Amcor Limited	Neutral	Amcor is one of the world's largest PET-based packaging companies. Key end markets include food (45% of sales), beverage (22%), healthcare (12%), and home/personal products (5%). Amcor has pledged to have 100% of its products capable of being recyclable by 2025. In fact, nearly all of its rigid beverage packaging already meets this target. The company is currently working with global brand owners to increase the recyclability of its flexible packaging food product range, where the trade-off may be lower product shelf-life given reduced packaging barrier properties.

STOCKS UNLIKELY TO BE IMPACTED BY THE THEME

Stock	UBS rating	Comment
NA		

Q: What else should investors know? / the sector impact in more detail

If the sustainability and PET substrate substitution trend continues, beverage can producers stand to benefit as they are viewed as offering the most sustainable alternative (recycling rates for aluminium cans and paper are estimated to be nearly 50-60% vs. less than 20% for plastics). We have seen acceleration in growth for beverage cans and we think this will likely continue going forward as more new beverage products are introduced in cans. That said, we have yet to see existing products shift away from plastics as plastics still offer the lowest cost per unit amongst the three primary substrates (plastics, cans, glass).

In our view, the biggest opportunity will be in a shift from plastic PET water bottles to cans. Even a small shift would require significant investments from the industry as it is currently capacity-constrained

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European Capital Goods

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

We think the impact on the capital goods sector growth would be neutral overall if the use of PET as a bottling packaging material were to fall materially as a result of tougher regulation or consumer preferences – or both. This is because if demand for PET bottling lines were to fall, it would likely increase for glass, can or carton bottling lines. As we think the value-added of a PET bottling line is higher than for a non-PET bottling line due to the additional element of a stretch-blow moulding machine in a line, the margin impact would likely be negative for suppliers such as Krones. More specifically, Krones generates low triple digit €m in standalone stretch-blow moulding equipment revenues (below 5% of group sales) that carry a 2-3% higher gross margin than the average. We estimate that if hypothetically stretch blow-moulding revenue were to disappear entirely, it would reduce EPS (2018) by 6%.

We think that the quest for plastic alternatives in the beverage industry is likely to have a short-term negative impact on growth for the bottling machinery makers as beverage companies await more clarity on regulation and have to do more R&D on developing potential alternatives or a comprehensive recycling model. We think bottling machinery manufacturers are therefore likely to suffer in the short term but could benefit if they come up with the right plastic alternative solutions or plastic recycling concepts. Paper packaging could be a potential long-term beneficiary and result in more demand for paper machinery in our view.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

Short-term negative impact on growth and margin mix. The long-term growth impact will likely depend on plastics regulation (e.g. recycling or ban) and development of alternatives (e.g. paper packaging).

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

We think that the legacy plastic bottling machinery makers have been taken by surprise by the speed of 'PET shaming' and need to put in greater efforts to come up with economical recycling solutions or plastic alternatives with a better ecological footprint.

STOCK IMPACT

Q: Which stocks are better/less favourably positioned in this scenario?

Valmet (paper packaging machines) and Krones (no carton bottling machines) offer the largest exposure to the theme whereas Alfa Laval and GEA are more marginally impacted relative to Krones given a much lower pure beverage exposure. Krones cut guidance on 10 July. While it still expects 3% sales growth in 2019 (UBSe +3%, consensus +3%), it lowered its EBT margin expectation to around 3% from around 6% (UBSe 6.0%, consensus 4.9%). The sharp reduction in EBIT guidance was due to underutilisation in high value-added products such a PET stretch-blow moulding machines, high material and wage costs, and weak service business.

STOCKS MOST FAVOURED BY THE THEME	Stock	UBS rating	Comment
	Alfa Laval	Neutral	Skew to carton packaging.
	Valmet	Neutral	Paper packaging machinery maker.

STOCKS LEAST FAVOURED BY THE THEME	Stock	UBS rating	Comment
	GEA Group	Neutral	Skew to plastic – no paper packaging.
	Krones	Neutral	Skew to plastic – no paper packaging.

STOCKS UNLIKELY TO BE IMPACTED BY THE THEME	Stock	UBS rating	Comment
	NA		

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Global Chemicals

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

Single-use plastics represent a relatively small percentage of total plastics consumption for the sector. We believe growth in higher valued specialty plastics should be unaffected by near-term culture shifts as these products enable other secular trends (e.g. lightweighting/electric vehicles). However, demand for more commodity plastics could be impacted by a combination of reduced single-use plastic demand, and changes in consumer purchasing trends (e.g. plastic packaging/films). The major commodity plastics production in our coverage are polyethylene (used more in consumables), polypropylene (more in durables), and vinyls (PVC – more in construction). Polyethylene & polypropylene have historically grown at ~1.4x GDP growth (~4-5%/year on average), while vinyls have grown modestly below GDP. Growth outlooks have not changed significantly with increased conversation of regulatory or cultural pressure, but we believe the risk is a lower growth rate, not a significant decline in consumption.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

The industry has typically grown faster than GDP, perhaps growth falls to more GDP-like levels (~100 bps below 20-year growth rate). Producers in our coverage are generally at the low end of industry cost curves (using lower cost gas-linked feedstocks), with product prices generally linked to oil. We believe margins will likely be stable, but could be negatively impacted by an over-build of supply against weaker demand. Lower growth, combined with a more negative perception, could impact longer-term valuations. For the European sector there is no material direct exposure to basic polymers used in packaging but there is some moderate indirect exposure via companies such as BASF, Clariant, Covestro and Croda which sell intermediates (e.g. process catalysts, plastic additives) to polymer producers. On the flip side, we would emphasise that companies such as Corbion, DSM, BASF and private concerns like Genomatica and GC Innovation America (formerly Myriant) have been operating in the plastic replacement/recycling verticals for a while and there are at least nine distinct business models in this area (see page 103 of our Q series report).

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

Larger plastic producers have ramped up efforts to be more involved in either recycling advocacy programs, aiming to use more recycled materials in products, developing bio-based polymers, or more direct involvement/investment in recycling technology/facilities. However, the financial impact of these efforts is relatively small compared to the base plastics business. One of the major challenges in managing plastics is waste collection and compliance. If this were improved, plastics demand growth could be relatively unchanged, and we believe our coverage could be leaders in using recycled feedstock. If there were a much larger scale negative reduction in plastics use, companies could see increased competition due to lower asset utilisations.

STOCK IMPACT

Q: Which stocks are better/less favourably positioned in this scenario?

In terms of our coverage we don't particularly see any winners in a lower plastic consumption scenario. But we believe companies with a greater diversity of products should have more opportunities to optimise product mix to deal with any structural industry changes.

STOCKS MOST FAVOURED BY THE THEME

Stock	UBS rating	Comment
NA		

STOCKS LEAST FAVOURED BY THE THEME

Stock	UBS rating	Comment (% sales)
DOW	Buy	Revenue exposures: ~60% silicones, polyurethane formulations & ingredients, and ethoxylates, with the remaining ~40% polyethylene plastics/films. We do not expect a material impact on the stock for the next 12 months.
LyondellBasell Industries	Neutral	Revenue exposures: ~65% polyethylene & polypropylene
Westlake Chemical Corp	Sell	Revenue exposures: ~20% polyethylene and ~80% vinyls (& chlorine co-product caustic).

STOCKS UNLIKELY TO BE IMPACTED BY THE THEME

Stock	UBS rating	Comment
Kuraray	Buy	Some exposure to packaging, but the sales growth of its biomass-derived biodegradable plastic should offset it. The company expects PLANTIC (biomass-derived biodegradable plastic) sales to top $100m in 2026 and aims for a 20% OP margin in the business.

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APAC Commodity Petrochemical

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

We think APAC commodity petrochemical companies will likely be the most negatively impacted sector if plastic demand growth is structurally lower. First, APAC chemical companies use oil-based feedstock (naphtha) and this puts them at the high end of the global cost curve. Second, these companies are largely undiversified with at least half of earnings coming from the plastics that we believe could be impacted.

We estimate that the aggregate 2020-30 industry utilisation for impacted plastics (PE, PP, PS, PVC and PET) could be as much as one percentage point lower at 84.1% and growth rate 300 bps lower at 3.8%. In our view, the industry could face a double-dip downcycle prior to adjusting to structurally lower growth rates.

On average large scale petrochemical facilities take five years from final investment decision (FID) to commercial operation. We do not expect the industry to adjust investment to structurally lower growth rates until there is clear evidence that per capita plastic consumption in OECD countries is either stabilising or slowing. We expect this to occur in 2022, but believe it could take several years of hard data before companies start slowing investment and or/shelving existing plans. We think this could lead to at least a five-year period where there is a mismatch between global supply and demand growth.

In our view this could occur in between 2022-2027. During this unexpected prolonged downcycle, we believe that global high cost producers could permanently close capacity. We believe sub-scale oil-based petrochemical producers in Japan and Europe would likely be the most at risk of closure. China's unconventional largely coal-based petrochemical producers could also see closures. However, the economics of these projects have always been unclear, and closures would more likely require a policy shift by the central government.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

We estimate that both margins and returns will come under pressure from 2022-2027. We think some plastics could see 20-year lows in terms of utilisation rates. Nonetheless, once the industry adjusts to lower growth rates and appropriately sizes investments decisions, we believe the underlying cyclicality of the industry should continue.

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

The industry is well aware of the continuous headlines that largely originate from OECD counties. However, 90% of global incremental demand growth is coming from developed countries with China accounting for almost half of global growth. Per capita plastic consumption in these countries is still 50-80% below OECD countries. Structural demand drivers such as the migration of food trade from open air markets to organised trade in packaging0intensive supermarkets continues to accelerate. Additionally, online shopping and the growing online take-out service trend in both developing and developed economies are seen as being supportive to long-term demand growth.

At the same time, the industry is aware that investor concerns about unsustainable plastic consumption are rising. We have seen small scale green M&A and pilot production for green plastics. Very limited R&D into green plastics gives a more accurate picture of corporate urgency to develop green solutions.

STOCK IMPACT

Q: Which stocks are better/less favorably positioned in this scenario?

In APAC we believe the best positioned companies are those that have combined chemical expertise and upcycle cash flows to move into EV batteries and EV battery materials.

STOCKS MOST FAVOURED BY THE THEME

Stock	UBS rating	Comment
NA		

STOCKS LEAST FAVOURED BY THE THEME

Stock	UBS rating	Comment
Formosa Petrochemical Corporation	Sell	Upstream petrochemical producer and oil refiner.
Formosa Chemicals & Fibre	Sell	Polyester intermediate producer.
Lotte Chemical	Buy	Pure play commodity petrochemical producer.

STOCKS UNLIKELY TO BE IMPACTED BY THE THEME

Stock	UBS rating	Comment
LG Chemical	Buy	Relatively, one of the better positioned commodity petrochemicals businesses in Asia and diversified into other business lines. A top 3 global EV battery producer reaching an earning inflection point.
SK Innovation	Buy	Relatively, one of the better positioned commodity petrochemicals businesses in Asia and diversified into other business lines. Established EV battery materials producer aggressively moving into EV battery.

Q: Further information

Commodity petrochemical producers in APAC have been more focused on moving towards "value add" plastics as compared to green plastics. In general this would likely include more customised solutions for consumer products. Features could include increased or reduced opacity, rigidity and melting points.

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European Oil & Gas

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

There would likely be a negative but limited impact on the industry. Petrochemicals overall made up ~14% of total oil consumption in 2017 (IEA estimates), and of this figure we estimate that plastics accounted for ~60% of demand (Levi, Cullen 2018). This implies therefore that plastics make up ~8-9% of total oil demand. Substitution out of single-use plastics could also increase the demand for more durable plastics. Therefore the underlying exposure to the most likely regulatory measures to limit plastic use is limited relative to overall crude consumption.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

The financial impact on the industry would likely be generally negative given its position early in the supply chain as a producer of raw/intermediate materials (as opposed to consumption). Petrochemical margins could be impacted although flexibility in the overall supply chain could limit the impact over time.

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

The industry is making meaningful steps to adjust to a more environmentally sustainable market although plastics are a relatively minor aspect of this transition. Direct carbon emissions are a far more significant concern for the industry today, and the industry (particularly companies based in Europe) are increasing exposure to lower-carbon energy sources including natural gas and renewables.

STOCK IMPACT

Q: Which stocks are better/less favorably positioned in this scenario?

Within our coverage Sasol has the most significant exposure to chemicals, particularly following the start-up of its new ethane cracker in the US. Neste, on the other hand, is at the forefront of developing bio-plastics solutions, made from renewable feedstocks. The company is also working on using waste plastics as feedstock for its traditional refining business. Among the European integrateds, Total has the most significant petchem capacity at 21mtpa while ExxonMobil is the largest supermajor globally with 27mtpa.

STOCKS MOST FAVOURED BY THE THEME

Stock	UBS rating	Comment
Neste	Neutral	Leader in the bio-plastics solutions made from renewable feedstocks.

STOCKS LEAST FAVOURED BY THE THEME	Stock	UBS rating	Comment
	Sasol	Neutral	The most heavily geared to chemicals and plastics in our coverage.

STOCKS UNLIKELY TO BE IMPACTED BY THE THEME	Stock	UBS rating	Comment
	NA		

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India Oil & Gas

Impact on sector … **Growth:**  **Margins:**  **ROIC:**  **Valuation:** 

SECTOR IMPACT (1)

Q: What is the likely impact on your industry if regulation or cultural shifts mean a reduction in plastics use?

The Indian government has an ambitious plan to ban all single-use plastics by 2022 – some form of regulations are already in place in a majority of the states. However, there is limited impact on the petrochemicals sector of the country as the major players in the segment like Reliance Industries (RIL), Indian Oil (IOCL) and GAIL India have integrated polymer/polyester manufacturing facilities with a small portion of the product slate being single-use plastics. The majority of single-use plastics are manufactured by small companies, which are already under pressure and even shutting shops in regions where the bans are properly enforced. However, India's per capita per year plastics consumption (11kgs) is much lower compared to the world (China: 45kgs, USA: 109kgs) and will likely continue to grow.

SECTOR IMPACT (2)

Q: What will be the likely financial impact on the industry?

Despite the ban on single-use plastics, PE and PP demand in India has been growing at a CAGR of 6-7% due to low per capita consumption. Also, India was a net importer of PE and PP, however, due to expansion of capacities, India's supply now exceeds the domestic demand and may remain in excess until demand growth offsets it. Hence in the near term, domestic prices look set to remain under pressure due to higher supply addition, affecting the margins.

SECTOR HEALTH CHECK

Q: Is the industry prepared for disruption?

The large petrochemical players are unlikely to be particularly concerned with the ensuing regulations on plastics usage due to their limited exposure to single-use plastics – hence disruption in the organised segment does not seem likely. Also, they are diversifying into high-end specialty chemicals.

STOCK IMPACT

Q: Which stocks are better/less favourably positioned in this scenario?

Indian players with refining-to-petchem integration are well positioned amid any regulations for the plastic industry in our view. Additionally, Reliance with its feedstock diversification and upgrade projects should remain mostly resistant to volatility in the commodity segment. However, MRPL's site suffers from frequent shutdowns and project delays, hence already depressed margins could come under further pressure in the event of plastic ban regulations. Petchem segment for GAIL is exposed to feedstock cost variability.

STOCKS MOST FAVOURED BY THE THEME

Stock	UBS rating	Comment
NA		

	Stock	UBS rating	Comment
STOCKS LEAST FAVOURED BY THE THEME	NA		

	Stock	UBS rating	Comment
STOCKS UNLIKELY TO BE IMPACTED BY THE THEME	GAIL	Sell	Exposure to international gas prices.
	Indian Oil	Buy	Refining-petchem integration.
	Mangalore Refinery & Petrochemical	Neutral	Site suffers from frequent outages, impacting production & margins.
	Reliance Industries	Buy	Enhanced feedstock flexibility, refining-petchem integration.

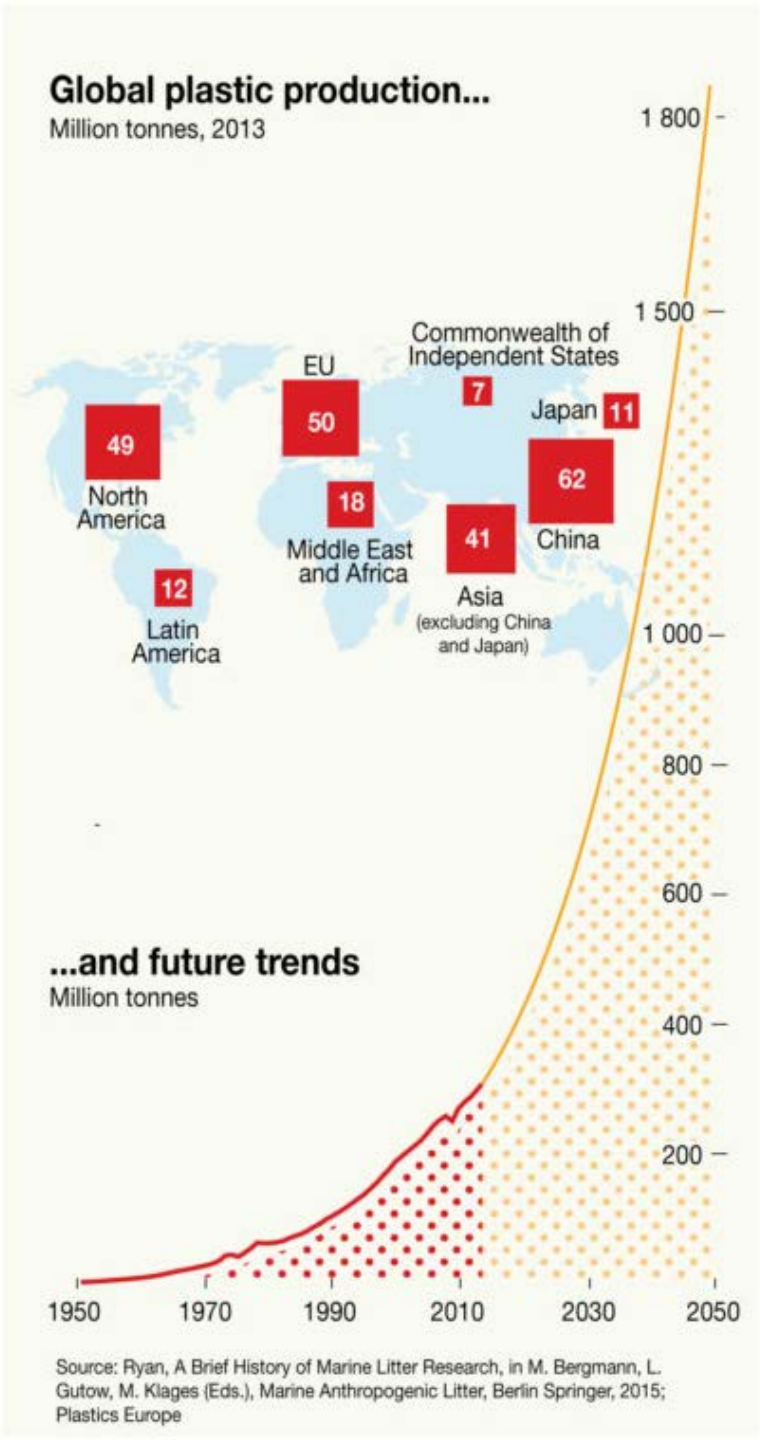
Q: Further information

There still remains confusion among both consumers and retailers over what's banned and what's exempted, and major resistance has come from the All India Plastic Manufacturers Association. However, apart from regulations, significant drivers have been undertaken by Indian Railways, some airlines, a few food delivery apps, as well as international brands to move way from single-use plastic usage. The consumer has become more conscious towards the environmental threat that plastics pose through consumer education programs. For effective compliance, considerable resources would need to be allocated – the Central Pollution Control Board would need to be revamped, and alternatives such as fibre or reinforced paper would need to be subsidised.

Amit Rustagi, Analyst amit.rustagi@ubs.com +91-22-6155-6052

2. Plastic: A *lot* of it…

Figure 35: Global plastic production



Projected global plastics production to 2050

Source: UN Grid Arendal, Maphoto/Riccardo Pravettoni.

According to the OECD, global plastic production was c400m tonnes in 2015, vs 2m tonnes per annum in the 1950s[11], and the MIT Environmental Solutions Initiative refers to cumulatively over 8 billion metric tons of plastic having been manufactured to date.[12] Key end-use sectors include packaging (42% of global plastic use and 146m tons of waste annually)[13], building and construction, automotive, textiles, industrial machinery, consumer and institutional products. Plastic is ubiquitous. It is absolutely everywhere. A quick scan of this analyst's immediate desk area alone results in the following tally:

Floor carpet, telephone, headset and stand, squawk box, at least four charging cables, the desk itself, chair, PC and associated cabling, two monitors, mouse, innumerable plastic pens, plastic folders, pen holder, pencil sharpener, stapler, calculator, scissors, sticky tape, four plastic conference pass holders, gym kit, headache tablet bottle, mini sun cream tube, desk keys with plastic heads, one single-use plastic spoon, footrest, various bits of tech and two plastic mobile phone cases, credit cards, a £5 note, two pairs of headphones, building security pass, a name plate in a plastic stand, recycled plastic reusable carrier bag…and much more.

[11] OECD (2018), Improving Markets for Recycled Plastics: Trends, Prospects and Policy Responses, OECD Publishing, Paris, https://doi.org/10.1787/9789264301016-en, P15. Reproduced with permission.
[12] Plastics & the Environment: The Problem, MIT Environmental Solutions Initiative
[13] P53. Can We Cut Plastics Without Cutting Profits? How the Detergent Market is Working Towards a Clean Sweep, MIT Center for Transportation & Logistics

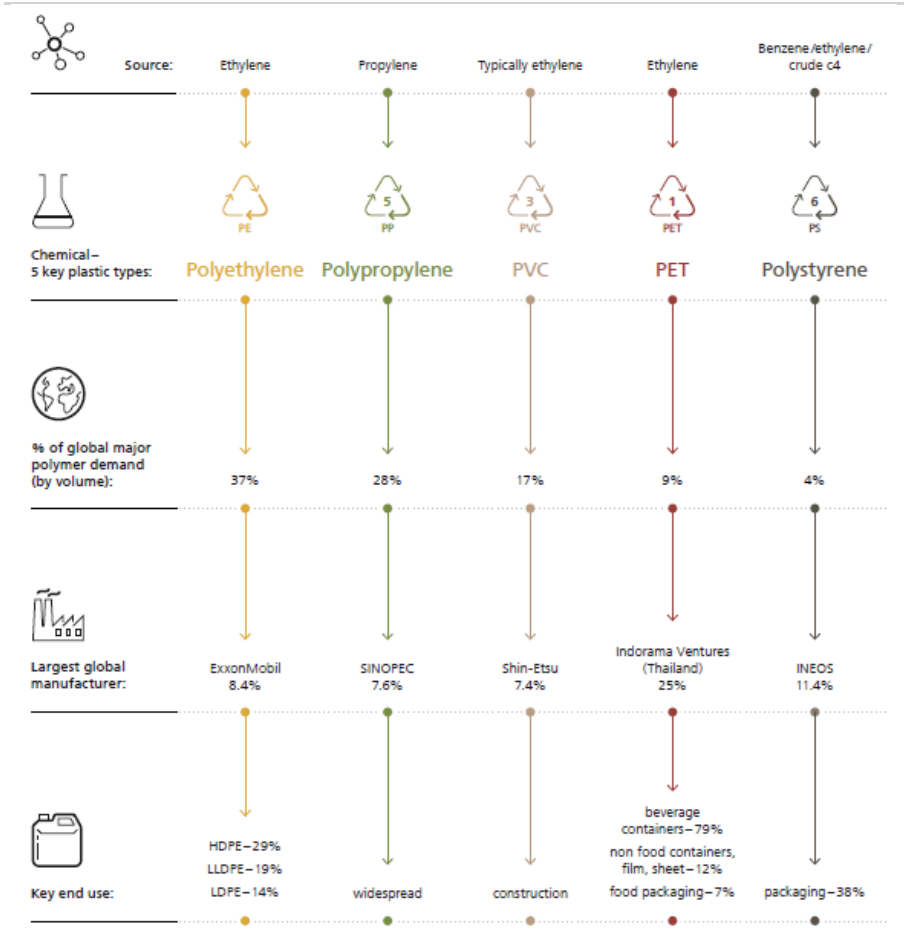
3. What is plastic (and where does it come from)?

A chemistry lesson

"Plastic" is not a single, easily categorised issue. Two key petrochemicals make up the bulk of plastic production, but as you go further down the chain, industry players, types of plastic, and end uses fragment meaningfully.

The vast majority (c99%) of plastic is produced from fossil fuel feedstocks[14] and is petrochemical-derived. The Centre for Environmental Law estimates an over 850m metric ton contribution to greenhouse gas production in 2019 from plastic production and incineration[15].

Figure 36: Five key plastic types represent 85-90%[16] of plastic produced, by weight



Source: IHS Markit, UBS, Indorama Ventures

[14] P1, Fossil fuels & Plastic, Center for International Environment Law, reproduced with permission.
[15] P2, Plastic & Climate: The Hidden Costs of a Plastic Planet, May 2019, www.ciel.org/plasticandclimate
[16] P15, Plastic & Climate: The Hidden Costs of a Plastic Planet, May 2019, www.ciel.org/plasticandclimate

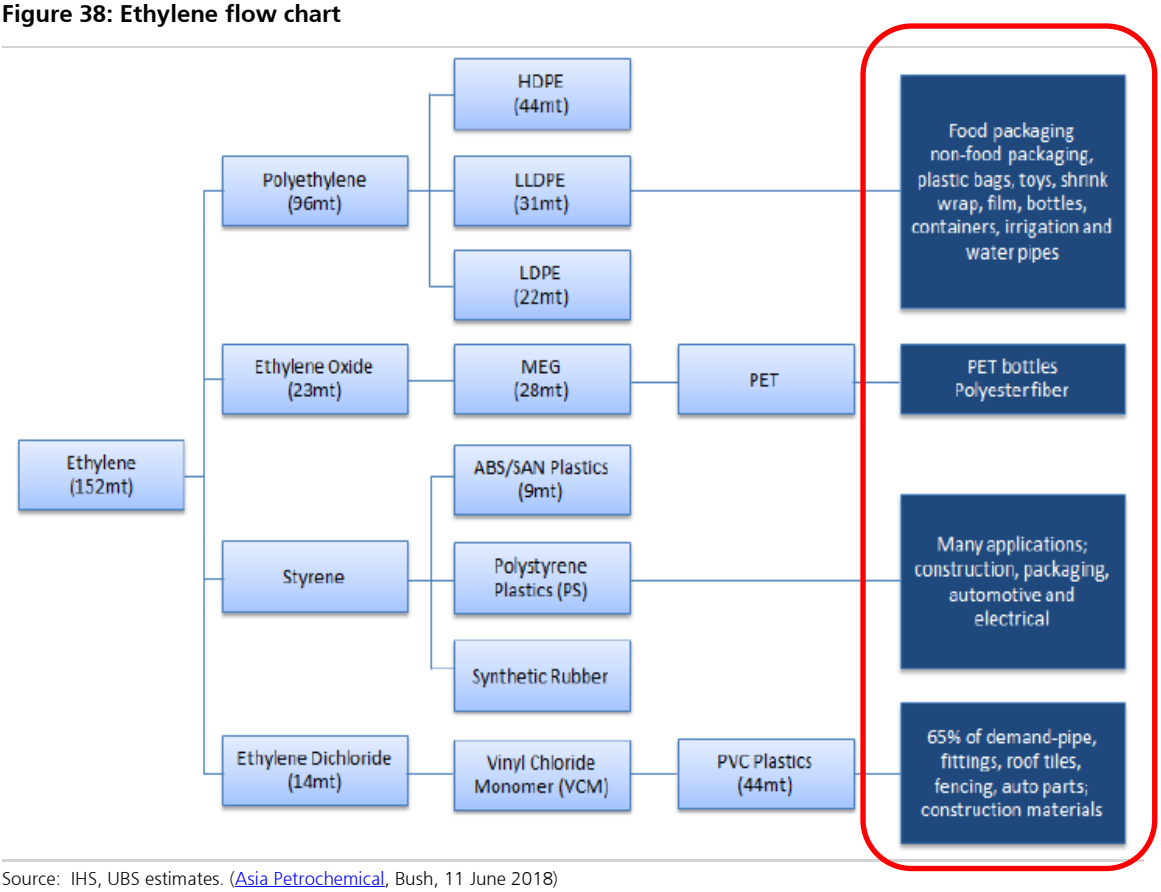
According to IHS Markit, "nondurable or consumable end uses – in particular, packaging – account for more than half of **ethylene** derivative consumption worldwide." [17] Various sources estimate packaging to be the largest single segment of plastic production, followed by construction, textiles, and others.

Figure 37: European plastics demand by end-use segment (2018, Thousand Metric Tons), packaging the largest component

	Packaging	Building & Construction	Automotive	Consumer Goods	Electrical & Electronics	Others	Total
HDPE	2,700	1,500	200	1,500		500	6,400
LD & LLDPE	3,300	1,700		2,600		600	8,200
PP	4,200	300	800	4,300		550	10,150
PVC	550	3,500	200	400	250	300	5,200
PS	800	300		100	200	200	1,600
EPS	350	1,100				50	1,500
PET resins	3,300						3,300
Total	15,200	8,400	1,200	8,900	450	2,200	36,350

Source: IHS Markit, UBS. (North American Paper & Packaging, 4 April 2019)

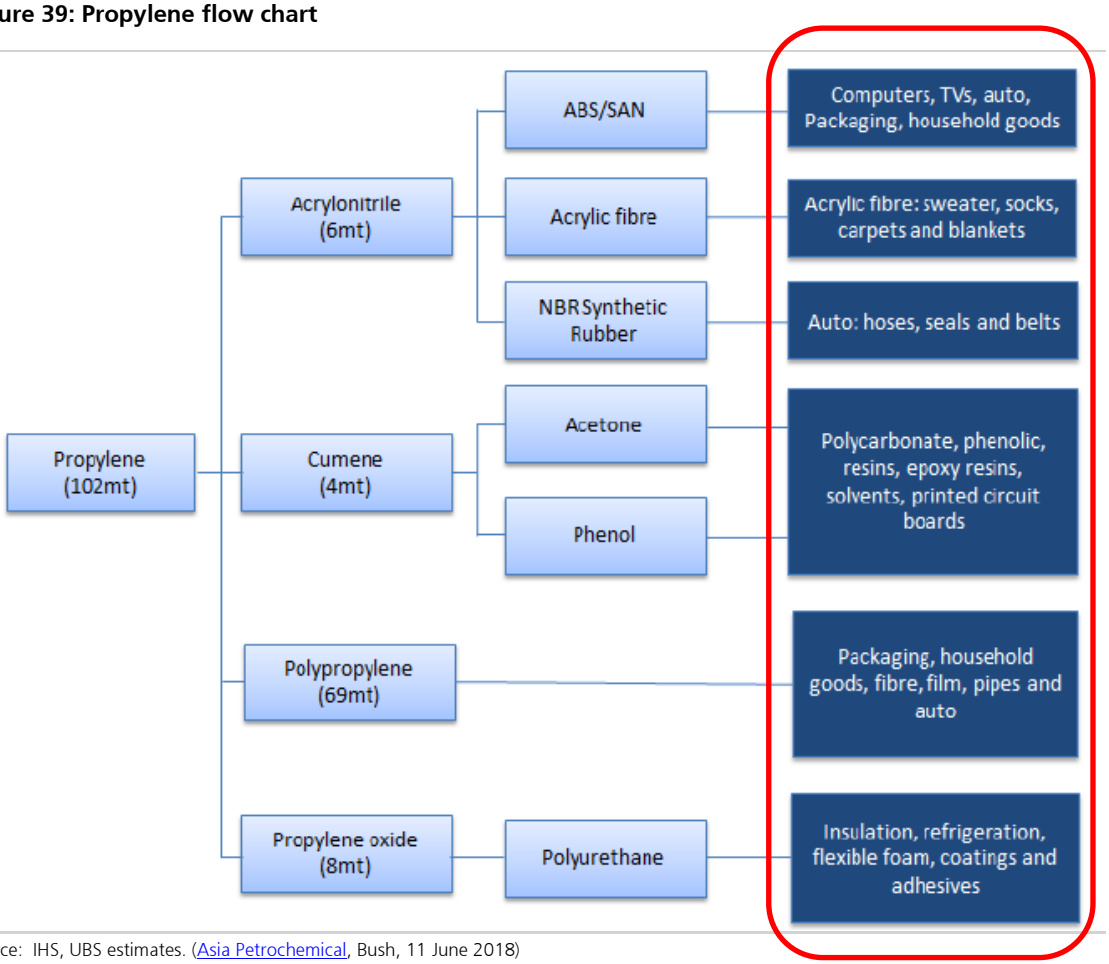
Figure 38: Ethylene flow chart



Source: IHS, UBS estimates. (Asia Petrochemical, Bush, 11 June 2018)

[17] IHS Markit, Chemical Economics Handbook: Ethylene, 15 February 2019, P10

Figure 39: Propylene flow chart



Source: IHS, UBS estimates. (Asia Petrochemical, Bush, 11 June 2018)

5 key plastic types

1. **Polyethylene (62% of total global ethylene consumption[18], 37% of 2018 global major polymer demand[19])** "Sustainability and plastics recycling has continued to take on more focus…single use products, which are under most pressure, make up ~4% of current PE demand."[20] We would also note the probability that a high percentage of the film (particularly the food packaging film) goes towards single-use applications, meaning the 4% single-use number in Figure 40 is likely to be understated.

[18] IHS Markit, Chemical Economics Handbook: Ethylene, 15 February 2019, P10
[19] As per Figure 36
[20] North American Chemicals Industry Primer (Roberts)

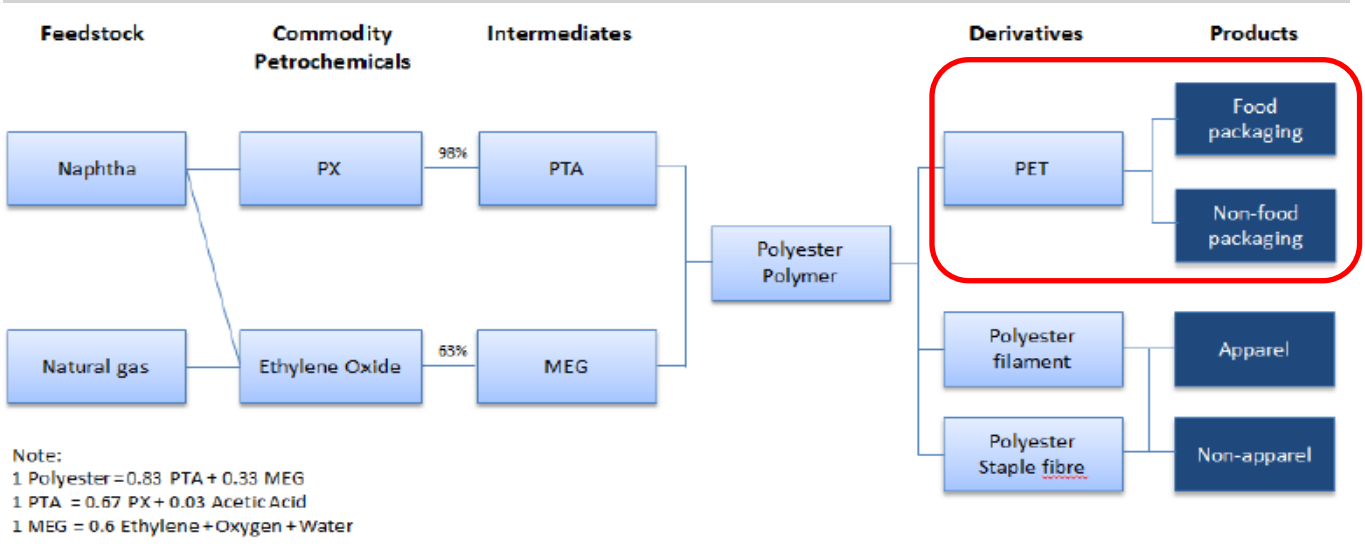
Figure 40: 2018 breakdown of global polyethylene demand (mil MT)

	mil MT	% of total
Film - packaging	40.8	40%
Film - Food packaging	10.2	10%
Molded Plastic	23.5	23%
Other	23.5	23%
Single Use	4.1	4%
Total	102	100%

Source: IHS Markit, UBS. (North American Chemicals, Roberts, 9 April 2019).

2. **Polypropylene (65% of 2017 total global propylene demand[21], 28% of 2018 global major polymer demand[22])**
3. **Polyvinyl chloride (PVC)**
4. **Polyethylene terephthalate (PET)**

Figure 41: Polyester production



Source: IHS, UBS estimates. (Asia Petrochemical, Bush, 11 June 2018)

5. **Polystyrene**

Fragmented markets

According to UBS US chemicals analyst John Roberts, around half the companies in the largest basic chemical producers' global leaders (league table) are North American public companies. The largest chemical companies in the world are dominated by state-run entities (like SINOPEC in China), or chemical divisions of oil companies (ExxonMobil is among the largest US chemical companies). Many of the market shares are small, even for leaders. There are over 100 ethylene producers worldwide, with the largest producers having less than a 10% share, much like the refining industry.

[21] IHS Markit, Chemical Economics Handbook: Polypropylene Resins, 22 December 2017, P5
[22] As per Figure 36

Figure 42: Ethylene, 2019 top 5 producers & buyers

Company - producers	% of total capacity
Dow Chemical	7.5%
SABIC	6.2%
ExxonMobil	5.6%
SINOPEC	5.1%
Abu Dhabi Gov	4.2%
Company - buyers	**% to total**
INEOS	7.0%
Occidental	4.6%
Formosa	3.9%
Westlake	3.6%
Shin-Etsu	3.5%

Source: IHS Markit, UBS. (North American Chemicals, Roberts, 9 April 2019).

Figure 43: Propylene, 2019 top 5 producers & buyers

Company - producers	% of total capacity
SINOPEC	6.1%
CNPC	3.9%
Royal Dutch Shell	3.3%
LyondellBasell	3.3%
ExxonMobil	3.2%
Company - buyers	**% to total**
LyondellBasell	5.9%
INEOS	5.5%
Abu Dhabi Gov	3.8%
SINOPEC	2.1%
Odebrecht Quimica	2.1%

Source: IHS Markit, UBS. (North American Chemicals, Roberts, 9 April 2019).

Figure 44: Global ethylene production breakdown & growth (mil MT)

	2018	2023e	CAGR%
Total	**159.8**	**192.8**	**3.80%**
Regional breakdown			
NE Asia	46.1	60.7	5.7%
Middle East & Other Emerging Markets	56.4	65.5	3.0%
North America	37.2	46.6	4.6%
Western Europe	20.2	20.0	-0.2%

Source: IHS Markit, UBS. (North American Chemicals, Roberts, 9 April 2019).

Figure 45: Global propylene demand breakdown & growth (mil MT)

	2018	2023e	CAGR%
Total	**109.6**	**135.2**	**4.30%**
Regional breakdown			
China	34.4	47.9	6.9%
North America	16.9	19.8	3.2%
Western Europe	14.4	15.3	1.1%
Middle East	9.2	10.6	2.8%
ROW	34.5	41.5	3.8%

Source: IHS Markit, UBS. (North American Chemicals, Roberts, 9 April 2019).

4. Why (& how) does plastic cause an environmental problem?

Quantity and durability are the major contributing factors, not the material itself (in isolation)

As we describe elsewhere in this report, plastic is not in and of itself inherently problematic, or at least not measurably more so than other materials. In fact, plastic can be *less* problematic from an environmental perspective than materials commonly used to replace it. For example: cotton and paper bags have a heavier environmental footprint (unless reused a significant number of times) than a plastic bag, heavier packaging materials vs lighter weight plastic result in higher carbon emissions during transportation, and paper is a finite resource with potentially significant carbon emissions on harvesting (and as Nicole Rycroft from Canopy commented during one of our expert access events, there are simply not enough trees on the planet to replace plastic).

An Environment Agency (UK) 2006 study found that cotton bags need to be used 131 times, and paper bags 3 times, to have *less* global warming impact vs. a conventional (non-reused) HDPE plastic carrier bag.[23]

Specifically with regards to paper, bio-assets, forests in particular, are considered extremely beneficial in combating climate change. Deforestation is seen as particularly harmful in the context of climate change. As the IPCC comments:

> Changes in forest cover for example from afforestation, reforestation and deforestation, directly affect regional surface temperature through exchanges of water and energy (high confidence). Where forest cover increases in tropical regions cooling results from enhanced evapotranspiration (high confidence).[24]

A 2010 study commissioned by the Plastics Division of the American Chemistry Council (an industry body that self describes as an "advocate for public policies that support the creation of groundbreaking products") estimates a considerably worse environmental impact from the use of plastic packaging substitutes.

> For the six packaging categories analyzed – caps and closures, beverage containers, stretch and shrink film, carrier bags, other rigid packaging, and other flexible packaging – 14.4 million metric tonnes of plastic packaging were used in the US in 2010. If other types of packaging were used to substitute US plastic packaging, more than 64 million metric tonnes of packaging would be required. The substitute packaging would result in significantly higher impacts for all results categories evaluated: total energy demand, expended energy, water consumption, solid waste by weight and by volume, global warming potential, acidification, eutrophication, smog formation, and ozone depletion, as shown previously in Figure 4-1 [F46 below].[25]

[23] Life cycle assessment of supermarket carrier bags: a review of the bags available in 2006, Report: SC030148, The Environment Agency
[24] Almut Arneth et al, Summary for Policymakers, An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems, 07 August 2019 , IPCC, P12.
[25]Life Cycle Impacts of Plastics Packaging Compared to Substitutes in the U.S. and Canada, Franklin Associates, A Division of Eastern Research Group, on behalf of the American Chemistry Council, 2018. P160. Reproduced with permission.

Figure 46: Weights of US Plastic and Substitute Packaging

	Weight (million kg)		
	Plastic Packaging	Substitutes	Ratio
Caps & Closures	779	769	1
Beverage Containers	3,095	14,568	4.7
Stretch & Shrink	748	6,418	8.6
Carrier Bags	1,297	2,436	1.9
Other Flexible	4,188	16,830	4
Other Rigid	4,264	23,079	5.4
Total	**14,373**	**64,100**	**4.5**

Source: Table 4-1, Pg 128, Life Cycle Impacts of Plastics Packaging Compared to Substitutes in the U.S. and Canada, Franklin Associates, A Division of Eastern Research Group, on behalf of the American Chemistry Council, 2018. Reproduced with permission.

Figure 47: Cumulative Energy Demand for US Plastic Packaging and Substitutes

	Cumulative Energy Demand (billion MJ)						
	Plastic Packaging	Substitutes, Max Decomp	Substitutes, No Decomp	Ratio, Max Decomp	Ratio, No Decomp	Savings, Max Decomp	Savings, No Decomp
Caps & Closures	78.9	40.1	40.4	0.5	0.5	-38.9	-38.5
Beverage Containers	255	404	407	1.6	1.6	150	152
Stretch & Shrink	58.5	250	255	4.3	4.4	191	196
Carrier Bags	111	225	228	2	2.1	114	117
Other Flexible	384	1,056	1,083	2.8	2.8	673	699
Other Rigid	423	530	531	1.3	1.3	107	108
Total	**1,309**	**2,505**	**2,544**	**1.9**	**1.9**	**1,196**	**1,235**
Substitutes % Higher than Plastics		91%	94%				
Plastic Results as % of Substitutes		52%	51%				
Savings Equivalencies							
Million passenger vehicles per year						18	18
Thousand tanker trucks of gasoline						1,073	1,108

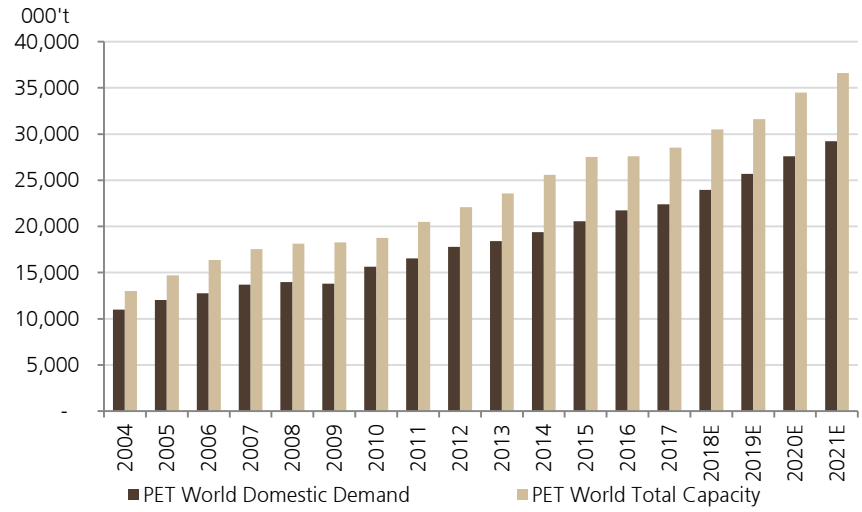
Source: Table 4-4, pg 135, Life Cycle Impacts of Plastics Packaging Compared to Substitutes in the U.S. and Canada, Franklin Associates, A Division of Eastern Research Group, on behalf of the American Chemistry Council, 2018. Reproduced with permission. Note: decomp and no decomp refer to none or complete decomposition of material in landfill.

In our opinion, the "plastic problem" is largely one of quantity (with associated concerns around carbon emissions), particularly in low value applications, and especially with regards to the quantity of plastic *entering an ill-equipped waste stream*. Prominent scientific bodies, including the IPCC, IPBES, and the US Global Change Research Program discuss human impacts including growth and material consumption on, for example, climate change and biodiversity loss.

The IPBES, as discussed in our report here, identifies the following requirements to address biodiversity loss, all of which are relevant to the plastics discussion: a decoupling of quality of life from growing material consumption; a reduction (in absolute and relative terms) of total consumption and waste; a cultural shift towards a more responsible mode of consumption, supported by the elimination of key inequalities (e.g. income, gender), and by a fair sharing of the costs and benefits of economic activity; and (relatedly) a cultural shift towards a more environmentally aware and socially diverse mode of technological and social innovation. In our opinion, what is needed to address these issues is the polar opposite of the current socioeconomic system as described (for example) in our MIT writeup, where "a cycle of planned obsolescence and technology upgrades…encourages consumption."

IPBES references, for example, US$577bn in annual crops at risk from decline in pollinators. Required: a reduction in total consumption and waste

Figure 48: PET world supply/demand estimated and forecast



Source: PCI, UBS estimates. (Asia Petrochemical, Bush, 11 June 2018)

Similarly, in our 2019 outlook we asked whether technology-driven market behaviours might over-ride all attempts to reduce carbon emissions (the same can equally be asked with regards to plastics consumption), invalidating all of the initiatives prompted by the annual talks of the UNFCCC. Speed and acceleration in the usage and delivery of "stuff" is a significant problem, from the perspective of sustainability. It exacerbates the failure of modern economies to dematerialise, described by economist Vaclav Smil in his seminal book *Making the Modern World* (Wiley, 2014) as the 'river economy.' **An important message underlying these discussions is the need for (possibly radical) changes in business models.**

The messaging on solutions required to address climate change, biodiversity loss, and other negative environmental impacts is often at odds with growth expectations. The Center for Environmental Law refers to significant expansion in plastics-related chemicals facilities in the US as cheaper energy (shale) results in cheaper chemical feedstocks for plastics.[26]

Double-edged sword: plastic's attributes contribute to the environmental problem

The "Great Pacific Garbage Patch" is largely made up of tiny and often invisible to the naked eye microplastics[27], not solid debris, and it stretches from the surface to the ocean floor. The Marine Debris Program at the National Oceanic and Atmospheric Administration comments that it is nearly impossible to remove the particles.[28]

The positive list of attributes for plastic is long: inexpensive, strong, lightweight, numerous usage applications to which it is perfectly suited and for which finding alternatives would be difficult to impossible (ranging from convenience on the one hand to potentially life saving applications in food, pharmaceuticals, various safety equipment on the other), and durable. However, the durability for which it is so

[26] How Fracked Gas, Cheap Oil, and Unburnable Coal are Driving the Plastics Boom, Fueling Plastics, Center for International Environmental Law, P3, reproduced with permission.
[27] NOAA. Ocean garbage patches. Accessed on 16 October 2019
[28] NOAA. Great Pacific Garbage Patch. Accessed on 16 October 2019

prized becomes highly problematic once it enters the waste stream. Unless recycled or incinerated, plastic stays in the natural environment for centuries, either intact, or in smaller and smaller particles ("microplastics") as the original item is ground down by water.

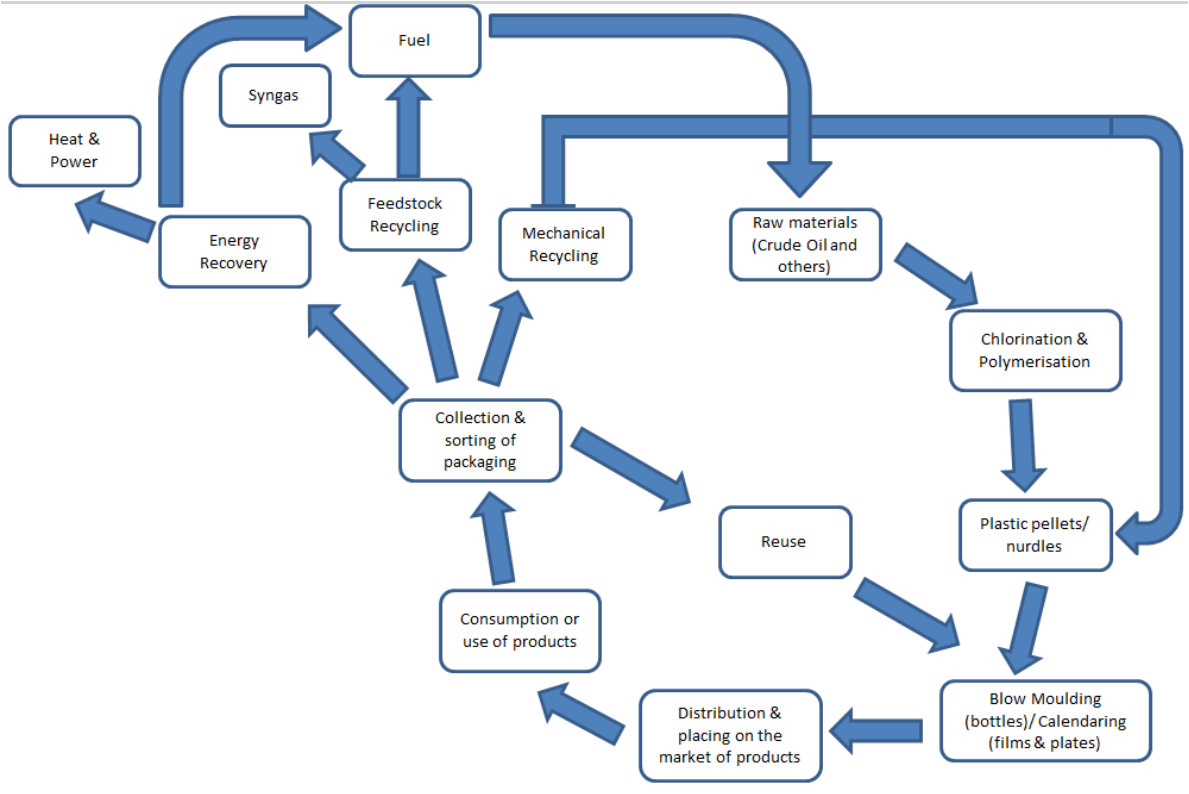
We have focused our attention in this report on what we consider to be "problematic" plastic, namely low value, short lifecycle and high volume. Figures 49-52 describe lifecycles of three common end uses of plastic, the key differentiator among them being the **duration of use**. Plastic packaging is cheap, high volume, and discarded either immediately or after a relatively short lifecycle. On the other hand, autos and construction PVC for example can have much longer life spans.

Figure 49: Illustrative example – distribution of PVC materials in relation to PVC service life

Service life	Applications	Life
Short life	Packaging, medical applications, stationery	< 2 years
Medium life	Wall covering, flooring, footwear	2 to 10 years
Long life	Flooring, wire and cable covering, furniture, automotive	10 to 20 years
Extra-long life	Pipes, window profiles, cables, roof liners, aircraft	> 20 years

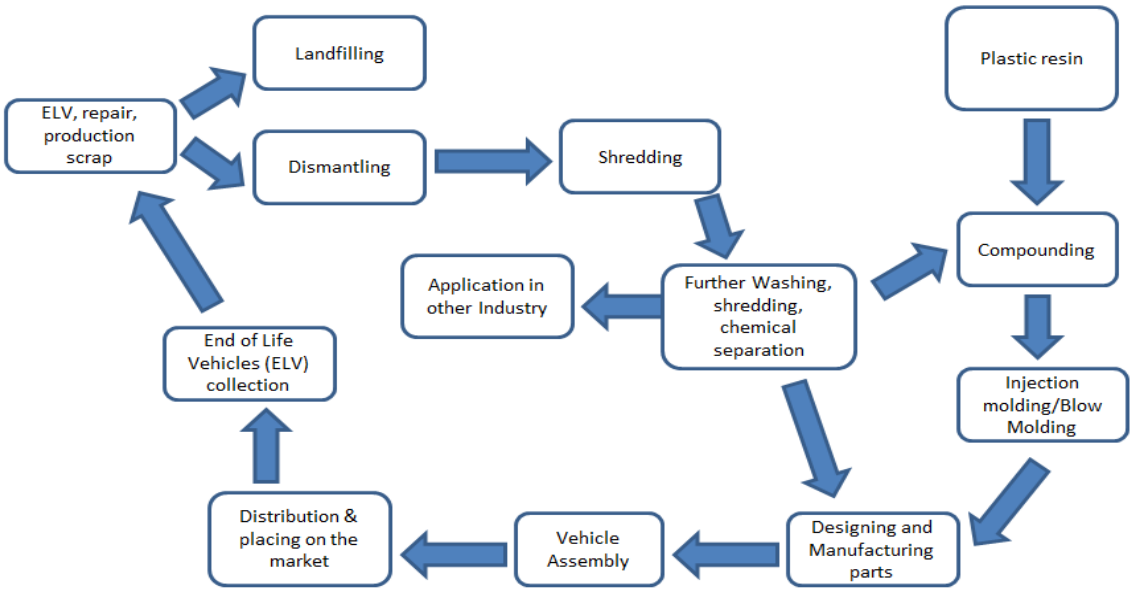
Source: Table 4-12, Pg 76 Life Cycle Assessment of PVC and of principal competing materials, European Commission.

Figure 50: Packaging industry, plastic lifecycle



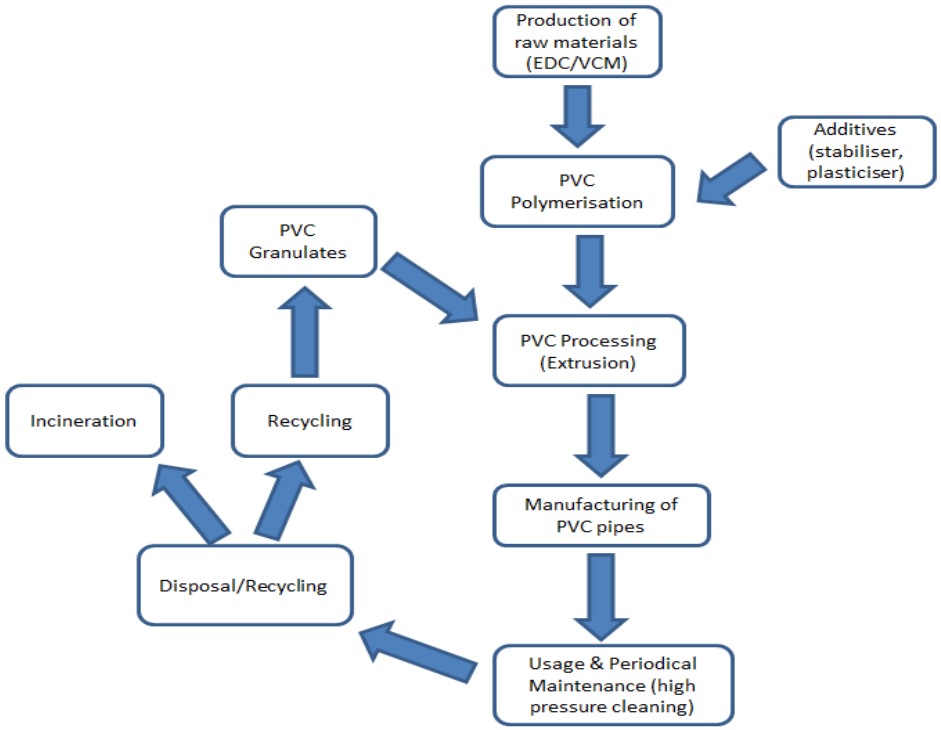
Source: UBS

Figure 51: Auto industry, plastic lifecycle



Source: UBS

Figure 52: Construction industry, plastic lifecycle (PVC piping)



Source: UBS

Plastic packaging delivers significant benefits in cost, convenience, food safety and preservation, design possibilities (endless), strength and weight (which has the added benefit of reducing emissions in transport vs other heavier materials). However, the sheer quantity produced (in addition to the fossil fuel feedstocks used and emissions generated in production) and disposal, are highly problematic. The Ellen MacArthur Foundation estimates that 95% of annual plastic packaging production by value is lost as the material is discarded after a single use.[29]

We see packaging (especially single use) as a category likely to come under our Group Three category risk (see further discussion here) from potential cultural or regulatory change. It is also the segment that is most emblematic of the need to address the issues discussed above; the need to tackle growing material consumption; a required reduction (in absolute and relative terms) of total consumption and waste; and a cultural shift towards a more responsible mode of consumption.

[29] The New Plastics Economy: Rethinking the future of plastics & catalysing action, Ellen MacArthur Foundation, 2017, P12. Reproduced with permission.

5. Where Does End of Life Plastic Go?

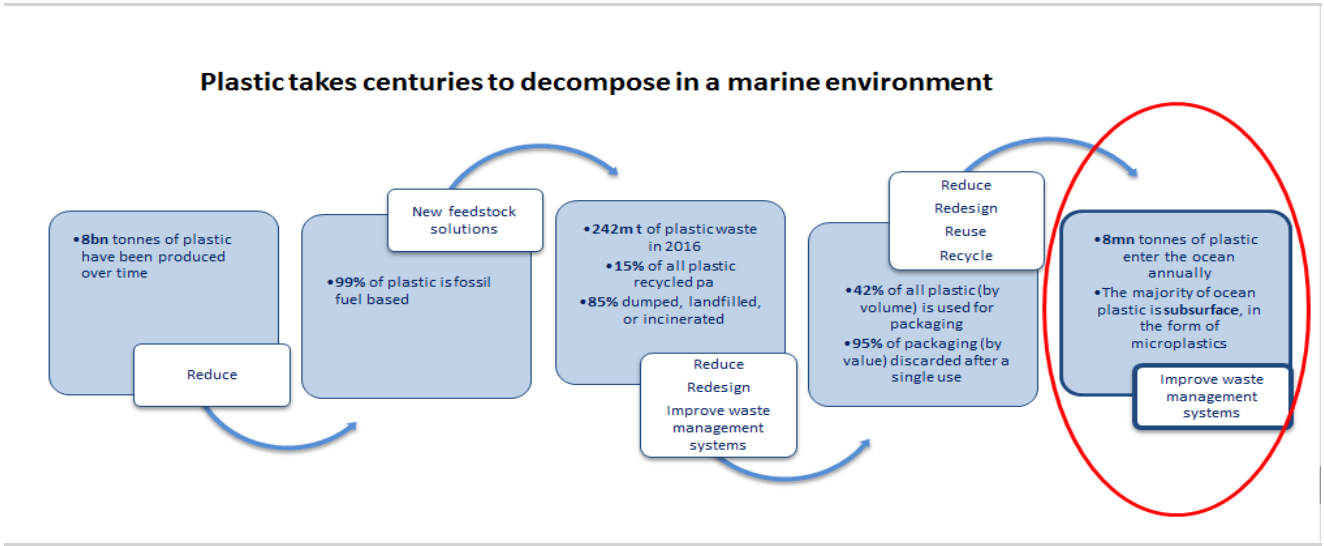
Figure 53: Plastic takes centuries to decompose

Source: iStock/Getty Images

As discussed elsewhere in this report, plastic is not necessarily inherently more or less "bad" than other materials. In fact, there are significant positive attributes to plastic relative to other materials in some cases. However, investors are by now likely well aware of the increasing public concern around *plastic waste*, particularly (but not limited to) plastic waste that ends up in the ocean. The sheer quantity of plastic waste, combined with inefficient systems to deal with it, and compounded by the very qualities that make plastic attractive (largely, durability) are of significant concern. According to NOAA, plastic in a marine environment likely takes centuries to degrade.[31]

Plastic is 12% of total global waste generated; 242 mt of plastic waste was generated globally in 2016[30]

Figure 54: Plastics and marine pollution



Source: UBS, others as cited throughout the report. **Note, all numbers are approximate.**

[30] Kaza, Silpa; Yao, Lisa C.; Bhada-Tata, Perinaz; Van Woerden, Frank. 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Urban Development;. Washington, DC: World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/30317 License: CC BY 3.0 IGO, Pxi and P29

[31] NOAA. Can marine debris degrade on its own in the environment? At https://oceanservice.noaa.gov/facts/degrade.html, accessed 16 October, 2019

Issues arising from plastic waste disposal include:

In developed markets, frequently disposed of via landfill or incineration, contributing to pollution, release of toxins, and GHG emissions

Open burning in countries or areas without waste management infrastructure resulting in the release of emissions and toxins

Quantity overwhelming landfill or waste collection capabilities and therefore escaping those systems, or being dumped in the open, material often ends up in the marine environment

Leached toxins from dumped plastic (in water and on land)

Serious harm to marine life

Blocking of key infrastructure

Microplastics entering the human food chain[32] as the original plastic material is ground down in water

Negative financial impact to tourism and fisheries affected by plastic waste

Ocean pollution

The Woods Hole Oceanographic Institution refers to "an estimated 8 million tons" of plastic entering the ocean each year, and that only 1% of ocean plastic is visible at the surface.[33] Much of this is ground down into microplastic fragments which are difficult to track and study. Their size and dispersal significantly complicates any potential clean-up or removal efforts; the complexity of removing tiny particles from the farthest reaches (and depths) of the ocean is daunting.[34]

A 2017 study, Export of Plastic Debris by Rivers into the Sea[35] concluded that a significant amount of ocean plastic waste originates in rivers, and that plastic pollution in those rivers is "positively related to mismanaged plastic waste" generated in the surrounding areas. Ten rivers globally contribute 88-95% of ocean plastic pollution: eight in Asia and two in Africa. Multiple studies on the leakage of plastic into oceans discuss the need for solutions in both the formal waste industry, as well as informal waste collection (where leakage into the environment tends to be significantly higher) channels. We discuss shipments of plastic waste from developed markets to developing markets on P67 and P68; it is possible that some plastic waste leaking into marine environments actually originates elsewhere.

[32] The Guardian, National Geographic American Chemical Society
[33] ©Woods Hole Oceanographic Institution, Microplastics in the Ocean, 2019. Reproduced with permission.
[34] NOAA. Ocean Garbage Patches. Accessed 16 October 2019
[35] Reproduced with permission, Export of Plastic Debris by Rivers into the Sea, Christian Schmidt, Tobias Krauth, and Stephan Wagner, Environmental Science & Technology 2017 51 (21), 12246-12253, Copyright 2017 American Chemical Society.
DOI: 10.1021/acs.est.7b02368

"Mismanaged" often includes dumping; dumped plastic waste far more easily escapes into waterways. According to a 2016 study, only 39% of waste in lower income countries is formally collected.[36]

Solutions

In our opinion, the solution to the plastic problem does *not* involve substituting another material for plastic, especially in the same quantities as current plastic consumption. Substitution does not address the underlying issue of growing materials consumption and growth for growth's sake, and could result in simply substituting one problem for another – and potentially worse – problem. We believe any discussions around solutions to the plastic pollution problem also require a much broader discussion around waste management and waste management systems, particularly in emerging markets.

Reducing use in the first place preferably coupled with comprehensive product or packaging redesign (serving many purposes, including replacing designed obsolescence, and making materials easier to recycle – e.g. by reducing multimaterial/multiformat plastics which are problematic to recycle)

Reuse of material

Recycling

Recovery (including energy recovery)

And…

Business practice changes

Public policy initiatives

Reformatting

Product redesign can lower plastic consumption as well as potentially providing new revenue opportunities

An example of successful product redesign is detailed in an MIT Supply Chain study Can We Cut Plastics Without Cutting Profits (here), which discusses efforts to concentrate laundry detergent in the US market. Benefits include less water usage in the product, and smaller plastic bottle sizes and therefore lower emissions generated in transport. Consumer education on the lower environmental footprint of concentrated *and* that concentrated product is as effective as non-concentrated led to widespread consumer take-up. A further boost came in the form of Walmart requiring all detergent it sold to be "at least 2x concentration."

Examples of other product or packaging redesign initiatives include:

- Chewable toothpaste (plastic toothpaste tubes are problematic to recycle).
- Concentrated product refills for plastic bottles, enabling re-use of the original container. See example here, referring to significant reductions in

[36] Kaza, Silpa; Yao, Lisa C.; Bhada-Tata, Perinaz; Van Woerden, Frank. 2018. What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050. Urban Development;. Washington, DC: World Bank. © World Bank. https://openknowledge.worldbank.org/handle/10986/30317 License: CC BY 3.0 IGO, P2.

plastic use and transportation, and Amazon's "Clean Revolution" range here.

- Elimination of plastic packaging to secure multipacks, for example Carlsberg's "Snap Pack."

Other initiatives include deposit-return schemes such as Loop, which aims to eliminate disposable packaging altogether. Participants in the scheme include well known consumer brands.

More complicated technological solutions to the plastic problem include searches for entirely new (or reformulated) material to replace plastic. This does not necessarily, however, address the need to reduce overall materials usage.

Biodegradable (or biological-based) plastic isn't the answer (yet?)

Biodegradable plastic is not straightforward. Contrary to what a consumer might reasonably assume, most biodegradable plastic does not biodegrade in a natural setting. Instead, biodegradable plastic is often *only* biodegradable in an industrial incinerator plant, at high temperatures.[37] In addition, when biodegradable plastics end up in a conventional plastic recycling stream, they can cause contamination issues.

Further complicating the issue, some fossil fuel-based plastics are biodegradable, while some plastics based on biological feedstocks are *not* biodegradable. This leads to consumer confusion about what can be recycled when and where, leading to lower availability of recyclable material. Further complications arise in considering the source material for biological plastic (if the feedstock is not a waste product); could the feedstock be more productively used in – for example – food production? Would production growth of the feedstock cause displacement or lead to an (additional) serious environmental issue, as has been the case with palm oil?

Regulatory or public policy approaches could be effective

Our discussions with various industry experts indicate that deposit return or various polluter pays schemes do (or could) make a significant difference where they operate, but that rolling these out further is often not a key policy priority (and can face opposition from key industry players). Certain European deposit return schemes which typically include glass, some plastics including PET, and cans have high return rates: lowest return rates are Estonia (83% total return) and highest is Norway (97% plastic bottle recycling rate).[38] Bans or levies, where enforced, can also be highly effective. The United Nations Environment Programme discusses several case studies worldwide, including 90% reductions in plastic bag use post levy introductions.[39]

[37] Single-Use Plastics: A Roadmap for Sustainability, 2018, Claudia Giacovelli, United Nations Environment Programme ,P14
[38] https://www.governmenteuropa.eu/deposit-return-schemes-plastic/91699/
[39] Single-Use Plastics: A Roadmap for Sustainability, 2018, Claudia Giacovelli, United Nations Environment Programme, P46

It is important, however, to consider unintended consequences with various regulatory actions, and in our opinion where possible tie any actions back to a goal of reducing total overall use in the first place. For example, the UK Department for Environment, Food & Rural Affairs announced in July this year that sales of single-use plastic bags at seven of the UK's largest retailers declined 90% since the introduction of a 5p levy in 2015.[40] However, this does not take into account sales of heavier (i.e. more plastic usage per bag vs. single use) plastic bags "for life" which are intended to be used repeatedly. Various press reports indicate higher use of this type of product, and that in fact approximately one billion bags for life were sold in the UK in 2018.[41]

Sales of single-use plastic bags in the UK declined c90% after the introduction of a 5p levy, but some substitution into heavier "bag for life" products

Recycling, and why doesn't plastic recycling work "better"?

Impediments to higher plastic recycling rates include:

Poor economics and logistical difficulties around collection of low value post-consumer material (i.e. collection from individual households)

Numerous different types of plastic all requiring specific recycling treatment (further complicated by multi-format packaging where a combination of materials is used)

Different types of additives (lack of information on additives or required recycling treatment is also a significant issue)

Frequent contamination (e.g. by food) of material rendering recycling difficult or impossible

Consumer confusion about what can be recycled when and where, meaning less material enters the recycling stream in the first place, or ends up in the wrong place and contaminates other product

The OECD estimates that global recycling rates for plastic are 14-18%, with 24% being disposed of by incineration. The balance is either sent to landfill, burned in the open (not in an incinerator) which releases toxins, or dumped. Recycling rates vary widely, with higher rates in the EU (30%), lower rates in the US (10%), and typically limited recycling in emerging markets.[42] Figures 55 and 56 below are illustrative examples.

[40] Plastic bag sales, Gov.UK
[41] Channel 4 News, The Times The Independent
[42] OECD (2018), Improving Markets for Recycled Plastics: Trends, Prospects and Policy Responses, OECD Publishing, Paris, https://doi.org/10.1787/9789264301016-en. Reproduced with permission. P15.

Figure 55: PET bottle collection rates 2017

Region	Collection rate
China	~83%
Europe	~55%
US	~30%
Rest of Asia	~75%
Rest of N. America	~50%
World	~52%

Source: IHS Markit, UBS. (North American Paper & Packaging, 4 April 2019)

Figure 56: EU Plastic Waste Volumes

Use	2018e	2030e
Incineration	~40%	~40%
Export	~15%	~15%
Landfill	~32%	~17%
Mechanical recycling	~12%	~17%
Chemical recycling	0%	~12%
Total	100%	100%

Source: IHS Markit, UBS. (North American Paper & Packaging, 4 April 2019)

Recycled plastics markets in most countries do not work efficiently, and industry economics are highly problematic; there is limited to no incentive to collect and process low value plastics. The issue is further complicated by a fragmented industry with global reach, and compounded by few profitability incentives for producers to use recycled material (which restricts availability of, particularly, post-consumer recyclable content).[43]

In addition as discussed in UBS research here, in the US consumers in general have been reluctant to pay material premiums for containers with recycled content, so pricing is limited to competition with virgin material. And the cost of processing plastic waste is relatively high, except in low-wage emerging markets. Since China has stopped buying waste plastic from the rest of the world, US collection agencies have increasingly turned to burning plastic waste, rather than having it reprocessed (link).

Consumer confusion

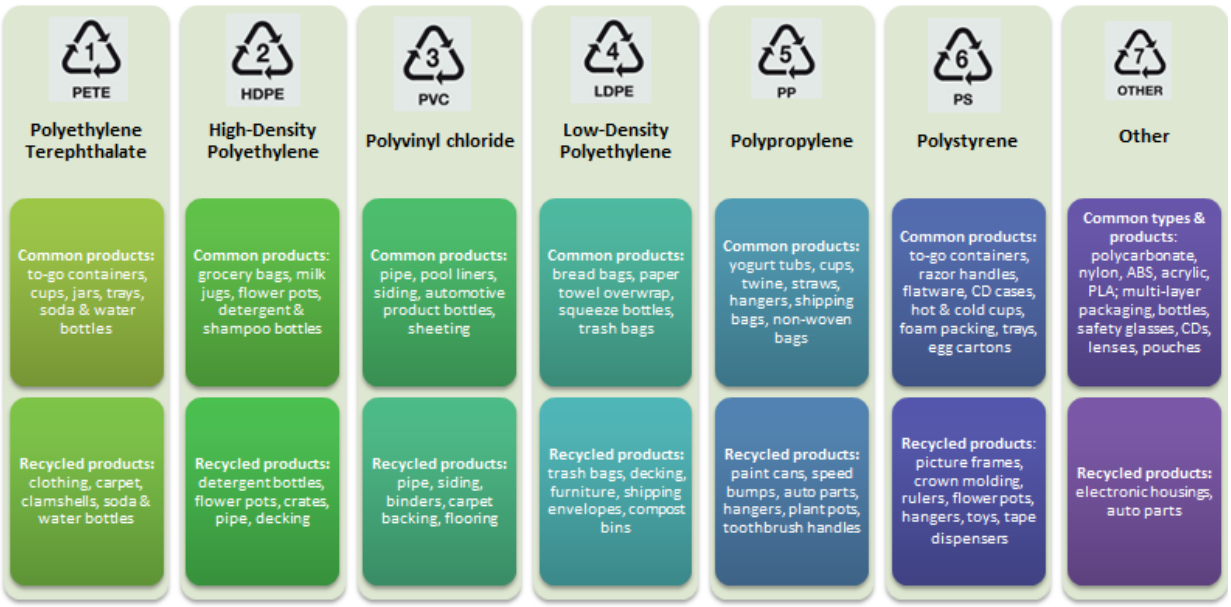
Post-consumer plastic recycling is relatively complicated, and consumers are often (we would argue, understandably) confused as to what can and cannot be recycled. To illustrate the relative complications faced by individuals, London's Wandsworth Council lists the following items that **cannot be included** in regular domestic recycling collections: plastic tops from food and drink cartons, pump mechanisms from spray dispensers, polystyrene/Styrofoam, toys, cups, plant pots and any other plastic items not in the (relatively short) accepted category list. The BBC further lists other commonly used plastic items.

Consumers are often unaware – for example – that black plastic[44] and small format plastic (e.g. lids, sachets) are generally very difficult, if not impossible, to recycle

[43] OECD (2018), Improving Markets for Recycled Plastics: Trends, Prospects and Policy Responses, OECD Publishing, Paris, https://doi.org/10.1787/9789264301016-en, P12

[44] http://www.severnwaste.com/envirosort/faqs/. © Copyright 2018, see "why can't I put black plastic into my recycling collection" FAQ

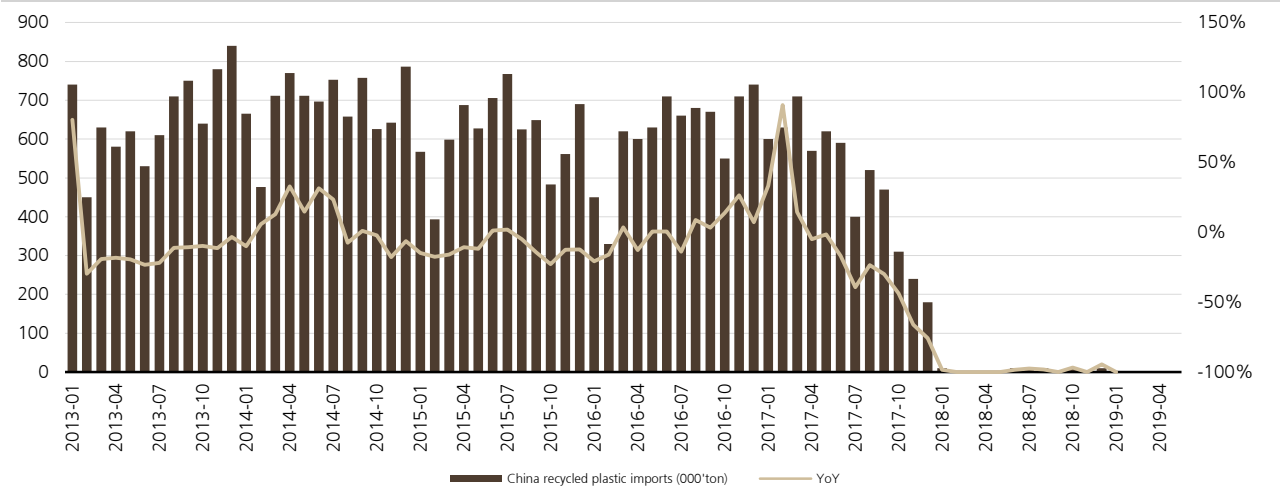
Figure 57: Plastic resin & recycling codes – a complicated picture



Source: ASTM International, UBS. Reproduced, with permission from Standard Practice for Coding Plastic Manufactured Articles for Resin Identification, copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428.

The Chinese ban on imported recycled plastics announced in July 2017 (UBS comment here and here) further complicated an already problematic recycling situation. Prior to the ban 40-50% of EU and US collected scrap plastic was exported to China. Material that would previously have ended up in China and which might (but not always) have been recycled is now being kept in country of origin where systems are ill-equipped to deal with the volume. Or, material is being diverted elsewhere, including to other ASEAN countries[45] that are even less able to cope with the material and are now considering bans of their own.

Figure 58: China recycled plastic net imports



Source: WIND

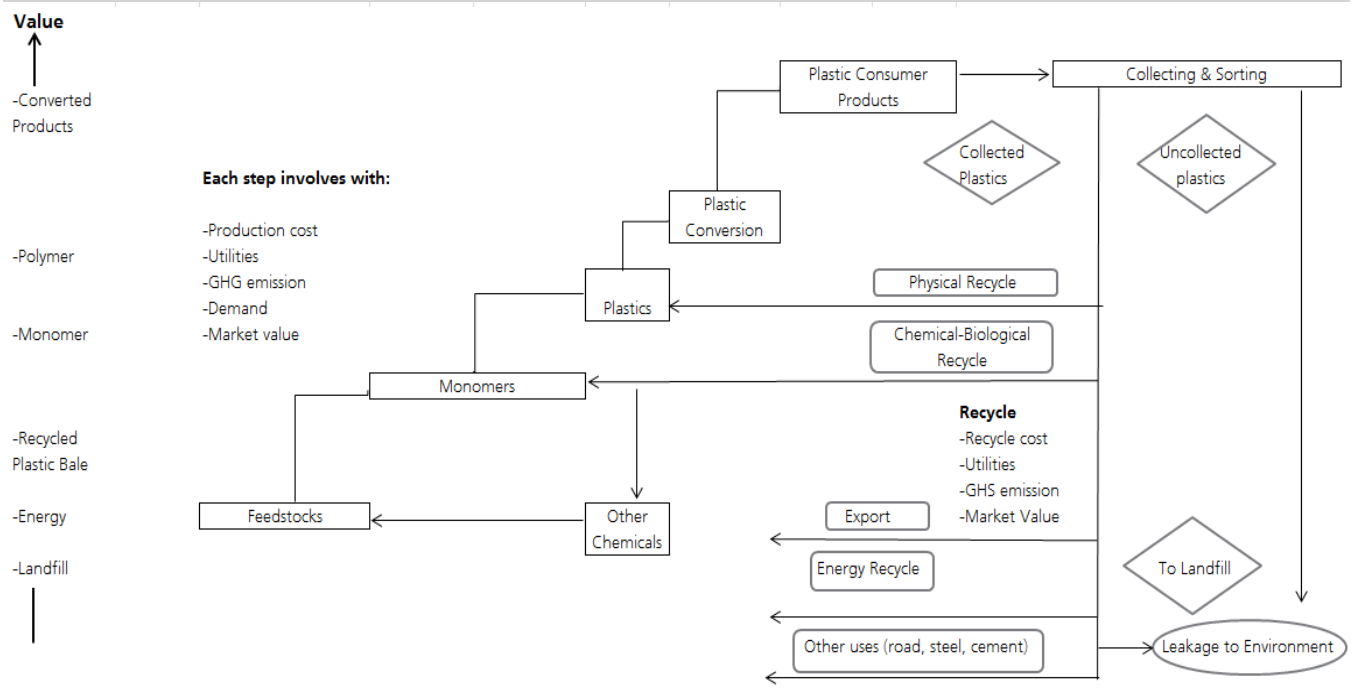
[45] Thailand to ban foreign plastic waste from 2021, The Financial Times

Numerous press[46] and NGO[47] [48] reports refer to exported plastic waste, including household domestic material, being dumped illegally with the likelihood that some of this waste ends up in waterways and then the ocean.

Your household plastic recycling might not be headed for a recycling facility at all

A different way of thinking about the economics of the recycling stream

Figure 59: Plastic recycling – a process economics framework



Source: IHS Markit, UBS. (North American Paper & Packaging, 4 April 2019)

Figure 59 was discussed at a recent IHS plastics sustainability conference, and is a framework for considering the economics of post-consumer resin. On the left are uses of increasing value – with landfill the lowest (actually a cost), then incineration (energy value), and converted products having the highest value.' Leakage to the environment' is a result of collection practices, which may be hard for the plastics and packaging industries to influence.

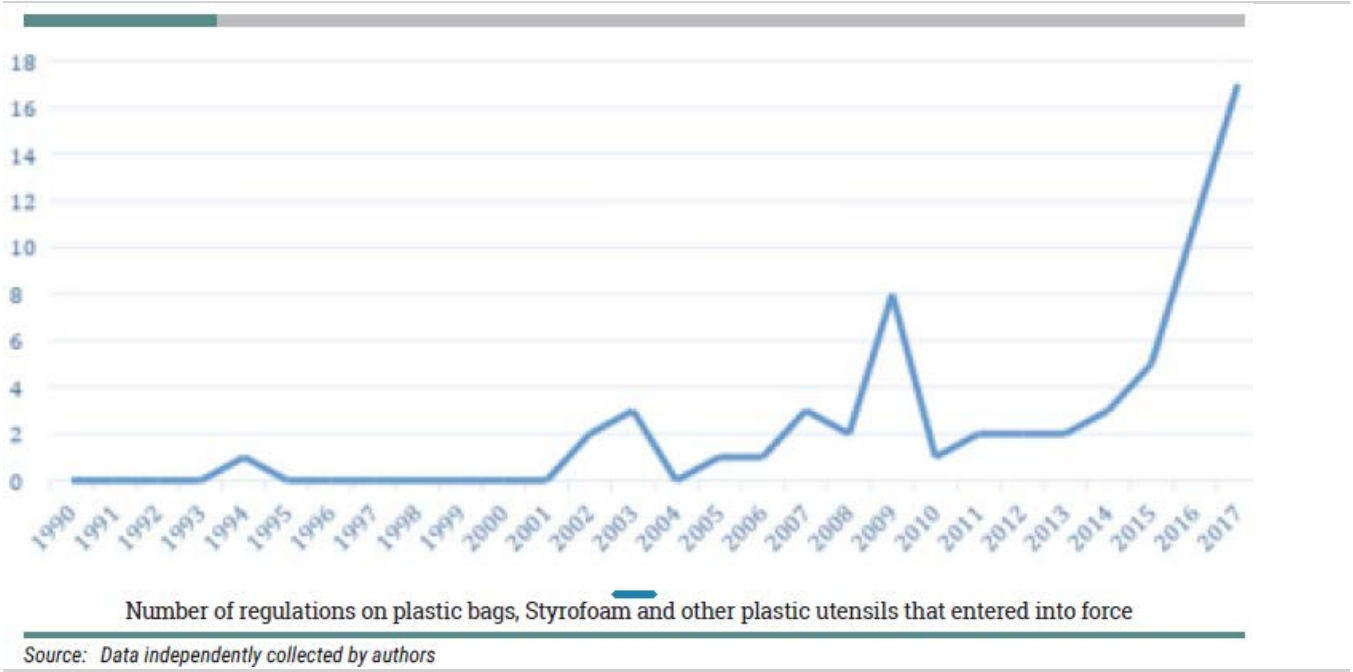
[46] BBC UK, FT, The Guardian
[47] UK Household Plastics, Unearthed.greenpeace.org
[48] US plastic waste, Unearthed.greenpeace.org

6. Regulations, and "Group Three" Risk

As we discuss earlier in this report, it is our opinion that a key driver in reducing use will be **changes in business practices**. We are seeing an increase in plastic-related regulation and bans, but we think these changes will have greater impact than individual efforts in addressing the issue of plastic quantity, waste and overall environmental footprint.

Multiple countries have or are in the process of introducing plastic bans or fees. These typically focus on single-use plastics (especially plastic bags and expanded polystyrene products). The UN Environment Programme considers existing bans to have been very effective, other than in areas where enforcement of the new regulations has been an issue, or where reasonably priced substitutes for plastic do not exist.[49] However, as we discuss elsewhere, banning certain single-use products such as bags or straws does not materially affect the overall situation given the size and fragmentation of the plastics market. Where bans can and do potentially have a broader effect, however, is on raising public awareness of plastic pollution. This can have more powerful knock-on effects.

Figure 60: Estimated number of new regulations on single-use plastics entering into force at the national level worldwide



Source: UN Environment Programme, Single Use Plastics – A roadmap for Sustainability, reproduced with permission

The regulatory landscape varies widely by geography. For example, the Council of the European Union Proposal for a Directive of the European Parliament and of the Council on the reduction of the impact of certain plastic products on the environment (18 January 2019) lays out a comprehensive regulatory framework. This includes restrictions on "placing on the market" of certain types of single-use plastics (see P60 of the Proposal for a Directive for the comprehensive list). The document also proposes the introduction, where substitutes for a single-use

[49] Single-Use Plastics: A Roadmap for Sustainability, 2018, Claudia Giacovelli, United Nations Environment Programme, P10

material do not exist, of "polluter pays" or "producer responsibility" schemes.[50] As we discuss elsewhere, producer pays schemes have the potential to be effective.

The picture in the US is somewhat different. A handful of states have introduced, or written into law, bans-on-bans, i.e. prohibiting measures to ban disposable plastic items. The UN Environment Programme discusses the possibility these measures have been introduced in an effort to protect industry groups.[51] Certain jurisdictions, however, have or are restricting plastic: for example, the San Francisco airport recently announced a ban on the sale of plastic water bottles which received widespread press attention.[52]

Country comments

We highlight significant actions at national and state level indicating the scope and size of the problem. While enforcement and impact of different approaches will vary, we believe the direction of travel is important and is likely to result in continued pressure on companies exposed to plastic production and use.

India (Gautam Chhaochharia)

Policies may drive plastic demand growth to be lower than expected earlier, but still strong

The Indian government has undertaken to eliminate all single-use plastics by 2022

Some form of ban on manufacture, supply, storage and use of plastics (specifically single-usage plastics, such as shopping bags) already exists in at least 25 of the country's 29 states. Many states have taken significant steps to incentivise adherence: the Maharashtra government has a buyback option with consumers returning plastic bottles getting retail discounts. Maharashtra reported a 40% drop in plastic waste in the first seven months of the ban. The plastic waste management rules (2016) include extended producer responsibility (EPR) guidelines, which require manufacturers to pay for the collection and recycling of waste their products become. However, there is consumer and retailer confusion about which products are banned or exempt, compounded by uneven enforcement. Major resistance has come from the All India Plastic Manufacturers Association, which claims tens of thousands of job losses from the state of Maharashtra plastic ban. There have been strikes in some places on the basis of the ban disproportionately and unfairly affecting small retailers. Considerable resources need to be allocated for effective compliance to the regulations – the Central Pollution Control Board needs to be revamped, for example, and alternative solutions need to be made more readily available.

Multiple organisations focusing on reducing plastic usage

The nation's largest transporter, Indian Railways, has banned single-use plastic material on its premises and trains, from 2 October 2019. Plastic bottle crushing machines are being set up. Airlines such as Vistara have also recently stopped

[50] Proposal for a Directive of the European Parliament and of the Council on the reduction of the impact of certain plastic products on the environment, European Council, P19
[51] Single-Use Plastics: A Roadmap for Sustainability, 2018, Claudia Giacovelli, United Nations Environment Programme, P23
[52] San Francisco International Airport: Zero Waste and San Francisco International Airport: Plastic free

providing plastic bottles onboard. Restaurant and food-service industries are one of the industries heavily impacted by regulations; India's food delivery apps such as Swiggy have started to provide restaurant partners with sustainable packaging. International chains such as McDonald's and Starbucks are replacing items such as plastic straws. Pepsi is considering a pilot project for its industrially compostable packaging in India. To set an example, non-reusable plastic items have also been banned from the Parliament complex.

Consumers are becoming more concerned about the environment

Though doubts remain over the ambitious plan to eliminate single-use plastics, consumers have unquestionably become more aware of the environmental threat that plastics pose. Consumer education programs by the central and state governments, bolstered by infomercials featuring local celebrities in the local media, have linked single-use plastics to pollution, poor health, overflowing drainage systems and breeding mosquitoes. Universities and schools have been tasked with conducting workshops for students. Micro industries pertaining to manufacture of bags made of cotton and jute are on the rise.

Plastics demand to continue strong growth, balanced by waste management

India has a fairly low per capita use of plastics (24lbs or 11kgs/year, compared to 240lbs or 109kgs/year in the US). And consumption of plastics is set to ramp up significantly with the economy growing at a robust pace. However, waste management remains an issue – much of the country's recycling sector is informal and unregulated, operating without government oversight. Every day, India generates 15mn kgs of plastic waste, of which only 9mn kgs are collected and recycled.

Malaysia (Nicole Goh)

Since Pakatan Harapan came to power in 2018, the coalition government has been vocal and proactive at addressing the environmental issues such as carbon emission and plastic waste. The government's effort on addressing plastic waste issues was evident with the Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC) introducing "Malaysia's Roadmap Towards Zero Single-Use Plastics", which aims to eliminate the use of single-use plastics by 2030. Key changes being pushed by the ministry include: 1) "no straw by default" practice, 2) pollution charge for plastic bags, and 3) ban on plastic waste imports.

The pollution charge for plastic bags is paid by consumers and is set at RM0.20 per bag. Other initiatives approved with the 2019 national budget include:

1) Companies producing plastics from bio-resin and biopolymer can opt for either Pioneer Status incentive (income tax exemption – 70% of statutory income for 5-10 years) OR investment tax allowance (60% capital allowance on qualifying CAPEX incurred for 6 years).

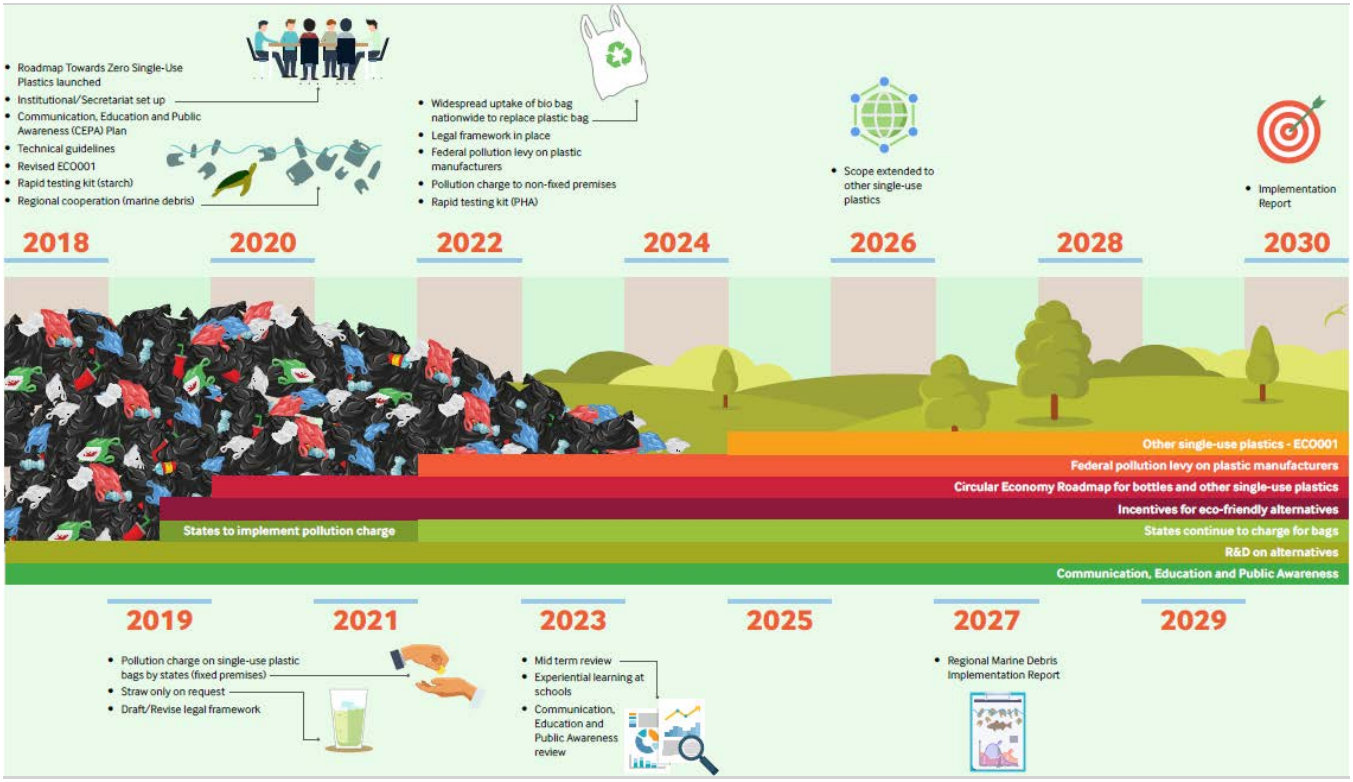
2) RM2bn of Green Technology Financing Scheme offered by the government and RM1bn Sustainable Development Financing Fund offered by Bank Pembangunan Malaysia Berhad, both with 2% interest cost subsidised for the first 5 years.

While the government pushes for regulatory change to reduce the overall usage of single-use plastics, it also acknowledged that eliminating the usage of plastic

products is no mean feat. With that in mind, the government has rolled out funding schemes as well as tax incentives to encourage the private sector to push for R&D and replace the usage of single-use plastics with alternative products such as biodegradable plastics. Moving forward, the government will likely take bolder moves such as imposing a pollution levy on plastic bag manufacturers and introducing a legal framework on single-use plastics, eventually replacing the single-use plastics circulation with biodegradable alternatives.

One example is Top Glove (the world's largest glove manufacturer)'s recent launch of its BioGreen gloves – biodegradable medical examination nitrile gloves. While interests from Top Glove's clients are not significant at this juncture with the product selling at a premium price, management is keen to market the product to its environmentally conscious clients and envisions that the biodegradable alternative will eventually take up ~50% of its nitrile glove production in 5 to 10 years. On the other hand, the Malaysian Plastics Manufacturers Association is doubtful that replacing plastic packaging entirely with biodegradable alternatives would be practical.

Figure 61: Malaysia's Roadmap Towards Zero Single-Use Plastics



Source: Ministry of Ministry of Energy, Science, Technology, Environment and Climate Change Malaysia. Reproduced with permission.

Thailand (Piyanan Panichkul)

After the Chinese government's recycled plastic ban in 2017, we witnessed a significant increase in plastic waste imports for recycling in Thailand (and Vietnam) in 2018. However, the Thai government in 2019 tightened environmental regulations which served to curb the growth of plastic waste imports year to date. These include reducing investment privilege approval for environmentally sensitive industries and delaying approvals of business licences for waste recycle operators.

On the demand side, there are significant efforts from both government and private sectors to reduce plastic consumption in Thailand, particularly after well-

publicised marine life fatalities related to plastic (including an orphaned baby dugong). Many major department stores in Thailand are not providing plastic bags on selected days.

On the supply side, two major plastic companies, Siam Cement Group and PTT Global Chemical, have launched new initiatives. Siam Cement Group, in particular, aims to reduce its single use plastic production to <20% of total portfolio, and to launch new products which provide a 100% recycled packaging solution to its customers in consumer product industries. PTT Global Chemical has developed bio-based plastics which should decompose faster than petroleum-based plastics.

Philippines (Karen Hizon)

The Philippines is one of the largest global contributors of plastic waste, with a significant portion ending up in the ocean. Part of the problem is the "sachet culture," as companies target lower income consumers. Single-use sachets are typically thin laminated plastic and aluminium, which are low value from a recovery perspective, and problematic to recycle.

Recognising the sachet problem, most companies identified as top sources of plastic waste in the Philippines (based on Break Free from Plastic's Global Brand Audit Report in 2018), including Mondelez International, Universal Robina Corp (URC), Coca-Cola, Unilever, Procter & Gamble, Nestle, PT Mayora, Pepsi Co and Colgate-Palmolive, have partnered with the Philippine Alliance for Recycling and Materials Sustainability (PARMS). They are investing in a residual plastic recycling facility, which will address the need to recycle flexible, low-value plastics such as sachets. In addition, Mondelez's facility in the Philippines is already using recyclable or recycled materials for packaging, while URC is using materials that can be upcycled (i.e. use of Bi-axially Oriented Polypropylene (BOPP) film, which can be upcycled into plastic pallets typically used in food manufacturing).

Meanwhile, a number of local governments have passed ordinances to regulate the use of plastic, including shopping bags, plastic utensils and expanded polystyrene, among others. Business establishments are now allowing the use of or offer alternatives, such as customer-owned reusable bags, used carton boxes or paper bags. The Republic Act 9003, or the Ecological Solid Waste Management Act of 2000, has mandated local governments to organise and manage the collection and disposal of solid waste. However, enforcement difficulties have made implementation a challenge, particularly for second- and third-tier cities and municipalities.

Lawmakers have filed the Single-Use Plastics Regulation and Management Act of 2019, which seeks to mandate a nationwide ban of single-use plastic, and regulate the production, import, sale, use and disposal of plastic products, and impose penalties, levies and incentives for industries, businesses and consumers. The proposed law includes:

- A minimum levy of P5 (US$0.10) will be charged to consumers for each single-use plastic used, 20% of which will be kept by the establishment, while 80% will be remitted to the Special Plastic Fund.
- For food and beverages, consumers will be given a discount of P5 for bringing their reusable or recyclable containers.

- Those engaged in the manufacture of single-use plastics alternatives will be given incentives provided under existing laws and from local government units, while violators will be penalised with fines or cancellation of business permits.

Korea (Jennifer Han)

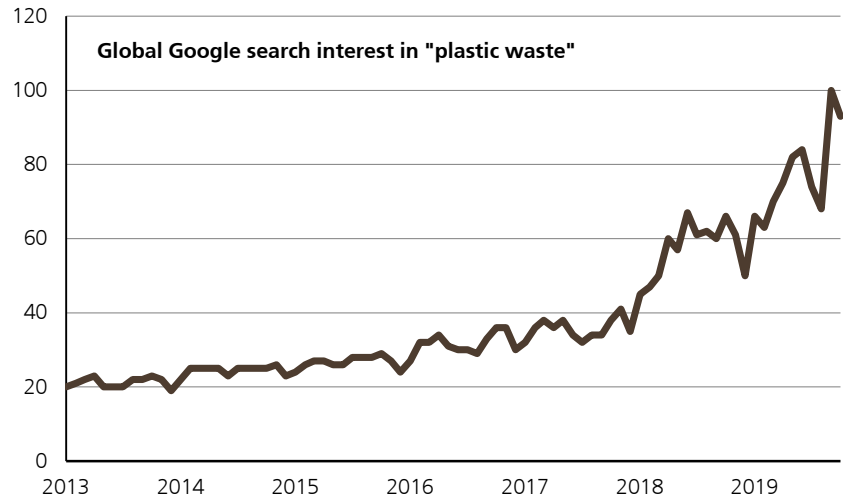
In 1999, the government banned the provision of free single-use plastic bags in retail stores that are larger than 33m2. Despite the regulation, the ban was not strictly enforced and plastic bag usage continued to increase.

In May 2018, the Ministry of Environment announced plans to reduce plastic waste by 50% and push recycling rates up from 34% to 70% by 2030.

In January 2019, the Korean government banned the use of single-use plastic bags in department stores, discount stores and supermarkets that are larger than 165m2. The regulation was successfully applied to retail stores, changing consumer behaviours from using single-use plastic bags to using non-disposable shopping bags. For instance, three months after the implementation of the ban, the single-use plastic bag usage volume in Lotte Mart, one of South Korea's largest discount stores, had decreased 48.2% QoQ.

7. What Does an ESG (Plastic-Aware) DCF Mean?

Figure 62: Public interest in the global plastic waste issue has materially increased



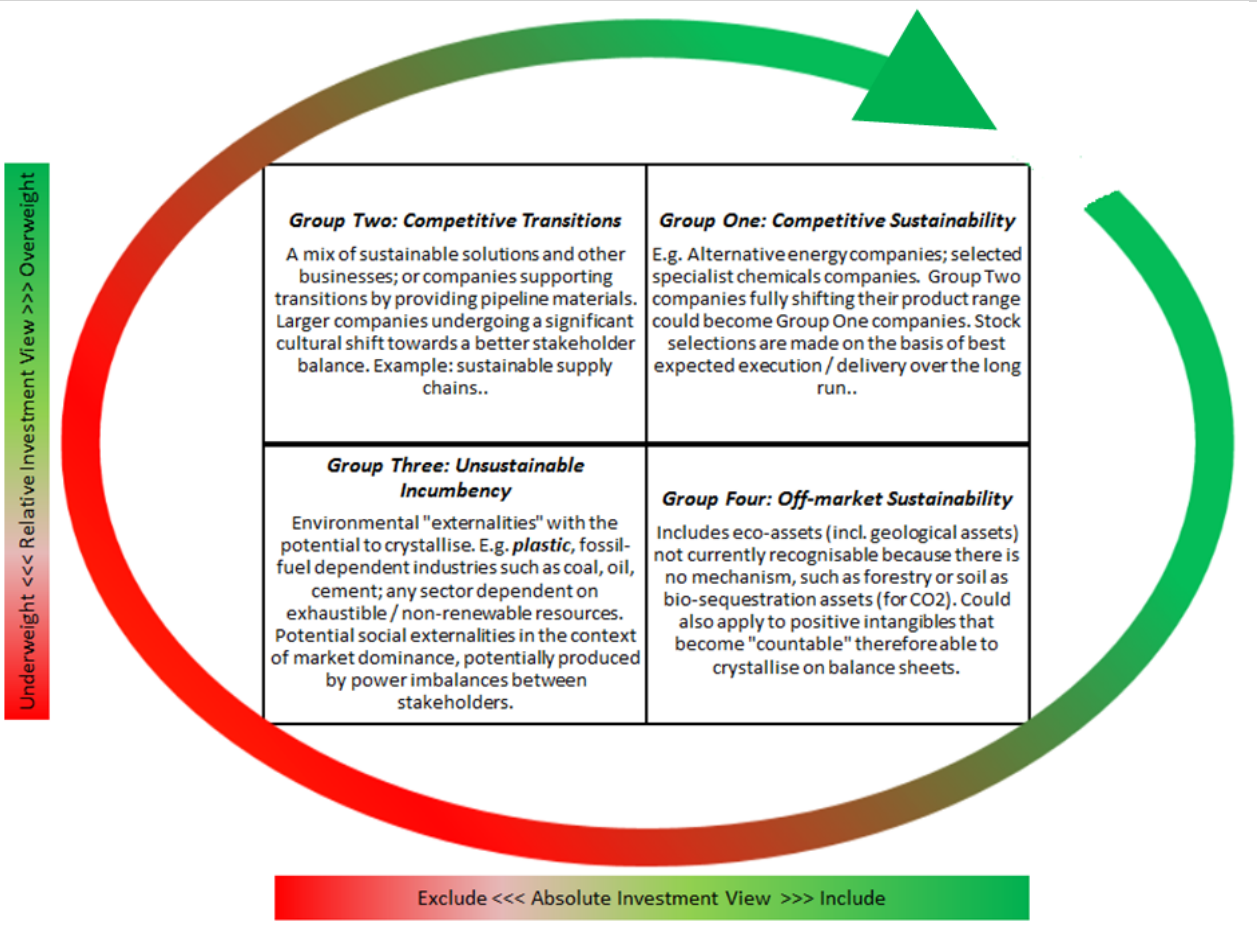
Source: Google Trends. Note: Numbers represent search interest relative to the highest point on the chart for the given region and time. A value of 100 is the peak popularity for the term. A value of 50 means that the term is half as popular. A score of 0 means there was not enough data for this term. Data as of 16 October 2019.

A "Group Three" Risk

It is our belief that ESG issues are having investment impact in shorter timeframes than ever before. Companies and industries may previously have had years, if not decades, to adjust to new regulations and cultural shifts; we think companies will now be forced to deal with issues with more urgency and with greater potential disruption, including risks to a company or industry's licence to operate.

In our four-part sustainable investing framework which considers the impact of ESG factors on investment considerations, plastic sits squarely within "Group Three," our "at risk" category (see Figure 63). We view Group Three companies as vulnerable to regulatory or cultural change. In a plastics context, we see greater risk to consumer staples, and potentially, food retail companies given the higher visibility around plastics. Companies with meaningful plastic packaging exposure are also potentially at risk. We also see potentially negative impacts to fossil fuel and chemicals companies though we note that these often have less visibility around their plastics production, and plastic (particularly packaging inputs) is often a smaller contributor to overall production or profitability.

Figure 63: What is ESG Stock Selection? Four-part Framework



Source: UBS

A non-linear trajectory

Group Three risk in the context of plastic could crystallise in different ways and the trajectory is unlikely to be predictable. In certain cases change is likely to be abrupt; in others, change could happen over a longer time period. We have highlighted examples including outright bans, a combination of both gradual and sudden shifts away from plastic use, and innovations that further impact plastic use.

"Single use" became Collins' dictionary's 2018 word of the year

In addition to the regulatory environment discussed above, consumer behaviour and cultural shifts are an important factor to consider with regards to impact on plastic consumption. Waitrose noted an "800% increase in questions about plastic" to their customer services team following the release of David Attenborough's Blue Planet II episode on plastic marine pollution. The same report noted that since watching the episode, 60% of consumers "more regularly" use a reusable coffee cup for takeaways.[53]

We note other examples, including IHG announcing the replacement of all single-use miniature toiletries across the group. The company notes it "currently has an average of 200 million bathroom miniatures in use across its entire hotel estate every year." The shift to bulk size is expected to be completed during 2021.[54]

[53] Waitrose & Partners Food and Drink Report 2018-19, 01 Nov 2018, Waitrose & Partners
[54] IHG press release

Shortly after IHG's release, Marriott announced the replacement of "single-use toiletry bottles of shampoo, conditioner and bath gel" with (presumably refillable) larger bottles, across the chain. The company makes reference to a successful pilot program launched in 2018 to replace single-use bottles with larger sizes, and comments that "hotels that have made the switch overwhelmingly report positive feedback from guests."[55]

In addition to addressing potential Group Three risk with such initiatives, UBS European Leisure and Transport analyst Jarrod Castle has previously commented that "green practices can generate substantial cost savings" and boost hotel profitability. As we note above, however, such initiatives *individually* do not necessarily have significant impact on packaging companies given the relatively small contribution to total earnings. We do consider the direction of travel to be meaningful, however.

We also note the following comment from UBS analyst John Roberts (emphasis ours) with regards to sustainability issues on growth rates:

> Chlor-chemicals (incl. PVC & caustic) are assumed to grow less than GDP, as capacity growth is expected to be less than GDP growth. All other chemicals are assumed to have sufficient capacity growth for demand to grow faster than GDP. There is no demand reduction from plastic waste issues in this intermediate-term horizon. **But polyethylene and polypropylene (and therefore ethylene and propylene) have the greatest demand risk longer-term from plastic sustainability issues.**[56]

Figure 64: Share of plastic-based packaging in total global packaged food, 2017 (% unit volume) 1.6tn units

Source: Euromonitor

The United Nations Environment Programme, Trucost, and the Global Partnership on Marine Litter estimate that within consumer, the largest user segment of plastic is food, while the segment with the highest revenue intensity of plastic is toys.[57] While we view the entire plastic usage chain as at risk over time, we note that the consumer sector has a higher public profile with a significantly more visible *and identifiable* pollution impact. For example, we note a joint Greenpeace/Break Free

[55] Marriott press release
[56] North American Chemicals Industry Primer (Roberts) See P14
[57] UNEP Valuing Plastic: The business case for measuring, managing, and disclosing plastic use in the consumer goods industry, Copyright © United Nations Environment Programme (UNEP), 2014, P6

From Plastic report on a significant (10,000 volunteer) plastic pollution cleanup effort which also sought to publicly identify the sources of plastic pollution. The report comments:

> Our analysis of that data reveals the Top Polluters worldwide from participating brand audits: Coca-Cola, PepsiCo, Nestlé, Danone, Mondelez International, Procter & Gamble, Unilever, Perfetti van Melle, Mars Incorporated, and Colgate-Palmolive. The top three companies alone (Coca-Cola, PepsiCo, and Nestlé) accounted for 14% of the branded plastic pollution found worldwide.[58]

Company actions

We highlight examples of actions companies are taking to address the potential Group Three risk. We note increasing disclosure on the part of certain consumer, retail and packaging companies, for example as part of the Ellen MacArthur Foundation's New Plastics Economy Global Commitment document. This report very clearly identifies (where disclosed) plastic packaging volume used per year, as well as future commitments with regards to plastic packaging use. Lack of disclosure in the context of this paper is very visible; we would expect a combination of pressure from consumers, NGOs and institutional investors given the significant momentum we are seeing in the field of ESG and sustainable investing to result in additional disclosures and reduction commitments over time.

As discussed in UBS research many consumer companies have made commitments towards recycled materials. But many commitments are nuanced, requiring "recyclable" materials (i.e. virgin PET is recyclable) rather than requiring already recycled material content. Some commitments are also brand-specific, such as Nestlé having different targets for Poland Springs vs Perrier.

Figure 65: Published Packaging Commitments of Selected Consumer Companies with Food Grade Brands

Coca Cola	By 2030: 50% recycled material in packaging; 100% recyclable packaging
Danone	By 2025: 25% recycled material on average; 50% in water/beverage bottles; 100% in Evian bottles
Kraft Heinz	By 2025: 100% recyclable or compostable packaging, but goal for % of recycled content not stated
Mars	By 2025: 100% recyclable or compostable packaging, but goal for % of recycled content not stated
McDonald's	By 2020: 100% fibre packaging from recycled/"certified" sources; rPET content goals not stated
Mondelez	By 2025: 100% of packaging will be made with recyclable material by 2025
Nestle	By 2025: 35% of water bottles globally and 50% in the U.S with rPET; 100% recyclable packaging
PepsiCo	By 2025: 25% recycled content in all plastic packaging and 33% in PET packaging
Unilever	By 2025: 25% recycled content in all packaging; 100% recyclable, reusable, compostable packaging
Similar commitments by retailers (e.g., Walmart, Starbuck's, Whole Foods), non-food grade brand owners (e.g., Clorox, Colgate-Palmolive, L'Oréal) and producers of packaging material (e.g., Plastipak/Amcor)	

Source: IHS Markit, UBS, rPET Holdings LLC, (North American Paper & Packaging, 4 April 2019).
Note: comments as of 4 April, 2019

[58] Break Free From Plastic Global Brand Audit Report 2018, reproduced with permission.

US Beverage (Sean King)

Coca-Cola: KO and its bottling partners are one of the largest global users of end-market PET for consumers. In an effort to mitigate future regulatory and reputational risk, KO has undertaken a number of initiatives designed to reduce its exposure to soft PET bottles. KO aims to increase usage of recycled material from 30% in 2018 to 50% in 2030 as part of its World Without Waste program. KO and its network of bottlers already use 9% recycled material in PET packaging and rolled out 100% recycled PET bottles in select markets with a goal to expand globally by 2030. Per management commentary, 56% of all its packages are either refilled or collected for cycling. KO and its bottlers are helping local governments to streamline the collection process for recycling in a number of countries. KO is sharing its PlantBottle technology with other companies to help reduce PET plastic in bottles by up to 30%.

PepsiCo: We believe PEP's acquisition of SodaStream (at-home beverages) in 2018 reflects leadership's commitment to beverage growth away from traditional PET/can packaging. PEP's Drinkfinity platform provides beverage solutions in the form of a reusable bottle that uses pods to add flavours. Drinkfinity claims to use 65% less plastic while producing a 40% lower carbon footprint compared to 20oz disposable PET bottles. In addition to SodaStream and Drinkfinity, PEP engages other platforms (Hydration Platform, Pepsi Spire) as part of its Beyond the Bottle initiative. Within its core beverage portfolio, PEP strives to use 100% recyclable packaging globally by 2025 from 90% in 2017. By 2025, PEP also aims to use 25% recycled plastics in global packaging and 45% recycled plastics in European Union. By 2025, PEP plans to reduce 35% of virgin plastic across its global portfolio which equates to 2.5m metric tons of cumulative virgin plastic, and targets to use 100% recyclable, compostable or biodegradable packaging material across its beverages and snacks operations by 2025.

PEP recently announced measures to cut 8,000m tons of virgin plastics by next year through a number of measures: a) transitioning LIFEWTR packaging to 100% rPET, b) rolling out Aquafina water brand in aluminium packaging in US food outlets while extending trials into retail markets, and c) Bubly sparkling water will only be available in aluminium cans.

In order to understand the financial implications of reducing reliance on virgin PET, we laid out two plausible but hypothetical scenarios. Under Scenario 1 we developed a framework to measure the increasing use of recycled PET in the production of PET bottles. Based on US Nielsen tracked channel data, we estimate the normalised consumption to be roughly 12.5B PET packages over the latest 52-week period ending 9/7/19. From that, we assume that 10B packages or 80% mix is from virgin PET.

Scenario 1: Assuming PEP's US Beverages business (NAB) shifts 20% of packaging from virgin PET to recycled PET at 50% incremental cost relative to virgin PET, this would lead to a -1.2% decline in FY20 EPS. Such an effort would eliminate roughly ~50,000 tons of virgin PET.

Scenario 2: We assume that PET bottles of all sizes are homogeneously replaced by aluminium cans (12oz). If PEP NAB segment shifts 20% of PET portfolio into aluminium, this could lead to an EPS decline of -4.4% after factoring in cost of additional units of cans required to replace large PET while assuming no changes in other costs of production. This approach suggests a ~50,000 ton decline in PET

exposure at every 20% shift in portfolio leading to 2.5B fewer PET bottles, while adding 62,000 tons of aluminium exposure.

Figure 66: A sensitivity analysis on PEP's North American Beverages segment suggests that increasing use of recycled PET as well as a shift to aluminium cans would lead to a decline in overall profitability all else equal

Scenario 1

Virgin PET to Fully Recycled PET

EPS % Impact on FY20 PEP		Virgin PET as % of Total PET				
		80%	60%	40%	20%	0%
% Chg in cost/bottle	30%	0.0%	-0.7%	-1.4%	-2.1%	-2.9%
	40%	0.0%	-1.0%	-1.9%	-2.9%	-3.8%
	50%	0.0%	-1.2%	-2.4%	-3.6%	-4.8%
	60%	0.0%	-1.4%	-2.9%	-4.3%	-5.7%
	70%	0.0%	-1.7%	-3.3%	-5.0%	-6.7%
Virgin PET Bottles Removed (bln)		-	2.5	5.0	7.5	10.0
Virgin PET removed ('000 tons)		-	50	100	150	199
Aluminum added ('000 tons)		-	-	-	-	-

Scenario 2

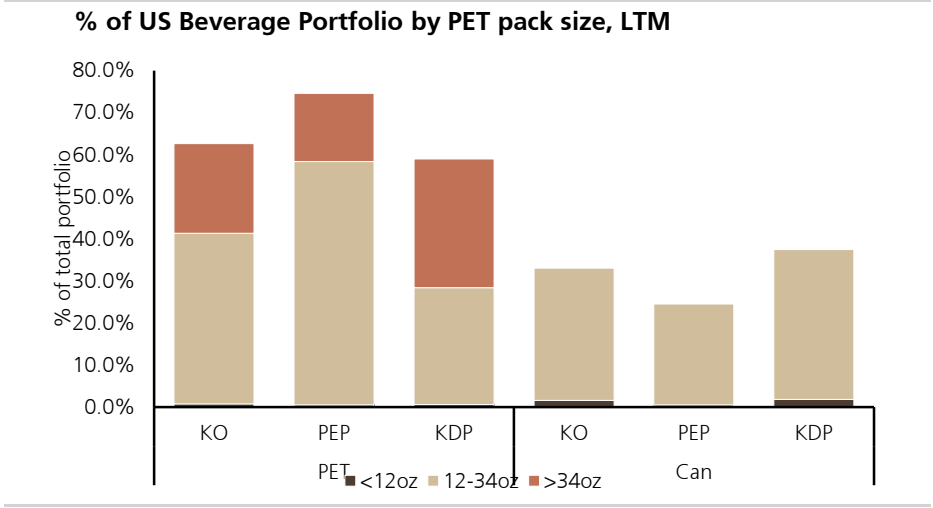
Virgin PET to Aluminum Cans

EPS % Impact on FY20 PEP		Virgin PET as % of Total PET				
		80%	60%	40%	20%	0%
% Chg in cost/can	-20%	0.0%	-5.1%	-10.3%	-15.4%	-20.6%
	-10%	0.0%	-4.7%	-9.5%	-14.2%	-19.0%
	0%	0.0%	-4.4%	-8.7%	-13.1%	-17.4%
	10%	0.0%	-4.0%	-7.9%	-11.9%	-15.8%
	20%	0.0%	-3.6%	-7.1%	-10.7%	-14.2%
Virgin PET Bottles Removed (bln)		-	2.5	5.0	7.5	10.0
Virgin PET removed ('000 tons)		-	50	100	150	199
Aluminum added ('000 tons)		-	62	125	187	249

Source: Nielsen, UBS

Keurig Dr. Pepper: In its Coffee pod operations, KDP is committed to transition to recyclable pods in the US the by end-2020. By 2025, KDP aims to achieve 100% recyclability across its portfolio and use of 30% recycled material.

Figure 67: PEP is most exposed to plastics with 74% of total US portfolio tied to PET



Source: Nielsen, UBS

Monster Energy: While MNST's portfolio is already heavily reliant on recyclable aluminium, leadership commentary indicated ambitions to further light-weight its PET bottles of Monster Hydro by 10-20%.

Molson Coors: Molson Coors leadership introduced a new plastics strategy in 2019 and aims to make 100% of packaging reusable, recyclable, compostable or biodegradable while using a minimum of 30% of recycled content in plastic packaging by 2025. In the UK, the company plans to remove plastic wraps from multi-packs by March 2020, as well as replace plastic rings with recyclable cardboard sleeves on Carling and Coors Light cans by March 2021.

Japan Retail (Nozomi Moriya)

Figure 68: Packaging Commitments of Selected Japanese Retail Companies

Company	Commitment
Seven & I Holdings	By 2030: Completely eliminate use of plastic bags at cash registers. By 2030: 50% of packaging for products developed in-house will use environmentally conscious materials (biomass, biodegradable materials, recyclable materials, paper, etc.). By 2050: Aiming to increase use of such materials to 100% of packaging for in-house products.
Fast Retailing	By 2020: Reduce use of disposable plastics in stores by 85%.
Kirin Holdings	By 2027: Replace 50% of current PET resin use in Japan with recyclable plastics.
Asahi Group Holdings	By 2030: 60% of plastic packaging to be made from recycled PET or plant-based materials.
Kao	By 2030: Aiming to increase diffusion rate of revolutionary new packaging films to 300m rolls a year, among other goals.
Lion	By 2050: Aiming to double use of recycled plastics or biomass plastics from 2017 levels.
FP	Aiming to reduce FY19 PET raw material use by 7,100 tonnes. By FY20, aiming to increase PET bottle recovery to 5,000 tonnes/month.

Source: UBS

EU Oil & Gas (Jon Rigby)

As discussed in the 2 September ESG Symposium in the context of exclusions vs engagement investing approaches, we think the potential for Oil & Gas majors (and indeed, chemical companies) to be part of any *ongoing solution* needs to be considered. This is equally as true for plastic pollution as it is for carbon emissions. However, initiatives to address the plastic problem at the moment are simply too small in the context of the overall groups to be meaningful.

Oil & Gas Companies – Plastic waste & recycling solutions

Integrated oil & gas companies are investing in and developing technology solutions in the area of plastic and plastic waste. Shell is involved in the R&D of waste-to-fuel. In India, Shell has built a demonstration plant that will turn waste – including plastics – into petrol and diesel fuel for vehicles. BP's focus on sustainable plastic solutions includes its partnership with Virent and Johnson Matthey – aimed at advancing the commercialisation of Virent's Bioforming process for production of bio-paraxylene, a key raw material for renewable plastic; developing technologies for chemical recycling that can make previously unrecyclable plastics infinitely recyclable (with BP looking to commercialise the technologies by 2025); plus efforts to reduce plastic in packaging across its product line. Total acquired Synova (a French manufacturer to high-performance recycled polypropylene) in Feb-19, a company which produces 20kt/yr of polypropylene from recycled plastics. Total is also associated with Citeo, Saint-Gobain and Syndifrais in a project aiming to create a polystyrene recycling system in France by 2020. In addition, Total is a major player in the growing bioplastics market; through its JV with Corbion it has a 75kt/yr Poly Lactic Acid (PLA) production facility in Thailand – a

100% bio-based, recyclable and biodegradable bioplastic. Chevron, through its Chevron Phillips Chemicals joint venture, is involved in a new chemical recycling JV aimed at converting used polystyrene products back to their original liquid form, which can then be taken to make new polystyrene products without downgrading the quality of the plastics.

Outside the Majors, other European Oil companies are investing in recycling solutions from plastic waste. Eni is investigating the production of hydrogen from non-recyclable plastic packaging waste, while Repsol is involved in both plastic waste recycling and biodegradable plastic projects. Neste has started a development project targeting the use of liquefied waste plastic as a raw material for its fossil refinery, with the aim of processing >1 million tons of plastic waste annually by 2030. Meanwhile, OMV, in a slightly different vein, launched a pilot plant in 2018 to convert used plastics into so-called synthetic crude oil, which can then be used as a refinery feedstock to produce fuels or as base materials for the plastics industry.

Members of the Alliance to end plastic waste

Shell, ExxonMobil, Chevron, Total and Eni are all members of the 'Alliance to End Plastic Waste'. This is an alliance of 35+ global companies (including chemicals manufacturers, consumer goods and waste management companies) along with the World Business Council for Sustainable Development. Its commitment is to invest $1.5bn over the next five years to develop solutions aimed at eliminating plastic waste in the environment. However, we would note this is less than 1% of capex across the group.

Appendix

Appendix

Sources for Figure 6:

1. Plastic bag bans, at: https://www.gov.uk/government/publications/carrier-bag-charge-summary-of-data-in-england/single-use-plastic-carrier-bags-charge-data-in-england-for-2018-to-2019

2. Mandatory GHG emissions: Jouvenot, Valentin and Krueger, Philipp, Reduction in Corporate Greenhouse Gas Emissions Under Prescriptive Disclosure Requirements (August 8, 2019). Available at SSRN: https://ssrn.com/abstract=3434490 or http://dx.doi.org/10.2139/ssrn.3434490

3. Soft drinks sugar tax: Álvarez-Sánchez C, Contento I, Jiménez-Aguilar A, et al. Does the Mexican sugar-sweetened beverage tax have a signaling effect? ENSANUT 2016. *PLoS One*. 2018;13(8):e0199337. Published 2018 Aug 22. doi:10.1371/journal.pone.0199337 at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6104929/

4. Hotel environmental nudges (Hilton LightStay and TripAdvisor survey), at https://neo.ubs.com/shared/d26yXowmbu/

5. Smoking prevention campaigns: Jackson SE, Beard E, Kujawski B, et al. Comparison of Trends in Self-reported Cigarette Consumption and Sales in England, 2011 to 2018. JAMA Netw Open. Published online August 28, 20192(8):e1910161. doi:10.1001/jamanetworkopen.2019.10161

6. Mandatory seatbelts, UK, at: https://www.roadsafetyobservatory.com/HowEffective/vehicles/seat-belts

7. Mandatory seatbelts, US, at: http://www.law.harvard.edu/programs/olin_center/papers/pdf/341.pdf, P3

Sustainable Investing is an active approach to investment decision-making that takes relevant environmental, social and governance (ESG) issues into account. UBS's ESG research team believes that ESG issues are inevitably embedded in any firm's business model, and are therefore no different than the many other issues taken into consideration in investment research.

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Neutral	FSR is between -6% and 6% of the MRA.	40%	29%
Sell	FSR is > 6% below the MRA.	15%	21%
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Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 30 September 2019.
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2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.
3:Percentage of companies under coverage globally within the Short-Term rating category.
4:Percentage of companies within the Short-Term rating category for which investment banking (IB) services were provided within the past 12 months.

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Company Disclosures

Company Name	Reuters	12-month rating	Short-term rating	Price	Price date
Alfa Laval	ALFA.ST	Neutral	N/A	SKr205.30	16 Oct 2019
Amcor Limited[4, 5, 7, 16, 18b]	AMC.AX	Neutral	N/A	A$13.97	17 Oct 2019
Anheuser-Busch InBev[16]	ABI.BR	Neutral	N/A	€83.66	16 Oct 2019
Beiersdorf[7, 18a]	BEIG.DE	Sell	N/A	€106.20	16 Oct 2019
Brown-Forman Corp[16]	BFb.N	Neutral	N/A	US$63.50	16 Oct 2019
Church & Dwight[16]	CHD.N	Neutral	N/A	US$72.99	16 Oct 2019
Coca-Cola[3a, 16]	KO.N	Neutral	N/A	US$53.49	16 Oct 2019
Coca-Cola Hellenic Bottling Company S.A[3a, 5, 12, 14]	CCH.L	Buy	N/A	2,451p	16 Oct 2019
Colgate-Palmolive India	COLG.BO	Neutral	N/A	Rs1,529.85	17 Oct 2019
Constellation Brands Inc[16]	STZ.N	Neutral	N/A	US$198.48	16 Oct 2019
Dabur India Ltd.	DABU.BO	Buy	N/A	Rs462.20	17 Oct 2019
Diageo[2, 4, 7, 16, 22]	DGE.L	Buy	N/A	3,163p	16 Oct 2019
Dow Inc[6c, 7, 16]	DOW.N	Buy	N/A	US$47.12	16 Oct 2019
DS Smith Plc[2, 13]	SMDS.L	Neutral	N/A	352p	16 Oct 2019
Formosa Chemicals & Fibre	1326.TW	Sell	N/A	NT$87.90	17 Oct 2019
Formosa Petrochemical Corporation	6505.TW	Sell	N/A	NT$97.30	17 Oct 2019
FP	7947.T	Neutral	N/A	¥6,570	17 Oct 2019
GAIL (India)	GAIL.BO	Sell	N/A	Rs128.70	17 Oct 2019
GEA Group[18a]	G1AG.DE	Neutral	N/A	€26.36	16 Oct 2019
Hindustan Unilever	HLL.BO	Neutral	N/A	Rs2,103.60	17 Oct 2019
Indian Oil	IOC.BO	Buy	N/A	Rs146.45	17 Oct 2019
Kao	4452.T	Buy	N/A	¥8,373	17 Oct 2019
Kirin Holdings[4, 7]	2503.T	Buy	N/A	¥2,301.0	17 Oct 2019
Krones[18a]	KRNG.DE	Neutral	N/A	€55.55	16 Oct 2019
Kuraray	3405.T	Buy	N/A	¥1,337	17 Oct 2019

Company Name	Reuters	12-month rating	Short-term rating	Price	Price date
LG Chemical	051910.KS	Buy	N/A	Won304,000	17 Oct 2019
Lotte Chemical	011170.KS	Buy	N/A	Won239,500	17 Oct 2019
LyondellBasell Industries[7, 16]	LYB.N	Neutral	N/A	US$86.45	16 Oct 2019
Mangalore Refinery and Petrochemical	MRPL.BO	Neutral	N/A	Rs51.55	17 Oct 2019
Molson Coors Brewing Company[16]	TAP.N	Buy	N/A	US$56.32	16 Oct 2019
Mondelez International Inc[16]	MDLZ.O	Buy	N/A	US$54.27	16 Oct 2019
Mondi[2, 4, 5, 13, 14, 18c]	MNDI.L	Buy	N/A	1,615p	16 Oct 2019
Monster Beverage[16]	MNST.O	Sell	N/A	US$56.52	16 Oct 2019
Neste[13]	NESTE.HE	Neutral	N/A	€28.36	16 Oct 2019
Nestle India Ltd.[22]	NEST.BO	Buy	N/A	Rs14,512.75	17 Oct 2019
Nomad Foods Ltd[2, 4, 6a, 16]	NOMD.N	Buy	N/A	US$19.20	16 Oct 2019
Orora Limited[3b]	ORA.AX	Neutral	N/A	A$3.02	17 Oct 2019
PepsiCo Inc[2, 3c, 4, 5, 6b, 7, 16]	PEP.O	Neutral	N/A	US$136.42	16 Oct 2019
Reliance Industries	RELI.BO	Buy	N/A	Rs1,396.15	17 Oct 2019
Sasol Ltd[16]	SOLJ.J	Neutral	N/A	RCnt28,418	16 Oct 2019
Seven & I Holdings	3382.T	Buy	N/A	¥4,328	17 Oct 2019
SK Innovation	096770.KS	Buy	N/A	Won162,500	17 Oct 2019
Smurfit Kappa Group Plc	SKG.I	Buy	N/A	€29.46	16 Oct 2019
The Clorox Company[16]	CLX.N	Sell	N/A	US$148.51	16 Oct 2019
Unilever NV[4, 6a, 7, 16]	UNA.AS	Neutral	N/A	€54.01	16 Oct 2019
Unilever Plc[4, 7, 14, 16]	ULVR.L	Neutral	N/A	4,609p	16 Oct 2019
UPM-Kymmene OYJ[7]	UPM.HE	Buy	N/A	€28.01	16 Oct 2019
Valmet	VALMT.HE	Neutral	N/A	€17.87	16 Oct 2019
Westlake Chemical Corp[5, 16]	WLK.N	Sell	N/A	US$62.21	16 Oct 2019

Source: UBS. All prices as of local market close.
Ratings in this table are the most current published ratings prior to this report. They may be more recent than the stock pricing date

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Company profile and fee and risk statement under the Japanese Financial Instruments & Exchange Law

Company Name etc: UBS Securities Japan Co., Ltd., Financial Instruments & Exchange Firm, Kanto Local Financial Bureau (Kinsho) No.2633

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