



Analysis of Upstream Economic Opportunities from change in the plastics life-cycle



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Analysis of economic opportunities from change in the whole plastics life-cycle

Introduction

Successful, effective, cost-efficient national, regional and international responses to plastic pollution require initiatives, actions and activities that embark on a transition towards “a more sustainable management of plastics throughout their *life cycle* in order to increase sustainable consumption and production patterns”. (1)

Companies in the upstream sector of the plastics value chain (plastic producers, manufacturers, commercial buyers) are considered pivotal players with great potential to benefit. (2–4)

This paper show how companies in the upstream sector can benefit economically, describing:

- The upstream sector
- Growth markets
- Better management of risks and liabilities
- Actions to seize opportunities
- Necessary enabling elements of a Global Plastics Agreement

Key insights

The paper contains detail on:

Capturing Growth Markets

- The upstream sector can respond and capitalise on increasing consumer demands for more sustainable plastics, gaining from faster growth rates in the increasing market shares of more sustainable plastics and increased profits from higher value products.
- They can profit from increased the reuse and recycling of plastics:
 - » profiting from a possible growth of the related profit-pool of US\$60 billion in 2030 for reuse and recycling. These markets are growing faster than the average of the total global plastic production and are likely to reach substantial shares in the global plastic production in the near future, and
 - » retaining the material value of plastic products in the plastics economy worth between US\$80 billion and US\$120 billion a year or roughly between 14 and 21 percent of the turnover of the global plastics industry in 2020.

Mitigating Risk and Liabilities

- They can avoid economic costs of existing and possible regulations that even in conservative estimates could amount to US\$120 billion per year or around 20 percent of the current turnover of the plastics industry.
- They can avoid or reduce economic costs of an internalisation of external costs of plastic production that could amount up to US\$294 billions in 2020 or 51 percent of the plastics industry's turnover in this year.

Actions to seize opportunities are realisable

- The prospects of seizing the possible business opportunities are generally promising. Many analyses emphasise that even with currently available solutions significant shifts towards more a more sustainable and ultimately more circular plastics economy are possible (e.g., 5) and the leakage of plastics into the environment could be reduced by about 80 percent until 2040 while realising economic and societal benefits (e.g., 2).
- McKinsey & Company estimates that to achieve a 50 percent recovery and recycling rate in 2030, investments of US\$15 billion to US \$20 billion per year would be necessary. This is around 15 to 20 percent of what the global petrochemical and plastics industry have been investing over the past decade.(6)

Good design of GPA elements to enable opportunities

Good design of a GPA would enable these opportunities by clarifying opportunities and de-risking investment. It could most usefully provide:

- Clarity and strength of signals of future market growth opportunities and risks
- Certainty and credibility that policy frameworks supporting those future markets will deliver
- Financial mechanisms which de-risk and prioritise investments and support innovation

Describing the upstream sector: its constituents and influence

The upstream sector includes 3 categories of businesses

In the current linear plastics economy, the upstream sector comprises three groups of actors:

1. Plastic producers (raw material production): a) *oil and gas companies* that extract the fossil fuel feedstocks for plastics and b) *petrochemical companies* that produce plastic pellets either from virgin materials or from recycled plastics.
2. Plastic processors and converters (manufacture and use): companies that manufacture specific plastic products for a wide variety of applications in industrial and consumer markets by using and processing the plastic pellets from plastic producers.
3. Plastic consuming industries and business: companies that use plastic products and applications for their economic activities and business models.

While there are only a few hundred plastic producers, several thousand plastic processors and converters exist, together with millions of plastic consuming industries and businesses. Each of these groups influences the others. The plastic production sector is highly concentrated: Minderroo estimates that in 2019 only 20 plastic producers were responsible for more than half of the global single-use plastic waste that was generated in this year. (8)

A key influence on the life-cycle and economics of plastics

Plastics producers, through their position at the first stages of the plastics value chain, their investments, decisions and business models, influence the entire plastics value chain and either open up or limit possibilities in the subsequent stages for the residual value of products for recycling, and the shift towards opportunities of a more long-term sustainable or more circular plastics economy. They do so by choosing and organising materials which mainly determine the environmental sustainability and recyclability or circularity of the plastics economy. (7).

Wider design choices made by all the upstream companies shape any plastic product's lifetime, the technical feasibility and economic viability of its collection, sorting and recycling, and its environmental and health effects. Their decisions therefore strongly influence the re-usability of plastic products, their value before and after use, the net costs of waste management, the potential growth and economic viability of the recycling sector, the volume of plastic leaking to the environment, and ultimately the environmental harm of plastics.

An illustrative case in point is the recyclability of plastic products. Petrochemical companies produce different plastic types (polymers), of which some are (more) easily recyclable, like polyethylene terephthalate or PET, while others are not or hardly recyclable, like polyvinyl chloride or PVC. Likewise, plastic processors and converters design and manufacture plastic products that are more or less easily recyclable by deciding on products' formats and materials. For example, dark coloured plastics or plastic products that compound different plastic types or combine plastic with other materials (multi-layered plastics) are more difficult to recycle, if at all.

Finally, plastic consuming industries and businesses determine with their business models the extent to which finished plastic products with varying degrees of recyclability are ultimately supplied to the end-user. Largely similar considerations apply to the reusability, compostability and non-toxicity of plastic products.

Capturing Growth Markets

Capitalising on demands from individual or business consumers

If companies in the upstream sector change their business practices towards more sustainable and ultimately more circular production and consumption patterns, they can capitalise on actual or future increases in demands for more circular plastic products in the subsequent stages of the plastics life cycle. Demand ultimately determines what materials and products will succeed on the market, generate revenue and bring profits.

Demand of and thus market potential for more circular plastic products is currently already increasing and likely to increase further in the future. A case in point are plastics used in the packaging, textile and consumer good sectors, which accounted for more than half of all virgin plastic production in 2017. (23) Here, somewhat interrelated shifts in demands for more circular plastic products and business models can be observed among two groups of actors.

Growing consumer demand for more circular plastic products

First, a significant share of individual consumers prefer more circular plastic products and services. Various national and international surveys reveal that plastic pollution is among the top environmental concerns among individual consumers, in some surveys only second to climate change. In Asia and Eastern Europe, plastic pollution even ranked first among the most pressing environmental concerns. (21) According to an international survey by Boston Consulting Group in 2020, 57 percent of consumers consider plastics as harmful and 65 percent associate it with ocean pollution. (24) The survey was conducted among 15,620 consumers in 9 countries, 6 of which are among the ten countries with the highest per capita plastic waste generation, namely US, Brazil, Argentina, UK, Germany and Italy, as well as France, Spain and Poland. These concerns and the rising awareness of plastic pollution go often hand in hand with a willingness to pay more for more circular plastic products and services.

According to the survey of the Boston Consulting Group, 75 percent of consumers are willing to pay up to 10 percent more for eco-friendly packaging. (24) In general, the perception of plastic pollution as serious environmental risk has increased. (20) Plastic consuming businesses that are able to satisfy these new preferences with more circular plastic products or innovative business and delivery models will have a competitive advantage over those that are not able or willing to do so. Amongst others, such competitive advantages can translate into faster growth rates, like for example in the case of the Sustainable Living Brands of Unilever, the world's fourth largest fast-moving consumer good (FMCG) company with an annual revenue of US\$60 billions. In 2018, the Sustainable Living Brands grew faster than any other of the company's businesses and contributed 75 percent of Unilever's growth in that year. (4) Overall, the global market of sustainable plastic packaging amounted to US\$80 billion in 2020 and is expected to grow by 59 percent or a Compound Annual Growth Rate (CAGR) of 5.3 percent to US\$127.5 billion by 2028. (25)

Changing business demand for more circular plastics

Second, plastic consuming businesses in the packaging, textile and consumer goods sector are changing their plastic use and business models towards more circularity, also in response to the just described preferences of individual consumers. This provides economic opportunities for plastic producers, processors and converters that are able to satisfy the resulting demand for more circular plastic products and business models in the plastic value chain. They might gain growing market shares and power to determine prices. (11)

An increasing number of major FMCG companies, for example, view plastic packaging as top environmental issue that needs to be addressed in order to secure continuous support from internal and external stakeholders as well as to ensure long-term business success. (26) Many of these companies committed to phase out single-use plastics and implement targets for the use of recycled materials in their products and delivery services. (3)



Under the New Plastics Economy Global Commitment, companies committed to targets that are expected to reduce their demand for virgin plastics by around 19 percent between 2018 and 2025. (27) Among the companies are six of the world's largest FMCG companies, namely Nestlé, PepsiCo, Unilever, the Coca-Cola Company, L'Oréal and Danone, with a total combined revenue of more than US\$311 billion, as well as 4 of the world's 12 largest retailers, namely Walmart, the Schwarz Group, Target Corporation and Ahold Delhaize with a total combined revenue of more than US\$810 billion.

Nestlé, the world's largest FMCG company, aims at reducing the amount of virgin plastics in its packaging by one third between 2018 and 2025. Procter & Gamble, the world's second largest FMCG company, aims at achieving the same reduction by 2030. Unilever, the world's fourth largest FMCG company, aims at halving the amount of virgin plastics in its packaging between 2018 and 2025. (28)

Likewise, the Chinese A. S. Watson Group, which is the world's largest international health and beauty retailer, committed to only use reusable, recyclable and/or compostable packaging from 2025 onwards.

Consequences

An example from plastic processors and converters that respond to these changes and embark on more circular plastic products is Amcor, the world's fifth largest packaging producer, that aims at eliminating all problematic or unnecessary plastic packaging and at using 100 percent reusable, recycled or compostable plastic packaging by 2025. Between 2018 and 2020, the reduction in the use of virgin plastics that has been achieved by all signatory companies was largely driven by a 60 percent increase in the use of recycled plastic content in their packaging. (27) If all signatories met their targets, including plastic processors and converters, this would reduce the demand for virgin plastic production from these companies by 8 million metric tons or 2 percent of the global plastic production in 2020.

Overall, investment analysts conclude that companies that engage in more circular use of plastic products avoid reputational risks that might reduce the brand's value and jeopardise shareholder value. (11) In other words, they safeguard or even increase their brand's value and reputation by moving towards more circular plastic products and business models, thereby capitalising on prospects of increasing market shares in these segments. Some argue that the current trend might result in "a make or break situation, where companies that best respond to the sustainability challenges will have a significant competitive advantage". (19)



Profiting from increasing reuse and recycling of plastic

Favourable Market Growth Trends

Globally, KPMG research expects that in 2030 recycled plastics will account for 30.6 percent of global plastic production (compared to 12.2 percent in 2019) and for 30.4 percent of global plastic market value (compared to 13.9 percent in 2019). (29)

By contrast, fossil fuel-based plastics are projected to lose shares in production volumes and market value, from 85.1 percent in 2019 to 54.7 percent in 2030 and from 81 percent in 2019 to 45.3 percent in 2030 respectively. (29)

A scenario developed by McKinsey & Company even projects that under certain conditions 50 percent of all plastics worldwide (or 220 million metric tons) might be reusable and recyclable in 2030, that is four times more than nowadays. (6)

According to the reviewed market analyses and projections, two factors mainly drive this development: increasing awareness among consumers about the environmental effects of plastics and more stringent policies and regulations.

Potential Economic Benefits for the Upstream Sector

Advancing the reuse and recycling of plastic is not only desirable from an environmental perspective. It also provides substantial economic benefits for companies in the upstream sector. Even the petrochemical industry, which is often considered to be one of the potential losers of a more circular plastics economy, might benefit. In a scenario on the development of the global plastic market until 2030, McKinsey & Company estimate that their profit-pool could grow to US\$60 billion from increased reuse and recycling of plastics. (6) “Reusing plastics waste could thus become an important driver of profitability for chemical companies. Incumbent players need to make the right moves now to tap this opportunity”. (6) Moreover, it would also increasingly reduce the need for virgin, fossil fuel-based feedstock, thereby contributing to avoid or reduce the economic costs of possible climate related regulations for the plastics industry.

Four opportunities

Four opportunities contribute to promising growth and secured profitability for those companies in the upstream sector that advance the production and use of reusable and recycled plastic products.

Faster relative growth

First, if companies in the upstream sector contribute to more reusable and recycled plastic products they can benefit from fast growing markets for these products. While estimates of market developments vary in the reviewed market analysis (see table 1), they all indicate that markets for reusable and recycled plastics will grow at significantly higher CAGR than the global market for all plastics, which is expected to rise at a CAGR of 3.4 percent between 2021 and 2028. (25) In particular recycled PET and high density polyethylene (HDPE) contribute to this market growth. (30)

Table: Development of markets for reusable and recycled plastics

Baseline in US\$ billion (year)	Projection in US\$ billion (year)	CAGR in %	Source
41.47 (2020)	56 (2026)	8.5	Market Data Forecast (31)
41.13 (2020)	76.23 (2028)	8.2	Fortune Business Insights (32)
34 (2019)	60 (2027)	6.8	Transparency Market Research (33)
33 (2020)	47.3 (2026)	6.1	Global Industry Analysts (30)
45.5 (2021)	65.3 (2026)	7.5	Infogence Global Research (34)
45.1 (2019)	66.6 (2027)	5.0	Grand View Research (35)

Potentially higher market share

Second, and related to the fast-growing markets for reusable and recycled products, companies in the upstream sector that capitalize on these markets will be able secure parts of the growing production volumes and market shares and thus revenues of reusable and recycled plastics in the global plastics market. Many estimates expect increasing demand for reusable and recycled plastics in important domestic markets. For the US, for example, it is expected that this demand will have increased by 5 to 7.5 million metric tons in 2030. (36) Another example is the EU. Here, it is estimated that its recycling target of 55 percent for 2025 will double the demand for reusable and recycled plastics to 10 million tons. (37) For some recycled plastic, namely PET, high density polyethylene (HDPE) and to a smaller extent polypropylen (PP) demand already exceeds supply, making possible higher prices. (38)

Feedstock price volatility buffers

Third, the increased production and use of reusable and recyclable plastic products through companies in the upstream sector would reduce their dependency from the volatility of prices for the fossil-based feedstocks for plastics. (38)

Retention of material value

Fourth, if companies in the upstream sector engage in advancing the reuse and recycling of plastics they benefit from retaining (all or some of) the value of plastic products in the plastics economy by avoiding that they end up as waste on landfills or dumps or leak into the environment. Instead, reusable and recyclable plastic products re-enter the value chain of the plastics economy. The extent to which the value can be retained of course depends on the extent to which plastic products are reused or recycled and, in the latter case, also on the quality of the recycled plastics and its potential subsequent uses. The maximum possible value that can be retained equals the estimated loss of economic value that results from plastic leaking into the environment or being disposed of on landfills and dumps. This loss is estimated to lie between US\$80 billion and US\$120 billion a year (2) and thus roughly amounts to between 14 and 21 percent of the turnover of the global plastics industry in 2020. Retaining this value could contribute to lower prices for plastics.

Better Management of Risks and Opportunities

Given their crucial role in determining the plastics life-cycle, companies in the upstream sector come under increasing pressure to gear their business practices towards more sustainable and ultimately more circular production and consumption patterns, like the others sector involved in the plastics economy. (9) This is even more so given that the upstream sector typically creates most of the environmental costs associated with plastic pollution. In case of plastic use in the consumer goods sector, this share is estimated to amount to over 80 percent. (10)

Some observers therefore warn that if companies do not adapt but retain their current business practices, they “will face substantial new commercial risks in coming years”. (11) Yet, already in 2014 the United Nations Environment Programme (UNEP) concluded with regard to pressures on the plastics economy: “Where there are risks, there are opportunities which businesses can turn to their advantage.” (12)

Mitigating economic costs of existing and future regulations

If companies in the upstream sector change their business practices towards more circularity, they reduce their economic risks and associated costs resulting from existing and possible regulations that increasingly shift the responsibility and costs for tackling plastic pollution onto them.

This is the case when regulations aim at internalising (some of) the external costs of plastics, e.g. through extended producer responsibility schemes for plastic products, taxes on virgin plastics or certain chemical additives, or tax differentiations between more and less circular plastic products. Even if companies shifted these costs onto consumers, any companies that avoid them by adopting more circular business models and reducing the negative costs of their business models would have a competitive advantage over those that retain their traditional business models. This is also the case if such regulations ban certain plastic products.

Companies that did not prepare for such regulation, e.g., by tapping into new, more circular market segments in the plastics economy, then risk losing entire markets, experiencing lower sales and suffering more or less significant revenue losses, depending on share of the banned plastic products in their portfolio. Even if regulations do not directly target the upstream sector in the plastics economy, any regulation in other stages of the plastics life cycle will affect companies in the upstream sector through changes in demands for certain plastic products. (13)

Estimated scale of the risk

The scale of the risk from regulations increasingly linking upstream firms to the life-cycle costs of their products can be estimated. The actual costs of regulations to business actors will be determined by the actual design of the regulations. Assessing the external costs and thus the possible costs to business is a controversial issue and estimates vary. Drawing on a review of several such estimates, Carbon Tracker Initiative assessed the life-cycle externality costs of plastics to range between US\$800 and US\$1,400 per ton of plastics in 2020. (14) Given that the global plastics production was 376 million metric tons in 2020, even the minimum and conservative estimate would amount to US\$294 billion of life-cycle externality costs in 2020 or almost 51 percent of the plastics industry turnover in this year.

Two more specific estimates reveal the possible magnitude of business risks, if life-cycle costs were fully internalised under more specific conditions. First, it was estimated that in 2014 the economic costs for companies in the upstream sector of the plastics economy would on average rise by 44 percent, if the external costs that they create were fully internalised. (12) Second, it is estimated that in 2020 the upstream sector would have to pay between US\$245 and US\$327 per ton of plastic, if governments obliged companies in the upstream sector to pay all costs of plastic waste collection, management and disposal. (14) Given the global plastic production in 2020, this means that the upstream sector would have to bear costs between US\$90 billion and US\$120 billion, depending on the share for plastic that eventually becomes waste (75 or 100 percent).

These costs make up around 20 percent of the current turnover of the plastics industry. In 2050, the costs would more than double. Under a business-as usual scenario and currently projected production volumes and recycling rates, global plastic production would reach more than 1 billion tons in that year. The costs only for waste collection, management and disposal would then amount to between US\$245 billion and US\$327 billion. (14)

Current regulatory pressures

Actual regulatory pressures currently come from two political developments. On the one hand, an increasing number of policies and regulations that directly target plastic pollution have been adopted at global, regional and national levels. At national level, for example, regulations on single-use plastics were in place in 115 countries in 2020, including bans on certain plastic products, economic incentives and disincentives, taxes, etc.. (15) This not negligible given that single-use plastics account for more than one third of the global plastic production. Such regulations or potential regulation also had already economic impacts, for example on European packaging producers. In 2018, they lost more than one-fifth of their value. Market analysts attributed this loss at least partially to worries over potential regulations on plastic pollution. (16)

At the regional level, an increasing number of comprehensive regional action plans on plastic pollution have been adopted and implemented, for example in the Mediterranean, South Asia and the Wider Caribbean. (15) The EU, an important market for plastics, has adopted several regulatory instruments and plans with the aim to reduce plastic pollution. At global level, several non-binding instruments that target plastic pollution were agreed upon, for example the Honolulu strategy or several UNEA resolutions. (15)

Clear upward trends in regulation

Overall, comparative analyses and inventories of plastic-related policies show “a clear upward trend in the number of public policy responses to the plastic pollution problem over the last decade, at global, regional and national levels”. (17) Policy experts describe the observable trends as an “unusually accelerated rate”. (16) And “more policies will be developed and implemented over the next decade”. (18) Increasing societal pressures are likely to add to this current momentum (19) and are also considered to have partially driven existing regulations. (20) In the US, the country that generates most plastic waste per capita, more than two thirds of citizens assign responsibility to companies that produce and use plastics to bear the costs for waste management, including collection, sorting and recycling. (21)

A contribution to managing transition to carbon neutrality

On the other hand, the plastics economy comes under increasing regulatory pressure in the wake of policy efforts to combat climate change. (11) 135 countries have pledged to achieve carbon neutrality, 66 countries have even set concrete goals and dates when they plan to achieve carbon neutrality (mostly in 2050). This requires decarbonising economic activities and reducing carbon footprints of national economies which will also affect the plastics industry that emitted 850 million metric tonnes of greenhouse gas emissions in 2019. (22) Moreover, many governments around the world currently discuss the phase-out or reduction of fossil-fuel subsidies. Such policies would increase the prices of virgin plastics, which – as result – then lose (some of their) competitive advantages vis-à-vis alternative feedstocks, be they bio-based or recycled plastics. The likelihood of regulations targeting the carbon footprint is virulent and increasing, given that the greenhouse gas emissions of the plastics industry are expected to consume 10 to 12 percent of the global carbon budget by 2050. (22)

Overcapacity and Stranded Assets

Overall, “many businesses will be affected by new and rapidly changing laws regulating aspects of plastic production, distribution, use, consumption and disposal. These regulatory changes will reduce the demand and increase the costs of many plastic materials and products, thereby changing the economic case for their use”. (16)

In the worst case, increased regulation of plastics products is expected to overall reduce the annual growth rates of the plastics industry between 2018 and 2030 by 2.4 percentage points from currently 3.5 percent to 1.1 percent until 2030. (18) In this context, some investment analysts warn of “overcapacity”, “stranded

assets” and “capitalisation at risk” in particular in the petrochemical sector. (14) Already in 2014, UNEP therefore recommended: “Prepare your business for future regulations. This could help companies to achieve first mover advantage on future bans, taxes and regulations.”. (12) That such are not hypothetical and markets respond to them

Actions to seize the opportunities

Companies in the upstream sector can seize economic opportunities if they start to proactively embark on the transition towards more sustainable and circular production and consumption patterns in the plastics economy. More precisely, if they find and embrace ways to “unlock value from a circular economy that derives revenue from circulation of materials rather than one based on the extraction and conversion of fossil fuels” (2) and adapt their current business practices in a way that

- problematic or unnecessary plastics are increasingly eliminated,
- single-use plastic products are increasingly reduced,
- more plastic products are reusable or recyclable,
- plastic production is increasingly decoupled from the consumption of finite resources, and
- more plastic products are free of hazardous chemicals.

3 areas of action to seize opportunities

In order for companies to exploit the possible growth opportunities and prospects of improved and secured profitability as well as to avoid economic costs of regulations and capitalise on consumer demands, many studies underscore that companies need to collaborate across the value chain, also among plastic producers, plastic processors and converters, and plastic consuming businesses. (5)

Companies that do so have good prospects in realizing competitive advantages (19) and should develop innovations in three key areas:

1. Design and scaling up of reusable plastic products and business models
2. Design and scaling up of recyclable plastic products
3. Development of, investment in and scaling up recycling technologies

In each of the three areas mentioned above more specific economic opportunities exist for companies in the upstream sector if they pursue and implement appropriate solutions. Many companies already started doing so (3) and several analyses underscore that a great variety of promising solutions already exists. (2,5) Moreover, often “their implementation is technically feasible, economically viable and socially acceptable”. (2)

These actions often include action through large international collaborations of multinational upstream companies: 3 examples are presented.

Design and scaling up of reusable plastic products and business models

In particular the plastic consuming businesses can benefit economically from designing and scaling up (more and better) reusable products and business models mainly by implementing new delivery models and by building brand loyalty.

New delivery models enable these companies to cut packaging and transportation costs, for example, if they use compact containers for supplying refills and provide refills in concentrated form. The cost reduction can be further increased if companies share reusable packaging in wider networks across brands or sectors, thereby capitalizing on resulting economies of scale in distribution and logistics. (43)

Brands for consumer goods may be particularly interested in moving to higher value, reusable plastic products as a way to increase loyalty of consumers. This can be increased in several ways. First, companies in the plastic consuming businesses can set up their own deposit and refund schemes for their reusable plastic products. Second, Reusable plastic products can also be used to gather intelligence on consumer behaviour and preferences by integrating digital technologies into reusable products. This intelligence can then be used for tailored marketing strategies or improvements and cost reductions in the reusability system. Third, brand loyalty can also be increased by using higher-value plastic products that improve user experience through enhanced functionality, haptic and appearance. The initial higher costs for such products are offset by the multiple reuse of the products and by the other advantages they provide, including cost reductions in packaging and transportation costs as well as increased brand loyalty. More high-end reusable plastic products also provide benefits to plastic processors and converters because it enables them to sell their products at higher prices and increase their margins. (43)

Overall, the Ellen MacArthur Foundation estimates that a substitution of 20 percent of single-use packaging through reusable packaging is already economically viable and could create a market worth US\$10 billion. (43)

An example for a successful substitution is ZerO Box from Huidu in China, which rents reusable boxes on a monthly, yearly or one time basis for e-commerce deliveries that can be returned upon delivery, the subsequent delivery or at drop-off stations. (4) Jingdong, the world's second largest online retailer with a revenue of more than US\$114 billion in 2020, uses these boxes and estimated that they might save US\$4.5 million per year if only ten percent of their orders would be delivered in ZerO Box. ZerO box also partners with several other leading Chinese companies, like Cainiao (which partners with Alibaba, the world's third largest online retailer), Suning (the world's fourth largest online retailer) and state-owned China Post. Overall, ZerO box has replaced more than 18 million single-use boxes from 2018 to 2020 (43).¹

Design and scaling up of recyclable plastic products

All groups of business actors in the upstream sector can benefit economically from designing and scaling up (more and better) recyclable plastic products. It is estimated that the economics of recycling can be improved by US\$120 per metric ton if a few basic requirements are followed in the design of plastic products. (2)

These benefits can be shared between upstream companies, namely by setting in motion a process that will eventually result in lower and more competitive prices for recycled plastics and thus in lower costs and competitive advantages for plastic producers, plastic processors and converters, and plastic consuming businesses that use recycled plastics as feedstock for their plastic products. (5)

At the same time, such products can be marketed as green(er) and (more) circular and allow companies to capitalize on the increasing demands for such products and to increase prices (44)

Essentially, companies in the upstream sector can do so by changing the design of plastic products so that the economics of recycling are improved. This would enable higher collection and recycling rates and also to better quality of recycled plastic materials. This would improve the profitability of plastics recycling and then drive yet higher collection and recycling rates and improved quality. This would eventually lead to lower prices for recycled plastic products. The design features of plastic products that would facilitate higher collection and recycling rates and improve the quality of the recycling yield are well known and already put into practice by a variety of business actors in the upstream sector. Five improvements stand out (2) which are described in the analysis note on "Improving the value of plastic at its end of use".

The Coca-Cola Company, for example, changed the colour from its Sprite bottles from green to clear. Nestlé developed and uses plastic containers that are made of only one white plastic type (PP). Both initiatives significantly improve the recyclability of the plastic packaging. (4)

¹ More examples in (4).

Development of, investment in and scaling up of recycling technologies

Petrochemical companies have already started expanding their investments into recycling technologies and facilities, even though they also continue considerable investments into fossil fuel-based virgin plastic production. (45) In particular in Europe large petrochemical companies acquired plastics recycling companies in the past and in doing so increased their capacities to produce recycled plastics. (6) Moreover, they increasingly invest in technologies for mechanical and chemical recycling of plastics, including five of the ten world's largest petrochemical companies, namely Dow Chemical, ExxonMobil Chemical, LyondellBasell Industries, INEOS and Saudi Basic Industries Corporation. (8,13) Current trends indicate that chemical recycling increasingly complements mechanical recycling, which is already economically viable and applied at larger scale.

In 2021, plastic producers in Europe announced plans to increase investment into chemical recycling to EUR7.2 billion in 2030. Even plastic consuming businesses in the consumer goods sector, like Adidas, Coca-Cola, and Procter & Gamble, and large investment firms, like Blackrock or the Rabobank, increasingly invest in chemical recycling. (19)

In case of recycling technologies, in particular the petrochemical companies in the upstream sector that produce plastic pellets can benefit economically from a more circular plastics economy and the use and scaling up of already existing or available recycling technologies. Some even see the petrochemical industry as ideal candidate to further push recycling technologies, using experiences from the aluminum and paper industries that significantly contributed to the establishment of effective recycling infrastructure and became important players in a profitable recycling industry with recycling rates of around 70 percent. (6) In particular the technological capacities of the petrochemical companies as well as their experiences with large-scale capital investments and operation of large-scale facilities that are needed to further advance plastics recycling put them in a strong position. (46) Under the scenario developed by McKinsey & Company that was cited earlier and that projected a growth in the profit pool of US\$60 billion by 2030, two thirds of that growth would be generated by recycling through the petrochemical industry. (6)

Against this background, it is hardly surprising that the addressable market for chemical recycling was estimated at US\$120 billion in North America alone. (36)

Yet, chemical recycling still struggles with several challenges as regards its carbon and environmental footprint, most importantly high energy use and intensity as well as the treatment of possibly toxic byproducts, and its economic viability, in particular its limited commercialization at larger scales. Mechanical recycling is therefore still often seen as the preferable option, whereas chemical recycling still needs to be improved to work better, provide higher margins and operate at larger scales. Nevertheless, many analyses deem chemical recycling – in particular if it overcomes the environmental and economic challenges and operates at larger scales – as an increasingly promising option in a circular plastics economy. (5) Chemical recycling can recycle plastics that are very difficult and costly to recycle with mechanical recycling, avoids the risk that recycled plastic is contaminated with harmful additives and substances, results in recycled plastic that has the same quality like virgin plastics and thus has the potential to completely close the loop in plastics recycling. (19) To fully exploit the potential of chemical recycling and – in combination with mechanical recycling – to achieve the 50 percent recovery and recycling rate under the McKinsey & Company scenario in 2030, of US\$15 billion to US \$20 billion per year would be necessary. This is around 15 to 20 percent of what the global petrochemical and plastics industry have been investing over the past decade. (6)

In sum, McKinsey & Company expects that “it’s possible to imagine a wholly new configuration of petrochemical and plastics plants”. (6)

For example, since 2020 Berry Global, a US based plastic packaging producer, cooperates with Saudi Basic Industries Cooperation (SABIC, the world's sixth largest petrochemical company, which is owned by Saudi Amraco, the world's third largest oil and gas company) to recycle plastics with a quality of virgin plastics. (47) In 2018, SABIC also partnered with Plastic Energy, a chemical recycling company, in order to ensure the supply of recycled plastic to partners like Unilever. (48) In 2018, Indorama Ventures from Thailand announced to invest US\$1.5 billion into the expansion of its mechanical recycling capacities and to increase its share of recycled plastics to over 12 percent of its total production. (47) Sinopec from China, together with Lanza Tech that benefitted from venture capital of BASF and operates in the US, China and India, produces plastic packaging from industrial carbon emissions. (8)

Leading examples of international collaboration

Companies in the upstream sector are recognizing these opportunities and start taking action. Over the last years, several initiatives have been established in which companies across the plastics value chain join forces in the realisation of a more circular plastics economy and seek to seize the economic opportunities that such an economy provides. The European Academies' Science Advisory Council sees these initiatives as “further evidence that the leaders in the industry accept that the linear economy for plastics must change towards a circular model”. (38)

| New Plastics Economy Global Commitment

For example, since 2018 more than 480 companies joined the New Plastics Economy Global Commitment. This initiative by the Ellen MacArthur Foundation and UNEP aims at more circularity in the plastics economy. Its members comprise leading plastic producers (e.g., BASF and Borealis), plastic processors and convertors (e.g., Alpla and Amcor) and plastic consuming business and industries from different sectors (e.g., Apple, H&M, Henkel and Nestlé). Also companies from outside the Global North take part in this initiative, like Sinopec from China (the world's third largest chemical company with a turnover of almost US\$70 billion) or Indorama Ventures from Thailand (the world's 29th largest chemical company with a turnover of almost US\$11 billion). All companies that sign this initiative (are mandated to) formulate specific targets and take concrete action in order to promote circularity in their business practices. (39)

| Alliance to End Plastic Waste

Another example is the Alliance to End Plastic Waste which was established in 2019 and brings together 65 companies that committed up to US\$1.5 billion in investments, including large multinational companies in the upstream stage of the plastics life cycle like Dow, Formosa Plastics from Taiwan (the world's sixth largest chemical company), ExxonMobil, Shell, Procter & Gamble and Pepsico. It carries out more than 35 projects in 29 countries that identify, implement and marketize solutions for a more circular plastics economy, including solutions in the upstream sector. (40)

| Plastic Pacts

A last example are Plastic Pacts in several countries or regions which have been signed by companies from across the plastics value chain since 2018, including the upstream sector. Such pacts currently exist amongst others in India, 20 countries of the European Economic Area, the United Kingdom, Canada, the US, Australia, New Zealand, India, South Africa, and some small island developing countries in the Pacific, and are prepared for Senegal, Morocco, Kenya and Malaysia. (41) On the basis of these pacts, the companies cooperate in the development and implementation of solutions that advance a more circular plastics economy. The Indian plastic pact, which was launched in 2021 and has been signed by more than 20 companies, pursues four targets: 1) elimination of unnecessary plastic packaging and items, 2) 100 percent of plastic packaging to be reusable or recyclable, 3) 50 percent of packaging to be effectively recycled and 4) a recycled content of 25 percent of all plastic packaging. Among the signatories is Tata Consumer Products, a beverage producer that is the second largest player in the world for branded tea products. The European Plastics Pact (42), which currently covers 20 countries in the European Economic Area, has been signed by more than 120 companies and 15 national governments. It sets ambitious targets on reduction of virgin plastic production, reusability, and recyclability.

Implications for a global plastics agreement: clear signals of future markets are needed

A global agreement on plastic pollution can help unlock the potential of the upstream sector and accelerate its efforts to shift to more sustainable and circular production and consumption patterns in the plastics economy. Essentially, it can do so by de-risking the changes and investments required to achieve it.

Clear, precise market signals

On the one hand, a global agreement on plastic pollution, like any other global agreement, can reduce (business) risks of the necessary changes and investments by setting the basic direction of the transition towards a plastics economy with more sustainable and circular production and consumption patterns.

Clear and precise signals on the ambition, scope and speed of the transition process would contribute to more certainty among business actors and stabilise their expectations on the future development of the global plastics economy, in particular the scale and growth of future markets and market segments that will result from the transition.

This enables companies in the upstream sector to better assess and more reliably predict their business opportunities and possible profits in this transition and, on this basis, to plan and implement the adaptation of their business models and necessary investments in short-, medium- and long-term accordingly.

On this basis, and with more certain or predictable future markets and prospects for profits in a more sustainable and circular plastic economy, companies in the upstream sector are certainly more willing and able to take on investments into the often lengthy and capital-intensive development of new technologies, facilities, products and delivery models.

National or regional policies could attempt to do the same within individual countries or regional markets like the EU, where the plastics market is sufficiently large and influential.

A global agreement could make the regulatory and economic direction of change in diverse markets more aligned and comprehensive. For companies in the upstream sector, which are often global players, this would further increase the possible economic opportunities of this transition as they can benefit from even larger economies of scale, simpler expansion into new markets, and ultimately the incentives and security of larger revenues. By establishing an appropriate framework, a global agreement on plastic pollution can thus contribute to stimulating much needed private investments.

Mobilising and delivering financial resources

On the other hand, a global agreement on plastic pollution, like any other global agreement, can de-risk the changes and investments required to achieve more sustainable and circular production and consumption patterns in the plastics economy by mobilising and delivering public and private financial resources needed for this transition. It can do so in four ways. (49)

First, it can provide direct funding through supporting measures for countries in need.

Second, it can facilitate access to existing financial resources by identifying existing multi- or bilateral funds and donors or business actors and by assisting in applying, receiving and using these funds.

Third, it can assist countries in mobilising and delivering domestic financial resources through technical assistance and capacity building in this area. The financial resources that are mobilised in one or several of these ways can then be used to de-risk and, consequentially, attract and stimulate private investments.

Fourth, a global agreement on plastic pollution can facilitate the exchange of knowledge on and best practices in existing and new solutions that enable more sustainable and circular production and consumption patterns in the global plastics economy.

To conclude:

“It is not the lack of technical solutions that is preventing us from addressing the ocean plastic pollution crisis, but rather inadequate regulatory frameworks, business models, and funding mechanisms.”

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