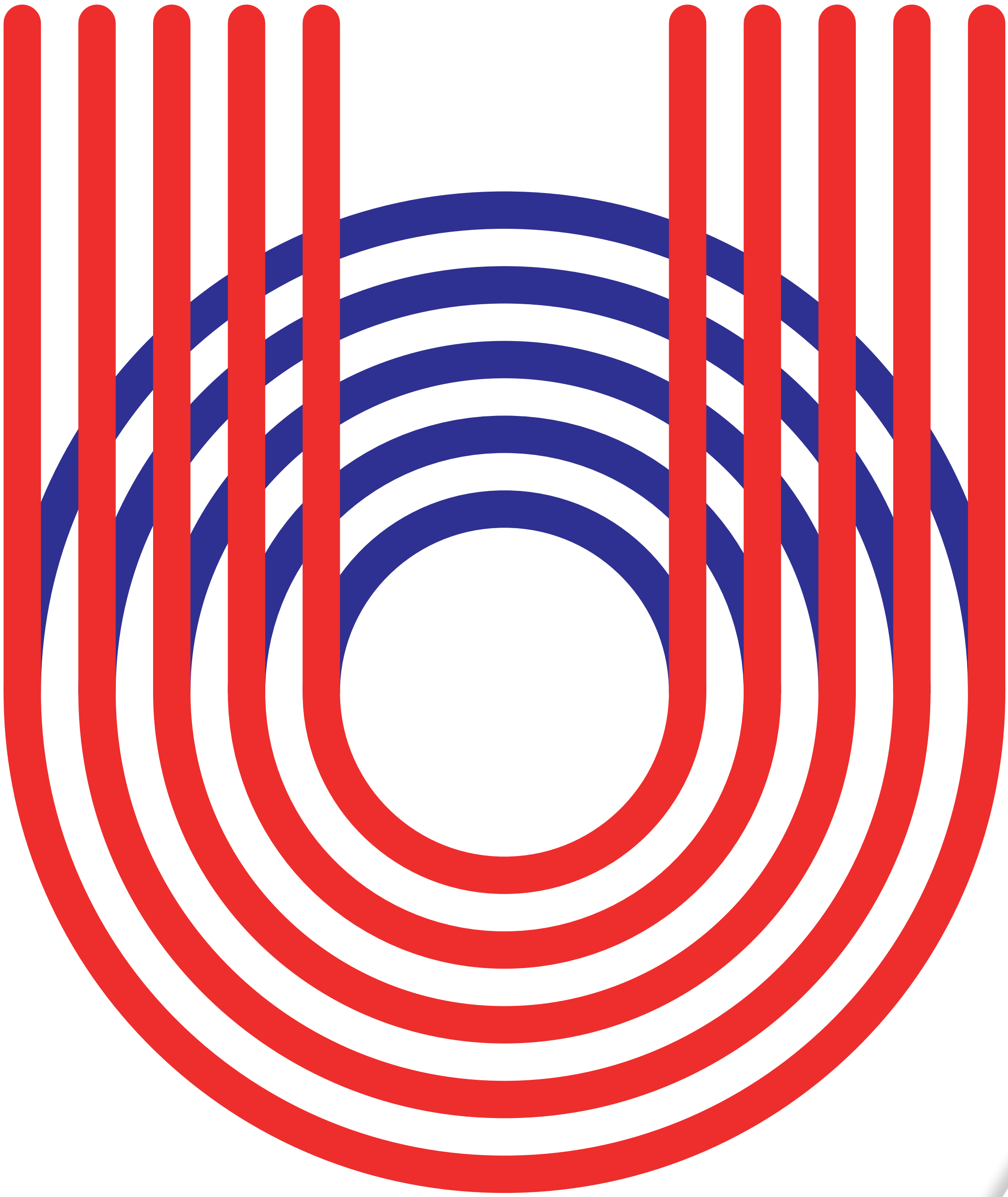
Meeting of the OECD Council at Ministerial Level

Paris, 30-31 May 2018



THE CIRCULAR ECONOMY - IMPROVING PLASTICS RECYCLING

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BETTER POLICIES FOR BETTER LIVES

The Circular Economy - Improving Plastics Recycling

Background Document

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Note from the Secretariat

This paper on *The circular economy - Improving plastics recycling* has been prepared as a background document for the 2018 Ministerial Council Meeting, which will be held on 30-31 May 2018. The paper is intended to inform discussions under agenda item *10. Multilateralism to meet the challenges of biodiversity, climate change and natural resources.*

The paper is based on the forthcoming OECD report *"Improving Markets for Recycled Plastics – Trends, Prospects and Policy Responses", OECD Publishing, Paris*, which will be an output under the 2017-2018 EPOC Programme of Work contributing to work on Resource Efficiency and the Transition towards the Circular Economy.

Key messages

- Plastics are widely used materials that deliver a range of important benefits to society. Their global production and use are expected to increase four-fold to 2050.
- Plastics production, use, and disposal are also responsible for significant greenhouse gas emissions and, when poorly managed, lead to pollution in the natural environment, particularly in drinking water and the oceans. The ecosystem damages and risks to human health resulting from marine litter are only beginning to emerge, but are of considerable concern given the longevity of plastics.
- Transitioning to a more circular economy – one characterised by longer lived plastics products with less toxic content and higher plastics collection and recycling rates – could reduce the diffusion of plastics pollution in the environment. One of the obstacles to this transition is poorly functioning markets for recycled plastics: market volumes and liquidity are limited, and prices are highly volatile. Global plastics recycling rates are estimated to be less than 20% (with significant variation across countries), and the market share of recycled plastics is currently less than 10%.
- Potential suppliers of recycled plastics do not invest sufficiently in sorting and recycling capacity because the profitability of these operations is limited. Potential buyers (i.e. manufacturing firms) have limited incentives to use recycled plastics as inputs because of uncertainty about their availability and quality. Market outcomes could improve significantly if these issues were addressed.
- Policy interventions need to address bottlenecks on the demand and supply side of recycled plastics markets. On the demand side, measures need to focus on helping establish a separate demand for recycled plastics and levelling the playing field between virgin and recycled plastics. On the supply side, measures are needed to help increase the supply of recovered plastics and the quality of the resulting feedstock. This should include efforts to improve the sustainability of plastics materials and products at the design stage.

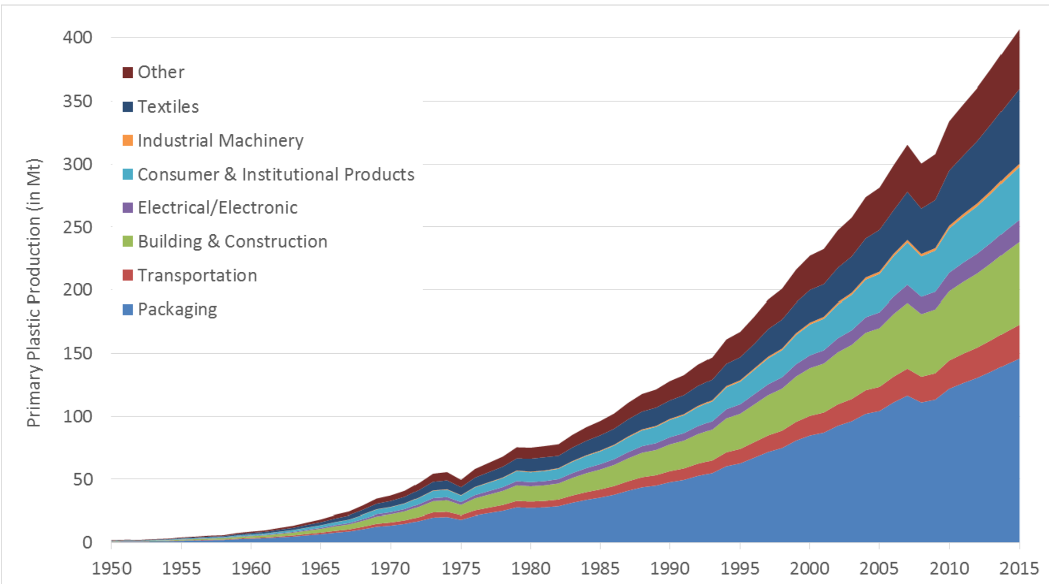
1. Plastics: Production, uses, and benefits to society

1. Plastics have gathered much attention recently due to their ubiquity in the global economy, the low material recovery rates that they currently achieve, and the environmental impacts associated with current disposal methods.

2. Although early forms of plastics were already in existence during the mid-19th century, plastics other than Bakelite were largely unknown prior to 1950. Since then, plastics have rapidly become one of the most commonplace materials on the planet. In 2015, global plastics production reached 407 million tonnes per annum (Mtpa) (Figure 1), making it more than the production of paper (400 Mtpa), fish (200 Mtpa), and aluminium (57 Mtpa) (WWF, 2018[1]; World Bank, 2018[2]; USGS, 2016[3]).

3. Plastics are now so ubiquitous in the environment that they have been proposed as a geological indicator for the Anthropocene era (Zalasiewicz et al., 2016[4]).

Figure 1. Plastics production from 1950 to 2015



Source: (Geyer, Jambeck and Law, 2017[5])

4. The production and use of plastics is expected to continue to increase in the coming decades. Annual plastics production grew at a rate of 5% per annum between 2000 and 2015; more than half of the plastics ever produced were made during this period. If production continues to grow at similar rates, annual plastics production will reach 1 600 million tonnes in 2050 (EMF, 2017[6]).

5. The rapid growth of plastics production and use is largely due to the unique properties of the material. Plastics have a high strength-to-weight ratio, can be easily

shaped into a wide variety of forms, are impermeable to liquids, and are highly resistant to physical and chemical degradation. Plastics can also be produced at relatively low cost. It is these properties that have led to the substitution of traditional materials (e.g. concrete, glass, metals, wood, and paper) by plastics in many applications.

6. The widespread use of plastics has generated a number of benefits for society and for the environment. Plastics are often used to protect or preserve foodstuffs and, in doing so, help to reduce food waste. Plastics are also an important input in vehicles, where their relatively light weight results in lower fuel use and greenhouse gas emissions. Plastics are widely used in infrastructure applications, where their impermeability and durability can lead to water savings in urban areas. Finally, the use of plastics rather than materials derived from biomass (e.g. wood and paper) in a range of applications can slow land-cover change and biodiversity loss.

2. The environmental side effects of plastics production and use

7. The increasing pervasiveness of plastics has not been without drawbacks. The production, use, and disposal of plastics is responsible for significant greenhouse gas emissions and, when poorly managed, generates significant volumes of plastics pollution in the natural environment.

Greenhouse gas emissions

8. Traditional plastics production involves the transformation of petroleum or natural gas into their constituent monomers. This process is highly energy-intensive, and was estimated to account for 400 million tonnes of greenhouse gas emissions (around 1% of the global total) in 2012 (EC, 2017[7]).

9. The fossil fuel feedstock used in plastics production also accounts for 4% to 8% of global oil and gas production (Hopewell, Dvorak and Kosior, 2009[8]; WEF, 2016[9]) and this share could increase further in the future (WEF, 2016[9]). The hydrocarbon molecules that are bound into the structure of plastics are initially inert, but release carbon dioxide as well as other air emissions when incinerated.

Plastics pollution

10. The proliferation of plastics use, in combination with poor end-of-life waste management, has resulted in widespread, persistent plastics pollution. Around 6 300 million tonnes of plastics waste are thought to have been generated between 1950 and 2015, of which only 9% had been recycled, and 12% incinerated, leaving nearly 80% to accumulate in landfills or the natural environment (Geyer, Jambeck and Law, 2017[5]). Plastic pollution is present in all the world's major ocean basins, including remote islands, the poles and the deep seas, and an additional 5 to 13 million tonnes are introduced every year (Jambeck et al., 2015[10]).[1]

11. The proliferation of marine plastics, in the form of micro- or macro-plastics[2], has impacts on the quality of marine and coastal environments. Marine wildlife is harmed through ingestion of macro-plastics or entanglement, while the ingestion of micro plastics has the potential to transfer toxins into the food-chain (Thompson, 2015[11]; GESAMP,

[1] Modelling undertaken by the same authors suggests that OECD countries are responsible for a small proportion (~5%) of marine plastics pollution. Instead, around 70% of these inputs originate in ten countries, most of which are located in South Asia or East Asia.

[2] Micro-plastics are plastic pieces that are smaller than 5 mm in size and originate from the fragmentation of macro-plastics (e.g. decomposing plastic bags, but also abrasion of tyres and release of textile fibres during washing), or from sources such as cosmetics where they have been added intentionally.

2015[12]; Wardrop et al., 2016[13]; Takada, 2017[14]).[3] These effects serve to reduce the value of fish-stocks and have been valued at USD 13 billion per year (UNEP, 2014[15]). Another area is the impact of beach litter on tourism, natural beauty, and terrestrial wildlife. Marine plastic debris has been estimated to account for annual losses of USD 622 million for the tourism sector in the Asia Pacific Economic Area (McIlgorm, Campbell and Rule, 2011[16]).

12. Plastics pollution also poses risks for human health. The presence of plastic in seafood, including fish and shellfish, and their subsequent consumption by the public has led to concerns about chemical bio-accumulation in the food chain, even if empirical evidence for this is currently limited (Thompson, 2015[11]; GESAMP, 2015[12]; Koelmans et al., 2017[17]). Plastics are also entering the food chain more directly. Research by Kosuth et al. (2018[18]) and Mason, Welch and Neratko (2018[19]) found microplastic contamination in tap water and bottled water across a number of countries. Plastic contamination has also been found in sea salts (Yang et al., 2015[20]).

13. Plastics pollution warrants considerable attention for two additional reasons. The first relates to the longevity of plastics: those that accumulate in the natural environment will only decompose over hundreds, or even thousands of years, during which time they fragment into smaller microplastics and nanoplastics. The second relates to uncertainty about the magnitude of the damages. Significant quantities of plastic have only been introduced into the natural environment relatively recently. While the full impact on marine and terrestrial ecosystems will only emerge in the longer term, some environmental effects of plastics pollution are already clearly visible.

[3] Ingestion of plastics, or entanglement in them, has been documented in around 500 species of marine mammals, fish, and seabirds, with clear negative consequences for marine ecosystems and the fishing industry (UNEP, 2016[44]).

3. Higher plastics recycling rates could improve environmental outcomes

14. The environmental impacts of plastics can be reduced in a number of ways, including through better collection and treatment of waste plastics, the promotion of waste prevention strategies such as the introduction of reusable plastic products, through the substitution of alternative, less environmentally harmful materials, through the development of bio-based or bio-degradable plastics, or through the design of more easily recyclable plastics and effectively recovering them at end-of-life (Box 1).

15. The focus of this paper is on the role that better functioning markets for recycled plastics could play in driving higher plastics collection and recycling rates. This would help to reduce the diffusion of plastics pollution in the environment while continuing to allow the beneficial aspects of plastics use to be realised. The diversion of waste plastics towards recycling facilities, and the resulting production of recycled plastics, would also reduce demand for incineration of waste plastics and of virgin plastics production (due to substitution), both of which are highly carbon-intensive activities.[4]

Box 1. Additional approaches to addressing the environmental impacts of plastics – and their associated risks

In addition to higher plastic waste collection and recycling rates, there are at least three other pathways through which the environmental side effects of plastics production and use could be addressed. Each of these approaches has considerable potential, but also raises a set of associated risks.

Waste prevention (through "light weighting"[5], product re-use, or the reduced use of unnecessary plastic packaging or products more generally) is a widely accepted means of reducing plastics pollution. However, depending on the approach taken, prevention may also create new risks. One example relates to the emergence of "dematerialised" or low-density plastics. There is anecdotal evidence to suggest that the low market value of these plastics serves to hinder informal collection in low-income countries.

The use of alternative materials in the place of plastics can reduce the environmental damages associated with plastics, but may also negate the use-phase energy savings that they bring in the first instance. Switching to alternative materials can also magnify

[4] It should be noted that plastics recycling is by no means the only policy option to address the environmental impacts of plastics and that determining the best possible approach will vary by type of plastic and application. Ideally a life-cycle approach should be taken to identify the most effective policy approach.

[5] This term refers to the process of using less material input to achieve a similar level of functionality.

environmental burdens elsewhere. For instance, cotton tote shopping bags, while helping to reduce the diffusion of plastics in the environment, also have a relatively large greenhouse footprint. Recent research indicates that a cotton shopping bag would need to be re-used around 150 times before attaining the lifecycle greenhouse gas footprint of a single-use plastic bag (UK EA, 2011[21]; Denmark EPA, 2018[22]).

Shifting to bio-based or biodegradable plastics may also have unintended consequences. Increased demand for biomass feedstock can amplify land-cover change and biodiversity loss. Enhanced biodegradability can increase the dispersion of microplastic fragments in the environment (when degradation is incomplete) and reduce the quality of the waste plastics required for recycled plastics production.

16. A large number of life-cycle assessments (LCAs) have been carried out on the relative environmental impacts of various options for end-of-life plastics management. Several recent meta-analyses of this body of work unambiguously conclude that plastics recycling has a significantly smaller greenhouse gas footprint than plastics incineration or landfilling (WRAP, 2010[23]; HPRC, 2015[24]; Bernardo, Simões and Pinto, 2016[25]). Around three quarters of the individual LCA studies assessed in WRAP[6] (2010) found that the global warming potential associated with plastics recycling was, at a minimum, half of that associated with incineration or landfilling.[7]

17. The displacement of virgin plastics by their recycled equivalents is one important reason for the relative desirability of plastics recycling. Figure 2 shows the energy intensity of virgin and recycled plastics production.

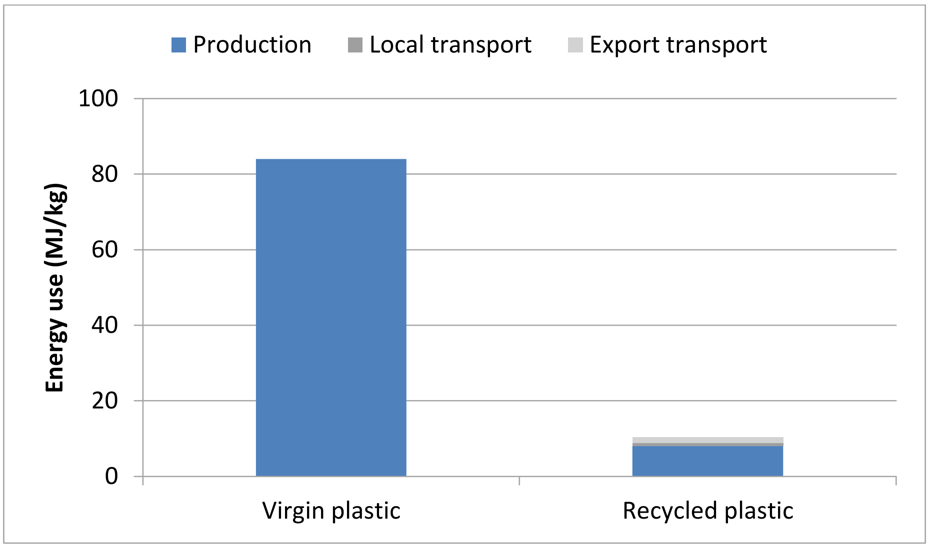
18. The LCA literature for plastics focusses mostly on environmental indicators such as global warming potential, energy use, and water use. Less attention has been directed towards other environmental impact categories such as those associated with marine plastic pollution. Despite the lack of empirical evidence, recycling is likely to be just as effective as alternative waste treatment options – landfilling or incineration – in reducing the flow of plastics waste into the environment: in each case, initial waste collection is a prerequisite for further treatment.[8]

[6] The UK’s Waste and Resources Action Programme.

[7] Under certain conditions, landfilling of plastics can also generate leachates rich in chemicals such as bisphenol A (Teuten et al., 2009[47])

[8] In some situations, such as where waste is disposed of in open dumps, or where incineration takes place in facilities lacking adequate particulate capture technology, plastics recycling may be clearly preferable to disposal activities from the perspective of reducing marine plastics pollution.

Figure 2. Relative energy intensity of virgin and recycled plastics production



Source: (Wong, 2009[26]).
Note: Data are for plastic resins only

4. Markets for recycled plastics do not always function well

19. The dysfunctional character of markets for recycled plastics manifests itself in several ways. Market volumes and liquidity are limited, trade flows are small as a proportion of total plastics waste generation, and market prices are highly volatile. Global plastics recycling rates are thought to be less than 20%, and the market share of recycled plastics less than 10%.

Recycling rates

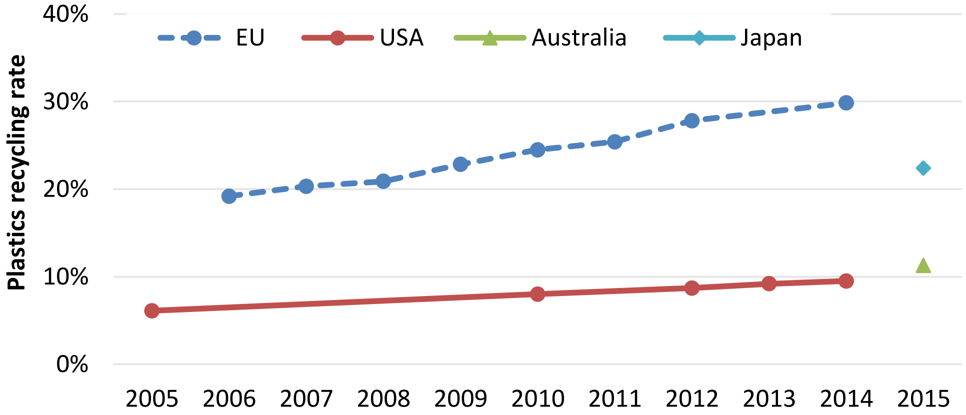
20. Despite recent efforts, plastic recycling continues to be an economically marginal activity. Current recycling rates are thought to be 14–18% at the global level. The remainder of plastic waste is either incinerated (24%), or disposed of in landfill or the natural environment (58–62%) (Geyer, Jambeck and Law, 2017[5]). Plastics recycling rates are substantially lower than those for other widely used materials. Recycling rates for major industrial metals – steel, aluminium, copper, etc. – and paper are thought to exceed 50% (UNEP, 2013[27]; Van Ewijk, Stegemann and Ekins, 2017[28]).

21. Plastic recycling rates vary significantly across different countries,[9] waste streams,[10] and polymer types. Some polymers are more widely recycled than others. Recycling rates for polyethylene terephthalate (PET) and high-density polyethylene (HDPE) commonly exceed 10%, while those for polystyrene (PS) and polypropylene (PP) are closer to zero. Recycling rates in the European Union average 30%, and are thought to be considerably higher in some EU Member States (PlasticsEurope, 2017[29]). Recycling rates in other high-income countries are typically on the order of 10% (Figure 3). Recycling rates in low to middle income countries are largely unknown, but may be significant in situations where there is a well-established and effective informal sector. Data from Wilson et al. (2009[30]) indicates that plastics recycling rates may be approaching 20–40% in some developing-country cities.

[9] Different methodologies are used to calculate recycling rates in different countries. In some cases, recycling rates are calculated as the proportion of waste generation that is recycled (i.e. proportion of waste that becomes secondary raw material suitable for reintroduction into manufacturing processes). In other cases, recycling rates are calculated as the proportion of waste generation that is *collected* for recycling. The latter method does not account for the residual materials that are generated during the recycling process and need to be disposed of, and can therefore overstate the true recycling rate.

[10] Recycling of post-industrial plastics is well-established and has been relatively stable over recent decades. Recycling of post-consumer plastics is less common, but has increased steadily since the 1980s as municipal waste management systems have developed.

Figure 3. Recycling rates in high income countries

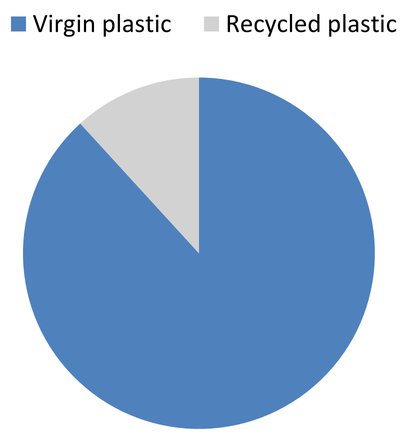


Source: OECD (2018[31])

Recycled plastics market share

22. Production statistics for recycled plastics are largely unknown. However, data provided in Geyer, Jambeck and Law (2017[32]) allow some rough approximations to be made. A global plastics recycling rate of 18%, and plastics waste generation of 258 Mtpa[11] (both resins only) translate into approximately 46 million tonnes of recycled plastics production per year. This represents 12% of total global plastics production (Figure 4), but is likely to be an upper estimate because, in some cases, the material that is reported as "recycled" may refer only to the material diverted towards recycling: some proportion of this is likely to become recycling residues that require disposal.

Figure 4. Estimated global market share of virgin and recycled plastics



Note: Data are for resins only.
Source: Geyer, Jambeck and Law (2017[5]).

[11] This figure has been adjusted downward (from 302 Mtpa), so as to not include polyester, polyamide, and acrylic (PP&A) fibres.

Trade flows

23. The volume of plastics waste trade is small relative to total plastics waste generation. Of the 300 million tonnes of plastics waste generated in 2015 (Geyer, Jambeck and Law, 2017[5]), only around 13 million tonnes (or 4%) was exported outside the country of origin (UN COMTRADE, 2018[32]).[12] Imports of these materials are concentrated in a small number of countries. For example, China accounted for around 8 million tonnes (or 60%) of plastics waste imports in 2016 (UN COMTRADE, 2018[32]). The concentration of demand in a small number of countries renders the markets for recycled plastics vulnerable to demand shocks (see Box 2).

Box 2. China import restriction relating to plastics

China made two WTO notifications relating to imports of solid waste or secondary materials in 2017. The first announcement (G/TBT/N/CHN/1211) was made on 18 July 2017, and lists 24 kinds of "solid wastes" that will be prohibited for import as of 1 January 2018. The second announcement (G/TBT/N/CHN/1233), made on 15 November 2017, sets out maximum acceptable levels of contamination (0.5% by weight) for eleven types of imported materials. Plastic waste and scrap fall under the latter regulation, which entered into force on 1 March 2018. The stated rationale for both regulations was the protection of the environment or of human health (WTO, 2017[33]).

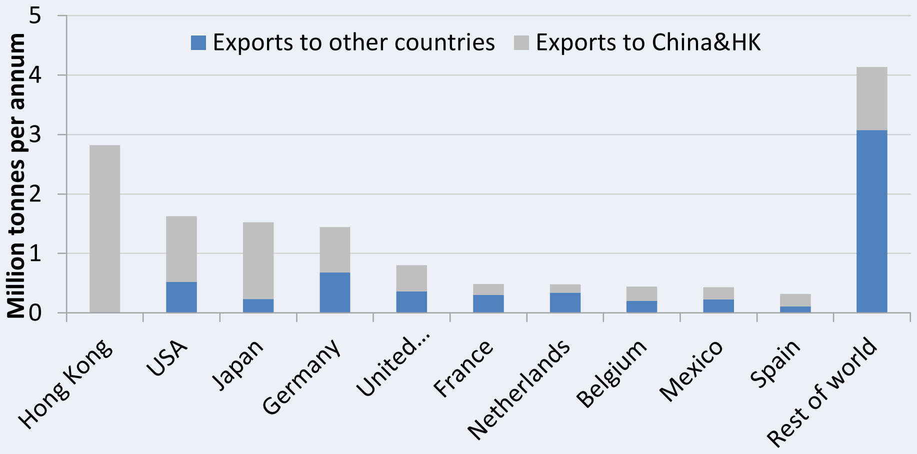
China announced import prohibitions on a further 32 types of solid waste (including plastic waste and scrap from post-industrial sources) in April 2018 (BIR, 2018[34]). These additional restrictions will begin to take effect in December 2018, and in combination with the already existing prohibition of imports of post-consumer plastics, are anticipated to stem the flow of all plastic waste and scrap to China.

Chinese imports represented 60% of the total global trade of plastics scrap in 2016, making China the largest market for these materials. The largest exporters of plastics waste to China in 2016 were Hong Kong[13], the United States, Japan, Germany, and the United Kingdom (Figure 5), with each shipping between 0.5 million tonnes and 1.3 million tonnes of material in 2016. The monetary value of these exports amounted to USD 1.7 billion in 2016 (UN COMTRADE, 2018[32]).

[12] There are important differences across countries. For example, data from Eurostat (2018a[51]) and Eurostat (2018b[52]) indicates that the proportion of domestic plastics waste generation that is exported beyond the EU varies between 5% (Bulgaria, Hungary, and Italy) and 40% (Germany and the United Kingdom).

[13] Note that the vast majority of plastic wastes exported by Hong Kong is only going through Hong Kong on its way to China, but has not been generated by Hong Kong domestically.

Figure 5. Top ten exporters of plastics waste to China in 2016



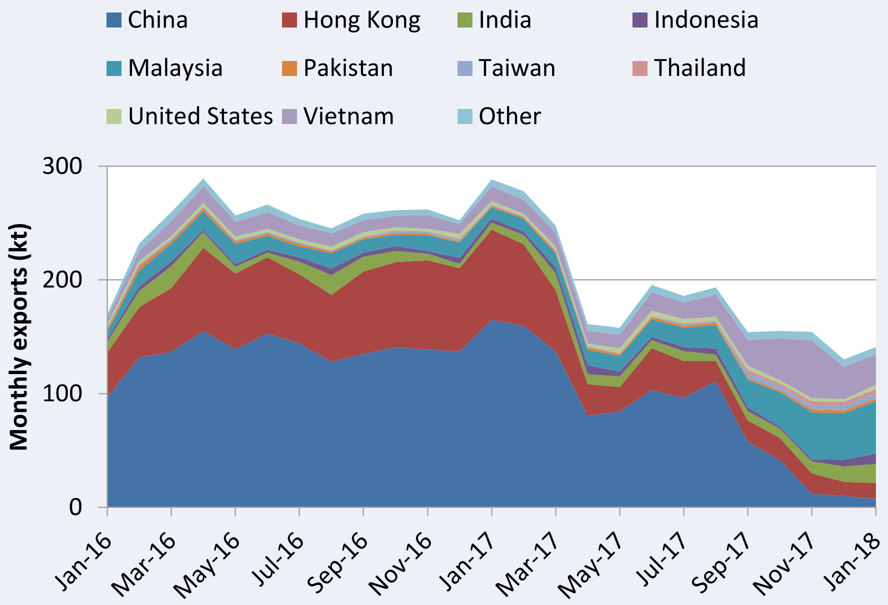
Source: UN COMTRADE HS codes 391510, 391520, 391530, 391590

The effects of the Chinese regulations relating to plastics waste are only beginning to emerge, but it is apparent that they differ across countries, mainly due to differences in policy frameworks for domestic management of plastics waste. In some countries, exported materials appear to be sufficiently well processed, and are therefore not subject to the restrictions. In other countries, the restrictions are leading to a growing waste stockpile as export volumes fall (Recycling International, 2018[35]). Increased domestic incineration and landfilling will probably be required in the short term, and this may have implications for achieving national recycling rate targets, where they exist.

The build-up of plastics waste in exporting countries is also leading to a search for new market outlets where this material can be recycled. Shipments to Thailand, Malaysia, Vietnam, Turkey and India increased significantly during the second half of 2017 (Figure 6). This trade has triggered concerns about the health and environmental damages that could emerge if waste plastics are diverted to countries with relatively weak treatment standards.

The effects of the trade restrictions can already be observed in China. A significant decrease in imports of plastic waste (Resource Recycling, 2018[36]) has resulted in feedstock shortfalls for the Chinese recycling industry, which has led to a surge in prices for domestic waste streams (Jing and Ge, 2018[37]). It also appears that the ban has prompted an increase in black-market trading in plastic waste products (Tang, 2018[38]; Stanway, 2018[39]). In the longer term, it may be that higher prices will improve the incentives for improved waste collection and sorting in China, which may result in less plastics dispersion in the environment overall.

Figure 6. Monthly exports of plastics waste from the EU by destination: 2016 to 2018



Source: Eurostat: HS code 3915

5. Key challenges in markets for recycled plastics and possible policy responses

24. There is a co-ordination failure at the heart of poorly functioning markets for recycled plastics. Potential suppliers of recycled plastics do not invest sufficiently in sorting and recycling capacity because the profitability of these operations is limited. Potential buyers (i.e. manufacturing firms) have limited incentives to use recycled plastics as inputs because of uncertainty about their availability and quality. Market outcomes could improve significantly if these issues were addressed.

25. Suppliers and buyers of recycled plastics would both benefit from larger and more liquid markets for recycled plastics, but neither party has strong incentives to act alone. In turn, improved market outcomes could, to some extent, become self-fulfilling as scale efficiencies are captured and a more widespread consumer acceptance develops. These factors provide a clear rationale for policy intervention, as well as potential insights into how to do it effectively. In particular, policies are likely to be more effective if they jointly address the challenges – market failures, policy misalignments, and status quo biases – on both the supply and demand sides of recycled plastics markets. Put differently, an effective policy framework would address challenges across the entire plastics life cycle, from plastics and product design through to end-of-life management and recycled plastic production.

5.1. Key challenges affecting demand for recycled plastics and policy responses

Barrier #1: There is no differentiated demand for recycled plastics

26. Manufacturers of recycled plastics operate in the same market as traditional (virgin) plastics producers, and are price takers in that market. At present, recycled plastic production is, for the most part, not economically competitive at current prices. This is partly a consequence of the cost structure of recycled production (see Barrier #3 below), but also reflects virgin plastics prices that are highly volatile[14] and perhaps too low to reflect all external costs. Un-addressed market failures and existing policy misalignments (e.g. government support for hydrocarbon inputs to plastics production) both contribute to the low prices for virgin plastics.

27. Policy interventions to address these challenges could aim to level the playing field between virgin and recycled plastics or support the market for recycled plastics. They include:

[14] Hydrocarbon derivatives are the main feedstock for virgin plastics production; they represent upwards of 60% of the cost structure of virgin plastics production (The Economist, 2014[53]; CLP, 2017[54]). Price volatility in oil and gas markets therefore has downstream effects in plastics markets.

- Taxes on the use of virgin plastics or differentiated value added taxes for recycled plastics or plastic products;
- Reform of support for fossil fuel production and consumption;
- Introduction of recycled content standards, targeted public procurement requirements, or recycled content labelling; and
- Creation of consumer education and awareness campaigns (concerning the environmental benefits of recycled plastics) in order to stimulate demand for products containing recycled plastics.

Barrier #2: Uncertainty about the availability and quality of recycled plastics

28. Manufacturing firms have incentives to use recycled plastics in their production processes. Doing so can create reputational benefits[15], and may also allow a small price premium to be charged if the final product can be marketed as "green". That said, many manufacturers continue to rely solely on virgin plastic inputs, both because of their lower cost, but also due to inertia and uncertainty about the properties of recycled plastics. While the quality, performance characteristics, and near-term availability of virgin plastics are largely assured, there may be uncertainty about the same characteristics of recycled plastics. Status quo biases also hinder switching, even in situations where recycled plastics are cost competitive and of comparable quality to their virgin equivalents.[16]

29. There are also increasing concerns over hazardous or otherwise problematic additives and monomers that are used in the manufacture of some virgin plastics.[17] For manufacturers of recycled plastics, uncertainty about the presence of these additives in plastic waste can hinder recycling altogether (because the resulting output may be of low quality or pose significant health risks in certain food related applications as well as other applications such as children's toys). The lack of transparency regarding hazardous chemicals in plastic waste streams is thus a major barrier to increased plastics recycling.

30. Policy interventions that could address these challenges include:

- Creation of certification standards for recycled plastics;
- Facilitation of better coordination and communication across the plastics value chain, including through the promotion of chemical information systems; and

[15] Witness Coca-Cola's 19 January 2018 commitment to incorporate 50% recycled content in their packaging by 2030.

[16] Manufacturers have considerable experience with virgin plastics inputs, and well established supply chains for sourcing them.

[17] Exposure to chemicals from plastics is widespread with biomonitoring studies detecting bisphenol A and phthalates in over 90% of participants (Calafat et al., 2008[48]). Exposure to bisphenol A and phthalates has been associated with a range of adverse human health impacts (Katsikantami et al., 2016[49]; Rochester, 2013[50]). The effects of exposure to bisphenol A are, however, a matter of controversy. A recent assessment by the US Food and Drug Administration concluded that the substance is essentially safe in the food contact applications where it is authorised
www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm598100.htm.

- Restrictions on the use of hazardous additives in plastics manufacturing.

5.2. Key challenges affecting the supply of recycled plastics and policy responses

Barrier #3: The cost of recycled plastics production is relatively high

31. The cost structure of recycled plastics production is different from that of virgin production and is, at current oil prices, often higher. There are a number of reasons for this.

32. Plastics waste generation is geographically dispersed, and aggregating waste materials into economically viable quantities incurs considerable collection and transport costs. In many cases, this waste is co-mingled with food residues, paper, and other materials. The separation of the plastics fraction (and the individual polymers of plastic) into clean feedstock for reprocessing can be technically challenging and involves considerable capital or labour costs. In addition, a significant proportion of the plastics in the waste stream are built into more complex end-of-life products that, in many cases, are difficult and costly to disassemble.

33. On top of these factors, the alternative waste management options to recycling – landfill or incineration – are relatively cheap in many countries. Gate fees may not necessarily reflect the full social cost of these alternatives.

34. Policy interventions that could address these challenges include:

- Introduction of multiple stream collection systems allowing separated collection of recyclables;
- Creation of incentives for better product and plastics design (e.g. design for reuse and recycling), such as through better designed extended producer responsibility, product stewardship and deposit-refund systems;
- Support for R&D for improved plastics management systems and the sustainable design of plastics[18] (more easily recyclable or more easily biodegradable for example), working in close partnership with industry;
- Introduction of more ambitious recycling rate targets and harmonisation of the methods used to calculate these rates; and
- Increased stringency of landfill and incineration fees to better reflect the full social cost of these activities.

Barrier #4: An estimated 2 billion people globally do not have access to even the most basic waste collection services, hence large quantities of plastic waste are not collected at all

35. A lack of effective collection and treatment systems in emerging market economies leads to a significant loss of potentially recyclable material each year. This deprives the recycled plastics industry of scale, and the cost efficiencies that potentially

[18] See outcome of OECD Global Forum on Environment – Plastics in the Circular Economy – Design of Sustainable Plastics from a Chemicals Perspective, 29-31 May 2018, Copenhagen, Denmark

come with it. In addition, the absence of basic collection services and resulting fly-tipping and littering is a key driver of marine plastics pollution. Several studies estimate that upwards of 70% of the plastics entering the oceans each year originate in less than ten, mostly developing, countries (Jambeck et al., 2015[10]; Schmidt, Krauth and Wagner, 2017[40]). Similarly, significant amounts of plastic waste, such as from discarded toys, textiles and construction materials, are not captured by formal waste management systems in OECD countries or are diverted to landfills or incinerators, but could be recovered in the future to achieve scale.

36. Possible policy interventions for OECD countries include:

- Use of official development assistance to support the development of effective collection systems and waste-treatment infrastructure, and their operation, and the development of policy frameworks that are conducive to trade and investment in waste collection and recycling services; and
- Setting of recycling targets for plastic waste from additional product groups, possibly implemented through industry-funded product stewardship and extended producer responsibility systems.

5.3. OECD can support member countries to address these challenges

37. The OECD can support its members to address these challenges by continuing to develop analysis of the economics of plastics recycling and of the policy approaches that can help strengthen plastics recycling. Specific attention could be given to issues that sit at the interface of chemicals and waste management policies, building on current efforts on the sustainable design of plastics being pursued jointly by the Chemicals Committee and the Environmental Policy Committee.

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