SYSTEMIQ

Circular PET and Polyester: Issue brief

Potential impacts of recycled PET imports on the system vision for a circular PET/polyester economy in Europe

February 2024

Issue brief commissioned by Eastman and Plastic Recyclers Europe

This issue brief builds on the Circular PET and Polyester report published by Systemiq, July 2023

Link: www.systemiq.earth/pet-polyester

Background

This issue brief builds on the **Circular PET and Polyester** system analysis report published by Systemiq in July 2023. It is the third publication in a series focused on opportunities to build a circular economy system for PET packaging and polyester textiles in Europe. Prior publications in the series can be downloaded at www.systemiq.earth/pet-polyester.

The purpose of this issue brief is to assess the potential impacts of recycled PET imports on the system vision for a circular PET/polyester economy in Europe. The analysis is derived from the PET/polyester mass-flow model and system scenarios developed in the prior report, explained in detail in a technical appendix to that report. Expert inputs have been gratefully received and incorporated in this issue brief, which was commissioned by Eastman and Plastics Recyclers Europe and financed by Eastman.

For further information or to share your comments on this issue brief please contact: plastic@systemiq.earth

Potential impact of recycled PET imports on the system vision for a circular PET/polyester economy in Europe

The polyethylene terephthalate (PET) molecule is a key building block for plastic packaging and polyester textiles. It has valued uses across many industries, including food and beverages, healthcare, homeware, automotive and apparel. PET/polyester has abundant – but not yet realised – potential for circularity, through reuse and complementary mechanical and chemical PET recycling.

The Circular PET and Polyester system analysis report published by Systemiq in July 2023 presents an achievable vision for a circular PET/polyester economy covering both packaging and textiles in Europe (EU27+UK). The vision is based on ambitious application of proven approaches to reduce avoidable consumption, support reuse systems and scale up mechanical and chemical recycling.

Compared to a continuation of current trends, this "Ambitious Complementarity Scenario" for a circular PET/polyester system has the potential to reduce non-recycled PET/polyester waste – and so virgin PET production – by ~70%, and GHG emissions by ~50% by 2040. The scenario also more than meets the ambitious recycling rate targets for packaging laid out in European legislation, and supplies sufficient high-quality recycled PET/polyester to meet recycled content obligations and voluntary commitments by 2040, using European waste alone.

The Ambitious Complementarity Scenario considers exports of polyester textiles for reuse outside Europe but does not model imports of recycled PET into Europe or exports of PET packaging waste. Exports of packaging waste outside Europe have declined in recent years and are likely to decline further due to legislative changes[1]. This issue brief presents evidence for a potential scale-up of recycled PET imports[2] to meet demand for recycled content in Europe – specifically evidence that recyclers outside Europe are registering installations for import of contact-sensitive recycled PET into the EU (see Exhibit 1). The effect of recycled plastic imports on European recyclers has been highlighted as an issue of concern by the European recycling industry in 2023[3].

Two new system scenarios are presented to illustrate the implications for Europe if recycled PET imports slow or stall future investments in scale-up of European recycling systems (see Exhibit 2). This analysis shows that whilst recycled content targets could still be met through imports of non-European recycled PET if this trend continues, recycling rate targets for plastic packaging may not be met for PET packaging (34-50%[4] in 2030 vs target of 55%[5]). European end-of-life greenhouse gas emissions could more than double as more PET/polyester reaches waste-to-energy incinerators instead of recyclers (7.4-8.2MtCO2e/year in 2040 vs emissions of 3.7MtCO2e/year in the Ambitious Complementarity Scenario). The potential

[1] https://www.europarl.europa.eu/news/en/press-room/20231114IPR10510/deal-reached-on-stricter-eu-rules-for-waste-shipments
[2] "Recycled PET imports" is used throughout this issue brief to refer to both PET recyclate and decontaminated PET flake
[3] Plastic Recyclers Europe (October 2023): https://www.plasticsrecyclers.eu/news/low-demand-and-high-imports-endanger-the-european-plastics-recycling-industry/
[4] Range refers to range of outcomes from Scenario A (stalled investment in new infrastructure) to Scenario B (slowed investment)
[5] Packaging and Packaging Waste Regulation (PPWR) target for plastic packaging in 2030; assumes PET packaging follows target for all packaging; assumes linear growth of recycling rates between 2020-2040 in the new system scenarios

impact of recycled PET imports on reuse or reduction efforts outlined in the Ambitious Complementarity Scenario is recommended as a subject for further research.

Environmental impacts in exporting countries are not well understood and require further research (see Exhibit 3). Most of the recyclers registered for recycled PET supply into Europe are located in countries with higher rates of mismanaged plastic waste than EU averages. Increased demand and value of PET waste could potentially improve local waste management in these countries, or it could simply divert recycled PET from other uses without improving waste management. On the other hand, the carbon intensity of the electricity grid is generally higher in exporting countries (compared to Europe) and this is also an important factor – in those countries keeping PET packaging waste in country for recycling would likely be preferable to exporting to EU, from a GHG emissions perspective[6].

The analysis in this issue brief provides directional insights on the potential impact of recycled PET imports on the transition to a circular economy for PET/polyester in Europe. Any predictions about future changes in the system will require additional analysis including marginal costs of production and transportation for imported rPET compared to rPET produced in Europe, and system responses in EU member states (for example responses by Producer Responsibility Organisations that are implementing Extended Producer Responsibility for packaging). Overall, further discussion and research is urgently needed to understand the scale of this challenge and to ensure the goals of a European circular plastics economy are not jeopardised.

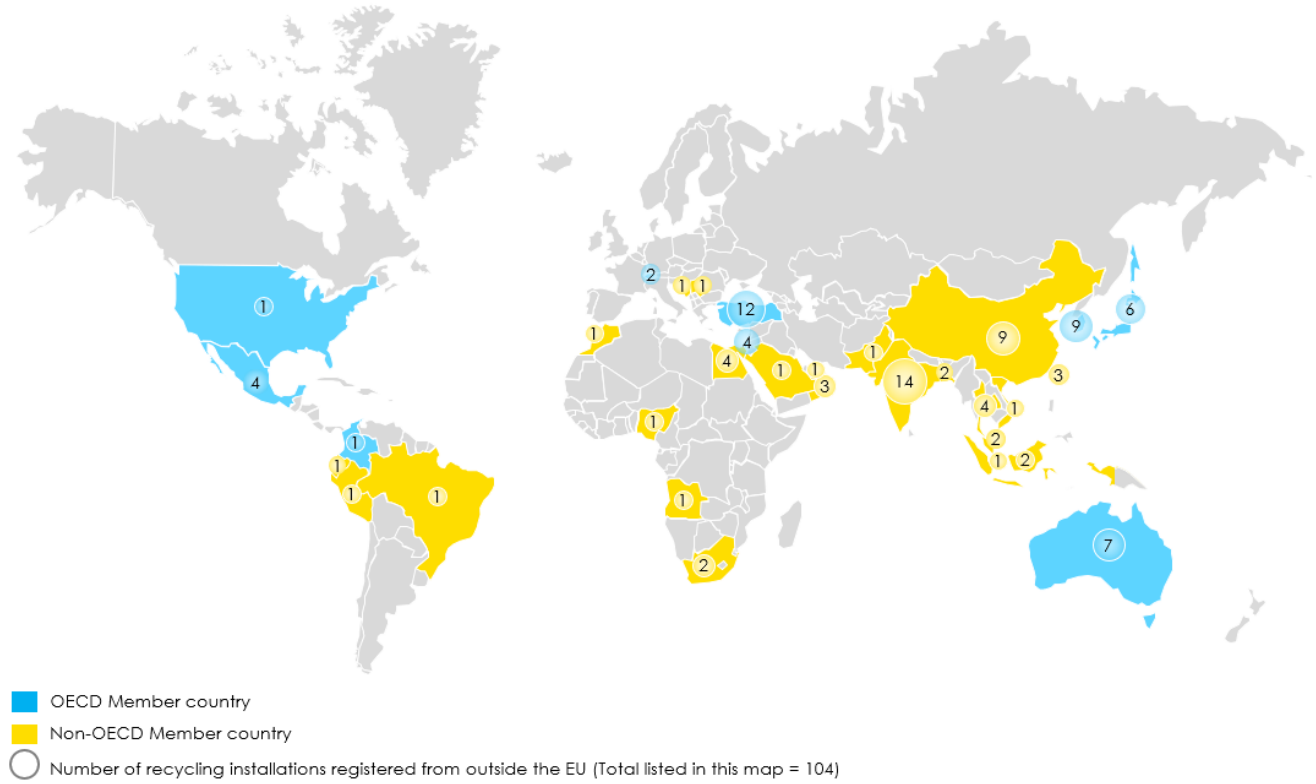
[6] Higher carbon intensity of grid electricity means that virgin PET production typically has a higher carbon footprint, so avoiding local virgin PET production through local recycling would be more beneficial for the climate, compared to exporting recycled PET to Europe. Greenhouse gas emissions from long distance transportation of recycled PET is another factor in favour of local recycling.

Exhibits

Exhibit 1: Significant PET recycling capacity outside the EU is being permitted for import of contact-sensitive recycled PET into the EU

- As of October 2023, the DG-SANTE Union Register announced ~100 recycling or decontamination installations outside the EU (not including the UK) accredited for import of recycled plastic materials and articles intended to come into contact with foods.
- Over half of these registrations are in non-OECD countries, where the export of plastic waste from the EU will be prohibited.[7] This means that in future any recycled PET imported from non-OECD countries would not be from EU PET waste and so the EU would be using other countries' waste to meet targets.

Fig. 1: ~100 recycling and decontamination installations outside Europe (excluding UK) have registered to sell contact-sensitive recycled plastic approved for use within the EU



Note: Fig. 1 represents number of plastic recycling installations outside the EU+UK registered, concerning the implementation of Regulation (EU) 2022/1616 on recycled plastic materials and articles intended to come into contact with foods. Figures consolidate installations registered before 31 December 2022 and between January 1st – October 27th, 2023, accessed at https://food.ec.europa.eu/safety/chemical-safety/food-contact-materials/plastic-recycling/resources-plastic-recyclers_en on 20th November 2023. Total registrations add up to 141, however 37 registrations with installations potentially in EU+UK were removed to visualise potential importers from outside this region. List of registrations represent initial draft version, validated with the assistance of authorities from EU member states, but may still contain errors.

[7] https://ec.europa.eu/commission/presscorner/detail/en/ip_23_5818

Exhibit 2: Two new system scenarios illustrate the potential implications for Europe if recycled PET imports were to stall or slow future investments in scale-up of European recycling systems

- Delivery of the Ambitious Complementarity Scenario by 2040 requires European collection, sorting and recycling infrastructure capacity to almost triple from 2020 to 2040. In this scenario, mechanical recycling capacity would expand from 2.0Mt/yr to 3.3Mt/yr by 2040, while chemical PET recycling would grow from negligible capacity today to 2.1Mt/yr by 2040.
- Building this scale of recycling infrastructure is estimated to require EUR 17 billion in investment into sortation facilities and mechanical and chemical PET recycling.[8] However, increasing capacity for imports of recycled PET into Europe could negatively impact investor confidence and slow or stall future investments in new collection, sorting and recycling infrastructure in Europe. The recycling industry in Europe has raised the alarm about this potential effect.[9] Two new system scenarios[10], outlined below, are presented to illustrate this potential effect.
- These new system scenarios assume that recycled PET imports would provide additional supply to meet the recycled PET/polyester volumes shown in the Ambitious Complementarity Scenario, by 2040. If so, this supply would meet EU recycled content targets in the Single Use Packaging Directive (SUPD) and Packaging and Packaging Waste Regulation (PPWR), as well as voluntary commitments by beverage companies, consumer goods and fashion brands.
    - **Scenario A**: **If investment in new sorting and recycling infrastructure in Europe <u>stalls</u> between now and 2040, due to high level of imports.** This scenario assumes that no additional sorting and recycling infrastructure is built, resulting in an average recycling rate of PET/polyester in 2040 of **32%** (vs. 67% in the Ambitious Complementarity Scenario). This would generate **5.2Mt/yr** of non-recycled waste (vs. 2.5Mt/yr) and **8.2MtCO2e/yr** of end-of-life GHG emissions arising in the EU (vs. 3.7MtCO2e/yr)[11].
    - **Scenario B: If investment in new sorting and recycling infrastructure in Europe <u>slows</u> compared to the ACS scenario.** This scenario assumes that legislative changes are enacted for effective Deposit Return Systems for PET beverage bottles across Europe (with associated sorting and recycling infrastructure scaling up in Europe) but no additional sorting and recycling infrastructure for other PET/polyester is built. In this case the average recycling rate of PET/polyester in 2040 would be **38%**, with

[8] Systemiq analysis drawing on industry data. Directional estimate based on industry input and not taking into account potential cost reductions through learning effects over time.
[9] Plastic Recyclers Europe (October 2023) has raised alarm about the threat to new investment and also existing recycling operation. Veolia has announced it will close its PET recycling site in Rostock, Germany at the end of 2023 citing difficulty securing sales of recycled PET. There has also been anecdotal evidence within the industry of a number of planned temporary shutdowns (https://newsroom.veolia.de/pressreleases/veolia-pet-germany-to-close-rostock-site-on-31-punkt-12-punkt-2023-3251854#:~:text=Veolia%20PET%20Germany%20GmbH%20will,total%20of%20around%2050%20employees.)
[10] In both scenarios we have assumed that the total amount of recycled content used in new products remains the same as in the Ambitious Complementarity Scenario, so that rPET imports fill the gap left by lower EU production of rPET. In addition, with the exception of recycling capacity, all other assumptions in the Ambitious Complementarity Scenario have remained the same, such as curbing the growth in PET/polyester consumption.
[11] End-of-life emissions arising in the EU refers to incineration and landfill, with landfill being close to zero. Incineration emissions account for credits due to avoided emissions from alternative energy generation.

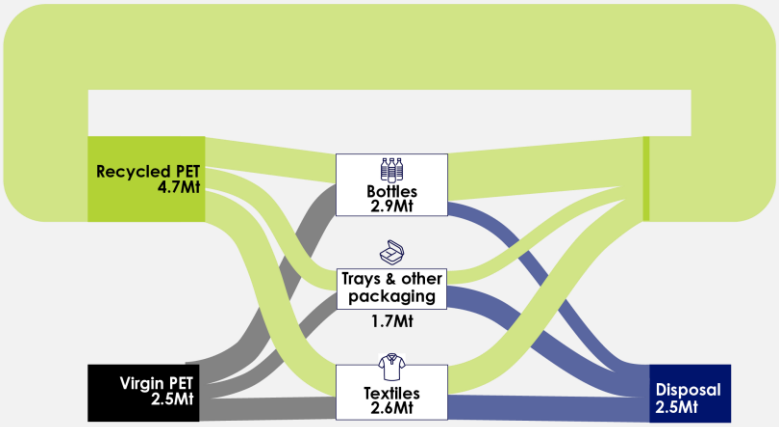
4.7Mt/yr of non-recycled waste and **7.4MtCO2e/yr** of end-of-life GHG emissions arising in the EU.

- If investment in European PET recycling and reuse infrastructure is reduced, job creation opportunities in collection, sortation and reuse/recycling will be affected. Relative to the Ambitious Complementarity Scenario (estimated 28,000 net new jobs in 2040), Scenarios A and B are estimated to create 10-11,000 fewer overall jobs in the PET value chain in Europe in 2040.

Fig. 2a: Two new system scenarios illustrate the potential effect if recycled PET imports stall or slow future investments in scale-up of European recycling systems

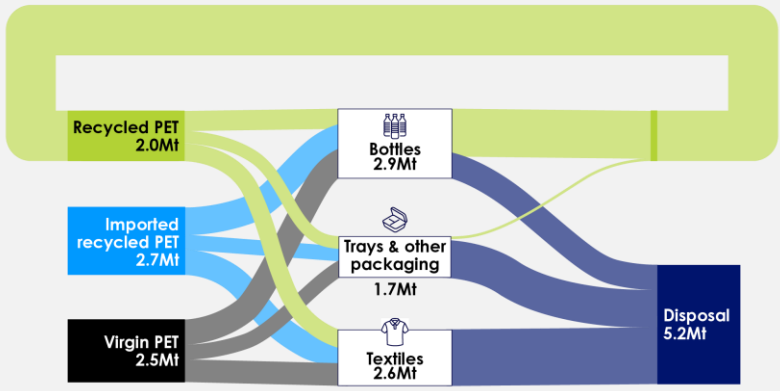
2040 material flow for PET packaging and polyester textiles in Europe

Ambitious Complementarity Scenario: Leading scenario from "Circular PET and Polyester" July 2023 report with no recycled PET imports



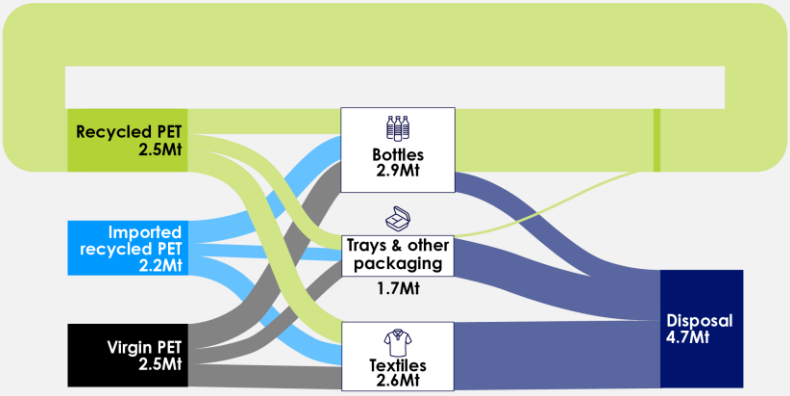
Recycled content	4.7 Mt
Recycling rate	67 %
Non-recycled waste	2.5 Mt
EU end-of-life GHG emissions	3.7 Mt

Scenario A: If investment in new sorting and recycling infrastructure in Europe stalls between now and 2040, due to high level of imports



Recycled content	4.7 Mt
Recycling rate	32 %
Non-recycled waste	5.2 Mt
EU end-of-life GHG emissions[1]	8.2 Mt

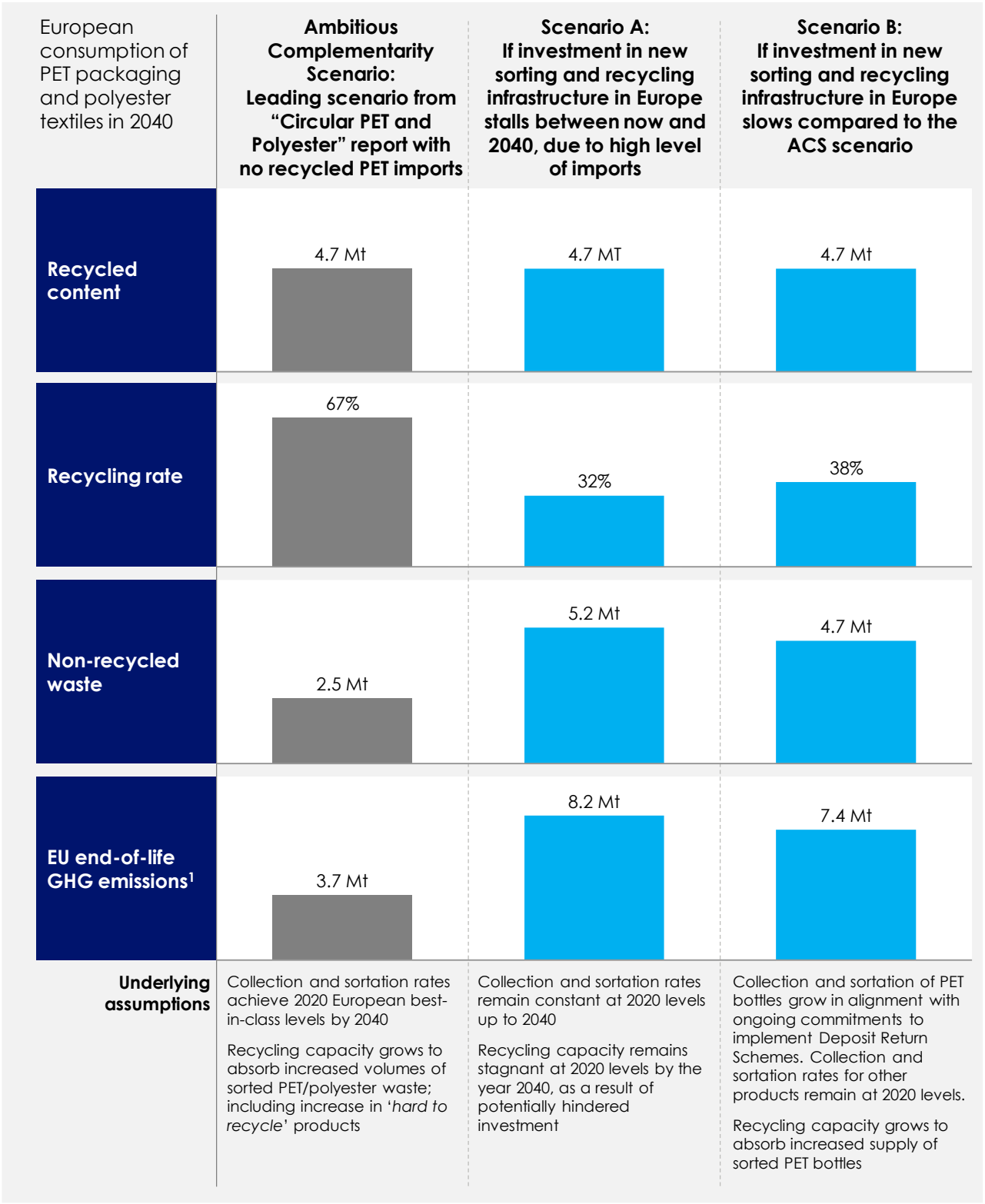
Scenario B: If investment in new sorting and recycling infrastructure in Europe slows compared to the ACS scenario



Recycled content	4.7 Mt
Recycling rate	38 %
Non-recycled waste	4.7 Mt
EU end-of-life GHG emissions[1]	7.4 Mt

[1]Possible increases in European GHG emissions resulting from imports do not take into account possible reductions in non-European emissions if recycling rates in those countries increase

Fig. 2b: Summary of environmental impacts of two new system scenarios

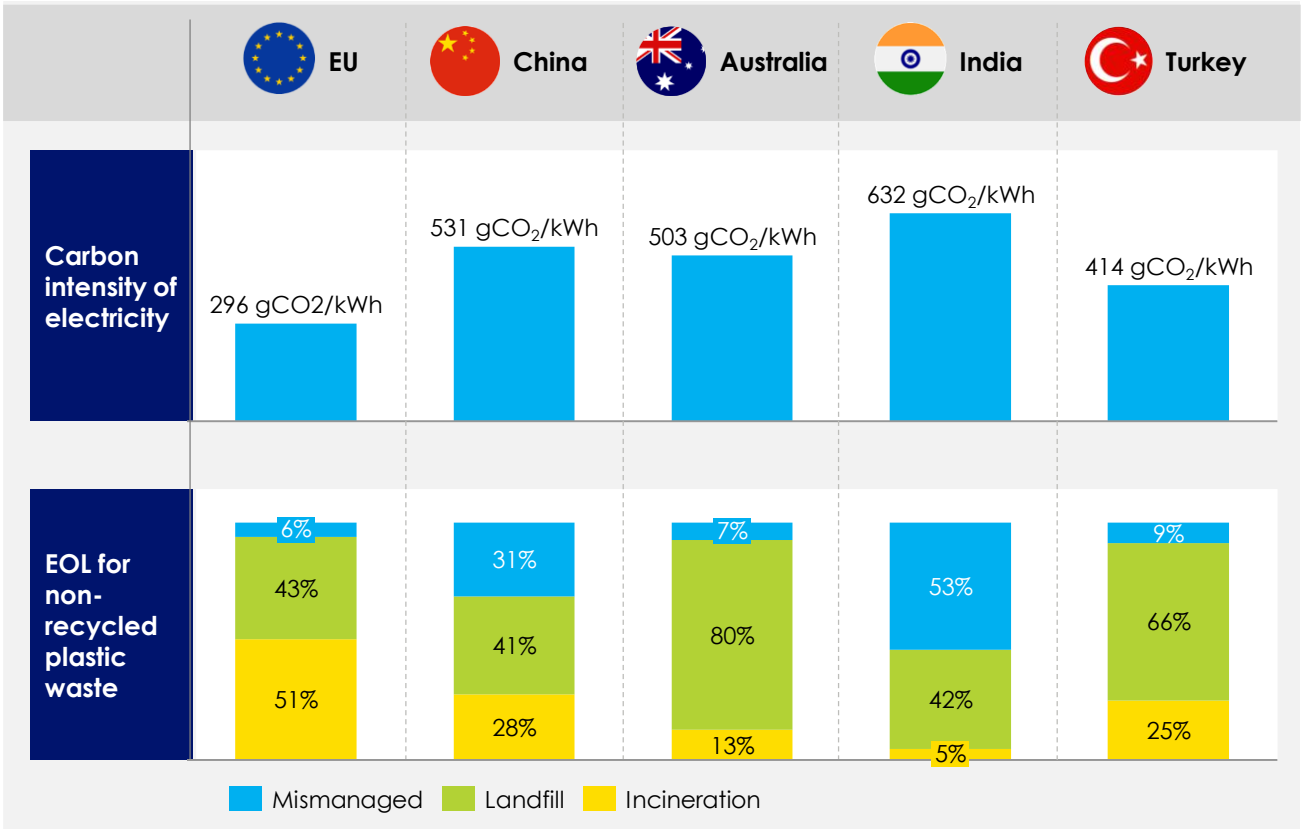


[1]Possible increases in European GHG emissions resulting from imports do not take into account possible reductions in non-European emissions if recycling rates in those countries increase

Exhibit 3: Environmental impacts in exporting countries are not well understood and require further research

- The GHG emissions intensity of the electricity grid in exporting countries is generally higher than Europe. This suggests that keeping recycled PET in these countries, may result in lower GHG emissions, compared to exporting it to Europe.[12] Further research is needed to investigate this effect.
- Environmental considerations in exporting countries are multi-faceted. For example, most have higher rates of mismanaged plastic waste than EU averages. Increased demand for recycled PET could provide economic stimulus to increase PET recovery rates, or could divert recycled PET from other end markets with lower demand than found in Europe. As with understanding the impact on emissions, more research in needed to understand the potential impact.

Fig. 3: The four countries with the most accreditations for import of contact-sensitive plastic to the EU show higher carbon intensity of electricity and higher rates of mismanaged plastic waste



[12] Higher carbon intensity of grid electricity means that virgin PET production has a higher carbon footprint, so avoiding local virgin PET production through local recycling would be more beneficial for the climate, compared to exporting recycled PET to Europe. Greenhouse gas emissions from long distance transportation of recycled PET is another factor in favour of local recycling. Further research is needed.
Fig. 3 sources: Carbon intensity from Ember; Energy Institute Statistical Review of World Energy. End-of-life for plastic waste from OECD Global Plastics Outlook Database (data for 2019, data for Turkey is averaged in the OECD Europe – Non-EU cluster, which includes Turkey and Israel).
Note for "EU" column, carbon intensity represents Europe, while end-of-life for plastic waste represents OECD EU countries.