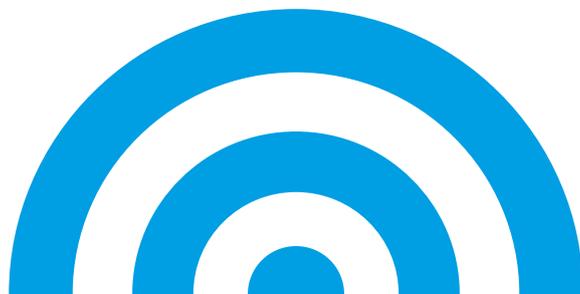
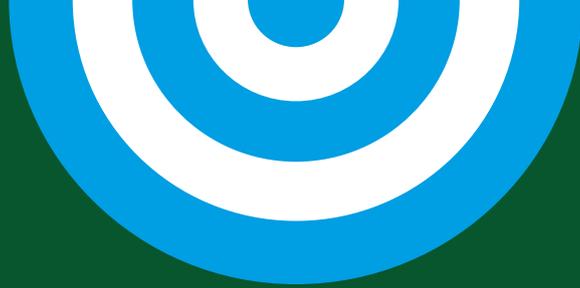




Target 90: The dual-action approach
for circular drinks packaging in Europe





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Target 90: The dual-action approach for circular drinks packaging in Europe

Worldwide sustainability efforts are imperative if we are to maintain a livable planet, but evidence has shown that much more needs to be done.

In its 2021 Emissions Gap Report¹, the United Nations Environment Programme (UNEP) announced that new and updated climate commitments fall far short of what is required to meet the goals of the Paris Agreement, leaving the world on track for a temperature rise this century of at least 2.7°C. The Intergovernmental Panel on Climate Change's (IPCC) latest report on the impacts, adaptation and vulnerability to climate change² further highlights that we must live with climate change and that some of its effects are now unavoidable. At the same time, a parallel crisis of waste is unfolding—both on land and in our oceans—and we are facing unprecedented demands to reduce our dependence on virgin resources.

The scale of these crises demands that we take real action now. The time for waiting is over. We can no longer afford—economically or ecologically—to ignore solutions that are proven to work, and that help us meet our objectives of climate mitigation, resource conservation and waste prevention. Deposit return systems (DRS) for all single-use drinks packaging and high (i.e. 90%) separate collection for recycling targets are proven solutions that are good for the climate and reduce waste. By conserving natural resources, they also contribute to enhanced resource efficiency, a real necessity for Europe in our current geo-political context.

1 United Nations Environment Programme (UNEP). 2021. "Emissions Gap Report 2021: The Heat Is On – A world of climate promises not yet delivered." www.unep.org/resources/emissions-gap-report-2021

2 Intergovernmental Panel on Climate Change (IPCC). 2022. "Climate Change 2022: Impacts, Adaptation and Vulnerability." www.ipcc.ch/report/ar6/wg2

In this report, Reloop investigates the climate and waste prevention impacts of recovering and recirculating—through closed-loop recycling—the vast majority of single-use drinks containers sold in the EU. And the results of our analysis are compelling: reaching a 90% separate collection for recycling rate for all drinks packaging (aluminium, plastic and glass), which can be achieved by implementing deposit return systems across all 27 EU Member States, offers multiple benefits across the board. The overall net impact is a reduction of virgin material demand across the EU, which, in turn, results in a significant reduction in carbon emissions. And due to the power of circularity, these impacts will only grow with time.

Reaching the 90% collection target reduces consumption by 1.6 million tonnes of virgin PET, almost 400 thousand tonnes of virgin aluminium and over 20 million tonnes of virgin glass. This offsets 10 million tonnes of CO₂ equivalent by 2030. The 2030 offset of 2.7 million CO₂e is equivalent to 1.4% of the EU's 2030 target, with the savings realised globally.

Together, the solutions identified in our proposal can help the EU achieve its goals of becoming climate-neutral by 2050, reducing waste and keeping Europe's resources circulating in Europe. Reloop believes the European Union has a huge opportunity to make real progress towards a circular economy.

Let's not waste it.

Acronym Glossary

DRS	Deposit return system
EU	European Union
HDPE	High-density polyethelene
PET	Polyethylene terephthalate
PPWD	Packaging and Packaging Waste Directive
rPET	Recycled polyethylene terephthalate
SUPD	Single-Use Plastics Directive
vPET	Virgin polyethylene terephthalate
WFD	Waste Framework Directive
tCO ₂ e	Tonnes of carbon dioxide equivalent
Kt	Thousands of metric tonnes
Mt	Millions of metric tonnes

Technical Terms

Circularity

Circularity for beverage packaging refers to a co-ordinated system with the participation of the value chain in design, collection, recycling, reuse and remanufacturing to create a closed loop, and directly displace demand for 'virgin' materials, reduce waste creation and maximise resource efficiency.

Deposit return system

This system sees customers pay a small amount of money upfront, which is reimbursed when they return the empty bottle or can to a collection point. The container can then be reused or recycled and used by the drinks industry to make new bottles and cans, avoiding the need for virgin resources. Also known as "container deposit (or refund) schemes" in Australia, or "bottle bills" in the United States.

Collection rate

In this report, this represents the weight of material collected for recycling as a portion of the total material put on the market. This weight includes contaminants such as labels, glue, dirt, and remaining liquids.

Closed-loop recycling

Closed-loop recycling means recycling a material into a raw material that allows repeated use into the same product over and over again, with minimal yield loss between loops. A perfect closed loop would result in materials recirculating indefinitely without degradation of properties. A closed loop recycling rate is synonymous with circularity rate, referring to the amount of total recycled material which is recycled back into its original purpose, in this case drink containers – bottle to bottle and can to can.

Separate collection for recycling rate

Article 3(11) of the European Union's Waste Framework Directive (WFD) defines separate collection as "the collection where a waste stream is kept separate by type and nature so as to facilitate a specific treatment." Based on this definition, in this report, separate collection for recycling rate is the weight of drinks container material collected separately from other waste streams as a portion of the weight of drinks container material placed on the market. Separate collection includes collection of recyclates, but excludes any collection from residual or mixed waste.

Emissions, CO2 emissions

In this report, greenhouse gas emissions are referred to as emissions or CO2 emissions. The global warming potential is used as the main impact indicator since it allows the conversion of any greenhouse gas emissions (responsible for global warming) into CO2 equivalent emissions.

Open-loop recycling (“downcycling”)

Open-loop recycling means recycling materials into a raw material that can no longer be used to make the same product again. The recycled material is used in a product that cannot be recycled back into a closed loop and is destined to become waste at the end of life.

CAGR

This is the Compound Annual Growth Rate. It means the yearly increase in sales averaged out over a period of time. CAGRs (by country) for aluminium were provided by industry, and extrapolated by Reloop for PET and glass.

Unit weights

The average weight of an aluminium can and expected weights (due to light weighting) were provided by industry. The average weight of a PET bottle was determined by Reloop based on weights provided by industry. The average weight for glass was determined by Reloop by individually weighing glass bottles and then calculating an average.

Recycled content

Recycled content refers to the percentage of recycled post-consumer waste material used in the production of new packaging or products. For example, glass bottles are usually produced partly from virgin material and partly from recycled glass. If a glass bottle has 35% recycled content, it means that it was produced from 65% virgin glass and 35% recycled glass.

Recycling rate

In this report, this represents the weight of material entering the final recycling process—after the collection and sorting phases—versus the weight of material placed on the market. It is different from a collection rate in that it accounts for contamination and yield losses that occur throughout the recycling system.

Polyethylene terephthalate (PET)

A type of plastic resin that is widely used for packaging drinks, especially soft drinks, juices, and water.

rPET

Recycled post-consumer PET plastic ready for use as a raw material in the production of new PET products.

vPET

Virgin PET plastic that has been newly created for the first time, without any recycled materials, ready for use as a raw material in the production of new PET products.

Background & Legislative Context

The European Union (EU) leads the world in accelerating the transition to a circular economy—in both policy and practice—through the European Commission’s Circular Economy Action Plan 2.0 and the European Green Deal, which aims to make Europe climate-neutral by 2050. As its legislative landscape continues to evolve, packaging remains a key focus for the EU. In that context, a number of recent and upcoming changes have occurred in several European Directives aimed at eliminating waste and ensuring that resources are recirculated through the economy for as long as possible.

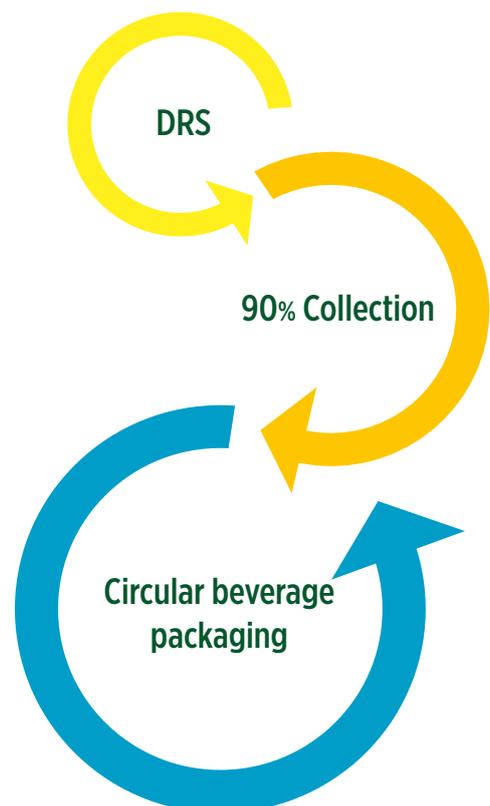
In 2018, the Waste Framework Directive (WFD) and the Packaging and Packaging Waste Directive (PPWD) were amended to include higher recycling targets, increased producer responsibility, product bans, and more accurate methods for calculating recycling rates. A year later, in 2019, the EU raised the bar even higher with the passing of its Single-Use Plastics Directive (SUPD). The SUPD places a particular focus on tackling the problem of single-use waste by introducing measures to reduce the consumption and use of single-use plastics at EU level; including more product bans, a recycled content target for drinks bottles (25% in PET bottles from 2025, and 30% in all bottles by 2030), and even higher collection for recycling targets for plastic drinks bottles (77% by 2025, increasing to 90% by 2029).

Although the implementation of these laws has been considered a success, volumes of packaging waste are still on the rise in the EU, and valuable resources are being wasted instead of being recirculated in the economy. In order to address the overconsumption that is damaging our planet and contributing to climate change, the European Commission is currently reviewing the PPWD; a proposal of the new version was expected in the summer of 2022. These latest amendments are likely to be more ambitious than previous revisions of the directive, which focused on recycling, promoting waste prevention, closed-loop recycling and reuse.

Target 90: A Dual-Action Proposal

Reducing packaging waste presents a huge opportunity for circularity within the EU, and as such, it is critical to get this review right. With this report, Reloop hopes to contribute to the upcoming revision of the PPWD by highlighting some of the key measures we believe are crucial for establishing a clear path to circular drinks packaging. Reloop therefore makes the following dual proposal:

- We propose the introduction of an EU-wide 90% separate collection for recycling target for recyclable drinks packaging, including plastic bottles, metal cans, glass bottles and other recyclable drinks containers in line with the SUPD's existing 90% target for separate collection of plastic drinks bottles (Article 9). All drinks containers should be effectively and efficiently reused or recycled (at scale) into secondary raw material to be used as primary substitutes across the EU.
- This ambitious but attainable target, which is based on recycling rates already achieved in best-in-class deposit return systems (DRS) in countries such as Denmark, Finland, Germany, Norway, and Lithuania, enables actors in the value chain (producers and material suppliers) to accelerate the circularity of not only plastic, but metal, glass, and composite packaging too. A 90% target also maximises waste prevention, litter reduction, and facilitates high levels of closed-loop recycling.
- We also support mandatory DRS for drinks packaging for all relevant materials. DRS should at least collect plastic bottles (PET and HDPE) and aluminium cans. For other types of containers such as glass bottles, circularity can be achieved through high separate collection, high levels of recycled content, and a high or increasing rate of refillable bottles. If these three criteria for circularity are met, glass drinks bottles could be exempt from a national DRS. Deposit return systems should be built based on a series of mandatory minimum requirements to maximise their efficiency and performance. As regards the most effective way of collecting high quantities of drinks packaging for high-quality recycling, it is proven that DRS has consistently out-performed other collection systems in terms of recycling rates and the quality of material that is collected. Deposit return systems guarantee high levels of circularity by allowing drinks bottles and cans to remain in a closed loop for as long as possible, thereby reducing net virgin material inputs.



The rationale for the dual-action proposal

Reloop has examined the economic and environmental impacts of higher rates of separate collection and closed-loop recycling (i.e. bottle-to-bottle or can-to-can) for drinks packaging in the 27 EU Member States (EU-27). Presented in this report, the results of our analysis are compelling. They support a dual-action proposal for a 90% separate collection target and mandatory DRS for all drinks containers. Our findings outline the benefits that can be achieved under the status quo versus a Target 90 scenario, where 90% separate collection for recycling and maximum levels of circularity for each material are achieved; can-to-can or bottle-to-bottle.

This dual action offers multiple benefits. First, in response to the global waste crisis, this proposal results in a significant decrease in container wastage and litter. The proposal also supports our efforts to mitigate climate change, by offering an overall net decrease in virgin material demand across all materials.

Why separate collection for recycling versus recycling target?

From plastic to paper, the separate collection¹ of different types of materials at the source is a precondition for high-quality recycling. The Commission defines² high-quality recycling as *“the reprocessing of waste into materials which have a similar or higher economic value in comparison to the products or applications from which the waste originates.”* Sometimes called “bottle-to-bottle” as shorthand. This, in turn, can only be achieved when materials are collected and managed separately, in a way that reduces contamination and ensures a clean stream of secondary outputs.

Unlike a recycling target, a separate collection for recycling target excludes recovery from mixed/residual waste. This is because Article 10(4) of the WFD ensures that separately collected waste streams that are collected for recycling cannot be incinerated. This is important, because while Member States are allowed to include in their recycling rate the aluminium that is recovered from incinerator bottom ash (IBA), for example, this aluminium is not recycled into new cans, thereby ending the (nearly) infinite circularity of aluminium.

1 The WFD (Article 3(11)) defines separate collection as “the collection where a waste stream is kept separate by type and nature so as to facilitate a specific treatment.”

2 European Commission. April 2020. “Guidance for separate collection of municipal waste.” http://publications.europa.eu/resource/cellar/bb444830-94bf-11ea-aac4-01aa75ed71a1.0001.01/DOC_1

Setting a 90% separate collection for recycling target for all drinks packaging will ensure that each Member State introduces a robust separate collection system focused not only on attaining the targets and reducing litter, but also on recirculating the materials in closed loops, thereby preventing waste through replacing virgin inputs with recycled content several times over. The higher the separate collection, the greater the rewards.

If 90% of all the drinks containers sold in the EU were separately collected, this would enable the possibility of more closed loop recycling for plastic, aluminium and glass. Of the material³ that was recycled into new bottles or cans, it too can be used again for the same purpose. And this is repeated, again and again until the end of the circularity, which for some materials could last for decades. The 90% target is vital for new bottles and cans to be produced from the original material multiple times, delivering significant economic and ecological benefits through virgin inputs reduction.

To illustrate the importance of a separate collection for recycling target when it comes to ensuring circularity, let's consider the example of Belgium. Here at least 50% of metal packaging that is recycled comes from incinerator bottom ash (IBA); unlike the metal recycled from used drinks cans, this metal does not get recycled back into new cans, and is unlikely to ever become a drinks can again. If Belgium were to separately collect 90% of all drinks cans sold and channel them into can-to-can recycling, after 10 years (cumulatively) an additional 59,000 tonnes of newly available aluminium (equivalent to more than 6 billion cans) would be available for use as recycled feedstock, directly supplanting virgin inputs which have significantly higher carbon intensities.

France offers another example. Currently, 0% of the cans collected for recycling in that country are recycled in closed loop (can-to-can) applications. If France were to separately collect 90% of all drinks cans sold and remelt them so they could be used in the production of new cans, there would be over 350,000 tonnes (equivalent to over 30 billion cans) of newly available aluminium can material for closed-loop recycling.

³ Some loss of material will occur during the drinks containers recycling process.

Why mandatory DRS for drinks packaging?

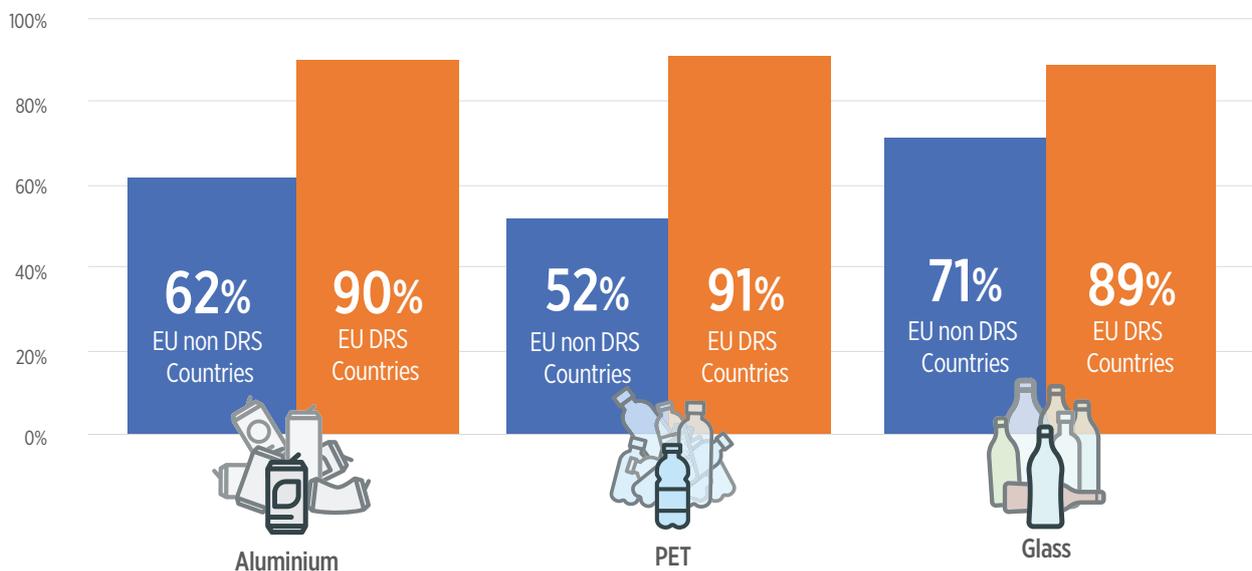
DRS is the only means to achieve 90% and beyond

Several EU Member States have already met the target and others are well on their way. What these countries have in common is that they have established mandatory DRS for single-use drinks packaging. Many European deposit return systems achieve recycling rates above 90% (with Germany showing the best results at 98%), diverting significant quantities of bottles and cans from disposal and keeping that material circulating in the economy.

While some Member States claim to be close to 90%, it is important to understand that these rates were calculated using the EU’s old calculation method and that under the EU’s new and more accurate method for measuring real recycling, these rates would be considerably lower.

The fact that no other method of collection can effectively recover 90% of drinks containers for closed-loop recycling explains why governments around the world have shown a renewed interest in deposit return systems. In the first half of 2022, Latvia and Slovakia implemented DRS, and the Netherlands’ DRS expansion to add cans, as well as Malta’s new DRS, are expected to launch by the end of the year. Over the next two to three years, new programmes are also expected to start in Romania (2022/23), Hungary (2023), the Republic of Ireland (2023), Portugal (2022/23), Greece (2023/24), Cyprus (2023/2024) and Austria (2025). And by the end of 2025, at least 18 Member States – representing 45% of the EU’s population – will have fully implemented deposit return systems for drinks packaging.

Figure 1: Average recycling rates by material, EU DRS vs Non-DRS countries



DRS reduces litter

Aside from increasing the recycling of drinks containers, a key benefit of DRS—and one that cannot be achieved without it—is reduced littering. To give one example of the potential for litter reduction, Eunomia conducted research on the effect a DRS would have on littering rates in Scotland⁴. The study found that, for a population of just 5.5 million people, an estimated 140,000 bottles and cans littered in Scotland each day would have been collected via DRS.



4 Eunomia. 2013. "Exploring the Indirect Costs of Litter in Scotland" www.eunomia.co.uk/reports-tools/exploring-indirect-costs-litter

DRS is a gateway for refillables

While Europe’s refillable market share has experienced a steady decline over the last two decades, interest is growing—both in the industry and government—in the substitution of single-use containers by ones that can be reused and refilled multiple times before being recycled or discarded. Each time a bottle is reused, the environmental impacts associated with producing new bottles is avoided, as are the end-of-life management impacts. Refillable drinks packaging also offers tremendous economic benefits in terms of material cost savings and job creation, which are multiplied with each reuse cycle.

Mandatory DRS for drinks packaging serves as a gateway for Member States to encourage greater use of refillable bottles because it establishes the infrastructure by which all containers (single-use and refillable) can be returned. This is a prerequisite for a successful reuse system.

As has been proven in a number of countries such as Germany, Estonia, Finland, Lithuania and the Netherlands, the return infrastructure and other DRS functionalities for single-use and refillable drinks containers are easily integrated. Consumers benefit from being able to return both types of packaging to the same collection points.

Figure 2: Integrated collection of single-use and refillable containers in a DRS



DRS keeps material in closed loops

As demand for recycled materials grows, a paradox is created in which there isn't enough high-quality material being collected and recycled to meet that demand. Deposit return systems offer a solution to this paradox by ensuring a clean stream of materials fit for closed-loop recycling, by collecting and managing materials in a way that minimises contamination and ensures high-quality outputs. This is why more and more drinks companies (including Coca-Cola, Pepsi, and Nestlé)⁵ and industry associations have begun to throw their support behind such schemes.

After years of opposing DRS, the drinks industry has begun to realise that DRS is the only realistic way to increase the recycled content of their bottles and cans to reach a higher material efficiency and meet their corporate sustainability targets. In an open letter to the European Commission in September 2020, the European Federation of Bottled Waters (EFBW)—representing natural mineral and spring waters, and UNESDA—representing soft drinks producers—called for the widespread adoption of DRS in European countries to meet the separate collection and rPET targets set in the EU's SUPD.⁶ The letter states: *“Both UNESDA and EFBW consider well-designed DRS an efficient recovery scheme for reaching the European collection targets for beverage bottles and for safeguarding the quality of recycled PET that our industries need. In addition, it can also contribute towards the EU's climate objectives, for example, by requiring less virgin materials to be used thanks to the closed-loop recycling which will result in a lower CO2 footprint.”*⁷

More recently, in October 2021, Natural Mineral Waters Europe (NMWE) and UNESDA (in association with Zero Waste Europe) urged the EU to acknowledge the role of DRSs in achieving a circular economy for beverage packaging in Europe, and to support the establishment of minimum requirements for new DRSs in the revision of the PPWD.⁸ In their joint statement to the European Commission, they state that: *“DRS have not only delivered high collection rates for beverage packaging in countries where they are in place, but they also have the benefit of providing high-quality, food-grade recycled material in a clean stream.”*⁹ In the statement, NWME, UNESDA, and Zero Waste Europe also note that *“setting up this guidance at EU level could help ensure that DRS infrastructure across Member States...accommodates where possible from the outset, refillable packaging, in line with the EU goals on packaging waste prevention and reuse.”*

5 Zoete, T. 25 September 2020. “Breaking: Coca-Cola, Pepsi, Nestle back deposit return on plastic bottles all over Europe.” recyclingnetwerk.org/2020/09/25/breaking-coca-cola-pepsi-nestle-back-deposit-return-on-plastic-bottles-all-over-europe

6 EFBW and UNESDA. September 2020. “DRS: UNESDA and EFBW call for a wide deployment of well-designed deposit return systems (DRS) in EU countries in order to meet the targets of the Single Use Plastics Directive.” www.unesda.eu/wp-content/uploads/2020/09/UNESDA-EFBW-joint-paper-DRS.pdf

7 Ibid.

8 Natural Mineral Waters Europe, Soft Drinks Europe (UNESDA), and Zero Waste Europe. 6 October 2021. “It's time to acknowledge the role of Deposit Refund Systems (DRS) in achieving a Circular Economy for beverage packaging in the EU.” naturalmineralwaterseurope.org/wp-content/uploads/2021/10/Press-release_DRS_NMWE-UNESDA-ZeroWaste-Europe-06-10-21.pdf

9 UNESDA. 6 October 2021. “It's time to acknowledge the role of Deposit Refund Systems (DRS) in achieving a Circular Economy for beverage packaging in the EU.” www.unesda.eu/its-time-to-acknowledge-the-role-of-deposit-refund-systems-drs-in-achieving-a-circular-economy-for-beverage-packaging-in-the-eu

Why closed loop matters – using Spain to illustrate the power of circularity

To illustrate the power of circularity in terms of resource efficiency, we modelled and compared the impacts on material demand of PET bottle recycling in Spain under three separate scenarios: a status quo scenario (assuming a collection rate of 37%), a scenario assuming a separate collection for recycling rate of 90%, and a scenario that assumes a 95% separate collection for recycling rate.

Based on sales of 5.4 billion PET bottles in Spain in 2022, with a weight based collection rate of 37%, and an average yield loss of 30%, it is estimated that the original PET could be recycled into 1.9 billion new bottles' worth of material after several cycles.

In contrast, if 90% of the material is separately collected and recycled in a closed loop, and where there is lower yield loss of 7% (as a result of collecting the material in a separate clean stream and measured by unit rather than weight, as is typical of DRS systems), the same 5.4 billion PET bottles could be recirculated through many more cycles into over 29 billion new bottles' worth of material. In other words, moving from Spain's current collection rate of 37% to a 90% separate collection for recycling rate offers a 1347% increase in circularity.

Further to this, the ecological and economic benefits of circularity become even clearer when we assume a 95% separate collection for recycling rate. Under this scenario, 95% of the material that was originally placed on the market is collected and can now be recirculated to be used in the production of 38 billion new bottles.

Figure 3

1347% increase in circularity

1.9 billion bottles

29 billion bottles

Modelling the impacts of Target 90 for the EU-27

In 2022, 150 billion drinks containers (excluding milk) will be sold in the EU, including 68 billion PET bottles, 45 billion aluminium cans, and 38 billion glass bottles. Only two-thirds of these containers were separately collected and sent to recyclers. The remaining 33% was discarded as waste in landfills or incinerators, or littered in the environment.

It is projected that in 2022 alone, approx 830K tonnes of PET, 140K tonnes of alu, and 9 million tonnes of glass, worth nearly EUR 900 million will be wasted. With increasing sales for most drinks categories, the magnitude of this lost opportunity will continue to grow year over year. By 2030, the cumulative wasted containers is expected to be greater than 500 billion. These materials would be worth over EUR 8 billion at today's material prices.

Our approach

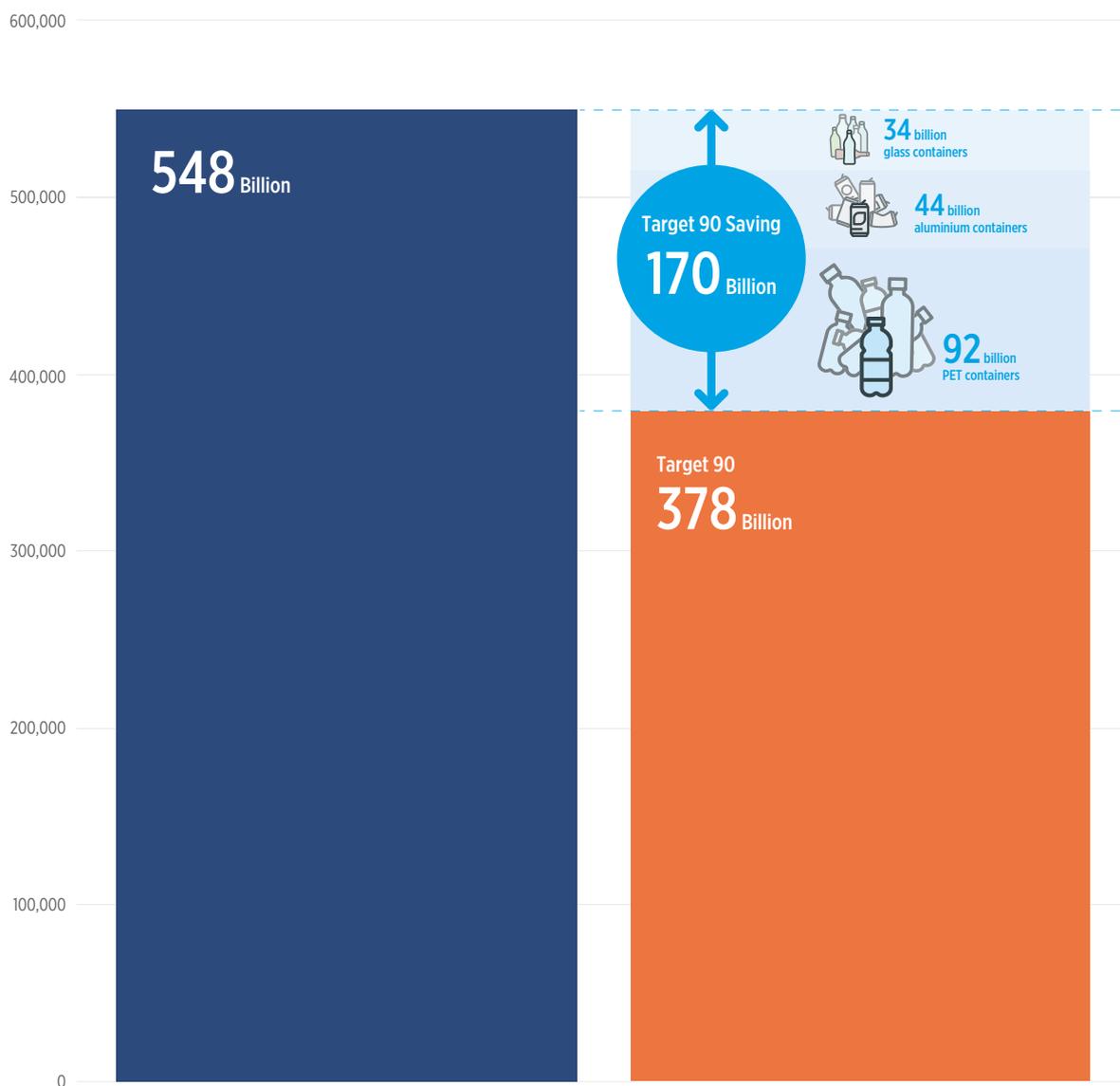
Reloop developed a model to calculate the annual and cumulative impacts of our dual-action proposal on waste and virgin material demand in the EU for PET plastic, aluminium and glass for the remainder of this decade (2022-2030) and for the decade of 2031-2040. The annual and cumulative impacts include waste reduction, increased recycling, reduced demand of virgin resources and the subsequent impact on emissions. The model, which can be applied to a single country or group of countries, can be used to estimate impacts for two scenarios:

- A status quo scenario, where collection rates (in countries where not all material is collected separately), separate collection for recycling rates, and circularity rates remain the same; and,
- A Target 90 scenario, where all countries move to separate collection for recycling and rates gradually increase to 90%, and where circularity rates of 75%, 95%, and 95% are achieved for PET bottles, aluminium cans, and glass bottles, respectively.

The results

The results of our analysis show that if Target 90 is achieved in the EU, with each Member State implementing a DRS between 2022-2029, the cumulative impact from 2022 to 2030 inclusive **would be 170 billion fewer containers wasted** compared with the status quo. The subsections that follow will present a breakdown of these impacts by material type.

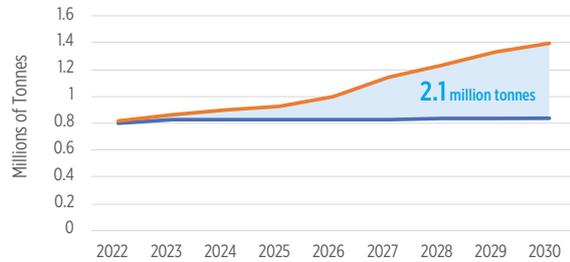
Figure 4: Cumulative Total Containers Wasted (Billions) 2022-2030 EU27 - Status Quo vs Target 90



PET drinks bottles

When applied specifically to PET bottles, the model reveals that under a Target 90 scenario, the EU would recycle an additional 2.1 million tonnes of secondary material (the equivalent of 92 billion PET bottles) compared with the status quo. This represents an economic opportunity worth over EUR 1.3 billion.

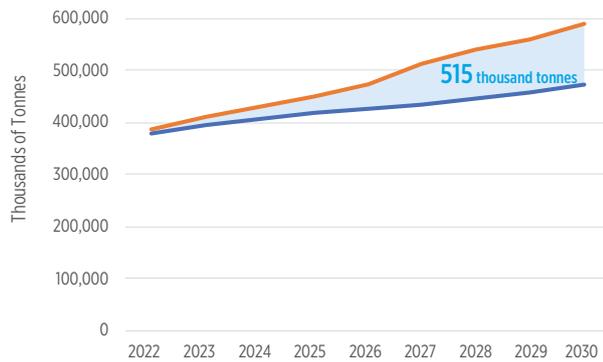
Figure 5: Tonnes PET Recycled
2022-2030 EU27 - Status Quo vs Target 90%



Aluminum drinks cans

If each Member State reaches Target 90 by 2029, our analysis shows that, by the end of 2030, the EU will collect and recycle an additional 515 tonnes of aluminium, representing over 44 billion cans, compared with the status quo scenario. This has an economic value of at least EUR 760 million. These separately collected cans could be recycled back into new cans with a very high yield of 95%, offering considerable longevity in terms of circularity.

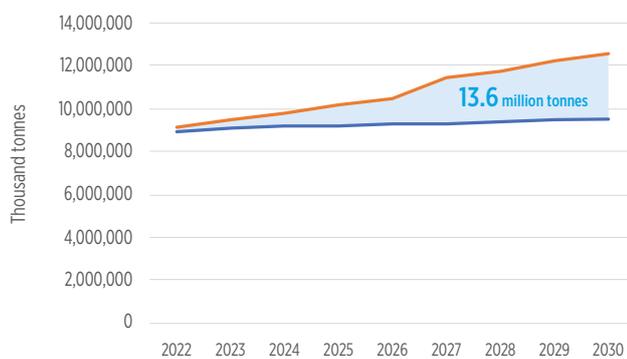
Figure 6: Tonnes Aluminum Recycled
2022-2030 EU27 - Status Quo vs Target 90%



Glass drinks bottles

Finally, the model reveals that reaching Target 90 for glass drinks bottles would mean an additional 13.6 million tonnes of recycled glass cullet, equal to 40 billion glass drinks bottles, available for European glass recyclers and brand owners, compared with the status quo. This has an economic value of EUR 235 million.

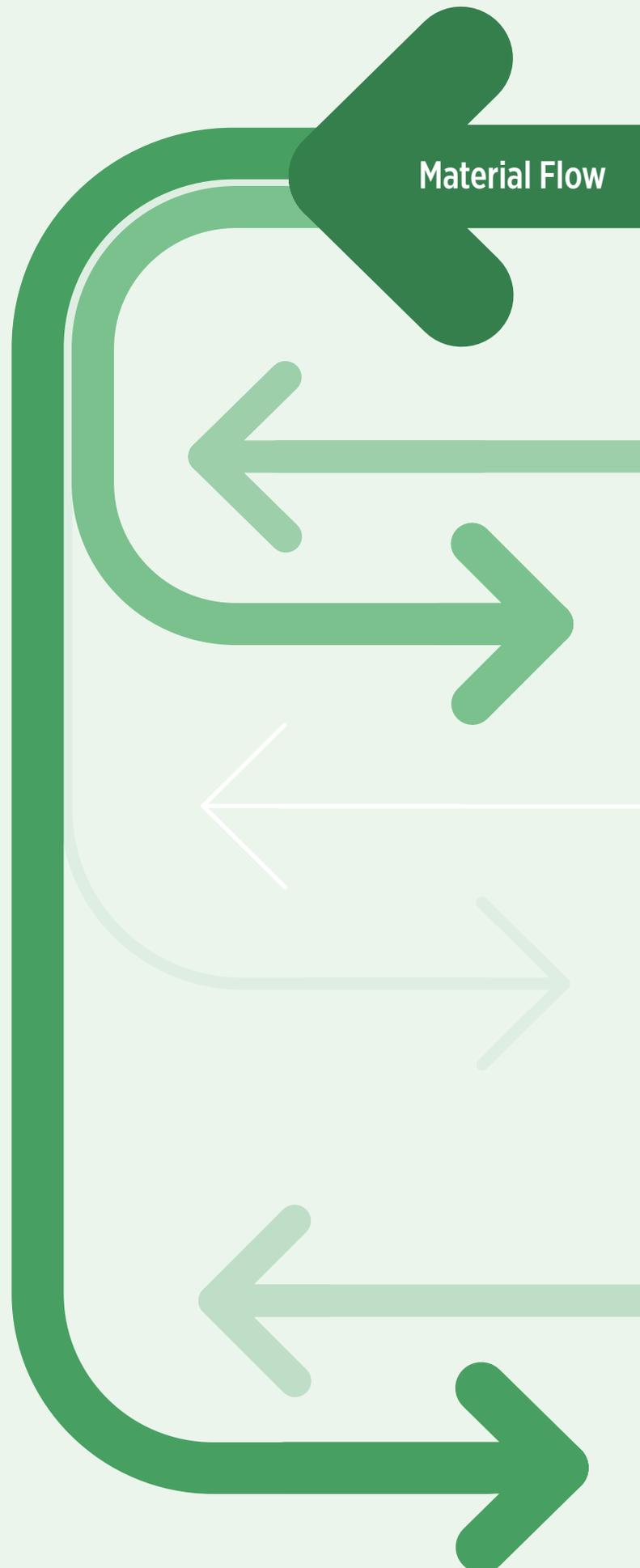
Figure 7: Tonnes Glass Containers Recycled
2022-2030 EU27 - Status Quo vs Target 90%



A closer look at circularity & material flow

Modelling the impacts of increased circularity for each container type requires an understanding of their theoretical maximum closed-loop recycling rate (for our purposes, we have assumed a 75% rate for PET, a 95% rate for aluminium, and a 95% rate for glass). It also requires an understanding of how much material is eventually “downcycled” in an open loop into other applications. Examples of “open-loop” recycling include using rPET flakes from PET bottles to manufacture trays (thermoforms) and textiles, or using the secondary cullet from glass drinks bottles in asphalt pavement construction.

Given the lack of viable, large-scale methods of recycling for these “open loop” applications, most non-bottle and non-can end uses follow a predominantly linear system of production, use and disposal, as opposed to a circular one. While circularity within these non-container streams might be improved in the future, the material would still likely flow—or ‘cascade’—into a lower-quality product stream.



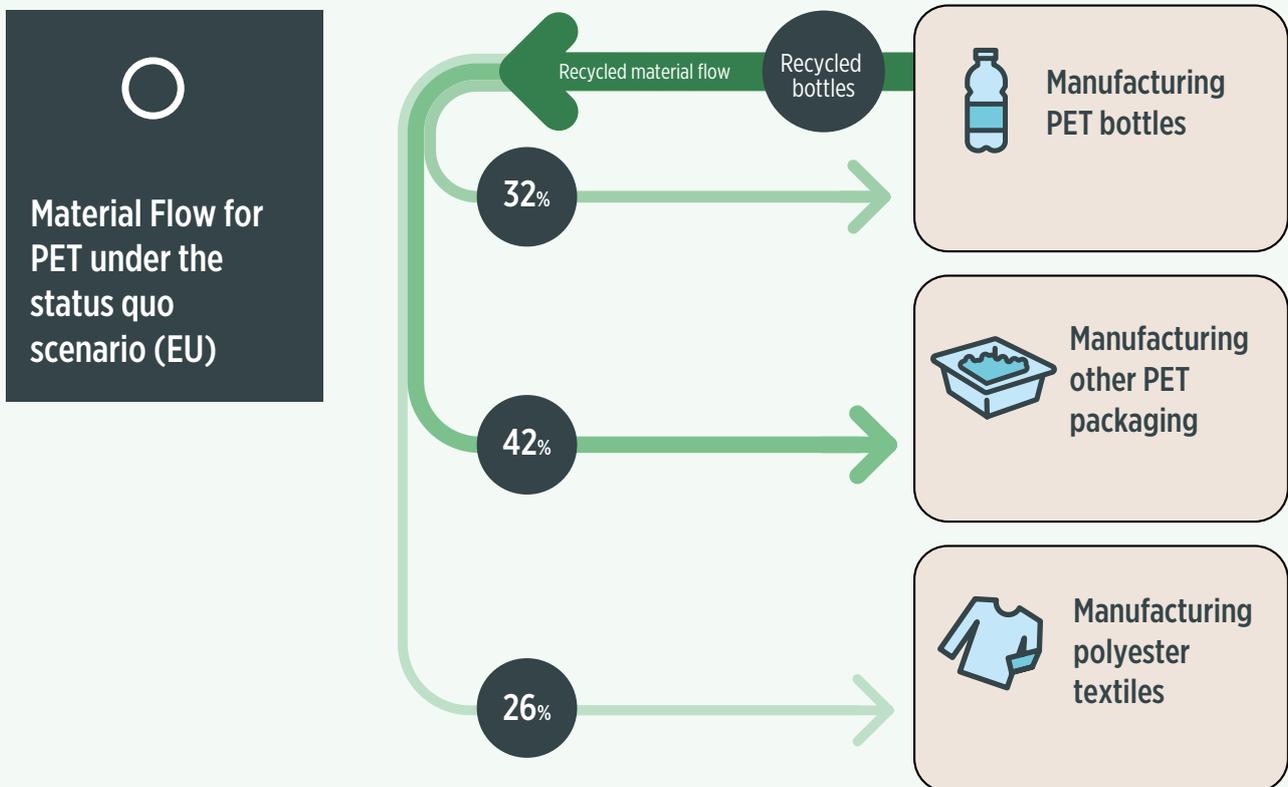
The example of PET bottles

Using material flow analysis to assess the impacts in the status quo scenario

In the EU today, an estimated 32% of PET drinks bottles collected for recycling remain in a closed loop – that is, recirculated into new bottles – and some of this material is collected and recycled again and again (see Figure 8). The remaining 68% is cascaded (downcycled) into other PET product applications—like polyester textiles (60%) and other PET packaging (8%)—where it cannot be recovered and recycled back into new bottles due to the change in its material properties.

In other words, the recyclates from drinks bottles that cascade down are caught in a one-way stream, where they are most likely to get only one additional life (i.e. production, use as a drinks container, use in other application, and disposal). This means that the recyclate from this product cannot be used in a higher-grade application again (e.g. a new PET drinks bottle).¹ In contrast, material recycled in a closed loop can be recycled multiple times into the same type of product, without significant impacts on quality.

Figure 8: Material Flow for PET under the status quo scenario (EU)



1 Zero Waste Europe and Eunomia. February 2022. "How Circular is PET? A report on the circularity of PET bottles, using Europe as a case study." zerowasteurope.eu/wp-content/uploads/2022/02/HCIIP_V13-1.pdf

When we apply the material flow concept to overall PET demand in the EU, our analysis shows that over a 10-year period, the combined effects of increasing separate collection and circularity result in an overall net reduction in vPET demand across all markets.

Currently, the largest use of PET² in the EU is bottles—at approximately 47% market share. About 20% is used in the production of other PET packaging applications (e.g. trays, flexible packaging), and polyester for textile and fibre manufacturing uses up the remaining 33%. Based on this approximate distribution of end markets, we can build a model that generates realistic material cascades to help us understand the impacts of our dual-action proposal on overall PET demand in the EU.



Material Flow

our analysis shows that over a 10-year period, the combined effects of increasing separate collection and circularity result in an overall net reduction in vPET demand across all markets.

2 Zero Waste Europe and Eunomia. February 2022. “How Circular is PET? A report on the circularity of PET bottles, using Europe as a case study.” zerowasteurope.eu/wp-content/uploads/2022/02/HCIP_V13-1.pdf

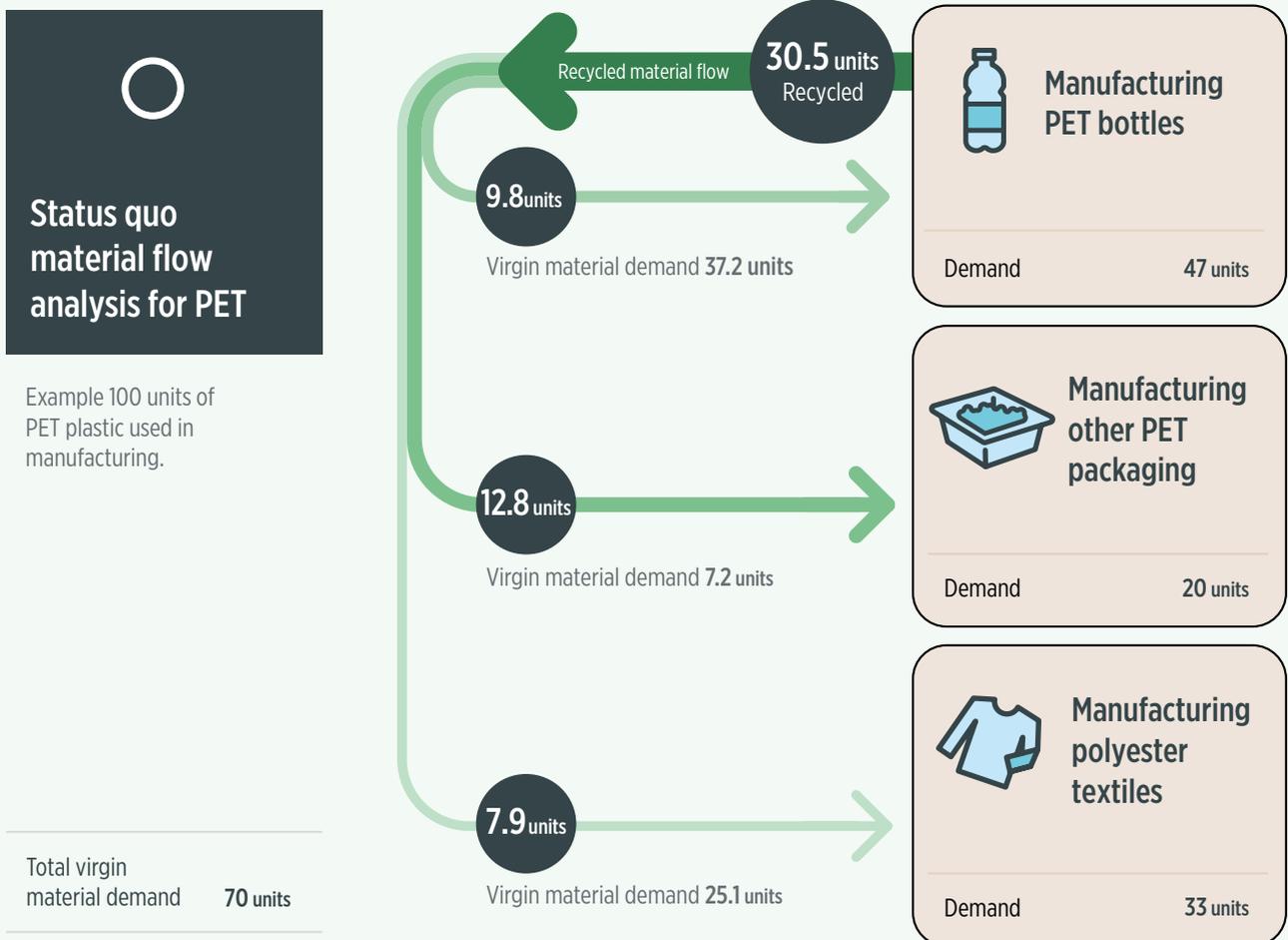
Applying material flow analysis

As a starting point—and based on the breakdown of PET product applications noted above—we have assigned 100 units to represent overall PET demand, where 47 units are used for bottle manufacturing, 20 units for other packaging, and 33 units for polyester textile (see Figure 9).

If our model applies the EU’s 2020 average collection rate of 65% for PET (and for the sake of simplicity, assumes maximum yield) then:

- There are 30.5 units of recycled PET (rPET) available (47 units x 0.65) to be distributed among the three end markets.
- In this example, 10 units (32% of the total) are recycled in a closed loop (back into new bottles) and 20 units (68% of the total) are recycled in an open loop;
- And, of those 20 units that enter an open-loop pathway, 18 are used in textile manufacturing and two are recycled into other PET packaging applications (e.g. trays, flexibles, and strapping). In this scenario, a total of 70 units of virgin PET (vPET) is needed in order to meet overall EU PET demand.

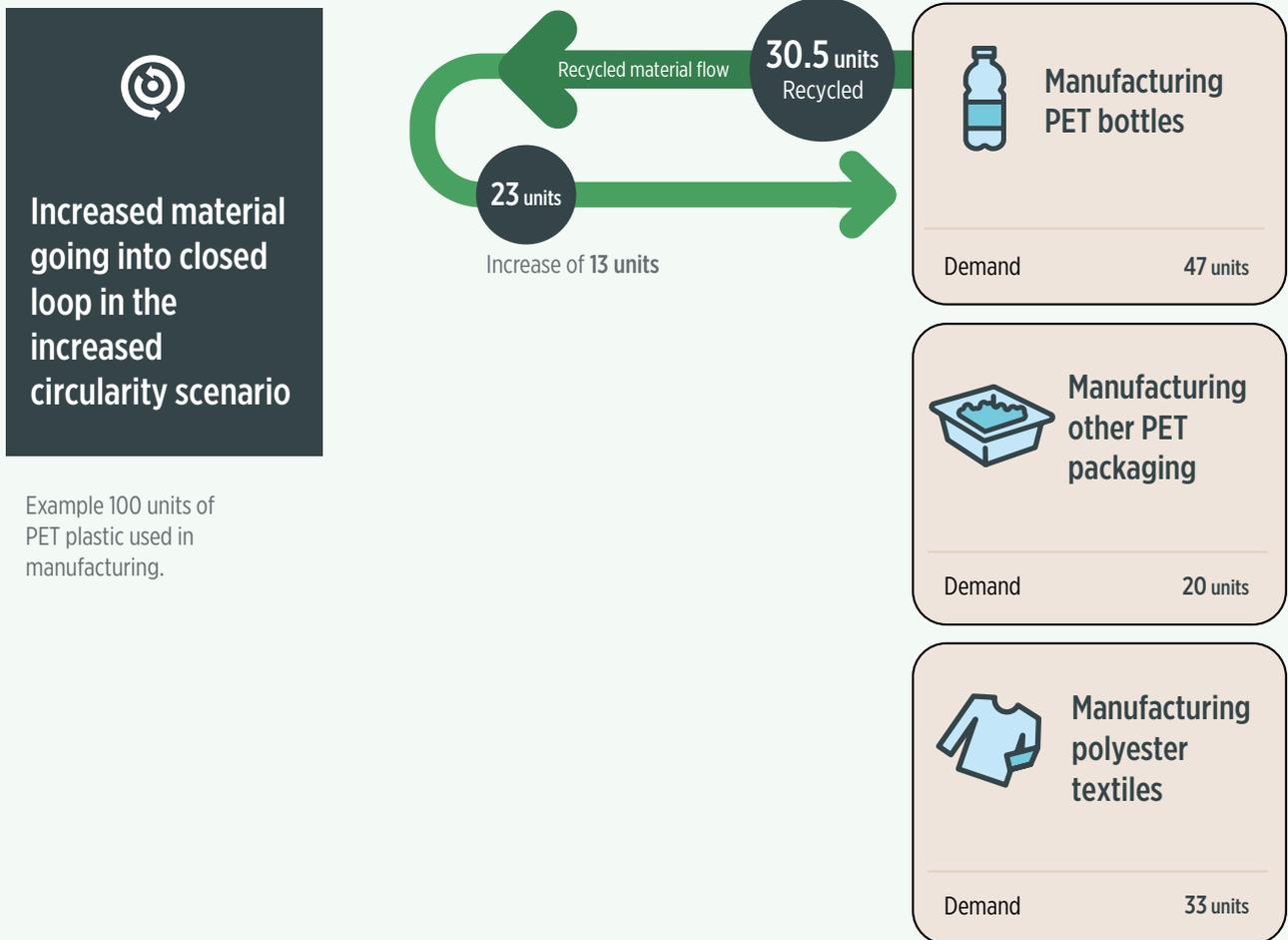
Figure 9: Material flow analysis for PET under the status quo scenario using 100 units input



Using material flow analysis to assess the impacts of increasing circularity

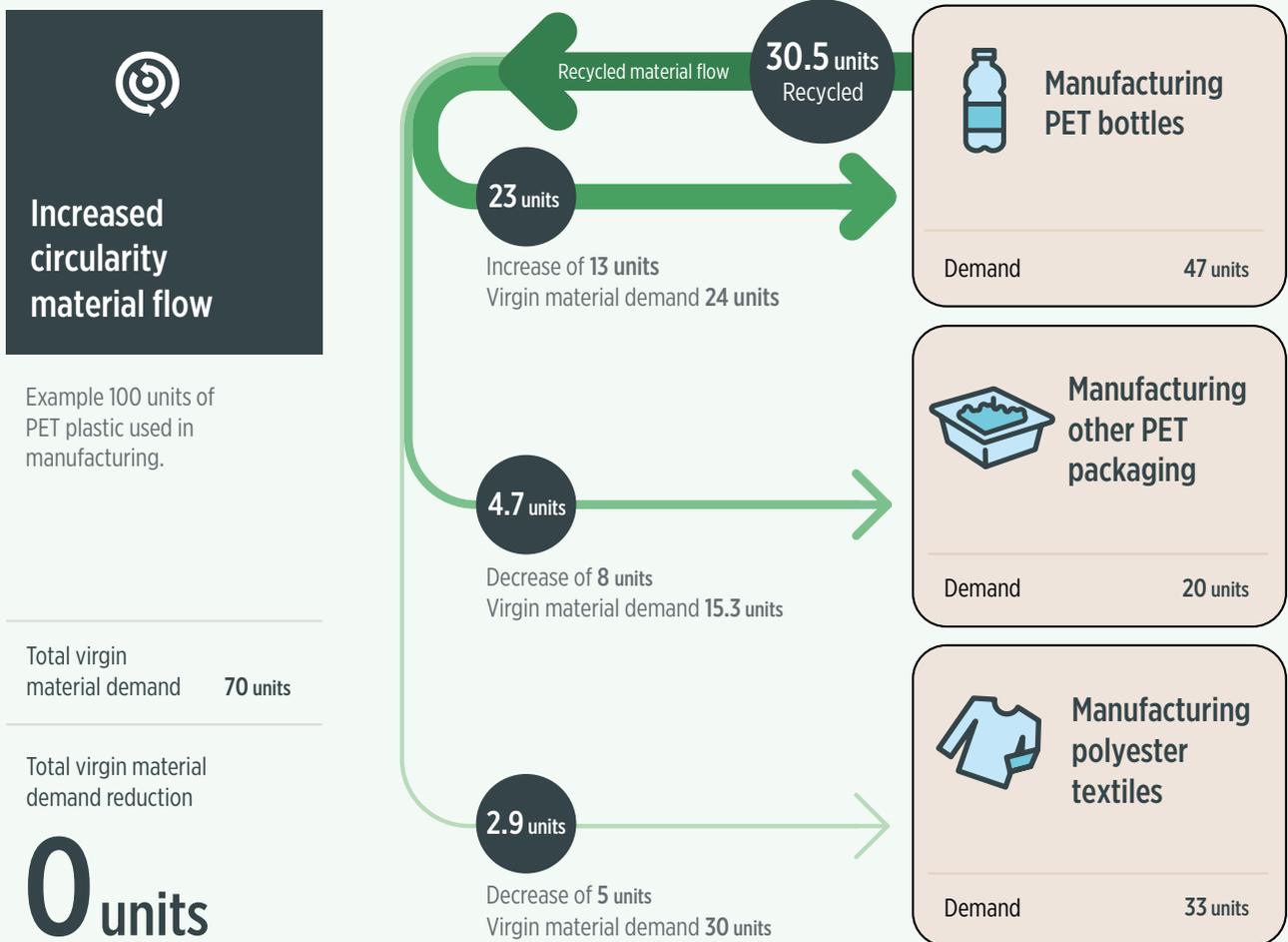
In order to reduce the demand for vPET in bottle applications, circularity must be increased. This can be achieved by the bottle industry by directing more collected bottles into closed-loop recycling, generating more rPET that can be used in the production of new bottles. In the status quo scenario, only 32% of PET bottles are recycled back into new bottles, but this can be increased to 75%. In a scenario where 75% of PET bottles are recycled in a closed loop (see Figure 10) , there are still 30.5 units available, but now 23 units (30.5×0.75) of PET could be recycled into bottles again (as opposed to 10 in a status quo scenario).

Figure 10: Increased material going into closed loop in the increased circularity scenario



Achieving this rate of circularity would reduce the bottle industry’s demand for vPET to 24 units. While this is good news for the bottle industry, it also means that less rPET is available for other end uses like textiles. In order to offset the losses in rPET availability, other PET markets will be forced to increase virgin material inputs. Simply stated, this scenario does not reduce overall vPET demand; it only reallocates it. The overall vPET demand remains at 70 units (see figure 11).

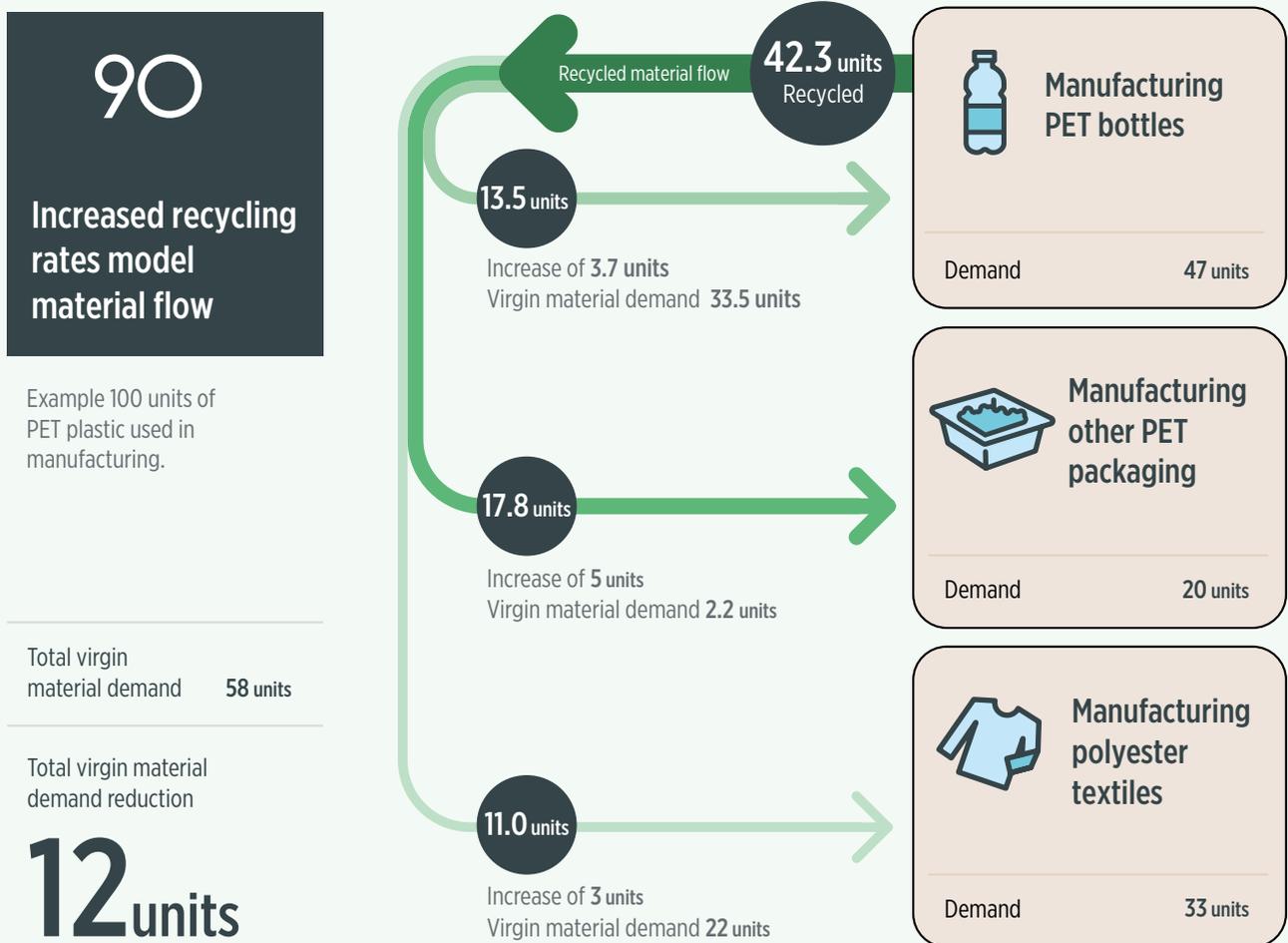
Figure 11: Increased circularity model material flow



Using material flow analysis to assess the impacts of increasing separate collection for recycling

When the collection for recycling rate is increased from 65% to 90% separate collection for recycling (see Figure 12), and the circularity rate remains at 32%, there are 42 units (47 units x 0.90) of rPET available to be allocated among the various end markets—a significant increase over the 30 units available in the status quo scenario. This increase in the rPET supply reduces vPET demand from 37 to 33 units for the bottle industry, from 18 to 17 units for manufacturers of other PET packaging, and from 15 to 8 units for the polyester textile industry. Overall, the demand for vPET in this scenario is reduced to 58 units.

Figure 12 Increased recycling rates model material flow

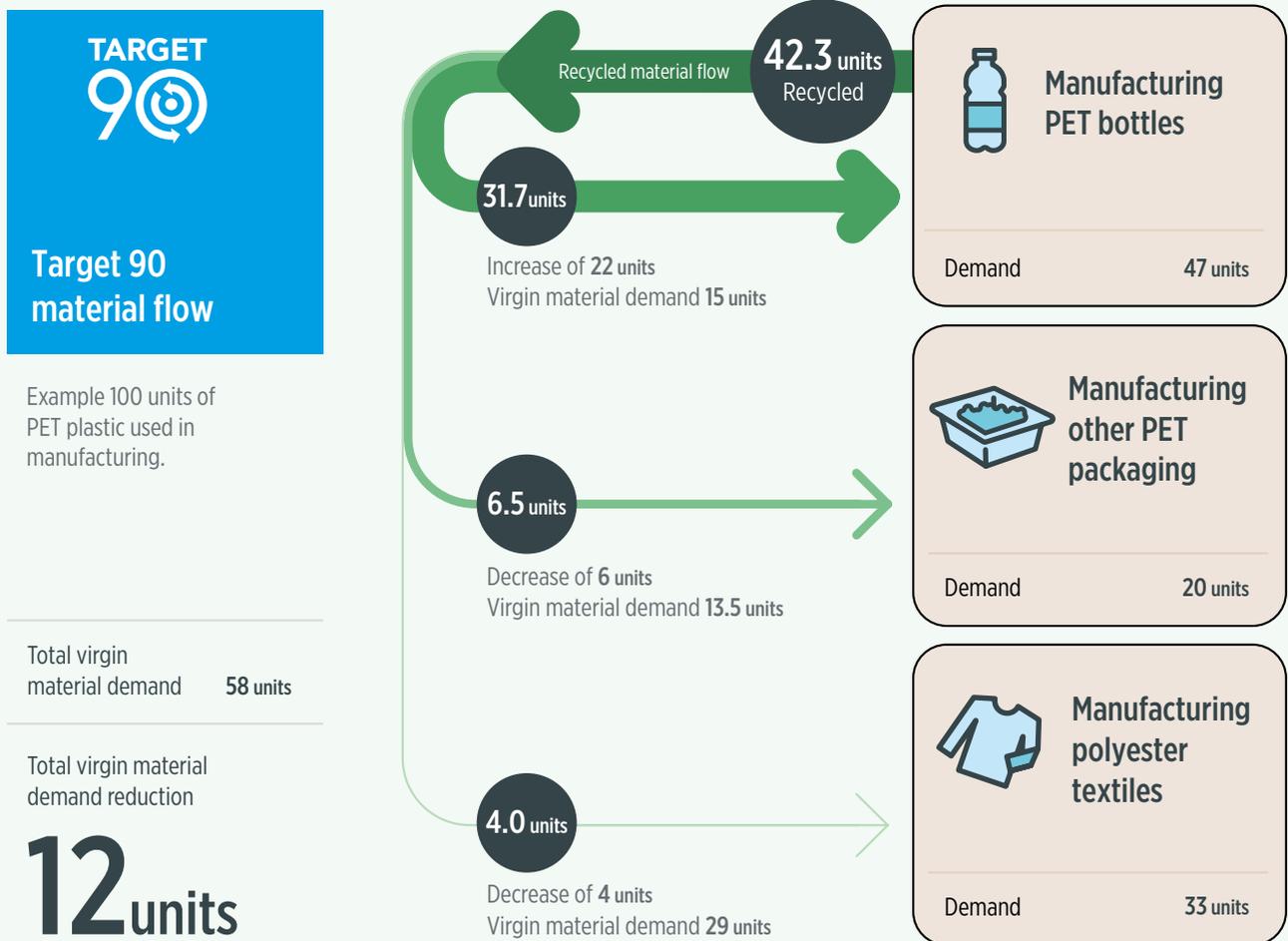


Using material flow analysis to assess the combined impacts of increasing circularity and separate collection for recycling rates

In a scenario where circularity is increased to 75% and 90% of PET bottles are collected separately for recycling (see Figure 13), we see the overall demand for virgin material decrease to 58 units, and that bottle producers experience the largest reductions in demand (from 37 units down to 15).

The benefit for bottle producers is two-fold: first, more material recirculating through the system—as a result of higher separate collection rates—means that more recycled material is available overall; and second, more material being recycled in a closed loop means improved rPET quality.

Figure 13 Target 90 material flow

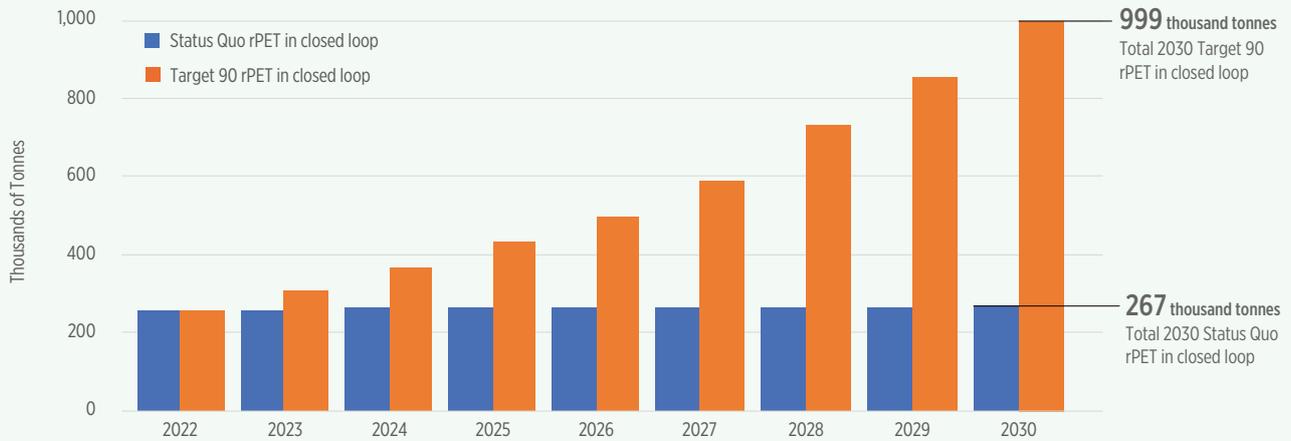


Impacts on prevention of virgin inputs for PET bottles

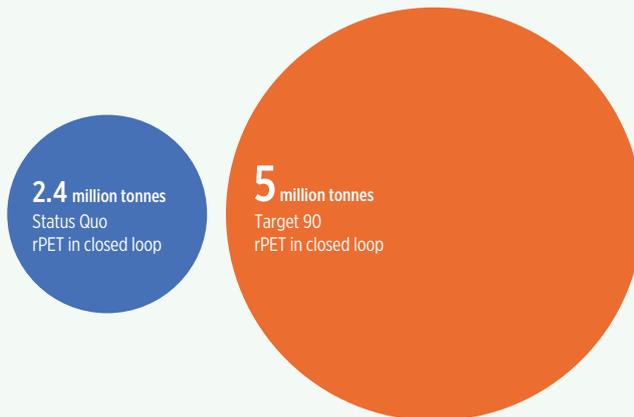
The combined impact of increasing the EU’s separate collection for recycling rate to 90% and recirculating 75% of PET bottles in a closed loop provides a compelling case for our dual-action proposal.

If we assume that EU separate collection for recycling and circularity rates remain the same from 2022 to 2030 (see Figure 14), 2.4 million tonnes of rPET made from recycled bottles will go back into PET bottles over the period 2022-2030. However, if all 27 EU Member States have a DRS in place by 2029—which will enable them to achieve a target separate collection rate of 90% by the same year, as well as a 75% circularity rate—over 5 million tonnes of rPET bottles could be produced.

Figure 14 Tonnes of beverage PET recycled back onto bottles (Ktonnes) EU 2022 - 2030

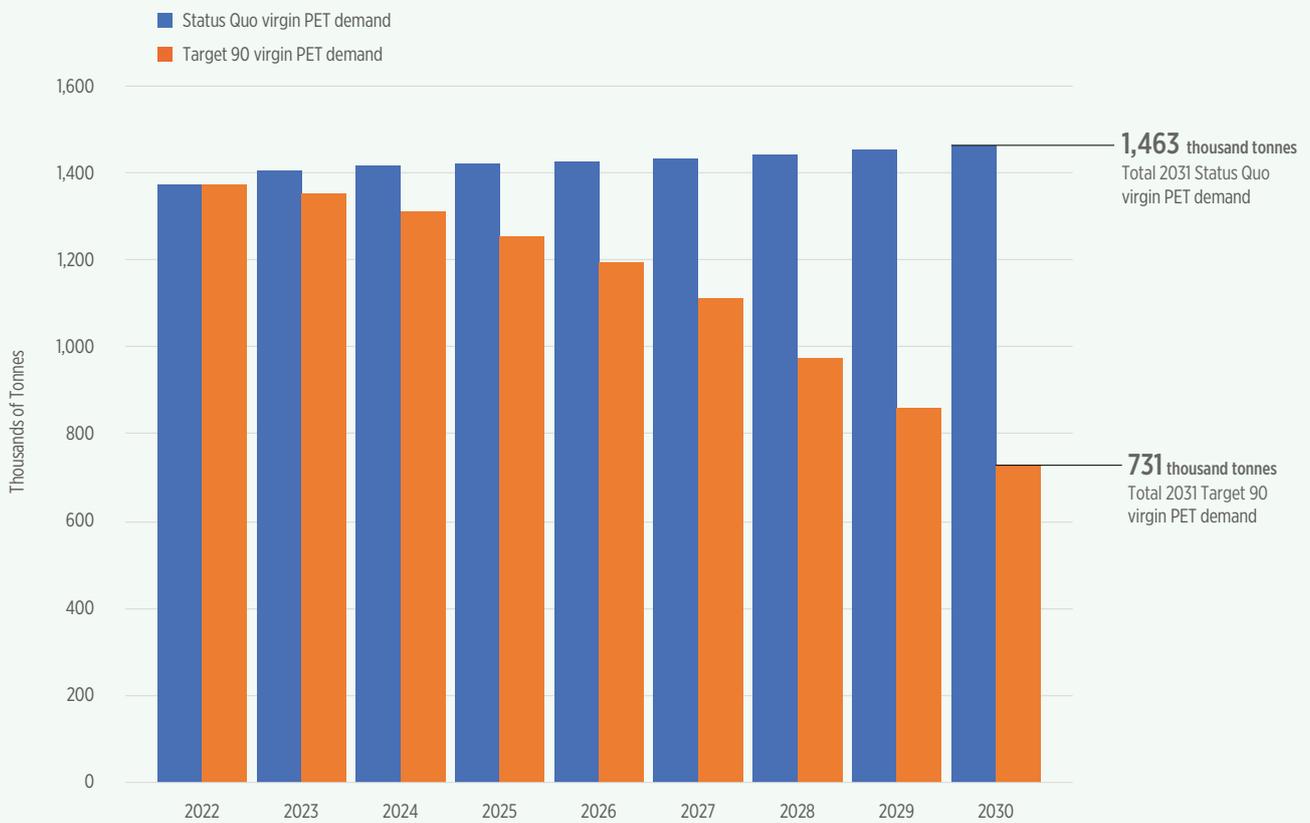


Cumulative totals EU 2022 - 2030



Because there is so much more material available to be recycled back into new PET bottles, the volume of vPET required by bottle makers is reduced from 12.8 million tonnes to 10.2 million tonnes (see Figure 15), meaning 2.6 million tonnes less of vPET will be needed by the bottle industry from the years 2022 to 2030.

Figure 15: Tonnes of virgin PET required (Ktonnes) to meet demand EU 2022 - 2030

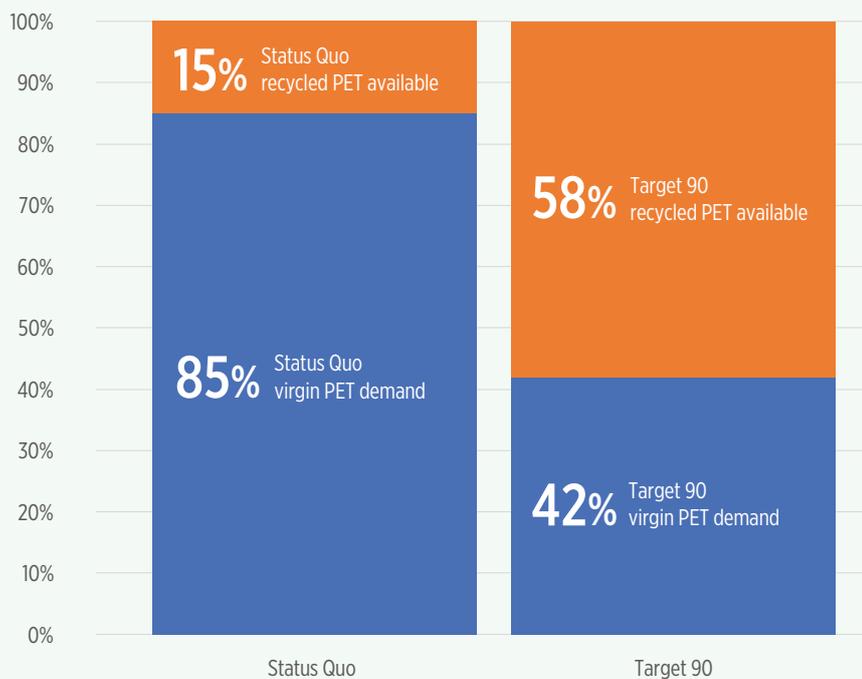


Cumulative totals
EU 2022 - 2030



These findings are extremely relevant in the current European policy context, where from 2025, PET bottles will need to contain 25% recycled content, increasing to 30% in all plastic drinks bottles by 2030. If we consider these regulatory requirements—as well as recycled content commitments made by drinks companies—and assume that the EU continues with the status quo, the potential to incorporate rPET will stagnate at approximately 15% for bottles by the year 2030. In contrast, under a Target 90 scenario, there would be enough rPET supply to meet nearly 60% of demand by 2030 (see Figure 16).

Figure 16: Plastic source to meet bottle demand, 2030, EU

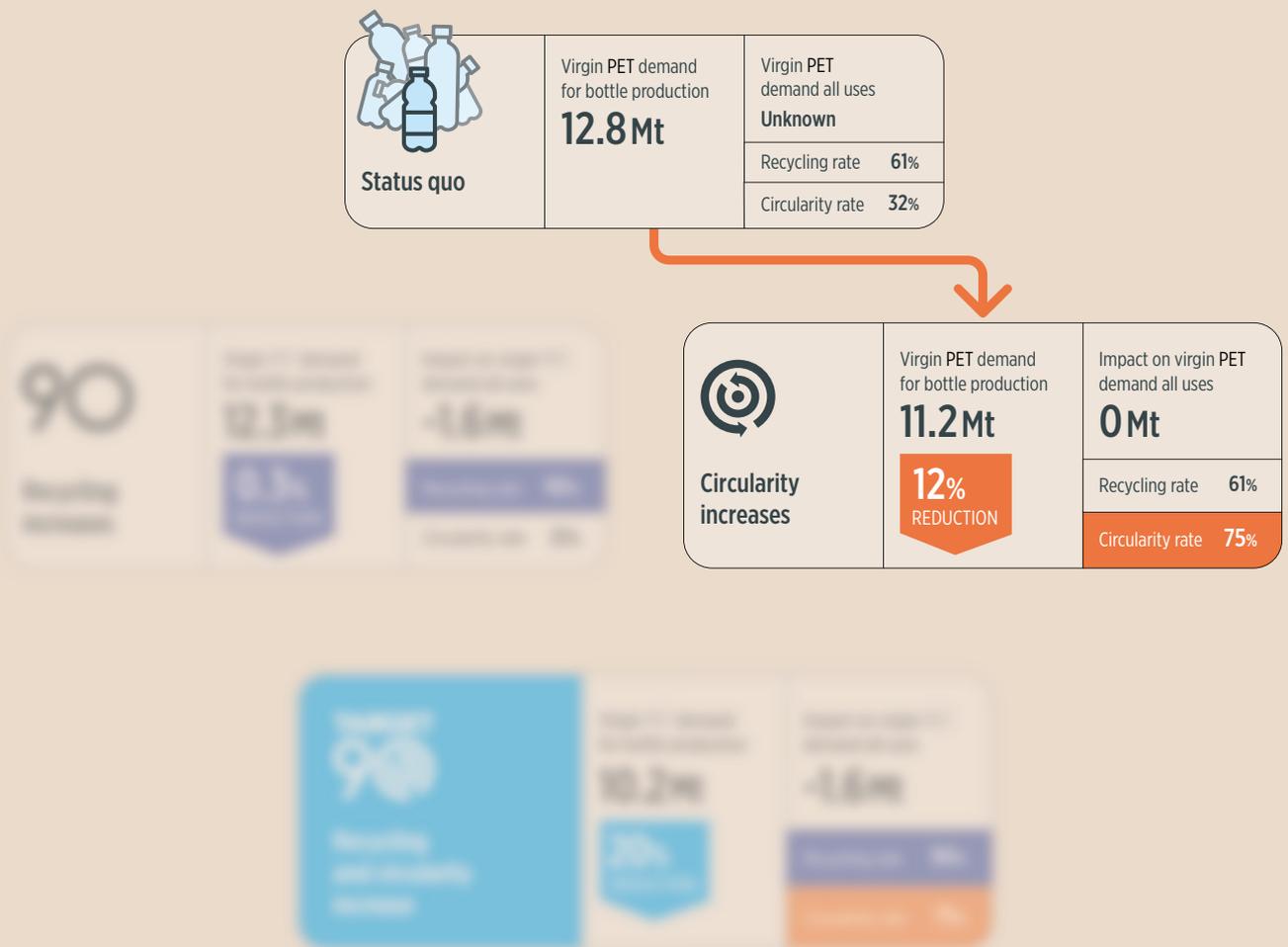


By increasing circularity

Redirecting 75% (versus 32%) of PET drinks containers to closed-loop, bottle-to-bottle recycling would lead to a reduction in vPET demand for the drinks industry from higher material circularity. However, on its own it would result in minimal benefit in terms of resource savings for other PET product end markets – namely the textiles industry and other types of PET packaging.

In other words, improving the circularity of a PET drinks bottle does not necessarily contribute to a greater level of circularity overall (that is, for all industries using PET). This is because when more rPET enters the closed-loop pathway to be used in bottle manufacturing, less rPET is available to be allocated to other end markets, meaning that the diversion of recycled plastic towards the bottle market increases by the same amount the demand of vPET for other applications (see Figure 17). In summary, this scenario does not increase overall recycling; it only reallocates it.

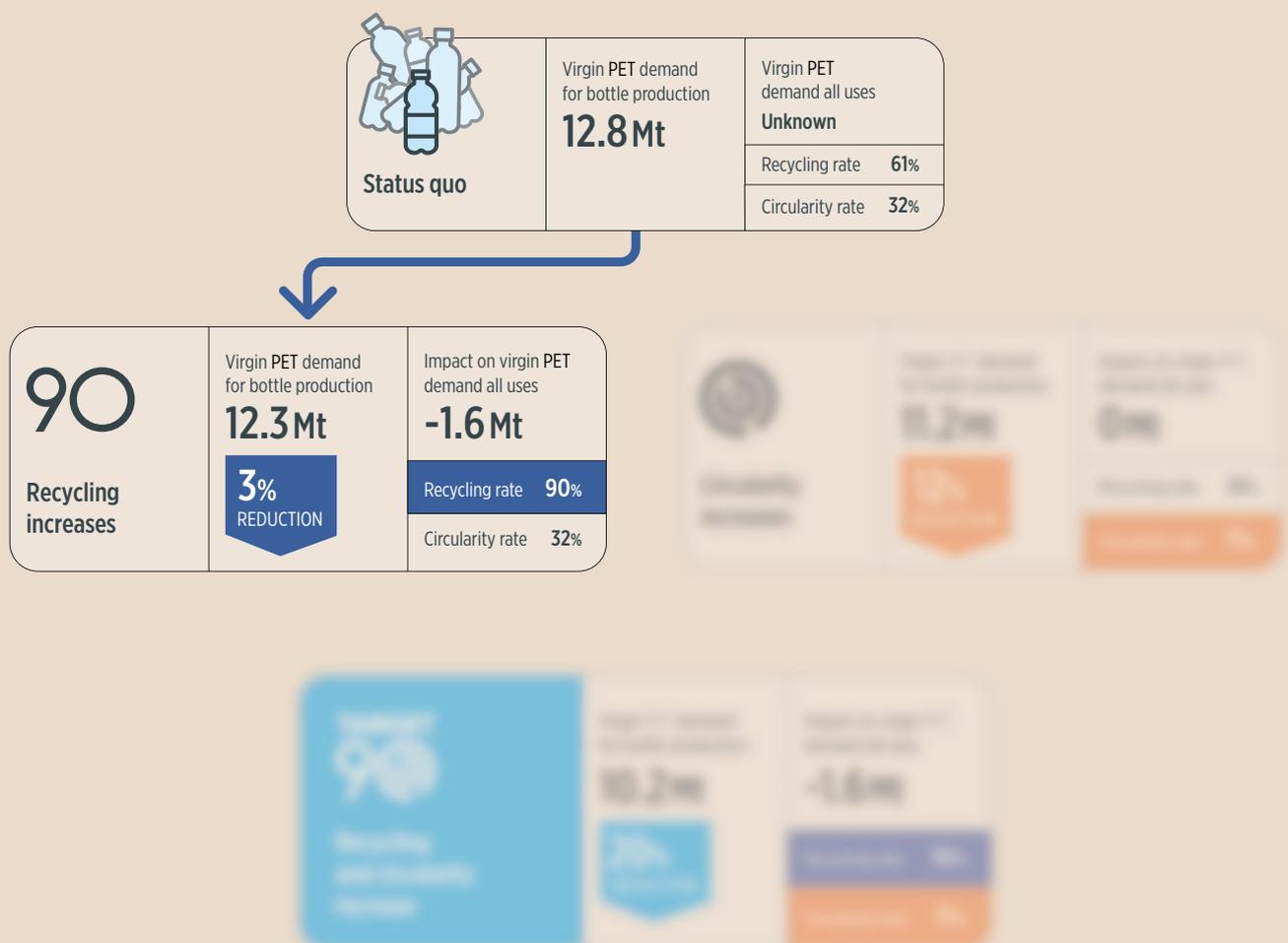
Figure 17: Changes in Virgin PET demand if circularity is increased



By increasing separate collection for recycling rates

Our results show that increasing the drinks packaging separate collection for recycling rate to 90%—up from the status quo—would benefit not only the plastic bottle market, but the PET market as a whole, as there would be much more rPET available to enter both open—and closed—loop pathways. To put it simply, increasing the separate collection for recycling rate results in a net overall reduction in vPET demand across all end markets.

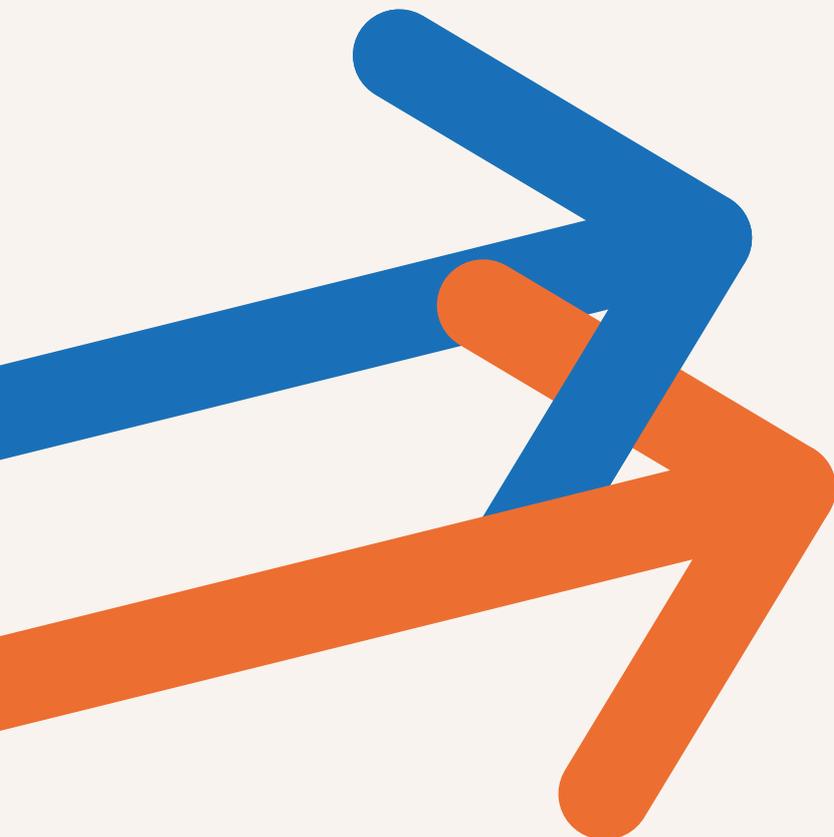
Figure 18: Changes in Virgin demand if Recycling rate is increased



By taking a dual-action approach

The combined effect of increased circularity and collecting 90% is greater than the sum of its separate parts. When 90% of bottles are collected and recycled back into new bottles (closed-loop recycling), everyone benefits. The benefits—in terms of material savings and associated impacts—are greatest for bottle manufacturers, but other industries using PET or rPET from post-consumer bottles will also reap the rewards, since higher separate collection rates will result in a net overall reduction in vPET demand.

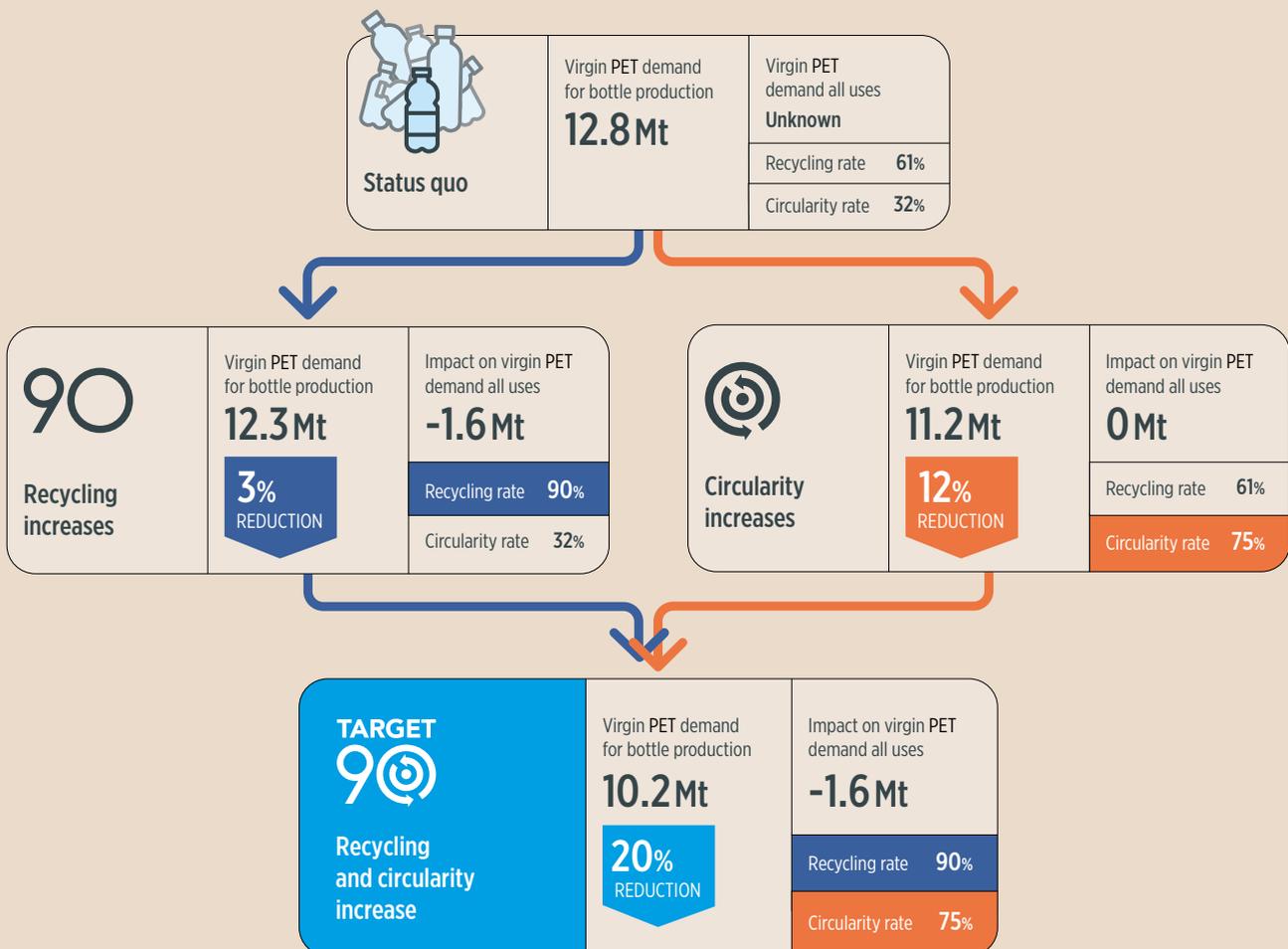
In some EU countries, such as Germany or Lithuania, the impact of our dual-action proposal is small, since they have already met the 90% separate collection for recycling target. However, for other Member States—notably Bulgaria, France, Hungary, Italy, Poland and Spain—where PET collection for recycling rates are currently low, the marginal impact is extremely compelling, especially in the final three years of the analysis when rates begin to hit 90%. The cumulative impacts of sustaining a 90% separate collection for recycling rate over the subsequent decade (2031-2040) will be far more significant.



Impact on virgin PET demand

In the status quo scenario (top left), which is based on an average separate collection rate of 65% and on the assumption that approximately 32% (status quo in 2022) of these are recycled into new PET bottles, the bottle industry will require approximately 12.8 million tonnes of vPET to meet demand from 2022 to 2030. In the Target 90 scenario, over the same period, the EU could produce enough rPET to reduce overall vPET demand by 1.6 million tonnes. This is equivalent to 66.5 billion PET bottles, or a carbon emissions reduction of approximately 3.5 million tCO_{2e}.

Figure 19: Changes in virgin PET demand 2022-2030, Target 90

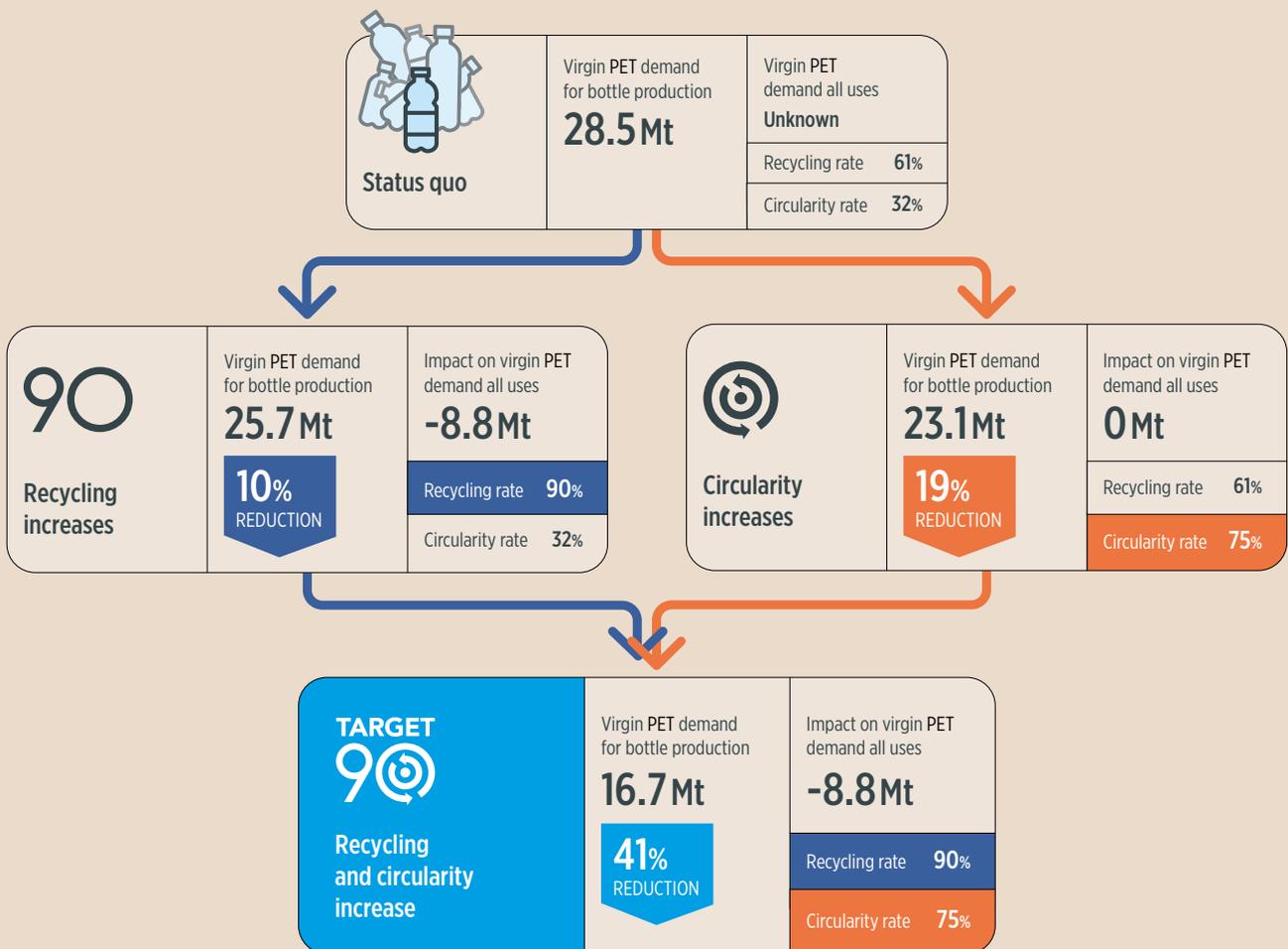


From today to the end of 2030, it is estimated that Target 90 would **reduce overall vPET demand across the EU by 1.6 million tonnes**. The greatest reductions in vPET demand are expected to occur in 2029-2030, when all Member States are set to achieve the 90% target.

If the time horizon is broadened to include another 10 years, we can see that the reduction in vPET demand between 2031 and 2040 is significantly higher than in the 2022 to 2030 period, during which the impact slowly ramps up. **Over the entire period (2022-2040), achieving Target 90 would result in an overall reduction in demand for vPET market-wide by 8.8 million tonnes.**

This is the equivalent to reducing carbon emissions by nearly 19.2 million tCO2e. It’s worth noting that in 2040 alone, the reduction in vPET demand that would result from adopting Target 90 would generate emissions savings of over 1.7 million tCO2e!

Figure 20: PET 2022-2040



Bottle manufacturers play a key role in transitioning the industry as a whole towards a circular economy, because they sit at the top of the material hierarchy and therefore have the ability to control the cascade of rPET to other end uses. Closing the loop on plastic bottles will also put pressure on manufacturers of other PET product streams (e.g., tray and textiles producers) to explore new design approaches that allow them to close their own recycling loops.

Without this, industries that use PET will not be able to reach their recycled content targets, as they cannot rely on plastic bottles alone for this. Only then can we move from the status quo (illustrated in the top panel of Figure 20 above) to a more circular system where resources remain resources (illustrated in the bottom panel of Figure 20 above)

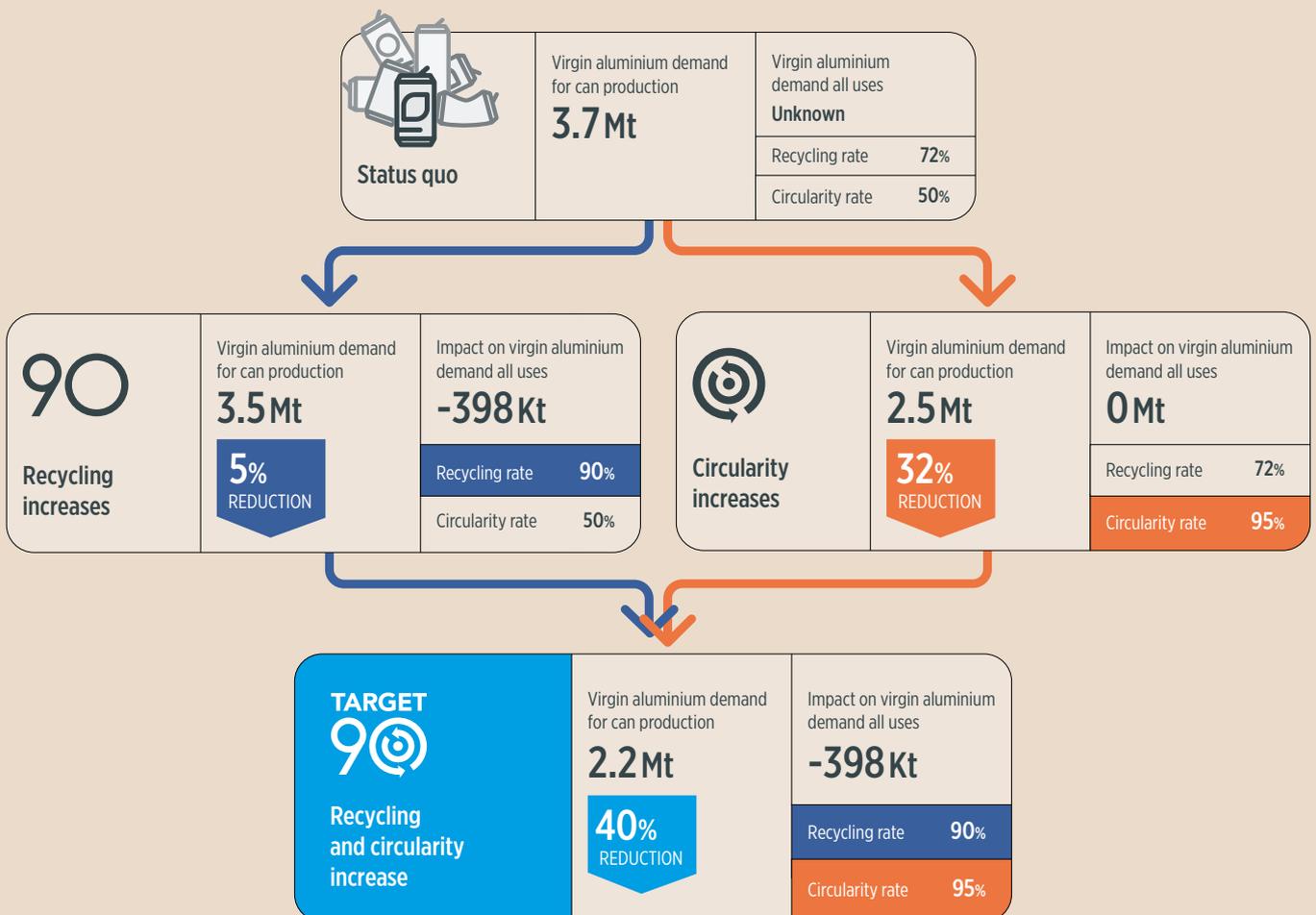


Impact on virgin aluminium demand

Adopting Target 90 would also generate significant benefits for the aluminium can industry, as more cans would be available to recycle into new cans. When we consider projected aluminium can sales from 2022-2030, and the associated virgin material that will be required to produce those cans, the adoption of Target 90 could cut the virgin aluminium demand for the can industry from 3.7 to 2.2 million tonnes.

The results of our analysis show that overall, increasing the EU’s separate collection for recycling rate to 90% and increasing circularity to 95%, **would reduce total virgin aluminium demand by nearly 400,000 tonnes**, equal to the weight of over 33 billion new cans.

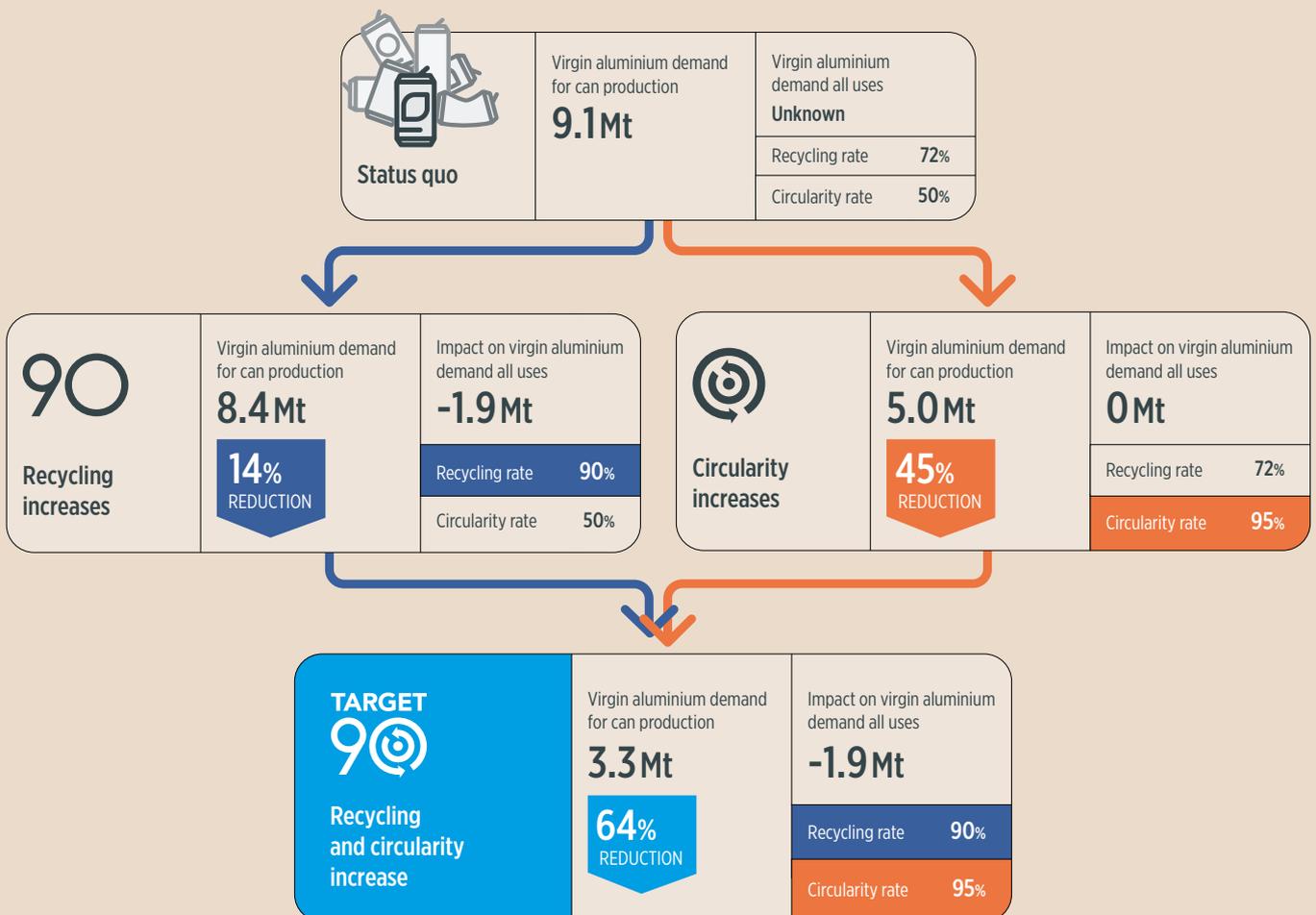
Figure 21: Aluminium 2022-2030



It's important to note that even though the virgin material savings for aluminium under our Target 90 scenario are much lower than they are for PET bottles, the carbon emissions reductions are still significant. By increasing the recycling rate and the percentage of closed loop recycling for aluminium cans from 50% to 95% between today and 2030, Target 90 could reduce the carbon footprint of beverage aluminium by 12.2 million tCO2e for that time period.

As is the case with PET, the benefits of adopting Target 90 for the aluminium can industry grow more pronounced over time. The impacts on virgin aluminium demand are considerable over 2022-2030, but especially in the later years of that period. From today to 2040, the reduction in virgin aluminium demand across all end markets could be as high as 1.9 million tonnes. **For can producers alone, our analysis shows a net reduction in virgin material demand from 9.1 Mt to 3.3 Mt, almost 6 million tonnes.**

Figure 22: Aluminium 2022-2040



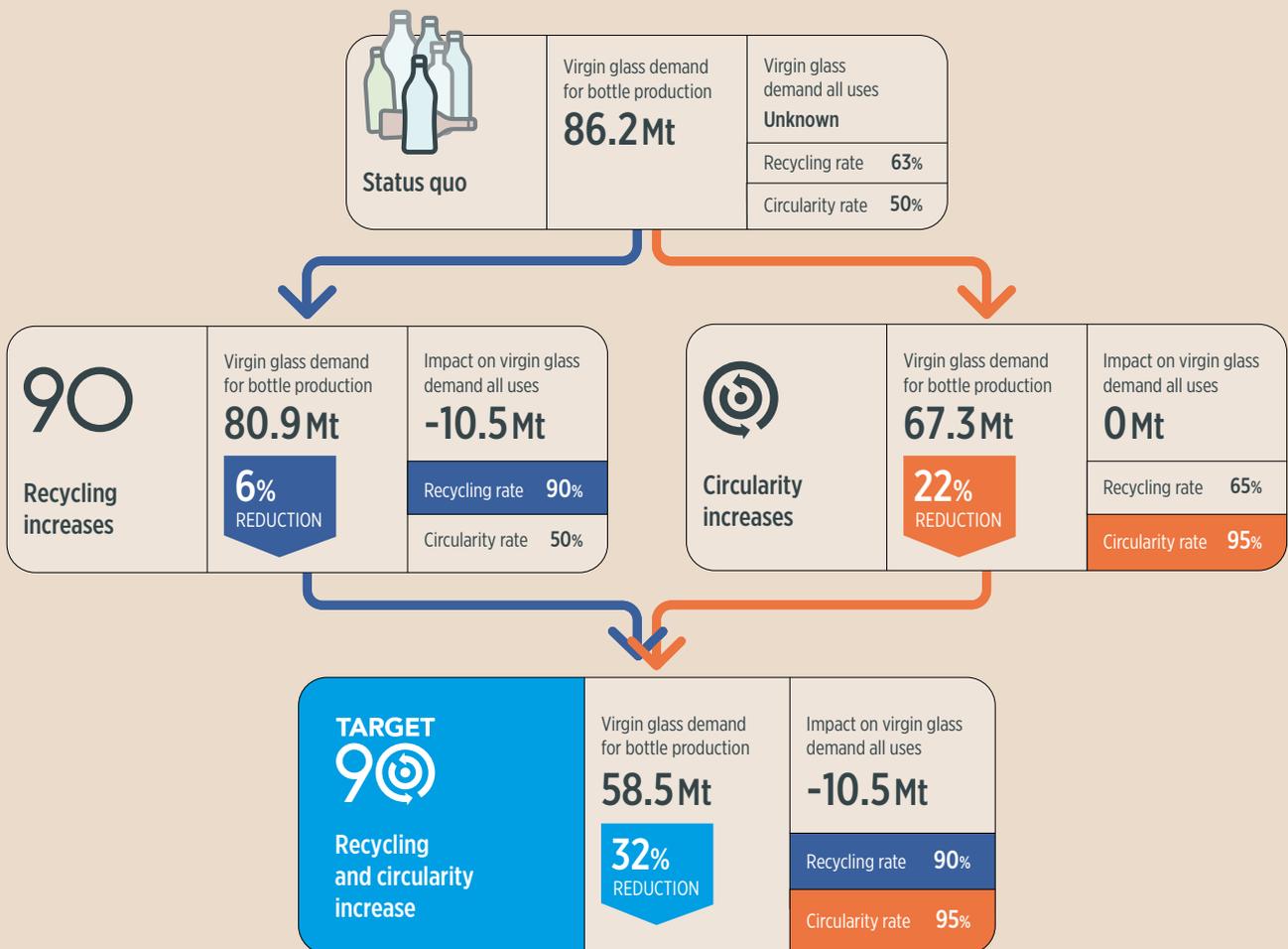
These material savings—over a period of 20 years—is equivalent to reducing total cumulative emissions by 15.4 million tCO₂e. In 2040 alone, emissions would be reduced by 1.4 million tCO₂e.

Impact on virgin glass demand

There are fewer glass drinks bottles, mostly wine or spirits bottles, on the market than either PET bottles or aluminium cans, but the adoption of Target 90 across the EU would still have a significant impact on glass bottle producers, as it would increase the quantity of clean, furnace-ready cullet available for recycling into new glass bottles. For the glass bottle market alone, the adoption of Target 90 would result in an 28 million tonne reduction in virgin glass demand from 2022 to 2030.

If we consider the glass industry as a whole, the data shows that demand for virgin glass would be reduced by over 10.5 million tonnes. This is equivalent to reducing carbon emissions by 3.3 million tCO₂e.

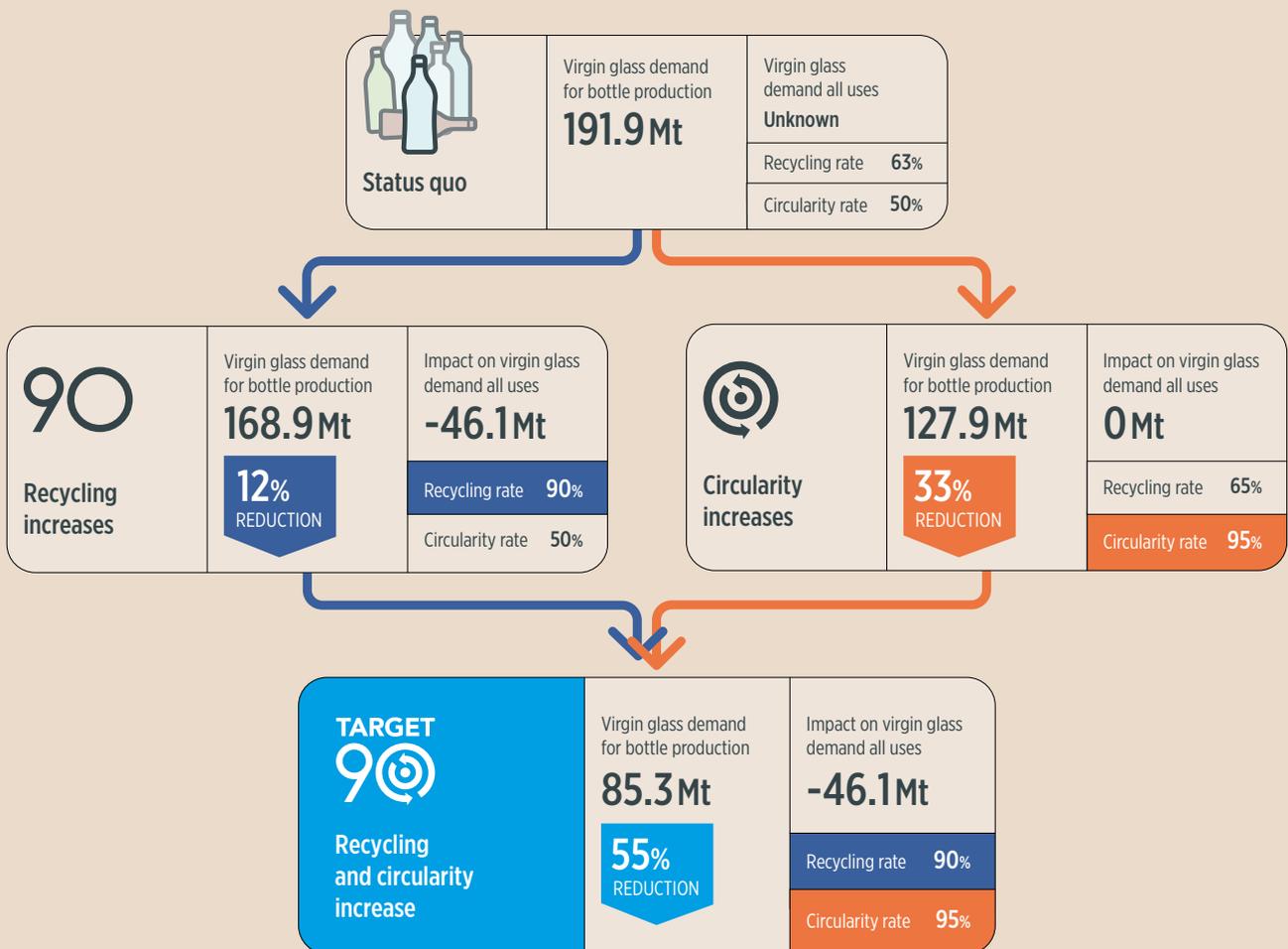
Figure 23: Glass 2022-2030



As is the case with PET and aluminium, the impacts of increased separate collection for recycling rates and increased circularity (i.e. more bottles being recycled in a closed loop) are more pronounced in the second part of our time horizon (2031-2040).

The cumulative virgin glass savings over the full period are calculated to be over 46 million tonnes. This translates to a carbon emissions reduction of 14.5 million tCO₂e.

Figure 24: Glass 2022-2040



Combined impacts – waste and emissions

If all 27 EU Member States have a DRS in place by 2029 and maximise the quantity of drinks containers going into closed-loop recycling, the combined reduction in virgin material demand would be significant. By 2030, there would be a cumulative reduction of 1.6 million tonnes of virgin PET, almost 400 thousand tonnes of virgin aluminum, and 10.5 million tonnes of virgin glass.

According to recent estimates, carbon emissions in the EU decreased by 31% between 1990 and 2020, surpassing the EU's target by 4 billion tonnes of CO₂e/year.¹ This success was aided by steep emissions reductions in 2019 and 2020, part of which were related to the COVID-19 pandemic. Looking towards EU climate goals for 2030, it's expected that total emissions in the EU will continue to decline to a net emissions reduction of 41% (to only 2 billion tonnes of CO₂e/year).² If each Member State moved quickly towards Target 90, our modelling shows that the emissions reductions achieved through increased circularity and higher separate collection of drinks containers alone could meet 1.4% of the reduction needed to achieve the EU's 2030 target.

If our model is projected for a further 10 years to 2040, the positive impacts of increased collection and higher circularity of drinks containers is multiplied even further. The results suggest that by 2040, at which point total emissions for that year should come down to 1 billion tCO₂e, **the adoption of Target 90 could eliminate the equivalent emissions of as much as 4.3% of the required reduction for that year** (that is, the reduction needed to meet EU climate goals).

The greatest impacts of adopting Target 90 would be felt in France, Italy, Poland, and Spain, which together would account for over 60% of that reduction. This is due to the fact that these large Member States—which account for a significant amount of annual packaging sales—also have low collection for recycling rates as well as low circularity within material categories.

A 90% target for all drinks packaging offers producers and governments an ambitious goal, ensuring each country will introduce a robust separate collection system focused not only on attaining the target, but also on recirculating the materials into closed loops, thereby preventing waste (in terms of supplanting virgin inputs with recycled content several times over).

1 European Environment Agency. 18 November 2021. "Total greenhouse gas emission trends and projections in Europe." www.eea.europa.eu/ims/total-greenhouse-gas-emission-trends

2 Ibid.

Conclusion

The world is in a climate crisis and our oceans are being choked with single-use waste. When it comes to real action, we do not have the luxury of waiting any longer. We do not have the time to turn down solutions that are proven to work, and that help us meet both our climate mitigation and waste prevention objectives.

Mandatory deposit return systems, together with a 90% separate collection for recycling target—our dual-action proposal—are proven solutions that are good for the climate and enhance Europe's resilience in terms of securing access to resources (i.e. material and energy). This opportunity is most timely given the current geo-political context in Europe, where security of energy supply and access to resources has become increasingly critical.

The results of our analysis are clear: reaching Target 90 for drinks packaging offers multiple benefits across the board:

- **Less waste:** From now to the end of 2030, the Target 90 plan is projected to eliminate over 2 million tonnes of wasted PET, 515,000 tonnes of wasted aluminium cans, and over 13 million tonnes of wasted glass.
- **Reduced virgin material extraction for drinks producers:** From today to 2040, drinks producers would require 11.7 million tonnes less virgin plastic, 5.8 million fewer tonnes of virgin aluminium, and over 100 million tonnes less virgin glass.
- **Net reduced virgin material extraction for all producers:** Over the entire study period (2022-2040), overall use of virgin plastic within the EU would fall by 8.8 million tonnes. Overall virgin aluminium and glass use would fall by 1.9 million tonnes and 46 million tonnes respectively.
- **Lower emissions:** By replacing virgin material used to produce drinks containers with recycled material, the impact in terms of avoided carbon emissions is equivalent to over 2.7 million tCO₂e/year by 2030 and 4.3 million tCO₂e/year by 2040.

While there are many ways to lower carbon dioxide emissions to meet the EU's climate targets, our analysis reveals that Target 90 can play a key role. In fact, the results of our modelling suggest that in year 2040, Target 90 overall impact on reduced global emissions is equivalent to 4.3% of the annual emissions reduction needed for the EU to meet its annual climate targets. Of that 4.3%, most of these reductions will be achieved by Member States that currently have low drinks container collection rates.

The Target 90 proposal is therefore one that reduces waste, reduces the need for more virgin materials, and saves carbon emissions for the whole of the EU. On numbers alone, the findings of this analysis are truly compelling. And now this opportunity for action can be grasped with both hands.

A Closer Look at the Model

Appendix 1: Additional sources

Input data

Sales: Data derived from licensed reports and data provided by GlobalData PLC globaldata.com.

Accessed 2022. Sales by unit of Glass, Metal, and PET beverages < 3L of the following types:

- Carbonates
- Waters (including packaged, flavoured, and enhanced waters)
- Fruit drinks (including juices, nectars, and still drinks)
- Sports and energy drinks
- Ready-to-drink iced tea and coffee drinks
- Beer and cider drinks
- Wine, spirits, and other alcohol drinks

Collection Rate

Most current rate available by material access 2022

- Aluminium is from european-aluminium.eu/media/3403/ffact-report-aluminium-beverage-can-recycling-rates-2019_final-20december2021.pdf
- PET is from ICIS report (Economia/PETCORE)
- Glass is from FEVE feve.org/glass_recycling_stats_2018

Value of Packaging Materials

Average value January-June 2022

www.letsrecycle.com





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We achieve this by working with governments, industry and society to accelerate the global transition to a circular economy for all resources.

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