TOMRA

Holistic Resource Systems

In short

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Introduction

TOMRA is a publicly listed company, headquartered in Norway. As the largest provider of reverse vending machines for the automated collection of used beverage containers, TOMRA has more than 81000 reverse vending machines installed in over 60 markets, with a global market share of around 75%. TOMRA is also the leading provider of smart sensor-based sorting machines for the recycling, food, and mining industries. In its sorting business for recycling, TOMRA has 8000+ sensor-based sorting units installed in more than 100 countries and an estimated global market share of 55-60%.

With 50 years' experience in circular waste management, TOMRA is a pioneer and innovation leader in waste collection and management. For any governments with ambitions to improve their waste management and recycling systems, and work towards a circular economy, TOMRA can contribute by sharing its experience on global best practice.

Holistic Resource Systems

Together with sustainability consultancy firm Eunomia, TOMRA has benchmarked waste management systems around the world and combined solutions from best practice systems into what it calls Holistic Resource Systems. Existing and proven systems have been benchmarked against their performance compared to the EU Waste framework directive, costs, and greenhouse gas (GHG) emissions.

TOMRA has found that the best performing systems are based on a holistic approach to waste management and integrates mandatory Extended Producer Responsibility (EPR) with the elements of Deposit Return Systems (DRS) for beverage containers, Separate Collections for certain waste fractions and Mixed Waste Sorting. EPR serves as the key enabling policy for high performance of these systems.

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Holistic Resource Systems that bring together an integrated package of waste management techniques to reuse and to deliver maximum recycling and the highest reduction in CO_2 emissions is the best way forward, here and now.

Deposit Return Systems

Deposit Return Systems for beverage containers incentivize consumers to return empty beverage containers via a financial reward (deposit). When buying a beverage, consumers are charged a deposit for the single-use packaging. After consumption, they can return the packaging at designated return points - either manually or automated through reverse vending machines, and receive their deposit. Deposit Return Systems give waste a value, incentivizing consumers to contribute to a circular economy.

Today, almost 50 markets are in operation and have been proven to be highly efficient in terms of preventing litter, boosting closed-loop circular value chains (e.g. bottle-to-bottle or can-to-can) and preventing the use of scarce resources, materializing full cost Extended Producer Responsibility systems, and addressing consumer awareness and behavioral changes.

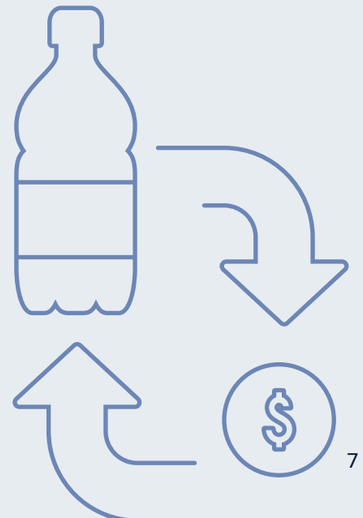
Today, most countries in Europe without a Deposit Return System in place, and many others around the world, are in the process of implementing, or evaluating, these systems.

Consistently high volumes and high-quality are the key elements of Deposit Return Systems that drive circularity.

Consistently high volumes:
A well-mandated system will typically have return rates of 90% and above. Germany, for example, has a collection rate of 98% for eligible Deposit Return System containers. Lithuania, which introduced Deposit Return Systems in February 2016, experienced return rates that rose from 34% to 92% in less than two years. An appropriate deposit value (market specific) ensures high collection rates in both high- and low-income countries, tackles economic up/down turns, as well as inflation, and prevents the littering associated with on-the-go-consumption. The same principle for driving collection rates applies for both one-way and reuse containers.

High-quality material:
With Deposit Return Systems, only legitimate packaging is accepted (usually through barcode recognition) and this material is kept as a separate stream throughout the recycling value chain. This ensures an extremely stable and high quality material yield. The system also provides good traceability and can ensure original food grade material for recycling. As a full cost Extended Producer Responsibility system, eco modulated fees can efficiently motivate Design for Recycling, further increasing the yield and reducing the cost of recycling (e.g. standardization on clear PET, no PVC label, no metal cap, etc.).

Today the Deposit Return System in Norway has a **collection rate of 92%** and is able to provide the industry with **80% recycled PET** content in new bottles.



Deposit Return System - how it works*

1

Consumer purchases beverage from retailer

Retailer

Pays price + deposit amount

Retailer purchases beverage from filler/ importer

Filler/bottler/importer

Deposit + EPR fee + sales data

Material

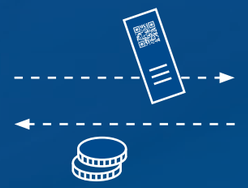
2

Consumer drinks beverage

3

Consumer returns empty beverage container to a retail location and receives deposit

Retailer



Reimbursement of deposit amount paid out by store/depot, and payment of handling fee per container received

Central organisation/clearing house

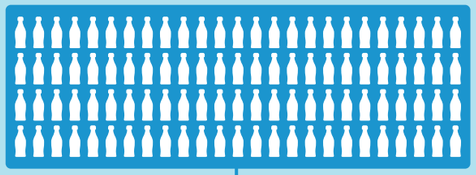
Material revenue

*Same principle to incentivize collection of refillable beverage containers applies with slight deviations of material flows and back-end stakeholders.

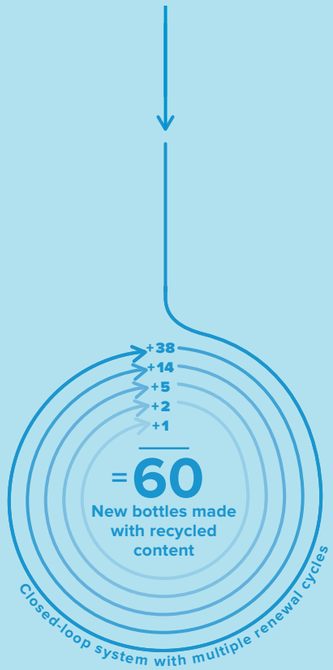
Increased closed-loop recycling rates...

Separate Collection*

100
Virgin PET bottles



49
out of 100
bottles collected

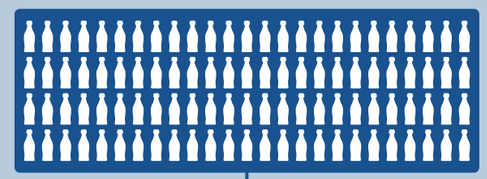


*Non-deposit containers. Collection rate based on 2017 European average. New bottles made with recycled content are based on a 75 % recycling rate for PET in a closed-loop system.

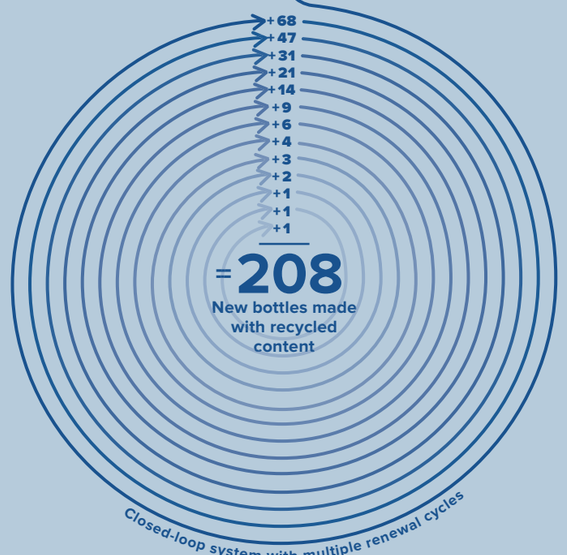
...drive exponential growth in circularity

Deposit Return System*

100
Virgin PET bottles



90
out of 100
bottles collected



*Exponential growth in circularity also applies to reuse systems.

Separate Collections

TOMRA has found that the best performing municipalities have source separation and separate collection for individual streams, such as organic, e-waste, textiles, paper and, sometimes, glass – all of which helps to increase recycling rates and reduce GHG emissions.

Notably, the source separation of plastics may not always be necessary when all components of the Holistic Resource System are in place. The necessity will depend on the particular circumstances for a given location.

The research and data available indicate that, in all likelihood, plastics collected solely in source separation systems are not enough to meet recycling targets for plastic packaging in the EU (50% by 2025 and 55% by 2030). Only by adding the third element of Holistic Resource Systems, Mixed Waste Sorting, can these targets be met.

Organic – Food and garden waste

Offsets demand of fossil-derived fertilizer and improves soil carbon through compost and digestate from source-separated organic material suited for agri-cultural needs. Reduction of organics in residual waste also likely to enhance the quality of Mixed Waste Sorting.

Glass – Glass packaging, cullet

Greatly reduces energy demands in primary production and curtails contaminants in dry mixed recycling streams. Source separation, in some cases by color, heightens the quality and quantity needed to enable maximum recycling yields.

Paper – Graphic, de-ink, and packaging paper

Maximizing the amount of reusable pulp for paper recycling requires dry and clean collection to avoid the structural degradation of material. Source-separated papers further reduce non-fiber contaminants resulting in the highest potential yields of pulp.

E-Waste – Electrical and electronic equipment and household batteries

Reduce demand for primary resources while protecting the environment from toxic substances by enabling the safe reuse and recovery of recyclable materials found in electrical and electronic equipment waste. Source-separated collection with possible integration into Deposit Return Systems could be considered in the future.

Textiles – Post-consumer apparel and industry scrap

Significant reduction of primary production impact on climate through reuse of textiles. Recycling pre- and post-consumer textiles requires clean and dry collection to effectively sort various types of fibers at scale for the garment industry.

Plastic - Post-consumer plastics

Optimize systems in regions where well-functioning separate collection is already in place. In regions without such systems, analyses should consider the exclusion of post-consumer plastics.

Mixed Waste Sorting

A 2019 study by Deloitte AS addressed plastic recycling in Norway, revealing that Mixed Waste Sorting recovers more than 2-5 times more plastic packaging per inhabitant than Separate Collections. The efficiency of Mixed Waste Sorting is being realized in more and more countries – Sweden, The Netherlands, Poland, Spain, India, and Germany, to name a few.

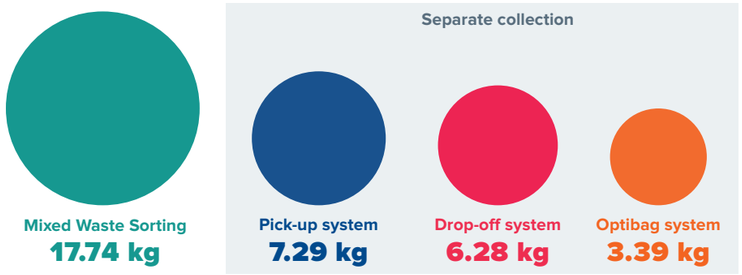
Mixed Waste Sorting ensures the highest capture rates of plastic for recycling and makes the system less dependent on the sorting performance of every citizen. In countries where the separate collection of plastics has not been introduced already, it also ensures that recycling is easier for the consumer while reducing educational efforts. Furthermore, the higher recovery rates of valuable material encourages Design for Recycling efforts. It also provides a platform for rapid implementation of new sorting innovations.

In addition to sorting plastics, metals (ferrous and non-ferrous) can also be recovered at high efficiency Mixed Waste Sorting plants. The additional recovery from source separation collections of paper, cardboard, beverage cartons, textiles, and glass, to further reduce the amount of waste going to landfill or incineration.

Mixed Waste Sorting can capture

more than double

the amount of plastic packaging for recycling.



Source: “Sirkulær plastemballasje i Norge – kartlegging av verdikjeden for plastemballasje” [Circular plastic packaging in Norway – mapping of the value chain for plastic packaging], Report for Forum for Circular Plastic Packaging, Deloitte AS, April 2019.

IVAR, Norway

“We‘ve invested in our waste sorting plant. As a result, our region has made a big step towards a resource efficient and climate-friendly circular economy.”

Rudolf Meissner
Chief advisor, IVAR IKS

Plastic quality

Globally, several hundred plants now sort plastics from mixed waste for recycling. The plastics recovered through Mixed Waste Sorting are recycled back into high-quality raw materials, like the quality seen in separate collected plastics in modern, high-end recycling plants.

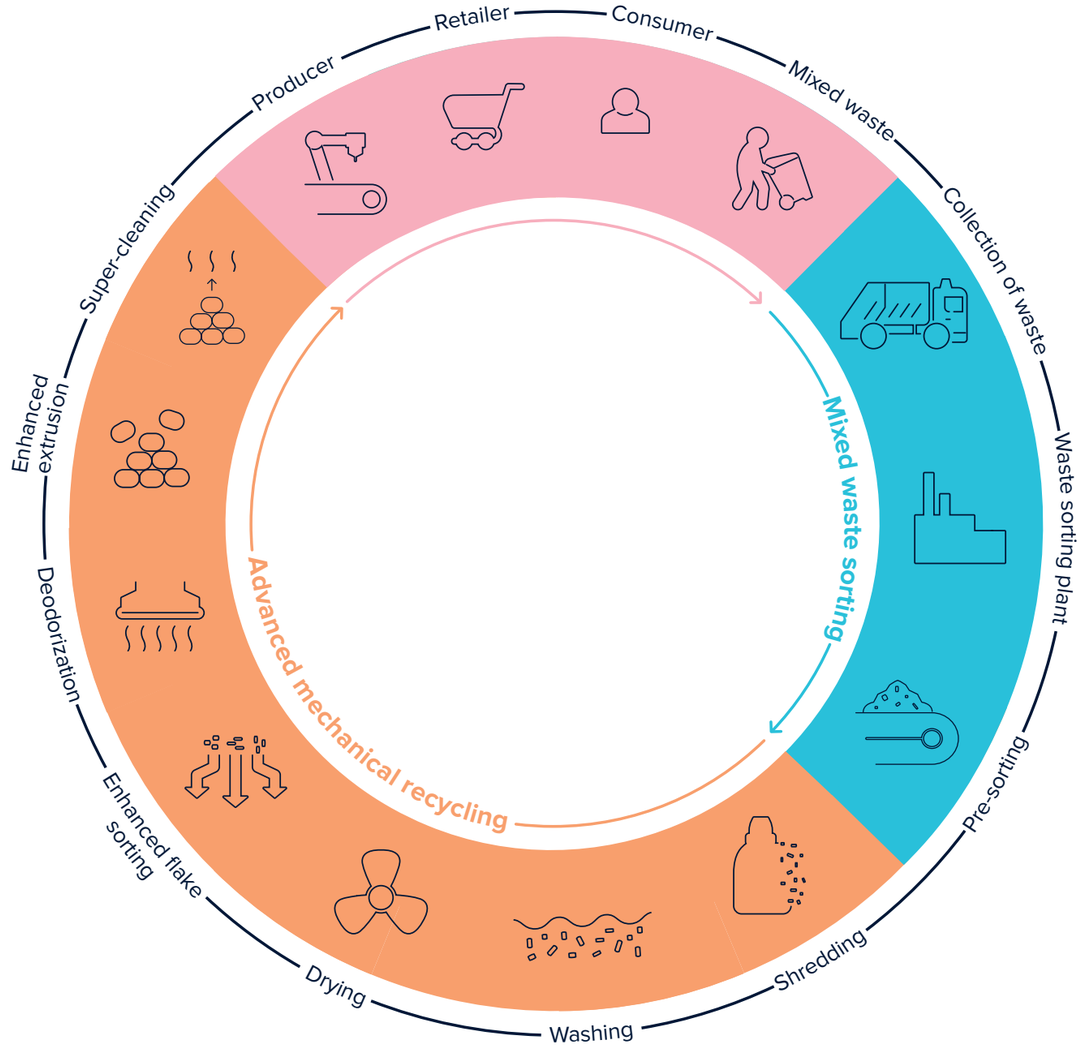
Based on the recent demand for high-quality recycled plastics, more sophisticated recycling plants, which include color sorting, hot-washing, and deodorization steps, are proving capable of recycling monomer plastics (PET, PE, PP, PS, PE film, PET trays, etc.) back into virgin-like qualities.

Mixed Waste Sorting can ensure the highest recovery rates of plastics, which is often essential in providing the required volumes to justify the establishment of domestic high-end plastic plants.

In 2021, TOMRA, Borealis, and Zimmermann Recycling opened a state-of-the-art plant for post-consumer plastic waste sorting and advanced mechanical recycling. This plant is able to generate material for brand owners and converters to qualify, validate, and prove fit for use in their applications.

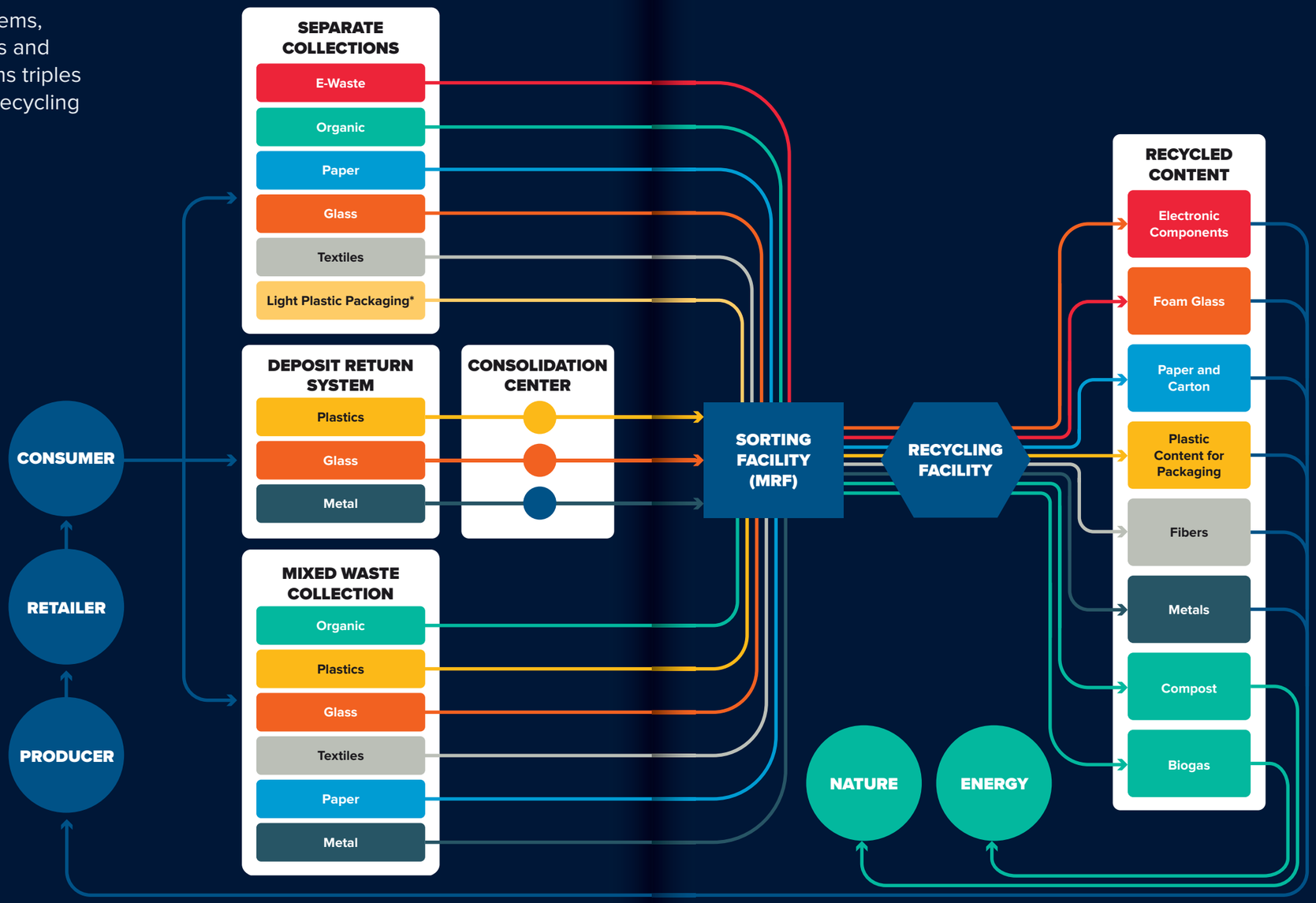
TOMRA strongly recommends taking advantage of the potential of Mixed Waste Sorting as a way to meet the mid- and long-term ambitions for waste management and the transition towards a circular economy.

Closed Loop for virgin-like material



Holistic Resource Systems - the potential to reduce CO_2e globally by 2.76 billion tonnes annually*

Deposit Return Systems, Separate Collections and Mixed Waste Systems triples it's impact on GHG recycling rates.



*2030 scenario vs. current waste management practice

*Depending on circumstances for a given location

TOMRA

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For further information, please contact:
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