switchmed

Funded by the European Union

MED TEST III in Israel

Advancing circular business models in Israel's plastic value chain

Project summary and achievements

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Each implementing organization contributes specialized experience and tools to partner with the eight beneficiary countries on activities that span policy development, capacity building, business support services, demonstration activities and networking.

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For more information on the UNIDO activities within the SwitchMed initiative, please get in touch with us at: u.dolun@unido.org

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UNIDO

The SwitchMed programme

The SwitchMed programme was launched by the European Union (EU) in 2014 to demonstrate the potential for a green and circular economy in eight Mediterranean countries. The program aims to upscale the transition to Sustainable Consumption and Production (SCP) practices in the Southern Mediterranean region. By showcasing business models that can reduce the inefficient use of resources and the environmental footprint of existing economic activities, the program has enabled industry demonstrations, policy development, networking opportunities, and support for start-ups and green entrepreneurs.

The SwitchMed industry component, implemented under the lead of the United Nations Industrial Development Organization (UNIDO), has realised more than 165 industry pilots demonstrating pathways for more resource-efficient and circular production models in the southern Mediterranean industry. These pilots were conducted during the MED TEST II (2014-2018) and MED TEST III (2018-2023) projects, making SwitchMed one of the region's most relevant resource efficiency initiatives.

By showcasing circular business and production models, the pilot projects have inspired industry actors with innovative production models that involve product reuse, refurbishment, re-manufacturing, and recycling to optimize productivity and recirculation. These resource-efficient practices are essential for achieving sustainability and economic objectives in the regional industry and building resilient supply chains. By adopting the demonstrated practices, businesses in the region can better adapt to the ever-changing global market and environmental conditions.

The MED TEST III project in Israel

Cheap, light and versatile, plastics have become the universal material of our economies and consumers and businesses alike rely more and more on plastics. Nevertheless, as plastic use grows, so does plastic waste. Unfortunately, much of this plastic waste rarely gets a second chance and ends up in incineration, landfills, or worse, finding another way into the environment.

The Organization for Economic Cooperation and Development (OECD) reports that plastic waste production worldwide has doubled in the past 20 years. Israel is one of the top-ranking nations in consuming single-use plastics. Unfortunately, according to the OECD, nearly 80% of 'Israel's municipal waste ends up in landfills, with only 7% being recycled and 1% incinerated for energy.

Despite the surging demand for plastics, some post-consumer plastic waste, collected through deposit and Extended Producer Responsibility (EPR) schemes, is exported rather than recycled in Israel. Given Israel's reliance on importing nearly 80% of virgin resins for its plastic sector, a robust plastic waste recycling value chain could reduce raw material import dependence and virgin material use.

This prevailing linear pattern of producing, consuming, and discarding plastics creates significant amounts of waste and is also an economic loss for society. To stem this development, circular economy principles need to be integrated across the plastic value chain to support reuse, improve waste management, and advance recycling capacities that can source safe, sustainable, and secondary raw materials.

Under the SwitchMed/MED TEST III initiative, UNIDO, in collaboration with the Ministry of Economy, the Ministry of Environmental Protection, the Afeka Institute of Circular Engineering and Economy (AFEKA), the Israeli Union of Environmental NGOs (Life & Environment) and stakeholders from 'Israel's plastic industry, has worked to promote more circular business models within the plastic value chain.

A survey conducted by UNIDO in 2019 among policymakers and stakeholders in the Israeli plastic sector identified key areas for intervention for the MED TEST III initiative on plastic. The review found that the plastic converting sector in Israel was willing to use recycled resins in their products. However, this was not likely at the time due to insufficient standards for the quantities and qualities of the locally recycled resins. Equally, plastic converters from other sectors, such as construction and agriculture, have already implemented circular take-back models but have difficulties acquiring sufficient amounts of recycled resins in the local market.

As a result, UNIDO proposed in consultations with the government activities to support the development of a national value chain that can incorporate recycled plastic waste into plastic product manufacturing. The main objectives of the MED TEST III project in Israel were to identify opportunities to increase the quality and quantity of sorted plastic waste streams to expand the capacity of the local recycling industry to handle larger volumes of post-consumer plastic waste to offer more sustainable packaging alternatives for the Israeli market.

The MED TEST III project in Israel was divided into two main workstreams to achieve its goals. The first workstream focused on institutional and governmental levels, aiming to improve the business environment for circularity. The second workstream worked directly with the private sector, providing practical examples for the local business community.

An initial phase of the activities focused on developing recommendations for regulatory and policy instruments to improve plastic recycling and increase the use of recycled plastic, suggesting new standards for plastic recyclates, mainstreaming the use of recycled plastic into public procurement and the construction sector, and implementing market-based instruments like guidelines for enhancing the recyclability of plastic packaging design.

Beginning in 2022, building up on the results of the plastic value chain mappings and following agreements with the Ministry of Environmental Protection and Ministry of Economy, three pilot projects were launched to demonstrate the potential for circular business models for the application of plastics in the agriculture sector and in consumer packaging.

Encouraging policies that support circularity and a conducive environment

Mapping the plastic waste recycling value chain

A comprehensive national survey was conducted to map the plastic waste recycling value chain in the course of 2020 and the first semester of 2021.

A database comprising more than 300 companies operating within the plastic value chain in Israel was established and segmented into specific categories such as packaging manufacturers, converters, sorting and recycling companies, brands, and suppliers. Key stakeholders from these segments were engaged in a targeted campaign involving interviews and focus group discussions. The primary objective of this initiative was to thoroughly analyse the perception from actors operating within the sector on the use of recycled plastic and map material flows across the value chain. The data collected was consolidated to identify key gaps and opportunities within the industry.

The identified barriers encompassed:

- A general lack of recycling infrastructure capacity, with inadequate funding;
- The absence of recycling facilities for processing specific types of plastic, such as polystyrene;
- The existence of long-term contracts between waste sorting facilities and incineration plants to manage mixed plastic waste, which diverts a significant portion away from recycling;
- Limited sorting capacity for flexible packaging at the sorting stations, which constitutes a substantial segment of plastic that can be recycled;
- The lack of consistency in how the government defines recycling leads to uncertainty, which impacts regulations and incentives.

Limited demand from brands for recycled materials, lack of packaging design regulations, absence of standardization in the use of recycled raw materials, and insufficient quality control laboratories contribute further to limit the development of a plastic recycling value chain. Challenges also arise from the low involvement in managing agricultural plastic waste, inadequate training, complex permitting processes, logistical complexities when it comes to plastic waste handling and transport.

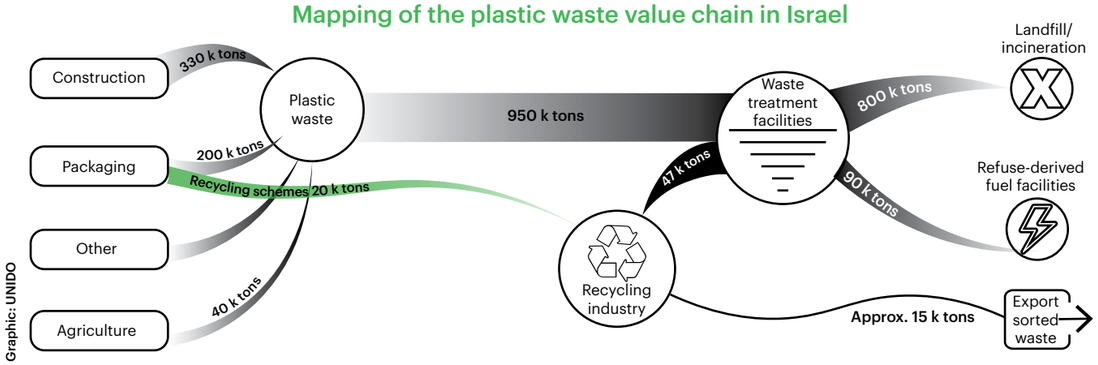
Regulatory gaps, fluctuating input prices, inadequate R&D support to plastic value chain business actors, absence of positive branding for eco-conscious entities, and the limited involvement of retailers in environmental performance definitions pose additional challenges.

Addressing these barriers requires a comprehensive approach, involving coordinated efforts from various stakeholders, including policymakers, industries, and research institutions, to bridge gaps, align regulations, and incentivize sustainable practices.

The value chain mapping delved into the complexities of sorting and recycling facilities, converters, and end-users. The outcomes of this comprehensive mapping exercise were presented to both institutional and industrial stakeholders in March 2021.

From a quantitative perspective, the value chain mapping has unveiled that Israel receives an annual influx of nearly 1 million tons of plastic material. Within this dynamic, huge amounts of plastic waste are generated in which the plastic packaging sector constitutes a substantial portion, amounting to over 200,000 tons, while an additional 40,000 tons originate from the agricultural sector. Furthermore, the construction sector emerges as a noteworthy plastic waste source, with annual quantities estimated at 330,000 tons.

Mapping of the plastic waste value chain in Israel



Most of the plastic recycled is packaging post-consumption and industrial waste collected directly or sorted through the EPR and deposit schemes in Israel. More than 90% of the plastic waste is directed towards incineration and landfilling, collectively constituting the predominant end-of-life solution.

This delineation of the current state of plastic utilization and waste management emphasizes the urgent need for strategic interventions to enhance recycling efficacy and promote sustainable end-of-life solutions within the plastic value chain. The survey provided valuable insights that were instrumental in shaping circular business scenarios and elaborating proposed pilot projects to demonstrate practical ways to address these identified gaps and opportunities.

Development of guidelines for "Design for Recyclability of Plastic Packaging"

UNIDO, in collaboration with the Afeka Institute of Circular Engineering and Economy (AICEE) and with the Israel Packaging Institute, has created an interactive tool for evaluating and designing recyclable plastic packaging. This tool provides a systematic approach, guiding users through a step-by-step process to assess packaging against criteria aligned with 'Israel's recycling capabilities and global standards. It also offers insights on resource reduction during the packaging design, aiding Israeli industrial professionals in creating sustainable packaging solutions.

Developed based on existing recycling technologies in the country and in line with the EU Packaging and Packaging Waste Directive as well as Recyclass protocols, the tool is adaptable and can be periodically updated to incorporate new recycling capabilities in Israel.

Policy recommendations and market-based instruments for enabling the business environment

Drawing upon European and international standards, as well as best practices, and in response to some of the key gaps out of the mapping survey, a set of activities was oriented to providing recommendations on producing recycled resins and manufacturing plastic products with recycled content. The recommendations also proposed amendments to green building standards to enhance incentives for using recycled plastic materials in the construction sector. Additionally, the recommendations delved into green public procurement practices in Israel, offering draft recommendations for measures and minimum criteria to stimulate the national demand for plastic products with recycled content in public sector acquisitions. They also explored various economic instruments, technological solutions, and market-based opportunities to support the development of a plastic circular economy in Israel.

In response to the recommendations by UNIDO, the Ministry of Economy decided in 2022 to establish a dedicated technical committee within the Israeli standard institution to thoroughly evaluate all the recommendations with the objective of developing Israeli standards for plastic recycling.

The Ministry of Environmental Protection also acted upon the recommendations from the UNIDO project, improving the existing deposit scheme to include large PET bottles (1.5 litres and above) in the deposit collection system. Additionally, recommendations regarding the potential introduction of an eco-modulation fee as part of the EPR scheme have been closely considered and could be part of the next EPR contractual arrangements.

In 2022, two standards were already officially adopted based on European Standards:

Israeli Standard SI 15°344 - Recycled plastics – Characterization of Polyethylene (PE) recyclates
Israeli Standard SI 15°345 – Recycled plastics – Characterization of Polypropylene (PP) recyclates
At the time of writing this report nine standards are in the process of being adopted

in 2023:

EN 15°348 – Recycled Plastics - Characterization of PET recyclates

in 2024:

EN 15 346 – Recycled Plastics - Characterization of PVC recyclates
EN 15 347 - Recycled Plastics - Characterization of plastics wastes
EN 15°342 - Recycled Plastics - Characterization of polystyrene (PS) recyclates
EN 15°343 Plastics recycling traceability and assessment of conformity and recycled content
EN 14°541 - Plastics pipes and fittings - Characteristics for utilization of non-virgin PVC-U, PP and PE materials
ISO 18263-2 - Mixtures of polypropylene (PP) and polyethylene (PE) recyclates derived from PP and PE used for flexible and rigid consumer packaging
ISO 20819-1 - Wood-plastic recycled composites (WPRC)
ISO 12418-2 - Post-consumer PET bottle recyclates Preparation of test specimens and determination of properties

Creating business opportunities for circularity in the plastic sector

Technology solutions "roadshow"

In October 2021, a comprehensive four-day webinar facilitated meaningful collaboration between international stakeholders, predominantly European technology and service providers, the Israel plastic business community and institutional actors. The primary objective of this event was to delve into viable solutions that could drive the adoption of circular economy practices in 'Israel's plastic value chain. The webinar generated significant interest, with more than 80 participants actively involved in the sessions and hundreds viewing the recordings after the event. These sessions encompassed diverse topics, including the presentation of innovative circular business models, impactful success stories, cutting-edge technology solutions, and collaborative partnership models involving various stakeholders.

The four-day webinar served as a platform for knowledge exchange and strategic discussions, fostering a spirit of innovation and cooperation within the global plastic industry landscape.

Market and prefeasibility study for an rPET Bottle-to-Bottle recycling plant

Upon requirements of the Ministry of Environmental Protection and the Ministry of Economy, a dedicated work stream was organized in 2019 to support the establishment of a bottle-to-bottle recycling plant in Israel, which did not exist at the time. A series of consultations were initiated involving key stakeholders, including ministry representatives, plastic packaging producers, beverage industry leaders, and waste management companies. These consultations aimed to achieve three main objectives: sharing insights on alternative business models for establishing a Bottle-to-bottle PET recycling plant, gathering essential data for a pre-feasibility study, and comprehending the specific requirements of national authorities for advancing the establishment of such a plant in Israel.

Subsequently, a comprehensive pre-feasibility study was developed. This study encompassed several critical elements, including ownership models, technological options for various stages of PET recycling, efficient sorting procedures, investment and operational cost analyses, regulatory frameworks, sourcing and business models for securing a stable supply of plastic waste, recommendations for improving existing EPR and deposit schemes, steps for regulatory approvals, quality and design parameters for the recycling process, and laboratory analysis requirements.

The pre-feasibility study provided a high-level technical blueprint for establishing a Bottle-to-bottle PET recycling plant in Israel, offering valuable insights and recommendations for its successful implementation.

Since the completion of the analysis, two rPET recycling facilities have been commissioned and are now fully operational. UNIDO provided technical support during the installation phase of the first rPET facility, which includes the most advanced rPET process line in food grade, approved by the FDA and EFSA. It is integrated into the PET waste stream from 'Israel's deposit scheme, ensuring that PET waste can be recycled and reprocessed as rPET resins in Israel.

Identifying pilot projects to showcase circular business models in the plastic value chain of Israel

Through the waste mapping, and over consultations with key stakeholders from the plastic value chain, a selection of plastic sectors with the highest potential for developing circular business models could be identified. The overall objective of the selected pilot projects was to demonstrate innovative business models, establish partnerships, and develop long-term agreements that could connect market players in Israel's plastic value chain to improve the loop for plastics and recyclability of plastic applications in Israel.

The pilot projects that were identified were focused on advancing:

- Circular business model for greenhouse agricultural plastic waste
- Design for circularity of food-contact plastic packaging
- Increasing the recycling rate of flexible plastic packaging

Demonstrating a circular business model for greenhouse agricultural plastic waste

Film covered greenhouse agriculture is common practice in Israel but creates significant environmental challenges. Used plastic films are discarded through incineration, landfills, or even into nature, resulting in approximately 6,250 tons of plastic film waste annually. The Israeli Ministry of Agriculture and Rural Development reports that there are approximately 100 km² of greenhouses in use in the country, highlighting the urgency of addressing greenhouse plastic film waste.

Greenhouse films are commonly made of low-density polyethylene (LDPE), which can be recycled to create economic opportunities while reducing environmental impact. However, soil contamination of the plastic films caused during removal makes recycling difficult.

Together with the Federation of Regional Councils in Israel, local farmers, and Infinya Recycling, UNIDO undertook a series of tests under real operational conditions using an alternative method for collecting greenhouse films for recycling. The new method uses a tractor for rolling the films on an irrigation pipe drum. This method prevents the film from touching the ground and being contaminated with soil so that the film can be recycled more easily.

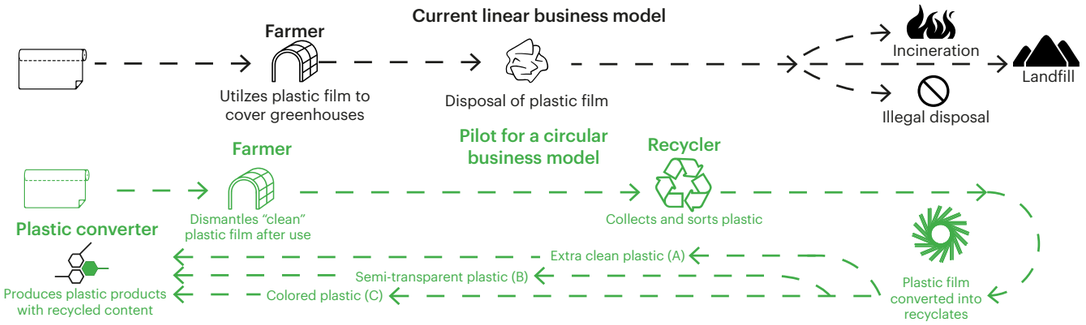
The collected films were converted to recyclates that met quality standards for semi-transparent plastic and can be sold to the electric and infrastructure piping sector at a 25-30% lower price than virgin material. If the quality of the plastic film collected meet the criteria for extra clean plastic, the recyclables can be sold with a 10% premium and used for higher-grade applications like packaging, increasing farmers' revenues. If supported and widely adopted, this business model could revolutionize greenhouse plastic film waste management nationwide.

While the solution demonstrated during the pilot project is viable for the central and northern regions of the country, it is important to consider the distance of farm to the recycling plant is a key consideration due to the transport costs.

One proposal to make the solution more profitable and accessible nationwide is establishing a set of collection hubs strategically located in agricultural areas. These hubs would invest in a plastic compactor machine, increasing the volume of plastics hauled to the recycled in each trip by a factor of three.

Another suggestion is to establish a second recycling plant for LDPE films in the southern region of Israel. This would decrease transportation costs, making the suggested business model available and profitable for all regions, nationwide. These two alternative scenarios offer great potential for the growth of the proposed solution and would promote better waste management practices in Israel's agriculture sector.

To establish a successful circular business model for greenhouse plastic films, it is important to maintain high-quality standards for the collected films and resulting recyclates. National standards should be built on existing standards such as the Israeli SI 821-1 (2013) and the European EN 15347. These standards could include a waste greenhouse cover film handling standard, dedicated testing protocols, and a greenhouse cover films standard. Policy enhancements, such as preventing air pollution from agricultural waste burning, including agricultural plastics under EPR laws and elevating landfill fees, as well as financial incentives, can promote even further adoption of the proposed business model.



Design for increased recyclability of food-contact plastic packaging

Despite the recyclability of materials like PP and PET, only a fraction of plastic packaging introduced to the market is recycled in Israel. In response, the Government of Israel has set a goal to achieve a 70% recycling rate for packaging waste by 2030, in alignment with similar global initiatives like the EU's Packaging and Packaging Waste Directive.

Several challenges contribute to the current low recycling rate. One of them is related to the widespread use of packaging composed of multi-materials, involving a mix of polymers. Because of this complex composition, the multi-material packaging is difficult to identify, sort and recycle and is, therefore, often sent to incineration. Another predominant challenge is related to the flexible packaging size. Packaging smaller than A4, even if the composition is mono-material, cannot be automatically sorted by the waste sorting technology currently available in Israel. Instead, small flexible packaging is directed to the Refuse-Derived Fuel (RDF) facilities. Only packaging that meet both size and composition criteria are sorted for recycling.

Modifying plastic packaging design is a crucial step to improving the recycling rate for plastic packaging in Israel. As part of the MED TEST III initiative, two workstreams were undertaken to demonstrate and investigate the potential for increased recyclability of the current plastic packaging by modifying its design.

Demonstrating circular design

In the first work stream, two pilot projects were undertaken to test the re-design of two selected products (yogurt and salad) from two Israeli companies, Strauss and Osem-Nestle. Both products use a PP cup and a Polyethylene Terephthalate Glycol (PETG) sleeve, and although these materials are recyclable separately, they lose their recyclability when combined. The PETG sleeve interferes with the infrared sensor (NIR) at the sorting station, preventing the product from being directed to the appropriate recyclable stream.

To solve this problem, the sleeve material was replaced with polyolefin (PO), which makes the entire packaging identifiable to the NIR and directed to the appropriate recyclable stream. The selected solution was tested and proven effective in every stage of the value chain, from packaging manufacturing to sorting and recycling. Several value chain actors collaborated to validate the solution's applicability, ensuring the consistency and reliability of the re-designed packaging throughout the manufacturing and filling stages.

The re-designed packaging is 49% more efficient in terms of carbon footprint, 60% more efficient in terms of fossil resource use, and 84% more efficient in terms of minerals and metal resource use than the current design. Although the PO sleeve costs 19% more than the PETG sleeve, the overall cost increase for the re-designed packaging is only 8% and 0.3% at the estimated goods retail price for consumers.

Following the experience of Osem and Strauss, the Central Bottling Company (CBC) decided to join the SwitchMed pilot project by introducing a PO sleeve on a PP cup of one of their flagship dairy products in Israel. The project also helped CBC to re-design their PET orange juice bottles, making them recyclable in Israel for Bottle-to-Bottle applications.

> "Our participation in this program provided us with exposure to professional content insights and business partners who have opened up a window for us to initiate further work towards creating mechanisms for a circular economy.
>
> Rachel Levi Ben Shalom
> Package Development Manager
> Coca-Cola Bottling Company"

Increasing the recycling rate of flexible plastic packaging

In Israel, flexible and rigid packaging are recycled together. According to a mapping of the flexible packaging waste stream conducted as part of the project, only about 25% of collected flexible packaging is efficiently sorted for further recycling.

The second work stream investigated the challenges faced in recycling flexible packaging, and proposes measures that can increase the amount of flexible packaging that are being recycled. The project focused on PP and HDPE package recyclates and tested their integration in the production of non-food-grade rigid packaging. The main objective was to find the best combination of flexible and rigid recyclates to meet the technical requirements for manufacturing packaging materials.

An analysis of flexible packaging materials in orange bins (dedicated for packaging) in three major cities in central and northern Israel was conducted in order to establish the baseline of quantities and types of flexible packaging in circulation.

This analysis revealed that flexible packaging represents 12% of the total plastic packaging and 12% of the HDPE plastic waste stream. Only 51% of the flexible HDPE/PP packaging is recyclable in Israel, due to the size and mono-material composition.

In collaboration with the administrator of the Israeli Producers Responsibility Organization (TMIR), packaging producers, R&D plastic experts, a series of lab tests were performed to check the chemical and mechanical properties of recyclates with different ratios of flexible/rigid plastics compositions to produce recycled rigid packaging for non-food grade applications.

The material tested was a mixed waste stream sourced from Plastic City, TMIR's recycling partner, containing rigid and flexible packaging. The HDPE mix sample, with the addition of small amount of environmental sound additives was shown to be suitable for open-loop recycling into new packaging.

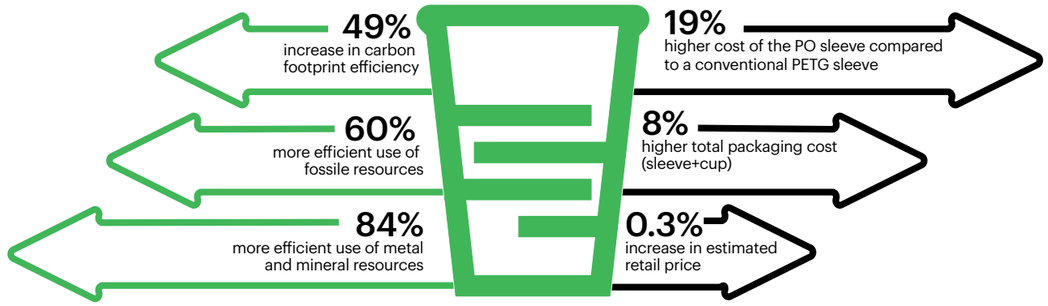
All pilot projects, except for flexible PP packaging, that requires further case-by-case additives adjustments to meet the specifications for non-food grade applications, proved the feasibility of transforming non-sortable, non-recyclable packaging into a sortable, recyclable material with many applications in Israel's plastic value chain. The solutions offer a sustainable and versatile approach to packaging that can be integrated into the plastic value chain in Israel.

It is worth emphasizing that major food and beverage brands have actively participated in these initiatives, demonstrating their commitment to the idea of "Designing for recyclability". This approach helps reduce the environmental impact associated with plastic packaging, and these brands are motivated to continue reviewing their product portfolio to apply a circular design strategy consistently.

Building on this momentum, developing policies that can incentivise manufacturers to adopt recyclable packaging is essential, as well as introducing standards, a new handling fee for the EPR scheme and an eco-modulation fee for more sustainable packaging.

> "At Osem - Nestlé, we have set goals that by 2025, all our packaging will be recyclable.
>
> Amit Ron – Packaging Manager
> Osem-Nestle"

Packaging with a PO sleeve compared to a conventional PETG sleeve



Graphic: UNIDO

Conclusions

As revealed in the mapping survey conducted in 2020, the SwitchMed project in Israel under the lead of UNIDO in collaboration with local partners, played a pivotal role in addressing critical challenges within Israel's plastic waste recycling value chain.

The policy recommendations, drawing upon European and international standards, targeted crucial areas such as producing recycled resins, the manufacturing of plastic products with recycled content, and green public procurement regulations. Adopting these recommendations by the Ministry of Economy reflects a significant step toward aligning regulations and incentivising sustainable practices.

Engaging key stakeholders from the plastic value chain, UNIDO identified plastic sectors with high potential for developing circular business models. These pilot projects showcased innovative alternatives, established partnerships, and laid the foundations for long-term agreements to improve the uptake for circular practices in the plastic value chain and enhance recyclability.

Addressing greenhouse plastic waste aligns well with national strategies to reduce the environmental footprint of agricultural plastic waste. UNIDO tested a circular business model under real operational conditions that not only tackles plastic film waste but also creates economic opportunities by converting collected films into recyclates for further applications in various industrial applications.

Regarding plastic packaging, the pilot projects scaled up within the sector, will enable the Ministry of Environmental Protection to contribute to the overall goal to reach a 70% recycling rate for packaging waste by 2030. The pilot projects engaged with major national brands like Strauss,

> "The ability to design and manufacture recyclable products, in growing quantities, forms the economic foundation of the Israeli recycling market. Circular thinking, as demonstrated in the pilot, should serve as a guiding light for the industry to advance it in the competitive world of a carbon-neutral economy."
>
> Eran Brokovich
>
> SwitchMed Focal Point - Ministry of Economy

> "Flexible packaging offers environmental benefits due to its lightweight nature, reducing the use of packaging materials. However, it presents a challenge in terms of sorting and recycling. The pilot demonstrated the feasibility of closing the loop even in such a challenging waste stream, thanks to dialogue and collaboration among all stakeholders in the value chain, including policy makers.
>
> Ohad Carni
>
> SwitchMed Focal Point
>
> Ministry of Environmental Protection

Osem and CBC, and their respective supply chain and demonstrated in real operational conditions the viability of solutions to increase recyclability rates, reduce carbon footprint, and improve efficiency in resource use. These pilot projects set a precedent for other companies, pioneering a more global shift towards circularity and sustainability in Israel's food and beverage packaging industry.

With a multi-faceted approach, from pilot projects and policy recommendations to collaborative events and support for the establishment of recycling facilities, UNIDO showcases a comprehensive and impactful contribution to 'Israel's national strategy on circularity for the plastic sector. By bridging gaps, aligning regulations, fostering innovation and building business linkages across value chain actors, UNIDO has transformed identified challenges into opportunities for sustainable practices and circular business models in Israel's plastic industry.

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