

# Industrial symbiosis: Good for economy, good for environment

How will industries break decades-long practice of waste-dumping when the economy encourages it?

By MAX KAPLAN-ZANTOPP

ZAVIT' Science and the Environment News Agency

As concerns about natural resource depletion and pollution buildup continue to grow, the need to transition our economies into a circular framework has become alarmingly pressing. As far back as the Industrial Revolution, national economic models have been overwhelmingly, if not entirely linear: the process of extracting raw materials to manufacture products to sell to people before they are ultimately disposed of.

According to a 2019 OECD Environmental Performance Review, the global demand for natural resources and materials has grown at an astonishing rate. From 1970 to 2017, the use of raw materials more than tripled from 27 billion metric tons to 89 billion metric tons, putting it on track to reach 167 billion tons by 2060. As a result of current linear economic models and industrial processes, a significant portion of these resources will ultimately be wasted.

This has particularly been the case for electronic products due to the marketing of persistent upgrades, which prompts people to get rid of the older products they perceive as obsolete, without considering the hazardous substances and valuable metals inside them. In fact, this is the most rapidly growing waste stream in the 21st century, clocking in at an annual rate of 20-50 million metric tons. Due to this accumulation of e-waste, electronic products have infamously earned them the moniker, "designed for the dump."

E-waste aside, however, this basic process is abundant in the vast majority of industries and factories around the world, regardless of the types of products they produce. At the end of the manufacturing process, industries are often left with a heap of waste material for which they no longer have any use.

Industries are in business of making money, and that means saving money anywhere they can. What's the most cost-effective method for waste disposal? Landfills. Why spend more time, effort and money to search for an alternative to your unwanted waste when you can quickly pay a small fee to quickly dump it in a regulated landfill?

Not only does this widely conventional practice give rise to a slew of environmental problems, it also creates untapped economic opportunities. For these reasons, Israel's Economy and Environmental Protection ministries initiated the Industrial Symbiosis Project. The government-funded project was developed to link together the resource inputs and waste streams of thousands of factories and other facilities in order to monetize waste management while limiting environmental damage from excessive landfilling.

As opposed to municipal solid waste (MSW), which originates from households and the public sector, industrial waste stems from manufacturing and industrial processes. And because an industrial sector is so diverse, so are the waste streams. These include dirt, gravel, masonry, concrete, scrap metals, glass, plastics, gypsum, oil, solvents, chemicals, organic matter, scrap lumber, and much more, depending on a factory's process.

How much industrial waste is being generated



A NIGHT VIEW OF Nesher factory, outside of Ramle. (Milla Avivi/Flash90)

to warrant such a shift from the linear economic model? It's hard to say, given the overwhelming attention that worldwide MSW generation has received, which experts predict will increase by 70% to reach a total of 3.4 billion metric tons per year by 2050.

However, MSW is dwarfed by industrial waste. In the United States, industrial and hazardous waste grew from an estimated 4.5 million tons per year after WWII to 57 million tons by 1975, and to 265 million tons by 1990. According to the EPA's Guide for Industrial Waste Management, a shocking 7.6 billion tons of industrial solid waste are now being generated and disposed of each year across American facilities alone.

ISRAEL'S INDUSTRIAL sector generates much less waste than the US; no surprise given that Israel is less than 0.3% the size of the United States. While Israel's Environmental Protection Ministry does not specify industrial waste specifically, it does acknowledge that as of 2019, six million tons of waste debris from the construction sector was being produced every year. That's in addition to the annual 5.3 million tons of municipal and commercial waste. According to an OECD Indicator report from 2013, Israel was producing 303,000 metric tons of hazardous waste every year.

For the sake of convenience and profits – and in the absence of sufficient waste infrastructure – the EPA's Guide for Industrial Waste Management and policies – these undesirable materials and substances are usually dumped in landfills for

a small cost. As a result, Israel dumps 82% of its waste into landfills.

"The situation is not ideal," says Hila Leo Shapira, project director of Aviv Consulting for the southern-central portion of the Industrial Symbiosis Project. "Although the government augmented the payment per ton for dumping to landfills, it's still very, very low compared to Europe."

Europe raised the price per ton of dumping in an effort to discourage the use of landfills, which are known to be a significant source of leachate (fluids that percolate through waste) as well as carbon dioxide and methane emissions. "In Europe," says Shapira, "you pay the equivalent of 700 shekels per ton, more or less. Here, it was raised from 40 shekels per ton to 100 shekels in 2007, but manufacturers are still dumping in landfills because it's still the most economical way to deal with waste in Israel. But when it comes to hazardous waste, the numbers are totally different, and it could go up to 2,000 or 3,000 shekels per one ton of waste, depending on how hazardous the waste is."

The motivation behind the Industrial Symbiosis project, however, has less to do with the environment and more to do with the economy.

"The main reason why the project started was because there was an economic potential that was not being used," says Arik Rvkin, director of low tech and circular economy for the Industries Administration in the Economy Ministry. "We have a market failure here because there

are around 16,000 factories in Israel and many more organizations that can use each other's waste for something."

However, tending to this economic gap also addresses the high rates of landfill-dumping that the Environmental Protection Ministry seeks to reduce. Same goal, different motivations.

At the end of the manufacturing process, a factory can either pay a fixed price to send waste to a landfill, or it can spend an indefinite amount of time and money looking for another company that can use its waste as raw material. "To solve that problem, we started the Industrial Symbiosis Project," says Rvkin. The project itself is managed by two consulting companies: Israel Materials Marketplace (IMM), which handles the industries in northern Israel, and Aviv Consulting, which handles those in the central-southern portion of Israel.

"Basically," Rvkin explains, "they are going to every single organization and factory and asking them the kinds of waste they have and the kinds of resources they use. Then they connect the dots."

THE PROJECT does not cost anything for the factories, manufacturers or other organizations.

"The consulting companies are getting paid by us, not by the organizations themselves, so for the organizations it's completely free," says Rvkin. "After the consultants connect factory A with factory B, they report to us and say, 'In this kind of symbiosis, X amount of tons

weren't dumped and it generated X amount of financial value for those companies,' and then we pay the consulting companies according to their performance."

Following the end of the project's pilot year in March 2020, the Economy Ministry evaluated its economic and environmental accomplishments and decided to continue a second year. Since then, the Industrial Symbiosis network has grown substantially.

"We have mapped the waste streams of around 1,400 clients, and in terms of tons, we have mapped 20 million metric tons worth of waste. The challenge is finding industries that will accept this waste," says Rvkin. Between IMM and Aviv Consulting, some 80 deals have been brokered thus far, which has prevented 28,000 metric tons of waste from going into a landfill, and generating a direct economic value of NIS 13 million, according to Rvkin.

The project is slated to be active for another three-and-a-half years. At that point, another evaluation will assess how much it will cost the government to finance the project into the future.

According to current trends and the rate of deals being made, Rvkin expects the industrial project will be able to bring in 8,000 clients, generate an economic value of NIS 140-150 million, and prevent 500,000 metric tons of waste from being dumped into landfills by the end of the project's fifth year.

But despite the achievements of industrial symbiosis thus far, and those expected in the coming years, there is still one thing that could reduce environmental and economic waste even further: reducing waste at its source.

"So many materials are on the brink of ending," says Aviv Consulting's Shapira, "so of course we need to rethink the way we are using resources and to find ways to repurpose them for another use. But having said that, I want to emphasize that it's better not to create that waste in the first place."

To address that baseline waste challenge, the Economy and Environmental Protection ministries also established in March 2020 the Israel Resource Efficiency Center (IREC).

"The scope of our work is inside the factory walls," says Doron Koll, head of IREC's Knowledge and Information Center. "We try to minimize the number of raw materials a factory uses, make their operations more efficient, and try to minimize the amount of waste they create."

IREC has consulted on waste reduction with 60 factories thus far, but conventional production processes make this task far from easy.

"A lot of factories that we go to help to make their inner processes more efficient sometimes still end up creating a lot of waste," Koll notes. "At which point, we direct them to the industrial symbiosis project."

Although waste generation seems inevitable, and impossible to avoid, Israel has made progress helping its industries reduce the amount of waste they generate, as well as providing them with financially lucrative options in the form of selling or repurposing their waste for use in raw material streams. By doing so, Israeli industries are beginning to understand and seek out the financial benefits that can be gained through a circular economy and environmental sustainability: a win-win situation.

## No, the pandemic wasn't good for the environment

COMMENT

By YANIR AHARONSON

The pandemic was great for the environment, they said. Earth had grown tired of human fossil fuels, so it made an executive decision to banish us into lockdown and reduce carbon emissions unilaterally.

Earth must have forgotten that plastic is killing it, too.

With everyone staying in their own homes, single-use plastic consumption rose dramatically, creating a detrimental impact on the environment around us. That's a bigger problem than some might think, as a whopping 90% of plastic globally cannot be recycled, according to Greenpeace. Yet hospitals, restaurants and a variety of businesses constantly contribute to the planet's plastic overload. There's only one solution to this problem: Ban single-use plastic and promote a circular economy in which plastic is reused several times over.

Carbon dioxide emissions dropped with the onset of the pandemic, as governments closed down borders and decreed lockdowns. Daily global emissions had decreased 17% by early April 2020, according to a Nature climate change report. So while COVID-19 was great for cutting carbon emissions temporarily, has it increased sustainability?

Hundreds of plastic containers, coffee cups and non-reusable masks are found littered around Israel's beaches, parks and streets. Israel has a serious plastic problem. We have the highest rate among OECD countries of landfill capacity – 80% – and recycle less than 7% of our waste.

It's not as though the rest of the world has done much better. Single-use plastic consumption spiked globally during the pandemic, and not only because people were using more straws. The medical sector relied heavily on plastic, including the use of the face shields (FF), gowns (LPE), vinyl gloves (PVC), disposable bags, tubes and masks (plastic sheet and non-woven fabric), to combat COVID, a UN report noted. China alone accumulated some 142,000 tons of medical waste this past year – masks, gloves, and other medical single-use protective gear – and scientists are still waiting to assess its impact on oceans.

Restaurants and clothing manufacturers have also used more non-recyclable plastic since the pandemic began. People didn't want to leave their houses, so everyone began shopping online and ordering food to their doors. Food delivery containers are often made of Styrofoam or non-recyclable plastic, and many times wrapped in even more non-recyclable plastic.

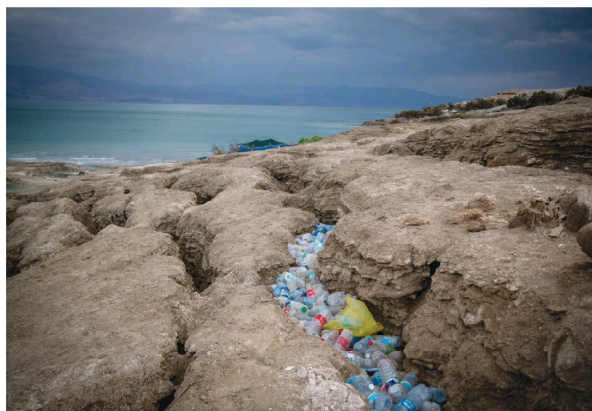
The way humans use plastic is contributing to three planetary crises: pollution, climate change and loss of natural habitat, according to the Ellen MacArthur Foundation Global Commitment 2020 report. So far, more than 500 businesses, organizations and governments have signed onto a pact aimed at creating a circular economy for plastic by 2025 so it never becomes waste. In addition, CELEX, the European organization of plastic recycling, has grown substantially, with 160 European corporations, organizations and associations on board. It suggests the use of mono-material that can be easily recycled. The organization is invest-

ing time and resources into creating a more sustainable world and promoting a more circular economy.

THESE FOUNDATIONS are not leading the charge alone. The European Union recently passed a new law stating, "Where sustainable alternatives are easily available and affordable, single-use plastic products will be banned from 3 July, 2021. This ban will apply to cotton bud sticks, cutlery, plates, straws, stirrers, and sticks for balloons. It will also apply to cups, food and beverage containers made of expanded polystyrene, including all products made of oxo-degradable plastic."

Many countries are implementing plastic taxes to dissuade people from using single-use, non-recyclable plastic bags. In the US, eight states have implemented laws prohibiting stores from distributing single-use plastic bags. Many supermarkets tend to offer inexpensive tote bags, and often charge customers an extra fee if they use plastic bags from the market. There is often an incentive to buy the tote, or bring one's own. However, new studies show that these cotton tote bags might actually be worse for the environment than plastic. As new research comes out, it seems that recycling plastic bags currently in use – using the Safeway bag again and again until it's time to put it in the recycling bin – may be the best way to go.

While governments are implementing these new incentives to dissuade single-use plastic, companies are also taking the fight into their own hands. It's becoming less and less common to find plastic straws at restaurants, cafes and coffee shops. Starbucks, for exam-



EMPTY PLASTIC bottles on a Dead Sea beach. (Yonatan Sindel/Flash90)

ple, changed the lids on its cold drinks so that customers wouldn't need straws. Other restaurants using paper straws and reusable metal straws have become increasingly popular among the environmentally conscious.

Climate change continues to be a hot topic. Every day we see signs and bumper stickers saying "Save our sea turtles" or "Stop climate change now."

Consumers are becoming increasingly environmentally conscious and are looking for greener alternatives.

However, even with all these initiatives, studies continue to predict at least a two-fold increase in plastic waste by 2030, continuing to ruin our oceans and kill wildlife. It's time to stop repeating the same cycle and come up with fresh solutions. One

step is to wear ourselves off single-use, non-recyclable plastic. These initiatives are a great way to start solving the problem, but not enough. Until corporations and people switch to fully recyclable plastic, we will continue to use plastic fill our landfills and pollute our oceans.

The writer is the CEO of Polysack ([www.polysack.com](http://www.polysack.com)).