Powering the shift from disposables to reusables

Issue Synthesis

2024 update

ZERO WASTE LIVING LAB

A program by envirn we build world changing companies

PLASTIC SOLUTIONS FUND

Index

Executive Summary

Plastic pollution contaminates oceans, water bodies, land and affects air quality. A truckload of plastic is entering the ocean already and this is expected to increase threefold by 2040. It is possible to achieve a significant reduction of plastic leakage into the environment by combining reduce and reuse strategies, redesign and innovation, improved waste management, and increased recycling capacity. Interventions are even more urgently needed in the Global South, where the plastic waste crisis is more severe, whilst almost 90% of all global investments in plastics circularity are directed towards wealthier nations in the Global North.

Indonesia is such a Global South country with a severe plastic waste issue. 70% of the plastic waste generated eventually ends up in the environment, either on badly managed landfills (open dumps), set on fire by individuals polluting the air, or flowing into rivers and oceans. This leads to major environmental and health related risks for Indonesia's inhabitants. Indonesia ranks among the top 3 countries globally where microplastic uptake via diets is highest. The Government of Indonesia has regulations in place to reduce plastic waste generation and to ban certain types of plastics. Enforcement is a challenge however and combined with the ever-growing consumption capacity of the Indonesian economy, the plastic waste crisis is forecasted to worsen over the coming years.

Innovative and systemic solutions that tackle the plastic waste crisis are urgently needed in Indonesia. Most impact can be made when focusing on the root causes of plastic pollution: non-recyclable plastics that are given out as single-use items. The place where we need to start therefore is to fundamentally rethink the way we consume so we can radically reduce the absolute volumes of plastics put on the market. This includes two main strategies: (1) eliminating plastics, (2) alternative delivery models with a distinction between consumer-owned models and provider/business-owned models.

Examples of reducing plastic consumption are emerging globally. With at least 175 countries agreeing to implement regulatory measures to reduce plastic waste, among the most widely adopted measures are those targeting plastic bags. At the same time, alternative delivery models are emerging. Consumer reuse efforts are observed which prolong the lifespan of products through reuse, involving items individually owned and managed (e.g., water bottles, reusable bags) that can be refilled at package free stores. Most of the innovation is seen in the business-owned product delivery models which include (1) provider-managed refill & return systems, (2) zero-waste commerce & services, (3) returnable food ware systems and (4) transport packaging systems.

The zero-waste innovation ecosystem is also developing in Indonesia with start-ups, entrepreneurs and larger organisations starting pilots. Enviu's Zero Waste Living Lab has been implementing various businesses and pilots since its start in 2019. There are still barriers in setting up plastic reduction businesses, such as the competition with cheap and very convenient single-use plastics and the perceived safety and hygiene of disposables. At the same time there are opportunities to create economic incentives for both resellers and consumers of returnable and reusable packaging systems. Other opportunities include the social media influence present in Indonesia, the rising health concerns of plastic pollution, and the damage plastic pollution is causing in the tourism sector.

In starting new ventures in Indonesia, we want to make most impacts that can be scalable. Starting from the most polluting sectors and narrowing down to business model opportunities within these, we will develop solutions in 3 industries: (1) Food and beverage sector, (2) FMCG products, and (3) Non-primary packaging.

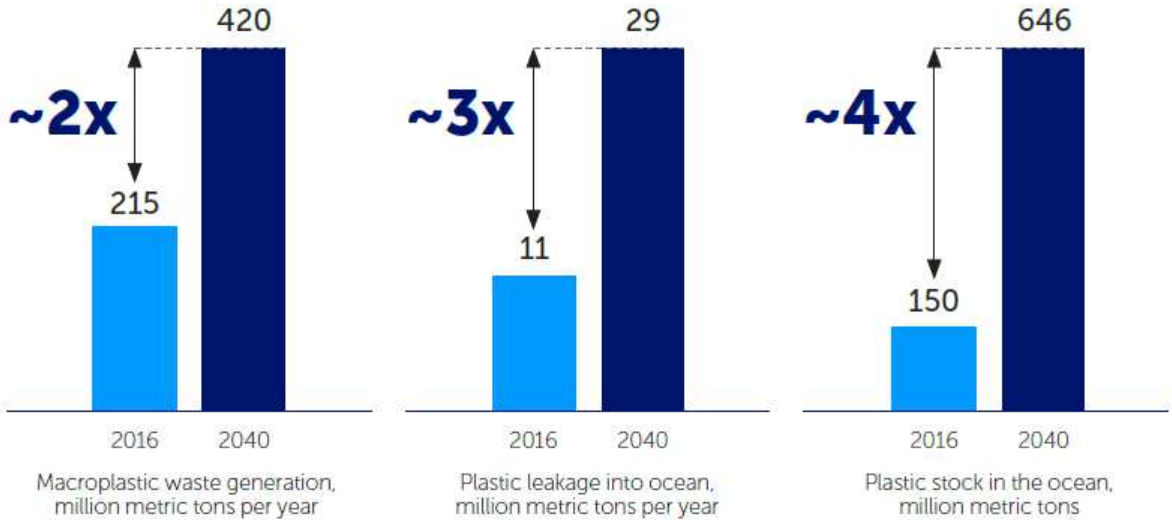
1. Global system context

Plastic pollution contaminates oceans, water bodies, land, and affects air quality. The current global plastics facts are the following (Geyer, Jambeck, & Law, 2017):

- Humans currently produce **>350 million tons** of plastic waste per year;
- The following happens to this global production of plastic waste:
  - **9%** gets recycled
  - **12%** gets incinerated
  - **79%** accumulates in landfills and the natural environment
- From the majority of plastic waste that ends up in the natural environment, plastics are leaking into waterways and oceans as well. This means that **a truckload of plastics enters the ocean every minute** and on an annual basis it considers 1 – 2 million tonnes of plastic waste that enter the ocean (PEW Charitable Trust & Systemiq, 2020; Ritchie, Samborska, & Roser, 2024).
- Plastics do not degrade in the environment. Instead, they dissolve into microplastics. Microplastics enter the food chain and thereby also our human bodies. The exact effects of microplastics on human health are still being researched, but initial findings show they can be damaging as the microplastics will stay in our bodies forever as we cannot process them.

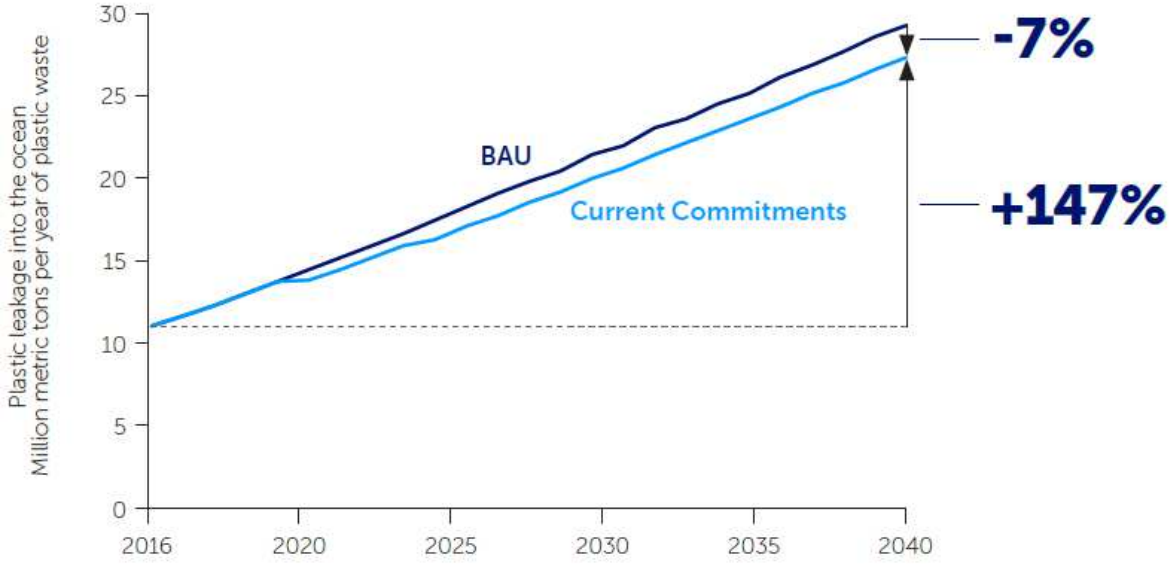
Where are we heading?

According to various sources (World Economic Forum, 2016; McKinsey, 2015), without immediate action, the stock of plastics in the ocean is expected to increase four to five times by 2050. Lau et al. (2020) and PEW Charitable Trust & Systemiq (2020) project that the flow of plastics leaking into the ocean will triple by 2040. With this trend expected to exponentially grow in the next years, we are on the path to have more plastics than fish in the ocean by 2050. Four trends resulting in plastics overflow are: (1) growing global population, (2) rising per capita plastic consumption, (3) shift towards low-value, hard-to-recycle plastics, and (4) a disproportionate growth in plastic waste generation in markets with low waste collection rates.



Business-as-Usual projections for critical plastic indicators: Until 2040, plastic waste generation is projected to double, plastic leakage to the ocean nearly triple, and plastic stock in the ocean more than quadruple (PEW Charitable Trust & Systemiq, 2020).

Current commitments from government and industry are failing to adequately address the plastic waste issue. Even if these commitments would be fully implemented, plastic flows into the ocean in 2040 would likely be only 7% lower than under business-as-usual projection (PEW Charitable Trust & Systemiq, 2020). In the meantime, hundreds of billions of dollars are being invested in new virgin plastic production plants, locking us deeper into the status quo every day.



Projected land-based leakage of plastics under the Business-as-Usual (BAU) and the current commitments scenario (PEW Charitable Trust & Systemiq, 2020).

Plastic pollution and climate change

Plastics are basically fossil fuels: over 99% of plastic is made from chemicals sourced from fossil fuels, and the fossil fuel and plastic industries are deeply connected (CIEL, 2024). Oil, gas, and coal are the fossil-fuel building blocks of plastics. Plastics therefore also contribute to climate change due to the various sources of greenhouse gases they release into the atmosphere during their lifetime. The vast majority of the climate change impact of plastics is linked to the production stage of plastics: around 90% of plastics' climate change impacts originate from converting fossil fuels into plastics (OECD, 2022). Emissions from the end-of-life tend to be relatively small. In 2019, CIEL estimated that production and incineration of plastic would add 850 million metric tons of greenhouse gases to the atmosphere – equivalent to 189 coal-fired power plants. By 2050 this could rise to 2.8 gigatons of carbon dioxide per year – or the equivalent of 615 coal-fired power plants (Edmond, 2022).

What are the business risks?

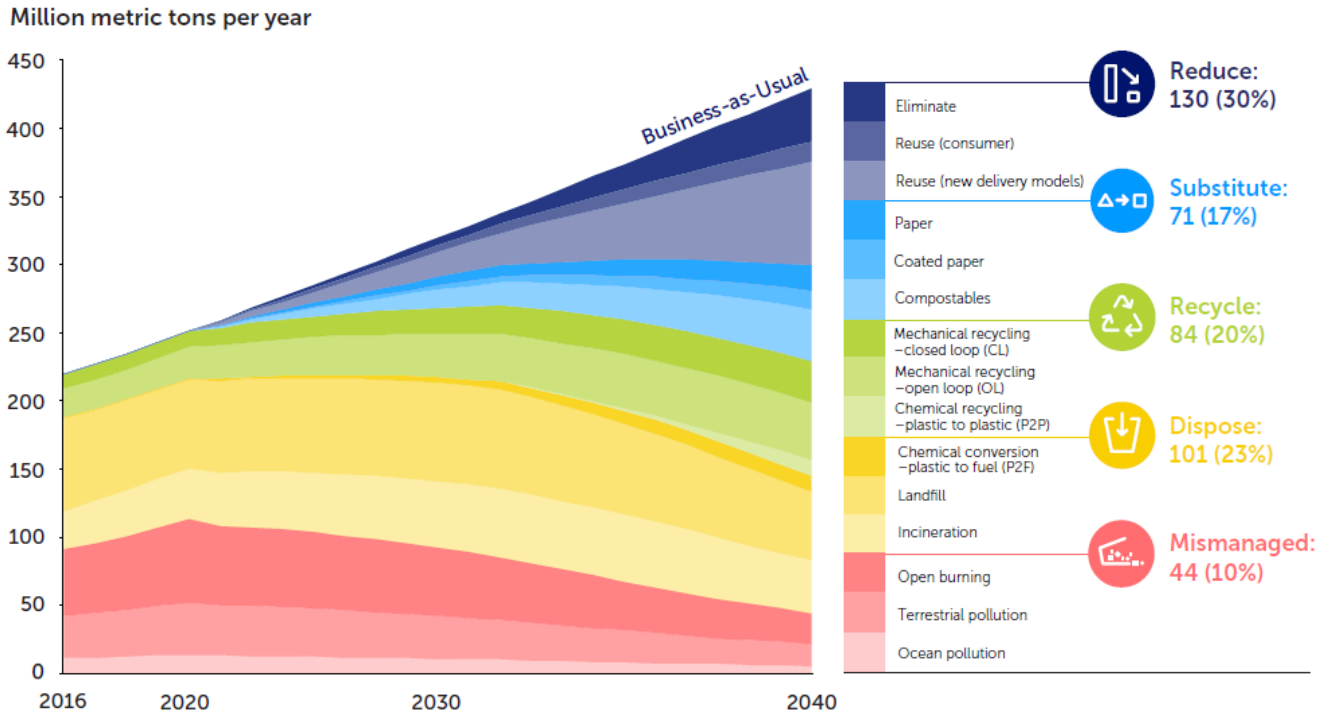
Even though plastic production is currently a thriving business, it is also more and more linked to business risks. According to PEW Charitable Trust and Systemiq (2020), the global cost of all municipal solid and plastic waste collection and management will be USD 100 billion in 2040 under the business-as-usual scenario. From this USD 100 billion, governments will fund USD 60 billion. The remaining "funding gap" of USD 40 billion presents a risk to the plastic industry in case it is required by government policy to fund that gap. Moreover, the industry also risks being required to pay for the USD 60 billion funded by governments via for instance extended producer responsibility (EPR) or other schemes. Together, this risk accounts for 25 per cent of the USD 400 billion of the plastic industry's turnover.

What is the way out?

It is possible to achieve a significant reduction of plastic leakage into the environment. Several roadmaps have been developed that combine reduce and reuse strategies, redesign and innovation, improved waste management and increased recycling capacity (UNEP, 2018; McKinsey and Ocean Conservatory, 2015; Ellen MacArthur Foundation, 2017). One recent report also quantified the effects these strategies could achieve: an approximately 80% decrease in plastic leakage to the oceans could be feasible compared to the business-as-usual scenario, using a combination of existing technologies throughout the whole plastics value chain (Lau, et al., 2020; PEW Charitable Trust & Systemiq, 2020)

However, different solutions come at different costs and effectiveness such that some are more favorable than others and will result in a larger decrease of plastic leakage to oceans. PEW Charitable Trust & Systemiq (2020) indicate the following division between the impact of strategies when action is taken on all aspects in the most optimistic scenario towards 2040:

- Reduce, which includes elimination, reuse, (by consumers) and reuse in new delivery models (e.g. reusable and refillable packaging systems) would account for 30% of the (theoretically) total achievable decrease in plastic leakage;
- Substitute, which includes the use of paper, coated paper, and compostables would account for 17% of the (theoretically) total achievable decrease in plastic leakage;
- Recycle, which includes mechanical recycling (closed and open loop) and chemical recycling (plastics-to-plastics) would account for 20% of the (theoretically) total achievable decrease in plastic leakage;
- Dispose, which includes plastics to fuel, landfills, and incineration would account for 23% of the (theoretically) total achievable decrease in plastic leakage.



The systems change scenario to significantly reducing plastic leakage to the ocean, which requires all solutions to be implemented concurrently, ambitiously, and starting immediately (PEW Charitable Trust & Systemiq, 2020).

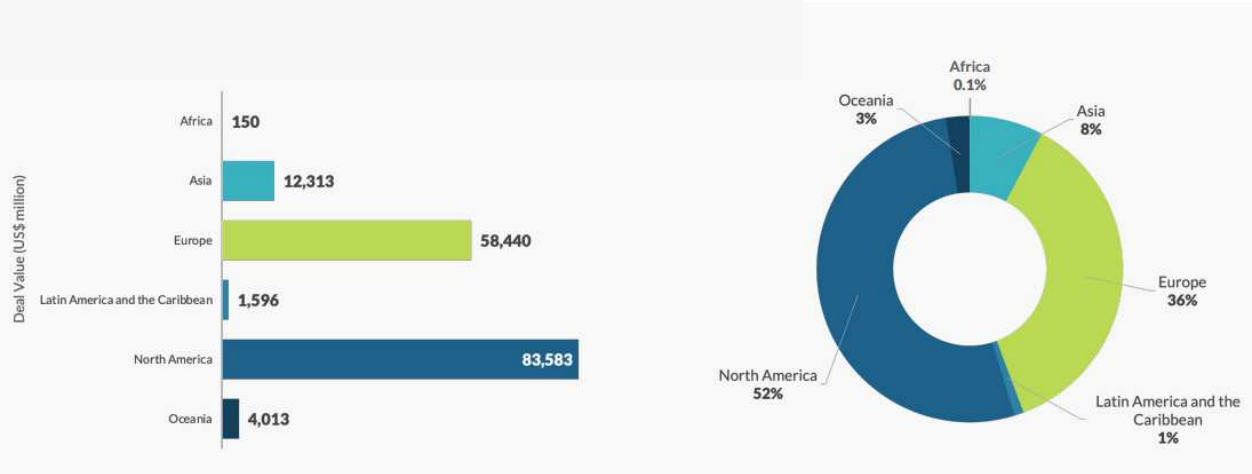
Global North versus Global South

Plastic pollution leads to a range of environmental and health related problems and externalities. We've already seen the figures on the business risks of plastic pollution. When we take a closer look at the distribution of the externalities of plastic pollution within and between countries, it becomes clear that some countries are more affected than others. In the absence of global regulation and standards, communities across low- and middle-income countries (combined: The Global South) are being exposed to the most harmful effects of plastic production and pollution, including air pollution, increased risk of flooding, the spread of infectious diseases, threats to livelihoods, and unsafe working conditions. This is due to two main factors:

1. Countries in the Global South have been overflown by non-recyclable plastic packaging types without them having any control over these plastic packaging items being put on their markets;
2. Countries in the Global South have less developed waste collection and waste management systems.

These factors lead to **true lifecycle costs of plastics being 8 times higher for low- and middle-income countries** than in high-income countries: mismanagement of plastics costs low- and middle-income countries at least $149 per kilogram of virgin plastic, compared to just $17 per kilogram for wealthier nations (WWF, 2023). Countries in the Global South simply don't have the means to prevent it from escaping into the environment and damaging ecosystems.

And yet, whilst the plastic pollution crisis is more severe in the Global South, 89% of investments in plastics circularity in the period of 2018-2023 occurred in the wealthy nations in Europe and North America (The Circulate Initiative, 2023). This means that investments in, and solutions for Global South markets are urgently needed.



Even though the plastic crisis is more severe in the Global South, 89% of investments in plastics circularity over the last 5 years went to Global North countries (The Circulate Initiative, 2023).

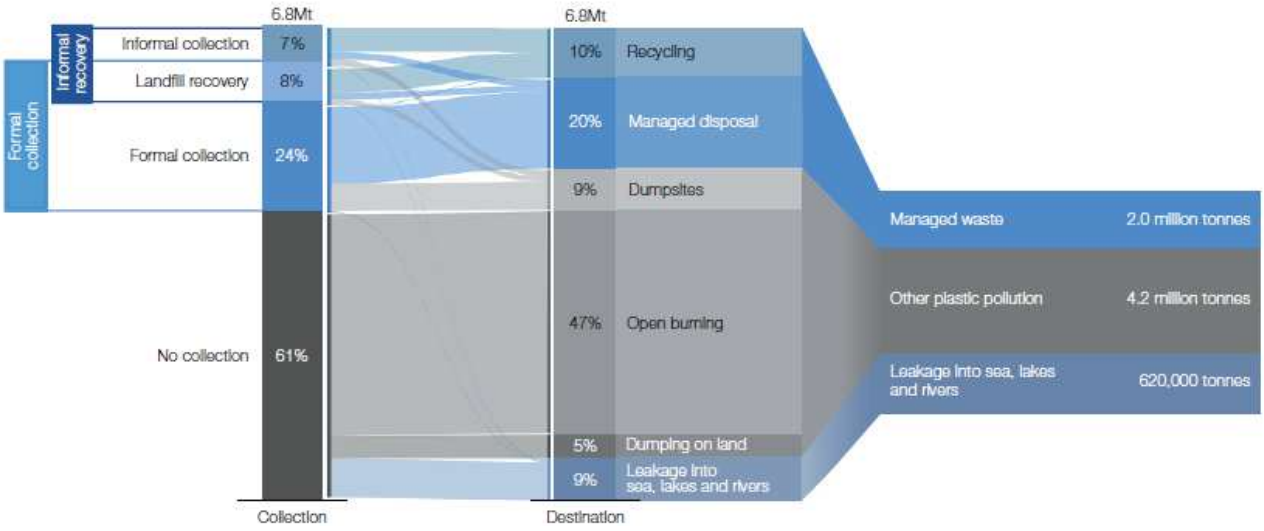
2. Country system context

Solutions for the global plastics crisis are urgently needed in low- and middle-income countries. Indonesia is an example of such a country and, due to its geographic island nature, is prone to polluting oceans with the plastic waste it generates.

2.1 Plastic pollution in Indonesia

In Indonesia, the following can be considered the 'baseline' situation on plastic pollution (National Plastic Action Partnership, 2020):

- Indonesians currently produce **6,8 million tons** of plastic waste per year;
- On average in the country, 39% of this plastic waste gets collected. For the remaining 61% of the plastic waste, no collection is in place.
- The following happens to the Indonesian plastic waste:
    - **10%** gets recycled;
    - **20%** is managed, meaning it is usually landfilled in managed landfills;
    - **70%** accumulates in the natural environment in various ways:
        - 78% of this 70% is burned by households;
        - 12% of this 70% is discarded in water bodies;
        - 10% of this 70% is dumped on land or buried and can end up in water bodies
- An estimated 620.000 tonnes of plastic waste leaks into sea, lakes and rivers.
- The informal sector plays a critical role in collection and recycling of plastics. They collect roughly 500.000 tonnes of plastics (8% of the total). Nearly all plastics the informal sector collects, ends up at a recycling facility.



Mass flows of where Indonesia's plastic waste ends up currently (as a percentage of the total waste generated) (National Plastic Action Partnership, 2020).

All things considered, Indonesia is in the top 10 biggest polluters of plastics into the ocean globally, Citarum river (Java) being one of the most polluted rivers in the world, and Bantar Gebang (Jakarta area) is the largest open landfill site in the whole of Southeast Asia (Oman-Raegan, 2017). Moreover,

a recent study found that Indonesia ranks in the top of countries where microplastics intake (from diets, mainly caused by seafood) is highest globally per capita (Zhao & Fengqi, 2024).

2.2 Urbanization increases the demand for (plastic) packaged food

Modern consumption is on the rise in Indonesia. Traditional markets are still serving a majority of the population, but the trend in the number of mini-markets shows a steep increase in the last few years. Today, 59% of Javas population lives in urban areas and this is expected to reach 78% in 2035 (Jones, 2014). Urbanization is associated with an increasing consumption of packaged food (Hoornweg, Bhada-Tata, & Kennedy, 2013). In a business-as-usual scenario, the demand for (plastic) packaged goods is projected to rise in Indonesia, leading to even more plastic leaking into the environment than today.

From traditional markets to modern markets in Indonesia: Urbanization increases the demand for packaged food and 'modern' mini-markets are on the rise (Hoornweg, Bhada-Tata, & Kennedy, 2013).

2.3 Policies to reduce plastic pollution in Indonesia

To address the issue of plastic pollution and marine debris, the Government of Indonesia had issued a National Action Plan for Handling Marine Debris for 2018-2025 as stipulated in Presidential Decree Number 83/2018 concerning Handling Marine Debris. In this regulation, the Indonesian government committed to (Government of Indonesia, 2017):

- reduce marine debris by 70%;
- reduce solid waste by 30%;
- handle 70% solid waste within a period of 8 (eight) years from 2018 to 2025.

Besides these targets, plastic bag bans are enforced in multiple cities and regions in Indonesia. In 2019, Bali became the first Indonesian province to impose a ban on the use of single-use plastic bags, straws and styrofoam packaging items. In Jakarta, the plastic bag ban was enforced in July 2020, but the usage of plastic straws, cutlery, and styrofoam is still allowed. A nation-wide ban on single-use plastic products is planned to be imposed by the end of 2029 (CNA, 2023).

Targets, policies and enforcements

Despite the fact that Indonesia has reduction targets and bans of single-use plastics in place, no major progress is being made in practice. This has to do with two main factors:

- Bans lead to trade-offs. When plastic bag bans are introduced, alternative solutions are searched for. A replacement for the plastic bag is often found in 'textile-based' bags. The often used 'spunbound textile' consists of polypropylene and polyester fibers, which are 100% plastics. These bags are given out as single use plastic bags, meaning no progress is made in reality.
- Enforcement is quite challenging as most of Indonesia's economy is positioned in the informal sector, despite the urbanization trend that is picking up (see 2.2). For Fast Moving Consumer Goods (FMCG) for instance, 69% of products are sold via informal traditional trade channels (Statista, 2024). Enforcing bans in these settings with unregistered businesses such as family stores (called warungs) or markets is very hard and time consuming.

3. Focus problem domain

In chapter 1, we've seen that an integrated System Scenario can achieve significant reduction in (marine) plastic pollution. The integrated approach combines multiple strategies of solutions. However, different solutions come at different costs and effectiveness, such that some are more favorable than others and will eventually result in a larger decrease of plastic leakage and pollution. We'll go over these strategies[1] one by one in this chapter to discuss the options and decide on the most impactful solution space to build solutions: our focus problem domain.

3.1 Dispose

The dispose strategy is about controlled disposal of plastic waste, which prevents plastic leakage into the ocean. The sub strategies include plastics to fuel, sanitary landfills, (no dumpsites) and incineration. This strategy would account for 23% of the (theoretically) total achievable decrease in plastic leakage (PEW Charitable Trust & Systemiq, 2020).

Sanitary landfilling
Sanitary landfilling is a method of disposing waste on land without disturbing the environment and public health by efficiently engineering them in the smallest area possible, before reducing the volume by covering with a layer of earth to ensure the least exposure to the air. Sometimes, landfill gas (methane leaking from the waste) is captured in these sanitary landfills so some energy from the waste can still be captured and utilised. Although this should be the practice, in many cases (with Indonesia as a bright example), sanitary landfills still act as open dumping sites, generating environmental problems such as air pollution, odour and groundwater pollution (Jong, 2015). They moreover have limited capacity, so when they reach their maximum capacity, more land needs to be cleared to store more waste.

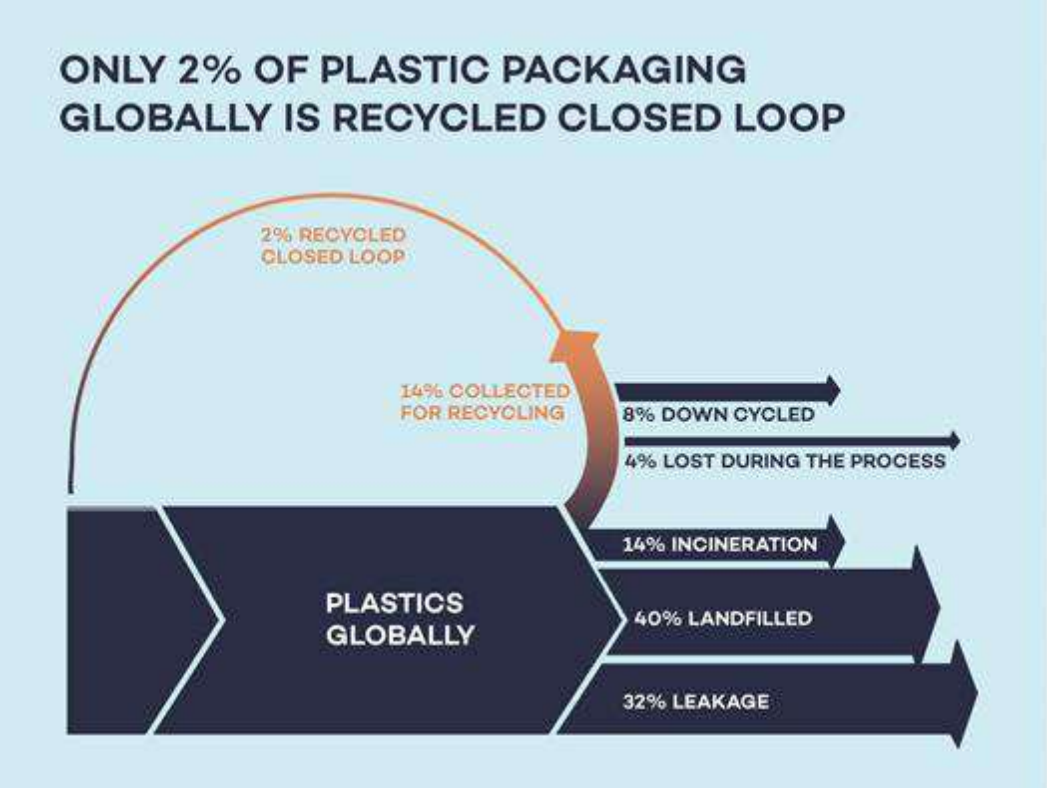
Incineration
Incineration or converting waste to energy means waste is burned in order to recover energy from it. It has been shown however that about 90% of burned waste could actually be composted or recycled. Waste-to-energy is considered harmful in respect to its externalities such as toxic emissions, CO2 emission and toxic ashes. Additionally, only one fifth of calories in these materials are captured when converting plastic waste to energy (GAIA - Global Alliance for Incinerator Alternatives, 2013). Following the research of Zero Waste Europe, burning these resources to create energy instead of recovering them "discourages efforts to preserve resources and creates incentives to generate more waste." And in fact, countries such as Denmark have shown that waste burning leads to dropping recycling rates and along with that reduces employment opportunities (Zero Waste Europe, 2018).

Plastics to fuel
Another disposal technology is called pyrolysis, where plastic waste is turned into a gas or an oil which can then be used as a fuel. There are some remarks to this technology however, as the process of converting plastics into fuel is very energy intensive. So, more energy has to be put in to treat the plastics than can actually be recovered by their usage as a fuel. Another issue with this technology is that heavy metals and dioxins become concentrated in the resulting fuels, which will then be released into the environment when combusted (Rollinson, 2018).

[1] All strategies discussed require that plastics are properly collected to be managed/used via the proposed solution. Collection of waste/plastics is therefore a precondition for all these strategies to happen.

3.2 Recycle

Recycling of products or materials. This strategy would account for 20% of the (theoretically) total achievable decrease in plastic leakage (PEW Charitable Trust & Systemiq, 2020). Looking at the projections on global plastic packaging production in relation to global plastic packaging recycling rates, a massive gap between both reveals itself. In 2013, about 14% of plastic packaging globally was *collected* for recycling of which 4% was lost during the process, 8% was downcycled into lower value material and only 2% was recycled in a closed loop (Ellen MacArthur Foundation, 2017). There are significant challenges on the pathway to increase global recycling rates to the extent that we no longer see leakage into the ocean.



Recycling rates are by no means keeping up with the massive amount of plastic packaging produced. © Enviu.

Sub strategies within recycling include open and closed-loop mechanical recycling and plastic-to-plastic chemical recycling.

Mechanical recycling

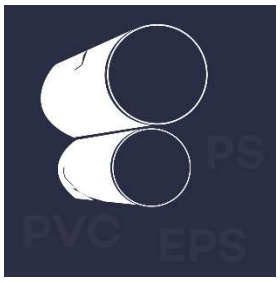
Mechanical recycling is processing plastic waste into secondary raw materials or products without significantly changing the material's chemical structure (Plastics Europe, 2024). This is the most applied form of recycling for plastics globally. It is, however, not an option for at least 50% of plastic packaging items. Small format, multi-material, uncommon, and nutrient-contaminated packaging cannot be recycled via mechanical recycling. In more detail, the problematic nature of plastic packaging that needs fundamental redesign and innovation before it can be recycled (World Economic Forum, 2016):

Small-format packaging

such as sachets, tear-offs, lids, straw packages, sweet wrappers and small pots, tend to **escape collection or sorting systems and have no economic reuse or recycling pathway.**

Multi-material packaging

such as pouches, snack packaging with different plastic and aluminum layers **cannot be economically, and often not even technically, recycled currently.**



Uncommon plastic packaging material

such as PVC, PS, and EPS are often technically recyclable, but not economically viable to sort and recycle because their **small volumes prevent effective economies of scale.**

Contaminated packaging

such as coffee capsules or fast-food packaging are often difficult to sort and clean to be able to enter high-quality recycling.

Following the *New Plastics Economy* report, these four categories represent at least 50% of plastic packaging (by number of items) and they are unlikely to have a proper recycling pathway at scale in the foreseeable future.

Mechanical Closed-loop recycling

Recycling might only replace a part of the virgin feedstock for plastic packaging production, through so called closed-loop recycling. Only for some high-quality materials, like PET, are closed-loop recycling technologies available that recycle back into (near) virgin quality feedstock and can be applied in (food-grade) packaging material again. For these closed-loop recycling technologies, the financials are challenging: it has to compete with the cheap price of virgin plastic – a battle which is currently being lost. However, the majority of plastics will see a decrease in polymer quality and can usually be recycled about 2-3 times before its quality decreases to the point where it can no longer be used in a circular manner (National Geographic, 2018).

Mechanical Open-loop recycling

Via open-loop recycling plastic waste is reprocessed and the recyclate is used in different applications, such as building materials or textiles. This is sometimes also termed ‘upcycling’. Favoring the recycling of these upcycled materials instead of virgin materials is preferable, but in many cases, upcycling plastics only moves the plastic problem to another sector. A notorious example is the fashion industry. One single polyester fleece jacket release almost one million fibers per washing (Mermaidseu Life+, 2016) – which end up in the ocean and ultimately our food chain (UNEP, 2016). Patagonia has upcycled soda bottles into fleece since 1993 (Patagonia, N.D.), and G-Star has replaced conventional polyester in their denims with recycled ocean plastics (G-Star, N.D.). Also upcycling for other applications such as housing or tiles often is just another form of extending the linear life with one lifecycle – not a circular model.

Chemical Recycling
Via chemical recycling technologies, plastic polymer chains are broken down – using heat, chemicals, or both – to create plastic feedstock again. Hence the term plastic-to-plastic recycling. Recent research, however, found that the technology is still failing and threatens the environment, the climate, and human health (IPEN, 2023). During the recycling processes for instance, hazardous waste is produced, which undoes the environmental benefits of recycling plastic materials.

Recycling in upcoming economies
Recycling pioneers such as Germany, struggle to recycle effectively and efficiently, despite 30 years of experience in the dual system, Germany is currently managing to feedback a mere 28,6% of its plastics waste back into new products in 2017 (Plastics Europe, BKV, 2018). Upcoming economies such as Indonesia often lack even the basic collection and waste management systems. It is highly unlikely that the current fragmented collection and waste management can be built up towards the required infrastructure in time to deal with the exponential tsunami of plastic coming their way.

3.3 Substitute

Substitution deals with replacing single-use plastics with alternative materials that meet functional requirements for specific applications but are more easily recyclable or compostable after their usage. This includes, for instance, replacing plastics with paper, coated paper, or compostable materials. This strategy would account for 17% of the total achievable decrease in plastic leakage (PEW Charitable Trust & Systemiq, 2020).

Although substitution should be part of the System Scenario, the substitution strategy also comes with trade-offs. For certain substitution materials, the production processes are more energy-intensive or polluting compared to their (single-use) plastic alternatives. Or they lead to other effects, such as land-use that could otherwise have been allocated for agricultural production for bio-based or compostable materials.

Biobased or compostable plastics may offer environmental advantages over their fossil-based counterparts, depending on the feedstock used in production, production method, product lifetime, and end of life treatment (WWF, 2020). However, to realize their potential, they should be coupled with organic waste treatment methods. This is currently challenging as biobased plastics are not collected separately for treatment/recycling. This means that they currently end up in the many technologies available for the treatment of conventional plastic packaging waste (Song, Murphy, Narayan, & Davies, 2009). There, they are complicating existing plastic recycling systems, as the (mechanical) recycling facilities are not meant to recycle natural fibres (Song, Murphy, Narayan, & Davies, 2009). Or these packaging types are incinerated or landfilled without utilizing their potential for organic treatment, such as creating biogas, compost, or usage in black soldier fly installations. This means that compostables can play a role, but only when integrated with proper separate collection schemes coupled to the right organic waste treatment route. In countries like Indonesia, these conditions are not yet present.

3.4 Reducing plastics at the source as the focus problem domain

Fundamentally rethinking product delivery, service systems, and plastic packaging leads to reducing waste at its source, striving for a circular economy with (social) businesses that skip plastics in the first place and may change the way we consume products forever, for the better.

> *"Recycling is better than disposal, reuse is better than recycling, but reduction is best of all. It is easier to deal with a flood by turning it off at its source than by inventing better mopping technologies."* _ *(Meadows, 1989)*

We need to start by bending the curve of plastic packaging production - tackling the problem at the beginning of the value chain. Introducing business models that reimagine consumption and delivery models have the potential to *actually* decrease the growth of plastic pollution. Simultaneously, new business opportunities loom on the horizon - especially as governments around the world are increasing legislation to ban single-use and disposable plastics. Innovation in this field, for example refill and reusable subscription models, could strengthen loyalty relationships with consumers, as well as increase value chain efficiencies, reducing costs and negative externalities. It is inevitably an opportunity for existing market players to lead the change, ensuring business continuity within a circular economy. As some pioneering start-ups are showing, there is a growing zero waste customer base to tap into. For example, in New Zealand, the trend of *nude shopping* (shopping vegetables and fruits without packaging) proves to be a successful business case, where supermarkets that ditched plastics reported a 300% increase in vegetable sales (New World, 2019). Moreover, successful start-ups such as CupClub (to-go-cup as a service), Algramo (refill vending machines) and Repack (reusable e-commerce system) show that skipping single-use plastics opens up a whole new sphere for completely innovating and redesigning today's shopping experience.

Towards a new paradigm for plastic solutions

The strategies of disposing, recycling and substitution all have their flaws and will not provide the solution to the exponentially growing plastic pollution problem. The reduction strategy also has the highest reduction percentage (30%) in the overall System Scenario (PEW Charitable Trust & Systemiq, 2020). The place where we need to start, therefore, is to fundamentally rethink the way we consume so we can radically reduce the absolute volumes of plastics put on the market. If we really want to bend the curve, we must innovate and scale business models that reduce plastics at the source. Only then will we be able to sustainably and fundamentally change the course of this problem.

This new paradigm consists of, adapted from (PEW Charitable Trust & Systemiq, 2020):

1. **Eliminating plastic:**
   Eliminating plastic packaging usage can be achieved in multiple ways, such as developing packaging-free products, decreasing consumption and production of avoidable plastic bags and films, redesigning overpackaging (preventing double-wrapping plastic packaging), increasing the utility per package, and extending the life of household goods. This can be achieved via policy interventions, changes in consumer behaviour, and incentives that lead to reduced material demands.
2. **Alternative delivery models:**
   a. Replacement of single-use products and packaging with reusable items which are owned and managed by the user/consumer (e.g. water bottles, reusable bags or containers for package free stores). This can be incentivised by means of apps or digital rewards.
   b. Services and businesses providing utility which was previously performed by single-use plastics in other ways. In this model, the provider/business manages the reusable items. This includes various reuse and refill mechanisms (see Chapter 4 for more details), package free stores, and reusable shipping and logistics.

4. Global Zero Waste Market

This chapter offers a brief overview of innovative strategies targeting plastic waste reduction, focusing on three primary approaches for reduction. While not exhaustive, this compilation offers valuable insights into the geographical and typological distribution of plastic reduction innovations, illuminating existing market gaps and potential opportunities.

Historically, various traditional and informal reduction methods, like India's Dabbawalla food delivery systems and informal milk vendors in Kenya**,** have long existed globally (Henderson, 2017; Evans, 2023). However, these practices have gradually eroded due to evolving consumption and production patterns. This overview will highlight contemporary solutions seeking to revitalize these traditional practices in innovative ways while also introducing entirely novel approaches to addressing the issue of plastic waste. The subsequent subchapters describe identified patterns of plastic reduction innovations, categorized into the three types of reduction strategies outlined in the preceding chapter.

4.1. Eliminating plastic

Elimination strategies focus on reducing plastic material consumption and use. A prominent yet indirect approach involves regulatory interventions, particularly through policy measures aimed at restricting or prohibiting the usage of single-use plastics. With at least 175 countries agreeing to implement regulatory measures to reduce plastic waste, among the most widely adopted measures are those targeting plastic bags (WWF, 2022). A growing alternative strategy is plastic taxation, which incentivises manufacturers to reduce plastic usage and increase the use of recycled materials.

Driven by evolving regulations, environmental concerns, and market demands, there has been an uptake in product redesign initiatives that aim to reduce plastic use in both the primary product and its ancillary components (e.g. packaging). These approaches have been identified globally for personal care and home care products, household goods, and other personal accessories. For instance, there is a growing trend towards packaging-free consumer goods, especially for personal care brands such as Amor Luminis (Australia) or Lush (United Kingdom) (Lush, 2024; Amor Luminis, 2024).

Another alternative product redesign approach is to increase utility per package and extend the life of goods, thereby minimizing waste and environmental impact in the subsequent stages of the product life cycle. For fast-moving consumer goods, notable approaches include concentrate-based refills presented in capsules, tablets, or modular caps (e.g., 900.care personal care tablets) and refill options facilitated through smaller-sized packaging (e.g., Solmates refillable sunscreen, B-CAP refillable bottle caps) (9000.care, 2024; Wallonia, 2019; Solmates, 2024). Other approaches for consumer goods involve designing durable and repairable products (e.g. DotDrops suitcases) and incorporating modular designs (e.g. Fairphone electronic goods) (Plastics le Mag, 2023; European Circular Economy Stakeholder Platform , n.d.).

4.2. Alternative delivery models

4.2.1 Consumer-owned models

Consumer based models are designed to encourage behaviors that prolong the lifespan of products through reuse and refill, involving items individually owned and managed (e.g., water bottles, reusable

bags). This approach relies significantly on the intrinsic motivation of individuals and organizations, making it a potential leverage for fostering a consumer-led transition.

Zero-waste shops come in both traditional and modern formats, catering to various customer segments. They typically offer refill systems in-store alongside bulk options, allowing customers to bring their own packaging (or sometimes use packaging provided by the store, which then would be a provider-owned model; see next paragraph). Examples of package-free shops include Package Free Shop chains (United States) and Original Unverpackt (Germany) (Package Free Shop, 2024; Original Unverpackt, n.d.).

The adoption of consumer-owned models can also be externally influenced and requires facilitation by the broader system. One approach involves promoting new reuse/refill norms through governmental regulations, organizational policies, or advocacy efforts (e.g., plastic bag bans, bring-your-own-bottle initiatives, plastic-free movements). Another effective method to influence behavior is through gamification, such as how Agentes do Meio Ambiente (Brazil) incentivise sustainable behaviours through cashbacks, or BuzzLoops' (Malaysia) reusables reward systems (AMA, 2022; Buzz, 2024).

The implementation of consumer-owned models often intersects with other sustainability strategies. For example, the availability and accessibility of alternative products resulting from elimination strategies bolster the adoption of reuse behaviors (e.g., transitioning from single-use plastics to durable, reusable alternatives). Additionally, consumer strategies establish a symbiotic relationship with provider-owned models. Consumer demand for reusable options drives the development of provider-owned models, while these models, in turn, facilitate the adoption of reuse behaviors among consumers.

4.2.2 Provider-owned models

Provider-owned models represent a spectrum of value chain innovation strategies aimed at introducing alternative products, services, and consumer interactions, thereby mitigating reliance on single-use plastics. Among these models are (FMCG products based) refill & return systems, zero-waste commerce & services, returnable food ware systems, and transport packaging systems. Zero-waste commerce and services providers are the most prevalent globally, making up over half of the identified solutions, followed by provider-managed refill and return systems which make up about around one-quarter (Overbrook Foundation & Plastic Solutions Fund, 2023).

Refill & return systems for FMCG products

Provider-managed refill and return systems represent innovative approaches to product-service delivery and return logistics, fostering novel business-to-consumer engagements. These systems are prevalent across items related to food & beverage, home & personal care, and drinking water (FMCG products).

Within this category, two primary systems have emerged, each exhibiting varying degrees of technological advancement and customer interactions. Pre-filled returnable systems equip consumers with ready-to-use products at the point of sale, accompanied by mechanisms for packaging return and reuse (e.g., På(fyll) delivery service for home care products, Circolution reuse solutions for food).

On the other hand, refill dispensing stations empower users to replenish their products using either provided or personal packaging at kiosks, vending machines, mobile stations, or embedded in retail

experiences. High-tech examples of these stations include those embedded with smart dispensing or tracking technology. Conversely, there are low-technology alternatives which are particularly prevalent in the Global South, such as the Refillable refill vans (Bangladesh) and the Kuha sa Tingi refill program in the Philippines (Refillable, n.d.; Greenpeace, 2024).

Zero-waste commerce & services

Zero-waste commerce & services focus on selling goods or delivering services in ways that significantly reduce or eliminate single-use packaging. The most common form of zero-waste commerce are stores which sell items in bulk, often providing alternatives to plastic-packaged products and featuring items produced through waste elimination strategies. Common product categories in these zero-waste shops include Food & Beverage and Home & Personal Care.

Another solution within this category is zero-waste service, which are service providers aiming to significantly reduce the amount of waste generated during their operations. As this subcategory is loosely delineated, the approach may intersect with other models, such as returnable food ware systems. These service providers, ranging from hospitality to event management, achieve waste reduction through prevention, byproduct reutilization, and recycling. Notable examples include Conscious Hotels (Netherlands), Silo Restaurant (UK), and Coldplay's most recent world tour (Conscious Hotels, n.d.; Silo, 2024; Coldplay, 2024).

Returnable food ware systems

Returnable food ware systems offer alternatives to reduce the reliance on single-use items for food and beverage consumption. Some providers, such as BillieCup (Belgium) and TURN (United States), specialize in cup programs, offering reusable and returnable cups for hot or cold beverages along with collection systems (Bommel, 2023; TURN, n.d.). In contrast, container programs such as Ecoceno (Portugal) focus on providing reusable takeout containers for food (Ecoceno, 2024). Providers like CLUBZERØ (United Kingdom) and r.World (United States) integrate both cup and container systems within a unified reuse system (CLUBZERØ, 2024; r.World, n.d.).

These returnable cup and container programs have been implemented in a range of venues, including cafes, universities, corporate complexes, and various transportation modes. Additionally, there are ongoing implementations and pilots to test the adoption of container programs for home delivery services. Some returnable food ware systems have embedded technological enhancements to increase their value proposition, such as RFID tracking, app-based gamification to boost return rates, or smart dispensing and collection machines (Reusable Packaging Association, 2020).

Transport packaging systems

This category focuses on reducing waste in transportation and delivery, both in business-to-business (B2B) and business-to-consumer (B2C) contexts. Given the diverse forms of packaging existing in transportation, B2B and B2C often tackle distinct forms of transportation and packaging types.

In B2B scenarios, alternative shipping options aim to diminish reliance on single-use cardboard boxes, insulating materials, and plastic pallet stretch wrap in logistical operations. Innovations like RePackify (United States) and Pandobac (France) exemplify solutions targeting this aspect (Pandobac, 2024; RePackify, n.d.). Conversely, in B2C settings, reusable shipping mailers replace single-use plastic mailers and cardboard boxes for both product delivery and reverse logistics (returns). Promising pilots for such solutions include RePack (Finland) and Boox (United States) (Boox, n.d.; RePack, 2024).

Additionally, some providers, like Boxbee (United States), offer specialized services with reusable containers for moving services (Boxbee, n.d.).

Another approach involves technological innovations in product design, means of distribution, or retail that reduce reliance on plastics to maintain product quality. This is evident in the use of non-toxic spray to preserve fruits at Albert Heijn retail stores in the Netherlands (Hollander, 2021).

4.3. Trends and lessons learned from the global zero-waste market

Since our initial research in 2018, the zero-waste market has experienced significant shifts, including the rise and fall of various business models. The pandemic has notably altered consumer behavior, with lockdowns driving an increased demand for convenience and home-based services, posing challenges for zero waste businesses that require physical interactions. Zero waste shops, which comprise a substantial portion of the global zero waste market share, have faced closures due to their reliance on in-person retail interactions and the difficulty in crossing the chasm into mainstream consumer adoption related to convenience issues (Wolfe, 2022).

A noteworthy trend is the adoption of alternative models by traditional environments and incumbent industry players. Instead of standalone bulk or refill shops, supermarket chains are increasingly incorporating bulk options or refill stations as part of their offerings. The application of alternative systems has also diversified. Returnable food ware, initially common in local coffee shops or restaurants, is now being piloted at events and universities. Although often still in trial or early stages, this adoption demonstrates the growing acceptance and implementation of zero waste models across various settings.

There has also been an increase in collaborative, cross-stakeholder approaches to implementing alternative models. For example, alternative e-commerce packaging pilots have been conducted by Austrian Post, retail companies in Austria, and the University of Upper Austria (SGI Europe, 2022). Similarly, the collaboration between Seoul Municipality and Yogiyo, a leading food delivery app in South Korea, piloted the implementation of reusable packaging solutions for food and beverages (Ji-Eun, 2022).

Moreover, with the growth of emerging technologies such as blockchain, we are increasingly seeing its implementation to drive circularity. These technological innovations are commonly leveraged to enhance the efficiency and accountability of zero waste initiatives, further supporting their adoption and scalability. For instance, blockchain can ensure traceability and transparency in the supply chain, enabling consumer trust and regulatory compliance. Circularise, based in the Netherlands, is an example where blockchain is used to design digital passports for product traceability.

At macro level, shifts have influenced the market in three key areas: consumer spending, the circular investment landscape, and business model viability. Economic uncertainties have led to more prudent consumer spending and investment decisions, posing challenges for the sustainability of certain business models. However, these shifts also push for pivots and exploration of viable business models. Additionally, regulatory measures banning plastics have created demand and provided pathways for alternative models to thrive.

5. Indonesian Zero Waste Market

This chapter focuses on the zero-waste solutions landscape in Indonesia, mapping entrepreneurs and start-ups that are capturing market opportunities and reducing single-use plastics at the source. It also highlights traditional and informal practices that have long contributed to the reduction of single-use items and lessons learned from initiatives within Enviu's Zero Waste Living Lab.

5.1 Zero-waste innovations and practices in Indonesia

This subchapter highlights both cultural practices and recent innovations that shape, or have the potential to shape, the zero-waste landscape in Indonesia. The subchapter will present several key examples and expand upon previous research conducted during the inception of Zero Waste Living Lab (Poggenpohl, 2018). Focusing the research on the island of Java, many of these initiatives operate exclusively at a local level, concentrating on their respective cities. Additionally, more informal practices often exist on an even smaller scale within these communities.

Meanwhile, identified innovators are predominantly located in larger cities such as Jakarta, Bandung, Bali, and Surabaya. To mainstream zero waste and a single-use plastic-free lifestyle, it is crucial to significantly expand the reach of these practices. This raises an important question on how these locally tailored solutions can be effectively applied across a diverse country like Indonesia, which varies greatly in terms of sociocultural, institutional, and environmental aspects.

5.1.1 Eliminating plastic

As discussed in the preceding chapter, Indonesia has implemented several targets and regulations to promote plastic reduction; however, the enforcement and effectiveness of these measures remain unclear. An exemplary case is the city of Banjarmasin, which successfully restricted plastic bags with strong government support and cooperation from businesses and the community (National Plastic Action Partnership, 2020). The city promotes the use of locally produced traditional baskets as alternatives.

The private sector has also shown some commitment. For instance, the leading retail company Mitra Adiperkasa pledged to reduce the use of plastic food ware and bags (Mitra Adiperkasa, 2022). GoTo Group, Indonesia's largest mobility and commerce company, has placed waste reduction as one of its main sustainability commitments (GoTo, n.d.). Nevertheless, greater accountability and thorough implementation for these ambitions are still necessary.

Senormal hand soap & refill tablet (Senormal, n.d.)

Refill pouches remain a widely adopted method for selling goods among FMCG companies, with consumers often using these pouches as primary packaging instead of refilling another container. Due to their economic benefits for both producers and consumers, these pouches are common for non-perishable food, personal care, home care, and cosmetics.

Meanwhile, there are fewer identified sustainability-oriented innovations in Indonesia intended towards increasing product utility and use cycle. There exist several innovations aimed at reducing the use of plastics in both main packaging and refill packaging. For example, Stoneroot Essentials offers natural

bars for both personal and home care, and Gracious Project provides customizable, make-it-yourself refills. Another approach is seen with Senormal, which offers concentrate refill tablets for home care products, aimed at increasing the utility per product.

5.1.3. Alternative delivery models

Consumer-owned models

Strategies encouraging reuse behaviors among individual and collective consumers are being implemented at various levels by different ecosystem stakeholders. Many identified consumer focused models primarily focus on incentivizing the reuse of plastic bags, beverage containers, as well as adoption of alternative reusable products.

One notable example of multi-stakeholder collaboration between the government and advocacy groups is the initiative by Dinas Lingkungan Hidup DKI Jakarta and Plastic Diet (Dietplastik) Indonesia. In response to the plastic bag ban in Jakarta, the initiative installed bag drop stations at markets, enabling consumers to recirculate their reusable bags (Dietplastik Indonesia, 2024).

Drop stations for reusable bags at a local market in Jakarta (Wardani, 2024); *Drinking water refill stations for Bluebird Taxi employees* (Haryono, 2023).

Academic institutions, corporations, transportation providers, and event organizers have been applying policies and communication campaigns to encourage people to bring their own bottle containers by providing more water refill stations and limiting the provision of packaged water in their facilities. As seen in the above example, Bluebird taxi company collaborated with WWF to install 1.500 refill stations for its armada of drivers (Haryono, 2023).

In the service industry, more restaurants and cafes are offering discounts to customers who bring their own drink containers, frequently in conjunction with selling their own branded tumblers. This trend is bolstered by a cultural shift in Indonesia, where Millennials and Gen Z exhibit a strong preference for owning tumblers (Nisa, 2022). This shift is driven by various individual reasons, including environmental concerns, lifestyle choices, aesthetic expression, and well-being.

It is also worth noting that more retailers and brands are implementing take-back systems, offering discounts and rewards in return for used containers. However, these initiatives are largely motivated by corporate sustainability efforts and tend to be more oriented towards recycling. For instance, cosmetics & personal care brand The Body Shop, as well as retailer Super Indo offer discounts when customers bring in used packaging (The Body Shop, 2024; Super Indo, 2024). This trend is enabled by the growth of waste management and recycling companies in Indonesia, such as WaHu and

Waste4Change, which offer B2B2C incentive programs and have formed partnerships with various retailers and brands. (Super Indo, 2024; Itsnaini & Alezander, 2024).

Water bottles at informal petrol stations, filled with petrol (Pertamini, 2024)*; Wafer containers refilled with savory shrimp crackers* (Iput, n.d.).

Culturally, there are established consumer practices that involve repurposing packaging originally intended for single use. Sometimes, products are reused for their original purpose, such as food containers being reused to store food. In other instances, products are repurposed for different uses, which theoretically fall into repurposing rather than reuse. Adoption of consumer reuse behaviour is also enabled by the availability of alternative reusable products for home use. These products range widely from reusable sanitary products, such as Perfect Fit, to locally produced straws made from bamboo (Bapelitbang Bintan, n.d.; PerfectFit, 2024).

Zero-waste retailers (bulk stores) in Indonesia largely resemble those found globally, focusing on product categories such as Food & Beverage and Home & Personal Care. In the late 2010s, there was a surge of modern bulk stores across Indonesia, particularly in larger cities like Jakarta, Bandung, Yogyakarta, and Denpasar (National Plastic Action Partnership, 2020; Poggenpohl, 2018). However, the number of these modern bulk stores has significantly declined, leaving only a few small-scale stores in these major cities. This reduction is partly due to the impact of the pandemic on physical stores and the fact that bulk shopping remains a trend rather than an integrated part of everyday consumer lifestyles, despite being competitively priced compared to regular grocery stores (Widiati, 2023).

Conversely, traditional zero-waste retailers have proven to be more resilient over time. Exemplary zero-waste traditional markets include Dhoplang Market in Wonogiri and Sindu Market in Bali, where plastic bags are banned for commerce activities. Additionally, there exist small-scale bulk stores catering to lower-SES segments, specializing in a single product category, such as rice, cookies, or savory snacks. While these stores sell items in bulk and allow purchases using consumer-owned packaging, plastic prevention or reuse is not their primary aim, resulting in the continued presence of single-use plastics for customers.

Bulk savory cracker vendor (Research Documentation)

Provider-owned models

This section highlights models in Indonesia that provide alternative products & services, both with intentional and unintentional efforts to reduce plastic waste. These delivery models can be elaborated into four distinct, yet interlaced categories: (FMCG product based) refill & return systems, zero-waste commerce & services, returnable food ware systems, and transport packaging systems.

Refill & return systems for FMCG products

Similar to the global innovation landscape, these refill and return systems in Indonesia exist in two distinct models: pre-filled returnable systems and refill stations. These systems cater to categories such as home and personal care products, water, non-perishable food, and beverages (FMCG products). Systems for home and personal care products are more widely implemented because their product quality and handling standards are relatively laxer, while food and beverage items require more rigorous handling (Dietplastik Indonesia, 2024). Meanwhile, the absence of adequate drinking water infrastructure contributes to the prevalence of water refill solutions in Indonesia.

Existing pre-filled returnable systems provide consumers with ready-to-use products at the point of sale, along with mechanisms for packaging return and reuse. Examples include Alner and Hepi Circle. Both businesses have expanded significantly, with Alner reaching over 600 sales points and Hepi Circle expanding its operations to Jakarta, where both companies synergistically use shared facilities. Another widespread pre-filled system in Indonesia involves water gallons, where a significant portion of distribution and collection activities to and from end consumers is handled by smaller-scale distributors and retailers, who then redistribute to producers or (informal) water refill depots.

Meanwhile, pre-filled returnable systems managed by both larger FMCG producers and smaller local producers are still in operation for certain product types. These systems typically cater to non-perishable food and beverages served in glass containers and distributed in crates. However, their scale is much smaller compared to the same products packaged in single-use plastic and the operations are more oriented towards businesses, such as restaurants and warungs. Examples of beverage products provided through these systems include sweetened tea (e.g., Teh Botol by Sosro), beer (e.g., Bintang), water (e.g., Aqua Reflections by Danone), soda (e.g Badak brand) as well as products from smaller local producers like jamu and soy sauce (PT. Sinar Sosro, 2024; Multi Bintang Indonesia, 2024; AQUA, 2024; Amanda Amelia, 2023).

Returnable glass bottles for soda (Tokopedia, n.d.)

Refill dispensing systems in Indonesia vary significantly in terms of technological advancements, means of provision, and market operations. Qyos introduced Indonesia's first high-technology refill machine, successfully piloting with multinational and local FMCG brands in partnership with retailers. Although Qyos has ceased operations, an iterated low-tech model is now being further piloted by Alner and Unilever (Unilever, n.d.). Another notable refill solution provider is Siklus, which offered motorcycle-operated refill stations that deliver directly to households (Siklus, 2024). Siklus needed to discontinue the mobile refill service however due to restrictions from the regulating agency (BPOM) in Indonesia. The most prevalent category of refill systems in Indonesia is water refill stations, with providers such as Waterhub, Paus Biru, Nazava, Izifill, and Terra Water operating in homes, schools,

transport hubs, offices, and various other public spaces (Waterhub, 2024; Paus Biru, n.d.; Nazava Water Filters, 2021; Cleanomic, 2024; Terra Water, 2022).

Additionally, there are MSMEs acting as refill providers, selling unlabelled, often lower quality products in bulk. These allows the refillable items to be sold at much cheaper prices, making them an economical option for lower socioeconomic segments. While these providers refer to their service as "refill" (isi ulang), these service providers do not place plastic prevention or reuse as their primary intent. However, they allow customers to voluntarily bring their own packaging. Common items sold in this manner include unrefined palm oil (minyak curah), liquid home care and personal care products (e.g., detergent, hand soap, shampoo), and perfume.

Customers purchasing unrefined cooking oil with gallons and jerrycan containers (Nusabali.com, 2022)*; An informal perfume vendor refilling a branded perfume bottle* (Fahleviana, 2022)

Zero-waste experiences

Service providers providing zero-waste experiences in Indonesia are largely found in hospitality, such as hotels and cafes. These businesses aim to reduce their waste generation through prevention, byproduct reutilization, or recycling. Examples include the beach club and hotel Desa Potato Head (Bali) and Ecaps cafe (Jakarta) (Kecipir, n.d.).

Returnable food ware systems

Providers offering returnable food ware systems in Indonesia include the same key players identified in earlier research: Taksu, Balikin, and Allas. These returnable food ware providers offer programs for both cups and containers, primarily targeting small-group events and festivals (B2B), whereas Allas has also piloted B2C delivery services. In 2024, Alner launched its ready-to-eat meals lineup, AlnerFood, partnering with F&B providers to deliver pre-scheduled meals to its customers.

Transport packaging systems

Despite the high volume of single-use packaging generated in the transportation and delivery of goods, few innovations have been identified to address waste reduction in this sector. One early-stage venture, Re-pax, focuses on reducing e-commerce tertiary packaging (PT Logistik Kembali Lestari, 2023). Additionally, Kecipir, while offering farm-to-fork services as its main proposition, actively delivers perishable food to customers using reusable packaging (Kecipir, 2021).Cardboard and industrial packaging (e.g. crates and pellets) are several types of secondary/tertiary packaging that have been identified to be recirculated for reuse. As they hold monetary value, there exist informal and formal marketplaces for these items (Dehotman, 2017). End consumers may have their used cardboard collected by door-to-door informal waste pickers, while used industrial packaging such as pallets can be found in both online and offline marketplaces. Within businesses, there are examples of

repurposing cardboard: for instance, Super Indo and Lotte Mart provide used boxes for customer purchases, while cut-up cardboard are repurposed for in-box fittings (Super Indo, 2017; Lotte Mart Indonesia, 2023). Bubble wrap, on the other hand, is found to be reused for smaller use cases by businesses and end consumers.

Used cardboard at Super Indo available for customer purchases (Research Documentation); Collection of used cardboard and paper for resale (Fitriana, 2017).

Cardboard and industrial packaging (e.g. crates and pellets) are several types of secondary/tertiary packaging that have been identified to be recirculated for reuse. As they hold monetary value, there exist informal and formal marketplaces for these items (Dehotman, 2017). End consumers may have their used cardboard collected by door-to-door informal waste pickers, while used industrial packaging such as pallets can be found in both online and offline marketplaces. Within businesses, there are examples of repurposing cardboard: for instance, Super Indo and Lotte Mart provide used boxes for customer purchases, while cut-up cardboard is repurposed for in-box fittings (Super Indo, 2017; Lotte Mart Indonesia, 2023). Bubble wrap, on the other hand, is found to be reused for smaller use cases by businesses and end consumers.

While not directly focusing on prevention or reuse, there is an increasing trend of brands aiming to use less plastic in their secondary packaging. This shift, driven in part by plastic bag regulations and growing environmental awareness, includes substituting plastic with alternatives such as paper and biodegradable materials in their delivery processes.

5.2 Lessons learned from our solution development

The zero-waste market presents itself as a potentially impactful avenue for promoting sustainability and resource efficiency. As the zero-waste market is an emerging market, it's crucial to analyze the learnings from pilots and initiatives implemented. In Enviu's Zero Waste Living Lab program we have summarized our learnings from our solution development in the period of 2019-2023 in this section.

Econesia (2019-2023)

Econesia offered water filters accompanied by reusable glass bottles for drinking water provision in hotels, restaurants and businesses. The product (the water filter) came with maintenance as a service. The product could also deliver what it promises: clean drinking water. Tests showed that the water from the filters is cleaner than the water sold in the gallon system that is common in Indonesia (based on refills). A large potential market was identified, especially on Bali, where the tourism

industry wants to take steps to reduce single-use plastic packaging waste. The system moreover has a business benefit as it is cheaper than using single-use water bottles in the long run. This allowed Econesia to expand and scale quickly initially, making large plastic reduction impacts: Econesia saved over 2 million single use plastic bottles or the equivalent of more than 26 tonnes of plastics.

Econesia however got impacted by the Covid-19 pandemic. As the hospitality industry in Bali was hit hard, Econesia's sales were also impacted. Covid-19 also increased concerns about hygiene of reusable packaging. Studies showed there was no health risk, but the perception was strong.It turned out to be hard to get consumer's trust on the filtering technology. Drinking water must be safe and consumers and resellers didn't trust the filtering technology that easily. These challenges need to be tackled, but with the proven impact potential and business model with cost savings for users, there is still big potential for these water filter solutions to tackle the pollution from single use plastic drinking water bottles.

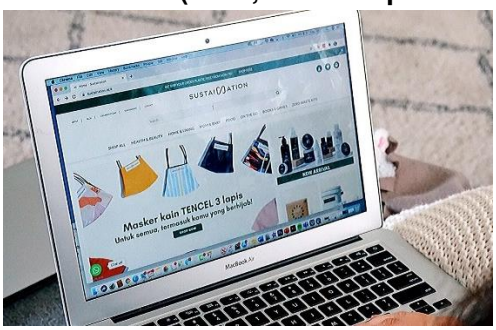
QYOS (2020-2023)

QYOS offered Indonesia's first refill-on-the-go station for daily FMCG products. Pilots were done both for food grade and non-food grade FMCG products. As the pilots were developed in close collaboration with the quality teams of the FMCG partners, QYOS was able to reach the food grade quality standards for dispensing via the machine. The technological basis was the Algramo developed refill machine, which was adapted to meet the local (FMCG) standards. Partnering with FMCG brands lowered the purchase barrier for consumers. It was also learned that allowing customers to bring their own bottles for refills improved the sales.

The QYOS pilot also revealed some barriers with regards to refill in Indonesia. Indonesian customers prefer personalized assistance over self-serving, so a machine is not their preferred serving method. Customers moreover prefer the purchase journey to be as simple as possible, so low technology fits better than high-tech technology. The business case around a QYOS machine was also a difficult one to make with high upfront costs, high maintenance costs accompanied by additional salespersons (needed for the Indonesian market), considering the machine was intended to be self-service. It was therefore difficult to compete with the pricing of the existing single use packaged products. The machine finally took up quite some space for dispending only 1 or 2 products also considering the refill stock that needed to be present in the warehouse. The space requirements were not feasible in the Indonesian context where mini marts make up the largest part of the modern trade retail sector.

The QYOS pilot showed us that there is a market for refill in Indonesia, but another set-up is needed. More low-tech refill solutions fit better in the context of Indonesia, tailored to specific products in specific areas.

Sustaination (2020, finalized partnership work in 2022)



Sustaination is a one-stop online shopping platform (e-commerce) and learning platform enabling consumers to adopt zero waste lifestyles. Sustaination was founded in 2018 by Dwi Sasetyaningtyas (Tyas). The platform is still growing its numbers of users/customers and available products. Sustaination and Enviu partnered in the period 2020-2022 to grow the impact and the business.

The Sustaination model revealed that there is a niche market of environmentally conscious consumers in Indonesia. These consumers show themselves to be very loyal, leading to recurring revenues instead of one-off purchases. The model also appears to be a great tool in creating awareness of zero waste. Besides income from the purchases itself, Sustaination also applies a pay to display (B2B2C) model, which generates large revenue streams. On the operational side of things, Sustaination is very strict on product stewardship: the platform applies high sustainable standards for brands to sell in Sustaination, demanding innovation on their packaging end (as zero waste as possible) for instance. The high sustainable procurement standard is also directly one of the main learnings, as it was quite hard to have brands/ product providers comply to these standards initially, limiting the amount of products offered when starting.

Kecipir (2019, finalized partnership work in 2022)

Kecipir is an e-commerce business in Indonesia serving fresh and organic produce from local farmers directly to urban consumers through a fully reusable, circular delivery system. Kecipir was founded in 2013 by Tantyo Bangun. The business is still active and gradually growing its operations. In June 2019, Enviu joined forces as co-entrepreneur of Kecipir to scale this impact-driven company. The partnership lasted until 2022.

The Kecipir model shows that convenient and affordable access to organic produce is possible, whilst at the same time majorly reducing plastic waste from fruits and vegetables wraps. Moreover, the organic farmers included in the Kecipir model can increase their profits by 40% due to a fair and direct market, as Kecipir eliminates multiple distribution and logistics steps that take up margins from farmers in standard agricultural supply chains.

The main learning from the Kecipir model is that it is quite hard to make this model mainstream, when competing with standard agricultural produce that is so widely available. So, till date, Kecipir is serving a growing niche market of environmentally aware consumers. Kecipir is experimenting with returnable packaging systems (with glass bottles for their milk for instance), partnering with another Enviu venture, Alner (see later on in this paragraph).

WashBy (2020)

WashBy provided a sustainable alternative to detergent packaging through a detergent dispenser. The refill model allowed laundry store owners to buy detergent in bulk straight from the producer, thus saving money and plastic in the process. By shortening the supply chain, the aim of WashBy was also

to offer a more cost-efficient detergent with the same quality and zero plastic waste. The model was designed specifically for dosing the right amount of detergent.

Washby was invalidated after an initial pilot, as not enough laundry stores were present to make for a feasible business case. Expanding the focus to other target areas would make the model like a normal online delivery model such as Tokopedia or Amazon. Competing with such players is very challenging.

Tapauware (2021-2022)

Tapauware was Malaysia's first reusable meal container service company. Tapauware operated a business model of purchase or upfront deposit that allowed users to use pay for the packaging per use and get refunded by returning it.

The initial market study showed that consumers welcomed this idea to combat single-use plastics in the food and beverage sector in Malaysia. It was learned, however, that these initial enthusiastic responses were from the minority of sustainability minded middle to upper-class demographics. The actual pilot afterwards was run in a district with middle-income consumers, who valued convenience, cost savings, and coolness. The growth of uptake in the model was not what it was projected to be. Operations were therefore too expensive for the limited uptake: mass adoption is needed before cost savings become apparent and these meal container models can be financially sustained.

ALLAS (2021 – date)

ALLAS operates a similar model as Tapauware did: it is Indonesia's first returnable packaging service for meals and drinks. ALLAS was a follow-up of our earlier venture Cupkita, that focused on reusable coffee cups only. Two main business models have been tested or operated: (1) providing reusables for events or closed areas such as canteens or food courts where food and beverage providers are present on-site, and (2) delivering food and drinks from restaurants to consumers via returnable food ware.

Best practices from ALLAS show that there is a high demand for this service (both types) in niche markets of environmentally aware businesses and individuals. As the consumers are intrinsically motivated, ALLAS also shows very high return rates: averages of 93% were obtained over the last years. Like the Malaysian situation, the demand from a niche market leads to a loss-making model: operational costs outweigh the pricing structure of the returnable packaging model. On top of this, the second model of delivering food and drinks from restaurants deals with additional challenges.

The food and drinks delivery service (called 'sustainable meal assistance') of ALLAS was invalidated early 2024. The following reasons underpin this invalidation:

- The model is heavily dependent on restaurants and logistics services for the service: when they don't deliver in time/at the right quality standards, this is also reflected negatively on ALLAS;
- Serving via online food delivery services (e.g. GoJek and Grab in Indonesia) does not work as adjustments are needed on the application's operational and UX end;
- There are no incentives/regulations in place in Indonesia that stimulate to move away from single-use plastics in the food and beverage sector. It is seen from European and American markets, for instance, that having the right regulations (such as taxing single-use plastics take-outs for meals and drinks) stimulates the use of returnable meal packaging systems;
- Orders for sustainable meal assistance, both from companies and individuals, are rather limited in size compared to orders for events, for instance. This leads to an even more challenging business case for this model as the logistics costs per order are even higher.

ALLAS is exploring the returnable packaging system for events and closed loop spaces.

Alner (2020 – date)

Alner operates a tech-enabled reusable packaging system for consumer goods on a deposit and reward model to replace sachets and other types of single-use packaging. With a focus on such replacements, Alner is reducing the usage of one of the most polluting types of packaging by offering local warungs, mini markets, and waste banks with a reuse option for their daily needs. This prevents single-use packages from being created altogether and provides brands with a simple zero-waste opportunity to sell their products.

Alner is showing an increase in consumer uptake numbers. Consumers can be divided into two main categories: (1) offline / community-based consumers, and (2) online, e-commerce-based consumers. The first category of consumers is usually lower to middle-income consumers, that got introduced to the model via their local waste bank or local shop. The second category of consumers is usually higher income consumers that buy directly from Alner's platforms due to environmental reasons. The growth in the engaged communities, with over 700 communities engaged now, shows the success of Alner: Alner takes out many distribution steps in the FMCG supply chain, allowing the reselling communities to increase their income by on average 10-15%. Alner, therefore, needlessly combines environmental and social benefits in their model. Alner itself is also revenue generating, even when competing with very cheap single-use plastics.

Alner also had to overcome some challenges. As regulations and standards around cleaning and sanitizing returnable containers weren't defined yet in Indonesia, these standards were set together with the FCMG partners involved. This took a lot of time and effort, but eventually also led to the Alner facility including all its activities being officially certified early 2024. Setting up a completely new circular supply chain for returnable containers also required Alner to engage in many activities at the same time: providing returnable containers, refilling services, distribution, reversed distribution of empty

containers, cleaning and sanitizing. Alner is currently focusing its activities and preparing its model for large scale uptake in collaboration with supply chain partners.

5.3 Barriers that challenge zero waste innovation in Indonesia

As we are interested in identifying market opportunities to bring the zero-waste market to maturity, we need to understand the key challenges and barriers that zero waste innovations face. These are more general barriers and opportunities, besides the venture specific lessons learned as summarized in paragraph 5.2. This paragraph focuses on the barriers first: zero waste innovations are in competition with single-use plastics that currently provide many benefits for people. Let's understand the perceived benefits and habits of single-use plastic packaging in the local context of Indonesia.

Single-use plastics are cheap, lightweight and convenient
Competing with plastics is not an easy battle. Single-use plastics are cheap and therefore mostly given for free to customers. Switching to reusables usually demands a bit more financial investment such as a reusable cup or bag and sometimes an extra effort as one has to bring the cup always. How might we design systems that reward this new habit, ensure convenience and attach a personal value to reusable items?

Cupped water and small bottles: part of the service culture and kindness
Single-use plastics are cheap packaging that serves as a service gesture by the vendors. Plastic bags are understood as kindness by both sellers and consumers. Usually, Indonesians are hesitant to reject kindness from other people. It is part of the *baraka*, in Arabic, meaning blessing, for them to give you. It is not easy in Indonesia to say no (Poggenpohl, 2018). Offering a plastic bag to one's customers at the *warung* or cupped water to a visitor is a service. Even the taxi-driver or the airline has 150 ml bottles of water available for its travelers. So, how might we design reusable services that enable stakeholders to keep or enhance their culture of kindness and service? How could this local habit be a driver to skip single-use plastics? And how could we keep offering a service when automating certain reuse or refill habits around packaging?

High trustworthiness and safety associated with plastic packaging
The devil lies in the details: an additional plastic sealing for bottled water ensures a customer's feeling of hygiene, that it has not been opened before. Receiving the cutlery in plastic packaging in restaurants strengthens the trust in the cleanliness of the place. Single-use plastics are not just a matter of convenience, but they have managed to communicate a deep feeling of trustworthiness. The Covid-19 pandemic has enforced this even more. During the pandemic, additional plastic bags or wraps were used to give users the feeling that their (e-commerce) orders were safe and hygienic. These pandemic habits now seem to persist in many services, increasing the (unnecessary) plastic packaging use in Indonesia.

Niche eco-conscious segment versus diversified consumer segmentation
The eco-conscious market segment in Indonesia remains small but is gradually growing. Observing the invalidation and pivots of zero waste innovations, it is evident that relying solely on this niche market makes it challenging for innovators to sustain their ventures. This is exemplified by the pivots of Allas and Siklus, as well as the closure of bulk stores across Java. In contrast, Alner has been able to grow by breaking into different market segments and archetypes.

5.4 Opportunities that enable zero waste innovation in Indonesia

The Indonesian culture provides a variety of opportunities and chances that enable to reduce single-use plastics and switch to more sustainable innovations. Let's reveal some insights and trends of the local context that could help boost zero waste innovations.

Switching single-use plastics to reusables is economically attractive
Even though single-use plastics are super cheap (subsidized by fossil fuel subsidies), reusables can make economically attractive business models, especially in Indonesia where operational costs are low. Reusable packaging skips many steps in the single-use plastic packaging supply chain where numerous distributors make margins on the products before they get sold. In setting up ventures like Alner, Enviu's Zero Waste Living Lab moreover learned that economic incentives for both consumers and resellers can be applied to support adoption of the reusable packaging. Resellers make higher margins on Alner's returnable packaging than they do on single-use plastics, allowing them to increase their income from selling these items by an average of 10-15% per month. Consumers in turn, can make use of cheaper purchases when they get the "cashback" upon returning their empty packaging, allowing them to also save an average of 5-10% on the groceries they buy in returnable packaging.

Diving in a plastic soup threatens tourism sector
Concern in local media is rising that plastic pollution is also an increasing threat for the tourism sector in Bali, (Dinata, 2019) and Indonesia's fishing industry. The tourism sector is a major economic driver and accounts for 5,8% of GDP in Indonesia, peaking at islands such as Bali. The potential economic losses deriving from environmental degradation therefore create a business case to reduce single-use plastics, especially in the view of Indonesia's strategy with ambitious tourism goals for 2024, mainly also based on 'sustainable and green tourism' (Koumelis, 2024). Paradoxically, the sector itself also drives an increase in demand for single-use plastics. Thus, this also offers an opportunity to stand out and reimagine a zero-waste tourism and restaurant experience.

Oceans have no borders:
Snack packaging floating protected area of Komodo Nationalpark

Religious quotes/support to reduce plastic bag use
A PhD research revealed that plastic bags are perceived as convenient and a "status statement of modernity". Key learning of this research is that giving out reusable bags for free through NGOs "had no effect on plastic bag reduction". Still, the researcher argues that it may yield higher results if the bags are distributed through local shop owners instead of the NGO ecoBali. "Customers who received a reusable bag with the printed quote by the Religious Authority reported a reduction of 10 plastic bags per week" (Spranz, 2018).

Health concerns as a driver to go zero waste
Personal concerns about the effects of plastics on the health or the health of the family have been identified as drivers to adopt a zero-waste lifestyle. Health and beauty have been mentioned as the

main drivers that draw people towards a zero-waste lifestyle. Concern about the environmental impact of plastic pollution has been mentioned as well in some cases (Poggenpohl, 2018). New zero waste innovations can use these drivers as vehicles in their communication to reach their target audiences.

Social media engagements are going zero waste

Social media engagement shows that concern about plastic pollution and an interest in zero waste is mainly derived from millennials and moms. A high engagement can be discovered in people ranging between 18-24 years with a university degree. From age 35, the engagement on social media drops (Brand24, 2019). With the young generation boosting this new paradigm, they can greatly serve as early adopters for zero waste innovations. Some examples of recent social media influencers that highlight these topics are, Pandawara Group (river waste cleaning action group), Bule Sampah (waste activist), and Mama4Planet (online community of eco-minded mothers) (Nariswari, 2023; Kurniawan, 2023; Mama4Planet, n.d.).

The phenomena of Instagram entrepreneurs

Starting in a very lean way, without much business infrastructure like an office, an interesting phenomenon is rising in Indonesia: zero-waste Instagram entrepreneurs. Instagram and WhatsApp are key communication channels in Indonesia. In Indonesia, Instagram counts over 100 million users which is about thirty five percent of Indonesia's population and ranks Indonesia fourth in a global comparison (Statista, 2024). Instagram is for free and an easy platform to test and launch new ideas, products and services.

6. Focus solution domain

Based on the massive scale and the high complexity of the plastic issue, we see that actions to solve this problem are urgently needed. Our aim is therefore to build a showcase to radically reduce single-use plastics in Java and beyond. We want to make the zero-waste lifestyle the 'new' normal that is affordable and convenient for everyone. We work towards a world where plastic waste is greatly reduced, by switching from disposables to reuse in Southeast Asia, starting in Indonesia.

The impact potential that we aim to reach by 2026 is divided into two main parts: (1) a minimum of 20.000 tonnes of single-use plastic packaging avoided per year and (2) a minimum of 50.000 consumers using a lot less plastic.

6.1 Narrowing Down Opportunity Spaces

In building ventures that support our aim and vision, the ventures need to solve problems that are relevant to the market, but also viable for us to scale. We've explored opportunity spaces starting from where plastic waste generation is most problematic. We then clustered these spaces and mapped them based on our previous exploration, which new sectors can we expand on, and which interventions can be a support ecosystem for upstream solutions.

We've narrowed down the opportunity spaces by prioritizing some variables that we applied to the priority sectors for solutions and will enable us to scale, which are:

- **Impact potential: environmental** (type and volume of waste that can be prevented by the solution and urgency to tackle the waste generated) and **social** (positive change that can be made to the society related to the sector).
- **Desirability potential: market demand** (the estimated size of market that can be targeted with the solution and who is willing to pay for the solution) and **top-down policy** (existence of any push from public authorities that affect the sector's need for sustainability interventions).
- **Viability potential: existing solutions** (business case for sustainable solutions in the sector) and **market accessibility** (ease of access to penetrate the market).
- **Feasibility potential: technical feasibility** (availability and ease of access to resources needed to develop the product and/or service) and **scalability** (possibility to scale up according to the market size, pilot replicability, technical and financial feasibility).

These variables are used to prioritize and narrow down several intervention sectors. The intervention sectors were chosen based on the potential to remove single-use plastic waste. They therefore represent the most polluting sectors[2] in terms of single-use plastic waste according to various sources (Ocean Conservancy, 2024; Annur, 2023; Be The Story, 2024). The seven intervention sectors are:

1. **Nonperishable food (FMCG)**
   Interventions in this sector focus on tackling plastic waste generated from prepackaged food products from Fast-Moving Customer Goods companies, such as powered coffee or sauces.
2. **Personal care and home care products (FMCG)**

[2] These seven intervention sectors are chosen based on their impact potential. We've considered other sectors (such as for instance the agricultural sector) during our research as well but prioritized the most polluting ones in terms of single-use plastic waste.

Interventions in this sector focus on tackling plastic waste generated from prepackaged personal care and home care products from Fast-Moving Customer Goods companies, such as soap, detergents, and dish wash products.

3. **Ready-to-consume drinks & water bottles/cups (F&B)**
   Interventions in this sector focus on tackling plastic waste generated from prepackaged, ready-to-drink products, such as sodas, beer, and drinking water.
4. **Non-primary packaging**
   Interventions in this sector focus on tackling plastic waste generated from additional packaging on top of the original packaging, mainly used for transportation and shipping (e.g. secondary and tertiary packaging).
5. **Prepared food and drink packaging (F&B)**
   Interventions in this sector focus on tackling plastic waste generated from any point of the process or supply chain of food and drink prepared from restaurants, cafés, or any kind of food and drink stalls.
6. **Medical waste**
   Interventions in this sector focus on tackling plastic waste generated from any medical product, packaging, or any point of the process or supply chain in the medical and pharmaceutical industry.
7. **Diapers & sanitary products**
   Interventions in this sector focus on tackling plastic waste generated from diapers for any demographic and female hygiene products.

	Nonperishable food (FMCG)	**Personal care and home care products (FMCG)**	**Ready-to-consume drinks & water bottles/cups (F&B)**	**Non-primary packaging**	**Prepared food and drink packaging (F&B)**	**Medical waste**	**Diapers & sanitary products**
Impact potential Environmental and social impact potential	High	High	High	High	High	Medium	Medium
Desirability potential Market demand, top-down policy	High	High / Medium	High	Low	High	Low	Low
Viability potential Existing solutions, market accessibility	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Feasibility potential Technical feasibility, technical scalability	Medium	Medium	Medium	Medium	Low	Medium	Low

Applying the variables to the 7 sectors above and merging some product categories, we arrive at the top 3 industries we would want our solutions to focus on, being:

1. **Food and beverage sector**
   The sector consists of both ready-to-consume drinks and water bottle/cups and prepared food and drink packaging. Research conducted by International Coastal Cleanup shows that 39% of the plastic waste found at shores around the world is from food and beverage packaging (Ocean Conservancy, 2024). This shows the huge impact potential to create more sustainable solutions. Food and beverages are also daily necessities for people of all backgrounds and demographics, from survival to enjoyment, allowing for great potential to raise awareness on the issue of plastic waste.

2. **FMCG products**
   The sector consists of both of non-perishable food and personal care/home care. According to a sachet pollution survey conducted by DMUI, around 13% of total weight from collected sachet and pouch packaging are from FMCG personal and home care products, and 22% for nonperishable foods packaging (Souisa & Mann, 2024). The Indonesian Ministry of Environment moreover encourages producers to reduce waste from packaging by 30 per cent of the total production by 2029 and to phase out smaller sachets by 2030 (Souisa & Mann, 2024).

3. **Non-primary packaging**
   Non-primary packaging is used for almost every product in most supply chain processes. One example of the polluting effects of secondary packaging is e-commerce, whereby 96% of e-commerce packaging is made from plastic (Burhan, 2020). The international examples with returnable e-commerce packaging and relating services shows potential for exploration in Indonesia.

7. Pathways for future solutions

Within the focus problem domain, there are different opportunity spaces for future solutions. This chapter describes these potential business models that emerge as building blocks of a single-use plastic-free future.

7.1 Food and beverage sector

In the food and beverage sector the following opportunities are identified to replace the current excessive single-use plastics usage.

Advocacy / consulting - rethinking disposables
In many closed loop food and beverage spaces such as office buildings, hawker centres, education areas, or (cinemas within) malls, policies around F&B tenants and whether they need/can use disposables are made upfront. A service to enable the area managers of these spaces or even the local government to implement reusable cups, plates, and cutlery alongside washing facilities will enable them to switch from disposables to reuse. This could also include a kit that supports in the procurement of the reusable items. Existing similar examples that are applying this are Huella Verde, Rethink Disposable, or the project by Dietplastik Indonesia to have local markets use reusables instead of single use plastics.

Reusables plus drop-off points in office buildings
In office buildings specifically, there is usually a dedicated F&B floor/area. From that area, people take away their food and/or drinks to consume them elsewhere within the building. Due to the movement, single-use plastics are the norm. This could be replaced by reusables when the service includes the set-up of drop-points on every office floor supported by a pick-up service/assistance to return the reusables to the F&B area. The cleaning (see next) should be integrated as well.

Washing facility
Using reusables for F&B requires the space to wash and clean them. For individual tenants, this space is not always available. Therefore, the idea is to set-up centralized cleaning stations within dine-in areas in for instance, office buildings, malls, or all kinds of food courts. This needs to be done in close collaboration with the area manager, tenant, or the local government. Existing similar examples that also includes this service are Huella Verde and Rethink Disposable.

Centralized drinking water hubs
Drinking water can be provided without single-use plastic packaging in many forms. It can, for instance, be provided via water filters, centrally in hospitality areas or schools, accompanied by reusable bottles. Refill stations are another common solution. Existing examples are Nazava, AYR-Water or Paus Biru.

Advocacy for reusable bottles in ready to drink packaging
Ready to drink packaging for instance, carbonated drinks or beer sometimes still come in reusable glass bottles in Indonesia. A well-known example are the bottles of the famous iced tea drink Teh Botol from Sosro. Major FMCG brands however switched to single-use PET bottles over the last ~10 years. Before that date, they all used reusable glass bottles with crate systems for the returns. Many of the factories of the refillable glass bottles are still in place but are idle. Advocating for these reusable glass bottle to be reintroduced would be an option to reduce single-use plastics in ready to drink packaging.

7.2 FMCG products

In the FMCG space, the following opportunities are identified to move away from single-use plastics.

Low-tech refills
Refill systems work if consumers can obtain the refills close to their homes in local *warungs*. In those cases, it's not a hassle to bring your own container as these local stores are within 100 meter walking distance. In these stores, consumers can be assisted by the *warung* owner in doing the refill using low-tech solutions like dispensers on jerrycans or measuring cups from jerrycans. Due to regulatory requirements this usually works best for home-care products as for personal care and food products, regulation is stricter around hygiene. Examples of these low-tech refill models are Kuha sa Tinggi in the Philippines, Alner Transform in Indonesia, or the refill projects from Bopinc in Bangladesh, Kenya and Nigeria.

Supporting returnable packaging systems
Returnable packaging systems for FMCG products are taking off in Indonesia with Alner and Hepicircle as examples. For them to reach scale, several supporting aspects still need to be developed and can be operated in separated business entities. These supporting businesses could for instance focus on:

- Optimising reversed logistics of empty packaging items, to include the most efficient routes and to prevent emissions by using the most sustainable transportation options;
- Tracking systems for packaging items that allow for real-time insights;
- Semi-automated refill systems to optimize the refilling of the returnable packaging.

7.3 Non-primary packaging

Several opportunity areas have been identified to reduce single-use plastics for non-primary packaging (secondary and tertiary packaging).

Product-service innovation for packaging reuse
With an unexplored innovation space and existing, albeit informal, reuse activities for non-primary packaging, there are opportunities to introduce products and services aimed at optimizing reuse and recirculation. This can be achieved by introducing new reusable packaging solutions like RePack or embedding reverse logistics layers into existing packaging types, similar to Boox. As there is a wide variety of packaging types and use cases, further scoping can identify the most promising starting points in terms of packaging types (e.g., boxes, shopping bags, bubble wrap), service propositions (e.g., B2B, B2C, B2B2C), and target markets (e.g., retailers, suppliers, end-consumers).

Better packaging collection & redistribution
This opportunity space focuses on improving collection activities for non-secondary packaging and may be linked to the previous space. Presently, packaging at its end-of-life is collected either by waste management actors or informal used packaging collectors. However, as this is treated as "waste," packaging collection is done in a manner that does not uphold packaging quality, preventing it from being recirculated for higher-value uses. As a result, it is often recycled or reused for low-value purposes before ultimately being disposed of. Given the lack of formal waste management infrastructure, especially for reuse, there is a gap in designing a collection and redistribution (e.g. reuse, recommerce) flow optimised for longer circulation. Taking inspiration from the Dietplastik and KLHK reusable bag drop points, installing dedicated drop points at markets provides a proper and more accessible means for recirculating these bags for reuse.

Tech-enabled incentive systems for behaviour change

With some forms of secondary reuse behaviors already present among businesses and individual consumers, as well as the adoption of recycling incentive systems by brands and retailers, there is a significant opportunity to implement behavioral change models targeted at end-consumers. This can be achieved through tailored reward systems (e.g., brand partnerships and consulting) and technology-enabled gamification (e.g., BuzzLoop and Goatote reward systems). This opportunity area is particularly relevant for shopping bags as the plastic bag regulation is leading to the increased use of spunbound bags, which are still plastic, while the production-consumption behaviour remains linear instead of circular. There is potential to expand these incentive systems to other B2C packaging types, such as e-commerce packaging and even other plastic waste streams beyond secondary packaging.

Improving forward logistics

This opportunity area focuses on improving the logistical processes through which non-primary packaging flows. Preliminary research indicates that in last-mile logistics, packages are often delivered via motorcycles, sometimes in open-air conditions, without proper and standardized carrying vessels. This presents risks for product safety, such as breaches, breakages, and water damage. Consequently, retailers feel compelled to use more packaging to ensure safety and product quality, which customers also expect. This results in excessive non-primary packaging for each delivered item, with layers of varying types of packaging applied. The key question then becomes: How might we improve forward logistics to reduce the need for single-use secondary packaging?

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