TURNING MONGOLIA INTO A ZERO WASTE COUNTRY

A **MASTER PLAN** TO **SOLVE THE WASTE CRISIS** WHILE **CREATING JOBS** AND **SAVING PUBLIC MONEY**

Written by **Pierre Guerber**, Ecosoum's Director,
Validated by **Narantuya Gursed**, Ecosoum's President.

OCTOBER, 2023

This publication was produced under the “Sustainable Plastic Recycling in Mongolia” project funded by the European Union, but it does not necessarily reflect the views of the European Union.

TABLE OF CONTENTS

TABLE OF FIGURES AND TABLES

ACRONYMS

3Rs	-	Reduce, Reuse, Recycle
AD	-	Anaerobic digestion
C&D	-	Construction and Demolition
СӨХ	-	Apartment Owner Associations
CO_2	-	Carbon dioxide
DRS	-	Deposit Return Scheme
EPR	-	Extended Producer Responsibility
EU	-	European Union
EUR	-	Euro
GAIA	-	Global Alliance for Incinerator Alternatives
GHG	-	Greenhouse Gas
LFGTE	-	Landfill Gas-to-Energy
MNT	-	Mongolian tugrik
MRF	-	Material Recovery Facility
MRBT	-	Materials Recovery and Biological Treatment
NGO	-	Non-Governmental Organization
PAYT	-	Pay-As-You-Throw
PBDD/Fs	-	Polybrominated dibenzo-p-dioxins and furans
PET	-	Polyethylene terephthalate
PRF	-	Plastics Recovery Facility
PTF	-	Plastic-to-fuel
RDF	-	Refuse-Derived Fuel
UN	-	United Nations
UNEP	-	United Nations Environment Programme
USD	-	United States Dollar
WTE	-	Waste-to-energy

EXECUTIVE SUMMARY

As the waste crisis intensified over the past decades, Mongolia has been struggling to find efficient solutions. To support the country in its fight against waste, international and local organizations have been multiplying fundings and projects – often with a primary focus on recycling. Yet, it seems we are not getting any closer to properly managing our waste. It is thus clear that something is fundamentally wrong in the way we have been trying to tackle the waste issue. Following the incredibly successful examples of many cities and countries all around the world, the time has come for Mongolia to implement a comprehensive Zero Waste strategy and finally put an end to its waste crisis.

WHAT IS ZERO WASTE?

→ **FROM "WASTE MANAGEMENT" TO "RESOURCE MANAGEMENT":** Simply put, Zero Waste means managing resources efficiently**.** The Zero Waste approach invites us to change perspective when addressing the current waste crisis: we must go beyond the outdated model of "waste management" to embrace the more relevant concept of "resource management". Adopting a Zero Waste approach means addressing the entire life-cycle of these items to make sure none of them will actually become "waste".

→ **THE ZERO WASTE HIERARCHY:** Providing more depth to the internationally recognized 3Rs, the global Zero Waste movement widely adopted a 7-level hierarchy to guide all actions aimed at tackling the waste issue: 1- "refuse / rethink / redesign"; 2- "reduce"; 3- "reuse"; 4- "recycle / compost / digest"; 5- "material recovery"; 6- "residuals management"; 7- "unacceptable". Unsatisfyingly, experience shows that most efforts are usually put on lower levels of the hierarchy (usually, from level 4 and below), which is why attempted actions have largely been failing. It is thus crucial to strictly respect this hierarchy when designing Zero Waste policies.

→ **KEY PRINCIPLES FOR EFFECTIVE ZERO WASTE SYSTEMS:** Efficient Zero Waste systems share a few transversal features that are essential to their success. These key principles primarily include: production of accurate data; at-source waste sorting and separate collection; accountability of producers; putting people and communities at the center; decentralization of resource management; strong political will, leadership and communication.

→ **ZERO WASTE, CIRCULAR ECONOMY AND RECYCLING:** The Zero Waste approach is the best way to set up a truly circular economy while creating many jobs and boosting the economy. However, it is important to understand that the concept of "circular economy" is at risk to be diverted and instrumentalized for purposes that oppose the Zero Waste principles. Policy-makers must be very cautious with alleged "circular" solutions that are in fact mere greenwashing that can only lead the country towards a counterproductive increase of plastic production, use and disposal.

WHY OPT FOR ZERO WASTE?

→ **ZERO WASTE SAVES PUBLIC MONEY:** It has been widely demonstrated that Zero Waste systems are most often the cheapest way for cities to manage waste properly. Waste reduction is the most effective way to decrease waste management costs, while material recovery strategies are always economically more interesting than disposal. Contrary to landfills and incinerators that create lock-in effects and long-term debts, Zero Waste investments quickly pay off and usually lead to incredible reduction in waste management expenses.

→ **ZERO WASTE CREATES JOBS AND STIMULATES ECONOMIES:** Zero Waste approaches that entail to reduce waste generation and to sort/reuse/recycle create much more jobs than landfills and incinerators. Reuse, recycling and remanufacturing are estimated to create about 200, 70 and 30 times more jobs, respectively, than landfilling and incineration. Moreover, the potential for job creation of Zero Waste systems goes way beyond the jobs created for resource/waste management itself as a true circular economy would require to create countless small businesses to produce locally, all over the country.

→ **ZERO WASTE HELPS MITIGATE AND ADAPT TO CLIMATE CHANGE:** Zero Waste solutions tend to reduce greenhouse gas emissions in various ways, and they are much faster to set up and implement than old-fashion waste disposal infrastructures. Therefore, implementing a Zero Waste approach can be a game changer in country strategies to mitigate climate change. Surprisingly, the mitigation potential of waste management has actually been shown to be greater than the waste sector's own emissions.

→ **ZERO WASTE PROTECTS HUMAN HEALTH AND ENVIRONMENT:** As they prevent waste-related contaminants (including hazardous micro- and nanoplastics) from penetrating human bodies and the environment, Zero Waste strategies greatly contribute to protecting nature and human health in many different ways. By essence, Zero Waste also directly contributes to saving natural resources and ecosystems.

→ **THERE IS NO REAL ALTERNATIVE TO ZERO WASTE:** Although most existing technologies – waste-to-energy, plastic-to-fuel, chemical recycling, bio-plastics, plastics credits, etc. – are often promoted as relevant solutions to solve the waste and plastic crisis, careful scientific assessments have clearly shown that they all are actually either insufficient or inapplicable in real life, when they are not downright counter-productive. All things considered, it appears that Zero Waste is not only the best and cheapest solution to solve the waste crisis the world is currently facing: it is the only realistic one.

HOW TO IMPLEMENT ZERO WASTE IN MONGOLIA?

→ **GETTING STARTED AND LAYING SOLID FOUNDATIONS:**

- ✓ ***Formally commit to Zero Waste:*** To seriously start walking the path towards Zero Waste, the first thing to do is to make a formal commitment to it. An official declaration from authorities is usually a powerful way to unite citizens around a joint and inspiring objective. More broadly, once committed to it, it is essential to consider Zero Waste as an overarching paradigm that should be explicitly reflected in all kinds of public policies.

- ✓ ***Organize participatory consultations to mobilize the people:*** It is of paramount importance to genuinely get people on board for the Zero Waste journey by being inclusive and favoring a bottom-up strategy rather than a top-down approach. National and local governments should thus organize people's consultations, assemblies and/or workshops from the beginning and all along the Zero Waste transition to ensure and maintain citizens' full involvement and support.

- ✓ ***Establish a clear baseline after evaluating the current situation:*** Public officers in charge of leading the transition towards Zero Waste need to gather all important facts and figures, while making sure that they are up-to-date and applicable to each context. Waste composition studies and brand audits need to be conducted at all relevant levels, along with gap analyses of policy/legislative framework, resources and infrastructure. All these

analyses must be carried out with the Zero Waste hierarchy in mind, focusing primarily on the highest-level priorities.

- ✓ ***Develop a menu of Zero Waste options and lead an economic analysis:*** Based on the baseline study findings, the next step is to develop a menu of all the potential Zero Waste strategies that could be implemented in a given context, and to conduct an economic analysis of each considered option to estimate the expected expenses and understand the potential cost-savings of each strategy. Community members can review the menu and provide feedback to help identify additional options for consideration, research, and analysis.

- ✓ ***Set realistic goals and relevant metrics:*** Zero Waste strategies must have clear and timebound goals and metrics to monitor progresses towards these objectives. Monitoring 'diversion rate' is a common practice, although it is absolutely not enough. Considering the limits of each possible indicator, it is essential to have several of them that complement each other, in order to assess different goals and overcome the flaws of each metric.

→ ENABLING SEPARATE COLLECTION AND MATERIAL RECOVERY

- ✓ ***Make at-source waste sorting easy and mandatory:*** Efficient resource/waste management systems cannot work without sorting and collecting each type of waste separately. Therefore, all waste producers must be mandated to properly sort their waste at the source. This legal obligation should be supported by a set of complementary measures, including awareness-raising campaigns, provision of user-friendly waste sorting equipment, standardization and clarification of the waste to be sorted, monetary and/or non-monetary incentives to reduce and sort waste. Experience shows that Pay-As-You-Throw (PAYT) schemes usually show excellent results in terms of waste prevention, sorting and collection – with very good acceptance and satisfaction by the people. Different collection frequency between recyclables/organics and residual waste has also proved very effective in many cities.

- ✓ ***Adapt infrastructures to the new Zero Waste paradigm:*** To allow Zero Waste policies to flourish and bear fruit, a dense network of adequate infrastructure must be set up. This includes 'prevention infrastructure' (sharing centers, repair workshops and stores, second-hand stores, reuse facilities and services, refill shops, food waste salvaging systems, etc.), 'recovery infrastructure' (decentralized Material Recovery Facilities and Zero Waste information centers to collect and sort waste), and 'circular reprocessing infrastructure' (reuse and repair facilities, washing plants, recycling industries, composters and anaerobic digestors, etc.). Establishing a more enabling (legal, fiscal, logistical, etc.) environment and providing support is necessary to help attract investments, let businesses strive, multiply jobs, and grow national and local economies. Such initial public investments can quickly be balanced by savings made on usual waste management expenses.

- ✓ ***Reorganize waste collection services, with focus on organic waste:*** For materials to be recovered and adequately processed to re-enter the economy, they need to be separately collected and transported between each stakeholder. Studies show that mandating and enforcing at-source sorting creates virtuous circles that make waste collection processes much easier and faster for currently overwhelmed collection teams. Special attention must be given to organic waste collection to reduce expenses, prevent soiling recyclables and avoid disposing biodegradable matters in landfills. Like in many countries and cities, waste that is not properly sorted and bagged should not be collected by waste collection teams.

→ REDESIGNING POLICIES TO REDUCE AND REUSE WASTE

- ✓ ***Incentivize and support local economies:*** Public policies should incentivize and support local businesses that tend to reduce waste generation and favor reuse one way or another. Governments at all levels should develop and/or update and clarify lists of businesses and activities that shall be systematically supported in line with the Zero Waste paradigm. Eligibility criteria (economic sectors, products and services, best practices, etc.) and planned supporting measures (subsidies, tax breaks, zero-interest loans, public procurement priority, etc.) should be fully transparent.

- ✓ ***Enforce a system that prevents food waste:*** Policy-makers should keep in mind that waste reduction is paramount, especially when it comes to food waste. Food waste can be prevented at the source through various means, including: awareness-raising and technical assistance, connection between growers/manufacturers and secondary resellers, incentives to purchase "ugly" products, elimination of all-you-can-eat practices, standardization and clarification of food labeling, redistribution of non-consumed food, etc. Municipalities should also facilitate home and community composting through education and technical assistance programs.

- ✓ ***Ban single-use plastics and disposable items:*** Banning single-use plastics (and other disposable items) is widely recognized as one of the paramount measures to fight against plastic pollution. Implementing such bans efficiently can be a challenge, but lessons learnt from other countries show that it can be done successfully. Key factors to success include: clear purpose and timebound targets; comprehensive and detailed regulation to avoid loopholes and gaps; coordination and integration of plastics ban into overall policy/legal framework; sufficient public investment and support during a relevant transition phase; clear indicators and monitoring mechanism; real political will and enforcement with sufficient follow-up and strict controls; transparent and consistent communication to ensure public's understanding.

- ✓ ***Standardize packaging and eliminate toxic additives in plastics:*** Standardizing packaging would not only help people sort their waste at the source, it would also facilitate the development of reuse schemes and recycling processes. Clear standards should thus be progressively designed, introduced and enforced for all types of products, applicable to all companies and brands, starting with the most problematic and/or easy to implement. Regulatory standards should impose priority use of effectively recyclable materials, prevent designs that make effective recycling too complicated, push packaging industry to reduce the range and number of materials they use, stop making multi-material packaging, and eliminate all hazardous chemicals and toxic additives from authorized plastics.

- ✓ ***Develop reuse/refill systems and deposit-return schemes:*** Replacing single-use plastic by other single-use materials would not fundamentally bring any circularity to the system, which is why a Zero Waste economy should always be based on reuse and refill systems. Returnable packaging systems with deposit – usually referred to as 'Deposit Return Schemes' (DRS) – have proven to be the most effective and sustainable way to reuse materials and prevent environmental pollution. DRS is fairly easy to implement and is already operating with great results in dozens of regions worldwide.

- ✓ ***Make producers really accountable through binding EPR policies:*** EPR primarily aims at shifting the responsibility of the product/waste towards the producer and away from municipality, while providing incentives to producers to take into account environmental

considerations when designing their products. However, EPR policies and their eco-taxes usually come with significant constraints and pitfalls, with which policy-makers must be very cautious to avoid counter-productive effects. But as long as eco-taxes are wisely framed and not designed or perceived as a 'right to pollute', lessons learnt from other countries can help set up and enforce relevant EPR schemes.

- ✓ ***Ensure adequate processing and landfilling of residuals:*** It is important to keep in mind that even state-of-the-art, modern sanitary landfills have significant and unavoidable negative impacts. Therefore, it is essential to align with global best practices by pre-treating residuals through 'Materials Recovery and Biological Treatment' (MRBT). This approach involves separating dry materials from organics to process them mechanically and biologically before landfilling. More broadly, planners should beware of not overbuilding landfills to avoid sinking all available financial resources into disposal infrastructure and prevent counterproductive lock-in effects that would undermine relevant Zero Waste policies.

- ✓ ***Make sure to implement a just transition for workers:*** In Mongolia like in most countries of the Global South, informal waste pickers provide a primary form of solid waste collection, providing widespread public benefits and enabling higher recycling rates. However, these waste workers are usually very vulnerable and face many challenges such as homelessness, difficulty to get official identity documentation, various health problems, social isolation and discrimination. It is crucial that Zero Waste policies recognize and fairly integrate formal and informal waste workers into the new resource management system.

The inspiring examples of successful cities all over the planet show that the Mongolian waste crisis is not a fatality. On the contrary, provided that enlightened decision-makers show sufficient political will to design, vote, and enforce ambitious policies that have largely proved effective in other countries, Mongolia has everything it needs to turn itself into a truly Zero Waste country in a foreseeable future. As long as the right strategies and policies – as outlined in this report – are in place and actually enforced, Mongolia can expect Zero Waste implementation to start showing success within less than a year – while reducing unemployment, boosting the economy, and achieving very significant savings in waste management costs.

INTRODUCTION

As the waste crisis intensified over the past decades, Mongolia has been struggling to find efficient solutions. To support the country in its fight against waste, international and local organizations have been multiplying fundings and projects. Yet, the impacts of waste – on the environment, human health, public funds, urban planning, the economy, etc. – have never been so dreadful as they are today. Summit meetings are organized, state-of-the-art landfills are built, recycling is promoted, new technologies are praised; and yet, it seems we are not getting any closer to properly managing our waste.

This sad observation that all Mongolians can make in their daily lives tends to show that something is fundamentally wrong in the way we have been trying to tackle the waste issue. Taking some perspective and looking at what has been happening abroad helps to understand that most of the alleged solutions that are usually promoted – starting with "waste-to-energy" incineration – are only making things worse. Most importantly, as the Executive Director of the UN Environment Program recently reminded: "*the truth is we cannot recycle our way out of this mess*".[1] What should we do, then?

In fact, the answer is quite simple: we should go "Zero Waste". It is certainly fair to say that everyone has heard these two words a million times; but it seems that not so many people truly understand what they mean – and even less try to implement them at a systemic level. Yet, Zero Waste is much more than a mere slogan: it is a powerful strategy than proved far more efficient than the inadequate solutions that have been implemented until now. That is why it seemed essential to summarize its ins and outs and to discuss how recommended policies and practices could be implemented in Mongolia.

Our initial intention was to go into more details than readers will find below; but it eventually turned out impossible without making this document even longer than it already is. However, this report can be seen as an overall masterplan towards Zero Waste, pointing in the right direction and clearing the ground for further studies and future actions. In addition, all along the report, we systematically referred in footnotes to the best sources we could find on each matter; therefore, readers interested in learning more about specific topics are strongly encouraged to follow the links.

After presenting Zero Waste principles (in the first part) and explaining the main reasons why Mongolia should structurally choose this approach (in the second part), we will try to clarify in the third part how the Mongolian system could broadly be reorganized and what main policies could be implemented to finally solve the waste crisis. We will see that, all things considered, these recommended actions – which are not so numerous – are not overly difficult to implement.

At this point, Mongolia already has everything it needs to turn itself into a Zero Waste country, provided that authorities decide to take effective leadership while actively involving the Mongolian population in the process. Incidentally, the benefits of choosing the Zero Waste approach would go way beyond solving the waste crisis – as boosting the economy, creating jobs and saving public money are only some of the many positive side effects decision-makers can reasonably expect from the Zero Waste journey.[2]

[1] UNEP, *A big step towards ending plastic pollution* (2023).

[2] Although the Zero Waste philosophy applies to all types of waste, this report primarily focuses on municipal solid waste.

PART 1 – WHAT IS ZERO WASTE?

FROM "WASTE MANAGEMENT" TO "RESOURCE MANAGEMENT"

Zero Waste is both an objective (generating no waste) and a process (implementing policies and actions that progressively lead to this objective). In that sense, Zero Waste is both visionary and pragmatic, long-term and short-term, local and global.

According to the only peer-reviewed definition, Zero Waste is "*the conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health.*"[3] In other words, Zero Waste is an innovative approach to the use of our resources, which ensures resource efficiency, resource recovery, and protection of scarce natural resources. It redesigns our current linear industrial system – which is highly unsustainable – into a circular system that minimizes unnecessary extraction and consumption, reduces waste, eliminates toxic substances, and ensures that products and materials are reused or recycled back into nature or into the market.

At the heart of this approach is an emphasis on the relationship of all sectors of society with the resources, materials and products they use. In a Zero Waste system, the value of materials and products is kept within the community where they are used over and over again. Any technology that does not allow for material recovery is considered incompatible with a Zero Waste system.

Simply put, **Zero Waste means managing resources efficiently.** Therefore, it is essential to understand from the beginning that **Zero Waste invites us to change perspective when addressing the current waste crisis: we must go beyond the outdated model of "waste management" to embrace the more relevant concept of "resource management".** While waste management is the last chain of a linear economy (aiming at best at turning waste into resources), Zero Waste is all about keeping resources from becoming waste, and is thus an essential part of a circular economy. Instead of focusing only on the end-of-life of our items (called "waste" when we do not need them anymore and want to discard them), **adopting a Zero Waste approach means addressing the entire life-cycle of these items** to make sure none of them will actually become "waste".

ZERO WASTE HIERARCHY

The Zero Waste International Alliance developed a detailed Zero Waste hierarchy[4], which describes a progression of strategies and policies to support a Zero Waste system – from best practices (on top) to worst and most unacceptable practices (in the bottom). It is designed to be applicable to all audiences, from policy-makers to industry and individuals.

This new hierarchy aims at:

- → providing more depth to the internationally recognized 3Rs (Reduce, Reuse, Recycle);
- → encouraging policy, activity and investment at the top of the hierarchy;
- → providing a guide for those who wish to develop systems or products that move us closer to Zero Waste.

[3] Zero Waste International Alliance, *Zero Waste Definition* (2018).
[4] Zero Waste International Alliance, *Zero Waste Hierarchy of Highest and Best Use 8.0* (2022).

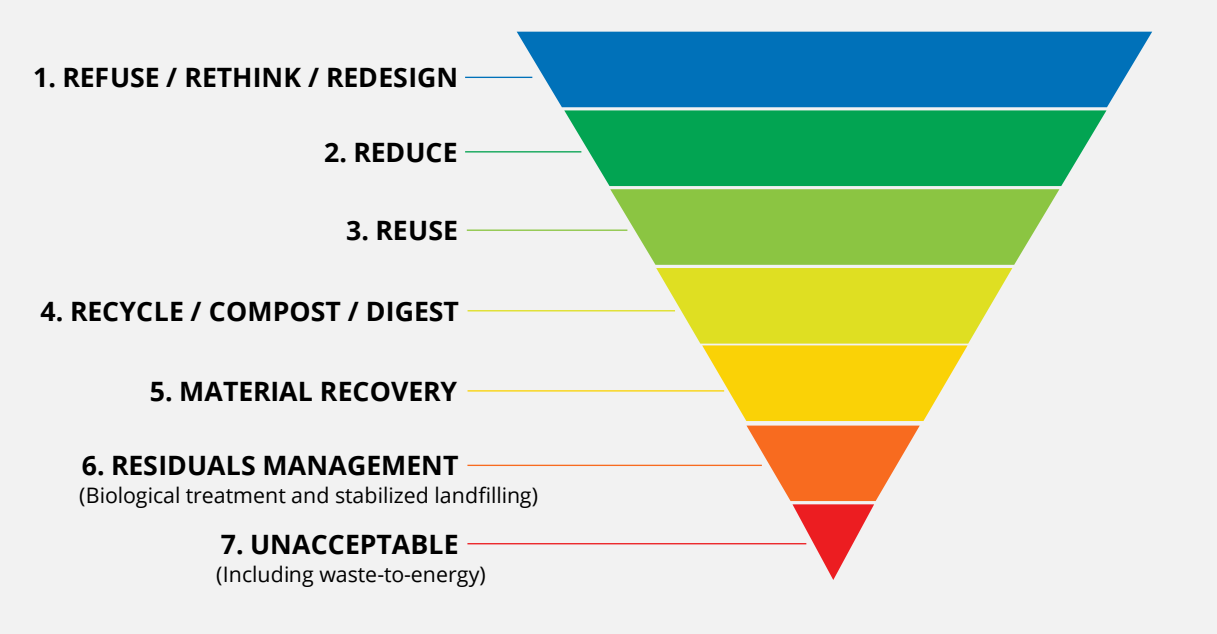

Figure 1 : Zero Waste Hierarchy (Source: Slightly modified by author from Zero Waste International Alliance and Zero Waste Europe)[5]

This hierarchy enhances the Zero Waste definition by providing guidance for planning and a way to evaluate and prioritize proposed solutions:

1. **REFUSE / RETHINK / REDESIGN**: First and foremost, a Zero Waste approach enables implementation of systemic change to address the root causes of the current linear economic model and move towards a Zero Waste system. At an individual level, refusing/rethinking means rejecting whatever we do not really need. But such individual changes are not sufficient if we do not collectively rethink current business models and redesign materials, goods and packaging in order to reduce resource-use and waste generation. These necessary changes require a revaluation of current scales of production/consumption as well as adequate policies to enable market shifts, to prioritize production only on what is essential, and to look at safe, locally-sourced alternatives that benefit communities.

2. **REDUCE**: Then, we need to take measures to reduce the quantity and toxicity of resources, products, packaging and materials we use and create, as well as their negative impacts on the environment and human health.[6]

3. **REUSE**: Third, we must shift our systems towards reuse and refill, including taking actions (such as checking, cleaning or repairing operations) that enable the most necessary products or components to be used and reused again – at a systemic level – for the same purpose for which they were conceived, without any transformation operation. These actions should support the continued use of products in ways that retain their value, usefulness and function. This implies an enabling policy environment, relevant market incentives, clear standards for toxics-free products and packaging, and sufficient reuse infrastructure.

[5] Zero Waste Europe, *The Zero Waste Master Plan – Turning the vision of circular economy into a reality* (2020). The Zero Waste International Alliance does not mention "refuse" in level 1 nor "digest" in level 4. On the other hand, Zero Waste Europe presents level 2 as "reduce and reuse" while describing level 3 as "prepare for reuse".

[6] While promoting reduction, it is acknowledged that people's basic needs should be met: not everybody needs to "reduce" similarly and social inequalities must be reflected in adequate policies.

4. **RECYCLING / COMPOSTING / ANAEROBIC DIGESTION**: If waste cannot be directly reused, we must ensure high quality material recovery from separately collected waste streams. In other words, we must take actions by which discards are mechanically reprocessed into similar quality products or materials or biologically processed to return to the soil.

5. **MATERIAL RECOVERY**: If proper recycling is not possible, the next step is to implement technologies and operations that enable recovering additional materials from the mixed waste flux, in order to turn them into new valuable materials in an environmentally sound way. (Such material recovery does not include "energy recovery" and reprocessing of waste into materials that are to be used as fuels or other means to generate energy, because these technologies are all conflicting with higher Zero Waste principles and/or impacting human health and the environment.)

6. **RESIDUALS MANAGEMENT**: In the end, waste that cannot be recovered must be biologically stabilized[7] prior to landfilling, so that this residual waste does not threaten the environment or human health. All waste that is landfilled should be analyzed to understand what exactly is wasted, and why – with the goal to either improve prior management processes (if landfilling this waste could have been avoided) or to make such waste disappear in the first place (through refusing / rethinking / redesigning).

7. **UNACCEPTABLE**: Systems and policies that tolerate or even encourage wasting and/or threaten the environment and human health are to be considered unacceptable. Options that do not allow for material recovery, have high environmental impact and create lock-in effects that threaten the transition to Zero Waste – such as waste-to-energy (WTE) incineration, co-incineration, plastic to fuel, gasification, pyrolysis, landfilling of non-stabilized waste, illegal dumping, open burning or littering – are to be strictly forbidden. If higher Zero Waste measures are implemented, such unacceptable "solutions" are not necessary anyways.

We cannot emphasize enough how important it is to respect this hierarchy when designing Zero Waste policies. We should move to the next best option, lower in the hierarchy, only if higher priority measures can really not be implemented: reuse only if we really cannot reduce; recycle only if we really cannot reuse; landfill only if we really cannot recover; etc.

Therefore, in light of this Zero Waste hierarchy, it is crucial to acknowledge that focusing most efforts directly on recycling – without prioritizing refusing/rethinking/redesigning, reducing and reusing – is a serious mistake that compromises the success of any Zero Waste strategy.

KEY PRINCIPLES FOR EFFECTIVE ZERO WASTE SYSTEMS

While the above-described hierarchy must be used as the backbone of any resource management system, a few transversal key principles are also essential to consider for enabling effective Zero Waste strategies.

[7] The biological stability of solid waste is one of the main issues related to the evaluation of the long-term emission potential and the environmental impact of landfills. Biological stability determines the extent to which readily biodegradable organic matter has decomposed. A material is considered stable if it contains mainly recalcitrant or humus-like material and it is not able to sustain high microbial activity. See more about biological stabilization below in Part 3.

PRODUCING NECESSARY DATA

Designing adequate resource management systems and setting up relevant objectives and targets for reducing and reusing/recycling waste requires having reliable data, so as to make informed decisions and monitor progress. Collection of precise waste-related data is often an issue when adequate systems and infrastructures are not in place yet, but efforts must be made to cooperate with waste workers and scientific organizations for setting up strong methodologies and to provide sufficient resources to ensure effective monitoring and data collection. **Ongoing data analysis must constantly provide feedback to adapt or improve Zero Waste systems** whenever necessary.

AT-SOURCE WASTE SORTING AND ADEQUATE SEPARATE COLLECTION

If preventable waste is avoided by changing our consumption and production methods, and if the waste that is non-preventable has been designed to be circular so that it can be reused or recycled within the economy, the only action that is needed to reintroduce a resource back into the production cycle to enable the entire Zero Waste system is to ensure that it is sorted and collected in the best and cleanest possible way, to make sure that its value is preserved for its next use.

In fact, **no Zero Waste system can function properly without each type of waste being sorted from each other and collected to be processed separately** in respective processing channels. Therefore, considering that it is virtually impossible to properly sort waste after it has been mixed,[8] all waste producers (households, institutions, businesses, etc.) must sort their waste at the source. Changing people's habits certainly takes time, but **sorting waste cannot be an option in an efficient Zero Waste system**. This means that all necessary measures must be taken to ensure swift and effective at-source waste segregation.

Similarly, at-source waste sorting is pointless if waste is subsequently mixed in collection trucks. Therefore, **separate collection must be ensured by municipalities or any other entity in charge of waste collection services**. Comprehensive collection systems must ensure clean separation of materials by relevant categories (depending on subsequent processing channels planned in the Zero Waste system). At the very least, **collected waste should be separated in three categories: organics** (food and garden waste); **reusable/recyclable materials** (plastics, glass, paper, metal, etc.); and **residual waste** (what is left after everything else has been properly separated).[9]

ACCOUNTABILITY OF PRODUCERS

To some extent, consumers can make good or bad consumption choices and municipalities have a responsibility to organize proper waste management as a public service. But citizens and municipalities never asked to be flooded with so much unavoidable single-use packaging and low-

[8] Although some people argue that waste can be mixed at the source and materials recovered afterwards in a dedicated facility (an approach called "Mixed Waste Processing"), reality tells otherwise: recyclables recovered from mixed waste processing are low in both quantity and quality, and many end-market buyers refuse to purchase from mixed waste processing facilities. (Incidentally, WTE incineration is not a real alternative to at-source sorting either, since many types of waste – starting with wet food waste – are hard to burn and incinerators actually require a relatively steady and homogeneous feedstock to operate properly.) See Resource Recycling Systems & Institute of Scrap Recycling Industries, *Mixed Waste Processing & Desirability of Recovered Paper Market Survey* (2016).

[9] Mixing organics and recyclables make adequate processing of both virtually impossible: organics contaminated by plastics and other waste cannot make toxic-free composts, and recyclables soiled by organics become very difficult to process efficiently in a safe and economically viable way.

quality disposable items. **Corporations' deliberate choice to favor disposable over reusable, for their own profit and against the general interest, is unarguably the reason why our economy became so linear and unsustainable** over the past decades, producing so much unmanageable waste.[10] Therefore, producers must be held accountable.

Companies that produce or market the products and packaging that end up constituting our waste should be effectively responsible for managing this waste. As such, 'Extended Producer Responsibility' (EPR) rules must be defined by policy-makers, with mandatory obligations rather than voluntary plans and pledges from corporations. Strict binding laws and policies should emphasize that the responsibility of these large companies include not only the end of life of their products and packaging (when they become waste) but their full life cycle costs and impacts. Upstream, producers should design more sustainable products and packaging which can be effectively repaired, reused, or recycled and are free of toxic substances; downstream, they should have active and significant logistical and financial participation to establish adequate waste management systems in all locations.

PEOPLE AND COMMUNITIES AT THE CENTER

Overall, the solutions that we aim to implement to solve the waste crisis should not only have a positive impact on the environment, they should also benefit the people, strengthen social justice and empower local communities. **The actions planned in a Zero Waste strategy should never lead to increase the burden on the people, especially the most vulnerable**. On the contrary, our solutions should prioritize the rights of the people most affected by waste, and create sustainable, decent jobs within the concerned communities.

Moreover, community education and participation are indispensable for the successful implementation of Zero Waste systems, which must take a people-centric approach to change. Citizens should be invited to adopt waste-free practices, but only after having the opportunity to actively participate in the design of resource management systems that significantly reduce waste production. **Any Zero Waste system that would be perceived as top-down or authoritarian, imposed on the people against their will, would be doomed to fail. Efficient programs not only have the buy-in of the community, they are also community-led.** This ensures that the program supports community organizing, education, and democracy, so that all citizens can participate and shape local resource management plans and tailor it to their specific needs and context.

Public education campaigns are critical to encourage and foster citizen participation. Given the constant changing of demographics, emphasis must be placed on ongoing education of citizens, providing them with informative resources to guide engagement with the Zero Waste plan. Municipalities should therefore prioritize community engagement and educational activities, as this sets the basis for a successful and effective local Zero Waste strategy.

Education and training are vital to shift the paradigm and progressively phase out waste. Key personnel from municipalities' environmental division, local waste management companies and other community leaders need to ensure they increase their levels of awareness and knowledge regarding resource management. Education and training initiatives are the best way to address cultural challenges around waste during the roll-out of a Zero Waste system.

[10] Ecosoum, *Zero Waste and Circular Economy: The Way Forward* (2021).

Greater incentives and support should also be provided to local entrepreneurs, social enterprises and groups. Given their local knowledge and prominent role within a Zero Waste city, these stakeholders should be invited to provide local solutions to the local challenges faced by their community.

DECENTRALIZATION OF RESOURCE MANAGEMENT

Experience from Zero waste success stories all over the world shows that **decentralization is a key to success for resource management**. Centralized landfills and incinerators were designed for our 20th century linear waste management systems, not for Zero Waste resource management systems of the 21st century.

In Zero Waste communities all over Asia (like in India, the Philippines or Japan, among many other examples)[11], waste management is decentralized down to the village or district level. Households are mandated to sort their waste, and waste collectors employed by villages and districts collect these discards regularly. Collected wastes are brought to Materials Recovery Facilities (MRFs), where biodegradables are composted (when they are not home-composted directly by households), recyclables are temporarily stored until they are sold, and residuals are kept until the city truck picks them up for disposal. To a large extent, these measures are similar to those successfully implemented by Ecosoum in Khishig-Undur soum[12] since 2020, and the same approach is perfectly relevant for all other soums and aimag-centers – and probably even in many areas in Ulaanbaatar.

STRONG POLITICAL WILL, LEADERSHIP AND COMMUNICATION

While people's involvement is essential, **efficient Zero Waste policies also need champions and political leaders at all levels**, from local to national. Relying only on market forces or the goodwill of concerned individuals and NGOs is never enough.

In communities and villages that have made big strides in their Zero Waste program implementation, there was always at least one political leader championing Zero Waste. Program implementation is beset with many challenges, among them changing people's behavior. **Without strong political will, Zero Waste programs cannot take off**. Ecosoum's experience in rural Mongolia does confirm that local authorities' motivation and commitment is absolutely necessary to implement systemic changes.

Likewise, although local-level is where resource/waste management is implemented, some crucial policies can only be taken at the national level, for the whole country. For instance, relevant Zero Waste policies are necessary for overcoming large corporations' reluctance to take responsibility, or for counterbalancing the negative trends imposed by globalized markets. **Making Zero Waste a national cause championed by high-ranking government executives significantly increases chances of success**.

To ensure that the system is consistently implemented and enforced, it needs to be ongoingly promoted and supported at all levels of government and public administration. People need to be aware of the system, appreciate its importance and benefits, and should be fully informed of its

[11] GAIA, *Greening Kerala. The Zero Waste Way* (2019); GAIA, *Route to Zero Waste. A Flood-Prone City Shows How It's Done* (2019); GAIA, *Picking Up the Baton. Political Will Key to Zero Waste* (2019); GAIA, *Sunshine After the Storm. A Typhoon-Ravaged City Rises to Become Zero Waste* (2019); GAIA, *Pioneer of Zero Waste. The Village that Inspired Cities to Go Zero Waste* (2019); GAIA, *Small Town Big Steps. The Story of Kamikatsu, Japan* (2019).

[12] Ecosoum, *How to set up proper waste management at the soum level* (2021).

principles and rules. While implementing the system, the local government should constantly reaffirm its importance, show its benefits, and strictly and consistently enforce it. The more people are informed and consulted, the more they will feel part of the Zero Waste system and care for its success.[13]

ZERO WASTE, CIRCULAR ECONOMY AND RECYCLING

According to Zero Waste Europe, a "circular economy" is "*a regenerative system in which resource input and waste, emissions, and energy leakage are minimized by slowing, closing, and narrowing material and energy loops. This can be achieved through long-lasting design, maintenance, repair, reuse, remanufacturing, refurbishing, and recycling. This is in contrast to a linear economy which is a 'take, make, dispose' model of production*."[14] In simpler words, **a circular economy is an economy that does not waste and pollute, an economy that keeps products and materials in use and rebuilds the natural capital of our ecosystems**. Clearly, the Zero Waste approach perfectly integrates the circular economy narrative, and a Zero Waste strategy can act as a relevant and important tool for countries and cities to start applying circular economy principles.

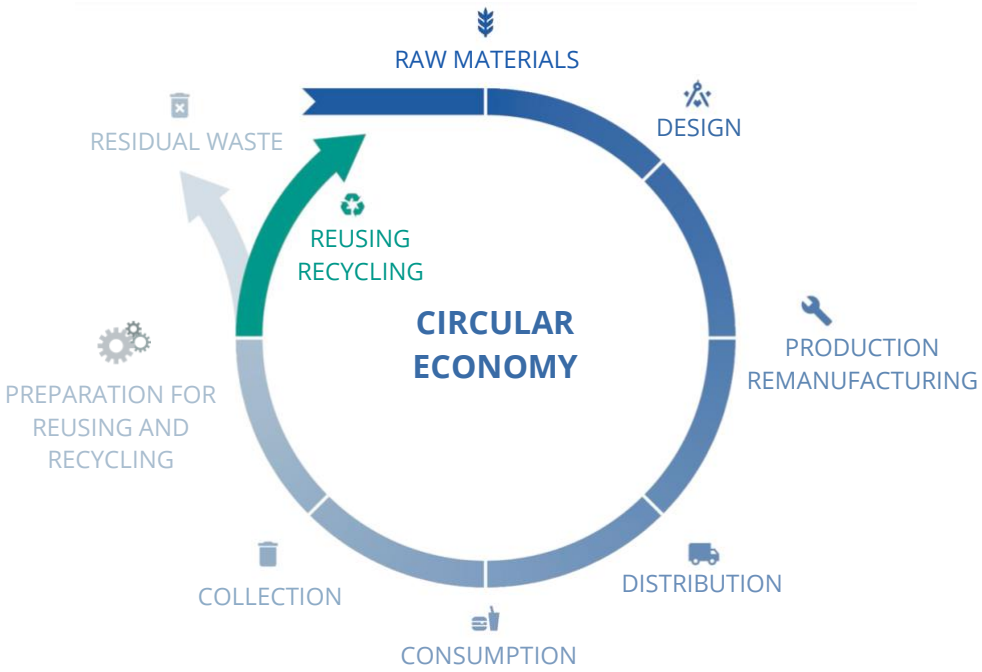

Figure 2 : Circular economy diagram (Source: Slightly modified by author from Zero Waste Europe)

A circular economy based on Zero Waste principles is very labor intensive, which means it has the potential to create many additional local jobs and enterprises both to reduce waste and to close the loop of the circular economy. Indeed, a significant part of over-packaging and waste is the result of the intensification of worldwide trade over the past decades, which required more and more packaging as the length of supply chains and the duration between production and consumption increased dramatically. Relocating the economy as much as possible, to reconnect local producers with local consumers, would result in drastically decreasing waste generation altogether. Likewise, circularity implies to create many new jobs to deal with the reuse

[13] GAIA, *Enabling Sustainable Cities Through Zero Waste. A guide for Decision- and Policy-Makers* (2021).
[14] Zero Waste Europe, *The Zero Waste Master Plan – Turning the vision of circular economy into a reality* (2020).

and recycling operations of finitely available material resources, including for collecting, sorting, washing and preparing materials that are to re-enter the economic cycle.

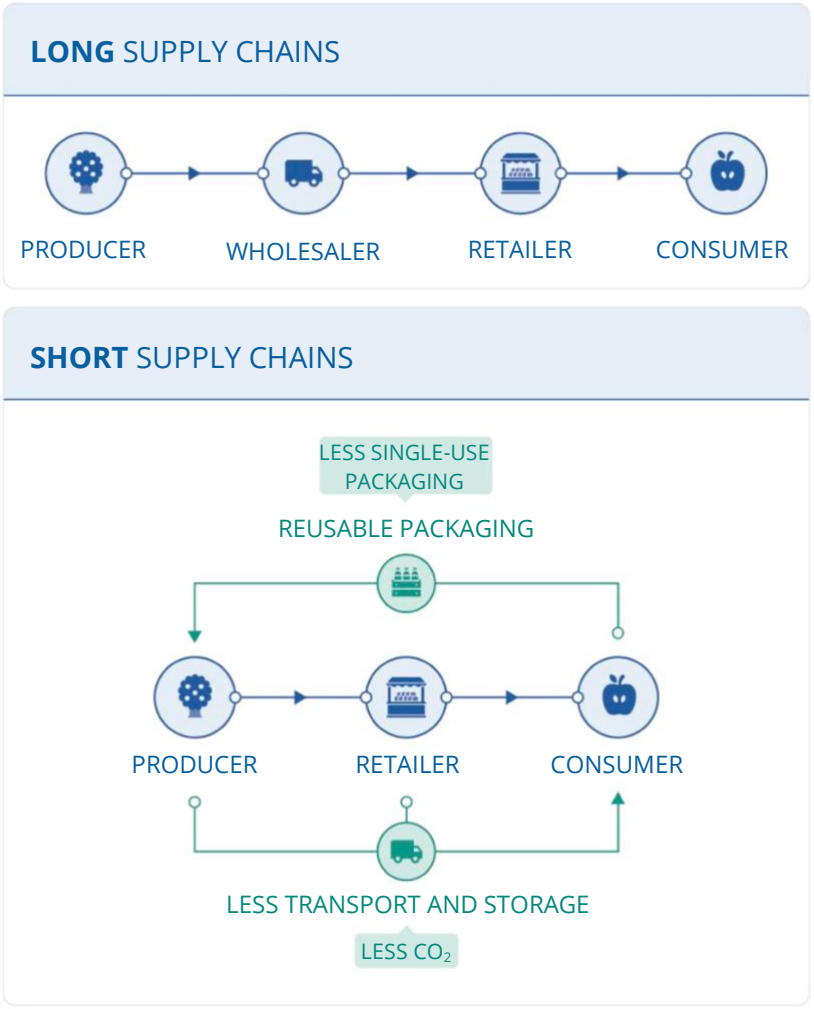

Figure 3 : Comparison between long and short supply chains (Source: Slightly modified by author Zero Waste Europe)

However, like all good and legitimate concepts, **it is important to understand that the notion of "circular economy" is at risk to be diverted and instrumentalized for negative purposes that oppose the Zero Waste approach**. Therefore, it is crucial to properly frame the concept and reject in advance misuses and misinterpretations that would be contrary to the Zero Waste principles.[15]

First of all, we must emphasize that a **real circular economy strictly excludes all forms of waste incineration** (including waste-to-energy, gasification, pyrolysis and plasma arc), as these technologies destroy materials and thus require to constantly extract new virgin natural resources in a very linear way.[16] Calling such waste incineration "energy recovery" does not make it circular.

Then, especially when talking about plastics, **the main risk with "circularity" is that the word can easily be co-opted by industry to move all efforts towards recycling and away from reduction and reuse**. And indeed, we observe that many "circular economy" policies focus only

[15] GAIA, *Plastics circularity: beyond the hype* (2023); CIEL, *Beyond Recycling. Reckoning with Plastics in a Circular Economy* (2023).
[16] Ecosoum, *Should we introduce waste-to-energy in Mongolia?* (2023); Ecosoum, *A guide to assess waste-to-energy projects or proposals* (2023).

on recycling, although recycling comes only fourth in the Zero Waste hierarchy (because it actually is the least effective way to conserve materials and achieve circularity compared to reduction, reuse and repair).

No material reprocessing is impact-free and, compared to alternatives higher in the hierarchy, recycling has greater process emissions and lower material efficiency. Collection and recycling of plastics cause CO_2, toxins and microplastics emissions, as well as energy, water, material and land use. These pressures on the environment can only be redeemed when recycling directly avoids primary (new, "virgin") plastic material production, which it currently does not.[17] **If recycling is mainly used by industry as a greenwashing alibi to exponentially increase plastic production, it is more counter-productive than useful**.

Plastic is inherently a non-circular material with limited recyclability[18]: in most cases, the same piece of plastic can only be recycled 2-3 times before its quality decreases to the point where it can no longer be used.[19] Recycling PET bottles with the most advanced technologies currently available in the world still leads to wasting approximately 30% of the initial material (due to contamination and process losses)[20], which mathematically means that 90% of the resources have disappeared after three recycling rounds, and all of it before the fourth round is over. In practice, many plastics simply cannot be recycled[21] and most plastic that can be are recycled only once, directly into lower-grade products such as polyester fibers or thermoform packaging, which are not really recyclable anymore.[22] All things considered, even with the best available recycling technologies, the maximum rate of recycling for the current mix of plastics we use is estimated to be between 36% and 53%.[23]

Furthermore, **recycling adds a layer of uncertainty to the presence of toxic chemicals in plastics, and their implications for human health**. Over 13,000 chemicals are associated with plastics, as constituents, additives or potential contaminants from production processes – and most have not been tested for safety, while chemicals transparency is lacking.[24] Recycling increases the potential for mixing and dissemination of chemicals in plastics. This makes it hard to find applications for recycled plastic that are both safe and high enough in volume to meaningfully displace primary production, hence the debate around recycled content requirements in food-contact materials.[25] **Without chemicals transparency, safe circular recycling is impossible.**

---

[17] Zink (T.) and Geyer (R.), *Material Recycling and the Myth of Landfill Diversion* (2018).

[18] GAIA, *Journey Towards a Global Plastics Treaty: GAIA at the Forefront of History* (2023); Greenpeace, *Forever Toxic. The Science on Health Threats from Plastic Recycling* (2023).

[19] National Geographic Society, *7 Things You Didn't Know About Plastic (and Recycling)* (2018).

[20] NAPCOR and Association of Plastic Recyclers, *Report on postconsumer PET container recycling activity in 2017* (2018). This 30% loss rate was confirmed by Coca-Cola and ALPHA when they announced the construction of a new recycling facility in Mexico in 2022 (see Recycling Today, *Alpla, Coca-Cola FEMSA invest $60M in Mexican PET recycling plant*, 2022).

[21] Greenpeace USA, *Circular Claims Fall Flat: Comprehensive U.S. Survey of Plastics Recyclability* (2020) and *Circular Claims Fall Flat Again* (2022).

[22] In such cases, we should rather talk about '*downcycling*' than '*recycling*'. Although there is no official definition of 'recycling' and 'downcycling,' effective recycling can be intended as a recycling process that produces very little or no waste, and aims to recreate the same type of item (e.g., a broken glass bottle is recycled into a new glass bottle). On the contrary, downcycling should refer to processes that produce a significant amount of waste and/or that turn alleged recyclable waste into a lower-grade item (such as PET bottles downcycled into clothes or carpets that will quickly end up in a dumpsite or incinerator). While true recycling contributes to closing the loop of the circular economy, downcycling does not: it only adds intermediary stages to the linear production-consumption-disposal chain.

[23] Denkstatt, *The potential for plastic packaging to contribute to a circular and resource-efficient economy* (2015).

[24] UNEP, *Chemicals in Plastics - A Technical Report* (2023).

[25] Plastic Soup Foundation, *Recycled PET plastic is not a safe packaging material for food and drink* (2022).

All in all, infinite plastic recycling is merely a myth.[26] Plastic recycling only delays final disposal (it adds small loops inside the linear system), but it does not really reduce or prevent it. Delaying disposal of plastic waste unarguably brings real benefits in the short term by lessening immediate harms associated with disposal; but those benefits do not make plastic recycling fully circular.

As emphasized above, **although recycling does have its place in a Zero Waste system, a true circular economy must primarily mean a shift towards other safer, more reusable materials rather than finding ways and false justifications to rely ever-more on plastics**. And since plastic recycling comes at a cost, the sustainable future of this process probably lies not in the mass-scale recycling of single-use plastics, but instead in the targeted high-quality recycling of truly useful plastics – for instance durable essential plastics in medical equipment, renewable energy infrastructure and other areas of the climate transition.

Waste recycling rates are most often used as the main indicator to assess the circularity of an economy. But this approach misses the mark since recycling is the lowest form of circularity compared to reuse and repair. We should rather make annual primary production or natural resources extraction the main metric for a true circular economy.

[26] Ecosoum, *Zero Waste and Circular Economy: The Way Forward* (2021).

PART 2 – WHY OPT FOR ZERO WASTE?

Now that we have clarified what Zero Waste is, we can highlight why countries and cities would be wise to adopt this approach.

ZERO WASTE SAVES PUBLIC MONEY

Firstly, **a Zero Waste system is most often the cheapest way for cities to manage waste properly**.[27] Strategies for saving money through Zero Waste can vary depending on the current state of waste management conditions, but existing World Bank data[28] and case studies assessed by GAIA show that opting for Zero Waste is always a cost-effective strategy.

The table below compares operation costs (in USD per ton) of basic Zero Waste system interventions (separate collection, recycling, and composting) and costs of waste disposal systems (WTE incineration and landfills).

	Collection	Recycling	Composting	Landfills	Incineration
Low-income countries	20-50	0-15	5-30	10-30	N/A
Lower-middle-income countries*	**30-75**	**5-30**	**10-40**	**15-40**	**40-100**
Upper-middle-income countries	50-100	5-50	20-75	25-65	60-150
Upper-income countries	90-200	30-80	35-90	40-100	70-200

**As of 2023, Mongolia is considered a lower middle-income country by the World Bank.*

Table 1: Cost estimate for waste management operations in USD per ton (Source: World Bank, What a Waste 2.0)

Considering that waste collection and transportation always leads to significant expenses, the first lesson from this table is that reducing waste generation at the source – in line with priorities of the Zero Waste hierarchy – is always the smartest move in terms of decreasing expenses. **The more waste a city reduces, the higher its cost savings.**

Then, for the waste that cannot be avoided, recycling and composting remain perceptibly less expensive than landfilling, and strikingly cheaper than waste-to-energy incineration. **Material recovery strategies are always economically more interesting than disposal** (even when incinerators are equipped for so-called "energy recovery", as WTE is proven to be the most expensive way to produce electricity[29] and a huge financial burden for cities and countries that rely on waste incineration[30]).

Zero Waste actions tend to reinforce each other in a virtuous circle. In other words, a comprehensive Zero Waste system wisely implementing reducing, reusing and recycling tends to

[27] GAIA, *Zero Waste Systems: Small Investment, Big Payoff* (2020).
[28] World Bank, *What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050* (2018).
[29] GAIA, *The High Cost of Waste Incineration* (2021).
[30] Ecosoum, *Should we introduce waste-to-energy in Mongolia?* (2023).

save more and more money: reduction of waste generation not only reduces collection costs but also enables enhanced collection, which in turn enables recovering more materials for reusing, recycling and composting – which eventually means a decrease in landfilling and associated costs.

Thus, **contrary to landfills and incinerators that create lock-in effects and long-term debts, Zero Waste investments quickly pay off and lead to incredible reduction in waste management expenses**. For instance, prior to Zero Waste program implementation, the City of San Fernando (Philippines) was spending 1.4 million USD annually on waste collection and disposal; with its Zero Waste program, the city has reduced its yearly spending for waste disposal to 677,404 USD in 2018 – a savings of over 50%.[31] Likewise, the city of Parma (Italy) has seen a 450,000 EUR reduction in overall annual costs for waste management after introducing a Zero Waste system.[32] San Fernando and Parma are not exceptions: most cities that decided to embrace Zero Waste experienced similar savings.

ZERO WASTE CREATES JOBS AND STIMULATES ECONOMIES

Zero Waste approaches that entail to reduce waste generation and to sort/reuse/recycle create much more jobs than landfills and incinerators – and jobs that are safer, greener and not necessarily with low wage.[33] **Reuse, recycling and remanufacturing are estimated to create about 200, 70 and 30 times more jobs, respectively, than landfilling and incineration**.[34] A study from the Tellus Institute projected that Zero Waste policies that would lead to diverting 75% of waste from landfills and incinerators would generate over 2.3 million jobs in the United States alone.[35]

A WIEGO study from 2019 explained that in developing countries, where informal workers play a significant role in the waste management chain, installation of incinerators actually leads to destroying more jobs than they create.[36] The same study showed that in the USA, recycling activities generated 10 to 20 times more jobs than incinerators. Another study from 2011 also highlighted that in Europe, the increased policy focus on material recovery and recycling between 2000 and 2007 has seen the overall employment related to this activity increase from 177,000 to 301,000 – not including at-source waste separation and collection activities.[37]

In addition, we should stress that **contrary to the few jobs created in waste-to-energy facilities, Zero Waste jobs can be decentralized and spread all over the country, especially in rural and peripheric areas where unemployment rates can be very high**. All in all, Zero Waste policies stimulate local economies much more than incinerators and landfills could ever do.

More broadly, it is important to understand that the **potential for job creation of Zero Waste systems goes way beyond the jobs created for resource/waste management itself**. As explained above when discussing circular economy, rethinking and redesigning our economies to follow Zero Waste principles and reconnect local producers and consumers would require to create countless small businesses to produce locally, all over the country and in various economic sectors, package-free goods to replace the over-wrapped ones that are currently transported on long distances from a few large-scale production centers (often located abroad).

[31] GAIA, *Picking Up the Baton. Political Will Key to Zero Waste* (2019).
[32] Zero Waste Europe, *The Story of Parma* (2016).
[33] Hasirudala, *Wastepickers To Robust Entreprenuers* (2016).
[34] GAIA, *Zero Waste and Recovery Economy. The Job Creation Potential of Zero Waste Solutions* (2021).
[35] Tellus Institute, *More Jobs, Less Pollution: Growing the Recycling Economy in the U.S.* (2016).
[36] WIEGO, *Waste Incineration and Informal Livelihoods: A Technical Guide on Waste-to-Energy Initiatives* (2019).
[37] Fisher (C.) and al., *Green economy and recycling in Europe* (2011).

For instance, rather than distributing plastic-wrapped bread or cookies from a few large industries, family-run bakeries that would not need to use single-use plastic (because their customers would be close by) could be created in all villages and districts. The list of such goods that are useful to communities and could be produced locally is endless. In Europe, the packaging-free shop sector is growing rapidly, with an increasing number of shops, jobs, and sales turnover over the past ten years. Long-term forecasts present a mid-estimate EU market for bulk goods of 1.2 billion EUR in 2030, with a best-case potential reaching over 3.9 billion EUR.[38]

ZERO WASTE HELPS MITIGATE AND ADAPT TO CLIMATE CHANGE

Today, the waste sector is responsible for approximately 20% of global anthropogenic methane emissions[39] (due to anaerobic decomposition of improperly-disposed organic waste) and, even when electricity generation is taken into account, each ton of plastic burned in a waste-to-energy incinerator results in the release of 0.9[40] to 1.4[41] ton of CO_2. **Implementing Zero Waste approaches can thus be a game changer in country strategies to mitigate climate change**.

Zero Waste systems can contribute to greenhouse gas emissions reduction in three main ways:[42]

- → Source reduction, separate collection, reusing/recycling and treatment of organic waste can avoid almost all landfill methane emissions and incineration CO_2 emissions (and reduces emissions associated with waste transportation).
- → Land application of compost or digestate enhances the carbon uptake of the soil.
- → Source reduction and reusing/recycling of all municipal waste streams reduces "upstream" emissions from natural resource extraction, manufacturing, and transport.

The mitigation potential of waste management is actually greater than the waste sector's own emissions, as waste reduction and material recovery strategies enable cities to avoid emissions associated with natural resources extraction and production, as well as the end of life of material goods. In fact, although it is usually recognized that the waste sector itself is responsible for 3.3% of global greenhouse gases (GHG) emissions[43], an analysis jointly conducted by the United Nations Environment Programme (UNEP) and International Solid Waste Association concluded that the waste sector has the potential of achieving a 20% reduction in GHG emissions.[44]

Moreover, as the climate crisis requires an urgent response, **Zero Waste solutions happen to be much faster to implement than old-fashion waste disposal infrastructures**. Contrary to major landfills and incinerators, which can take many years to site, permit, build and launch, Zero Waste strategies can actually show amazing results within just a few months. For example, in Santa Juana (Chile), organic waste sent to landfill was reduced by 35% in the first four months of implementation of a Zero Waste-oriented program.[45] Likewise, Sălacea (Romania) went from almost zero recycling to 40% in the first three months of Zero Waste implementation.[46] In light of

[38] Eunomia and al., *Packaging Free Shops in Europe. An Initial Report* (2020).
[39] United Nations Environment Programme and Climate and Clean Air Coalition, *Global Methane Assessment: Benefits and Costs of Mitigating Methane Emissions* (2021).
[40] CIEL, *Plastic & Climate: The Hidden Costs of a Plastic Planet* (2019).
[41] UKWIN, *Evaluation of the climate change impacts of waste incineration in the United Kingdom* (2018).
[42] GAIA, *Zero Waste to Zero Emissions: How Reducing Waste is a Climate Gamechanger* (2022).
[43] Climate Watch, *Climate Data for Action – Emissions and Policies*.
[44] Wilson (D.C.) and al., *Global Waste Management Outlook* (2015).
[45] GAIA, *Estudio de caso: Estrategia Basura Cero en Santa Juana* (2021).
[46] Zero Waste Cities, *The story of Sălacea* (2019).

the emergency we are facing with the climate crisis, postponing proper resource management or relying on futuristic technologies simply makes no sense.

Finally, we should mention that some Zero Waste practices are not only efficient measures for climate change mitigation, but are also considered adaptation strategies. For example, while flooding events are expected to multiply and worsen with climate change (as we have seen again in Mongolia in July, 2023[47]), poor waste collection is recognized as an aggravating factor, especially when improperly managed waste ends up clogging drains and blocking streams.[48] Therefore, Zero Waste practices can help cope with and reduce impacts of floods.[49]

ZERO WASTE PROTECTS HUMAN HEALTH AND ENVIRONMENT

In addition to reducing GHG emissions, **Zero Waste strategies contribute more broadly to protecting nature and human health in many different ways**. At the waste management level, the Zero Waste approach makes incinerators totally useless, which enables avoiding the extremely toxic substances such facilities routinely emit in the air and release into the environment through dispersion of hazardous ashes.[50] Likewise, Zero Waste leads to reducing the need for landfills and to adopting safer landfilling practices, which results in drastically reducing leakage of hazardous leachate that often contaminates soils and groundwaters.[51]

But here again, the potential of Zero Waste for protecting human health and the environment goes way beyond the waste management level. We must keep in mind that what eventually becomes our waste has negative impacts all along its life-cycle, from extraction of natural resources and transportation to manufacture and consumption. Plastics, in particular, pose tremendous risks to humans and ecosystems not only as waste but from the day petroleum is extracted (to produce plastic polymers) to the moment plastics are consumed and used as products or packaging.[52]

Even – and most particularly – when we do not see them, small particles of plastics (known as micro- or nano-plastics) and the many chemicals they contain[53] penetrate our bodies and move through our lungs, blood, brain and many other vital organs, where they have terrible effects on our health (including cancers, endocrine disruption, reproductive disorders, etc.).[54] Of course, these plastics affect not only humans, but also the rest of the biosphere, accumulating in marine[55] and terrestrial[56] food chains. **By reducing waste at the source and better managing the waste that is unavoidably generated, Zero Waste protects us and other living things from this overwhelming toxicity.**

---

[47] News.mn, *Mongolian capital hit by flash flooding* (2023).

[48] The World Bank, *Cities and Flooding. A Guide to Integrated Urban Flood Risk Management for the 21st Century* (2012).

[49] Pervin (I. A.) and al., *Adapting to urban flooding: a case of two cities in South Asia* (2020).

[50] As explained in Ecosoum's *Should we introduce waste-to-energy in Mongolia?* report, proven health impact of dioxins, heavy metals and other toxins released by incinerators notably include increased rates of preterm births, increased wheezing, headaches, stomach aches, and fatigue in schoolchildren, increased risk of miscarriages from exposure to particulate matter, increased risk of lymphoma due to dioxin emissions, and excess deaths due to stomach, liver, colon, and other cancers. For more information, see (among many other studies): Tait (P.W.) and al., *The health impacts of waste incineration: a systematic review* (2020); National Research Council, *Waste incineration and public health* (2000); IPEN, *Plastic Waste Management Hazards: Waste-to-Energy, Chemical Recycling, and Plastic Fuels* (2021).

[51] Ma (s.) and al., *Leachate from municipal solid waste landfills in a global perspective: Characteristics, influential factors and environmental risks* (2020).

[52] IPEN, *Plastics, EDCs & Health* (2020); CIEL, *Plastic & Health: The Hidden Costs of a Plastic Planet* (2019).

[53] UNEP, *Chemicals in Plastics. A Technical Report* (2023).

[54] CIEL, *Breathing Plastic: The Health Impacts of Invisible Plastics in the Air* (2023).

[55] Carbery (M.) and al., *Trophic transfer of microplastics and mixed contaminants in the marine food web and implications for human health* (2017).

[56] Huerta Lwanga (E.) and al., *Field evidence for transfer of plastic debris along a terrestrial food chain* (2017).

Being inherently a "resource management" approach, **Zero Waste also directly contributes to saving natural resources**. By refusing single-use plastic and enabling reuse, refill and recycling, Zero Waste reduces demand for precious virgin materials. Doing so, high amounts of water and energy are saved, depletion of non-renewable resources is limited, and destruction of natural ecosystems is avoided.[57] **Without a comprehensive Zero Waste strategy, it will be impossible to maintain ecosystems' health in the future.**

THERE IS NO REAL ALTERNATIVE TO ZERO WASTE

The old linear "production-consumption-disposal" approach long proved its unsustainable nature, especially when it comes to plastic. Yet, some try to redeem this linear system by suggesting technologies that, allegedly, would be capable of solving the waste crisis. **When we carefully assess these options, however, it stands out that they all are either insufficient or inapplicable in real life (at least not at scale) – when they are not downright counter-productive**. That is why many organizations fighting against waste and plastic pollution refer to them as "false solutions".[58] Among the most common "false solutions" usually promoted, we should mention at least waste-to-energy, plastic-to-fuel, chemical recycling, bio-plastics, plastics credits and plastic-to-road/brick.[59]

WASTE-TO-ENERGY

As explained above (and in detail in Ecosoum's '*Should we introduce waste-to-energy in Mongolia?*' report), waste-to-energy (WTE) incineration – even with "energy recovery" – creates many additional problems without really contributing to solving the waste crisis. Incineration turns regular municipal waste into hazardous byproducts and does not even replace landfills as toxic ashes (which can represent up to 30% of the initial waste[60]) still need to be disposed somewhere. WTE facilities are unreasonably expensive not only to build (investment costs) but also to operate (running costs, especially for pollution control systems), which entails long-term huge debts (often leading to bankruptcy of WTE facilities[61] or even of cities that invested in WTE[62]) and creates lock-in effects that disincentive Zero Waste practices (reducing, reusing, recycling, etc.).[63] WTE is not a renewable energy; it contributes to climate change, pollutes the air, contaminates ecosystems and threatens human health. There is not a single good reason to include WTE into an effective resource management system, which is why it is unequivocally considered "unacceptable" in the Zero Waste hierarchy.

PLASTIC-TO-FUEL

Plastic-to-fuel (PTF) processes use heat, pressure, and/or chemical solvents to break plastic waste down into liquids or gases that are to be burned as fuel. Although PTF technologies like gasification, pyrolysis and arc plasma are often described as not being incinerators, that is technically what they actually are – which is why they are in fact classified as incineration in the European legislation.[64]

[57] GAIA, *Zero Waste to Zero Emissions: How Reducing Waste is a Climate Gamechanger* (2022).

[58] Break Free From Plastic, *Missing The Mark. Unveiling corporate false solutions to the plastic pollution crisis* (2021).

[59] Scientific assessments of each of these "solutions" are presented in more detail and with additional references in Ecosoum, *Plastic Solutions Review* (2022).

[60] Funari (V.), *Sustainability assessment of bioleaching for mineral resource recovery from MSWI ashes* (2022).

[61] The New School, *U.S. Municipal Solid Waste Incinerators: An Industry in Decline* (2019).

[62] CBS News, *Municipal folly bankrupts a state capital* (2011).

[63] Luthra (A.), *Waste-to-Energy and Recycling. Competing Systems of Waste Management in Urban India* (2017).

[64] Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste.

As such, PTF processes essentially entail the same kinds of problems as conventional mass burn WTE (as described above).[65] In addition, despite decades of development, these technologies remain immature and unsustainable[66], which is why they have never been successfully implemented at large scale anywhere in the world.

CHEMICAL RECYCLING

Chemical recycling processes use heat, pressure, and/or chemical solvents to break plastic waste into its basic building blocks, which can then be remade into new plastic. In theory, chemical recycling offers an interesting approach to managing plastic waste, particularly for plastics that are otherwise difficult to recycle. In practice, however, it is technologically immature, economically infeasible, logistically challenging, has a significant carbon footprint, and results in toxic byproducts that threaten human and ecological health.[67] There is no evidence that chemical recycling will ever play a significant role in efficient resource management systems – in any case, it certainly is incapable of helping to solve the waste crisis today.

BIO-PLASTICS

The definition of the term "bioplastics" varies greatly around the world. It is most commonly used to refer to either bio-based, biodegradable, and/or compostable plastics – but things are most often very unclear. The distinction is essential, though, because these words reflect two very different features: one of the terms (bio-based) refer to the source of the material used to make the "bio-plastic", while the other two terms (biodegradable and compostable) refer to its end-of-life behavior.

→ **Bio-based plastics** are plastics that are partly or entirely made from biological feedstocks, such as sugar cane, corn, or potato starch. These "bio-plastics" are often chemically and functionally 100% identical to conventional, fossil fuel-based plastics. Being the exact same molecules, bio-based plastics essentially create the same problems and do not contribute to reducing plastic waste and pollution.[68] The main purported benefit of bio-based plastics is that they are made from renewable materials (agricultural products) instead of fossil fuels. However, being agriculture-based actually raises many sustainability issues, including harmful agro-industrial practices, competition with food crops, conflicts over land, deforestation, etc.[69] – not to mention that most bio-based plastics also contain fossil fuel-based materials, which can in some cases make up as much as 75% of the product.[70] All in all, bio-based plastics are clearly not a more sustainable alternative to conventional plastics.

→ **Biodegradable and compostable plastics** are plastics that can be broken down by microorganisms like bacteria and fungi into water, carbon dioxide, and other molecules found in nature. However, such materials biodegrade only under specific conditions, which can be controlled in industrial composting facilities but are not necessarily met in nature. In fact,

[65] Ecosoum, *A guide to assess waste-to-energy projects or proposals* (2023).

[66] Rollinson (A.) and Oladejo (J.), *Chemical Recycling: Status, Sustainability, and Environmental Impacts* (2020).

[67] GAIA, *All Talk and No Recycling: An Investigation of the U.S. "Chemical Recycling" Industry* (2020); Zero Waste Europe and al., *Understanding the Environmental Impacts of Chemical Recycling – Ten concerns with existing life cycle assessments* (2020).

[68] Zimmerman (L.), and al. *Are bioplastics and plant-based materials safer than conventional plastics? In vitro toxicity and chemical composition* (2020).

[69] Walker (S.) and Rothman (R.), *Life cycle assessment of bio-based and fossil-based plastic: A review* (2020); Popp (J.) and al., *The effect of bioenergy expansion: Food, energy, and environment* (2014).

[70] Álvarez-Chávez (C.R.) and al., *Sustainability of bio-based plastics: general comparative analysis and recommendations for improvement* (2012); Surfrider Foundation Europe, *Plastic Fakeout: Falling Into the Trap of Bioplastics* (2020).

evidence suggests that under many circumstances such "bio-plastics" actually fail to degrade and can remain intact for years before fragmenting into equally persistent and dangerous microplastics.[71] Thus, substituting conventional plastics with biodegradable plastics would not make much sense if the goal is to solve the plastic crisis. However, we should acknowledge that, under limited circumstances, certified compostable plastics could be used wisely for specific waste management purposes (e.g., to make compostable bags for separate collection of food waste, which could thus be composted directly without having to open, empty and segregate each plastic bag from the organics they contain) or as last-resort for truly indispensable single-use plastics (such as during disaster relief operations).[72]

PLASTICS CREDITS

A plastic credit is a tradable certificate that represents a certain amount of plastic waste that has been recycled, recovered, or prevented from entering the environment. Credits are generated by projects that physically recover or prevent plastic waste, and are bought – on unregulated, non-standardized, privately-run markets – by companies that want to offset the plastic waste that they generate.

By essence, plastic credits do not reduce plastic production, and therefore do not contribute to a solution to the plastics crisis. At most, they are intended to balance out the plastic waste generated by credit buyers, allowing pollution in one location to continue as long as it is offset by allegedly equivalent reductions somewhere else. In that sense, plastics credits tend to contribute much more to greenwashing communication than they actually help to stop unsustainable practices.

In addition, plastic offset projects face significant implementation challenges, including how to establish "additionality"[73] and how to match the impact of offset projects to the impact of waste production by credit buyers.[74] Moreover, there is no guarantee that plastic offset projects will not have other social or environmental impacts. For example, credits can sometimes be generated for plastic waste that is recovered but then incinerated, converted into refuse-derived fuels (RDF), or even disposed of in open dumps[75], although such practices do not contribute in any way to solving the waste crisis. Plastic credits could even have further indirect impacts by establishing perverse incentives that discourage plastic waste reduction, as it has been observed in carbon offset markets.[76]

Finally, beyond the implementation challenges that offset projects face, the plastic credits market as a whole presents logistical and financial challenges. Already, dozens of actors are involved in

[71] Haider (T.) and al., *Plastics of the Future? The Impact of Biodegradable Polymers on the Environment and on Society* (2018); Napper (I.) and al., *Environmental Deterioration of Biodegradable, Oxo-biodegradable, Compostable, and Conventional Plastic Carrier Bags in the Sea, Soil, and Open-Air Over a 3-Year Period* (2019); UNEP, *Biodegradable Plastics and Marine Litter. Misconceptions, concerns and impacts on marine environments* (2015).

[72] British Plastics Federation, *Compostable Bags for Organic Waste Collection* (2023).

[73] "Additionality" means that the activities enabled by the credits must actually come in addition to activities that would have been carried out anyway without the credits. This additionality is virtually impossible to prove in most cases, as carbon credit markets have largely demonstrated. See Pearson (B.) *Market failure: why the Clean Development Mechanism won't promote clean development* (2007) or Petersen (B.V.) and Bollerup (K.), *The Clean Development Mechanism and Its Failure in Delivering Sustainable Development* (2012).

[74] There are a wide variety of plastics, with different chemical properties, which can have very different impacts depending on the locations they are littered or recovered (for instance, 1 ton of PET bottles in a landfill in the USA does not produce the same impacts as 1 ton of single-use sachets littered in a river in Bangladesh). An effective plastic credits market thus requires an extremely high level of analysis and verification to match the impacts of waste generation and waste recovery, making the system even more complicated to implement.

[75] World Wildlife Fund, *WWF Position: Plastic Crediting and Plastic Neutrality* (2021).

[76] Schneider (L.) and Kollmuss (A.), *Perverse effects of carbon markets on HFC-23 and SF6 abatement projects in Russia* (2015).

the process of setting standards and definitions, developing offset projects, verifying these projects, creating credit-tracking systems, marketing credits, and brokering deals with buyers. Every link in the chain adds complexity and reduces transparency, resulting in a crisscrossed, international system that, as seen with carbon markets, is ripe for miscommunications, misrepresentation, and even fraud.[77] This in turn confuses and discourages consumers, reducing public pressure on companies to manage their plastic waste, and will require an incredible amount of regulatory oversight from both the private and public sectors, absorbing time and energy that could be spent on more effective solutions like actual plastic waste reduction.

PLASTIC-TO-ROAD AND PLASTIC-TO-BRICK

Another "solution" that is sometimes promoted – especially by well-intentioned entrepreneurs at local levels – entails to downcycle plastics into construction materials, to make bricks or roads.[78] However, such practices are not to be recommended,[79] mainly because exposing low-grade plastics to harsh outdoor conditions (sun UVs, wind, rain, ice, etc.) and abrasion from vehicles is the best way to quickly release toxic substances and hazardous micro-plastics into the environment, with all the previously-mentioned risks they entail for human health and ecosystems.[80] In addition, these plastic-based construction materials are most often a significant fire hazard.[81]

In any case, turning plastics into such low-grade materials means that further recycling is impossible: plastic-to-road or plastic-to-brick is a totally linear approach that does not get us any closer to a circular economy. The only application that could be relevant for such downcycling is extrusion and molding of low-grade plastics recovered from Materials Recovery and Biological Treatment (MRBT) facilities, as a last resort solution for residual waste that cannot be prevented and would otherwise be landfilled (see below in Part 3).

***

All things considered, it appears that Zero Waste is not only by far the best solution to solve the waste and plastic crisis the world is currently facing; it is the only realistic one. There is simply no real alternative.

[77] Badgley (G.) and al., *Systematic over-crediting in California's forest carbon offsets program* (2012); Pearse (R.) and Böhm (S.), *Ten reasons why carbon markets will not bring about radical emissions reduction* (2014).

[78] To make bricks, plastic is usually compressed by two iron rods in a modular brick mold; the mold is filled with an air-tight amount of plastic waste and heated for about one hour before to be cooled immediately with a jet spray. To make roads, plastic waste is shredded into a uniform size (a few millimeters) after cleaning; then, the mixture is melted at 160–180°C and blended with hot aggregates and asphalt at a similar temperature. There are different variations of the same techniques, but most rely on similar principles.

[79] Jayaraman (N.), *Heard about miracle "plastic roads"? Here's why it's not a solution to our plastic problem* (2015).

[80] CIEL, *Plastic & Health: The Hidden Costs of a Plastic Planet* (2019).

[81] Okotie (W.), *Introduction to False Solutions.* Zero Waste Academy Webinar (2023).

PART 3 – HOW TO IMPLEMENT ZERO WASTE IN MONGOLIA?

The first two parts of this report explained what Zero Waste is and why a country or city would benefit from adopting a Zero Waste approach. In this third part, we will explore how we could translate all these principles into tangible actions to put Mongolia on the path to becoming a Zero Waste country. Most recommendations below are intended to be relevant for both national and local levels, to be applied in Mongolia as a whole and/or specifically in Ulaanbaatar city, aimag-centers or rural soums. Whenever necessary, we focus particularly on one or the other level, but readers can easily adapt and implement whatever policies and actions they consider relevant to their own local context.

GETTING STARTED AND LAYING SOLID FOUNDATIONS

FORMALLY COMMIT TO ZERO WASTE

To seriously start walking the path towards Zero Waste, the first thing to do is to make a formal commitment to it.[82] Therefore, **we recommend that the Mongolian government officially declares Zero Waste a national cause and priority for Mongolia**.[83] Such a bold statement, publicly taken by the President or Prime Minister, would send a very strong political message to all citizens.

Considering that Zero Waste has the capacity not only to solve the waste crisis but also to simultaneously boost the economy, strengthen social justice, protect human health, reduce pollution and mitigate climate change, making it a national cause – while properly explaining why and actively communicating about it in the media – can be a **powerful way to unite the country around a joint and inspiring objective**.

Incidentally, such a commitment to Zero Waste should progressively **be reflected as an overarching paradigm in all public policies**. For example, considering how powerful a leverage Zero Waste strategies are to mitigate climate change, Zero Waste actions should be deeply integrated into climate-related plans and programs at all levels. Likewise, since Zero Waste has the capacity to create many jobs and small businesses, **Zero Waste actions should be formally included into policies aiming at fighting unemployment and boosting the economy**.

ORGANIZE PARTICIPATORY CONSULTATIONS TO MOBILIZE THE PEOPLE

National government or local authorities committed to Zero Waste could be tempted to go ahead, make plans on their own and impose a 'proper' resource management system on Mongolian citizens. Although this approach could probably show some results and lead to improvements compared to failing waste management schemes currently in place, **we strongly recommend to genuinely get people on board for the Zero Waste journey by being inclusive and favoring a bottom-up strategy rather than a top-down approach**.

Thus, after officially adopting Zero Waste as the new paradigm for Mongolia, the government should **organize participatory consultations of the Mongolian people to help setting clear and timebound Zero Waste objectives for the country and to provide inputs for shaping a**

[82] GAIA, *The Zero Waste Masterplan. A guide to building just and resilient Zero Waste cities* (2020).

[83] Provincial and local governments can perfectly be proactive and make Zero Waste the official objective and paradigm for their own city, aimag or soum even if national government does not take a stand for the whole nation.

roadmap and action plan towards these objectives.[84] Such consultations could take the form of in-person "Citizens Conventions"[85] of randomly selected people and/or rely on technologies to enable online "co-creation".[86] This initial consultation phase is also an opportunity to discuss and agree on guiding principles to frame the Zero Waste journey.[87] As much as possible, **interference from lobbies defending private interests should be combatted, so as to avoid corruption and remain focused on the general interest**. All discussions should be as transparent as possible, for instance with live-streams of assembly meetings and publication of official meeting minutes and summary notes at each stage of the process.

Once this national-level participative process has come to set a roadmap for the country (or instead of this nation-wide consultation if none is actually organized by national authorities), **similar people's consultations, assemblies and/or workshops must be organized at all local levels** (municipality, khoroo, aimag, soum), involving as many community people as possible to decide on local Zero Waste objectives and to translate them into action plans that are effectively relevant and implementable in each local context.

Whatever form these participatory consultations may take, the goal of this citizen-based, bottom-up approach is to ensure that the Mongolian population has a real opportunity to express their opinions and demands, so that the final Zero Waste national and local strategies are perceived as their own by the people. Incidentally, **community participation and involvement must be ensured not only during the initial phase but ongoingly, all along to Zero Waste journey, to make sure that people's feedback is systematically taken into account to constantly improve the system**. If citizens feel empowered by the new Zero Waste paradigm and have a real opportunity to participate in the design of new policies and actions, to make sure they reflect their views and expectations, chances of success will be greatly increased.

ESTABLISH A CLEAR BASELINE AFTER EVALUATING THE CURRENT SITUATION

Designing relevant and effective Zero Waste systems and monitoring progress require knowing where exactly we start from. This notably means understanding clearly what kind of and how much waste we have to deal with, what waste-related policies and regulations are currently in place, in what ways current waste management systems are succeeding and failing, and what kind of resources and infrastructures are presently available. The ultimate goal is to identify the amounts of materials that are – and could be – reduced, reused, recycled, composted and landfilled at each relevant level (country-wide, Ulaanbaatar city, aimags, soums, khoroos, etc.).

There are already a lot of information and data available about different levels and locations in Mongolia[88], **but public officers in charge of leading the transition towards Zero Waste need**

[84] When suggesting to rely on common people to make important decisions, we are sometimes told that ordinary citizens are not informed and educated enough, and that only experts can fully understand the problems and make good decisions. However, this technocratic way of thinking reflects elitist prejudice much more than reality (not to mention that the answer of a lack of education/information should certainly not be to exclude uneducated/misinformed people but, on the contrary, to increase efforts on raising awareness and improving access to quality education/information). Crowdsourcing policy-making is actually a rising trend that must be encouraged, especially in contexts where democracy is challenged by corruption and legitimacy of decision-makers is increasingly questioned by citizens. See Milotay (N.) and Sgueo (G.), *Collective intelligence at EU level. Social and democratic dimensions* (2020).

[85] Following the example of other countries, such as the Icelandic initiative to rewrite the Constitution in 2011 or the French Citizens Convention for Climate in 2019.

[86] Sgueo (G.), *Using technology to 'co-create' EU policies* (2020).

[87] The 'End Waste' Charter of principles for solving the waste crisis in Mongolia initiated by Ecosoum and signed by many other organizations can be a base – or at least an example – to develop such guiding principles.

[88] See, for instance: Volosĭnová (D.) and Fojtík (T.), *Research Report on the existing policies and processes regarding the recycling sector, waste generation, production and collection in Mongolia* (2021).

to gather all important facts and figures and make sure they are up-to-date and applicable to each context for which Zero Waste policies are to be designed (for instance, 10-years-old statistics may not be relevant anymore, nor may be city-related data to rural contexts).

Waste composition studies and brand audits need to be conducted at all relevant levels to understand in detail all important waste features, including: types of materials (plastics, glass, organic, etc.); types of items and products (broken products, food containers, beverages bottles, single-use packaging, etc.); main producers and importers (APU, MCS, etc.); current best processing channels available for each material (reusing, recycling, composting, landfilling, etc.); amounts and proportions for each feature (in volume and/or weight); etc.[89]

Policies and legislative framework analyses are useful to understand if new Zero Waste-compatible laws and programs need to be built from scratch or if relevant policies are already in place but fail to be implemented properly and efficiently. Likewise, **assessing the available resources and infrastructures will help clarifying if additional funding is necessary, if new staff must be hired, and if new facilities need to be built** – or if simple reorganization of currently available resources and infrastructures can be enough to achieve the set Zero Waste objectives.

Finally, **gap analyses are essential to identify which parts of the envisioned system are already functioning decently and, on the contrary, what aspects of proper resource management (separate collection schemes, material recovery facilities, repair and refill shops, etc.) are totally absent, problematic or failing**. Such analyses are necessary to assess the biggest expected challenges and the main opportunities for quick and effective results; thus, they will highlight where most efforts should primarily be put. It is important that these analyses focus not only on resource/waste management infrastructure but include also all other aspects of the economy that could lead to reducing waste generation (e.g., packaging-free local businesses with short supply chains).

We should emphasize that **these analyses must be carried out with the Zero Waste hierarchy in mind**: for example, focusing all efforts on assessing how to increase recycling rates is irrelevant – if not counter-productive – if the analysis does not start by assessing why so much waste is produced in the first place and what gaps have to be filled to primarily reduce waste generation and increase materials reusing.

The main output of this analysis should be the production of a clear baseline report summarizing all relevant information to build a detailed Zero Waste plan on.[90]

DEVELOP A MENU OF ZERO WASTE OPTIONS AND LEAD AN ECONOMIC ANALYSIS

Based on the baseline study findings, the next step is to **develop a menu of all the potential Zero Waste strategies that could be implemented in a given context**.[91] These strategies are the policies, processes and infrastructures that the community could implement to improve waste

[89] See for example Ecosoum's analyses for Khishig-Undur soum in *Waste Composition Study. Data analysis report* (2020) and *Who produces our waste? Brand audit report* (2022).

[90] For an example of baseline study in rural Mongolia, see Ecosoum, *Waste management baseline study report for Khishig-Undur soum* (2021).

[91] As a reminder, cities and soums are the level at which waste/resource management is implemented, so it is essential that Zero Waste plans are designed for specific local levels, taking into account the local context, rather than setting uniform rules for the entire country. On the other hand, some legislations can be more relevant if taken at the national level, especially those that aim to address the highest parts of the Zero Waste hierarchy by rethinking how the economy should be organized or what standards producers and importers should all respect.

refusing, reduction, sorting, collection, reuse, recycling, composting, recovering and proper disposal. Examples and suggestions of main relevant policies and strategies are presented in the next sections of this report.

Once public officers in charge and local advocates develop an initial menu of Zero Waste options, **community members can review and provide feedback to help identify additional options for consideration, research, and analysis**. This can be achieved through a workshop series where the needs and ideas of participants are incorporated into strategy options and presented back to the community at each phase. For each possible Zero Waste strategy, **the potential for waste reduction and diversion from landfill (through reuse, recycling or composting) should be estimated as precisely as possible**, to clarify which options appear more likely to show significant results and reach the set objectives.

Likewise, **an economic analysis should be conducted for each considered option, to estimate the expected expenses and understand the potential cost-savings of each strategy**, as well as the relative impacts on rate-payers or local communities. This economic assessment should notably include estimations of staff necessary to implement the strategy (in full-time-equivalent), investment costs for material and equipment, operational costs (in addition to human resources), and expected savings (from reduced landfilling and recovered materials value[92]). The analysis must not be limited to "downstream" waste management operations but include also "upstream" considerations (for instance, every ton of waste that can be reduced rather than discarded saves money, time, energy, and resources – which should be included in calculations). The level of detail of the economic analysis should be sufficient to include the annual or biennial budgeting process of the local municipality.

SET REALISTIC GOALS AND RELEVANT METRICS

Zero Waste strategies must have clear goals and metrics to monitor progresses towards these objectives. The goals must be **timebound**, possibly with intermediary targets and milestones. It is crucial to keep goals realistic (in order to avoid disappointments and frustrations), but objectives must nonetheless be ambitious enough to achieve substantial results and to inspire all stakeholders to actively embark on the Zero Waste journey.

Although there is no standard Zero Waste objective nor universal way to track achievements, **monitoring 'diversion rate' is a common practice**. In most cases, this indicator is calculated by measuring waste "generation", "disposal", and "diversion":

- → "Diversion" corresponds to the tons of waste that are diverted from landfills, incinerators and the environment. It includes all materials that are reused, recycled and composted – as well as, in many methodologies, waste that is reduced at the source.[93]
- → "Disposal" includes all materials that are landfilled (and incinerated).
- → "Generation" is the sum of diversion plus disposal.
- ⇒ Diversion rate corresponds to the tons of waste diverted divided by the total tons generated (diversion rate = diversion / generation = diversion / [diversion + disposal]).

[92] Determining the local market value of discarded commodities can be an important part of an economic analysis as these materials are valuable resources that should be kept in the economic mainstream. Understanding the value of these materials and their potential for creating economic value and good green jobs can be critical to justify investments in new or expanded policies, programs and infrastructure.

[93] See, for example, certifications methodologies by TRUE, UL, Zero Waste International Alliance, Zero Waste Canada, etc. We should highlight, however, that including waste reduction in the 'diversion' parameter mechanically leads to artificially maintaining waste 'generation' unchanged year after year (if generation is calculated as the sum of diversion and disposal), which is quite counterintuitive and questionable.

It should be noted that **the 'diversion' metric has been criticized** for several reasons.[94] One of the main reasons is that **this indicator does not really incentivize waste prevention**, although the latter is higher than reusing and recycling in the Zero Waste hierarchy. Another critic is linked to the fact that this metric is measured by weight: the diversion of inherently heavy materials like food scraps and glass can skew data to make diversion rates seem artificially high, which might cause municipalities to overlook the widespread generation of lighter (but more problematic) materials, such as plastic packaging. Nonetheless, diversion rate remains one of the most widely-used metrics, as it is relatively straightforward to measure, record, and communicate.

All things considered, there is no perfect indicator capable on fully capturing at once all aspects of good Zero Waste policies. Therefore, **it is essential to have several indicators that complement each other, in order to assess different goals and overcome the limits and flaws of each metric**.[95] The importance attached to each indicator should – as always – reflect the Zero Waste hierarchy; for instance, authorities should pay more attention to – and put more efforts on improving – the metric that monitors waste reduction than the one that monitors waste recycling.

Goals such as "*reducing municipal solid waste generation per capita by at least 15% before 2030 compared to 2023*" and "*reducing the amount of municipal solid waste disposed to landfill (or incinerator) by at least 50% before 2030 compared to 2023*" are good examples of relevant objectives set by many municipalities around the world. These main metrics can then be completed by specific indicators (with timebound targets) focusing for instance on reusing of glass bottles, recycling of plastics and/or composting of food waste. For example: "*50% of glass bottles used by the beverage industry are reused by 2030*"; "*50% of plastic packaging is recycled by 2030*"; and/or "*50% of food waste is composted or digested by 2030*". This way, the whole set of metrics enables clarifying how diversion from landfills is actually achieved (which help understanding if actions and goals are properly prioritized in line with the Zero Waste hierarchy).

In the end, whatever metrics are selected, **communities should make sure that measurement and calculation methodologies are clear, detailed and publicly available**. Reliability and accuracy are indeed essential to transparently and efficiently monitor actual progresses through time. Likewise, **it is crucial that metrics remain unchanging and consistent year after year**; otherwise, comparing figures over time would not be possible/relevant and data could easily be manipulated. Incidentally, each city or district can be free to design its own indicators to best match its local context and objectives, although standardizing (at least part of the) methodologies to be used in all areas would enable to make relevant comparisons and to aggregate data at the national scale.

ENABLING SEPARATE COLLECTION AND MATERIAL RECOVERY

MAKE AT-SOURCE WASTE SORTING EASY AND MANDATORY

Efficient resource/waste management systems cannot be carried out without sorting and collecting each type of waste separately. Therefore, **all waste producers (households, institutions, businesses, etc.) must properly sort their waste at the source**.

[94] Post Landfill, *5 Reasons Why The Diversion Metric Does Not Measure Zero Waste* (2019).

[95] The main flaws of the diversion rate can be circumvented by ensuring that Zero Waste policies create pathways for system/product redesign, waste reduction, and reuse; and by creating policies that specifically target high-quantity, low weight materials such as single-use plastics.

Sorting categories must be adapted to each local context and resource management system, but as mentioned above, **materials that should be segregated and separately collected include at the very least**:

- **organics** (food and garden waste);
- **reusable/recyclable materials** (such as paper, cardboard, glass and plastic containers, metal cans, products and components that are reusable);
- **residual waste** (which is essentially what is left after everything else has been separated).[96]

Changing people's habits can take time and effort, but very high compliance rates can quickly be reached through a cocktail of complementary measures that wisely wield the carrot and the stick, including:

→ **Making at-source sorting mandatory for everyone**: Even though tolerance for mistakes and non-compliance can be judicious in a first phase, relying solely on the commitment and good will of everyone is not enough. People should know that sorting waste is not an optional extra effort but the right and mandatory thing to do. A law or rule is not necessarily respected without controls, incentives and punishments[97], but an adequate regulatory framework enables sending the right signals and taking legal actions if necessary. Incidentally, as most people are reluctant to make efforts when they think they are the only ones to do so, mandating universal waste sorting can actually be perceived positively – rather than a negative burden – at least by those who understand why waste sorting is important.

→ **Educating people about Zero Waste and why/how to sort waste**: In fact, once people realize how important and easy at-source waste sorting actually is (or, at least, can be in the right conditions), most citizens gladly accept to comply.[98] Therefore, massive and ongoing awareness-raising campaigns must be led by authorities in partnership with activists and NGOs.[99] This training process should be decentralized as much as possible (through trainings-of-trainers and peer-education approaches) and rely on the involvement and leadership of respected community members. Likewise, waste sorting education and recommendations should not be broad and general, but provide citizens with details adapted to their local context, corresponding to local waste management rules.[100]

→ **Providing relevant waste sorting equipment**: Although concerned and motivated citizens can usually find ways to sort their waste without specific equipment, providing adequate bins can be a game-changing nudge to induce behavior changes[101] – especially when sorting bins are wisely planned and properly integrated in the local waste collection scheme. Thus, here again, waste sorting bins must be perfectly adapted to each context and enable respecting

[96] Ecosoum actually recommends to also sort as "recyclable" some types of waste for which there is still no processing channel in Mongolia. For example, in Khishig-Undur soum, we require waste producers to separate Tetra Paks from residual waste, like other "recyclables", although no processing channel is currently available. Such sorting is the only way to produce reliable data and enable relevant redesign of incriminated packaging and industry processes. See details about recommended sorting sub-categories in Ecosoum's *Waste Management Master Plan Template* (2023).

[97] It goes without saying that no one should be penalized for not sorting their waste if the resource/waste management system in place is not functioning properly and/or does not offer reasonable means to ensure proper sorting. However, if relevant Zero Waste policies are taken and at-source waste sorting can reasonably be implemented by waste producers, obligation to sort waste should be strictly applied and lawbreakers should be firmly penalized. For example, in Seoul, South Korea, violations of waste sorting rules can be fined up to 1,000USD; while in Germany, repeatedly not sorting your waste can lead to losing your apartment.

[98] Ecosoum, *Citizens of Khishig-Undur Talk About Waste Sorting* (2023).

[99] Zero Waste Cities, *The Zero Waste Training Handbook* (2022).

[100] Ecosoum, *'How to sort waste?' Guidance leaflet for household in Khishig-Undur soum* (2021).

[101] GIZ, *Social and Behaviour Change. Insights and Practice* (2021).

local sorting rules (in particular, number of sorting compartments should be consistent with number of requested sorting categories). For instance, in rural areas or ger districts, individual household metal bins can be installed in each family yard, while in apartment districts of Ulaanbaatar and other cities collective waste sorting equipment can be set up in (or next to) each building – to be used by all residents under supervision of Apartment Owner Associations (СӨХ) and janitors.

→ **Standardizing and clarifying the waste to be sorted**: One of the reasons people fail to properly sort their waste is that there are too many different types of waste and not enough clear information on most packaging (which constitutes the largest part of household waste[102]). Standardizing packaging to reduce the diversity of materials and the variety of shapes would not only facilitate downstream reuse/recycling processes[103], it would also largely ease the sorting process at the source. At-source waste segregation would become a child's play if most glass bottles had the same form, if most yogurt pots were made of the same type of plastic, or if unintelligible multi-material packaging came to disappear. Improving labeling and identification of materials would also help clarifying in which bin each product and packaging is supposed to go (for instance, although the type of plastic is clearly indicated on some items – especially PET bottles – transparency is still lacking on a vast majority of discards).

→ **Incentivizing people to reduce and sort their waste**: Sorting your waste properly should be cheaper and more convenient than not sorting it. Depending on local contexts, incentives can be monetary or non-monetary. For instance, 'Deposit Return Schemes' (DRS)[104] can be very effective in some places and for some items, while using waste collection as a leverage to encourage proper sorting is a common non-monetary incentive.[105] In addition to incentives for sorting, waste producers should also (and primarily) be incentivized to reduce waste generation in the first place. To that end, Pay-As-You-Throw (PAYT)[106] schemes have proved very effective in many Zero Waste cities around the world. Specific measures can also be applied to the largest waste producers, such as frequent waste audits with mandatory recycling and composting targets to reach.[107]

---

[102] Ecosoum, *Who produces our waste? Brand audit report* (2022).

[103] See more information about benefits of standardization in the "*Standardize packaging and eliminate toxic additives in plastics*" section below.

[104] DRS is a system in which a deposit fee is charged at the point of purchase and refunded to the purchaser when the bottle is returned via a specifically designed system (see more details about DRS in the "*Develop reuse/refill systems and deposit-return* schemes" section below).

[105] Indeed, a local waste management plan can perfectly establish a rule that says waste is to be taken by collection services only if it is properly sorted. In Germany, for instance, waste collectors usually leave garbage bags on the curbside if they can see waste is improperly sorted (and violators can be fined on top of it). In Khishig-Undur soum, Ecosoum informed local citizens that waste collection service would be provided (free of additional charge) only for households who proved they properly sort their waste (by bringing sorted waste by themselves to the waste management facility at least three times).

[106] PAYT is a system that charges people proportionately for the amount of waste they generate and throw away (see more details about PAYT in the "*Make extensive at-source waste sorting a reality with PAYT schemes*" section below).

[107] For example, to increase compliance with the city's mandatory waste sorting ordinance, the city of San Francisco (USA) began requiring large generators – multi-unit housing office buildings, hotels, and city buildings that contribute 20% of the city's landfill waste – to conduct a recycling, composting, and trash audit every three years. Audits receive a pass when contamination levels are lower than 5% for compostables, 10% for recyclables, and 25% for trash. Buildings that fail the compliance audit are required to hire on-site Zero Waste Facilitators at their own expense for one year, or face substantial fines. Zero Waste Facilitators are trained individuals that help property managers comply with ordinances and reduce building refuse costs. They educate and provide feedback to tenants and staff to improve collection efficiency and sort waste at the source to reduce recycling and compost contamination. The new requirement had strong union support for its job creation potential. See San Francisco Environment Department, *Refuse Separation Law – FAQ* (2023).

ADAPT INFRASTRUCTURES TO THE NEW ZERO WASTE PARADIGM

Globally, massive investments have been made to build "state-of-the-art" landfills and incinerators[108] but decentralized resource management facilities have systematically been under-funded – if not totally ignored. Thus, **to allow Zero Waste policies to flourish and bear fruit, budgets initially planned for future centralized disposal sites must be massively reallocated to build, equip and support small-size resource management infrastructure all over Mongolia**. Such Zero Waste infrastructure can be subdivided in three main categories depending on the role they play in the circular economy: prevention ("upstream"), recovery ("midstream") and circular reprocessing ("downstream").[109]

→ PREVENTION INFRASTRUCTURE

Reduction through prevention is the ultimate goal of any Zero Waste system. Prevention infrastructure can include different types of facilities, centers and platforms that play complementary roles in the system:

- **Sharing centers**: Facilitating convenient and accessible sharing of goods that are infrequently used reduces the demand for purchasing individual items. Successful examples of physical or virtual lending libraries exist for sharing or renting tools, equipment, and other household items (just like books can be borrowed or rented from conventional libraries).
- **Repair facilities**: Taking action to reverse planned obsolescence by repairing broken items results in job creation and extends the life of products. There are two main types of repair facilities:
  - **Repair workshops** are locations where people can come to repair their own broken items by themselves, alone or with the help of community members and/or professionals. Such workshops provide training and technical expertise to build capacity while strengthening social interactions and community spirit.
  - **Repair stores** are businesses where broken items are repaired by professionals. As disposable and cheap products become the new norm, such repair stores have dramatically declined in the Global North over the past decades. Although following a similar declining trend in the Global South, they remain widely present in countries like Mongolia, at least for some types of products. Investment in repair options for electronics, textiles, furniture and other materials builds a local economy, creates countless jobs and strengthens local resilience – while decreasing waste generation.
- **Reuse facilities**: Both upstream reduction and downstream diversion outlet, reuse entities can take several forms, including:
  - **Second-hand stores**: many models of successful for-profit and nonprofit second-hand shops exist, focused on household goods and textiles, building materials salvage stores, antique stores, sporting goods and others.

[108] Luckily, Mongolia currently has landfills but no large-scale incinerator. This situation is a chance since existence of waste incinerators is usually one of the main obstacles on the path to Zero Waste. Most often, municipalities that succeeded in implementing Zero Waste systems first had to shut down existing waste-to-energy facilities or turn down new projects, like in Capannori (Italy), Argentona (Spain), or Kamikatsu (Japan) – among many others. In that sense, the absence of incinerators in Mongolia gives our country a head-start towards Zero Waste.

[109] We should note that the boundaries between these three categories are sometimes hard to establish precisely. For instance, a repair facility can be considered both a "prevention" center (avoiding waste by repairing a broken item) and a "circular reprocessing" facility (making a material re-enter the economy by repairing a discarded item). As such, these three categories are largely artificial and arbitrary. Although fundamentally unnecessary, these categories are only intended to help readers understand how Zero Waste infrastructures are important at all stages of the circular economy: upstream, midstream and downstream.

  - **Reusable products**: a growing number of companies offer reusable products as alternatives to common single-use ones, such as washable diapers, menstrual cups, etc.
  - **Reuse services**: reuse businesses offer an alternative to single-use by providing reuse services such as washable diaper services for nurseries, reusable tableware for events (some even with mobile dishwashers), reusable delivery packaging for ecommerce, or clothing rental that allow consumers to participate in reuse with growing convenience.
  - **Packaging reuse systems**: such systems in which packaging (starting with drink bottles) is systematically returned to producers for reuse are a fundamental part of comprehensive Zero Waste systems. Associated with deposit-return schemes (see DRS section below), these reuse systems are particularly effective.
  - **Online donation or exchange platforms** facilitate the trade of usable goods from businesses, institutions or residents.
- **Refill facilities**: as opposed to reuse/DRS systems in which packaging is the property and responsibility of the producers, refill systems enable consumers to purchase goods with their own containers. Refill infrastructure mainly comprise:
  - **Farmer's Markets and Food Co-ops**, which have long offered opportunities for bulk purchasing using consumer's reusable containers.
  - **Refill shops**: a new wave of package-free Zero Waste stores have emerged worldwide over the past years, focused on providing a wide variety of goods in bulk or without packaging.
- **Food waste salvaging infrastructure**: salvaging food waste is a key solution to reducing overall waste (see "*Enforce a system that prevents food waste*" section below). Food salvaging infrastructure can include creating new markets such as sale of "ugly fruit", setting up food donation platforms and structures for people in need, etc.

Some of these prevention infrastructures already exist in Mongolia; some remain to be invented by young Mongolian entrepreneurs, following successful examples from other countries. **All will need adequate support and incentives to develop to their full potential** and pave the way to Zero Waste and circular economy in Mongolia.

→ RECOVERY INFRASTRUCTURE

Even when reduction policies and prevention infrastructures become and tangible reality at large scale, "waste" will still be generated and will need to be recovered to avoid ending up in landfills. **The cornerstone of Zero Waste recovery systems is a dense network of Material Recovery Facilities (MRF)**[110].

A MRF is the indispensable link between waste producers (households, industries, etc.) and material reprocessing infrastructures (repair and reuse centers, recycling facilities, etc.), without which overall circularity is impossible. **It is the place where waste collection services (or waste producers themselves) are to bring at-source sorted reusable/recyclable waste so it can be**

[110] Material Recovery Facilities (MRF) are sometimes also simply referred to as "waste management facilities" or other similar names, which can usually be considered as synonyms (unless specified otherwise). In this report (contrarily to our previous reports in which we still used the expression "waste management facility"), we favored the term "Material Recovery Facility" because it has become the standard one among the global Zero Waste movement and because it reflects the Zero Waste paradigm much better than other outdated wordings.

further sorted, densified, and sold for further processing or to end-markets that use the commodity as feedstock in manufacturing.[111]

In some cases, depending on local resource management systems, **a second level of specialized MRFs can be useful to further pre-process materials between primary MRFs and recycling entities**. For instance, plastics collected and densified in primary MRFs can be washed and grinded in **Plastics Recovery Facilities** (PRFs) as a final step before recovered items can be used as feedstock in manufacturing. Likewise, **glass beneficiation facilities** can be useful to further sort mixed glass by color and remove contaminants, so that broken glass can primarily be recycled into new bottles (the rest going to insulation, sand-blasting, or other aggregate uses).

As always with Zero Waste, **decentralization is the key. Small- and medium-size MRFs must be created all over the country, in order to best match local needs and reduce transportation. In rural areas, a MRF must be set up in all soum-centers**, like in Khishig-Undur.[112] Intermediary collection points (or even small MRFs) in bag-centers could be convenient for herder households (who unfortunately cannot realistically benefit from waste collection services due to their remoteness and isolation); however, if set up, such structures should be provided with permanent staff, or else risks of misuses and improper disposal would be too high (at least until all waste producers are used to perfectly sorting their waste).

In ger districts of urban areas, a very similar approach could be implemented: small MRFs should be set up in each khoroo, almost exactly like in rural soum-centers, to enable community-level resource management.

In city-centers, a small MRF for each khoroo would certainly be ideal, too; but population density and lack of space are challenges that probably make this scenario unrealistic. However, it would be possible to **set-up a belt of medium-size MRFs all around the city-center, at the interface with ger districts** (in locations like 100 Ail, for instance), to reduce waste transportation to a minimum.

These peripheral MRFs could be **complemented by small "Zero Waste information centers" homogeneously scattered all over the city-center**. These centers' mission would be twofold, both prevention- and recovery-oriented:

- **provide visitors with extensive information** and material (posters, flyers, guidebooks, reports, etc.) about Zero Waste and the new resource management system implemented in the city;
- **collect sorted recoverable material** (recyclable waste, repairable items, etc.) brought in person by citizens (before they are sent either to the closest MRF or directly to repair and reuse facilities).

Depending on local contexts and available resources, all these recovery facilities could be set up in existing buildings or in brand-new structures perfectly designed to match processing needs. In any case, what is essential is to quickly establish a dense network of functioning MRFs and Zero Waste centers to link waste producers with reprocessing infrastructure.

[111] For details about how such a MRF can be arranged and operated at local level, see Ecosoum's *How to set up proper waste management at the soum level* (2021), *Recommendation report for waste management scheme in Khishig-Undur* (2021), and *Recommendation report for waste management scheme in Bulgan aimag* (2022).
[112] Ecosoum, *How do we manage waste in Khishig-Undur?* (2023).

→ CIRCULAR REPROCESSING INFRASTRUCTURE

Once materials are recovered in primary and secondary MRFs, circular reprocessing can be performed in dedicated infrastructures:

- **Reuse and repair facilities**: these prevention infrastructures (as explained above) will be largely supplied by MRFs with materials recovered from municipal waste. Once repaired and/or prepared for reuse, valuable materials are ready to re-enter the market.
- **Reusables/refillables washing facilities**: for reusable and refillable containers organized at scale in deposit schemes, washing facilities can be necessary to clean returned containers before they can re-enter the economy loop. (In many cases, though, it can be more relevant to carry out the washing step directly in the production line, right before refilling the container rather than washing it earlier and/or elsewhere, which can raise hygienic and logistical issues. But even in this case, industries must invest to make washing processes systematic and economically interesting.)
- **Recycling plants**: a growing number of plastic recycling companies have emerged in Mongolia over the past years. These recycling facilities must be developed further to a larger scale, and supported to transition towards effective recycling rather than downcycling (as many still do).[113] Recycling plants must also be set up for other common recyclable materials such as glass and aluminum.
- **Composting and anaerobic digestion facilities**: to process organic waste, it is crucial to develop composting capacities all over the country. Home-composting and community-composting should be favored whenever possible (by providing trainings and equipment to residents) to reduce the need for transportation and the pressure on municipal infrastructure; but small- or medium-size, decentralized composting facilities[114] are also needed (especially in cities) to enable composting all organic waste. Anaerobic digestors (AD) can be a valid alternative under certain conditions[115], especially in densely populated areas – although composting remains preferable due to its climate benefits, limited investment needs, low-carbon nature, and scalability. Some municipalities have also found success in co-locating AD and composting facilities in an integrated system.[116]
- **Construction and Demolition (C&D) recycling plants**: many discards from construction products are reusable and recyclable. C&D recyclers sort incoming material for reuse and recycling prior to sending what is left to a C&D landfill.[117] A centralized C&D recycling plant

[113] Ecosoum, *Who produces our waste? Brand audit report* (2022).

[114] These facilities often use an aerobic method such as aerated windrows or aerated static piles that require relatively low capital costs and take about 3-6 months to make finished compost for use in growing food or landscape. In Mongolia, the long and cold winter can be a challenge, but composting remains possible and relevant if properly set up and carried out.

[115] Anaerobic digestion creates a biogas which is captured for use in energy or renewable fuels. AD is more capital intensive, but the process only takes between 15 and 40 days. The best system for a community is predicated on the incoming feedstock and availability of end markets. Policy-makers should note that in order for AD to be relevant (and climate positive), it should: occur as close to the source of waste as possible; replace fossil fuels instead of just adding to overall energy production; and use only waste as feedstock, not timber or food grown for the purpose of biogas production. See Environmental Defense Fund, *Not all biogas is created equal* (2019).

[116] Karidis (A.), *Why Co-locate Compost and Anaerobic Digestion?* (2018).

[117] We should emphasize that the Zero Waste hierarchy should also be applied for C&D waste: cities can reduce C&D waste by reducing materials use at the source, requiring the reuse and recycling of C&D waste through ordinances or building permits, requiring contractors to sort out recyclable C&D waste at the source, creating zoning incentives for development using recycled or reused materials, and creating financial incentives for contractors to deliver C&D materials of a recovery facility through a deposit scheme. Promoting "adaptive reuse" is also a source reduction approach for C&D materials: it involves renovating and retrofitting an existing building so it can be reused for new, modern functions and remain a community asset. Choosing adaptive reuse over new construction reduces material use at the source, prevents demolition debris from entering the waste stream, and preserves community culture by preserving the unique visual character of a

is currently under construction in Ulaanbaatar along with a new landfill, but similar (smaller) facilities would also be useful aimag-centers.[118]

In our current linear economy, many of these prevention, recovery and circular reprocessing infrastructures still struggle to emerge, develop and/or find sustainability, because they have to compete on an unfair playing field with cheaper entities designed for single-use and disposal. But **establishing a more enabling (legal, fiscal, logistical, etc.) environment and providing support (through subsidies, zero-interest loans, long-term leases on property, priority on public procurements to ensure end markets, etc.)**[119] **would help attract investments, let businesses strive, multiply jobs, and grow national and local economies** (see main policy recommendations below).

Doing so, overall waste generation would decrease drastically and material recovery capacities (through reusing, recycling and composting) would expand and strengthen like never before, progressively leading residual waste (to be disposed in landfills) shrink to a fraction of today's discards. In the end, **the money initially invested to support Zero Waste infrastructure would largely be balanced by savings from landfilling fees, with countless economic, social, health and environmental additional benefits**.

REORGANIZE WASTE COLLECTION SERVICES, WITH FOCUS ON ORGANIC WASTE

While proper Zero Waste infrastructure is paramount, another crucial piece of the resource management puzzle is proper collection and transportation. **Materials need to be separately collected and transported between each stakeholder for materials to be recovered and adequately processed to re-enter the economy**.

Once at-source sorted materials have reached a MRF (where they are recovered and further prepared for circular reprocessing infrastructure), transportation issues tend to disappear as shipping costs can simply be integrated into selling prices (like for any other product/supply) to reuse/recycling facilities (and/or direct logistical arrangements can be made between concerned parties).[120] This means that the main challenge in terms of waste collection is to arrange pick-up from waste producers and separate transportation to the closest MRF (or, in some cases, directly to other facilities).

As it turns out, **mandating and enforcing at-source sorting creates virtuous circles that make waste collection processes much easier and faster for currently overwhelmed collection teams**. The reason waste collection is failing in most Mongolian cities – starting with Ulaanbaatar – is not necessarily that it is inherently underfunded, but rather that current waste management systems are improperly designed and thus lead to tremendous extra and unnecessary work for waste collectors. In other words, **we should not be looking for more efficient ways or increased budgets to collect mixed and improperly stored waste; we should make sure that at-source**

neighborhood. Adaptive reuse also creates local jobs: preservation of old buildings typically has a higher proportion of labor expenses and a lower proportion of material expenses compared to new construction. See Mohamed (R.) and al., *Adaptive reuse: a review and analysis of its relationship to the 3 Es of sustainability* (2017).

[118] Montsame, *Construction and Demolition Waste Recycling Plant to be Completed in 2024* (2023).

[119] Wise public contracting can be a powerful lever to support emerging Zero Waste actors. See recommended best practices for Zero Waste contracting in GAIA, *The Zero Waste Masterplan. A guide to building just and resilient Zero Waste cities* (2020).

[120] Actually, the issue of transporting waste from MRFs to reprocessing infrastructures does not solve itself magically, but it is rather an issue of producers' responsibility and low competitivity of recycled materials compared to subsidized virgin materials. These issues are certainly not to be neglected (and will be discussed further in the next sections of this report), but they are not really a waste collection problem.

sorting is enforced so that waste collectors can do their job properly without having to increase expenses.

When analyzing the waste management system in Bulgan city, Ecosoum came to the unarguable conclusion that such an objective is in fact easily achievable. Calculations showed that simply sorting and properly bagging waste at the source (instead of mixing all waste, unbagged and soiled, inside or next to overloaded bins) would allow not only to carry out door-to-door waste collection three times more often (once a month instead of once every three months presently) but also to do it with only 10 staff instead of 17 as it is today – allowing 7 staff to be dispatched to other essential waste management tasks (such as working full-time in the local MRF).[121] Although each context is different, similar calculations in other Mongolian cities would probably lead to similar results. Even more so that these calculations did not consider that relevant prevention policies would lead to reduce the total amount of waste generated (and thus to be collected).

Depending on local contexts, it can be more relevant either to have different trucks collect each category of material (recyclables / organics / residuals) or to divide the trunk of each truck into three parts to allow separate collection – although the first solution is probably preferable (at least in cities) if collection rates are to be different for each category of waste (more frequent for recyclables and organics, less frequent for residual waste). The best solution should probably be selected after testing each option, depending on how local resource management and waste collection schemes are designed. **In any case, the essential thing is that at-source segregated waste must be kept clean and never be mixed in the collection trucks**.

When on-site composting is really impossible, **special attention must be given to organic waste**[122] **collection, to avoid soiling recyclables and/or disposing biodegradable matters in landfills**. Actually, collecting organic waste is not necessarily more complicated than collecting other types of waste, provided that collection schemes are properly planned and that at-source waste sorting is effectively implemented. For example, the Italian city of Milan (1.4 million inhabitants with 7,000 people/km^2 and 80% of the population living in apartment buildings) is collecting organics from 100% of its population with and 88% rate (meaning that 88% of all organic waste produced in the city is separately collected) and a contamination/impurity rate lower than 5%.[123]

Incidentally, **enforcing efficient organic waste collection does not necessarily entails higher expenses (at least in the long term); on the contrary it is often a key to reducing waste management costs for municipalities** as it reduces dependence on centralized landfills (the costs of which are always higher).[124] In the same way, treatment through composting enabled by separate collection is good for the economy as it creates new green jobs – almost four times more than landfills (and incinerators).[125]

Organic waste collection schemes must be planned carefully taking into account various parameters, such as waste generation (total volume of waste, proportion of organics, etc.),

[121] Ecosoum, *Recommendation report for waste management scheme in Bulgan aimag* (2022).

[122] Organic waste (sometimes also referred to as "bio-waste") means biodegradable food and kitchen waste from households, offices, restaurants, wholesale, canteens, caterers and retail premises, as well as garden and park green waste. Usually, it is recommended to collect and manage food waste and garden waste separately as they have different properties (density, humidity, etc.) and are not produced with the same frequency (garden waste being dryer and more seasonal). In this report, we essentially focus on food/kitchen waste when addressing the issue of organic waste, as it is usually the most problematic.

[123] Zero Waste Europe, *Bio-Waste Generation in the EU: Current Capture Levels and Future Potential* (2019).

[124] Compostplus, *La Collecte Séparée Des Biodéchets, Une Solution d'avenir* (2018).

[125] GAIA, *Zero Waste and Recovery Economy. The Job Creation Potential of Zero Waste Solutions* (2021).

urban characterization (population size, density, etc.), **building typology** (apartment building or detached houses, existence of gardens, etc.) **and economic situation** (number of restaurants and other business that inherently produce large amount of food waste, average income, etc.). The size of the bins[126] and the frequency of collection[127] must be defined based on these parameters. As previously mentioned, **the distribution**[128] **and use of certified compostable bags**[129] **can be recommended to collect organic waste** (and only organic waste, as we explained above that bioplastics should not be promoted except for this specific purpose) in order to facilitate collection and composting processes while reducing plastic contamination – provided that adequate composting infrastructures (actually capable of biodegrading these bags) are in place.[130]

Gradually rolling out organic waste collection – by starting with pilot districts or neighborhoods to test assumptions and methodologies (size of bins, frequency of collection, etc.) – is often a key to success. Beginning with identified largest producers (restaurants, hotels, canteens, markets, etc.) can also be a smart way to bring quick and significant results, before to expand the organic waste collection scheme to households.

As previous mentioned, after a transition period during which people will be educated and the Zero Waste scheme will be set up, **waste that is not properly sorted and bagged should not be collected anymore** (using transparent waste collection bags allows quick visual inspection by waste collectors). Contraveners should be required to re-sort their waste and/or bring it by themselves to the closest MRF, and otherwise (in last resort, if non-compliance is repeated) be fined in a really dissuasive manner.[131]

When designing collection systems for organic waste, it is particularly crucial to embed the regular capture of data, both at the start (to set the baseline from where progress can be measured) and throughout (in order to effectively map progress). At a minimum, **indicators to implement a high-performing scheme should include**:

- **Generation and reduction**: as reducing waste generation is always paramount, monitoring yearly organic waste generation (and ensuring that this figure decreases year after year) is a must – although it does not say much about the collection system itself.
- **Capture rate**: how much organic waste being collected (in kg/person/year) compared both to total organic waste being generated (%) and to overall municipal waste generation (%).
- **Quality rate**: percentage of impurities found in collected organic waste, which can be measured by calculating the discards from the total collected organic waste. Key data also includes what kind of impurities are found, to help improve upstream policies and collection schemes.

[126] It appears that European cities with best performances are using one primary 10-liter bin inside household kitchens combined with a secondary bin (35 liters for single-family households or 120 liters for apartment buildings) which is filled up from the smaller primary bins and put out in the street for collection. It is recommended that kitchen bins are vented/aerated to allow air circulation, which reduces moisture and avoids potential bad odors.

[127] Food waste can be collected from households once or twice a week while residuals are collected only one time every two to four weeks (which provides incentive to sorting organic waste). Organic waste collection can be more frequent for hotels and restaurants (up to once a day), provided that they should pay proportionately according to the amount and frequency of collection – as it is for instance in the city of Lund (Sweden), among many others.

[128] Free distribution of compostable bags by public authorities can be economically interesting if it enables increasing significantly organic waste collection and composting rates. Percentage of impurities has also been shown to decrease when compostable bags are provided. See ECBPI, *Unwrapping the biowaste potential* (2022).

[129] In the European Union, the current standard for compostable bags is EN-13432.

[130] See for example Ministry of Territory and Sustainability of Catalunya, *Guide and Experiences of Reference for Implementing the Selective Collection of Municipal Waste* (2020).

[131] As mentioned above, Seoul citizens can be fined up to 1,000USD and German residents can lose their home if they are found repeatedly violating waste sorting rules. Suggestions on how to implement this 'no-sorting/no-collection' rule in Mongolia are presented in above-mentioned recommendation report for Bulgan.

- **Organic waste diversion rate**: percentage of organic waste in residual waste going to landfill. This metric is probably the best way to measure the true efficiency of the system.

For more information about how to organize organic waste collection, we recommend to refer to materials produced by Zero Waste Cities.[132] Relevant policies to prevent and reduce food waste at the source are recommended below in the "*Enforce a system that prevents food waste*" section.

REDESIGNING POLICIES TO REDUCE AND REUSE WASTE

Now that we have seen what kind of infrastructures and overall sorting/collection rules would be necessary to enable effective resource management, we can discuss what other policies and actions should be taken to increase the Zero Waste system's efficiency – with the Zero Waste hierarchy constantly in mind. **The critical question in policy-making is not '*how can we build a circular economy for plastics?*' but rather '*how can we redesign our economy to reduce the total volume of materials and products in it, and thus to be more circular?*'**.[133]

INCENTIVIZE AND SUPPORT LOCAL ECONOMIES

As previously explained, **Zero Waste is a powerful tool to boost local economies and create sustainable green jobs**. At all (national, provincial, local) levels, **public policies should incentivize and support local businesses that tend to get us closer to our Zero Waste objective** one way or another. That means supporting not only Zero Waste infrastructures as presented above (repair shops, reuse services, etc.) but more broadly all economic activities and social practices that tend to reducing waste generation, especially through reducing the need for packaging.

Governments – if possible, at the national level; but, if necessary/relevant, at local levels – **should develop and/or update and clarify lists of businesses and activities that shall be systematically supported in line with the Zero Waste paradigm**. Eligibility criteria (economic sectors, products and services, best practices, etc.) and planned supporting measures (subsidies, tax breaks, zero-interest loans, public procurement priority, etc.) should be transparently established so that everyone clearly understands what activities are promoted and in what way they are incentivized.

Supporting measures must be designed taking into account the results of above-mentioned baseline studies, especially initial waste audits and gap analyses, so as to best match real needs. **Policy-makers should always keep in mind that the devil hides in the details: best policies on paper are useless if hidden loopholes make them impossible to effectively implement in real life**. That is why it is crucial to take into account the feedback of field-based stakeholders who know first-hand what actual constraints they are facing and what systemic changes are necessary to enable developing their activities.

MAKE EXTENSIVE AT-SOURCE WASTE SORTING A REALITY WITH PAYT SCHEMES

Considering that proper at-source waste sorting is the paramount condition without which proper resource/waste management is impossible, it is absolutely fundamental that public authorities take all necessary measures to ensure comprehensive at-source waste sorting by all waste

[132] Zero Waste Cities, *How to best collect bio-waste. Guidance for municipalities on the best-performing methods to separately collect bio-waste* (2022); Zero Waste Cities, *Collection of bio-waste in densely populated areas. Webinar* (2018).
[133] CIEL, *Beyond Recycling. Reckoning with Plastics in a Circular Economy* (2023).

producers. As explained above, **a wise combination of legal obligation, massive awareness-raising, provision of adequate equipment, standardization of packaging and materials, clarification of sorting rules, and efficient incentives will certainly be necessary to reach that objective**. Undoubtably, changes of habits take time; but policy-makers should remember that "*waste is like water: it always flows the easiest way*".[134] In other words, if the **Zero Waste system is designed to be user-friendly and makes waste sorting cheaper and more convenient than not sorting**, there is no reason why Mongolians would not accept to do it – like hundreds of millions (if not billions) of people already do all over the planet.

Experience shows that **Pay-As-You-Throw (PAYT) usually shows excellent results in terms of waste prevention, sorting and collection**. PAYT is a system that charges people for the amount of waste they generate and throw away, usually with a fixed fee for everyone – to cover the core operational costs of waste management – and a variable part that is calculated based on the volume of waste generated by the user. PAYT can take various forms, but it is **fundamentally designed to incentivize waste producers both to reduce waste generation** (the more waste you produce, the more you pay) **and to sort recyclable and compostable waste** (fees are higher for landfill-bound waste than for source-separated recyclables and organics, which can even be collected for free). Being an effective and equitable[135] system, **PAYT is usually highly motivating and very much appreciated by citizens**.[136]

The following case study can help understand how PAYT schemes can be advantageously implemented. In 2011, the city of Portland decided to implement further PAYT incentives for residents to sort their waste. The city started collecting organics and recyclables on a more frequent schedule than landfill-bound trash. In fact, **such difference of collection frequency between recyclables/organics[137] and residuals is a recommend key measure implemented in most Zero Waste cities**. In its first year, Portland's new system generated a 38% decrease in landfill-bound residential waste and a threefold increase in compost.[138] To ensure successful implementation, the city contracted with community groups to raise awareness prior to program implementation. Although some residents were initially skeptical about having less frequent trash pickups, they soon saw how much of their waste was actually compostable. As a result, **87% of survey respondents said they were satisfied with the city's new system.** Despite a few conservative people that always complain at first, such very high satisfaction rates are most common in cities that implement PAYT efficiently.

In Mongolia, PAYT schemes may not be suitable for rural areas, where people could easily bypass the system by littering into the environment.[139] However, **a PAYT scheme could certainly be applied effectively in Ulaanbaatar and aimag-centers**. Apartment buildings where several households live can pose a challenge to implementing PAYT since waste is generally collected in a

[134] Enzo Favoino, *Collection of bio-waste in densely populated areas. Webinar* (2018).

[135] As PAYT charges proportionally to waste generation, it is inherently an equitable system. In addition, PAYT rate structure can be flexible to ensure that low-income households do not pay a disproportionately high share of their income on waste disposal, as compared to a more affluent household that generates the same volume of waste. Policy-makers can offer a percentage or flat-rate discount, some free bags, or reduce the base service charge for low-income households.

[136] Collectors project, *Report on implemented solutions and key elements in selected cases for societal acceptance* (2021).

[137] A frequent collection of food waste (once or twice a week) also has the advantage of removing organic waste from households before any fermentation process begins in the bin, which avoids possible discomfort for people and incentivizes them to sort and evacuate food waste fast rather than keeping them in the residuals' bin for several weeks.

[138] City of Portland, *History of Portland's garbage and recycling system* (2023).

[139] In rural Mongolia, where people are often used to disposing their waste by themselves in wild dumps, PAYT would probably provide an economic incentive to littering into nature (it would be cheaper for people to dump part of their waste in a nearby ravine rather than paying for waste management fees).

central location per building, not per household (it can thus be difficult to disaggregate the volume of waste generated in a given building). But this issue can easily be overcome if Apartment Owner Associations (СӨХ) set clear monitoring mechanisms and janitors are trained and involved to oversee waste sorting and disposal within the building. Actually, if all residents of a given building are bound together when it comes to waste fees (paying more if they collectively generate a lot of waste, paying less if they decrease their building's total waste production), **social pressure from neighbors can actually be a key factor to push reluctant citizens to properly sort their waste**.

ENFORCE A SYSTEM THAT PREVENTS FOOD WASTE

We discussed above how organic waste should be sorted and separately collected. But **policy-makers should keep in mind that waste reduction is paramount, especially when it comes to food waste** – considering that one third of food produced for human consumption is wasted every year throughout the world.[140] Preventing food waste at the source is thus essential, even more so that it brings countless beneficial side effects (in terms of nutrition and food security, GHG emissions, financial savings for businesses, customers and municipalities, etc.).[141] Which is why specific measures should be taken to that end, in line with the 'hierarchy to reduce food waste'.[142]

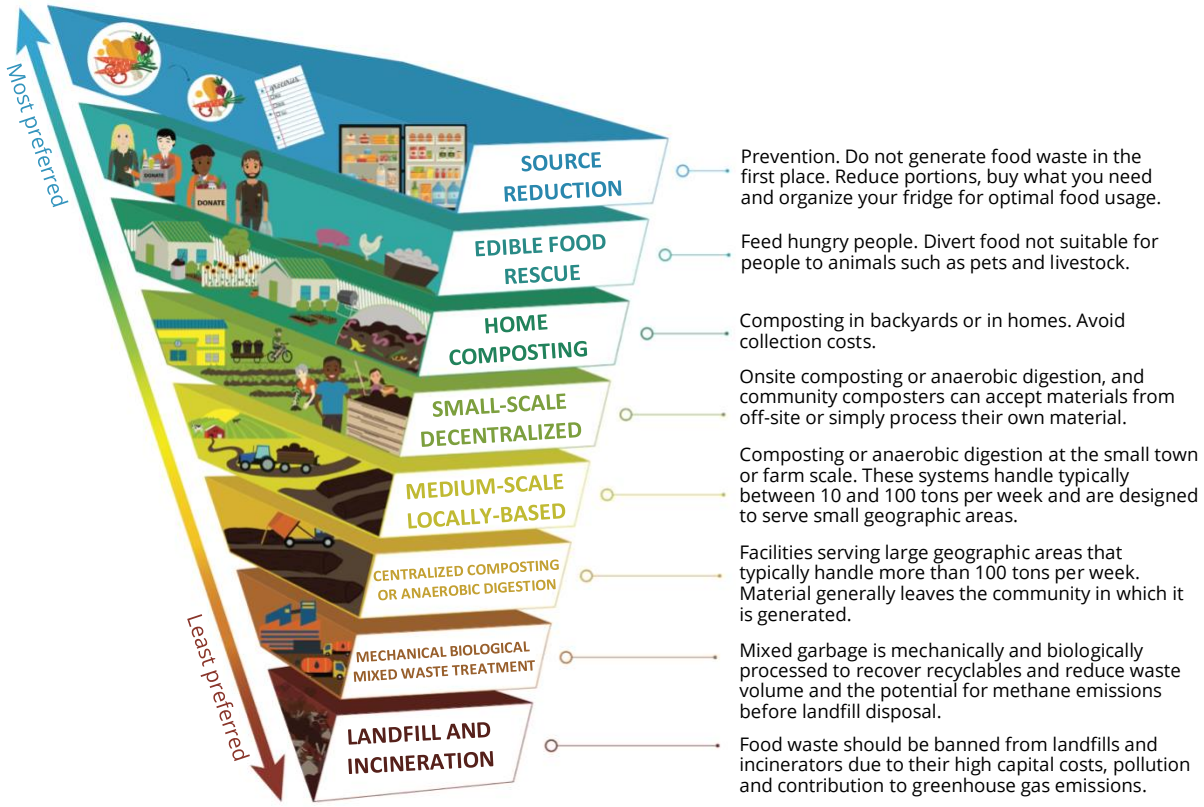

Figure 4 : Hierarchy to reduce food waste and grow community (Source: Institute for Local Self-Reliance)

[140] UNEP, *Food Waste Index Report* (2021).
[141] World Resource Institute, *The Global Benefits of Reducing Food Loss and Waste, and How to Do It* (2023).
[142] Institute for Local Self-Reliance, *Hierarchy to Reduce Food Waste & Grow Community* (2017).

Public authorities and communities can prevent and reduce food waste at the source through different means, starting with the following:[143]

- **Raising awareness and providing** restaurants, school cafeterias, hotels and other food service establishments with the **technical assistance to identify wasteful practices** and improve inventory management.
- **Connecting growers and manufacturers to secondary resellers** that sell unwanted products and processed food at discounted prices to avoid waste and support food security.
- **Encouraging retailers, foodservice providers, and consumers to purchase "ugly" products** in order to prevent edible products from being wasted because of irregularities in size, shape, or color.
- **Eliminating all-you-can-eat practices** in food-serving establishments, or even menus that include unwanted courses and dishes that customers do not intend to eat.
- **Supporting community education programs to help save money and reduce wasted food**, such as by distributing toolkits for households and businesses to calculate the costs of their food waste.
- **Encouraging businesses to participate in voluntary food waste reduction programs** with the promise of cost savings (as it has been shown that investing in food prevention leads to saving much more money than what was invested)[144]. Main key actions that restaurants can take to successfully reduce food waste include:
    - **Rethinking inventory and purchasing practices**.
    - **Creating a "food waste inventory"** to measure how much and where food is wasted to prioritize interventions and monitor progress.
    - **Engaging staff** to be more vigilant and improve their practices.
    - **Reducing overproduction**, as certain production techniques (such as batch cooking and buffets) can be more wasteful than cook-to-order preparation.
    - **Repurposing excess food**: forecasting customer demand is not a perfect science, so having a Plan B for how to safely repurpose ingredients can allow restaurants to generate revenue from potential waste.
- **Standardizing and clarifying food labeling**, as misinterpretation of date labels on food is often a leading contributor to food waste. Markers such as "use by" and "best before" do not serve as a consistently accurate indicator of freshness – they are usually under-regulated and lack standard legal definitions or timeframes. Date labels also complicate food donation processes, causing confusion around what is and is not safe to redistribute. Education campaigns can also be led to promote public understanding of food date labels as a way to prevent food waste and save money, particularly in times where household budgets are tight.
- As an estimated 1 in 4 Mongolians experience moderate or severe food insecurity[145], **food that is not consumed for its primary purpose should be redistributed to people in need**, so as to reduce food waste and malnutrition at the same time. Municipalities and

[143] For more details, suggestions and recommendations, see: GAIA, *The Zero Waste Masterplan. A guide to building just and resilient Zero Waste cities* (2020); Zero Waste Europe and Slow Food, *Reducing food waste at the local level. Guidance for municipalities to reduce food waste within local food systems* (2021); Zero Waste Europe, *Food Systems: a recipe for food waste prevention* (2019); Zero Waste Cities, *Decentralised management of organic waste. Webinar* (2020); Zero Waste Cities, *Food waste prevention. Webinar* (2019).

[144] Champions 12.3, *The Business Case for Reducing Food Loss and Waste* (2017).

[145] FAO, *The State of Food Security and Nutrition in the World* (2020).

nonprofits should conduct outreach to retailers, manufacturers, restaurants, and other businesses on local food donation options as well as donation liability laws. Collaboration between municipal and State governments can help standardize health department regulations for safe food handling for donation to reduce confusion and liability concerns. Lastly, cities may implement or expand tax benefits for food donations.

- When food waste cannot be rescued for human consumption, **leftovers and peels can be given to pet dogs and livestock**, as it is already largely done in rural Mongolia (and, to some extent, in ger districts).

Implementing such food waste prevention and recovery policies and programs would mean less leftover food for municipalities to manage. Then, as previously mentioned, organic waste that cannot be rescued for consumption should be composted and returned to the soil, prioritizing decentralized and locally-based compost systems. Composting should occur as close to the source of waste as possible to reduce transportation costs and emissions. **Municipalities can facilitate home and community composting through education and technical assistance programs**,[146] and by providing grants and other financial incentives.

Medium-scale, locally-based composting covering small geographic areas is preferable to centralized composting where materials must be transported away from the communities in which they are generated. These types of compost systems can be located at or near community gardens, urban farms, and other local food production to strengthen local food economies.

BAN SINGLE-USE PLASTICS AND DISPOSABLE ITEMS

Banning single-use plastics (and other disposable items) is widely recognized as one of the paramount measures to fight against plastic pollution, and it is also a very popular measure as a global survey showed that 75% of people want single-use plastics to be banned.[147] In fact, many countries and cities around the world have been voting and implementing single-use plastics bans, including Mongolia since March 1st, 2019.[148]

However, these bans have not always led to tangible results, including in Mongolia where single-use plastic bags are still omnipresent today. There are several reasons why such bans are not always effective, including:[149]

- Regulations on plastics often **fail to embrace its entire life-cycle** (for instance, it is impossible to fully ban plastics in shops if we do not impose restrictions in manufacturing, production, imports).
- Bans are **rarely comprehensive**, meaning that they target only specific items (such as plastic bags) and/or are based on limited features (such as thickness), which can be easy to circumvent and fail to effectively reduce plastic production and use.[150] Bans based on thickness can have the counter-productive effect to lead to merely increasing plastic bags thickness without changing single-use/disposable practices (which means overall plastic consumption is actually increased, not reduced).[151]

[146] Nair (S.K.), *Back to Earth. Composting for Various Contexts* (2022).
[147] IPSOS, *Three quarters of people in global survey want single-use plastics banned* (2022).
[148] News.mn, *Plastic bag sinimplemented across Mongolia* (2019).
[149] Chadran (P.), *Limitations of national plastic related policy mechanism.* Zero Waste Academy Webinar (2023).
[150] In Mongolia, only single-use plastic bags thinner than 0.035 mm were forbidden in 2019.
[151] Scientific Action and Advocacy Network, *Effectiveness of plastic regulation around the world* (2019).

- Ban **regulations often lack details and/or have too many exemptions** (not applied in all economic sectors), which create loopholes that undermine or totally annihilate bans' effectiveness.
- There are sometimes **inconsistent and conflicting policies** which make bans ineffective (for instance, ban on single-use plastic on one side, but industrial/importation policies that, on the other side, end up encouraging plastic use).
- We often observe a **lack of political will, resistance and follow-up** to actually implement bans after voting and announcing them (after a few weeks, nobody talks about it anymore, so bans are not really implemented).
- Often, bans enter into effect with **poor transition planning, unrealistic timelines**, **and/or too little public investment** to enable transition from single-use plastic towards alternative substances/products – which make bans totally impossible to implement and demolish their credibility.
- Most bans **lack clear targets, monitoring and transparency** about data and effective implementation, which creates doubts for consumers/citizens.[152]

In light of these common pitfalls, we can conclude that for a single-use plastics ban to be successful, there must be:

- clear **purpose and timebound targets**;
- **comprehensive and detailed regulation** to avoid loopholes and gaps;
- coordination and **integration of plastics ban into overall policy/legal framework**;
- sufficient **public investment and support** during a **relevant transition phase**;
- clear **indicators and monitoring mechanism**;
- real **political will and enforcement** with sufficient follow-up and strict controls;
- **transparent and consistent communication** to ensure public's understanding and acceptance.

Different types of single-use plastics can be banned progressively, starting with the most problematic and/or easiest to phase out. Despite the disappointing results of the 2019 thickness-based ban, single-use plastic bags could actually be relatively easy to eliminate in Mongolia, providing that authorities do not take half-measures and dare to effectively enforce a clear and strict ban.[153]

The first step should probably be to vote an update of the 2019 ban and publicly announce that all grocery store and supermarket plastic bags will be totally forbidden within three or six months. The recommended alternative should be based on a reuse/refill approach consistent with the Zero Waste hierarchy (see "*Develop reuse/refill systems and deposit-return schemes*" section below). For instance, all shops that are used to giving single-use plastic bags would now have to

[152] Global Plastics Policy Centre, *A global review of plastics policies to support improved decision making and public accountability* (2022).

[153] A ban on single-use plastic bags should also include plastic wrapping of fruits and vegetables – like France did in 2022, for example. Although plastic wrapping is often presented as a way to avoid food waste, some studies conclude on the contrary that plastic packaging increases fresh food waste. In any case, while additional research may be necessary to find the best possible way to sell and store fresh food, the Zero Waste paradigm clearly forbids to consider single-use plastic wrapping as a legitimate option.

sell reusable cotton bags instead – small, lightweight ones to replace fruits/vegetable bags[154] and larger, stronger ones to replace plastic shopping bags[155]. Authorities could set standards for reusable bags and require shops to order such bags from seamstresses by themselves; alternatively, relevant public administrations could take care of ordering sufficient stocks and then sell the ordered reusable bags to shops. In any case, such a measure would boost the Mongolian textile sector, creating useful jobs in the process (especially if reusable bags manufacturing is decentralized down to each local level to be handcrafted by local seamstresses).

For some time, it is probable that many people who go shopping would forget to bring their own bags and need to purchase new reusable ones in the shops. But **a massive education campaign to explain the new law and teach people why favoring reusable bags is better would help increase acceptance and lead people to change purchasing habits relatively fast and smoothly**. After a transition period, consumers will naturally end up bringing their own bags systematically (just like people in soums or ger districts do not forget to bring their reusable water containers when they go to fetch water to the well). To improve the circularity of the system and avoid unnecessary production and accumulation of reusable bags, people who forgot theirs at home and had to buy additional ones in shops could be given an opportunity to sell back the extra ones they do not need to shops or to MRFs (which could in turn sell them back to shops).[156]

Over time, similar approaches and development of systemic reuse/refill schemes for a broad variety of products and packaging should be used to get rid of other types of single-use plastics such as beverage containers, delivery packaging, single use cutlery and tableware, and so on.

Incidentally, **intentionally-added primary micro-plastics**[157] – such as the micro-beads used in personal care products (like hand cleaners, facial scrubs, tooth paste and so on) and in a variety of industrial applications (such as abrasives in paint removers or cleaning products for engines and metal surfaces)[158] – **should also be banned to protect human health and ecosystems**.[159] Forbidding products and substances that use such harmful micro-plastics (which are often imported) could provide a strong incentive to develop safe alternatives in Mongolia; **eco-friendly companies and brands that struggle to be economically viable today would suddenly become much more competitive, which would surely boost the Mongolian economy in these sectors and create new job opportunities**.

[154] See for example Plastic Free July, *Fruit & vegetables* (2023). We should emphasize that relying on reusable bags is not opposing the possibly to pre-pack fruits and vegetables in shops, as it is often done in Mongolia (allegedly for convenience purposes for customers). As long as a formal (DRS) reuse system is in place, fruits/vegetable bags can easily flow back to shops to be reused (see more about reuse systems below).

[155] See for example Plastic Free July, *Plastic shopping bags* (2023).

[156] Selling price to shops and/or MRFs could be lower than initial purchasing price, to incentivize people to actually reuse their bags rather purchasing/selling new ones each time. But on the contrary, it could also be possible to set up a formal deposit-refund scheme for shopping bags, which would remain the property of supermarkets (at least for large chains with many branches).

[157] Microplastics fall into categories based on their source. 'Primary' micro-plastics are intentionally produced at microscale for a specific use (such as agrochemicals or pharmaceuticals). In contrast, 'secondary' microplastics result from the mechanical, chemical, and physical fragmentation of larger (macro) plastics, which can include "legacy" plastics disposed of in the environment decades ago.

[158] Dius (K.) and Coors (A.), *Microplastics in the aquatic and terrestrial environment: sources (with a specific focus on personal care products), fate and effects* (2016).

[159] CIEL, *Plastic & Health: The Hidden Costs of a Plastic Planet* (2019); CIEL, *Breathing Plastic: The Health Impacts of Invisible Plastics in the Air* (2023).

STANDARDIZE PACKAGING AND ELIMINATE TOXIC ADDITIVES IN PLASTICS

As mentioned above, **standardizing packaging would not only help people sort their waste at the source, it would also facilitate the development of reuse schemes and recycling processes**. Waste management could become so much easier if all drink bottles, all yogurt pots, all shampoo containers, had the same standardized dimensions. They would be so much faster and convenient to sort, clean, refill and recycle.

Advertising could become more complicated for brands; but, after all, if the products are good and quality, if people really need them, aggressive advertisement and marketing should not be necessary. Actually, tackling compulsive overconsumption is one of the main prerequisites for an effective Zero Waste circular system, which is why policy-makers should not be afraid of purposely limiting advertising capacities. In any case, marketing issues should be considered secondary and should always come after ecological and sustainability considerations.

Incidentally, besides enabling improved resource management and reducing overconsumption, **standardization of packaging could also have positive side effects on totally different fronts**. For example, standardizing alcoholic beverages' bottles to make them neutral could contribute to reducing alcohol consumption (which would probably be beneficial in a country that has one of the world's highest alcoholism rates[160], including among adolescents and youth[161]). Such an assumption can reasonably be made if we relate to the positive effects that standardizing cigarette packages had in some countries such as Belgium or France.[162]

Therefore, **we recommend to progressively design, introduce and enforce clear standards for all types of products, applicable to all companies and brands, starting with the most problematic and/or easy to implement**. Priority should be given to food packaging and beverage containers (which constitute the bulk of household waste), which should all be made reusable and systematically integrated into DRS schemes or other forms of reuse systems (see next section).

When products truly cannot be made reusable, **regulatory standards should impose priority use of effectively recyclable materials** (non-recyclable materials should be strictly banned when a recyclable alternative exists) and **should prevent designs that make effective recycling impossible**, even when theoretically recyclable materials are used. Likewise, standardization measures should be used to **push packaging industry to reduce the range and number of materials they use** (especially in terms of plastic types) and **stop making multi-material packaging** that cannot be effectively recycled.[163]

Standardization of packaging material, shapes and dimensions should go along with the **elimination of toxic additives that are used throughout feedstock extraction and plastics production, manufacture, use, and disposal, as these hazardous chemicals represent a major obstacle to any kind of 'circularity'**.[164] This elimination of toxic additives should go way beyond the most mediatic cases (such as infamous Bisphenol A, Phthalates or PBDD/Fs in toys)[165]

---

[160] News.mn, *Banning alcohol consumption in some Mongolian provinces* (2020).

[161] Dashpuntsag (K.), *Awareness and Attitudes of Mongolian Adolescents and Youth toward Alcohol Consumption and Alcohol-related Harm* (2021).

[162] Europe 1, *Tabac : le paquet neutre a des effets sur les fumeurs* (2019).

[163] Ecosoum, *Zero Waste and Circular Economy: The Way Forward* (2021).

[164] CIEL, *Beyond Recycling. Reckoning with Plastics in a Circular Economy* (2023).

[165] Andulari (G.), *Plastic toys as a source of exposure to bisphenol-A and phthalates at childcare facilities* (2018); Budin (C.) and al., *Detection of high PBDD/Fs levels and dioxin-like activity in toys using a combination of GC-HRMS, rat-based and human-based DR CALUX® reporter gene assays* (2020).

to actually get rid of all chemicals for which we do not have solid evidence of safety for human health.

Strictly applying the precautionary principle is indeed the only way to avoid substituting additives under regulatory or consumer pressure with a similar 'chemical cousin' demonstrating similar (or sometimes even worse) risk profiles – as, for instance, it has been the case when substituting Bisphenol A with Bisphenol S or Bisphenol F.[166] Keeping all plastics free of toxic substances is the only way to enable harmless usage and sound waste management processes (plastic recyclers being particularly exposed to these hazardous substances, which are routinely released during recycling operations).[167] Incidentally, eliminating the types of plastics that appear inherently toxic also seems like an important measure to take as swiftly as possible.[168]

As long as our plastics will include proven or potentially toxic chemicals, especially with such lack of transparency, it will be impossible to enable a safe circular economy and we will never be sure whether or not our items made of recycled plastics do not include intentionally or unintentionally added contaminants – which is particularly concerning for food and beverage packaging. Considering how difficult it is for a national government to ban toxic substances from plastics that come from all over the world without adequate control[169], the issue of plastics additives should actually be considered a good enough reason in itself to phase most plastics out of our society as fast as possible.

DEVELOP REUSE/REFILL SYSTEMS AND DEPOSIT-RETURN SCHEMES

Replacing single-use plastic by other single-use materials would not fundamentally bring any circularity to the system; it would just replace one problem with another. For instance, massifying single-use paper bags to replace single-use plastic bags would raise other sustainability issues, starting with deforestation.[170] Likewise, increasing single-use metal (like aluminum cans) would come at a huge price for the environment.[171] Even when using effectively recyclable materials such as aluminum or glass, recycling always brings more ecological impacts than reusing.[172] That is why **a Zero Waste economy should always be based on reuse and refill systems, especially for its packaging**.

Reuse and refill systems can take several forms, including:[173]

- **Refillable by bulk dispenser**: Customers use their own reusable packaging (containers, bottles, cups) or branded refillable packaging provided in-store, thereby avoiding the need

[166] Muncke (J.), *Tackling the toxics in plastics packaging* (2021).

[167] He (Z.) and al., *Pollution characteristics and health risk assessment of volatile organic compounds emitted from different plastic solid waste recycling workshops* (2015); Salhofer (S.) and al., *Plastic Recycling Practices in Vietnam and Related Hazards for Health and the Environment* (2021); IPEN, *Environmental, Food and Human Body Burden of Dechlorane Plus in a Waste Recycling Area in Thailand: No Room for Exemptions* (2023); SAICM, *Plastics and Chemicals of Concern In Consumer Products* (2020).

[168] Center for Health, Environment & Justice, *PVC, the Poison Plastic: Unhealthy for Our Nation's Children and Schools* (2009).

[169] UNEP and al., *Plastic's toxic additives and the circular economy* (2020).

[170] ILSAS, *The Negative Impact of Deforestation and the Paper Industry* (2023).

[171] Rainforest Rescue, *Aluminum – a light metal with a massive impact* (2023).

[172] Of course, the environmental relevance of reusing (versus single-use and recycling) is directly linked with the number of cycles a reusable item undergoes, which must counterbalance the initial environmental impact of its production. But as initial impact is divided by half after each cycle and efficient reusables can go through dozens of cycles, the impact per cycle usually turns out very limited (not to mention that, if properly designed, the reusable item should be eventually recycled when it reaches the end of its life). The relevance of reuse also depends on the amount of transportation needed to make the reusable system work, although reverse transportation or decentralized logistics models can usually help reduce transport emissions. See Reloop Platform and Zero Waste Europe, *Reusable vs. single-use packaging. A review of environmental impacts* (2020).

[173] Zero Waste Cities, *Creating effective systems for reuse. Webinar* (2021).

to produce new packaging. This system is implementable for a wide variety of products such as cereals, candy, water, beer, juice, detergent, soap, body care products and so on.

- **Parent packaging and concentrate refill**: The refill packaging (container, bottle, pouch, pod, tablet, powder) is made with less material than the parent packaging, which can be refilled in different ways: pouring product inside parent packaging; placing container inside of parent packaging; or diluting concentrated product in water inside parent packaging. This system is common for body care and cleaning products such as tooth paste, deodorant, cosmetics, etc.
- **Transit packaging**: Customers receive the product in reusable packaging (boxes, containers, soft packages), which is returned by door delivery/pick-up or through the post office. Customers reuse packaging multiple times before being returned to the producer or disposed of. Such reusable packaging can be used for transport or shipping of perishables or non-perishables goods.
- **Returnable packaging**: Customers return empty packaging (container, bottle, etc.) that will be cleaned and refilled for future use by the retailer/producer. This system, which works particularly well when combined with a deposit scheme, is relevantly applicable for many products, including beer, soft drinks, mineral water, perishables, detergent, soap, cosmetics, hair and body care products, etc. Reusable cups, bowls, plates or containers can also be very convenient for events, cafés or restaurants.

Refillable systems, in which consumers usually use their own containers, are becoming more and more popular these days. However, and although being very relevant in some cases (e.g., grocery and shopping bags, as mentioned above, or cups and vacuum flasks), they usually imply an already-high ecological consciousness from the consumer, who has to be aware of the necessity to favor reuse/refill systems and remember to carry its packaging/containers with them whenever necessary. This requirement of environmental consciousness can be a challenge that makes such refillable systems hard to scale up and implement at a systemic level for many products. In addition, concerns have been raised about hygiene and safety issues, although these challenges are not impossible to overcome.[174]

All things considered, **returnable packaging systems with deposit – usually referred to as DRS ('Deposit Return Schemes' or 'Deposit Refund Schemes') – have proven to be the most effective and sustainable way to reuse materials and prevent environmental pollution**.[175] DRS is a system whereby consumers buying an item pay an additional amount of money (a deposit) that will be reimbursed upon the return of the packaging or product to a collection point. The system is based on offering an economic incentive for consumers to return empty containers to retailers[176] to ensure that they will be reused (or recycled).

Many arguments are usually put forward in favor of DRS, among which:

- DRS achieves the **highest rates of separate collection** – around 90% in Europe.[177]
- DRS for reuse is an effective tool for **helping citizens visualize the impact of their actions**.

[174] Global Plastics Policy Centre, *Making reuse a reality: A systems approach to tackling single-use plastic pollution* (2023).
[175] Zero Waste Europe and al., *Deposit Return Scheme Manifesto* (2019).
[176] It is also possible to organize return in MRFs, but it is widely acknowledged that possibility to return containers to (a wide number of) local retailers is paramount as it makes the whole system very practical and user-friendly.
[177] CM Consulting Inc. and Reloop Platform, *Deposit Systems For One-Way Beverage Containers: Global Overview* (2016).

- DRS unarguably results in **net savings for municipalities**[178]; it does not imply extra costs for public institutions as it can finance itself (no matter what system – manual or automatic[179] – is chosen).
- DRS is a tool that is actually **supported by many Fast-Moving Consumer Goods companies**.[180]
- DRS is usually **very well appreciated as people's support rates for DRS are always above 80%,** often even much more.[181]
- DRS are one of the **most efficient instruments to tackle plastic leakage into the environment**. For instance, DRS is reported to reduce drink containers in the ocean by up to 40%.[182]
- DRS tends to **create local jobs and to support a thriving local economy**.[183]
- DRS can **promote eco-design for better recycling**.[184] It is the best system to allow for **bottle-to-bottle recycling** and **provides higher quality recyclates**, which have a much higher market price.
- DRS does not need a centralized organization to operate the system; once set up, it can **manage itself through a decentralized combination of self-interest** from each stakeholder involved – as shown by the German example.[185]
- DRS for single-use items can be a **stepping stone towards more refill and reuse, as the collection infrastructure is often the same**.[186] In addition, DRS of reusables can be perfectly combined with the recycling industry, which can handle the defect reusable containers (see example of reusable bottles in Figure 5).

For beverage containers, **DRS is fairly easy to implement and is already operating with great results in dozens of regions worldwide**.[187] In fact, it is certainly most relevant to start introducing DRS in Mongolia in the beverage sector as well, for at least three main reasons:

---

[178] Reloop, *Deposit Return System: Studies confirm big savings to municipal budgets* (2018).

[179] While high-tech, automatic collecting machines are usually popular, we should keep in mind that in a context of underemployment it is probably more relevant to rely primarily on labor-intensive manual collection rather than privileging capital-intensive machines. In addition, although automatic collectors may be relevant in specific locations, we should also keep in mind that, globally, we are reaching our planet's limits in terms of natural resources extraction, which means that aiming to multiply and systematize everywhere such automatic machines (which notably rely on insufficiently-available metals and "rare earths" materials) is probably unrealistic in terms of sustainability – this comment obviously applies not only on DRS collectors but all systems relying on high-technologies. See Bihouix (P.), *The Age of Low Tech. Towards Technologically Sustainable Civilization* (2020).

[180] One of many examples where big brands use DRS is Loop. We should also mention that, according to expert Clarissa Morawski, there is currently no credible research available that attributes a direct decline in sales as a result of introducing a new deposit program; on the contrary, despite what companies may fear, evidence tends to show that introducing DRS has no negative impact on selling trends. There is a simple reason for that observation: DRS is a balanced system that does not induce a price increase for customers. The very first time a customer will purchase an item under DRS, they will indeed pay a little extra as deposit; but this deposit will be refund next time the customers brinks the container back, which means they will actually have more money to spend in the shop on that day.

[181] Valencia Plaza, *El 95% de los valencianos aprueba el plan de envases retornables, según un sondeo del Consell* (2016).

[182] The Conversation, *Deposit schemes reduce drink containers in the ocean by 40%* (2018).

[183] Eunomia and Reloop Platform, *Better Together. How a Deposit Return System Will Complement Ontario's Blue Box Program and Enhance the Circular Economy* (2019).

[184] Infinitum, *How to join Norway's deposit system for refundable packaging* (2023).

[185] Zero Waste Cities, *Creating effective systems for reuse. Webinar* (2021).

[186] In any case, a deposit must also be applied on single-use containers, because if deposits are only applied on refillables, there will be an incentive for customers and retailers to opt for single-use. See Zero Waste Cities, *Deposit Return Systems (DRS) for beverage containers. Webinar* (2019).

[187] Zero Waste Cities, *An introduction to Deposit Return Schemes (DRS). Webinar* (2019).

- large amounts of bottles are sold to consumers daily (and beverage bottles clearly comprise a significant part of the waste stream);
- a large proportion of these bottles is consumed away from home, and thus likely to escape separate collection schemes (a disproportionately high share of littered waste is in fact drink bottles);
- plastic and aluminum beverage containers consume a lot of energy in manufacturing, which makes them a priority in terms of recovering.

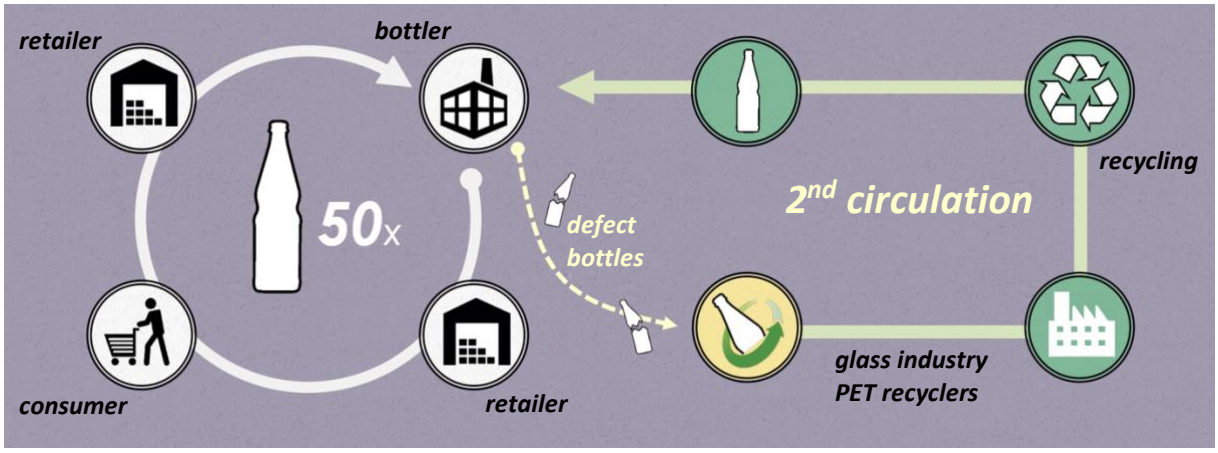

Figure 5 : Double circuit (reused/recycled) of reusable bottles in Germany (Source: GDB)

Contrary to refill systems that essentially put the reasonability on the consumer, **DRS systems have the significant advantage to clearly put the accountability on the producer** – as it is one of the key Zero Waste principles. Indeed, for beverage bottles and many other returnable packaging, DRS is to be intended as part of 'Extended Producer Responsibility' (see next section). It means that it should be the responsibility of producers, within a sector-focused EPR scheme, to organize and operate a deposit-refund mechanism.

Besides being framed by the producer's responsibility principle, usual keys to successful DRS include:

- **being run by non-profit organizations** accredited by the Ministry of Environment;
- **actively involving all concerned stakeholders** (retailers[188], recyclers, etc.);
- **correctly setting-up the system** (law, handling centers, logistics, infrastructure, etc.) from the beginning;
- **designing and using durable containers** (to enable as many reuse cycles as possible), while pooling containers among as many different companies as possible (to facilitate scaling up and reduce need for transportation when products are sold nationwide);
- **efficient controlling mechanisms** enforced by authorities (to avoid fraud);
- **simplicity and user-friendliness** for consumers (to increase acceptance and participation);

[188] It has been observed that while supermarket chains can sometimes show reluctance to introducing DRS and have collection points in the stores, small and medium shops are often more supportive of the system as it has the potential to drive more customers to their shops (people who have collected a few bottles may be tempted to go to the local store to drop their containers, get the deposit back… and spend the money in the shop).

- **constant awareness-raising** towards public and stakeholders.[189]

Of course, DRS should certainly not be limited to the beverage sector; on the contrary, **deposit schemes should progressively be expanded to relevant other sectors**, starting with shipment packaging, food containers, reusable cups, etc. On the other hand, DRS is not necessarily applicable to all goods, so it is important to thoroughly analyze which sectors and products are most relevant to start with.[190] We should also highlight that in some sectors, reuse systems seem to be implemented even more effectively with other types of incentives (rather than deposits). More specifically, **fee-based systems – in which customers are charged a daily fee after a set time**, until they return the reusable item or until the full cost of the packaging has been paid – are preferred to DRS in some cases.[191]

In any case, reuse and refill systems – whichever form they may take and whichever kinds of incentives are used depending on the contexts and products – are the essential key to enable Zero Waste systems and true circular economy, which is why their development should be a top priority for public authorities. Wisely combined with complementary policies such as bans (or at least taxes) on single-use packaging/products, **reuse systems can really be a game changer to solve the waste crisis**.[192]

MAKE PRODUCERS REALLY ACCOUNTABLE THROUGH BINDING EPR POLICIES

Extended Producer Responsibility (EPR) is theoretically defined as a policy principle aiming at "*extending the responsibilities of the manufacturer of the product to various parts of the entire life cycle of the product, and especially to the take-back, recycling and final disposal of the product.*"[193] In real life, beyond DRS discussed above, this responsibility is often reduced to a financial accountability, based on the "Polluter Pays" principle,[194] under the form of modulated eco-taxes.[195]

As such, **EPR policies primarily aim at shifting the physical and/or economical responsibility of the product/waste towards the producer and away from municipality, while providing incentives to producers to take into account environmental considerations when designing their products**.[196] In other words, EPR essentially aims at providing funding for waste management (which can help make economically viable some circular economy loops that would not be viable without this specific funding) and at influencing producer choices and behaviors towards better eco-conception of products and packaging.

---

[189] Interestingly enough, experience shows that the monetary incentive aspect of DRS ("*bring your bottle and get your money back*") is not necessarily the key feature on which communication campaigns should be built. More precisely, although it can be an important enabler when the system is first introduced, focusing communication on the ecological benefits of the DRS system can turn out more effective at some point.

[190] For instance, a necessary feature for relevant reuse system is frequent turnover: packaging or goods that are stored for a long period before consumption are probably not fit for a reuse scheme (for example, it would make no sense to use reusable bottles for high-quality wine that is going to be store ten years in a cellar).

[191] Global Plastics Policy Centre, *Making reuse a reality: A systems approach to tackling single-use plastic pollution* (2023).

[192] For more information about reuse systems and policy recommendations on how to design and implement them, see: Global Plastics Policy Centre, *Making reuse a reality: A systems approach to tackling single-use plastic pollution* (2023); Miller (S.) and al., *Reusable solutions: how governments can help stop single-use plastic pollution* (2019); Zero Waste Cities, *Putting second-hand first to create local jobs. Guidance for municipalities to develop local re-use strategies* (2021); Zero Waste Cities, *Setting up a reuse strategy for the city. Webinar* (2019).

[193] Lindhqvist (T.), *Extended Producer Responsibility in Cleaner Production: Policy Principle to Promote Environmental Improvements of Product Systems* (2000).

[194] Institute for European Environmental Policy and WWF, *How to Implement Extended Producer Responsibility (EPR)* (2020).

[195] In the framework of EPR policies, these taxes are sometimes referred to as "eco-contribution" or "eco-participation"; but in this report we use the term "eco-tax" for simplicity and because it seems to be the most common wording in Mongolia.

[196] OECD, *Extended Producer Responsibility* (2022).

Considering that it formally puts emphasis on producers' accountability, which is one of the key principles of Zero Waste, EPR should certainly have a positive role to play in efficient resource management systems. However, beyond its obvious bright sides, **EPR usually also comes with significant constraints, pitfalls, drawbacks and even counter-productive effects, which should not be underestimated**. As the French EPR system is often regarded as a pioneer and one of the most advanced in the world, learning from its feedback can be of great help to design relevant and efficient EPR policies in Mongolia.[197]

Within the French EPR scheme, **producers pay an eco-tax to "eco-organisms"**, which are private entities (accredited by public authorities) **in charge of collecting and distributing the money to waste management operators** (municipalities, non-profits, etc.).[198] These eco-taxes are established through two levels of modulation:

- **First, eco-taxes are modulated depending on various features** such as materials, weight, number of packaging units in the packaging sector, etc. This is what they call "modulated fees".
- **Then, these initial modulated fees undergo a secondary "eco-modulation" process**, which means that financial bonus/malus or rewards/penalties are additionally applied depending on practices and reflecting the ease with which each material or product can be reintroduced into the production cycle as secondary raw material.

EPR policies for the packaging sector[199] were introduced in France in 1992. Feedback shows that this packaging EPR scheme suffers clear limits (which are also observed in other sectors):[200]

- According to official data from French administration[201], **eco-modulations actually represent a very small percentage (6%) of the overall amount of eco-taxes**, which means that the effect of bonus/malus modulation is actually very limited.
- **Eco-taxes are mostly modulated towards bonuses** (95%), not maluses (5%), which gives the impression that most companies have virtuous practices although it clearly is not the case for most of them.
- Most maluses (93% of them) are applied on paper/cartons (for mineral inks), but **there is almost no malus (only 5% of maluses) for plastics**, although plastics are by far the paramount problem in our current waste crisis. In other words, barely 5,000 tons of plastic packaging are affected by a malus out of the 1.1 million tons of plastic used by the packaging sector and theoretically included in the EPR scheme. Here again, these figures

[197] GAIA, *Points forts et limites de la REP: le retour d'expérience français* (2023).

[198] Actually, there is a noticeable difference between "financial EPR" and "operational EPR". Financial EPR corresponds to eco-organisms that, as mentioned above, collect money and distribute it to operators (usually, municipalities). The advantage of this system is that municipalities guaranty the universality and public service nature of actions that are carried out (collecting all types of waste, collecting everywhere in the concerned area, etc.). Operational EPR, on the other hand, corresponds to eco-organisms that not only collect the money but also implement actions. The problem with operational EPR is that such eco-organisms work with a private sector mindset, which means they are usually focusing primarily (if not exclusively) on the most valuable types of waste (e.g., PET bottles) and neglect those that do not have any value (yogurt pots, blisters, etc.). They also tend to work only in areas where it is easy to collect a lot of materials, but they neglect remote areas where it is less profitable for them. The lesson learnt form the French experience is that EPR must remain framed by the general interest and not tend to be privatized, which is why "financial EPR" is preferable. If "operational EPR" has to be favored for some reason, the State and/or municipality must stipulate strict terms of reference to make sure that EPR remains focused on public interest.

[199] EPR policies are typically divided by economic sector and/or product: they are designed for specific waste streams such as packaging, batteries, electronics, textile, toys, etc.

[200] Zero Waste France, *Revoir le système des REP, un enjeu pour la réduction des déchets plastiques* (2023).

[201] ADEME, *Portail open data de l'ADEME* (2021).

make it seem like 99.5% of plastic packaging is not problematic, which is absolutely not true.

- **The vast majority of bonuses (over 63%) is given for merely providing sorting instructions** on packaging, while almost none of the bonuses (about 1%) is used for waste prevention, less than 5% is dedicated to reuse, and barely more is given as reward for effectively recycled content.

All things considered, it appears that **eco-modulations do not function properly and are prioritizing actions in the exact opposite order compared to the Zero Waste hierarchy**. Although it is usually hard to access eco-organisms' data, it is clear that EPR policies have not been implemented in a way that incentivizes waste reduction. In the end, the tension between the two objectives of the Polluter Pays principle (which are on the one hand financing of recycling, and on the other hand the incentive to reduce the production of polluting products) seems to be one of the main weaknesses of the EPR mechanism.

The main reason why EPR appears so inadequate and inefficient has undeniably to do with the **structure and governance of these "eco-organisms", which are private entities with clear conflicts of interests**. The Board of these eco-organisms is composed of the very companies that are supposed to be evaluated by the eco-organisms. In addition, eco-organisms are essentially funded by these companies, which are both its members and clients. In such a situation of subordination and financial dependence, it is virtually impossible for eco-organisms to actually apply the penalties or maluses that are supposed to make EPR relevant and efficient. In the end, Citeo – the main eco-organism ruling the packaging EPR scheme in France – largely behaves as a lobbying entity, aligning on corporations' conservative positions and sometimes even turning against its own fundamental mission (preventing waste) by taking part in actions in favor of single-use plastics.[202]

In the end, **there is no scientific evidence that EPR eco-taxes are actually effective** (although packaging EPR has been in place for over three decades, plastic waste has not decreased in France). Eco-taxes do bring some money, but this system does not have much impact in terms of improving practices, especially when it comes to waste reduction.[203] On the contrary, **EPR is often perceived by producers as a "right to pollute", not as a real incentive to stop polluting**. In that sense, EPR as we know it tends to bring a counter-productive form of legitimacy to the current linear model: as long as producers are asked to pay, they can keep business as usual.

Therefore, to be relevant, **it is of paramount importance that EPR policies are designed in a way that**:

- **prevents conflicts of interest** and enables **transparent and democratic governance**;
- **respects the Zero Waste hierarchy** and includes ambitious **waste prevention targets**;
- drives a significant part of the **eco-tax fundings toward developing reuse systems**;
- enables using **bonuses and maluses in a balanced and relevant manner**;

[202] Berlingen (F.), *Recyclage : Le Grand Enfumage. Comment l'économie circulaire est devenue l'alibi du jetable, Editions Rue de l'Echiquier* (2020); Miñano (L.) and Peigné (M.), *Recyclage : Citeo, l'industrie d'abord* (2023).

[203] Actually, even the financial efficiency of French EPR has been questioned. It turned out that the money raised through eco-taxes essentially came as *replacement* to other (public) fundings, not *on top of* them. Which means that overall waste management fundings have remained insufficient and the situation never really improved.

- **raises enough money to cover actual waste prevention and management expenses** rather than (insufficient) theoretical amounts.[204]

It should also be clear that **EPR is not an alternative to other Zero Waste policies but a measure that should be implemented in addition**, in a coordinated fashion. EPR eco-taxes alone cannot be sufficient and should thus be relevantly coupled with heavy taxes and/or bans on single-use plastics, standardization of packaging and public investments in Zero Waste infrastructure. Incentivizing positive changes through EPR can be relevant if policies are properly designed, but authorities should not be afraid to use other forms of regulation and mandatory obligations to impose better industrial practices and true accountability – especially when it comes to the most problematic materials such as single-use plastics, which should simply bin banned once and for all.

Moreover, beyond the financial aspect of EPR, policy-makers should pay attention to actual implementation of alleged 'best practices' of large corporations. **The devil often hides in the details and polluting companies are known to systematically find loopholes in Zero Waste systems, allowing them to take very little action despite their social responsibility claims**. For instance, the main Mongolian beverage companies purport to buy back most of their glass bottles; but in real life, experience shows that their take-back rules and criteria are so strict (and frequently changing) that most bottles are actually refused (and thus not paid to local waste workers who spend lots of time and money collecting, sorting and transporting these bottles).[205]

In order to make producers really accountable, authorities must ensure that corporations take real relevant actions, at a sufficient scale, beyond communication campaigns and greenwashing claims. Taking back packaging should not be an option or a theoretical practice that is naively praised even when not truly implemented in real life. We must shift our minds (and laws) and systematically consider that, by default, packaging is always the property and responsibility of producers and/or importers/marketers. In the case of glass bottles, for instance, **companies should alleviate their rules and buy back each and all of their bottles, even if there are scratches or damages** – and not only the ones in perfect condition, if and when companies want.

Of course, companies cannot reuse damaged bottles, but it should be their legal responsibility to make sure the broken glass is properly recycled and not abandoned in dumpsites. Incidentally, bringing the responsibility back to producers – in practice, in real-life, and not just in theory – is the only way to **really incentivize them to improve the reusability of their containers** (when beverage companies will be obligated to take-back and reuse all their bottles – possibly through DRS –, they will quickly shift to stronger, simpler, more standardized models, instead of keeping the current fragile ones that are fundamentally designed for single-use).[206]

[204] In the case of France, reference costs are calculated based on theoretical scenarios that systematically lead to underestimating costs and underfunding municipalities' waste management services. Zero Waste France also recommends to include in eco-tax reference costs not only direct waste management operations but a broad scope of secondary waste-related issues, such as cleaning the streets and wild dumps in the nature. For example, costs for picking up cigarette buts and chewing-gums from the streets should be covered by the cigarette and chewing-gum industries, while operations to clean litter from the environment should be funded by the sectors that produce the items we find most in wild dumps. Incidentally, integrating the costs of clean-ups into eco-taxes is a strong incentive for companies to opt for DRS systems (especially for beverage companies), as DRS essentially guarantees to collect almost all containers (and thus save a lot of money compared to paying for clean-up costs).

[205] For more details, see Ecosoum, *Who produces our waste? Brand audit report* (2022).

[206] For instance, in Germany – where DRS is effective and 98% of beverage containers are collected – over 40% of beverages are sold in containers truly designed for reuse, which means that they can easily be refilled over 50 times.

ENSURE ADEQUATE PROCESSING AND LANDFILLING OF RESIDUALS

Even when implementing efficient Zero Waste policies and despite all efforts to reduce, reuse, recycle and compost waste, cities will probably always be left with at least some residual waste to manage. As we already explained, incineration – even with waste-to-energy – is not to be considered a legitimate solution for residual waste. In contrast, landfilling thus appears as the best option for residuals.

However, **it is important to keep in mind that even state-of-the-art, modern sanitary landfills have significant and unavoidable negative impacts**.[207] Rain and snow percolate through landfills and pick up contaminants from the waste, turning into a toxic liquid called leachate.[208] Protective liners and leachate collection systems always fail over time, which means leachate ends up leaking into groundwater.[209] In addition, most landfills emit large quantities of methane because of decomposing organic matter.[210]

Therefore, it is essential to ensure pre-treatment of residuals prior to landfilling, in order to prevent leachate pollution and methane emissions – although it is necessary to properly define "pre-treatment" so as to avoid counter-productive actions and forbid false solutions to come back insidiously.[211] Simply put**, the current best practice for pre-treating residuals is usually referred to as "Materials Recovery and Biological Treatment" (MRBT)**.[212] MRBT is a process to recover as much residual waste as possible, biologically stabilize the fermentable fraction, and – only then – send what is left to landfill.

A MRBT facility should essentially include three sections:

- **A section to separate dry materials from organics**: the easiest way to accomplish this separation is to install primary screens after bag openers. Primary screens allow most dry materials – such as paper, plastics, metals and cartons – to end up with the larger, coarse materials, while most organics will get diverted into the smaller materials.
- **A mechanical sorting section**: previously-separated dry, coarse materials undergo a series of processes (ballistic separators, optical sorters, magnets, eddy current separators, extruders etc.) that enable recovering additional recyclable materials, especially high-value non-packaging plastics (which tend to escape EPR policies and end up in residual waste) but also metals, paper, carton and other materials that can still be valued somehow.
- **A biological treatment section**: mechanically-separated organics should go through a range of processes from mixing and aeration techniques to more complex biological treatment systems. All in all, this "biological stabilization" process – which is essentially

[207] Conservation Law Foundation, *All Landfills Leak, and Our Health and Environment Pay the Toxic Price* (2018); Ma (s.) and al., *Leachate from municipal solid waste landfills in a global perspective: Characteristics, influential factors and environmental risks* (2020).

[208] Abdel-Shafy (H.I.) and al,, *Landfill leachate: Sources, nature, organic composition, and treatment: An environmental overview* (2023).

[209] Even if landfill operators were actually capable of preventing leakage during the period they ensure operation and maintenance of a landfill, the monitoring period never exceeds a couple of decades after the landfill's final closure, which means that a time always comes when nobody is there to prevent leachate to contaminate groundwaters. The fact that pollution happens in the future, when no one is looking anymore, does not mean it does not happen.

[210] Lou (X.F.) and Nair (J.), *The impact of landfilling and composting on greenhouse gas emissions – A review* (2009).

[211] Zero Waste Europe, *Building a bridge strategy for residual waste. Material Recovery and Biological Treatment to manage residual waste within a circular economy* (2020).

[212] Morris (J.) and al., *What is the best disposal option for the "leftovers" on the way to Zero Waste?* (2013).

similar to composting[213] – aims to reduce fermentability of residual organics and thus minimize landfill methane emissions and acidity of leachate.

In the end, such MRBT processes lead to reducing the volume/weight of waste disposed in landfills[214] and to significantly decreasing landfill methane generation (by 80-90% or more).[215] **It is thus crucial that large landfills in Mongolia (starting with new one being built in Ulaanbaatar) are equipped with a MRBT facility.**

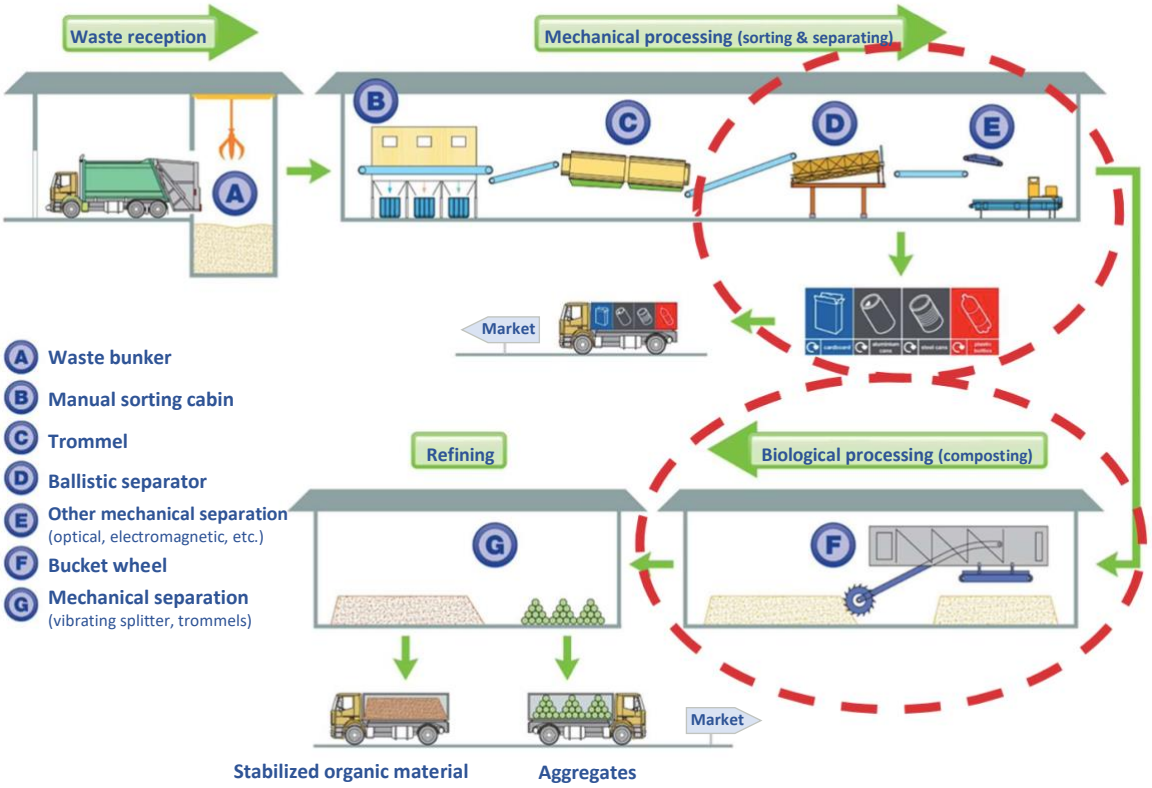

Figure 6 : Example of MRBT facility layout (Source: Urbaser Ltd)

Although it is not part of MRBT, we can mention that **a final mitigation step that can additionally be useful for landfills that continue to receive a large dirty organic fraction (or for older landfills with organic waste in place) is to use a biologically active landfill cover (biocover)**.[216]

[213] Although the process is similar to composting, it does not generate usable compost because the residual waste is mixed and contaminated.

[214] The highest recovery rates in Europe are currently around 30-35% of residual waste, which may be complemented by a further 10% process loss from stabilization. Thus, the quantity of rejects that will indeed be disposed in landfills remains high, which is why source-separation and higher Zero Waste measures are paramount. But the benefit of stabilizing fermentable organics, recovering some valuable materials and producing crucial data still make MRBT a must in a proper Zero Waste system (which is why waste pre-treatment is required by the Landfill Directive in the European Union).

[215] Bayard (R.) and al., *Assessment of the effectiveness of an industrial unit of mechanical–biological treatment of municipal solid waste* (2010); De Gioannis (G.) and al., *Landfill gas generation after mechanical biological treatment of municipal solid waste. Estimation of gas generation rate constants* (2009); Scaglia (B.) and al., *Estimating biogas production of biologically treated municipal solid waste* (2009).

[216] Biocover is not to be confused with "landfill gas-to-energy" (LFGTE) systems, which are certainly not an effective solution to organic waste nor to proper landfilling. It has been shown that only a fraction of landfill methane is successfully captured by LFGTE systems for conversion to energy and that the emissions impact of methane leaking out from LFGTE exceeds the modest benefit of offsetting carbon emissions on the energy grid. Long-term problems include breakage of the pipes that collect landfill gas, an inability to recover energy from landfill gas that is low in methane content, and air pollution from the gas combustion. LFGTE systems are one of the costliest approaches to methane mitigation, which creates a perverse incentive to maintain high rates of methane generation by landfilling organic waste that could have been returned to the

Biocover refers to soil and compost that contain "methanotrophic" microbes, which means that these micro-organisms feed on fugitive methane emissions from the landfill. **Studies have shown biocover to reduce fugitive methane emissions by an average of 63%** (in some cases, biocover is so effective that it not only consumes all the fugitive methane emissions but draws down ambient atmospheric methane as well).[217]

Through its inherent recovery approach, MRBT further supports high diversion rates in communities with successful source separation programs. **MRBT systems can handle both mixed waste and source-separated waste, meaning that the system can be adjusted to a declining tonnage of residuals as cities reduce waste and improve source separated collection**. MRBT is much less expensive than waste-to-energy, and takes less time to be built and operational.[218] Additionally, unlike landfills or incinerators, MRBT infrastructure can be scaled so that communities can be self-reliant and manage residuals locally.[219]

Finally, beyond its direct benefits, MRBT is also essential to produce paramount data. **Analyzing the types of waste that make their way to the gates of landfills, through the Zero Waste system, is a crucial step to ongoingly improve resource management schemes**. By principle, whatever residual waste that could not be recovered one way or another by the system is theoretically to be considered a waste that should never have existed in the first place; in other words, assessing what residual waste comprises – thanks to the MRBT processes (instead of disposing waste in landfills directly, without really checking what is in it) – enables circling back to the top of the Zero Waste hierarchy and informing policy-makers of the types of waste they still need to focus on to make them disappear at the source.

In any case, it should be clear **that MRBT (and biocover) must never be used *instead of* functioning programs to reduce and source-separate waste, but *in addition to* and *as part of* a comprehensive Zero Waste system** (as a last-resort solution for "unavoidable" residuals, but certainly not as a primary solution for reusable/recyclable materials).[220] In addition, although a landfill is unquestionably necessary to dispose biologically-stabilized residual waste, **planners should beware of not overbuilding landfills**, so as to avoid sinking all available resource/waste management financial resources into disposal infrastructure and prevent counterproductive lock-in effects that would undermine relevant Zero Waste policies.

MAKE SURE TO IMPLEMENT A JUST TRANSITION FOR WORKERS

Across the globe, the livelihood of millions of people relies on the recovery (collecting, sorting, recycling) and sale of valuable materials previously discarded as waste by someone else.[221] In many countries of the Global South, waste pickers provide the primary form of solid waste collection,

soil. See: Recycling Works Campaign, Sierra Club, & International Brotherhood of Teamsters, *The Danger of Corporate Landfill Gas-to-Energy Schemes and How to Fix It* (2009); Gonzales-Valencia (R.) and al., *Hotspot detection and spatial distribution of methane emissions from landfills by a surface probe method* (2016); Morris (J.), *Bury or Burn North America MSW? LCAs Provide Answers for Climate Impacts & Carbon Neutral Power Potential* (2010).

[217] Boldrin (A.), and al., *Composting and compost utilization: accounting of greenhouse gases and global warming contributions* (2009); Stern (J.) and al., *Use of a biologically active cover to reduce landfill methane emissions and enhance methane oxidation* (2007); Barlaz (M.A.) and al., *Evaluation of a Biologically Active Cover for Mitigation of Landfill Gas Emissions* (2004); Monster (J.) and al., *Quantification of methane emissions from 15 Danish landfills using the mobile tracer dispersion method* (2015).

[218] GAIA, *Zero Waste to Zero Emissions: How Reducing Waste is a Climate Gamechanger* (2022).

[219] Zero Waste Cities, *The transition strategy to deal with residual waste. Webinar* (2019).

[220] This is essential not only to respect the Zero Waste hierarchy but also for operational reasons: for instance, if residual waste contains a high rate of organic waste, the mixed materials get dirty and sticky, which highly diminishes the efficiency of MRBT processes.

[221] Morais (J.) and al., *Global review of human waste-picking and its contribution to poverty alleviation and a circular economy* (2022).

providing widespread public benefits and achieving high recycling rates.[222] Globally, waste pickers collect approximately 60% of all the plastic that is collected for recycling.[223] Without them, the waste crisis would be far worse; and yet, most informal waste workers often face low social status[224], deplorable living and working conditions[225], and get widely ignored by national and local governments.[226]

Unfortunately, Mongolia is not an exception, as study showed that waste pickers in Ulaanbaatar are facing many challenges such as homelessness, difficulty to get official identity documentation, various health problems, social isolation and discrimination.[227] Some of these waste pickers are children and elderly who do not have many other options to make a living but to collect waste from landfills.[228] In the countryside, too, a significant number of people among the most vulnerable appear to be surviving from collecting and selling littered recyclables.

As Mongolia will undergo its Zero Waste journey, it will be of paramount importance to acknowledge these people and the important role they have been playing until now in managing our country's waste. It is crucial that the transition towards a healthier society and a circular economy is not done at the expense of the valuable waste workers who have been preventing Mongolia from being buried under its waste.[229] These thousands of waste pickers must not be deprived of their livelihood without compensation and real support to transition towards a new career.[230]

Recognizing and integrating informal waste pickers into the formal resource management system (by giving them priority on newly created Zero Waste jobs) will probably be one of the most enabling factors for them to transform their daily struggle into a decent and sustainable livelihood.[231] For example, before the district of Potrero (Philippines) established its new Zero Waste system, an informal waste picker used to earn about 20-40 USD a month from selling recyclable materials to junk shops; now, they receive a monthly salary of 60 USD as a formal village waste worker, on top of what they earn selling recyclables from the recyclable waste they collect from households.[232]

There are probably many actions that could be taken to help informal waste workers during the transition towards Zero Waste (organizing workers cooperatives, facilitating obtention of administrative documents, providing access to health and education, etc.); but rather than making a broad list of ungrounded suggestions on behalf of waste workers, **we can only recommend for authorities to actually meet with them and directly ask them what they would need and how they would like to take an active part in the new resource management scheme**. Letting

[222] WIEGO, *Waste Pickers* (2022).
[223] IAWP, *GlobalRec seeks meaningful participation of waste pickers in the first negotiations of Plastics Treaty in Uruguay* (2022).
[224] Barford (A.) and Ahmad (S.R.), *A Call for a Socially Restorative Circular Economy: Waste Pickers in the Recycled Plastics Supply Chain* (2021).
[225] World Economic Forum, *Waste pickers risk their lives to stop plastic pollution – now they're shaping recycling policies* (2022).
[226] Del Pilar Moreno-Sanchez (R.) and Higinio Maldonado (J.), *Surviving from garbage: the role of informal waste-pickers in a dynamic model of solid-waste management in developing countries* (2006).
[227] Uddin (S.M.N.), and Gutberlet (J.), *Livelihoods and health status of informal recyclers in Mongolia* (2018).
[228] Hoffman (D.), *Living on the edge: waste collection at Mongolia's landfill rehabilitation project* (2019).
[229] Environmental Justice Atlas, *Waste pickers risk losing their livelihood as Ulaanbaatar modernizes landfills, Mongolia* (2020).
[230] In fact, in the case of Ulaanbaatar's landfill restauration project funded by EBRD, public authorities are supposed to ensure proper resettlement and compensation for the workers who can no longer carry on their business as usual, as the bank requires its clients to adhere to certain principles and standards for livelihood restauration in the case of economic displacement.
[231] Schenck (R.) and al., *Enabling factors for the existence of waste pickers: A systematic review* (2016).
[232] GAIA, *Route to Zero Waste. A Flood-Prone City Shows How It's Done* (2019).

people design their future and decide for themselves – while making sure their expressed needs are actually met – is certainly the best way to empower them and enable a just transition.

Incidentally, **decision-makers would be wise to listen to waste workers before to draw new waste management plans in detail, as their experience and expertise is certainly unrivalled and crucial to design relevant policies.** A perspective from the field always brings up unexpected challenges that must be taken into account if new policies are to avoid loopholes and counterproductive backlashes.[233]

In addition, we should also emphasize that **this just transition should also benefit the waste workers that are already integrated in the formal waste management sector**. As mentioned above, workers of the recycling industry are particularly exposed to toxic substances and various hazards.[234] Thus, protecting the health and improving working conditions of formal waste workers should also be a priority for a just transition.

Public authorities can of course improve the legislation to that end; but they could also easily use their contracts, franchises, leases, licenses and partnerships with private sector recycling companies as points of intervention to protect workers. Implementing such safe and good working conditions could be one of the criteria to provide subsidies and other forms of support to recycling companies, so as to make the virtuous ones more economically viable and competitive than those that prove careless about their workers' rights.

LEARNING FROM SUCCESSFUL ZERO WASTE CITIES ABROAD

The best way to convince ourselves of the relevance to implement the above Zero Waste policies is probably to have a quick look at some cities that successfully did in other countries. Zero Waste Europe and GAIA produced enlightening case studies from European and Asian cities; the main ones were already presented by Ecosoum in a previous report[235], but it can be useful to briefly summarize some of them here, too, as these success stories were all made possible by implementing a mix of the above main policies.[236]

→ SALACEA (ROMANIA)[237]

In the small city of Sălacea, local authorities (in partnership with expert NGOs) began their journey towards Zero Waste by implementing a complete door-to-door separate collection system, engaging actively with local stakeholders and launching a comprehensive four weeks education program associated with a strong communication strategy to engage the community. **After only 3 months** the results were already outstanding: **total waste generated decreased by 55%; recycling rate increased from 0 to 40%; separately collected waste rose from 1% to 61%;** waste that went to landfill dropped from 105 ton (98% of previous total) to 26.3 (55% of new total generated waste); rates of local citizen engagement increased from 8% to 97%.

---

[233] For example, waste pickers have highlighted that EPR policies can have the tendency to drive or amplify the rapid privatization of the recycling industry and usher in a new wave of competition for materials. See Talbott (T.C.), *Can the circular economy deliver a just transition?* (2022).

[234] This concerning fact is unfortunately true not only in the Global South but also in rich countries. For example, injury rate among recycling workers in the USA is reported to be twice as much as national average. See Graham (T.) and al., *Sustainable and Safe Recycling: Protecting Workers who Protect the Planet* (2015).

[235] Ecosoum, *Should we introduce waste-to-energy in Mongolia?* (2023).

[236] For details about each success story, readers can refer to the original case studies referenced for each city.

[237] Zero Waste Cities, *The story of Sălacea* (2019).

→ BRUGES (BELGIUM)[238]

In 2015, after assessing that 750 tons of edible food were wasted every year by retailers, the city of Bruges launched an ambitious Zero Food Waste strategy which involved analyzing in detail how much and where food was wasted, building action plans through a participatory approach, and focusing on healthcare sector (which was identified as one of the top food waste generators). **After only 2 years, 43% of food waste were prevented in the main local hospital**, and experience showed that this Zero Food Waste strategy was also a significant money saver: **for every euro invested in preventing food waste, the city saved 8 euros** usually dedicated to manage food waste.

→ SARDINIA (ITALY)[239]

In 2000, Sardinia was Italy's worst performing region in waste management, with a separate collection rate of only 3.8%. But the situation changed in 2004 when local authorities decided to set up a Regional Program for organic waste within its Waste Management Plan (which included compulsory separate collection of organic waste; increase of the landfill tax; bonus/malus system on the cost of residual waste management based on the municipalities performances; and promotion of door-to-door collection, PAYT systems, and home composting). **Today, Sardinia is the best performing island in the whole Mediterranean Sea** and sits at the forefront of Italian and European regions with a **separate collection rate of 60%, waste generation per capita decreased by 17%, and residual waste reduced from 500 to 176 kg per inhabitant**. Proof that (very) touristic areas can also overcome their waste crisis.

→ BESANCON (FRANCE)[240]

The city of Besançon and its surroundings (225,000 residents, half living in densely populated areas) used to primarily rely on incineration to manage waste. In 2008, instead of rebuilding the old incinerator, authorities decided to shift towards a Zero Waste with 3 main measures: implementation of a PAYT system; adoption of a waste prevention plan (-15% of residual waste over 5 years); development of an extensive decentralized composting system. After a few years, the plan clearly paid off: **total waste generation went from 531kg/capita in 2000 to 464kg/capita in 2017; residual waste was reduced by 77 kg/capita between 2008 and 2017**; in 2016, more than **7,400 tons of organic waste were composted, leading to save around 800,000 euros of waste management costs**.

→ ROUBAIX (FRANCE)[241]

Roubaix, considered to be the poorest town in France, decided to address waste at the source in 2014, by creating a vibrant constellation of actors committed to reducing their waste: families, schools, businesses, associations, and the municipality itself. In only one year, Roubaix achieved impressive results: **25% of households managed to reduce their waste generation by over 80%, and 70% of them reduced it by 50%;** families who took up the challenge have also seen **important economic savings**; the network of actors involved in moving the town forward grown fast and helped to create a social fabric. Now, Roubaix is not only contributing towards the national path to Zero Waste but it also portrays a new image of itself as a city.

[238] Zero Waste Cities, *The story of Bruges* (2018).
[239] Zero Waste Cities, *The story of Sardinia* (2018).
[240] Zero Waste Cities, *The story of Besançon* (2018).
[241] Zero Waste Cities, *The story of Roubaix* (2018).

→ **PARMA (ITALY)**[242]

In 2012, the city of Parma (190,000 inhabitants) considered building an incinerator to deal with the terrible waste crisis it was facing. However, thanks to social mobilization, **the need for a new model of waste management became a central element during the local council elections, which removed the pro-incineration mayor and elected a new one** that was committed to start a journey towards Zero Waste (with introduction of door-to-door separate collection system and PAYT scheme). Thanks to political will, involvement of civil society and a clear strategy based on minimizing residual waste, Parma achieved significant results **in only 4 years: total waste generation reduced by 15%; separate collection increase from 48% to 72%; residual waste rate decreased by 59%; reduction in the overall annual costs; increase in the number of jobs** connected to waste management.

→ **GIPUZCOA (SPAIN)**[243]

In 2011, Gipuzkoa province struggled to meet EU recycling targets, but its new plan aimed at phasing out the disposal of recyclable waste and stopping landfilling of untreated waste. To achieve these ambitious goals four measures were implemented: intensive separate collection; special attention to the treatment of organic waste with promotion of home-composting and community composting; specific awareness-raising projects about waste reduction and reuse; collaboration with the Food Bank of Gipuzkoa to reduce food waste and work with people in risk of social exclusion. Today, Gipuzkoa is the living proof that a transition towards a circular economy is possible: **waste generation reduced by 7%; residual waste reduced by 32%; recycling rate raised from 32% to 51%; creation of 10 times more jobs in the treatment of waste; distribution of hundreds of tons of food** to people in need.

→ **LJUBLJANA (SLOVENIA)**[244]

In 2014, Ljubljana became the first European capital city to officially move towards Zero Waste. Snaga – the public company that manages waste in the province of Ljubljana – adopted three main strategies: introduction of a door-to-door collection system, specifically focused on the collection of organic waste; lower the frequency of collection for residual waste while keeping the collection of recyclables and organic waste the same; strong communication strategy focused on prevention and reuse to engage citizens. After 10 years, data speak for themselves: **total waste generation decreased by 15 %; recycled/composted waste average went up to 61%; the amount of waste sent to landfill decreased by 59 %**. And all these achievements were enabled **while maintaining waste management costs among the lowest in Europe**.

→ **PRIULA AND TREVISO (ITALY)**[245]

In 2005, authorities of Italian district of Priula and Treviso (50 municipalities and more than 554,000 inhabitants), formally decided to keep incineration out of the system and intensify Zero Waste policies. Thanks to good political will, transparency measures, great waste separation at source and PAYT scheme, great results were achieved within a few years. **Separate waste collection reached 85%**, with peaks around 90% in some municipalities, ranking **twice above the national average (42%) while maintaining low waste management costs** (178 euros/year/household on average). To improve this already winning system, in 2015 Contarina set to **open a MRBT plant,**

[242] Zero Waste Cities, *The story of Parma* (2018).
[243] Zero Waste Cities, *The story of Gipuzkoa* (2018).
[244] Zero Waste Cities, *The story of Ljubljana* (2019).
[245] Zero Waste Cities, *The story of Contarina* (2018).

which reduces the final residues to only 46% of the total residual waste. Now, Contarina recycles twice the European average and generates five times less residual waste.

→ VHRNIKA (SLOVENIA)[246]

Without a tradition of recycling, **Vrhnika managed to reach 76% separate collection of municipal solid waste,** showing how a small area can **go from landfilling everything to recycling most of its waste** in 20 years. In 2004, the municipality started implementing the first separate collection model in Slovenia, in several steps: setting up the necessary logistics and legislative framework for the new separate collection of recyclable waste through a mix of door-to-door and "eco-islands" collection system; introducing a PAYT scheme; engaging the community with activities in schools and partnerships with local businesses; implementing a strong awareness-raising communication strategy to change the public's perception of waste and encourage separate collection. As a result, **the municipality's waste decreased from 201 to 80 kg/capita between 2004 and 2013.** Moreover, in 2014 the waste management company opened a reuse center on its collection site, to upcycle waste into desirable goods and recover items that would otherwise be sent to landfills.

→ ARGENTONA (SPAIN)[247]

Up until 2004, Argentona was recycling less than 20% of its total waste as most of the waste generated was taken to the local incinerator. In 2004, the municipality started its journey towards Zero Waste by introducing a new door-to-door collection system and a PAYT system. As a result, **the recycling rates more than doubled in the area reaching a peak of 68.5%** in 2012; the **number of jobs tripled**, improving social inclusion and raising the environmental awareness of the community; **the municipality managed to save up to 35,000 euros per year**; the overall **residual waste decreased by 15%**.

→ CAPANNORI (ITALY)[248]

Located in the North of Italy, Capannori is the first town in Europe which declared the Zero Waste goal in 2007. **A small but determined movement stopped the construction of an incinerator and convinced the municipality to commit to sending no waste to landfill** by 2020. Transparency and public consultations with residents were the keys of the successful strategies, which featured: creation of a door-to-door collection system with PAYT fee; trainings for the community and strong engagement of the residents; creation of the first Zero Waste Research Centre in Europe; opening of a Reuse Centre where items such as clothes, footwear, toys, and furniture can be repaired and sold to those in need, thereby diverting them from landfill and serving a vital social function. In less than 10 years, results have been astonishing: **waste generation per person was reduced by 39%; separate collection rate increased to 82%; residual waste per capita reduced by 57%; waste tariffs for residents have been reduced by 20%; 93 tons of items were offered at the Reuse Centre**.

→ PENANG (MALAYSIA)[249]

In 2016, the Consumers' Association of Penang (CAP) started to leverage the existing waste segregation-at-source policy in the state of Penang to increase recovering of organic waste from the general waste by introducing various methods of composting at the domestic level. Thanks to

[246] Zero Waste Cities, *The story of Vrhnika* (2018).
[247] Zero Waste Cities, *The story of Argentona* (2018).
[248] Zero Waste Cities, *The Story of Capannori* (2018).
[249] GAIA, *Making a Case for Zero Waste. Laying the Groundwork for Zero Waste* (2019).

CAP efforts, **waste generation per capita decreased by 25% in one year**, from 2016 to 2017. CAP repeatedly urged the state government to stay on course towards Zero Waste. With Penang **achieving a record-high 43% recycling rate** in 2018 (more than double than the national average of 21%), the state has great potential in reaching a higher waste diversion target and is now an inspiration for the rest of the country.

→ KAMIKATSU (JAPAN)[250]

In 2001, the town of Kamikatsu banned the use of their incinerators installed just three years prior, and then declared its Zero Waste goal of eliminating waste by 2020, without resorting to incinerators or landfills. In 2005, the Zero Waste Academy, a local non-profit organization, was born to provide services to turn waste into something useful and conduct waste audits to identify the different categories of waste. On top of that, the NGO manages a Zero Waste accreditation scheme, where local businesses are given certification according to their efforts to reduce waste and control its use of single use products. It also manages the waste management center, which later expanded to include a circular shop. Today, **households themselves sort their waste into 45 categories and 81% of garbage is recycled, on top of what is reused and composted**. Following the implementation of its Zero Waste program, **Kamikatsu has saved a third of the town's former costs from waste incineration**. The only thing that prevents the town from becoming 100% Zero Waste is the reality that some manufacturers refuse to change the nature of their production process – they still use non-recyclable packaging and materials in their products.

→ SAN FERNANDO (PHILIPPINES)[251]

San Fernando, in the Philippines (where waste incineration is officially banned nationwide), is a busy city divided into 35 villages or districts. In 2011, San Fernando formed a partnership with an NGO to embark on a Zero Waste journey, and the positive results have been striking. **The city now covers all 35 barangays and reports 93% compliance with the law, with 85 fully functional MRFs**. A **policy of "no-segregation/no-collection"** is also strictly implemented and **the city's waste hauling costs were reduced by 50%** within just a few years. Additionally, **the savings that come from diverting waste from landfills also increased dramatically** (in 2018, San Fernando **saved the equivalent of over 1.2 billion MNT** thanks to proper waste management in the barangays). The city's **waste diversion rate increased from 12% in 2012 to 80% in 2018**. In 2015, San Fernando has declared a **total ban on plastic bags, which today has an 85% compliance rate**.

→ TACLOBAN CITY (PHILIPPINES)[252]

Before typhoon Hayan in 2013, Tacloban City was providing collection services to only 30% of the households with an annual budget of 5 billion MNT. In 2017, the city passed legislation requiring residents to segregate at source and used policy instruments and communication campaigns to ensure citizens' compliance. Then, Tacloban City implemented a **door-to-door waste collection system for everyone**, and this Zero Waste strategy quickly paid off as **collection costs were reduced by 72%** to less than 1.4 billion MNT **(while reaching 100% of households instead of 30% before)** thanks to the waste diverted from landfill.

[250] GAIA, *Small Town Big Steps. The Story of Kamikatsu, Japan* (2019).
[251] GAIA, *Picking Up the Baton. Political Will Key to Zero Waste* (2019).
[252] GAIA, *Sunshine After the Storm. A Typhoon-Ravaged City Rises to Become Zero Waste* (2019).

→ FORT BONIFACIO (PHILIPPINES)[253]

The district of Fort Bonifacio was facing an untenable situation in regards to waste: local residents simply left most waste in an informal dumpsite and four trucks came every day just to collect that waste and bring it to a landfill. Therefore, Fort Bonifacio formally established an ecological solid waste management program, mandating correct segregation, collection, recycling, and disposal, as well as an MRF. When the project went into full operation, after massive awareness-raising campaigns, local workers started to collect the waste every day, but organic waste and recyclables were collected separately. As of 2019, Fort Bonifacio boasts a **95% household compliance rate and waste diversion rate is 80%** – around the same level as other Zero Waste models. As the number of dump trucks dropped from four in 2012 to one per day in 2013, **just a year after the project began, hauling expenses have similarly been slashed by 75%.**

→ SEOUL (SOUTH KOREA)[254]

In Seoul, waste reduction and waste diversion from landfills have been the key priorities for authorities. Today, the city's visionary solid waste management policies include a **volume-based waste disposal fee system, a deposit refund system, extended producer responsibility, and bans on problematic plastic products and packaging**. The volume-based waste disposal fee system and high fines for residents who do not properly sort their waste were two of the keys to success. After introducing this disposal rate system for food waste in 2013, **the city achieved a 20% reduction in food waste**. Instead of providing disposable items free of charge, a deposit scheme was applied. The city has organized multi-stakeholder meetings including government officials, residents, small business owners, and NGOs in order to evaluate the existing infrastructure and build a Zero Waste (single-use-free) community. In 2017, Seoul Government opened Seoul Upcycling Plaza, an upcycling center that aims to raise awareness on environmental, social, and economic advantages of upcycling.

[253] GAIA, *Pioneer of Zero Waste. The Village that Inspired Cities to Go Zero Waste* (2019).
[254] GAIA, *Citizens at the Center. Seoul's Journey to Zero Waste* (2019).

CONCLUSION

With one major municipality, a few medium-size cities (aimag centers) and a little over three hundred villages (soum centers), Mongolia is characterized by a unique demographic context with very low overall population density. **This situation puts the country in a favorable condition to implement Zero Waste policies not only at the city-level (as it is usually done in most countries) but nation-wide all at once with adequate interactions between each level.**

The inspiring examples of successful cities all over the planet show that the current waste crisis is not a fatality. On the contrary, provided that enlightened decision-makers show sufficient political will to design, vote, and enforce ambitious policies that have largely proved effective in other countries, **Mongolia has everything it needs to turn itself into a truly Zero Waste country in a foreseeable future.**

After formally committing to Zero Waste and laying solid foundations – through participatory consultations, adequate baseline studies and clear objectives and metrics –, authorities that will mandate and incentivize at-source sorting, reorganize waste collection services, and support the development of Zero Waste infrastructure will quickly reap the benefits of their efforts. Of course, complementary **policies with specific and systemic targets – preventing food waste, banning single-use plastic, enforcing effective producer's accountability, developing deposit-return and refill systems, etc. – will also be essential** to finally change the linear economy and solve the current waste crisis.

As long as the right strategies and policies are in place (and actually enforced), Mongolia can expect Zero Waste implementation to start showing success within less than a year – while reducing unemployment and achieving very significant savings in waste management costs. This perspective of saving money, boosting the economy and creating countless jobs should motivate decision-makers at all levels to quickly invest as much as necessary, using all possible sources such as state and local funds, general income taxes, EPR fundings, elimination of subsidies for harmful industries and practices, additional tax revenues from new Zero Waste jobs, PAYT fees, contraveners fines, service provision fees, etc. Incidentally, since Zero Waste must be decentralized and grounded on local realities to be successful, **it will be crucial that national authorities let local administrations design and set up local waste management systems and taxes with more flexibility and autonomy than current legislations allow today – so that each community can best match its own identified needs, in the ways that they see fit for themselves.**

Decision-makers should keep in mind that **Zero Waste is a *journey* much more than a *destination***, which means that they should be ready to appreciate every little victory while constantly trying to improve their system. Overall, **Zero Waste is a straightforward approach and challenges are more *perception* than *reality***. Appreciation and involvement of the people are guaranteed if authorities ensure clear objectives, audacious policies, full transparency, proper information and political leadership.

ACKNOWLEDGMENTS

This report was prepared and written by NGO Ecosoum as part of the "Sustainable Plastic Recycling in Mongolia" project funded by the European Union. Although a wide variety of sources and references were used, authors acknowledge that this report would not have existed without the in-depth work of Global Alliance for Incinerator Alternatives (GAIA), Zero Waste Europe, and other leading members of the Break Free From Plastic global movement. Readers who would want to deepen their knowledge about Zero Waste and/or learn more about any topic addressed in the report are advised to primarily refer to these organizations' publications.

Ecosoum is a Mongolian association fighting for social and ecological justice through the strengthening of rural communities' autonomy. Founded in 2018 in Khishig-Undur soum, where it has been carrying out its first projects, Ecosoum now aims to share its knowledge more broadly, advocate for necessary changes, and support relevant initiatives all over the country. www.ecosoum.org

Global Alliance for Incinerator Alternatives (GAIA) is a worldwide alliance of more than 800 grassroots groups, non-governmental organizations, and individuals in over 90 countries whose ultimate vision is a just, toxic-free world without incineration. www.no-burn.org

Zero Waste Europe (ZWE) connects and supports a vibrant network of 35 local and national NGOs from all around Europe sharing common values and objectives and working together for a Zero Waste future. ZWE is the leading Zero Waste organization in Europe. www.zerowasteeurope.eu

#breakfreefromplastic is a global movement envisioning a future free from plastic pollution made up of 1,400 organizations from across the world demanding massive reductions in single-use plastics and pushing for lasting solutions to the plastic pollution crisis. www.breakfreefromplastic.org