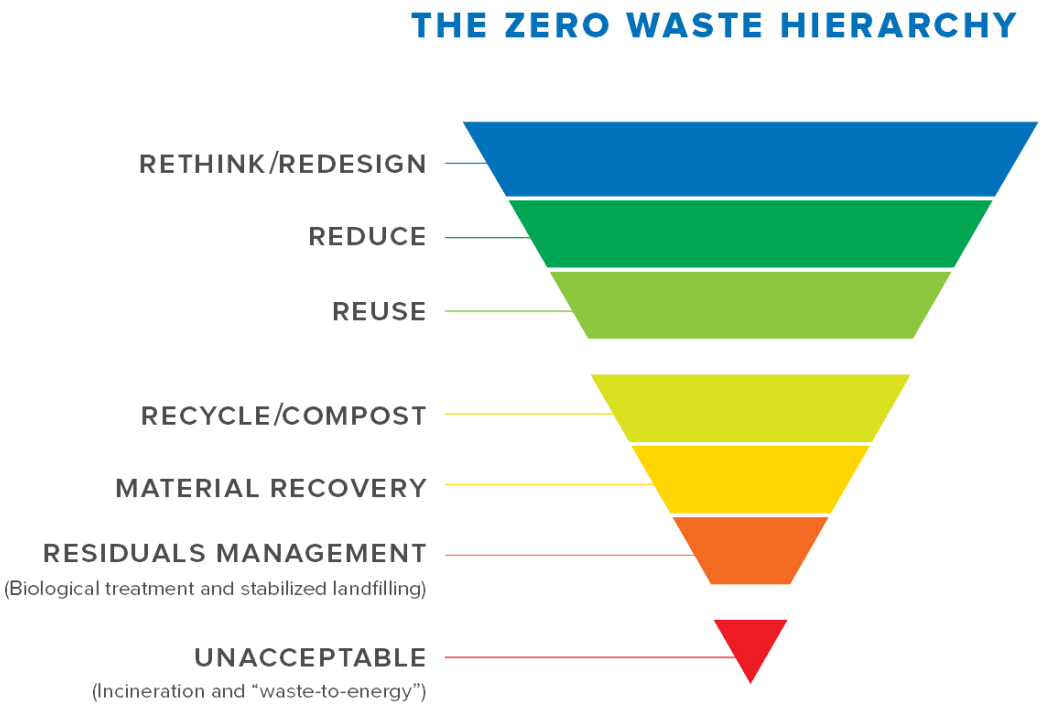
Zero Waste Hierarchy of Highest and Best Use 8.1

Purpose

The Zero Waste Hierarchy describes a progression of policies and strategies to support the Zero Waste system, from highest and best to lowest use of materials. It is designed to be applicable to all audiences, from policy-makers to industry and the individual. It aims to provide more depth to the internationally recognized 3Rs (Reduce, Reuse, Recycle); to encourage policy, activity and investment at the top of the hierarchy; and to provide a guide for those who wish to develop systems or products that move us closer to Zero Waste. It enhances the Zero Waste definition by providing guidance for planning and a way to evaluate proposed solutions. Users are encouraged to develop policies and actions starting at the top of the hierarchy.

Zero Waste Definition

Zero Waste: The Conservation of all resources by means of responsible production, consumption, reuse, and recovery of all products, packaging, and materials without burning them and with no discharges to land, water, or air that threaten the environment or human health.



*Guiding Principles

Closed Loop Systems**	Design systems to be closed loop rather than linear in their use of resources.
Close to Source	Processes to occur as close to the source as practical.
Conservation of Energy	More energy can be saved, and global warming impacts decreased, by reducing waste, reusing products, recycling and composting than can be produced from burning discards or recovering landfill gases.
Do No Harm	Consider the upstream ecological and social impacts of materials. Select materials, products, services, and systems that, in priority order: are beneficial, create no harm, or do less harm. Minimize the negative social and environmental impacts of the materials and discards throughout their lifecycle.
Do Not Export Harm	Do not send materials, toxic or otherwise, to areas, regions, or facilities that do not meet internationally accepted environmental and health standards for all phases of managing these materials, or have lower standards than the exporting region. Use laws or contracts to ensure these areas, regions, or facilities where materials are being managed are demonstrating the highest level of care in avoiding discharges to land, water or air that threaten the environment or human health. Avoid sending materials to areas, or facilities where they are unwanted by the community, and where it will negatively impact economic, social, and/or ecological systems. Other factors to consider include environmental justice, cumulative impacts and ability to handle materials without export. Exports meeting the above criteria can be preferable to building or maintaining harmful local infrastructure where financial resources could be better spent developing Zero Waste approaches.
Engage the Community	Promote changes and systems that work with communities to facilitate meaningful and sustained participation, increase understanding, and influence behaviour change and perceptions.
Highest and Best Use	Creating and keeping materials and products for a use as high on the hierarchy as possible and in the useful loop as long as possible. Keeping materials from being downcycled where the number of future uses or options are limited. Source separate items and materials to the extent necessary to ensure clean and marketable products and materials for reuse, recycling and composting streams.
Information & Improvement	Collect information on systems and use as feedback for continuous improvement.
Local Economies	Support the growth and expansion of local economies (production, repair, and processing) in order to reduce greenhouse gases from transportation, improve accountability and resiliency, and increase repair and parts opportunities.
Materials Are Resources	Preserve materials for continued use and use existing materials before harvesting virgin natural resources.
Minimize Discharges	Minimize all discharges to land, water or air that threaten the environment, or human health, including climate changing gases.
Opportunity Costs	Consider opportunity costs of investments and ensure investments occur as high as possible on the Hierarchy.
Precautionary Principle	Ensure that a substance or activity which poses a threat to the environment is prevented from adversely affecting the environment, even if there is no conclusive scientific proof linking that particular substance or activity to environmental damage.
Polluter Pays	Whoever causes environmental degradation or resource depletion should bear the “full cost” to encourage industries to internalize environmental cost and reflect them in the prices of the products.
Sustainable Systems	Develop systems to be adaptable, flexible, scalable, resilient, and appropriate to local and global ecosystem limits.

Zero Waste Hierarchy 8.0

RETHINK/REDESIGN Systemic change to move towards a closed loop** model; redesign of systems to avoid needless and/or wasteful consumption. Actions that address the root causes of the current linear use of materials.	
1	Consider if a purchase is necessary and reject unnecessary, unsolicited items
2	Design and purchase products from reused, recycled or sustainably-harvested renewable, non-toxic materials to be durable, repairable, reusable, fully recyclable or compostable, and easily disassembled
3	Shift funds and financial incentives to support a Circular Economy** over the harvesting and use of virgin natural resources
4	Enact new incentives for cyclical use of materials, and disincentives for wasting
5	Facilitate change in how end users' needs are met from "ownership" of goods to "shared" goods and provision of services
6	Support and expand systems where product manufacturing considers the full life-cycle of their product in a way that follows the Zero Waste Hierarchy and moves towards more sustainable products and processes. Producers take back their products and packaging in a system that follows the Zero Waste Hierarchy.
7	Identify and phase out materials that cause problems for Closed Loop Systems*
8	Facilitate and implement policies and systems to encourage and support Local Economies*
9	Re-consider purchasing needs and look for alternatives to product ownership
10	Provide information to allow for informed decision-making
11	Eliminate or avoid systems that drive needless consumption
REDUCE Measures taken to reduce the quantity and toxicity of resources, products, packaging and materials as well as the adverse impacts on the environment and human health (while reduction is noted here it is acknowledged that people's basic needs should be met; not everybody needs to reduce).	
12	Plan consumption and purchase of perishables to eliminate or avoid discards due to spoilage and non-consumption
13	Implement Sustainable Purchasing** that supports social and environmental objectives as well as local markets
14	Minimize quantity and toxicity of materials used
15	Minimize ecological footprint required for product, product use, and service provision
16	Choose products that maximize the usable lifespan and opportunities for continuous reuse
17	Choose products that are made from materials that are easily and continuously recycled
18	Prioritize the use of edible food for people
19	Prioritize the use of edible food for animals
REUSE Actions by which products or components are used again for the same or similar purpose for which they were conceived. Actions that support the continued use of products in ways that retain the value, usefulness and function.	
20	Maximize reuse of materials and products
21	Maintain, repair or refurbish to retain Value**, usefulness and function
22	Remanufacture with disassembled parts; dismantle and conserve "spare" parts for repairing and maintaining products still in use
23	Repurpose products for alternative uses

RECYCLE/COMPOST** Actions by which discards are mechanically reprocessed into products or materials or biologically processed to return to the soil.	
24	Support and expand systems to keep materials in their original product loop and to protect the full usefulness of the materials
25	Maintain diversion systems that allow for the highest and best use of materials, including organics
26	Recycle and use materials for as high a purpose as possible
27	Develop resilient local markets and uses for collected materials wherever possible
28	Provide incentives to create clean flows of compost and recycling feedstock
29	Support and expand composting as close to the generator as possible (prioritizing home, on site or local composting)
30	Consider industrial composting whenever home/decentralized composting is not possible, or if local conditions require/allow anaerobic digestion

MATERIAL RECOVERY Any operation to salvage additional materials after the actions above. Does not include energy recovery and the reprocessing into materials that are to be used as fuels or other means to generate energy, which are unacceptable practices.	
31	Maximize materials recovery from mixed discards after extensive source separation
32	Consider chemical processing for material recovery** in the form of repolymerization (i.e. Plastic-to-Plastic or P2P) only for materials which are not suitable for mechanical recycling
33	Backfilling**
RESIDUALS MANAGEMENT Handling of discards that were wasted in a way that does not threaten the environment or human health. Analyze what was wasted and why.	
34	Examine materials that remain and use this information to refine the systems to rethink, reduce, reuse, and recycle in order to prevent further discards.
35	Ensure minimization of impacts by means of biological stabilization of fermentable materials. Recover energy using only systems that operate at Biological Temperature and Pressure**
36	Encourage the preservation of resources and discourage their dispersal and Destructive Disposal**
37	Plan systems and infrastructure to be adjusted as discards are reduced and its composition changes
38	Minimize Gas Production and Release** and maximize gas collection
39	Use existing landfill capacity and maximize its lifespan. Ensure it is Responsibly Managed. **
40	Contain and control, for responsible management, discards that threaten the environment or human health.
UNACCEPTABLE Systems and policies which encourage wasting or threaten the environment and human health.	
41	Don't allow policies and systems that encourage the Destructive Disposal and/or the destruction of discards
42	Don't allow energy and Destructive Disposal systems that are dependent upon the continued production of discards
43	Don't allow the Incineration** of discards
44	Don't allow discards to be used in products or materials that risk or cause adverse environmental or human health impacts.
45	Don't allow chemical processing of discards into fuel** (i.e., Chemical Processing of Plastics to Fuel) including but not limited to the use of pyrolysis and gasification
46	Don't allow the use of discards in cement kilns

**Definitions:

Biological Temperature and Pressure — The ambient temperature and pressure that occurs naturally without the use of added energy, or in any case not above 100 degrees Celsius or 212 degrees Fahrenheit.[1]

Backfilling — Any operation where suitable non-hazardous, non-contaminated inert material such as stone, soil, clay, sand, brick, porcelain, ceramic, or glass is used for purposes of reclamation in excavated areas or for engineering purposes. Discards used for backfilling must be suitable for the aforementioned purposes, and be limited to the amount strictly necessary to achieve those purposes.

Chemical Processing for Material Recovery — Processing of carbon-based materials such as plastics aiming at repolymerization (Plastic-to-Plastic (P2P)) or recovery as new polymers not intended for fuels. This may include solvolysis, solvent-based purification, and the like. Recovery of material must be over 90%.

Chemical Processing for Fuel — Any type of process (for example, Plastics to Fuel (P2F)), that converts – typically through thermal cracking – most of the carbon included in plastics, into a syngas and/or other fuel. It may also be inappropriately described as “chemical recycling” or “advanced recycling”.

Circular Economy — “A system where materials are never wasted and where nature is regenerated. In a circular economy, products and materials are kept in circulation through processes like maintenance, reuse, refurbishment, remanufacturing, recycling, and composting. The circular economy addresses climate change and other global challenges, like biodiversity loss, waste, and pollution, by decoupling economic activity from the consumption of finite resources.” (Ellen McArthur Foundation) In a circular economy, materials are kept in the loop, in their highest status, for as long as possible, rather than wasted, hence "leakages" of resources are minimized and therefore excludes options that are inherently linear such as incineration and landfilling.
A circular economy should clearly follow the Zero Waste Hierarchy of Highest and Best Use and not show energy recovery as a process prior to landfilling.

Closed Loop System — A system with negligible material exchange outside of itself, as opposed to open loop where material may flow in and out of the system. This purpose is to avoid the extraction or addition of new primary raw materials.

Destructive Disposal — Discarded materials placed in a landfill or in an Incineration** facility.

Discards — Materials that are disposed of because they are no longer useful or desirable to their current owner. This includes but is not limited to materials sent for reuse, composting, recycling, landfilling, or incineration.

Incineration — Incineration is a form of Destructive Disposal via combustion or thermal conversion/treatment of discarded materials into ash/slag, syngas, flue gas, fuel, or heat. Incineration includes facilities and processes that may be stationary or mobile, may recover energy from heat or power and may use single or multiple stages. Some forms of incineration may be described as resource recovery, energy recovery, trash to steam, waste to energy, energy from waste, fluidized bed, catalytic cracking, biomass, steam electric power plant (burning waste), pyrolysis, thermolysis, gasification, plasma arc, thermal depolymerization, refuse derived fuel, or chemical processing of plastics to fuel.

[1] Unless higher temperatures are required as a pretreatment, not to exceed 150 degrees Celsius (e.g., to control diseases, or reduce pathogens) to be then subject to composting or Anerobic Digestion; the pretreatment should never be used to destroy materials.

Minimize Gas Production and Release	Keeping out source-separated organics and biologically stabilizing the materials that go into landfill. For existing landfill cells that already contain unstabilized organics, the gas production should be minimized by keeping out rainwater and not recirculating leachate. Minimize methane release by permanently capping closed cells with permanent covers and installing gas collection systems within months of closure (not years). Maintain high suction on collection wells and do not damp down wells or rotate off the wells to stimulate methane production. Filter toxins in the gas into a solid medium that is containerized and stored on site. Note that this is not considered a renewable energy.
Problematic for a Closed Loop System	Materials that make it hard to recycle or compost the materials themselves or other materials. These may be contaminants for a material (like some forms of biodegradable plastics or stickers on fruit and vegetables) or materials that clog processing systems (like plastic bags).
Recycle	Any operation by which discarded materials are mechanically processed into products, materials, or substances whether for the original or other purposes. This does not include incineration, the reprocessing into materials that are to be used as fuels, backfilling operations, or materials used as landfill cover.
Recycling of Organics (Composting and Anaerobic Digestion)	Any operation by which clean, discarded organic materials are biologically processed to produce soil improvers, growing media or soil amendments. Input feedstocks must come from separate collection, and the end product must be suitable for a use which is beneficial to soils and/or plant growth activities. When these conditions are met, the materials that count as recycled are the material inputs (including losses during the processing). If anaerobic digestion is used, it is recommended to be followed by a composting process.[2]
Responsibly Managed Landfills	Manage landfills to minimize discharges to land, water or air that threaten the environment and human health. This must include plans for closure and financial liability.
Sustainable Purchasing	The purchase of goods and services that take into account the economic value (price, quality, availability and functionality) and the related environmental and social impacts of those goods and services at local, regional, and global levels.
Value	The importance, worth, or usefulness of something that may be economic, social, environmental, cultural, or sentimental.

[2] To get full details on composting, anaerobic digestion, and conditions to include them in Zero Waste strategies and schemes, refer to the ZWIA policy paper "Choosing between Composting and Anaerobic Digestion: soil, fuel or both?" https://zwia.org/composting-and-anaerobic-digestion-policy/