

ON THE ROAD TO

ZERO WASTE

A PRACTICAL GUIDE

Compiled and
Written by
Jeff Conant and
Cecilia Allen



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GAIA is a worldwide alliance of more than 800 grassroots groups, non-governmental organizations, and individuals in over 100 countries whose ultimate vision is a just, toxic-free world without incineration.

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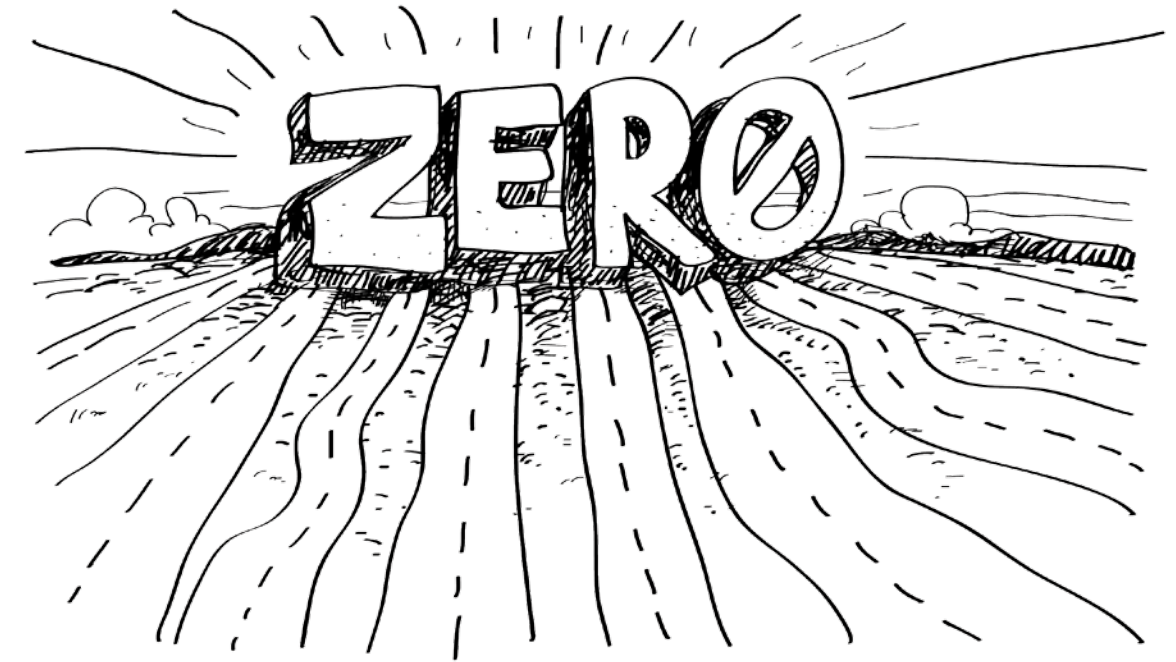
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How to Use This Guide



This Guide is intended to provide information and support to those seeking to orient waste management policies and practices towards zero waste. It will be useful to local governments wanting to improve waste management policies and programs, communities looking for safe and practical alternatives to building new landfills and incinerators, people who already understand the zero waste concept and want to initiate zero waste practices in their own communities—and also those who may have a zero waste program in place and are seeking new ideas to enhance it. The focus is on zero waste approaches at the municipal or community level, but many of the suggested actions can be taken by entire nations and regions, or by individual institutions and businesses.

While many zero waste planning elements, practices, and strategies are presented, this Guide does not contain an exhaustive list,

and it is not necessary to adopt every one of the actions suggested. Each location's zero waste program will consist of a different combination of these elements, practiced according to local contexts and opportunities. Nonetheless, for a waste management plan to be oriented toward zero waste, it must integrate actions within **each** of the four core strategies presented in the Guide: (1) *setting a new direction*; (2) *establishing comprehensive reuse, recycling, and composting programs*; (3) *engaging community participation*; and (4) *designing out waste*.

The Guide is designed to be modular; one can explore and apply parts of it or read the full report, as desired. A companion report is available as well. **On the Road to Zero Waste: Successes and Lessons from Around the World**,¹ presents the stories of nine communities that have successfully established zero waste programs.²

Why Zero Waste? Planetary Limits, Social Justice

The flow of materials in the global economy tends to move in a linear path, beginning with extraction, continuing into production, then distribution, and finally, consumption. The waste generated at each step damages human and environmental health and well-being.⁴ All over the world, our waste management policies and programs are oriented around the assumption that waste is inevitable. This has given rise to a focus on providing services for the convenient removal of waste and building facilities for the destruction or storage of waste (incinerators and landfills).

“You cannot run a linear system on a finite planet indefinitely.”³

As a result, “waste management” has permitted the growth of a wasteful, throw-away society. Waste prevention and recycling are secondary, if they are considered at all—largely because waste management is considered an end-of-pipe process that does not engage producers or upstream strategies.

What is Zero Waste?

Zero waste replaces the current one-way model with a more sustainable cyclical system, emphasizing chains of connectivity and responsibility, and focusing on waste prevention. Zero waste is about “designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them.”⁶

Zero waste is both a goal and a plan of action. The goal is to ensure resource recovery and protect scarce natural resources by ending waste disposal in incinerators, dumps, and landfills. The plan encompasses waste reduction, composting, recycling and reuse, changes in consumption habits, and industrial redesign.

Just as importantly, zero waste is a revolution in the relationship between waste and people. It is a new way of thinking that aims to safeguard the health and improve the lives of everyone who produces, handles, works with, or is affected by waste—in other words, all of us. In a zero waste approach, waste management is not left to politicians and technical experts; rather, everyone impacted—from residents of wealthy neighborhoods to the public, private, and informal sector workers who handle waste—has a voice.

Practicing zero waste means using all materials to their utmost potential, and integrating the needs of people—workers and communities—into production and reuse systems that minimize impacts on the environment. It is much like establishing zero defect goals for manufacturing, or zero injury goals in the workplace.

“Nature has been operating the longest-running, most successful zero waste model of all. To achieve sustainability, humans will have to learn to ‘act naturally.’”⁵

Zero waste is ambitious, but it is neither unachievable nor part of some far-off future. In small towns and big cities, in communities rich and poor, in the global North and South, innovative plans in place today are making real progress toward the goal of zero waste.⁷

Zero waste also strives to reduce the toxicity of products and manufacturing processes, reduce waste at source, maintain a sustainable level of consumption, and redesign products to allow for easy and safe reuse. Taken together, these approaches ensure that eventually a community with a zero waste plan will be able to phase out waste disposal in landfills and incinerators.

Zero waste can be implemented in a town, a city, a province/state or a country, as well as in a school, a university, a business, and a neighborhood. Government support in coordinating efforts related to resource management is key, because it can facilitate cooperation across multiple decentralized zero waste actions and programs in a community. In addition, the interests of residents, businesses, industry, and workers should be represented in any zero waste plans.⁸



What is NOT Zero Waste?

Because of its compelling appeal, the term “zero waste”⁹ has been co-opted by proponents of conventional waste management approaches. For example, some incinerator companies claim that their technology produces “zero waste,” even though waste incineration relies on the generation of huge quantities of waste and produces hazardous residues that must be disposed of carefully. Some companies and localities that adopt “zero waste to landfill” goals continue to funnel massive amounts of waste into incineration.¹⁰ Some municipalities have announced “zero waste” programs that may focus mainly on reducing litter on the streets or cleaning up parks or beaches. None of these aim to reduce the amount of waste generated in the first place.



Zero Waste: The Evolution of New Thinking¹¹

The term “zero waste” dates back to the 1970s, when it emerged as an industrial concept to reduce waste. The idea was based on the Japanese concept of “zero defects,” which aims to progressively reduce defects by continuously making improvements. The term was later applied to municipal systems and promoted by environmentalists and governments. The first formal zero waste policy was created in 1995 when Canberra, Australia endorsed a goal of “No Waste by 2010,” and New Zealand became the first country to adopt the goal country-wide. Zero waste has been endorsed as an official goal by over one hundred governments, and many municipalities follow the concept informally. It has also been adopted by businesses, universities, schools, and other institutions.

In short, zero waste:

- Takes consumption to sustainable levels;
- Emphasizes reuse of products;
- Recycles everything that is safely recyclable;
- Returns the nutrients in organic material to the soil through composting and supports creating energy from organic material through anaerobic digestion;
- Avoids products and packaging which cannot be safely and easily reused or recycled, and redesigns the manufacturing of items so they can be used in further production or returned to nature; and
- Places responsibility on producers for the life cycle costs and impacts of their products and packaging.

Zero Waste Values: A World Where Nothing—and No One—Goes to Waste

Waste is often considered the responsibility of engineers and other “technical experts.” Yet waste has direct implications for human and environmental health, equity, race, power, economics, gender, poverty, and governance. Thus, a comprehensive zero waste program, like a zero waste society, prioritizes environmental justice, social justice, and human rights. This means everyone should have a voice in determining how local zero waste plans are designed and implemented, and consideration should be given to how these plans impact everyone living and working in the community, including waste pickers and others involved in informal recycling.

Specifically:

- A zero waste society is not based on values related to corporate profit, but on human values related to community, culture, health, respect, and equity.
- A zero waste society understands the value of cultural diversity, preserves and protects local culture and local knowledge, and resists the dominance of global production and overconsumption.
- Zero waste relies on strong community action to make decisions about the present and future of waste management programs. In a zero waste society, community members assume responsibility for doing their part to make zero waste possible.
- Zero waste relies on a socially-conscious government to influence and regulate industry through sound policies such as outright bans on hazardous materials and practices.

- A zero waste society calls on producer responsibility to provide safe products that can be readily reused, recycled, or composted, minimizing the amount of materials used, using recycled content, and protecting their workers and communities by avoiding the use of hazardous chemicals in products and in manufacturing.
- Zero waste emphasizes efficient use of resources; safe manufacturing and recycling processes to protect workers; product durability; and design for disassembly, repair, and recycling. If it cannot be reused, composted, or recycled, it just should not be produced in the first place.

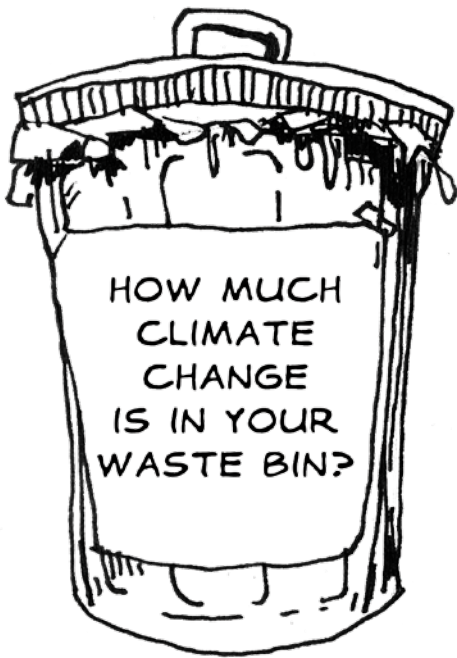
Is Zero Waste Practical?

In the past, the idea of zero waste has been dismissed as impractical or even idealistic. But just as manufacturers set goals of zero defects and workplaces aim for zero injuries, communities adopt zero waste goals to signal a commitment to continuous system improvements. By adopting zero waste as a goal and backing it up with policies and programs, community efforts can align with a vision against which all actions can be evaluated and progress can be measured. Zero waste is a long-term strategy that can bring about substantial waste reduction, while using comparable or fewer resources than would be needed to design and build landfills or incinerators.

The Benefits of Zero Waste

Zero waste practice can have a wide range of effects, from mitigating climate change on a global level to improving air quality in a neighborhood, to assisting a single family or individual living in poverty. We identify several specific benefits below and briefly explain how each is related to one or more zero waste practice.

- **Decreased pressure on the environment.** Maximizing the reuse of materials and reducing consumption to sustainable levels relieves the excessive extraction-intensive burden on the natural environment, conserves resources for future generations, and reduces greenhouse gas and toxic emissions.¹²
- **Reduced pollution and improved environmental justice.** The less waste society generates, the fewer waste disposal facilities—incinerators and landfills—there will be to burden local communities economically, socially, and environmentally. These sites, often located in already disadvantaged communities, are the source of some of the most damaging toxins known, and their closure will prevent serious harm to current and future generations.¹³
- **Protected human dignity.** Thousands of people earn their livelihoods from the waste stream. By integrating waste pickers¹⁴ and others involved in the informal recycling sector into formal zero waste plans, safer work and economic opportunities can be created, such as contractual work arrangements.



- **Economic development and livelihoods.** Zero waste moves away from building capital-intensive incinerators and landfills and instead boosts opportunities for local businesses that repair, recycle, and compost discarded materials. The result: a revived domestic manufacturing sector, based on local reusable and recyclable materials, that creates many more jobs than burying and burning discards.^{15, 16}
- **Strengthening democracy.** Community engagement and informed participation in the design and implementation of the zero waste system empowers people and stimulates civic participation that benefits the entire community.

Ultimately, the reason to work toward zero waste is that we are over seven billion people sharing the finite (and dwindling) resources of a single planet. For our survival, zero waste is the only practical option.

Comparing the Current System to a Zero Waste System¹⁷

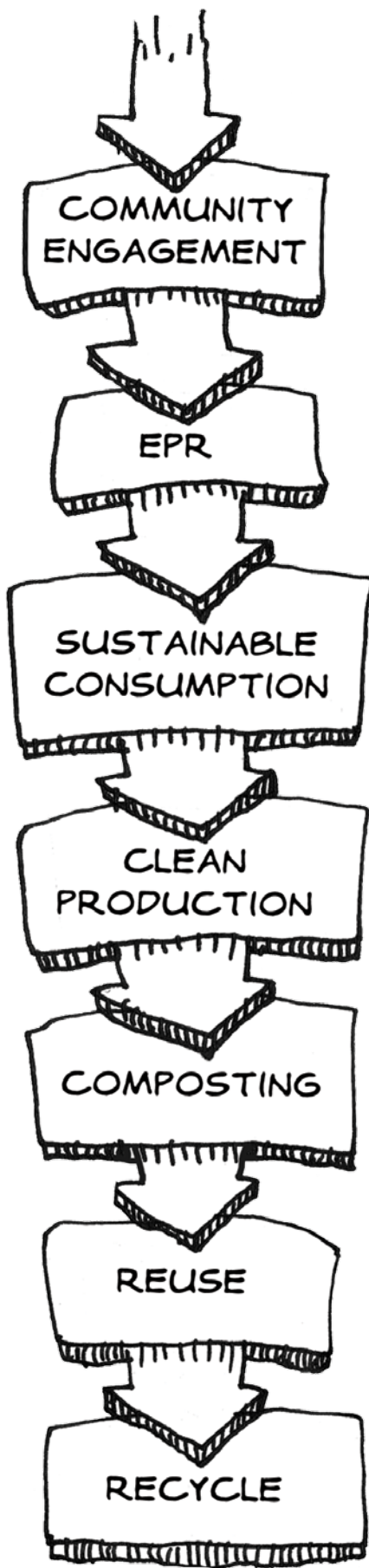
Current Industrial System	Zero Waste System
Material Economy <ul style="list-style-type: none">• Linear• Benefit derived from maximizing profit• Based on centralized, large-scale, capital-intensive resource extraction and waste disposal	Material Economy <ul style="list-style-type: none">• Cyclical• Benefit derived from maximizing quality and efficiency of natural, social, and financial capital• Relies on many decentralized, smaller-scale, knowledge-intensive businesses
Responsibilities <ul style="list-style-type: none">• Government: focuses on sanitation and disposal, sometimes fails to address waste issues altogether• People: often lack awareness about resource conservation, the impacts of their actions on others, or the environment. While “consumer choice” can be effective, it does not adequately address systemic problems• Manufacturing industries and businesses: take minimal and often only voluntary responsibility for the environmental impacts of the waste and toxins created in production and the waste their products become	Responsibilities: <ul style="list-style-type: none">• Government: provides leadership in setting and implementing strong resource conservation goals, policies, and programs; uses incentives and disincentives to encourage less waste and more justice• People: are engaged in the design, implementation, and monitoring of programs and policies relating to waste• Manufacturing industries and businesses: take full responsibility for the environmental impacts of their products and strive to reduce associated negative impacts
Public Policies <ul style="list-style-type: none">• Goal is to manage waste• Short-term perspective is to dispose of or hide waste• Subsidies benefit extraction and waste disposal industries• Product price does not reflect full cost of production and disposal• Informal recyclers are ignored or excluded from waste management systems	Public Policies <ul style="list-style-type: none">• Goal is to prevent waste• Long-term vision incorporates discards into the economy• Subsidies encourage conservation, energy-efficiency, ecological design, and social equity• Product price reflects true cost of production and disposal• Recycling work is fairly compensated, safe, and respected for all workers, including those in the informal sector
Product design <ul style="list-style-type: none">• Design for maximum profit• Attention principally on production and sales• Most products and packaging used once• Short product life-spans increase sales	Product design <ul style="list-style-type: none">• Design for waste reduction/elimination• Attention on reuse and recycling• Products and packaging reused or recycled• True cost accounting, life-cycle analysis
Materials <ul style="list-style-type: none">• Mostly new, requiring more natural resources• Best are cheapest, regardless of ecosystem impacts• May be transported many miles and multiple times between extraction and finished product	Materials <ul style="list-style-type: none">• Mostly recycled, non-toxic• Best are durable, repairable, recyclable• Chosen because they are locally available and ecologically sustainable
Manufacturing <ul style="list-style-type: none">• Large companies, mass production, growth market• Creates end-of-product-life hazards such as ash and toxic emissions due to incineration/landfills• Only technical solutions are considered• Manufacturers’ responsibility limited to production	Manufacturing <ul style="list-style-type: none">• Local production fortified by global information-sharing• System-design avoids pollution and toxic hazards• Ecological and social solutions to problems• Producer responsible for product life-cycle, including safe re-integration back into the economy or the environment
Distribution <ul style="list-style-type: none">• Long-distance and global distribution	Distribution <ul style="list-style-type: none">• Mostly local and regional distribution
Customers <ul style="list-style-type: none">• Consumer expects to throw away product after use	Customers <ul style="list-style-type: none">• Maximize reuse and repair opportunities
Discards <ul style="list-style-type: none">• Waste is managed, centralized, and disposed of with capitalintensive technologies: landfilling, incineration• Limited energy may be generated from incineration and methane gas, but most material value is destroyed	Discards <ul style="list-style-type: none">• Products can be dismantled, materials separated into reusable, recyclable, and compostable streams• Recovery facilities collect materials for repair, reuse, recycling, anaerobic digestion, or composting

The Road to Zero Waste: Many Ways to Get There

No two zero waste programs are the same, and no one approach will work everywhere. Each community or municipality will have different needs and capacities. Moreover, different actors will engage in different aspects of waste reduction: producers will redesign products and processes; local businesses will provide recovery/recycling or repair/refurbishing services for products and compostable materials; government will develop regulations and standards to promote the production and use of reusable and safely recyclable products, and will support resource recovery; people will separate recyclables, compostables, and reusables; neighborhood groups will organize educational events and hold governments and businesses responsible for protecting public welfare; and so forth.

While developing a zero waste plan, it is important to ensure that every step leads the community closer to a zero waste outcome. Interim milestones will help determine whether the plan is progressing adequately. It is critical that the community does not settle for an interim approach that will later become an obstacle to zero waste (for example, a contract that requires a certain amount of waste to be sent to a landfill or incinerator for the next 20 years, or public education that leads to the mistaken belief that recycling alone is enough).

The following section offers four core strategies for getting to zero waste and a menu of actions to take for each. Then a “Quick Start” list describes some of the easiest steps to start walking on the road to zero waste.



Four Core Strategies

Zero waste comprises a number of distinct actions, tied together by the common philosophy and goal of zero waste. These actions can be grouped in four core strategies:

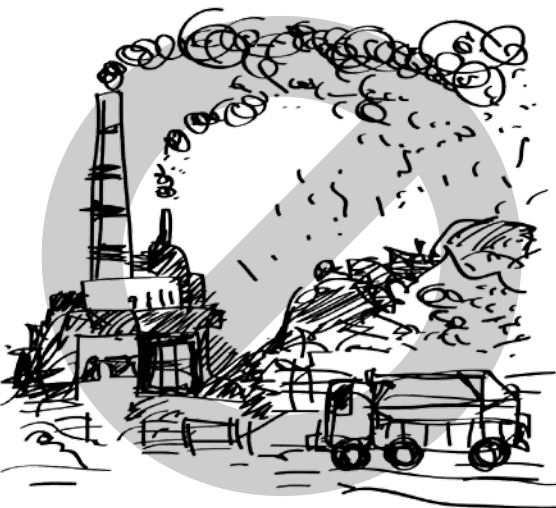
1. Setting a new direction away from waste disposal
2. Supporting comprehensive reuse, recycling, and organics treatment programs
3. Engaging communities
4. Designing out waste

Core Strategy 1: *Setting a new direction away from waste disposal*

Zero waste begins as a commitment to end poor waste disposal practices, and thus, to end waste. Landfilling, dumping, and incineration (including incinerators that recapture some energy) can appear to be low-cost options to policy-makers interested in making waste “go away.” In fact, long-term contracts with private waste management companies may require little up-front public investment, but result in high costs to the public over the long term .

The first strategy in achieving zero waste, then, is doing away with open dumps, landfills, incinerators, and the prioritization of disposable over reuseable, which has helped create an inefficient industrial system that externalizes its costs onto the environment, local residents, and future generations. Zero

When the human, public health, and environmental costs are factored in, waste disposal is never cheap.



ZERO WASTE MEANS,
FIRST AND FOREMOST,
DOING AWAY WITH LANDFILLS
AND INCINERATORS.

waste proposes an efficient and equitable human-scale economy that exists within ecological limits and safeguards the interests of all members of society, now and in the future.

Following are some of the principal elements necessary to bring about an end to waste disposal. Some aspects of zero waste must be mandated by local, regional, or national governments, while others are best carried out by NGOs, the private sector, the informal sector, or community groups. Still, because waste tends to be dealt with on a local level, it is usually necessary for local governments to take the leading role in coordinating efforts.

Governments can move away from waste disposal through:

- **Setting goals and target dates.** Passing legislation declaring a zero waste goal and setting milestones for achieving that goal serves many purposes: it shows political commitment; it establishes certainty in the policy environment and provides businesses a long term planning framework; it breaks the zero waste road into manageable pieces; and it combines the long-term vision with short- and medium-term actions. It is always better to set goals aimed at preventing waste in the first place than recovering waste, since increases in reuse and recycling will not reduce overall waste landfilled or incinerated if waste generation increases at the same rate. One way to address this is by using as a baseline the amount of waste buried and burnt in a given year, and setting goals to reduce that amount by certain target dates.
- **Banning the sale and disposal of toxic products.** Many products now in use pose risks during their production, use, and disposal phases. These include those containing PVC plastic or items containing mercury such as thermometers. Local governments should not take responsibility for managing or paying for the disposal of such hazardous products. Progressively banning the disposal of these items will force manufacturers to redesign their products for durability, deconstruction, recycling, and reuse and will encourage them to substitute toxic materials for non-toxic ones.
- **Banning incineration.** Eliminating all waste incineration—including waste-to-energy incinerators and incinerator technologies such as pyrolysis, gasification and plasma arc¹⁸—ensures that all discards are reduced or recovered safely and sustainably. Incineration can appear to be an easy way to achieve waste reduction goals, but its purpose and consequences are in direct opposition to those of zero waste. Because burning waste (vs. preventing waste) depends on a consistent supply of discards, it undermines zero waste efforts and will inevitably prevent a community from getting close to zero. Enacting a legal ban on incineration is also a way to protect the spirit and purpose of the zero waste plan even when government leadership changes.¹⁹
- **Taxing “throwaway” products.** Allowing the price of disposable products to more accurately reflect their cost to the environment makes durable items more cost competitive and provides an incentive for industries to redesign disposables (see Core Strategy #4 below).
- **Banning the use of disposables in public institutions and schools.** Items like disposable cups and tableware are commonly used in schools and public office buildings, and they can be easily replaced by reusable items. Moving away from disposables in these institutions can help build momentum toward the phase-out of these products in the entire community. Promote tap water and guarantee it is drinkable. This will help to reduce the use of plastic bottles.

- **Landfill fees.** By using true cost accounting,²⁰ landfill fees can be set at realistic levels which both pay the true cost of the service, and incentivize reuse and recycling. Further, adding fees to each ton of waste creates funds to use in zero waste programs. Even though these funds will shrink as waste disposal approaches zero, they can still be used for one-time or start-up expenses of zero waste plans.
- **Ban the export of hazardous waste to other countries.** Sending toxic materials that we do not want at home to foreign disposal sites is dangerous and unethical. Industrialized nations need to take responsibility for our own waste. Zero waste is about environmental justice!
- **Deal intelligently with residual waste.** Residual waste is the waste that is not recycled or composted. Landfills, incinerators, and the mindset that creates and accepts waste will not be abolished overnight. Until our industrial systems are redesigned to do away with waste entirely, it is important to develop plans for managing residuals in a way that minimizes harm. Examples include building a stabilization plant that processes residual waste through composting or anaerobic digestion²¹ prior to landfilling in order to reduce leachate and emissions. Another is stockpiling recyclable materials until processes are set up to recycle them. It is important to remember that these plans are only interim strategies that should be phased out as the community implements zero waste practices. Analyzing periodically what is still being landfilled helps quantify

It is always better to prevent waste in the first place than to recover waste later on.

the potential to increase reuse, recycling, and recovery, and identify what materials are still being produced that need to be redesigned.

While dealing with residual waste, governments **should not**:

- **Invest efforts and resources in methods that undermine waste reduction strategies.** Building mega-landfills, waste incinerators, and costly facilities to deal with problematic products drains huge amounts of money that otherwise could be used for waste prevention and recycling efforts, and in some cases may lock communities into continued production and even importation of waste.
- **Sign “put or pay” contracts.** Billions of taxpayer dollars are spent subsidizing the construction and operations of incinerators. Most incinerator companies require contracts that commit cities to a constant high rate of waste generation for decades and block opportunities and efforts to dramatically reduce waste. For a fraction of these costs, investments in recycling, reuse, and remanufacturing would create significantly more business and employment opportunities.²²

Core Strategy 2:

Establishing comprehensive reuse, recycling, and organics treatment programs

In order to end waste disposal we need to develop a system that is directed toward the safe and efficient recovery of materials. While the actions that are part of Core Strategy 1 are oriented to push us away from the disposal system, those described in this section pull us into a closed loop system where all discards are safely recovered. Such a system includes recycling, but only after preventing, reusing, and repairing. Moreover, it is a comprehensive system that goes well beyond the typical recycling system limited to a few materials such as paper, cardboard, and certain plastics that may not include organic material or waste reduction policies. Zero waste includes recycling as just one part of a broader strategy oriented to reducing waste, redesigning products and recovering all discards.

To make zero waste a reality, it is extremely important to allocate adequate resources—both human and financial—to identify or create a group of people or an agency responsible for implementing the zero waste plan.

Likewise, it is vital for a zero waste system to be created in a democratic and socially just way, integrating the community and all social actors—formal and informal—involved in resource conservation. Following is an outline of some of the steps to achieve this comprehensive recovery system.

Zero Waste includes recycling but as just one part of a broader strategy oriented to reducing waste, redesigning products and recovering all discards.

A. Study the local situation.²³

A realistic and effective recovery program must be based on the existing circumstances and available resources. A baseline assessment should help identify the following:

- Source, nature, and quantity of waste generated. In order to get this information, the first step is to conduct a waste composition study, or waste audit, to answer the following questions:
 - How many tons are produced daily or monthly?
 - What percentage is paper, plastics, organics, textiles, hazardous, etc.?
 - What percentage comes from businesses, households, public offices, etc.?

A waste composition study²⁴ can be done by analyzing the contents of a sample of bins and collection vehicles. It is important to take samples from diverse places, including businesses and households, and also to take into account factors that can influence waste composition, such as level of income and time of the year (since holidays and intense plant growing seasons change the composition of waste). The information collected by the waste composition study will guide the design of the collection and treatment systems. For example, if the waste study shows that organic material represents 40-50% of the waste produced, then efforts should be made to collect clean organics for composting or anaerobic digestion. You can create a core group of citizens and officials working on the zero waste program to conduct this research, or hire someone who will do it in coordination with the environment agency.



- Potential in terms of materials recovery, local expertise, and allies. It is useful to know if there are already people or businesses recovering discards, how much is being recovered by them, and what markets and users exist for repairable, recyclable, or organic materials. The core group or consultant coordinating the zero waste program can perform this analysis and then identify major waste reduction, reuse, and recycling opportunities that should be considered in the zero waste plan. In many cities, thousands of informal recyclers are the de facto recycling system and depend on the system for their livelihoods. It is crucial to tap their expertise in the research phase, and to integrate them throughout the design and implementation phases, as their knowledge about the current conditions can inform and contribute to a well-designed zero waste system.
- The existing level of awareness, attitude, and behavior of citizens with regard to waste. This will help design information campaigns and source separation systems that are convenient for people. Surveys can be conducted to find out how much residents know about the destiny of waste, the benefits of composting and reuse, which materials are compostable or recyclable, etc.

B. Source separate materials. The key to recovering materials is to keep them separated at the time of discard. Once waste is mixed, paper gets contaminated with organic material, organic material gets polluted with cleaners and solvents, and so on. If materials are collected together and then separated after they reach sorting facilities, recovery rates will be lower and workers who manually separate discards will be exposed to noxious and sometimes hazardous mixed waste. To achieve high recovery rates, a minimum of three separate

waste streams are recommended: organics, recyclables, and non-recyclables. These three waste streams can be complemented by separate collection of household hazardous waste (such as batteries, paints and solvents, etc.), bulky items (like furniture), or special and less frequent collection. Any system must prioritize the separation of organic material (such as food scraps and yard trimmings) from dry materials, since that is the biggest fraction of the waste stream in many places, the one that most contaminates the other recyclables, and a priority to keep out of landfills.

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Strategies to encourage source separation:

Many strategies have proven to be effective in encouraging people to separate at source. A few tips to keep in mind when designing the system are:

- **Make it convenient:** If it is not relatively easy, people will not participate!
- **Make it mandatory:** Just as everyone is required to comply with transit signals and other rules in society, everyone should be required to separate discards for the good of all.
- **Make it simple:** The separate categories/streams of waste should be clear, intuitive, and easy to understand. Graphics and colors help communicate the message to people of all ages and languages.
- **Be persistent and consistent:** Participation rates in source separation will probably not be high overnight. Be

patient, give the new system some time to get established, and make it very clear to all that source separation is here to stay! Communication campaigns should be consistent and sustained for the long term. As more people participate, others will be encouraged to join.

- **Give recognition to those who do a good job:** Providing incentives or awards can be very effective. These include “pay as you throw” systems,²⁵ stickers to put in doors and windows saying “We separate our discards!”, economic prizes for those whose bins contain the right materials, free compost to people who separate organic material, etc.
- **Warnings, fines, and penalties:** Leaving warning notes with suggestions to improve separation, and issuing fines and penalties can also help when other strategies are not enough.

C. Keep streams separate during collection. Starting source separation programs without a differentiated collection is very counterproductive in terms of encouraging citizens’ participation. If people see that the materials they have separated are mixed in the same garbage truck, they will lose faith in the program. Differentiated collection can be done with compartmented carts, trucks, or vans, and by planning

efficient transportation routes and days, which will also reduce greenhouse gas emissions. If there are informal recyclers already collecting recyclables or other materials, the new collection system should not put them out of work, but instead, should improve their working conditions by incorporating them into the formal zero waste plan.

Recognizing the work of informal recyclers and incorporating them into the zero waste system

In many countries, people collect recyclable materials for sale as a source of income. These people are called waste pickers,²⁶ or informal sector recyclers, and they generally work in very poor conditions. So-called developing countries in particular support large populations in the informal recycling sector. In many places, informal recyclers are the only people recycling discards, due to the lack of formal recycling programs.

Because they are poor and often socially marginalized, informal recyclers are frequently excluded from public planning processes. Zero waste, as a strategy rooted in both justice and sustainability, offers an opportunity to improve informal recyclers’ conditions and position within society while expanding their work to cover other activities beyond recycling, like treatment of organics and reuse activities. Because of their large numbers, and the importance of the recycling system to their livelihoods, informal recyclers can be forceful advocates for a zero waste system, if it is designed with their participation and designed to meet their needs.

When designing a zero waste plan, it is important to include informal recyclers both in the design of the plan and in the actual work. Instead of taking away their livelihood by having someone else collect and sort the waste, the new plan should incorporate them into the formal system. As with other aspects of zero waste, there is no single best approach for doing this; it will depend on how the informal recyclers are organized and what vision they have for themselves. As a general rule, a zero waste plan should ensure that informal recyclers gain formal recognition, which means all of the following: increased or stabilized payment for recyclable materials; improved working conditions; equipment; the right to their livelihoods; and training that will provide opportunities to work in other resource conservation activities like composting and anaerobic digestion, repair, and reuse. Depending on local circumstances, other issues such as physical safety or the role of child workers may also need to be addressed.²⁷

D. Establish ways to recover organic materials.

Source separation and management of organic material (such as food scraps and yard trimmings) should be a priority in any zero waste plan.²⁸ Treating organics is also an important way to create new jobs and economic activity. There are several methods to recover organic material, such as:

- **Food donation** – organizing and supporting food banks, encouraging restaurants, hotels and markets to donate edible but unsalable food.
- **Animal feed** – using discarded organic material to feed animals. In many countries, this proves to be a great food source and waste management strategy!
- **Rendering** – processing fats, oil, and grease into tallow or animal feed.

- **Anaerobic digestion or “biogas” plants** – allowing source-separated organic material to biodegrade in an airtight container. The process can be applied on a variety of scales, from household level to centralized plants,²⁹ and the resulting biogas can be used to create energy.
- **Compost and vermicompost** – returning nutrients to the soil. These low-cost technologies also can be implemented in a range of scales, from on-site and home-composting³⁰ to community level (such as compost plants in parks) and centralized facilities.³¹ They improve soil structure and capacity to retain water, displace the use of chemical fertilizers, and reduce pests and plant diseases. Compost can be used in landscaping (public parks, squares, public land, sports fields, cemeteries), in agriculture (food and non-food production), and in nurseries; it can be gifted to residents who separate organics, and more!^{32 33}



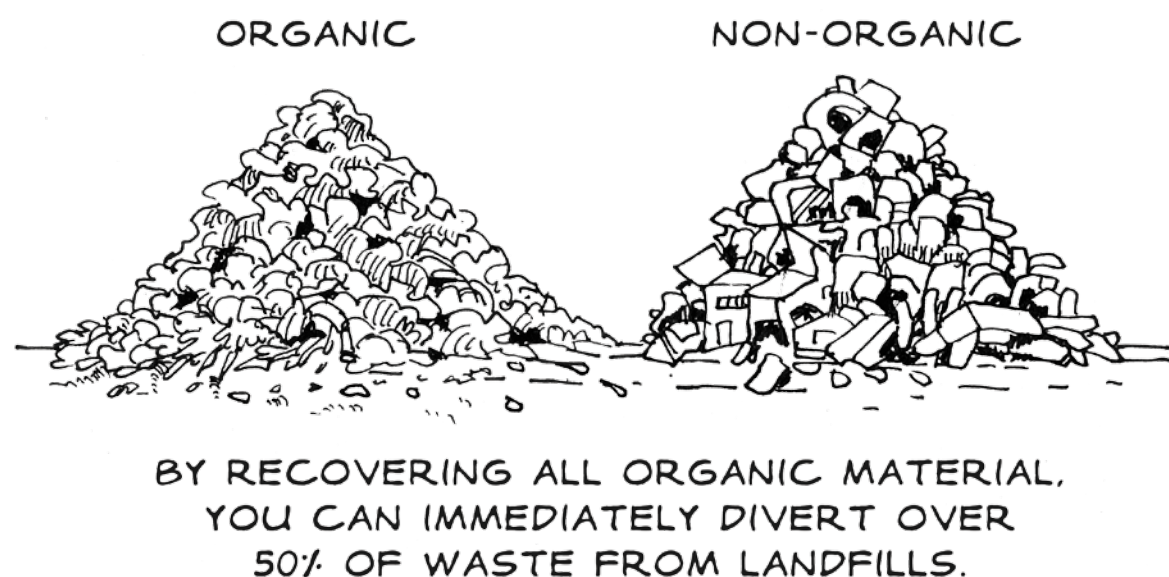
E. Establish sorting, reuse, repair, and recycling facilities.

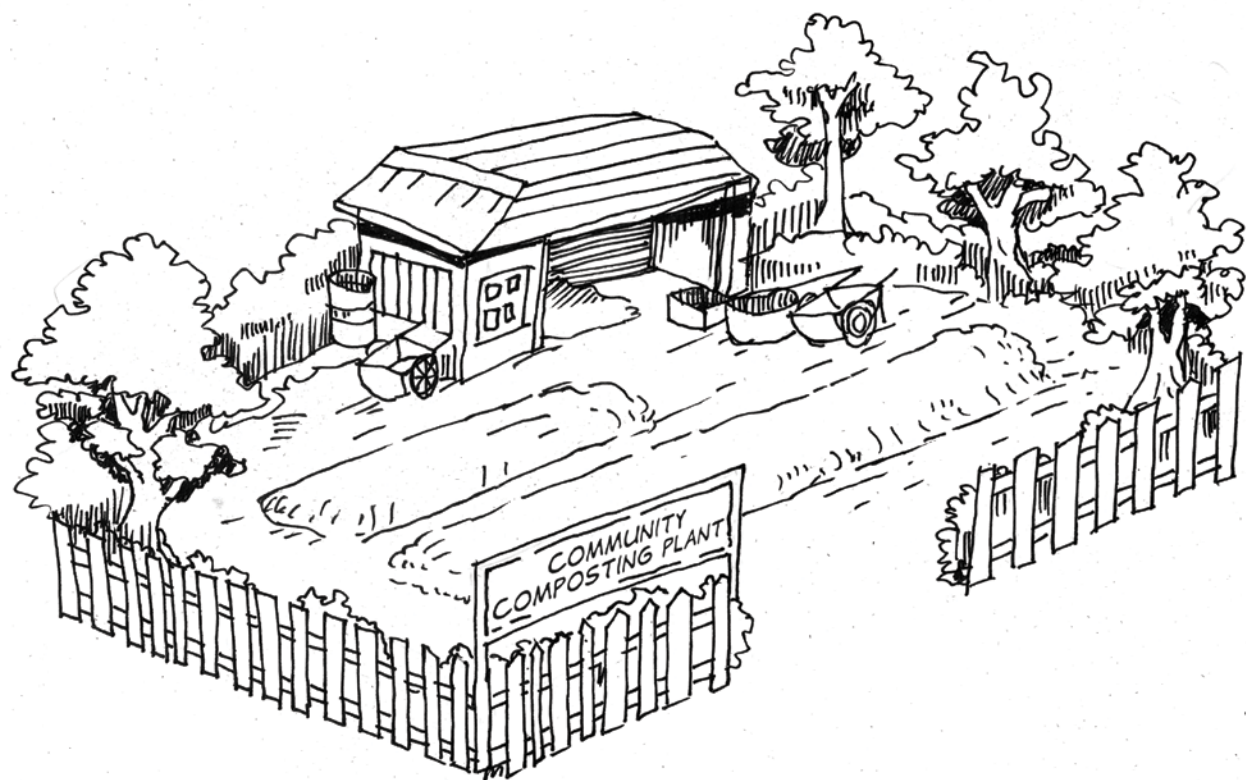
Once dry recyclable materials are separated and collected, they need to be sorted (paper from cardboard from metals, and so on) to be reused, repaired, or recycled. This classification is done in Materials Recovery Facilities, or sorting centers, which can widely vary from low-tech, labor-intensive sites to high-tech, capital-intensive facilities. A materials recovery facility usually has a sorting line, a scale, a compactor, a baling press, a grinder, and shredders, among other equipment used to prepare the materials for remanufacturing.

There are many ways to develop these facilities: through government or private sector investment, as part of an Extended Producer Responsibility program (see page 30) or in collaboration with cooperatives and non-profit organizations. Important aspects include door-to-door collection and/or a network of drop-off sites; adequate processing capacity for residential, commercial, institutional, and industrial discards; and active engagement on the part of community members in reuse and repair activities.

One way to support reuse and recycling industries is to establish Resource Recovery Parks or Centers. These parks differ from the Material Recovery Facilities in that they encompass a wider range of activities,

going beyond sorting and composting to include repairing, reusing, dismantling, remanufacturing, and reselling discards—all in one site. This centralized information clearinghouse will enable industries to feed off each other's waste products. Materials exchanges are part of ending cheap waste disposal (Core Strategy 1) and redesigning industry toward clean production (Core Strategy 4), but may also be seen as an interim step in establishing the systems necessary to maximize diversion. The park may be run by the government, non-governmental groups, and/or the private sector, and can combine public and private investment in reuse, composting, and recycling activities. Collection vehicles can deposit the materials according to their corresponding treatment. The site can receive discards from citizens and institutions and can include an environmental education center to teach about composting, reuse, and recycling. Having everything at the same site increases efficiency, for example by allowing businesses to share equipment and installations. Moreover, Resource Recovery Parks can become focal points for human, natural, and financial resources, where entrepreneurial and innovative activities combine with commercial forces to create jobs and businesses, while reducing waste disposal costs as well as costs related to importing new materials into the community.^{34 35}





Many discarded products are reusable and can be readily recovered by facilities that sell and exchange reused items or barter exchanges. Government can support these facilities by receiving collected items, publishing lists of facilities that receive and sell used products, managing these stores and repair facilities, organizing fairs, and donating reusable items to poor communities, schools, and charity organizations.

To avoid transport fees and reduce energy consumption, recycling industries should be actively encouraged to develop locally, especially those that represent high-value end uses and “closed loop” recycling, such as making old newspapers into newsprint or paper pulp products.

Stockpiling areas should be available in every Materials Recovery Facility or Resource Recovery Park to store discarded recyclable materials until buyers are found or processes set up to re-manufacture any materials for which there is no existing market.

Accurate monitoring systems must be put in place to ensure feedback between programs aimed at redesigning products and those that are recovering materials. A monitoring system should also look for indicators to measure progress, such as the following:

- participation and feedback of residents and businesses
- per capita waste production
- amount of waste going to landfills and incinerators
- composting, reuse, and recycling rates
- changes in product design

Results of progress should be reported to citizens, and educational campaigns should be developed around the progressive achievement of goals to congratulate everyone and encourage them to go for more.

Core Strategy 3: Engaging communities

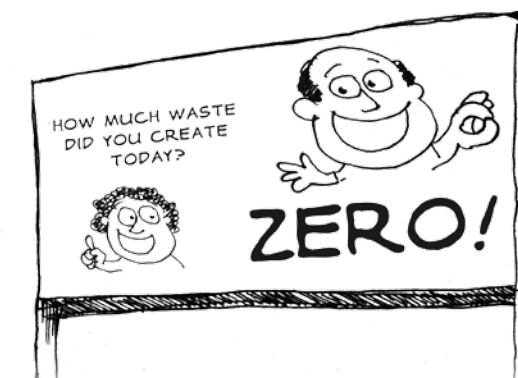
Successful implementation of zero waste relies on democracy and strong community action. In the current industrial system, community participation is typically restricted to informing citizens about new programs. While this kind of communication is necessary and useful, in effective zero waste programs, citizens play a variety of integral parts, which are described below.

- **Designing the zero waste plan.** Citizen participation in developing the local zero waste plan ensures an appropriate design, creates a sense of ownership among the entire community, and increases participation. Call a public meeting and invite everyone interested in working for a zero waste plan. Make a deliberate effort to reach out to groups that are already organized, such as residents’ associations or waste picker groups. Communicate in such a way that it is easy for everyone to actively participate, including those with limited time, access to email, or other limitations. Keep people involved by establishing mechanisms for them to monitor the implementation of the zero waste plan, and to provide suggestions. A good way to do this is by creating oversight and advisory bodies (see box in page 26).
- **Implementing the plan.** Another very important role of citizens is the actual implementation of the zero waste plan, including:
 - reducing waste generation (through reduced and conscious consumption, reuse, repair)
 - separating discards at source
 - home composting
 - entrepreneurial activity, such as creating new businesses out of recyclables or organic materials
- **Public education.** Public education to increase participation in reduction, reuse, recycling and composting programs should be sustained in the long term;

“If the community can take control of its waste stream, it can use the resource to create jobs, while at the same time reducing waste costs and providing new services to the community.” ³⁶

even high participation and diversion rates will deteriorate unless public education efforts are maintained. Such education takes many forms including:

- radio and print advertising that is engaging and easily understood
- billboards encouraging participation in zero waste programs and raising awareness of local resources



- periodic leafleting to households about changes in waste collection practices
- magnets and calendars for students to take home with collection dates, sorting instructions, and a number to call for more information
- simple how-to guides on home composting, non-toxic cleaners, skin care, and pest control
- educational talks at schools, markets, community centers and faith-based groups, as well as presentations to city councils, regulators, and other government officials
- a bibliography of informational resources about zero waste issues given to the public library, schools, and community groups
- free classes and instruction in how to compost, how to use compost in home gardens, and how to reuse and repair a variety of products
- zero waste contests and events

Core Strategy 4: Designing out waste


- **Keeping residents informed and involved.** Zero waste plans are best tailored to the community where they will be implemented; and who better to provide input than those who will be affected? Soliciting suggestions and input from the community helps to create a sense of ownership of the programs and policies which contributes greatly to their success. When bringing together individuals from diverse constituencies, such as citizens, government, and waste workers, consider using communication strategies such as the following:
 - advisory committees
 - community meetings
 - alliances with existent community groups
 - feedback mechanisms such as phone lines, and interactive internet systems
- **Mechanisms for accountability to the public.** Public access to information helps citizens to be more involved. Organize regular public meetings to inform citizens about activities and progress related to the zero waste program, and set up a telephone number and email address where people can ask questions and provide feedback on its practical implementation.

Even with the best efforts to reuse and recycle in place at the local level, there will still be waste because some products either are too toxic to be recycled, are made out of non-recyclable materials, or have mixed materials that cannot be separated at source. Further, calculations show that industry produces 40 to 70 kilograms of pre-consumer waste for every kilogram of product manufactured. Clearly, industrial design and production must change in order to reach sustainability. If it cannot be reused, composted, or recycled, it just should not be produced in the first place.

While zero waste incorporates a set of approaches for reducing waste at all points along the supply chain, it is most powerful as a design principle that considers the life of a product “from cradle to cradle.” In other words, the best way to eliminate waste is to design it out from the beginning by planning for disassembly, repair, and recycling, and by avoiding toxic materials and by-products in order to protect labor, the environment, and the consumer. It may seem difficult to achieve, but this long-range thinking is fundamental to any zero waste society.

The best way to eliminate waste is to design it out from the beginning.





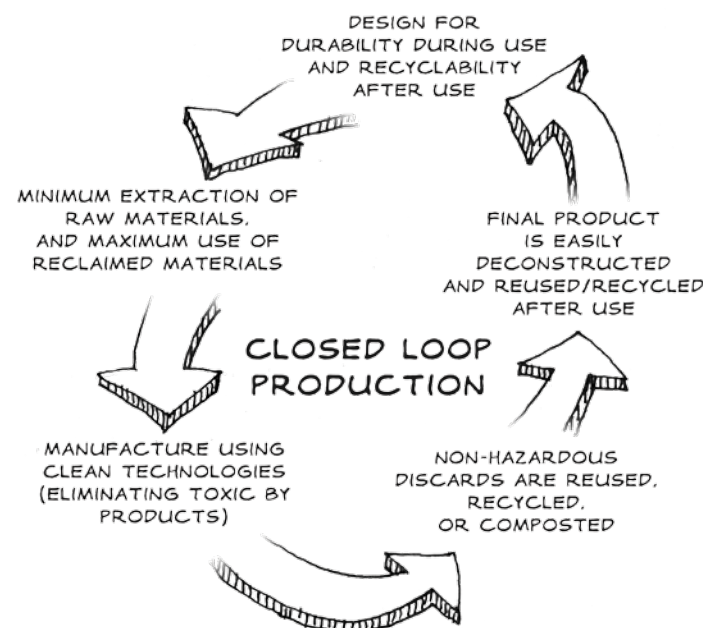
Designing out waste requires addressing a series of concerns:

- **Necessity:** Is the product really needed?
- **Environmental impact:** Is the product made from efficient use of materials that are nontoxic?
- **Economic impact:** Is the product manufactured locally using locally available resources?
- **Transportation:** Is it manufactured close to the point of use so as to minimize transportation and packaging?
- **Post-use recovery:** Can the product be reused, recycled, or safely composted at the end of its life?

Long-range thinking ultimately leads away from the linear chain of extraction-production-distribution-consumption-disposal toward cyclical, or “closed loop,” production. Closed loop industrial design avoids pollution and waste during production, creates durable and recyclable products that are not contaminated with toxic substances, and takes into account the destination of all parts of the product at the end of its life so that everything is reused and nothing is discarded.

A shift like this requires a fundamental change of mentality, and also implies shifting incentives in production. It is a common belief in many places that changing the production process to reduce or eliminate toxic chemicals and waste will increase costs. Yet time and again, case studies demonstrate cost savings through more efficient use of materials and reduced need for hazardous chemicals and waste disposal.^{38 39}

“If it cannot be reused, composted or recycled, it just should not be produced in the first place.”



Steps industry can take to design out waste:

- **Analyze processes and identify** opportunities to minimize waste and toxics use.
- **Design products for dismantling and repair** and provide repairing services as a new branch of services. Guidelines and standards for deconstruction can ensure maximum capture of reusable materials.
- **Substitute toxic and unrecyclable materials** for reusable or recyclable alternatives, such as shifting from toxic PVC plastic to textiles, glass, or safer plastics,⁴⁰ and from solvent-based to water-based paints. Look for alternatives, talk to suppliers, find out what materials other industries are using, be creative. Incorporate other elements such as redesigning products, in-process recycling of production materials,⁴¹ and regular maintenance.^{42 43}
- **Incorporate green chemistry**, which encourages product design and manufacturing processes that reduce or eliminate the use and generation of hazardous substances.⁴⁴
- **Practice dematerialization** (also known as lightweighting), which means using fewer new materials and less energy output, and ultimately manufacturing less altogether.
- **Maximize use of post-consumer materials in product design** with a priority given to materials sourced from the local or regional economy.
- **Redesign packaging** to be recyclable or compostable or take back packaging once the product is unpacked.



- **Shift from disposable to refillable containers** by taking back the containers to refill, and providing dispensers for refilling in retail stores.
- **Provide services instead of products** (such as rental services for cars, electronics, carpets, furniture, diapers, etc.) so items may be repaired for further reuse or recycled.

Every step toward zero waste must take into consideration the realistic economic value or cost of pollution, waste, and materials. Right now for many companies it is simply cheaper to pollute and create waste, because the true costs associated with wasting, polluting, and taking livelihoods away from informal recyclers are born externally, by the local environment and people. Government can shift policies and legislation to encourage closed loop production by supporting those industries that protect the resources, the workers, and the larger community, and by making it difficult, expensive, or even illegal to waste and pollute.

To encourage less wasting, governments can implement Extended Producer Responsibility (EPR) policies. EPR is a policy tool that extends manufacturers' current legal responsibilities to encompass responsibility through the full life cycle of their products, including the "end of life." The ultimate goal of EPR is to encourage cleaner, safer materials and production processes, as well as to eliminate waste at each stage of the product's life cycle.⁴⁵

EPR policies should lead to redesigning products and packaging to reduce the environmental and social impacts, for example by designing out toxic chemicals, designing for lowest carbon footprint, designing products that can be completely reused, recycled, or composted. EPR policies should also lead to maximal reuse or recycling of all parts of the product or packaging, and should strictly limit or prohibit landfilling and incineration of these resources

EPR involves either **financial responsibility** (such as paying a local government or business for handling a manufacturer's products), or **physical responsibility** (such as producers running a "take back" program for end-of-life products).

EPR policies should be carefully designed to avoid displacing existing businesses, recyclers, and others in recycling and composting systems. Some current EPR systems are run directly by producers: when no infrastructure exists for a product or packaging, that can be the best approach, but when infrastructure and businesses already provide these services, EPR programs should enhance instead of replace this infrastructure.

It is important to focus on the question of who makes decisions about how products are designed, and what products are available in the marketplace. We are all actors in the chain of production and consumption but manufacturers choose how products are designed, and these decisions set the parameters for how that product can be reutilized at end of life. Governments also have a regulatory role to protect the public and the environment, for example by banning toxic chemicals from products, and banning the sale of plastic bags.

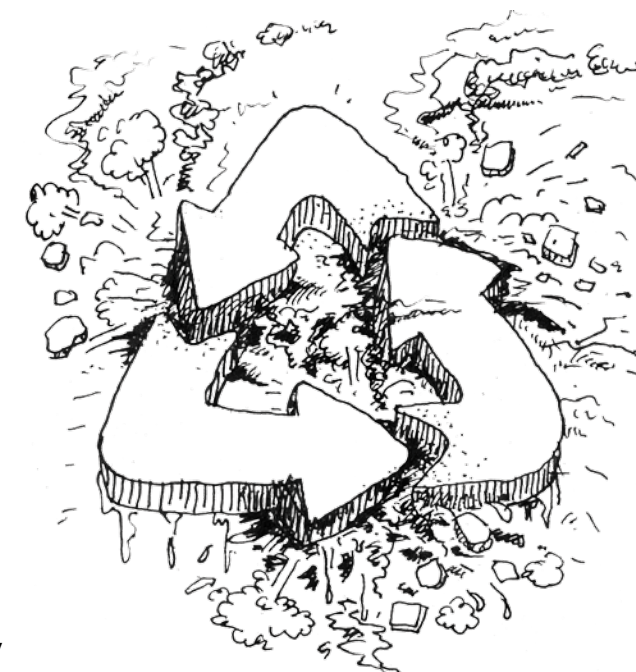
Promoting "cradle to cradle" approaches enforces a design strategy that takes into account the upstream environmental impacts inherent in the selection, mining and extraction of materials, the health and environmental impacts to workers and surrounding communities during the production process itself, and downstream impacts during use, recycling, and disposal of the products.⁴⁶ When individual producer responsibility is instituted, companies have a higher incentive to redesign their products, since the disposal costs will impact the company directly.⁴⁷

"Return to Mother Earth what comes from Mother Earth; return to father factory what comes from father factory."

— Sonia Mendoza
Mother Earth Foundation

Other things governments can do to encourage less wasting include:

- **Enact Toxic Use Reduction legislation and the Substitution Principle⁴⁸ within government chemicals policy.** Require industries to design and implement a plan to reduce the use of toxic materials at all stages of production, and to report the use of those substances and the progress made in the reduction plans.⁴⁹
- **Establish Clean Production policies** to encourage efficient use of resources, harness renewable energy, and create minimal waste. Clean Production essentially mimics natural cycles, meaning that resources are used sustainably, byproducts are reintegrated into the process, and no waste is created. Advocacy for Clean Production is rooted in the *Precautionary Principle* which urges us to develop industrial production systems and public policies that prevent harm.⁵⁰
- **Develop comprehensive labeling** as a way of raising public awareness and allowing the consumer to make informed choices.
- **Educate for sustainable consumption** vs. overconsumption. Under the current model, the most prevalent social role of citizens in industrialized nations is to consume (and discard) as much as possible, as quickly as possible. Overconsumption not only wastes resources, it undermines meaningful connection with family, friends and especially nature. Like educating people about how and why to use less water and less energy, governments could also educate about how and why to consume less overall and create less waste! Organizing zero waste events and coordinating collective purchasing of organic and bulky products are some of the activities governments, as well as citizens, organizations, and businesses, can do to move to sustainable consumption.



THE CHASING ARROWS SYMBOL IS AMBIGUOUS AND MISLEADING BECAUSE IT SUGGESTS THAT RECYCLING IS A CLOSED LOOP, WHEN IN FACT WASTE AND POLLUTION ARE GENERATED AT EACH STAGE OF THE PROCESS.

- **Establish environmentally preferable government procurement guidelines** to support the market for non-toxic, recycled materials. Because governments are significant purchasers of goods and services, when they opt for products made out of non-toxic, recycled materials, an economic incentive is created for industry to produce those products over less sustainable ones. Environmentally preferable purchasing also includes opting for products with less packaging that are manufactured locally, etc.
- **Implement Pollutant Release and Transfer Registers**, free public sources of information on the amount of hazardous chemicals used and wastes generated by companies. Making the information on emissions and waste production available to people encourages industries to waste and pollute less, and provides people with a tool to know what they are exposed to. This helps to build company accountability and public engagement.⁵¹

First Steps Towards Zero Waste

Want to get started on a zero waste plan right away? Here is a list of some primary steps you might take. Implementing any of these steps will provide quick and impressive results that can build momentum.⁵³

- 1. Adopt a goal of zero waste to landfills and incinerators,** with concrete objectives and deadlines for achieving this goal. Banning recyclables from landfills and incineration will go a long way toward incentivizing their proper treatment. The goal of banning waste incineration altogether will eliminate a major obstacle for waste minimization and will help guarantee that all that is not buried is either avoided or safely recovered.
- 2. Seek public input and involvement.** Organize a public meeting to discuss goals and ideas for beginning or expanding zero waste efforts in the community. It is especially important to involve those who make their livelihoods in recycling and reuse, as they know the existing system the best and will be the strongest advocates for its improvement, if brought into the process at the beginning.
- 3. Segregate waste streams.** Whether starting with a single stream like paper, or beginning a more comprehensive program, it is important to keep recyclables separate from mixed trash and to make participation easy and convenient. Again, where informal recycling exists, create ways to integrate waste pickers into the formal system by laying the groundwork for public policies that provide payment, training, proper equipment, and respect for their work.
- 4. Compost!** Making organic materials a priority is key to cost-effectively reducing waste generation by 50 percent. Collecting organics in a separate stream ensures that recyclables are not contaminated by wet trash, and organics are not compromised by any hazardous materials.

“For those at the bottom of the zero waste mountain, it is hard to believe it can be climbed. There is no single model, no one set way. But a broad pattern is emerging which makes it easier for those still looking up from below.”⁵²

- 5. Institute economic incentives that reward waste reduction and recovery over disposal,** such as reduced tipping fees for recyclable and compostable materials and pay-as-you-throw fees for trash collection.
- 6. Make participation convenient.** The more people participate, the more materials will be diverted from disposal. Education and outreach are critical. Zero waste programs depend on local citizens separating waste prior to collection, supporting relevant activities and revenues, and providing feedback for ongoing improvement.
- 7. Enact regulations to encourage business opportunities in reuse and recycling,** such as banning the sale of products that cannot be safely reused, repaired, recycled, or composted, and requiring the reuse and recovery of building materials in new construction and demolition. Develop markets for recycled materials and products, particularly local manufacturers. Government procurement can be a powerful tool to create demand of recycled goods.
- 8. Allocate human and financial resources to coordinate the work toward your zero waste goals.** In the beginning, this can take the form of volunteer organizers, but getting eventual support and participation from local government is crucial.



Discussion

Some zero waste projects are precipitated by a crisis. The crisis may be the closure of a landfill or incinerator, a growing awareness of environmental health problems, the need to comply with national or international laws or agreements, or any other development that signals the need for an infrastructural change. When “waste crises” arise, it is generally the case that only two waste management options are proposed: bury or burn. But both landfills and incinerators require huge financial investments and offer a payoff that includes wasting and polluting. Zero waste invests in resource conservation; its payoff is the prevention of future waste crises, among other worthwhile benefits (e.g., more jobs, less pollution).

As stated above, citizens must be involved from the outset, and must be informed about the progress and challenges of implementing zero waste as plans are made and put into practice. This is particularly true of those already engaged in recycling and reuse activities, as they have an important stake in the system and valuable expertise to share.

Frequently, there is a “champion” that promotes zero waste and engages others to take that idea into practice. This champion

may be one person or a few people working in the government, or participating in a community group. The perseverance of these zero waste promoters and the ability to engage different sectors (from government, industry, academy, community) are key to taking an initial idea of a few into a formal policy of the whole.

Of course, zero waste promoters do not have everything figured out before adopting a zero waste goal or starting to work towards it. There is no single correct way to start a zero waste program, because it must be tailored to the unique locality where it will be implemented. Most of the plans evolve over time from small scale waste-oriented programs to larger and more comprehensive systems that after a while create synergies between waste and other sectors working on the environment, poverty, jobs, health, etc.

So, zero waste will not happen overnight. Especially when there is no system of materials separation already in place, being patient and consistent in starting a zero waste plan is extremely important! In many places, new government administrations bring new programs for waste management that are not sustained over time. As a result,

people can be discouraged from participating in what they think will be another short-term program. To counter this, it is very important to make people realize that zero waste is not the new fashion of the moment, but is a long term waste management strategy. It may take some time for both the community and the government to adapt to source separation, but once the system starts, more and more people will get on board!

Adopting programs that bring about tangible progress in the short term is one strategy for fostering enthusiasm. Most existing zero waste programs start by composting or anaerobic digestion of organic material—which takes care of between a third to over a half of all residential waste—and a combination of reduction, reuse, recycling, and repair initiatives. With these efforts in place, diversion rates of 70% and higher are commonly achieved.

To close the gap between 70% diversion and zero waste, the 4th core strategy,

Designing out Waste, must come into play. This is generally the responsibility of the private sector, but will only come about with the support of government, through subsidies, legislation, regulation, and other demonstrations of political will.

In the meantime, as cities and municipalities worldwide set zero waste goals and steadily increase diversion rates, the landscape of extraction, production, distribution, consumption, and waste is changing significantly, moving steadily toward a zero waste future, a future based on values such as environmental and social justice, equity, democracy, recognition of informal workers, civic responsibilities, and civil rights. Let's embrace this vision that argues with the concept of "development" as a synonym for perpetual economic growth. It is time to face the consequences of that fallacy—depletion of resources, climate change, and increased human and environmental health problems—and rethink our values in favor of sustainability and zero waste.

End Notes

1. See <http://www.no-burn.org/on-the-road-to-zero-waste-successes-and-lessons-from-around-the-world>.
2. Visit GAIA's website (www.no-burn.org) for new zero waste cases, or our blog (www.zerowasteworld.org) to offer ideas from your own experience!
3. Dr. Paul Connett, Professor of Chemistry, St. Lawrence University.
4. For an excellent explanation of this, watch The Story of Stuff, by Annie Leonard www.storyofstuff.com/international Jensen: 2003.
5. www.zwia.org The Zero Waste International Alliance adopted the following definition for Zero Waste: "Zero Waste is a goal that is ethical, economical, efficient and visionary, to guide people in changing their lifestyles and practices to emulate sustainable natural cycles, where all discarded materials are designed to become resources for others to use. Zero Waste means designing and managing products and processes to systematically avoid and eliminate the volume and toxicity of waste and materials, conserve and recover all resources, and not burn or bury them. Implementing Zero Waste will eliminate all discharges to land, water or air that are a threat to planetary, human, animal or plant health."
6. See GAIA's, On the Road to Zero Waste: Successes and Lessons from Around the World, for a collection of zero waste case studies.
7. For an extensive analysis of the Zero Waste concept, read Murray: 2002, listed in the Bibliography.
8. For example, see: www.zerowasteottawa.com and www.zerowastevancover.com.
9. For example, see: <http://www.metrovancouver.org/about/publications/Publications/ISWRMP.pdf>.
10. Adapted from Murray: 2002.
11. To learn more about the contribution of reduction, recycling, and composting on the climate read Platt, Ciplet, Lombardi, and Bailey: 2008, and the Zero Waste for Zero Warming campaign www.zerowarming.org.
12. To learn more about environmental health impacts of incinerators and landfills read Tangri: 2003; Platt: 2004 and Connett: 1998. Check also Energy Justice Network's information on landfills: <http://www.ejnet.org/landfills/>.
13. Waste pickers are people who informally collect discards from the streets or waste disposal sites to sell them for recycling or reuse, generally working in very precarious conditions.
14. For information on job creation through recycling and reuse in United States, see data from ILSR: <http://www.ilsr.org/recycling/recyclingmeansbusiness.html>.
15. See GAIA's More Jobs, Less Pollution: <http://www.no-burn.org/more-jobs-less-pollution>.
16. Adapted from Thanal: 2001, pg 39. These are generalizations that vary around the world.
17. For more information on these technologies, read Ciplet: 2009 and FoEUK: 2009. Also watch the video Pyrolysis, Gasification and Plasma Incineration, by Health Care Without Harm, available here <http://no-burn.org/article.php?list=type&type=107>
18. To learn more about the obstacles posed by incineration to waste reduction, read Plat: 2004.
19. That is, internalizing all the costs associated with the landfills, including those associated with water, air, and soil pollution; public health harms; wasting of resources; etc.
20. Note that in this case, composting and treating residual waste through anaerobic digestion are strategies to reduce the impacts of landfills, not strategies to treat organic materials. Given that residual waste has contaminants, the solid material that is produced by the compost and anaerobic digestion of this stream will not be suitable to use as soil amendment.
21. In 2011, Harrisburg, PA became the largest U.S. city to declare bankruptcy, and the financial blame rests squarely on the shoulders of its staggering debt payments for upgrades at the city's incinerator. Detroit taxpayers have spent over \$1.2 billion dollars in debt service payments from constructing and upgrading the world's largest waste incinerator. The city could have saved over \$55 million in just one year if it had never built the incinerator. See <http://www2.metrotimes.com/editorial/story.asp?id=12748>
22. Adapted from Nair, and Jayakumar: 2008.
23. For a guideline to conduct a waste composition study in businesses and institutions: http://www.resourcesmart.vic.gov.au/for_government/waste_and_recycling_2389.html
24. "Pay as you throw" is a system that charges individuals and businesses according to the amount of waste that they generate.
25. Waste pickers are known by many names in different countries: rag pickers, catadores, cartoneros, pepenadores, basuriegos, recicladores, zabbaleen, informal sector recyclers, grass roots recyclers, etc. "Waste picker" was the term agreed to in the First World Congress of Wastepickers.
26. For more information on the contribution of informal recyclers toward preventing climate change, read Cooling Agents, Chintan, 2009, available online at <http://chintan-india.org/cache/Cooling%20Agents%20Report.pdf> and "Respect for Recyclers: Protecting the Climate through Zero Waste", GAIA 2010, available here http://no-burn.org/downloads/Respect4Recyclers_English.pdf To find out more about informal recyclers struggles to gain recognition for their work, check the sites listed in the Recommended Resources section of this document.
27. Check more about the need to keep organics out of landfills at the site of Cool 2012 campaign <http://www.cool2012.com/>
28. For more information about anaerobic digestion, read FoEUK: 2007.
29. See tips for individuals to produce their own home composter <http://www.rafb.com/pages/compost/Complan.html>
30. There is a lot of information about compost out there! Check the recommended resources section for some.
31. For more case studies on organic materials treatment in different cities, see the publications of the Swiss Federal Institute of Aquatic Science and Technology here: http://www.eawag.ch/organisation/abteilungen/sandec/publikationen/publications_swm/index_EN#owm
32. See on the Road to Zero Waste: Successes and Lessons from Around the World. <http://www.no-burn.org/downloads/On%20the%20Road%20to%20Zero%20Waste.pdf>
33. From Envision New Zealand: 2003 and Anthony: 2007.
34. For more on Resource Recovery Parks, read Liss: 2001.
35. From Envision New Zealand: 2003.
36. For more information about clean production, see What is Clean Production? Clean Production Action (2009) <http://cleanproduction.org/Publications.php> and check the list of recommended resources.
37. For more info, see <http://www.grrn.org/zerowaste/business/profiles.php>

39. See On the Road to Zero Waste: Successes and Lessons from Around the World. <http://www.no-burn.org/downloads/On%20the%20Road%20to%20Zero%20Waste.pdf>.

40. See the Plastics Scorecard at <http://cleanproduction.org/Scorecard.Intro.php>

41. The removal of waste materials at a particular point in an industrial process and retuning them for use somewhere in that process.

42. For more information on toxics use reduction read “Substitution 1.0 – the art of delivering toxic-free products” International Chemical Secretariat (Chemsec), 2008. Available here: http://www.chemsec.org/images/stories/publications/ChemSec_publications/080917_substitution_1.0.pdf Also, see Healthy Business Strategies at <http://cleanproduction.org/HealthyBusiness.php>

43. Check case studies on toxics use reduction at the database of the Toxics Use Reduction Institute of Massachusetts, USA: http://www.turi.org/library/turi_publications/toxics_use_reduction_case_studies

44. For more information about Green Chemistry, read, “Why we need Green Chemistry” by Clean Production action: <http://www.cleanproduction.org/library/cpa%20green%20need%20fact.pdf> and also check <http://www.epa.gov/greenchemistry/>

45. From EPR works: <http://www.eprworkinggroup.org/>

46. For more information on EPR check CPA: 2004 and ZW Washington: 2003.

47. For more information on Individual Producer Responsibility, visit <http://www.iprworks.org/> and download How Producer Take-Back can promote Eco-design at http://www.cleanproduction.org/pdf/cpa_ecodesign_Apr08.pdf

48. The maxim that processes, services, and products should be replaced with alternatives which have a lower impact on the environment.

49. For more information on Toxic Use Reduction legislation, visit www.turi.org Read also: How Companies Can Eliminate their Use of Toxic Chemicals at <http://cleanproduction.org/Publications.php>

50. For ideas on how to incorporate Precautionary Principle in decision making, read “From Science to Policy – Precaution in decision-making.” International Chemical Secretariat (Chemsec), available here http://www.chemsec.org/images/stories/publications/ChemSec_publications/Booklet_2_C.pdf

51. More information on Pollutant Release and Transfer Registers (PRTTR) here: <http://www.chem.unep.ch/prtr/> Also see Public Access to Information and the Right to Know at <http://cleanproduction.org/Publications.php>

52. Murray, R.: 2002.

53. Adapted from Tangri: 2003.

54. See More Jobs, Less Pollution: Growing the Recycling Economy in the U.S., <http://www.no-burn.org/downloads/MoreJobsLessPollutionFinal.pdf>

55. For two specific examples, see <http://www.no-burn.org/zero-waste-solutions-highlighted-by-green-nobel---the-2013-goldman-environmental-prize>

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Glossary

Anaerobic Digestion is a biological treatment in which microorganisms decompose organic material in enclosed ambient, in the absence of external oxygen. As the materials decompose, they produce a gas (mostly methane and carbon dioxide) and a solid residue called “digestate,” which is similar but not equal to compost. The gas is then used as fuel for heating, and the digestate can be composted and then used to improve soil conditions.

Biogas is a gas produced by the breakdown of organic material in the absence of oxygen. In this guide, it is used to refer to the gas produced by anaerobic digestion of organic material.

Clean production is defined by the NGO Clean Production Action as “any practice which eliminates at source the use or formation of hazardous substances through the use of non-hazardous chemicals in production processes, or through product or process redesign, and thereby prevents releases of hazardous substances into the environment by all routes, directly or indirectly.”

Compost is the outcome of the biological decomposition of organic material under controlled conditions, in the presence of oxygen. Microorganisms such as fungi and bacteria decompose organic material creating a soil amendment that, among other benefits, supplies nutrients to the soil, helps retain water, increases the permeability and porosity of the soil, reducing and eliminating the need for synthetic agrochemicals.

Construction and demolition waste is the waste and materials discarded in the demolition and construction of buildings, including materials such as cement, tiles, wood, gypsum, bricks, etc.

Dematerialization means reducing the quantity of materials required to serve economic functions in society. In short, dematerialization means doing more with less.

Diversion rate is the percentage of municipal solid waste that does not go to dumps, landfills, or incineration, and instead goes to recovery processes such as compost, reuse, and recycling. The way it is measured varies in different municipalities.

Door to door collection or curbside (or kerbside) collection refers to the system in which materials and waste are collected on the curb of each household or building. It is different from other collection systems, for example having one large waste collection container per block.

Downcycling is the process of converting a used material or product into a product that has a lower quality. For example, making plastic furniture out of plastic bottles is a form of downcycling. True recycling would be turning the used plastic bottles into new plastic bottles.

Drop-off sites are facilities where residents and sometimes industries can take their recyclable or reusable materials.

Recommended Resources

Dumps or **open dumps** are sites where waste is simply thrown over the soil (sometimes in a pit), without any pollution control mechanism.

End-of-pipe intervention refers to the treatment of materials at the end of a given process or at the end of the useful life of a product. They do not take into account all the phases of the system, but only the last one. Examples of end-of-pipe technologies are waste treatment technologies such as landfilling and incineration that deal with waste once it is created but do not intervene in the other phases of production and do not re-use any of the products that have become waste.

Extended Producer Responsibility is a policy tool that extends manufacturers' responsibilities beyond their current accountabilities—for worker health and safety, consumer safety, and production costs—to also include responsibility for life cycle costs and impacts of their products and associated packaging.

Green chemistry, also known as **sustainable chemistry**, is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Green chemistry applies across the life cycle of a chemical product, including its design, manufacture, and use.

Incineration is a technology that treats waste with high temperatures, transforming the waste into gases, liquids and ashes that contain harmful substances. There are different types of incinerators, including “mass burn”, “pyrolysis”, “gasification”, “fluidized bed” and “plasma arc”. Some capture a small part of energy from the waste burnt—the so called “waste-to-energy” incinerators—but this amount of energy is immensely smaller than the energy required to produce the burnt products.

In-process recycling is the process of removing waste materials at a particular point in an industrial process and returning them for use somewhere in that process.

Landfilling is a technology to dispose of waste in a pit that has certain applications to reduce the pollution, such as a liner, a means of collecting the liquids that are created by the decomposition of waste, and a system to vent or capture gases. While landfills reduce pollution compared to open dumps, they release greenhouse gases and toxic gases and eventually leak pollutants to the soil and underground water.

Materials Recovery Facility (MRFs) is a plant where materials are sorted to be sold for recycling or reuse (paper separated from metals, from plastics, from glass, and so on). They usually receive only recyclable materials. Usually, the materials go through a continuous moving conveyor, where they are picked over (sometimes by hand, sometimes by machines) and separated for further processing. They are also called Sorting Centers and Materials Recovery Centers.

Organic materials is a term used to refer to discards including food scraps and yard trimmings (from pruning, grass clippings, etc.) that have come from the remains of once-living plants and animals and their waste products.

Pay as you throw is a system that charges individuals and businesses according to the amount of waste that they generate.

Precautionary principle, or **precautionary approach**, states that if an action or policy has a suspected risk of causing harm to the public or to the environment—in the absence of scientific consensus that the action or policy is harmful—the burden of proof that it is not harmful falls on those taking the action or implementing the policy.

Residential waste is the waste and discards created in households and apartment buildings, as distinct from commercial waste, which is created in shops and businesses, and institutional waste, which is created by public offices.

Residuals or **residual waste** is a way to refer to waste that is not captured for reuse, recycling, and composting programs, or is discarded by these programs and ends up being buried or burned either because the materials cannot be composted or processed for remanufacturing, or—more commonly—because they were not properly separated to be captured for remanufacturing.

Resource Recovery Parks or Plants are centralized facilities in which discards are classified, reused, composted, anaerobically digested, repaired, and recycled. They tend to be larger than Material Recovery Facilities, since they involve more activities than sorting.

Stabilization refers to a method of converting raw or partially treated sewage or waste to more stable forms. Waste is collected in ponds, also known as oxidation ponds or lagoons, where it is exposed to sunlight, air and microorganisms. Organic matter decomposes biologically, waste is stabilized, and pathogens are reduced through the action of bacteria and algae. This process reduces leaching and emissions in landfills. Given that residual waste has contaminants, the solid material that is produced by the compost and anaerobic digestion of this stream will not be suitable to use as soil amendment.

Substitution principle. The maxim that processes, services, and products should be replaced with alternatives which have a lower impact on the environment.

Sustainable. Harvesting or using a resource so that the resource is not depleted or permanently damaged.

Toxic Use Reduction prevents toxic material usage during manufacturing by targeting and measuring reductions in the upfront use of toxic materials.

Transfer station is a facility that receives the waste from the collection trucks or carts, and places it in bigger trucks that then take the waste to the landfill.

Vermicompost is the product or process of composting using worms, usually *Eisenia foetida* or Red Wigglers, to create a mixture of decomposing organic material.

Waste pickers are workers, generally in the informal sector, who recover recyclable material from waste and sell it for recycling. Waste pickers collect material from individual homes, offices, and businesses, from the street and waste containers, and from dumpsites.

Core Strategy 1: Set a new direction away from waste disposal

The Story of Stuff
www.storyofstuff.com/international

Global Alliance for Incinerator Alternatives
<http://www.no-burn.org/>

Sound Resource Management
<http://www.zerowaste.org/>

Energy Justice Network
<http://www.energyjustice.net/>

Core Strategy 2: Establish comprehensive reuse, recycling, and organics treatment programs

GrassRoots Recycling Network
www.grrn.org

Thanal
www.thanal.co.in

Institute for Local Self Reliance
<http://www.ilsr.org/>

Zero Emissions Research Institute
<http://www.zeri.org/>

Stop Waste
www.stopwaste.org

Biocycle magazine, about treatment of organic materials
<http://www.jgpress.com/biocycle>

Mary Appelhof’s website for worm composting resources
www.wormwoman.com

Cool 2012 campaign
<http://www.cool2012.com/tools/technologies/>

Inclusive cities
http://www.inclusivecities.org/waste_pickers.html

Waste Pickers and Climate Change blog
<http://frontlineagainstclimatechange.inclusivecities.org/>

Waste advisers on urban environment and development
<http://www.waste.nl/>

Core Strategy 3: Engage community participation

Story of Stuff
<http://storyofstuff.org/anotherway.php>

Zero waste New Zealand Trust
www.zerowaste.co.nz

Thanal
www.thanal.co.in

Core Strategy 4: Design out waste

Clean Production Action
<http://www.cleanproduction.org>

Toxics Use Reduction Institute
www.turi.org

International Chemical Secretariat (ChemSec)
<http://www.chemsec.org/>

Lowell Center for Sustainable Production
<http://www.sustainableproduction.org/>

The Marrakech Process
<http://esa.un.org/marrakechprocess/>

EPR working group
<http://www.eprworkinggroup.org/>

Individual Producer Responsibility Works
<http://www.iprworks.org/>

Product Policy Institute
<http://www.productpolicy.org/>

EPA’s site on Green Chemistry
<http://www.epa.gov/greenchemistry/>

Zero waste practices can have a wide range of effects, from mitigating climate change on a global level to improving air quality in a neighborhood, to assisting a single family or individual living in poverty.

