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A Systemic Game-Changer to Climate Change

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Edited by the Heinrich Böll Foundation

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INTRODUCTION

Over the last decades, action on climate change has concentrated on the sectors perceived to be contributing the most to the problem: primarily the energy and transport sectors, with special attention to the use of fossil fuels. While these sectors are undoubtedly important, keeping global warming below 1.5 degrees Celsius requires a much deeper and wider look at the way our economy operates, analysing our production and consumption habits in particular and resource management in general.

On the one hand, our linear economy, having led to a global and rapid increase in resource extraction, is as responsible for climate change as any other fossil-energy intensive source of greenhouse gas emissions. Its basic logic consists of extracting primary natural resources, producing an ever increasing amount of products generally designed not to last and involving dubious toxic impacts and environmental standards, transporting them all over the world by energy-intensive means, ensuring quick and compulsive consumption, and finally disposing of them in landfills or incinerators. In this sense, the linear economy is not only driving over-consumption and unsustainable exploitation of natural resources, but it also contributes to an ever increasing spiral of waste production, a highly problematic output in itself.

Waste, the end result of the linear economy – the mix of plastic, paper, food waste, and any random bit one may come across on a daily basis – contributes to climate change at its disposal stage once it is generated and taken away from households to landfills and incinerators. Emissions from organic waste rotting in landfills and from waste burnt in incinerators contribute 6.6 % of total anthropogenic greenhouse gas emissions.[1]

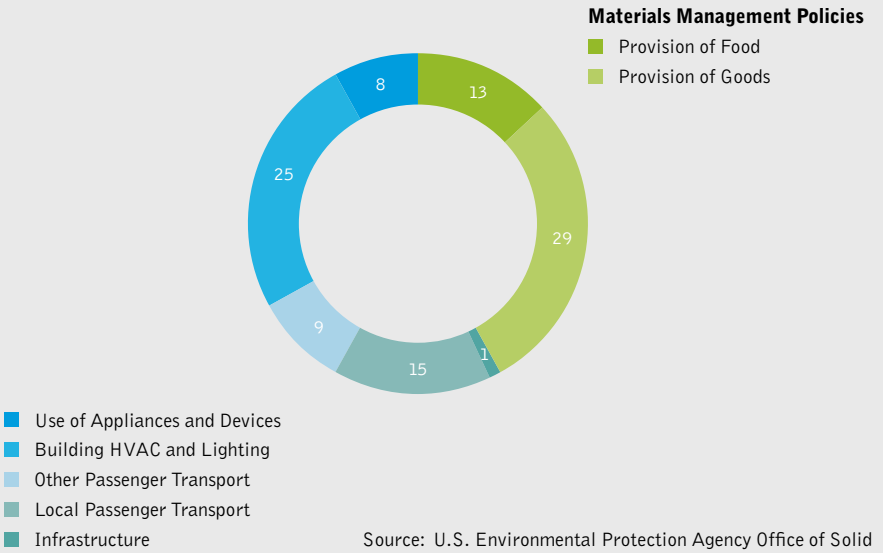
However, waste is not only an issue at the disposal stage. Waste itself is made of natural resources that have been extracted, manufactured, transported, consumed, and eventually disposed of, and all these steps in the linear economy system give rise to a major portion of the global anthropogenic greenhouse gas emissions that are effectively embedded in the products we consume and discard.

Thus, looking at the entire life-cycle of a product, the amount of greenhouse gas (GHG) emissions is large and significant. For example, it has been estimated that

1 Fischedick, M., et al. (2014). Industry. In IPCC, *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. (Edenhofer, O., et al. [Eds.]). Cambridge and New York: Cambridge University Press.

materials management – in other words, the provision of goods and food – was associated with 42 % of U.S. anthropogenic GHG emissions in 2006 (Fig.1).[2]

Figure 1: Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices



Source: U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response; own chart.

Unfortunately, the accounting guidelines set up by the Intergovernmental Panel on Climate Change (IPCC) for national greenhouse gas emissions inventories do not follow a life-cycle approach. For the waste sector, the inventories only require the reporting of emissions produced in landfills and incinerators. This accounting loophole, added to other methodological gaps in the greenhouse gas accounting systems which are explored further below in this chapter, presents a misleading picture of the potential contribution of resource management to climate change. In sum, the potential contribution of waste prevention and management to keeping global warming under 1.5 degrees Celsius could be far greater than the total reported emissions under the «waste» part of the inventory reported to the UNFCCC.

Opposite to the linear economy, the basis of a circular economy is a zero waste society, where everything that we produce and consume can return safely to nature or society. The IPCC already recognizes that programs that reduce, reuse and recycle

2 U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response. (2009). *Opportunities to Reduce Greenhouse Gas Emissions through Materials and Land Management Practices*. www.epa.gov/sites/production/files/documents/ghg-land-materials-management.pdf

municipal waste are effective and high-impact means of reducing greenhouse gas emissions.[3] But in fact, a zero waste circular economy goes beyond the model of the 3 Rs and proposes a much more comprehensive transformation of our production and consumption patterns to achieve high resource efficiency and move towards zero waste and zero emissions.

Zero waste solutions, alongside climate action in other sectors, can be a game-changer to achieve the global target of a maximum of 1.5 ºC global warming, embracing the principles of conservation of materials, reduction of toxics, equitable distribution, and access to resources.

Moreover, these solutions – including waste reduction, redesign, composting, biogas, producer responsibility, consumption habits transformation, community empowerment, and recycling – could be implemented today, using existing innovations, with immediate results.

In cities and regions around the world, cooperatives of recycling workers, visionary policy-makers, and innovative practitioners are showing that zero waste is a viable strategy. In contrast to the primitive idea of burning waste, zero waste solutions create livelihoods, save money, and protect the environment and public health. These efforts go hand-in-hand with clean production, producer responsibility, and waste minimization programs for dangerous and hard-to-recycle materials. Together, these practical, bottom-up strategies provide some of the most decentralized urban solutions for reducing climate pollution, conserving energy and natural resources. They present enormous opportunities for developing local economies.

3 IPCC. (2014). op. cit.

A systemic game-changer to climate change

A zero waste circular economy has critical climate implications. The bottom line is that zero waste programs ultimately result in less demand for virgin materials whose extraction, transport and processing are major sources of greenhouse gas emissions, and thus they reduce emissions in virtually all industries and economic sectors.

Moreover, the successful implementation of a zero waste circular economy will provide significant other environmental, social and economic benefits, such as resource efficiency, job creation, low-carbon prosperity, a healthy environment, clean production and sustainable consumption.

But to ensure such success, it is necessary to undertake a comprehensive approach. The transition to a zero waste circular economy requires fundamental changes across the entire economy based on the following interdependent pillars: constant reduction of residual waste via waste prevention and maximization of material recovery through separate collection schemes, product and process redesign, flexible waste treatment facilities, reforming renewable energy policies and greenhouse gas accounting methodologies and supporting the development of worker-led schemes – all of which is the operational translation of the overarching principles of the circular economy.

Waste prevention

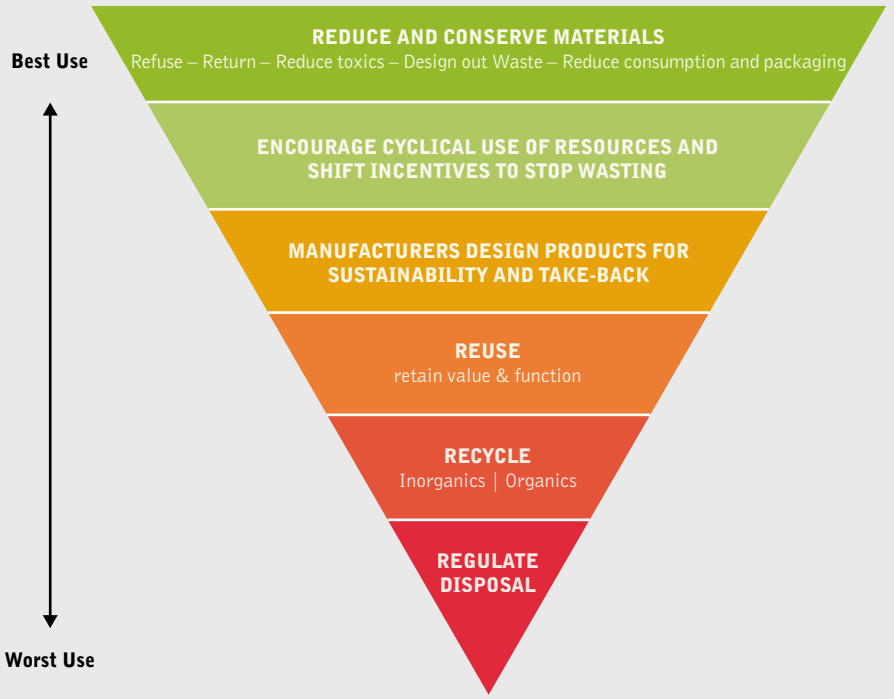
It goes without saying: the best waste is that which is never produced in the first place. Indeed, waste prevention and reduction is the most preferred option in the Waste Hierarchy in terms of sustainability (Fig. 2),[4] and the most effective option for climate change mitigation in resource management.

The effects of the different options are shown in conventional terms (excluding biogenic CO_2 emissions) in Figure 3.[5] As this shows, the main benefits come from waste prevention, while waste disposal, including incineration with energy recovery (known as waste-to-energy incineration), tend to make contributions to climate change emissions rather than helping to reduce emissions overall.

4 Waste Hierarchy. Reprinted from «From the 3Rs to the Zero Waste hierarchy», In *Zero Waste International Alliance*, 2013. https://zerowasteeurope.eu/2013/04/zero-waste-hierarchy

5 Eunomia. (2015). *The Potential Contribution of Waste Management to Climate Change Mitigation*. www.zerowasteeurope.eu/downloads/the-potential-contribution-of-waste-management-to-a-low-carbon-economy

Figure 2: Waste Hierarchy, indicating the order of preference for waste management options based on sustainability.



Source: Adopted by ZWIA board March 2013; own chart.

Textiles, aluminium, food waste and plastic are among the top waste streams that can be critical to climate change mitigation, if reduced.[6] In textiles production for example, greenhouse gas emissions totalled 1.2 billion tonnes of CO_2 equivalent in 2015, more than those of all international flights and maritime shipping combined, mainly due to the fast fashion nature of global production and consumption rates of clothing products. If only the average number of times a garment is worn were doubled, GHG emissions would be 44 % lower.[7] A zero waste circular economy for textiles including high rates of clothing utilization, improved recycling, and reduced waste in production would reduce the negative impacts.

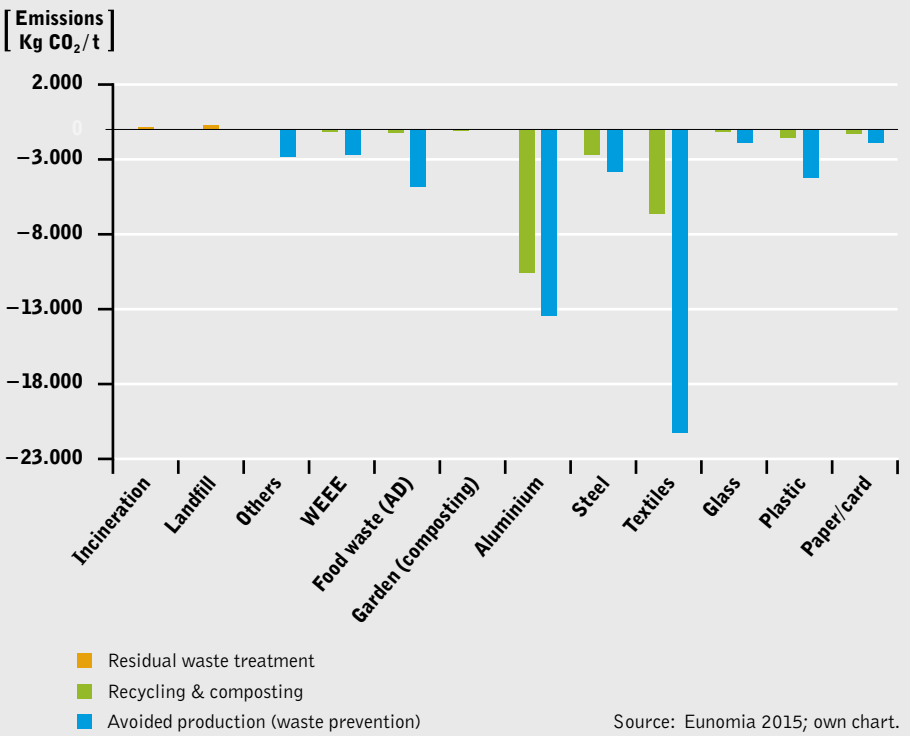
Similarly, the benefits from food waste prevention are significant: to the extent that separate collection of food waste can give rise – in both households and businesses – to enhanced awareness of what is thrown away (hence motivating a

6 Eunomia. (2015). op. cit.

7 Ellen MacArthur Foundation. (2017). *A new textiles economy: Redesigning fashion's future*. www.ellenmacarthurfoundation.org/publications/a-new-textiles-economy-redesigning-fashions-future

preventive effect), the benefits of such an approach become even greater. Data used to elaborate Figure 3 indicate that every tonne of prevented food waste saves 4.5 tonnes CO_2 eq.

Figure 3: Indicative Climate Change Impacts of Key Waste Management Activities
(exclusive CO_2 from biogenic sources)



Source: Eunomia 2015; own chart.

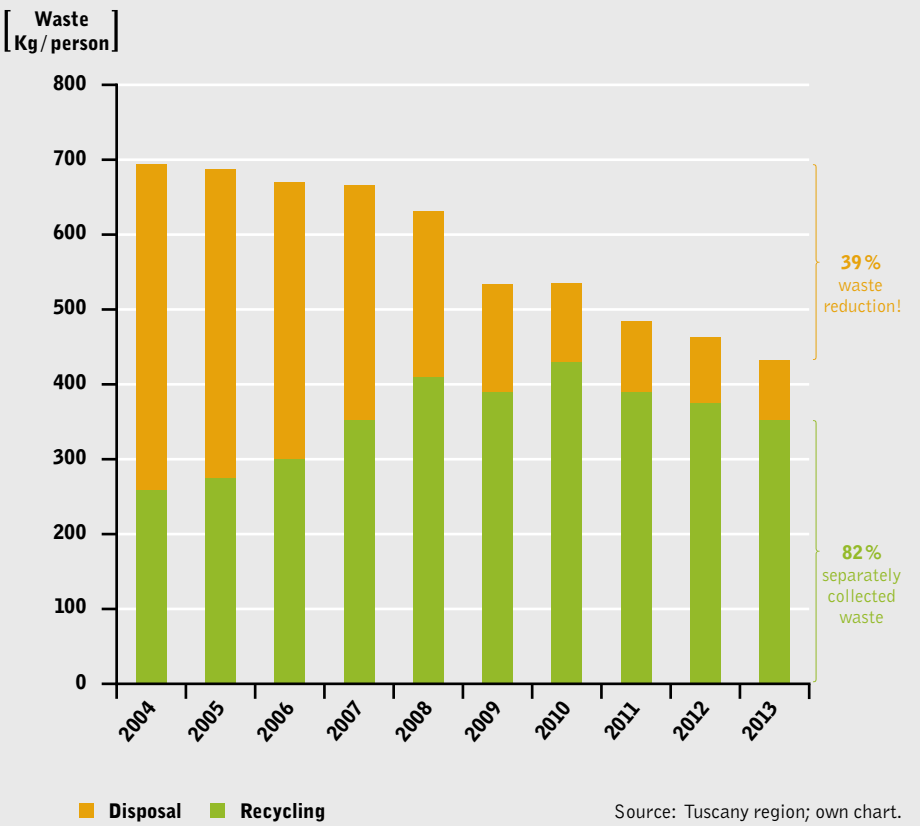
Maximization of material recovery

If prevention is not possible, a zero waste circular economy system ensures that any discards from our consumption are safely and efficiently recovered. In doing so, it ensures a continual reduction in residual waste per capita (the waste that isn't prevented, reused, recycled or composted) and a radical increase in resource efficiency.

Such a system requires separating waste at the source in order to reuse, repair, and recycle inorganic materials, and compost or digest organic materials. The introduction of such a system has proven to be a key element of success in, for example, Capannori (Italy), the first town in Europe to sign up to a Zero Waste Strategy in 2007, committing to sending zero waste to disposal by 2020.

In Capannori, door-to-door collection was introduced in stages across the municipality between 2005 and 2010, starting with small villages, where any mistakes could be identified and corrected early on, then extended to cover the entire municipal area in 2010. By that time, 82 % of municipal waste was separated at source, leaving just 18 % residual waste to go to landfill. Since this went hand in hand with a sharp reduction in waste arisings, the combined effect was an even more marked minimization of residual waste.

Figure 4: Evolution of separate collection and waste generation in Capannori 2004–2013



Source: Tuscany region; own chart.

Separate collection of organics is one critical step within the general waste collection system, as it prevents the greenhouse gas emissions from organics rotting in landfills. This is particularly important in the rapidly developing countries, where municipal solid waste keeps increasing and methane emissions from landfills alone

are expected to increase almost 50 % between 1990 and 2020.[8] Methane's short-term, heat-trapping effects are severe; over the next 20 years – the period of time during which effective action on global warming is most crucial – methane's potential to trap heat in the atmosphere is 72 times greater than that of CO_2, on a per tonne basis.[9] Therefore, curbing methane emissions is critical to preventing catastrophic climate change, as methane is second only to CO_2 as a man-made driver of global warming.[10]

Moreover, recovering organic waste contributes to closing the nutrients loop, and it allows vital components such as nitrogen, phosphorus and potassium to return to the soil in the form of compost, effectively capturing carbon and improving crop resilience, along with increasing the water retention capacity of the soil.[11] In turn, the use of compost avoids the use of chemical fertilizers and supports a pesticide-free agriculture, which delivers further greenhouse gas emissions savings, along with job creation and health benefits.

The climate benefit of material recovery maximization can be further illustrated by recent research on the Circular Economy Package, approved by the European Commission: assuming the implementation of 70 % recycling, 30 % food waste reduction, and 80 % recycling of packaging waste, the EU would save 190 million tonnes CO_2-eq/year, which would be the equivalent to the total annual emissions of the Netherlands.[12]

Regarding the implementation and further encouragement of a separate collection system, it is vital to address the economic incentives. Pay As You Throw programs, where households are charged a tariff based on how much residual waste they present for collection to the local authority, are an effective tool in increasing waste separation and recycling, and also encourage waste minimization. In Capannori, the new waste tariff implemented in 2012 through a Pay As You Throw scheme incentivized better separation and prevention, and was later followed by many other municipalities, driving local source separation rates towards 90 %.

8 Bogner, J., et al. (2007). Waste Management. In IPCC, *Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. (Metz, B., et al. [Eds.]). Cambridge and New York: Cambridge University Press.

9 Summary for Policymakers. In IPCC. (2007). *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. (Solomon, S., et al. [Eds.]).Cambridge and New York: Cambridge University Press.

10 IPCC. (2001). *Climate Change 2001: The Scientific Basis*. (Houghton, J. T., et al. [Eds]). Cambridge and New York: Cambridge University Press. http://pubman.mpdl.mpg.de/pubman/item/escidoc:995493/component/escidoc:995492/WG1_TAR-FRONT.pdf

11 See several papers on this published by the Marin Carbon Project. www.marincarbonproject.org/science/paper

12 Zero Waste Europe. (2018, May 18). Press Release: European Commission steps forward to cut on single-use plastics – but it's just the beginning. https://zerowasteeurope.eu/2018/05/european-commission-steps-forward-to-cut-on-single-use-plastics-but-its-just-the-beginning

Redesigning and phasing out products

Once optimal separate collection is in place, the residual waste fraction – that which is left over because it is either too toxic to be safely recycled or is made out of non-recyclable materials – becomes evident, and industrial design mistakes and inefficiencies can be studied and corrected. If it cannot be reused, composted, or recycled, it should be redesigned to meet the optimal standards for clean production, repairability, reusability or recyclability, or not produced in the first place.

If products cannot be redesigned, innovative alternatives should be found and obsolete products should be phased out. This is particularly important when it comes to plastic-based products: recycling plastic, on account of inherent technological and organizational constraints, will not be enough to reduce plastic production, consumption, subsequent disposal and dispersal into the environment. This is where product bans can be instrumental. Recent successful campaigns to ban plastic bags, straws, and other single-use products have shown the potential of product bans to reduce waste and greenhouse gas emissions. The European Commission recently announced clear legislative measures in this direction.[13]

Within this pillar, it's important to emphasise clean production. Toxic substances should be avoided at the design stage to allow products and materials to circulate in a closed loop without endangering the quality of materials and the health of citizens, workers and the environment. This requires changing our approach to toxic substances so that in a circular economy, hazardous substances will not hinder the processes of reuse, repair and recycling. Authorizing the inclusion of toxic substances in recycled products seriously threatens the credibility and economic model of the entire recycling industry.[14]

This strategy requires engaging with producers, pushing ambitious policies on Extended Producer Responsibility (EPR) and encouraging change in design systems. For instance, in Norway the deposit and return system for one-way beverage packaging has not only reduced litter and its associated costs and has achieved collection rates above 90 %, it has also affected the design of beverage packaging. Now a limited number of materials are used, all of them recyclable, hence ensuring they will be recycled. In the meantime in France, EPR systems with modulated fees have been used beyond packaging to cover items such as furniture or graphic paper, with a bonus-malus system that incentivizes the use of non-toxic recyclable materials and penalizes the toxic or non-recyclable ones.

Reforming energy and GHG accounting systems

As mentioned in the introductory section, the current climate and energy policies fall short of addressing and fully utilizing the potential of the resource management

13 Zero Waste Europe. (2018). op. cit.

14 Zero Waste Europe. (2017, March). *Policy Briefing: Creating a Toxic Free World: avoiding a collision between the EU and the Circular Economy*. http://zerowasteeurope.eu/wp-content/uploads/edd-free-downloads-cache/ZWE_PolicyBriefing_decaBDE-2.pdf

sector. Most importantly, several issues regarding the greenhouse gas emissions accounting methodology are misleading political action.

In the first place, the GHG emissions accounting methodology for IPCC inventories only looks at disposal treatment (incineration, landfill), appearing to be a minor contributor to climate change. Certainly, other stages in the resource management chain, such as extraction and transportation, may be addressed through other sectoral analyses, but compartmented analyses miss the full picture and overlook the contribution of the upper tiers of the Waste Hierarchy, which ultimately prevents proper guidance for waste and climate policies.

This situation is further exacerbated by the national GHG inventories being solely focused on emissions from national production and ignoring national consumption. The consumption-based approach captures direct and lifecycle GHG emissions of goods and services (including those from raw materials, manufacture, distribution, retail and disposal) and allocates GHG emissions to the final consumers of those goods and services, rather than to the original producers of those GHG emissions. In this way, wealthy countries with delocalized production and high consumption levels may appear to be lowering their contribution to climate change in their national emissions reporting, painting a misleading picture of how important it is to address wasteful consumption in order to tackle climate change.

Another key issue to be addressed within the emissions accounting methodologies is the misleading assumption that biogenic emissions resulting from burning organic or biomass waste can be considered zero or carbon-neutral. As Eunomia put it: «It is a mistake to assume that CO_2 from non-fossil sources does not matter [...]the only correct way to process is to account for emissions of all greenhouse gases since they will all have ‹warming potential›, irrespective of their origin».[15]

The assumption that burning organic waste is carbon-neutral has expanded to assume that it's a source of renewable energy, as in the European Union and many other countries which have consequently allowed energy policies to support various forms of waste-to-energy processes, both from the separately collected organics and from the mixed municipal and industrial waste. In the case of renewable energy subsidies for incineration of waste, this has driven the expansion of this polluting and resource-destructive, hence GHG intensive, industry. In the EU, fortunately the revision of the Renewable Energy Directive may, if finally approved, put an end to these subsidies.

Instead of providing economic incentives to burn waste, new methodologies must be developed to account for, and reward, the preservation of energy embedded in products or materials. Premiums for energy from waste incineration distort markets. Therefore they should not be considered unless there is a level playing field with embedded energy conservation, taking into account the reduction of greenhouse gas emissions from prevention, reuse or recycling in all comparisons. There is huge potential in preserving the energy embedded in products and materials and

15 Eunomia. (2015). op. cit.

preventing them from becoming waste; far more than can be generated by burning or landfilling them.

Development of communities and local economies

A successful zero waste circular economy must also be an inclusive and equitable one, giving priority to job creation and respect for workers' rights. Inclusive zero waste systems ensure that resource recovery programs include and respect the community and all social actors involved in resource conservation, especially informal recyclers whose livelihoods depend on discarded materials.

In the Global South, recycling provides a livelihood for approximately 15 million people worldwide – 1 % of the urban population.[16] These are self-employed workers, mostly in the informal economy, who retrieve reusable and recyclable items from the waste stream. They collect, sort, clean, and in some cases, process the recyclables, returning them to industry as an inexpensive and low-carbon raw material.[17]

In doing so, waste pickers can be incredibly efficient recyclers and thus represent a huge opportunity to reduce GHG emissions through increased recycling rates, if given proper recognition and support. In Delhi, the annual GHG emissions savings that the informal sector brings to the city is estimated to be 962,133 T CO_2-eq,[18] which is over 3 times more than other waste projects slated to receive carbon credits in the city.[19]

Today, waste pickers are increasingly organized all over the world. Key victories include the case of Bogotá, where the Constitutional Court has required the local waste management plans to incorporate informal recyclers after a long legal battle.[20] The Goldman Prize awarded in 2013 to Nohra Padilla, one of the Bogotá Recyclers Association leaders, was a major victory in gaining global recognition and visibility. In India, cooperatives of waste pickers in Pune or Mumbai run waste collection and management services for the city with outstanding results.[21]

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16 WIEGO. (2012). *Urban Informal Workers and the Green Economy*. www.wiego.org/sites/wiego.org/files/resources/files/WIEGO_Urban_Informal_Workers_Green_Economy.pdf

17 For more information on waste pickers, see Samson, M. (2009). *Refusing to be Cast Aside: Waste Pickers Organizing Around the World*. Cambridge, USA: Women in Informal Employment: Globalizing and Organizing (WIEGO).

18 Chintan. (2009). *Cooling Agents. An Analysis of Greenhouse Gas Mitigation by the Informal Recycling Sector in India*. www.chintan-india.org/documents/research_and_reports/chintan_report_cooling_agents.pdf

19 Vilella, M. (2012, April). *The European Union's Double Standards on Waste and Climate Policy*. Global Alliance for Incinerator Alternatives. www.no-burn.org/eu-double-standards-on-waste-management-climate-policy

20 Yler, M. (2015). Case Study on Bogotá. In UNEP and ISWA (Eds.). *Global Waste Management Outlook*. www.eawag.ch/fileadmin/Domain1/Abteilungen/sandec/E-Learning/Moocs/Solid_Waste/W1/Global_Waste_Outlook_2015.pdf

21 Global Alliance for Incinerator Alternatives. (2012). *On the Road to Zero Waste. Successes and Lessons from Around the World*. www.no-burn.org/on-the-road-to-zero-waste-successes-and-lessons-from-around-the-world-2

In sum, workers who handle waste should therefore be fully integrated into the design, implementation, and monitoring processes, as it is the application of their skills and efforts which ultimately make the system function. Moreover, by prioritizing job creation in a zero waste circular economy, the significant investments necessary for creating incineration infrastructure can instead be redirected to developing re-use centres and networks, recycling infrastructure and clean renewable energy, all of which require more, better quality jobs than incineration and landfilling. In the EU, the job creation prospects related to the full implementation of the existing EU waste legislation is estimated to be up to 400,000 jobs.[22]

Ultimately, zero waste builds on democratic tradition and strong community action to determine the direction of waste management programs. Citizens need to be part of the very design of the plan, and a lengthy initial consultation process can pay off with better design and higher participation rates. Residents must actively participate in the programs by consuming sustainably, minimizing waste, separating discards, and, whenever possible, composting at home. They should also be given the chance to be active in monitoring the implementation of programs in their community.

Phasing out waste incineration and landfills

Open dumps, landfills, and incinerators (including so-called waste-to-energy facilities) are part of a shortsighted and outmoded way of thinking that views waste disposal as cheap because true costs are not taken into account. Waste-to-energy is often described as a good way to extract energy from resources, but in fact it works against the circular economy, producing toxic waste, air pollution and contributing to climate change – all without delivering what it promised. The costs of pollution, resource depletion, climate change, health problems, and human suffering are externalized onto the environment and people, including future generations.

Most importantly, burning waste is far from climate neutral. Incinerators actually emit more CO_2 (per megawatt-hour) than coal-fired, natural-gas-fired or even oil-fired power plants.

Denmark, the poster child of Europe's incineration industry, recently discovered that its incinerators were releasing twice the amount of CO_2 than originally estimated, which led the country to miss its Kyoto Protocol greenhouse gas reduction targets.[23]

In addition, incinerators are the most expensive method to generate energy and to handle waste, while also creating a significant economic burden for host cities.

22 Zero Waste Europe, et al. (2015, May 18). *Walking the Circle: The 4 guiding pillars for a Circular Economy*. https://zerowasteeurope.eu/2015/05/walking-the-circle/#_ftn7

23 Plastic surgery for Copenhagen's recycling policy. (2011, April 15). *Plastics Infomart*. www.plasticsinfomart.com/plastic-surgery-for-copenhagens-recycling-policy

The story of Copenhagen's infamous Amager Bakke incinerator is just an example.[24] There are many cases of municipalities that have ended up in debt because of incinerators, while others are trapped in long-term contracts compelling them to deliver a minimum quantity of waste for 20 to 30 years, to repay investment costs, even creating a situation of incineration overcapacity as is the case in many European countries.[25] On the other side of the Atlantic, the city of Harrisburg in Pennsylvania, due to financial costs of upgrading the city's incinerator in 2011, became the largest US city to declare bankruptcy.

Moreover, burning these valuable materials in order to generate electricity discourages efforts to preserve resources and creates incentives to generate more waste. It is typical for countries that encourage waste burning to have low recycling rates as a result, or high waste production. Data on household waste in Denmark clearly shows this trend, with the regions that have high incineration rates producing the highest amounts of waste per capita.

Ultimately, a zero waste circular economy moves societies away from waste disposal by setting goals and target dates to reduce waste going to landfills, abolishing waste incineration, establishing or raising landfill fees, shifting subsidies away from waste disposal and into discard recovery, and banning disposable products, among other interventions that contribute to ultimately setting a new direction away from waste disposal.

24 Nicastro, C. (2017, November 13). Copenhagen goes all in on incineration, and it's a costly mistake. *Zero Waste Europe*. https://zerowasteeurope.eu/2017/10/copenhagen-goes-all-in-on-incineration-and-its-a-costly-mistake

25 Muznik, S. (2017, October 31). «Deliver or pay», or how waste incineration causes recycling to slow down. *Zero Waste Europe*. https://zerowasteeurope.eu/2017/10/deliver-pay-waste-incineration-causes-recycling-slow

Quantitative analysis for GHG emissions savings

Research undertaken by Eunomia for European countries has suggested that even though much progress has already been made in respect of reducing climate change emissions from waste, «further savings of the order 100–200 million tonnes CO_2 equivalent could be made simply through conventional waste management approaches: conventional waste prevention measures could deliver more substantial reductions, whilst measures designed to achieve a circular economy could further enhance emissions reduction through reuse, repair and remanufacturing.

The level of these savings compares with the reported level of emissions from waste of around 143 million tonnes in 2012 for the EU under the waste chapter of the IPCC GHG inventory. Of this, around 100 million tonnes is related to solid waste management (the majority of the balance being due to waste water treatment). Consequently, it would appear that the potential for emissions reduction from waste prevention and management is likely to be of the order two times the reported level of emissions under the ‹waste› inventory».[26]

New analysis undertaken at a global level suggests that GHG emissions savings in the order of 900 million tonnes CO_2 eq. might be achieved by applying similar conventional waste management approaches to all countries across the globe – namely through increasing the recycling of materials such as paper, plastics and metals, alongside the collection and treatment of organic waste (including food). The basis for this estimate is data from the World Bank on global waste generation for 2025. It is further assumed that a recycling rate of 65 % is achieved by the lower income countries and 70 % by the high-income countries.[27] As with the above estimates for the European countries, further savings would be possible by applying waste prevention measures, as well as additional measures designed to achieve a circular economy (through reuse, repair and remanufacturing).

While data on repair and remanufacturing are relatively limited, the potential contribution from waste prevention activities can be considered in part with reference to the data shown in Figure 3 of this report. This shows that the emissions associated with the production of food that is wasted are around 4 tonnes CO_2 eq. – around 80 times that of organic waste treatment. The World Bank dataset indicates there will be over 950 million tonnes of organic waste in 2025 – much of which will

26 Eunomia. (2015). op. cit.

27 World Bank. (2012). *What a Waste: A Global Review of Solid Waste Management, Final Report*. https://openknowledge.worldbank.org/handle/10986/17388

be food waste. A 10 % reduction in the amount of organic waste produced would therefore result in similar emissions reductions figure to that obtained by improving conventional waste management techniques – in the absence of any other activities such as repair and remanufacturing. A 10 % reduction in each of the waste plastics and waste textiles streams could save another 150 million tonnes CO_2 eq.

The IPCC GHG inventory suggests that global emissions from waste are around 700 million tonnes CO_2 eq., excluding the waste water treatment impacts. However, only emissions from waste disposal – principally those relating to the landfilling of waste, and disposal of waste in incinerators without energy recovery – are recorded under the waste chapter of the inventory. As such, there is considerable further potential on a global scale to reduce emissions from the waste sector by following the approach set out above.

CONCLUSION

As explained in this chapter, a zero waste circular economy can be a game-changer to keep the planet under 1.5°C of global warming, and experience shows that this visionary future is far closer if we look beyond business-as-usual scenarios and similar conservative climate and energy policies. Unfortunately, some mainstream climate policies are effectively outdated and are preventing the greatest greenhouse gas emissions savings we could have in the waste and resource management sector. The zero waste (ZW) circular economy principles are increasingly being implemented around the world, and it is necessary that climate policies are upgraded and aligned with them, instead of applying double standards.

In the Global North, developed countries are shifting away from incineration and embracing zero waste paths. Europe, despite having some of the most advanced waste burning facilities, has taken a first step to phase out incinerators in the context of the EU Action Plan for the Circular Economy. In the US, no new incinerators have been built since 1997 due to resistance from the public, health risks and high costs. Moreover, hundreds of municipalities around Europe have now set zero waste as their new goal, with cities like Parma or Besançon taking the lead and implementing zero waste policies. Other cities, even without adopting a formal ZW commitment, are successfully implementing various elements of a wider zero waste strategy, such as Milan, which is spearheading kerbside collection and separation of food scraps in metropolitan areas. Barcelona, Paris, and Copenhagen have also implemented promising pilot projects in the same direction.

In the Global South, many innovative and visionary cities, with the support of recyclers' cooperatives and civil society, are engaging on a zero waste path too.[28] This is the case in San Fernando in the Philippines with 305,000 inhabitants, which stands out by achieving a 78 % diversion rate for waste from landfill while revitalizing the local recycling economy through a cooperative of recyclers. It's important that international climate finance learns from these success stories and prevents investments in the opposite direction.[29]

Ultimately, a zero waste circular economy will require policies to make it legally and economically viable to sell services instead of goods, to sell durable goods that are repairable, reusable and upgradable, to promote shared or leased ownership, and to have deposit and return programmes. In short, resource consumption should be discouraged in comparison with product service, maintenance and repair

28 Global Alliance for Incinerator Alternatives. (2012). op. cit.

29 Vilella, M. (2017). *Climate Finance for the Waste Management Sector – Guidance for Policy-Makers and Project Developers*. Zero Waste Europe. https://zerowasteeurope.eu/downloads/climate-finance-for-the-waste-management-sector

operations, which should become cheaper. This would mean taxation shifting from labour to resources, especially virgin resources, as this will help to increase employment and decrease resource use while incentivizing businesses to move towards circular production and consumption patterns.

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