



What is waste-to-energy incineration?

Waste-to-energy incineration is an industrial process in which waste is burnt in a furnace to produce heat. The heat is used to produce steam that drives a generator to produce electricity.¹ While many different types of waste streams could be incinerated in this way, one of the most damaging is incineration of mixed municipal solid waste. While not condoning or endorsing other types of incineration, the Regeneration NOT Incineration campaign is focused on seeking a ban on incineration of mixed municipal solid waste, specifically.

Why is waste incineration dangerous?

In the past, incinerators were highly polluting facilities that pumped huge volumes of toxic pollutants into the atmosphere and produced vast quantities of toxic ash. Today's incinerators are much cleaner and have better filters, but they're still not perfect. The process of burning waste produces cancer-causing chemicals called furans (a type of dioxin) and releases them, along with toxic elements like cadmium and mercury, into the atmosphere.²

Pollutants that escape smokestack filters settle on surrounding land where they can accumulate over time. Both dioxins³ and heavy metals like mercury⁴ have toxic effects on the human body, and are especially dangerous to unborn children. When they are ingested by animals, they contaminate dairy and meat. They can also wash off the land into our waterways where they pollute the fresh and marine water species. These toxins can then enter our bodies when we eat contaminated kai moana and kai awa.

Meanwhile, toxins, heavy metals and other persistent organic pollutants (POP) are not destroyed during the incineration process. Those that are not captured in filters, are released to pollute the air. The rest ends up in ash and slag. What does not escape up the chimney is commonly dumped in landfills.^{5 6} Over time, these toxins can then leach into the environment

¹ Perrot, J.F. & Subiantoro, A. (2018). Municipal Waste Management Strategy Review and Waste-to-Energy Potentials in New Zealand. *Sustainability*. 10. 3114. <https://doi.org/10.3390/su10093114>. (p.5).

² Ibid., p.5.

³ World Health Organisation. (2016). Dioxins and their effects on human health. Retrieved from <https://tinyurl.com/y654z6y9>

⁴ World Health Organisation. (2017). Mercury and Health. Retrieved from <https://tinyurl.com/y9ppgyf6>

⁵ Perrot, J.F. & Subiantoro, A. (2018). Municipal Waste Management Strategy Review and Waste-to-Energy Potentials in New Zealand. *Sustainability*. 10. 3114. <https://doi.org/10.3390/su10093114>.

⁶ Joseph, A.M. et al (2018) "The Use of Municipal Solid Waste Incineration Ash in Various Building Materials: A Belgian Point of View" *Materials (Basel)* 11(1). <https://doi.org/10.3390/ma11010141>

(all landfill liners fail eventually). Some countries use incinerator ash in roading and construction, requiring multiple treatment of the ash to attempt to remove pollutants.^{7 8}

Is all waste-to-energy technology bad?

Generally speaking, any facility that generates energy or fuel from waste represents a linear approach for dealing with hard-to-manage resources at the end of their useful life. However, our *Regeneration Not Incineration* campaign is opposed to the use of mixed municipal solid waste in any technologies that seek to recover energy at anything other than biological temperature and pressure.⁹ Globally, the linear model is increasingly being challenged because it destroys resources and perpetuates the production of problematic materials.

With this in mind, we believe that all waste-to-energy proposals should go through independent cost-benefit analyses and be carefully assessed on a case-by-case basis based on a range of criteria. This includes their propensity to produce toxic pollution; destroy non-renewable resources; burn fossil fuels or their by-products; and create unacceptable emissions for the amount of energy they produce. Such cost-benefit analyses should assess whether some of the claims made by proponents of waste-to-energy technologies even stack up.¹⁰ For example, recent studies of pyrolysis and gasification not only suggest these technologies are underdeveloped and expensive¹¹, they also present evidence showing that their claims for efficient energy generation often violate the fundamental laws of thermodynamics.¹²

Is waste-to-energy incineration an efficient way to produce electricity?

No. Incineration companies happily point out that the waste they burn would otherwise be sent to landfill. However, what they fail to mention is that household waste is an extremely inefficient fuel. The World Energy Council found that not only is waste-to-energy incineration an expensive means of generating energy,¹³ but kilogram for kilogram, burning waste can produce as little as ten per cent the energy of coal and seven per cent the energy of natural gas while producing many times the pollution.¹⁴ In Aotearoa, we generate about 85% of our electricity from renewable sources. The Government plans to increase that to 100% by 2035.

⁷ Perrot, J.F. & Subiantoro, A. (2018). Municipal Waste Management Strategy Review and Waste-to-Energy Potentials in New Zealand. *Sustainability*. 10. 3114. <https://doi.org/10.3390/su10093114>.

⁸ Joseph, A.M. et al. (2018) "The Use of Municipal Solid Waste Incineration Ash in Various Building Materials: A Belgian Point of View" *Materials (Basel)* 11(1). <https://doi.org/10.3390/ma11010141>.

⁹ See Zero Waste International <http://zwia.org/zwih/>

¹⁰ See, for example: GAIA. (2016). *Questions to ask when evaluating a "waste-to-energy" incinerator project or proposal* at <https://tinyurl.com/y2llghrd>

¹¹ Perrot, J.F., & Subiantoro, A. (2018). Municipal Waste Management Strategy Review and Waste-to-Energy Potentials in New Zealand. *Sustainability*. 10. 3114. <https://doi.org/10.3390/su10093114>.

¹² Rollinson, A. & Oladejo, J. (2019). 'Patented blunderings', efficiency awareness, and self-sustainability claims in the pyrolysis energy from waste sector. *Resources Conservation and Recycling*. 141. 232 - 242. <https://doi.org/10.1016/j.resconrec.2018.10.038>.

¹³ World Energy Council. (2016). *World Energy Resources 2016 - Waste to Energy*. (p.486). London: World Energy Council. Retrieved from <https://tinyurl.com/y2llghrd>

¹⁴ Ibid., p.457.

Waste-to-energy incinerators impede these renewable energy goals and undermine our commitment to a low emissions economy.¹⁵

Are incinerators better than landfills?

No. We have a common misconception that incinerators eliminate the need for landfills. While incinerators reduce the overall volume of the waste, they don't magically make waste disappear. All of the mass that goes into an incinerator must come out as waste incineration residues. These either discharge through the chimney as flue gases and dust particles when not captured by the filter; as waste water from wet flue gas filter devices where these are present; as fly ash discharged in the environment; slag; and boiler ash. If an incinerator is equipped with (wet) flue gas filter devices (scrubbers), various (solid) residues are produced, i.e. scrubber salts, filter cake, sludge, and gypsum. The residual product (about 10-15% of the original volume and 20-35% of the original weight) is generally disposed to landfills. Some countries are attempting to reuse the ash (e.g. as cement), but this requires expensive and underdeveloped processes that attempt to render the ash safe, given that it is full of chlorides, heavy metals and other persistent organic pollutants.¹⁶

Regardless, the real issue is not whether incinerators are better or worse than landfills. The real issue is our ongoing production of waste that requires disposal in such facilities. Both landfills and incinerators are central components of a 'take-make-use-dispose' linear economy. They're end-of-pipe technologies to 'get rid of waste' rather than top-of-the-pipe approaches to reduce waste, conserve resources and lower greenhouse gas emissions. Incinerators and landfills burn and bury valuable resources we could have repurposed, reused, recycled or composted. Neither solves the problem of the linear economy and neither can be classed as zero waste solutions.¹⁷

So what is the solution to our waste problems?

We know New Zealand has a waste problem. Since 2009 our waste generation has increased by 35%.¹⁸ Meanwhile, our recycling system is in 'crisis' due to restricted international markets for certain plastics, and contaminated paper and cardboard.¹⁹ We have to change the way we do things. Incinerators and landfills are not solutions. They are bandaids on a broken system.

¹⁵ Wilson, D. & Hogg, D. (2018). Waste to Energy - a hot topic. *Revolve Magazine* (Oct 2018). Retrieved from <https://tinyurl.com/y4n1cqvx>

¹⁶ Joseph, A.M. et al. (2018) "The Use of Municipal Solid Waste Incineration Ash in Various Building Materials: A Belgian Point of View" *Materials (Basel)* 11(1). <https://doi.org/10.3390/ma11010141>

¹⁷ Envision New Zealand. (2003). *Getting There! The Road to Zero Waste: Strategies for Sustainable Communities*. Auckland: Zero Waste New Zealand Trust. Retrieved from <https://tinyurl.com/y5s2g2hf> p.6.

¹⁸ Ministry for the Environment. (2017). *Review of the Effectiveness of the Waste Disposal Levy 2017*. Wellington: Ministry for the Environment.

¹⁹ WasteMINZ. (2018). *Rebooting Recycling: What can Aotearoa do?* Retrieved from <https://tinyurl.com/y4qze9om>

As we look to the future, we need to embrace the zero waste approach and build a regenerative, circular economy to design out waste.²⁰ We should follow the waste hierarchy (see below) to prevent and reduce waste in the first place, and prioritise strategies to reuse, recycle, and compost resources, over strategies that destroy resources instead (i.e. incinerators and landfills). The more resources we can preserve in this way, the less we need to mine and extract new raw materials for new products (the most environmentally damaging part of the production phase).

Not only does this approach reduce our waste problem from the get-go, it also generates more jobs and offers the greatest wins from a climate change perspective. A 2015 report by Eunomia found that waste prevention and actions at the top of the waste hierarchy (such as reductions in waste or reuse systems) had the highest potential for reducing climate change impacts when compared with actions at the bottom of the waste hierarchy (disposal and incineration).²¹



This zero waste approach sounds all well and good, but is it even possible?

²⁰ Envision New Zealand. (2003). *Getting There! The Road to Zero Waste: Strategies for Sustainable Communities*. Auckland: Zero Waste New Zealand Trust. Retrieved from <https://tinyurl.com/y5s2g2hf> p.6.

²¹ Ballinger, A. & Hogg, D. (2015). *The Potential Contribution of Waste Management to a Low Carbon Economy*. Bristol, United Kingdom: Eunomia Research and Consulting. Retrieved from <https://tinyurl.com/yxu36hwt>.

Yes! Kick starting the zero waste, circular economy in Aotearoa requires us to:

1. **Invest in better systems for collecting and sorting our rubbish** to salvage as many resources as possible so that, rather than creating mixed waste streams, we have single material streams that are more easily put to highest resource use (i.e. reusing, composting, and recycling). We can do this through establishing and funding a network of resource recovery and recycling centres while introducing supporting policies, like bans on landfilling recyclable or compostable waste, and the development of container deposit schemes and food waste collection services that help keep material streams separate.²²
2. **Phase-out the use of problematic materials** that we would otherwise burn in a waste-to-energy incinerator or bury in the ground, such as single-use disposable plastics and multi-layer food packaging, using New Zealand's Waste Minimisation Act 2008.²³
3. **Support the Government's proposal to create regulated product stewardship schemes** for different products. Such schemes put greater responsibility on manufacturers to manage their waste rather than forcing individuals and councils to fund disposal of badly-designed products. Schemes can include minimum reuse and recycling targets, fees on problematic packaging, and other incentives for manufacturers to redesign their products to be less wasteful and invest in new ways of getting goods to consumers (like reusable packaging and refill stations).²⁴

Are incinerators temporary solutions for getting rid of plastic waste until we work out something better?

NO. Large-scale waste-to-energy incinerators for municipal solid waste are expensive to set up and require a return on investment - a long-term proposition. Once built, most large-scale modern incinerators require a consistent inflow of about 100,000 tonnes of municipal solid waste a year. Councils sign long-term contracts requiring them to deliver a minimum quantity of waste for 20 to 30 years. If they do not meet the minimum, they must pay fees to compensate the incinerator company for lost profits. Therefore, waste-to-energy incineration locks councils into an outdated way of wasting valuable, non-renewable resources,²⁵ and disincentivise strategies to reduce, reuse or recycle waste because this would leave nothing to burn.²⁶

²² Envision New Zealand. (2003). *Getting There! The Road to Zero Waste: Strategies for Sustainable Communities*. Auckland: Zero Waste New Zealand Trust. Retrieved from <https://tinyurl.com/y5s2g2hf>

²³ Blumhardt, H. (2018). Trashing Waste: Unlocking the Wasted Potential of New Zealand's Waste Minimisation Act. *Policy Quarterly* 14(4); and Blumhardt, H. (2019). *Implementing the Plastic-Free New Zealand Action Plan: A Policy Paper from Greenpeace New Zealand*.

²⁴ Blumhardt, H. (2018). Trashing Waste: Unlocking the Wasted Potential of New Zealand's Waste Minimisation Act. *Policy Quarterly* 14(4); and Blumhardt, H. (2019). *Implementing the Plastic-Free New Zealand Action Plan: A Policy Paper from Greenpeace New Zealand*.

²⁵ United Nations Environmental Programme. (2019.) *Waste to energy: Considerations for informed decision making*. Retrieved from <https://wedocs.unep.org/handle/20.500.11822/28413?show=full> p.9.

²⁶ Ibid., p.34.

But I've heard that the Nordic countries use waste-to-energy incineration and that it's great!

The Nordic approach to waste-to-energy incineration is often touted as an environmental success, but in reality it reduces recycling and disincentivises waste reduction. In 2017, the European Commission stated that waste-to-energy incinerators create “infrastructural barriers” to actions higher up the waste hierarchy and must be carefully assessed in light of the continent’s circular economy vision. The Commission advised EU countries with existing waste-to-energy incineration facilities (such as the Nordic countries) to phase-out their reliance on these, place a moratorium on new facilities, and invest in waste prevention, reduction, reuse and separate collection and recycling instead. The Commission also discouraged countries without waste-to-energy incineration facilities from building new ones.

²⁷

Furthermore, a 2019 study commissioned by the Nordic Council of Ministers found that Nordic countries will not achieve key elements of the EU circular economy package unless they reduce their reliance on waste-to-energy incineration. The report recommended a shift away from incineration towards policies shown to reduce waste generation, including a packaging tax, recycling and recovery rate targets, landfill bans on biodegradable waste, deposit return schemes and extended producer responsibility (i.e. product stewardship).²⁸

Don't waste-to-energy plants burn the stuff we can't do anything else with?

No. Several studies have shown that overseas waste-to-energy incinerators burn mostly recyclable or compostable waste.²⁹ In New Zealand, council analyses of the average household rubbish bag repeatedly reveal that most of what we throw out is recyclable or compostable.³⁰ Incinerating materials that can be recycled or composted violates the waste hierarchy, is energy inefficient, and represents a loss of resources and a massive opportunity-cost.³¹ Rather than investing in an incineration plant, we should invest in better separation of waste streams to allow for greater recycling and composting of these materials that might otherwise be burnt or landfilled.

Is it true that waste incinerators produce jobs?

²⁷ European Commission. (2017). *The Role of Waste-to-Energy in the Circular Economy* (Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions). Retrieved from <http://ec.europa.eu/environment/waste/waste-to-energy.pdf>

²⁸ Papineschi, J. et al. (2019). *Analysis of Nordic regulatory framework and its effect on waste prevention and recycling in the region*. Copenhagen, Denmark: Nordic Council of Ministers. Retrieved from <https://tinyurl.com/yywmlsv>

²⁹ United Nations Environmental Programme. (2019). *Waste to energy: Considerations for informed decision making*. (n.p.). Retrieved from <https://wedocs.unep.org/handle/20.500.11822/28413?show=full> p.34.

³⁰ See any local authority Waste Assessment completed as part of the Waste Management and Minimisation Plan process.

³¹ United Kingdom Without Incineration Network. (2018). *Evaluation of the Climate Change Impacts of Waste Incineration in the United Kingdom*, (n.p.). Retrieved from <https://tinyurl.com/yyu8us8c>

Incineration corporations love to tell us that waste incinerators create jobs. However, an EU social enterprise reuse, repair and recycling group called RREUSE recently looked into that and found that for every job an incinerator creates, recycling centres can create up to 36 jobs, and reuse activities can create up to 296 jobs.³² Other studies have found that recycling creates at least ten times more jobs than landfilling or incineration.³³ ³⁴ Resource recovery and recycling services could become the fastest growing sector if our country choose to take significant steps towards a circular economy. Incinerators destroy this potential.

Don't incinerators reduce greenhouse gas emissions?

No. Simply switching from landfills to incinerators has limited climate change benefits, given that the biggest potential for greenhouse gas abatement comes from actions higher up the waste hierarchy.³⁵

It is true that incinerators produce negligible levels of methane. However, they produce vast amounts of CO₂. Each tonne of municipal solid waste burnt in an incinerator produces up to 1.2 tonnes of carbon dioxide.³⁶ ³⁷ In effect, incinerators convert waste directly into greenhouse gas. Life-cycle assessments that include biogenic CO₂ emissions show that burning municipal solid waste produces more CO₂ emissions than burning fossil fuels (and calculations that exclude sources of CO₂ emissions from the burning of compostable material are increasingly discredited).³⁸ Right now, the world is urgently seeking ways to reduce our climate change emissions. Waste-to-energy incinerators compromise any steps toward this goal.

Undoubtedly, methane production from landfills is a problem. While modern landfills have methane capturing systems, methane production can be avoided altogether through a zero waste approach. Methane from landfills is largely avoidable because it comes from organic waste (food waste, green waste, paper, cardboard and timber) breaking down in landfills' anaerobic conditions. The solution is to ensure these materials cease to be part of the waste stream. The solution is not to burn organic waste along with plastics and other materials in an incinerator and turn it into CO₂. Removing organic materials from the waste stream means

³² RREUSE. (2015). *Re-use has higher employment potential than recycling*. Retrieved from <https://www.rreuse.org/re-use-has-higher-employment-potential-than-recycling/>

³³ Zero Waste Europe. (2017). 4 reasons why recycling is better than incineration. Retrieved from <https://zerowasteurope.eu/2017/09/4-reasons-why-recycling-is-better-than-incineration/>

³⁴ Envision New Zealand. (2003). *Getting There! The Road to Zero Waste: Strategies for Sustainable Communities*. Auckland: Zero Waste New Zealand Trust. Retrieved from <https://tinyurl.com/y5s2g2hf>

³⁵ Ballinger, A. & Hogg, D. (2015). *The Potential Contribution of Waste Management to a Low Carbon Economy*. Bristol, United Kingdom: Eunomia Research and Consulting. Retrieved from <https://tinyurl.com/yxu36hwt> p.10.

³⁶ Johnke, B. et al. (1999). Emissions from waste incineration. Background paper for expert meeting on Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories: Emissions from Waste. IPCC/OECD/IEA National Greenhouse Gas Inventories Programme. (n.p.). Retrieved from https://www.ipcc-nggip.iges.or.jp/public/gp/bgp/5_3_Waste_Incineration.pdf

³⁷ United Nations Environmental Programme. (2019). *Waste to energy: Considerations for informed decision making*. Retrieved from <https://wedocs.unep.org/handle/20.500.11822/28413?show=full>, p.40.

³⁸ Ibid.

they will be composted, turned into soil and returned to the land to regenerate it. And NZ needs to regenerate its soil. A 2018 report presents the dire status of our soil quality as a result of soil erosion and intensive agriculture.

Aren't incinerators supposed to be a renewable energy?

The European Union classified incinerators as a form of renewable energy to help EU countries meet their climate change commitments.³⁹ To achieve renewable energy status, more than half the waste stream fed into an incinerator must be biological material. Aside from being a terrible use for these nutrients that feed our environment, biological material is a really inefficient fuel that needs to be bulked up with large quantities of plastic and paper to make it burn. And we all know that plastic is made from oil.

A growing number of experts are criticising the classification of biological waste as renewable or carbon neutral and questioning the removal of biological waste when calculating CO2 emissions from waste incinerators.⁴⁰

In New Zealand, 85% of the energy produced in our electricity grid is from renewable sources. So, for us, waste-to-energy incineration would displace true renewable energy generation.⁴¹ Proponents argue that waste-to-energy could be used instead of burning coal for the remaining 15 percent. However, municipal solid waste incineration produces more CO2 than coal when biological materials are not excluded from the emissions assessment.^{42 43}

Added to this, the idea that we can produce renewable energy by destroying non-renewable resources is, at best, greenwash propaganda and spin. Governments, businesses and communities everywhere are looking for ways to protect valuable non-renewable resources through reuse, repair, refurbishing, recycling and composting activities. Burning these resources in an incinerator directly contradicts these efforts.

The answer is not to keep burning coal or to burn rubbish instead, but rather to decarbonise this last non-renewable portion of our electricity grid by switching to truly renewable sources. This is consistent with zero waste goals which promote proper adherence to the waste hierarchy meaning we have less and less waste to burn over time.⁴⁴

³⁹ Confederation of European Waste to Energy Plants. (n.d.). *How much energy does Waste-to-Energy produce? Is it renewable?* Retrieved from <https://tinyurl.com/y5f6523y>

⁴⁰ United Nations Environmental Programme. (2019). *Waste to energy: Considerations for informed decision making*. Retrieved from <https://wedocs.unep.org/handle/20.500.11822/28413?show=full> p.40.

⁴¹ Wilson, D. & Hogg, D. (2018). Waste to Energy - a hot topic. *Revolve Magazine (Oct 2018)*. Retrieved from <https://tinyurl.com/y4n1cqvz>

⁴² United Nations Environmental Programme. (2019). *Waste to energy: Considerations for informed decision making*. (n.p.). Retrieved from <https://wedocs.unep.org/handle/20.500.11822/28413?show=full> p.40.

⁴³ see calculations without removing biological material in International Energy Agency. (n.d.). *Municipal Solid Waste and its Role in Sustainability*. Retrieved from <https://tinyurl.com/y4xfvkv>

⁴⁴ Ballinger, A. & Hogg, D. (2015). *The Potential Contribution of Waste Management to a Low Carbon Economy*. Bristol, United Kingdom: Eunomia Research and Consulting. Retrieved from <https://tinyurl.com/yxu36hwt> p.11.

Why are incineration corporations targeting Aotearoa New Zealand?

Markets for incinerators around the world are drying up as countries get serious about tackling climate change and zero waste.⁴⁵ In fact, incinerators are being shut down in communities across the world because of the pollution they create and the fact they are incompatible with the circular economy. Here in Aotearoa New Zealand we've been slow off the mark with climate legislation and waste policies. As a result, companies have come here to lock in incineration facilities before our climate legislation and more progressive waste policy proposals come into force.

Which places have plans for incinerators?

At present, we're aware of two proposals to build incinerators: one in Hokitika and the other in Huntly. However, Wellington City Council has included incineration as a potential replacement for its Southern Landfill which is nearing the end of its useful life. Several mayoral candidates in Auckland had also endorsed incineration as an option. We are aware that councils, iwi and other groups around the country have been approached by waste-to-energy companies. Check with your council about whether they plan to build an incinerator in your neighbourhood.

What can you do to stop incinerators being built?

- You can join us by adding your signature to [our petition](#)
- You can find out more about the circular economy in Aotearoa New Zealand [here](#)
- [If an incinerator company invites you to a meeting to discuss establishing a plant in your community, here are some questions you can ask.](#)
- The Ellen MacArthur Foundation has released a wide range of resources [here](#)

⁴⁵ United Nations Environmental Programme. (2019). *Waste to energy: Considerations for informed decision making*. Retrieved from <https://wedocs.unep.org/handle/20.500.11822/28413?show=full> p.13.