

# International Policy Overview of Organic Waste Bans to Landfill

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## Introduction

The aim of this project was to provide a comprehensive overview of countries, states, and prominent cities that have implemented organics bans in landfills as at March 2024. This research was undertaken in response to the growing interest in implementing similar bans in Aotearoa New Zealand, aligning with local initiatives to achieve net zero carbon emissions by 2050 (Action 15.4 of Aotearoa New Zealand's first emissions reduction plan).<sup>1</sup>

Food waste (FW) is a global issue, with experts estimating that roughly one third of all food produced goes uneaten. Organic materials, such as FW, produce methane, a greenhouse gas approximately 28 times more potent than carbon dioxide. Given the mammoth amounts of FW generated, and the harmful consequences to our environment, preventative strategies are being discussed at every echelon of society, including numerous legislative measures, on how to improve FW management and practices.

The purpose of this project was to:

- Compile a list of countries which have introduced some form of an organics ban to landfill.
- Identify their scope, results and any additional, relevant information about the ban.
- Create a conclusion of the most effective strategies used globally to enforce or to complement the enforcement of the landfill bans.

Two tables have been developed to categorise the diverse organic waste bans worldwide. Table 1 describes the international policies in place across various countries while Table 2 describes localities that are intending to or have previously attempted to implement policy. As outlined by the Landfill Ban Investigation, this is often done by source, type or property.<sup>2</sup>

- Waste Source: Where the source or waste stream is used as the basis to define the ban. For example, landfill bans could apply to waste from household or municipal solid waste (MSW), commercial and industrial or construction and demolition sources.
- Waste type: Where a specific waste type is identified, often accompanied by a defined level of material 'recoverability' or level of 'waste treatment' that will have a direct influence on the potential for material recovery of the waste.
- Waste property: Where the ban is based on particular physical or biological properties of the waste, which may include combustibility, biodegradability or total organic carbon (TOC) value.

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## List of abbreviations

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<b>Abbreviation</b>	<b>Definition</b>
BMW	Biodegradable Municipal Waste
CE	Circular Economy
EEA	European Environment Agency
EU	European Union
FW	Food Waste
GHG	Green House Gases
LOI	Loss on Ignition
MBT	Mechanical-Biological Treatment
MSW	Municipal Solid Waste
PAYT	Pay-As-You-Throw
TOC	Total Organic Carbon
VBWF	Volume-Based Waste Fee
WBFWF	Weight-Based Food Waste Fee

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Table 1: International policy overview of organic bans to landfill

Place	Organic Ban Details				Diversion results of Organic Waste	Additional Instruments/Comments
	Name	Year Enacted	Target/Scope	Food Waste Specifics		
<b>Canada</b>	Canada does not have any nation-wide organics ban, however Nova Scotia (state), Prince Edward Island (state), and Vancouver (city) have an organics ban. Ontario (state) and Montreal (city) are considering the introduction of a organics ban in the near future (see, Table 2).					
<b>Nova Scotia, NS (State)</b>	Solid Waste-Resource Management Regulations (SWRMR, 1996), enabled under the Nova Scotia Environment Act (1994-95). <sup>3</sup>	1998. <sup>4</sup>	All combustible organic material. <sup>5</sup>	FW included in ban on all organic waste.	By 2000, NS was the first Canadian state to meet the Canadian-wide goal of 50% diversion, set out in 1995 under the solid waste management strategy. <sup>6</sup>  In surpassing this goal, NS set to further reduce the solid waste disposal rate to ≤300kg/person per year by 2020. This ambitious goal was not met. <sup>3</sup>	In addition to the landfill ban, NS uses a landfill levy, producer responsibility measures, Pay-As-You-Throw (PAYT), material recovery depots, education (to establish waste-separation standards) and related management facilities to decrease the incentive for landfilling organic waste. <sup>7</sup>  <sup>8</sup> Another initiative includes mandating clear plastic bags to allow waste collectors to visually check each bag as they collect it. <sup>7</sup>

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<b>Prince Edward Island, PEI (State)</b>	Environmental Protection Act in 2002 (GPEI, 2022). <sup>6</sup>	1998. <sup>4</sup>	All organic waste.	Specified food scraps to include meat, fish, dairy products and bones are included in the ban on all organic waste. <sup>9</sup>	In 2020, Prince Edward Island reported diverting 54% of all organic waste, equating to 129 kg per person. <sup>10</sup>	<p>Unique to the Canadian provinces, PEI doesn't have an overarching plan or strategy specific to waste.<sup>10</sup></p> <p>PEI set the ongoing goal to divert more waste per person from landfill than any other Canadian province.<sup>11</sup> This was achieved in 2014, though recent statistics are not available to confirm its continuation.<sup>12</sup></p>
<b>Vancouver (City)</b>	Solid Waste By-Law NO. 8417. <sup>13</sup>	2015. <sup>14</sup>	All organic material, including food scraps. <sup>14</sup>	Food scraps included in the ban.	401,890 tonnes of yard waste and FW have been diverted in 2021. <sup>15</sup>	The organics disposal ban is enforced the same as the region's other disposal bans. Waste is inspected when it is delivered to a regional disposal facility. If a waste load contains excessive amounts of food scraps, the hauler pays a surcharge of 50% on the cost of disposal. <sup>16</sup>

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<b>European Union (EU) - Member States (27)</b>	The Landfill Directive (1999/31/EC) <sup>17</sup>	1999. <sup>18</sup>	<p>According to the Directive 1999/31/EC on landfill of waste, member states must reduce the amount of BMW going to landfill</p> <ul style="list-style-type: none"> <li>to 75 % of the total amount of BMW generated in 1995 by 2006;</li> <li>to 50 % of 1995 levels by 2009; and</li> <li>to 35 % of 1995 levels by 2016.</li> </ul>	The Directive does not currently include any firm declarations toward organic bans to landfill, but rather focuses on the concept of the circular economy (CE) and its assisting policies. <sup>19</sup>	No condensed data on total EU FW diversion results.	<p>The Directive limits the landfilling of municipal waste to 10% of the generated municipal waste by 2035.</p> <p>Increasing pan-European policy dimensions is resulting in many EU members embedding their national policies on the Directive.<sup>20</sup></p>  <p>The diagram is a triangular pyramid titled 'Waste hierarchy'. From top to bottom, the levels are: PREVENTION (with a globe icon), PREPARING FOR RE-USE (with a circular arrow icon), RECYCLING (with a recycling symbol icon), RECOVERY (with a truck icon), and DISPOSAL (with a trash can icon). To the right of the pyramid, there are two labels: 'PRODUCT (NON-WASTE)' at the top and 'WASTE' at the bottom, with arrows indicating the flow from product to waste.</p>

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<b>Austria</b>	Landfill Ordinance, Federal Law Gazette II No. 291/2016. <sup>22</sup>	2004. <sup>23</sup>	All organic waste streams with TOC content >5%. All waste has to be pre-treated by MBT or incineration before landfilling. <sup>24</sup>	If TOC >5%, FW included in ban (no specific FW regulation).	Austria met its target by achieving 0% BMW landfilled in 2016, fulfilling the goal set by the EU landfill directive of reducing it to 35% of the generated amount in 1995. <sup>25</sup>	In addition to the landfill ban, Austria uses a landfill tax, incineration tax, producer responsibility measures, PAYT and mandatory separate collection systems to decrease the incentive for landfilling organic waste. <sup>2</sup>
<b>Belgium</b>	Belgium's ban on organic waste landfilling varies by region: Brussels capital region has a complete ban, while Flanders and Wallonia each enforce their own regulations. Overall, Belgium prohibits organic waste from being sent to landfills, despite regional differences in policies. Belgium is safely on track to meet its target, achieving 0.8%-1.1% BMW landfilled for 2017-2022, fulfilling the goal of reducing it to 35% of the generated amount in 1995 by 2035. <sup>26</sup>					
<b>Brussels Capital Region (State)</b>	Not applicable.	Not applicable.	The Brussels Capital Region lacks landfills; hence, no landfill ban is enforced. <sup>26</sup>	Not applicable.	Not applicable.	Not applicable.
<b>Flanders (State)</b>	VLAREMA-regulation. <sup>27</sup>	2007. <sup>26</sup>	All combustible waste streams with a TOC >6% and loss on ignition (LOI) >10% (2000), and all biodegradable waste streams (2007). <sup>26</sup>	If TOC >6%, FW included in ban (no specific FW regulation).	Over a 10-year period, since the introduction of the landfill ban, Flanders saw a decrease from 25% to 3% of waste to landfill. <sup>2</sup>	The landfill ban added to the existing landfill tax and incineration tax. This hierarchises the preferred methods of disposal from sorting and recycling, to incineration, to landfilling. However, the

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<b>Wallonia (State)</b>	Legislative name unknown.	2007. <sup>26</sup>	All combustible waste streams with a TOC >6% (2004), and all biodegradable waste streams (2007). <sup>26</sup>	If TOC >6%, FW included in ban (no specific FW regulation).  Wallonia developed the REGAL plan to target various points along the food chain with the intent of decreasing food loss and waste by 30% from 2015-2025. <sup>28</sup>	Specific data unknown.	reduction in landfilling has meant an increase in incineration rates due to lacking technology and infrastructure creating a mutual exclusivity of the latter options. <sup>26</sup>
<b>Denmark</b>	Legislative name unknown.	1997. <sup>29</sup>	All recyclable and combustible waste. <sup>30</sup>	If recyclable and combustible, FW included in ban (no specific FW regulation).	The landfilling rate of Denmark remains around 1%. Denmark met its target by achieving 0% BMW landfilled for 2019, fulfilling the goal of reducing it to 35% if the generated amount in 1995. <sup>30</sup>	The low landfilling rates relative to Europe can be attributed to both the landfill ban and landfill tax, as well as the high incineration capacity, easing the barriers of diversion. <sup>30</sup>  Enforcement includes fines and imprisonment. <sup>2</sup>



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<b>Estonia</b>	Regulation of Ministry of the Environment (MoE) 29.04.2004, No 38 (RTL 2004, 56, 938). <sup>31</sup>	2008. <sup>32</sup>	All untreated and unsorted waste including MSW. <sup>31</sup>	FW included in ban if untreated and unsorted (no specific FW regulation).	Estonia is on track to meet its target by achieving 9% BMW landfilled for 2019, fulfilling the goal of reducing it to 35% of the generated amount in 1995. <sup>33</sup>	Other fiscal policies including a landfill tax, municipal waste user charge, PAYT, packaging tax, penalties and fines all contribute to the effectiveness of the ban. Public acceptance is lacking and requires further attention to be more effective. <sup>31</sup>
<b>Finland</b>	Government Decree on Landfills 331/2013 – Prohibiting Landfill of Organic Waste. <sup>34</sup>	2016.	All organic and biodegradable waste with TOC >10% <sup>35</sup>	If TOC >10%, FW included in ban (no specific FW regulation).	Finland met its target by achieving 3% BMW landfilled for 2016, and 1% for 2017, 2018 and 2019, fulfilling the goal of reducing it to 35% of the generated amount in 1995. <sup>36</sup>	While exemptions have been outlined in the decree, Finish authorities claim that these have not been widely applied to municipal waste. <sup>36</sup>  Statistics suggest that the most significant reduction in landfilling between recorded 1997 and 2016 is from the landfill tax. <sup>34</sup>

<p><b>France</b></p>	<p>LOI n° 2016-138 du 11 février 2016 relative à la lutte contre le gaspillage alimentaire.<sup>37</sup></p>	<p>2002.</p>	<p>Establishment of an anti-food waste action hierarchy in the following order:</p> <ul style="list-style-type: none"> <li>• FW prevention through discounts and awareness raising: <ul style="list-style-type: none"> <li>• Donation to charity organisations</li> <li>• Animal feed</li> <li>• Composting or anaerobic digestion</li> <li>• Disposal</li> </ul> </li> <li>• Obligation to establish a partnership with a charity organisation to donate unsold food products, for supermarkets of more than 400 m2</li> </ul> <p>Food retailers are forbidden to destroy unsold food products still fit for consumption.<sup>38</sup></p>	<p>FW is collected via separate door-to-door collection and bring points in cities and towns and suburbs, and in rural areas via bring points. However, this process is not common.<sup>38</sup></p>	<p>France met its target by achieving 15% BMW landfilled for 2016, fulfilling the goal of reducing it to 35% of the generated amount in 1995.<sup>39</sup></p>	<p>Sorting at the source has been a vital pre-treatment tool to prevent waste reaching the landfills.<sup>40</sup></p> <p>This is supported by a landfill tax which differs by landfill classifications. France plans to increase its landfill tax by 2025. An emphasis to diverting to recycling has been incentivized by a municipal waste incineration tax.<sup>39</sup></p>
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<b>Germany</b>	Commonly referenced as “Landfill Ordinance”, <sup>41</sup> may vary legislatively.	2005.	All organic waste streams with TOC >3%. <sup>42</sup>	If TOC >3%, FW included in ban (no specific FW regulation).	Germany met its target by achieving 0% BMW landfilled for 2016, fulfilling the goal of reducing it to 35% of the generated amount in 1995. <sup>42</sup>	In addition to the landfill ban, Germany uses PAYT and mandatory separate collection systems to decrease the incentive for landfilling. <sup>2</sup>
<b>Hungary (Partial Ban)</b>	Decree No. 385 of 2014 (XII. 31.) Korm of the Government concerning the conditions of providing waste management public service. <sup>43</sup>	2003. <sup>44</sup>	All hazardous waste streams including waste tyres, shredded rubber and partially organic wastes. <sup>44</sup>	No specific FW regulation.	The European Environment Agency (EEA) reported that Hungary has not met its 2016 target, instead landfilling 28% BMW landfilled for 2019, failing to reduce it to 35% of the generated amount in 1995. <sup>44</sup>	Unsure why the ban is only considered partial.  Partial ban referenced in the EEA’s Country fact sheet – Hungary (Early warning assessment related to the 2025 targets for municipal waste and packaging waste), the EEA’s Municipal Waste Management in Hungary and CEWEP MSW. <sup>44,45,46</sup>

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<b>Lithuania</b>	Law on Waste Management (No. VIII-787). <sup>47</sup>	2003. <sup>48</sup>	All untreated municipal waste and all biodegradable waste from gardens, parks and green areas. <sup>49</sup>	FW included in ban (no specific FW regulation). <sup>47</sup>	The EEA reported that Lithuania has eventually met its target by achieving 3% BMW landfilled for 2019, fulfilling the 2016 goal of reducing it to 35% of the generated amount in 1995. <sup>49</sup>	In addition to the landfill ban, Lithuania uses a landfill tax, producer responsibility measures, PAYT and some mandatory separate collection systems to decrease the incentive for landfilling organic waste.  The lack of an incineration tax, and the increased investment in incineration infrastructure has meant much of the waste is diverted to incineration. <sup>2</sup>
<b>Luxembourg</b>	Specific policy name not retrieved.	Specific year not mentioned	Ban on untreated MSW and organic waste (TOC > 5%). <sup>50</sup>	If TOC >5% or is untreated MSW, FW included in ban (no specific FW regulation).	The EEA reported that Luxembourg met its target by achieving 5% BMW landfilled in 2016, fulfilling the goal of reducing it to 35% of the generated amount in 1995. <sup>50</sup>	According to the EEA's early warning assessment for Luxembourg, the effect of municipal waste reduction cannot yet be fully assessed as no reliable data on the average loss rates for Luxembourg are available. This has been attributed to the application of new calculation rules. <sup>50</sup>

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<b>Netherlands</b>	Commonly referenced as “Decree Landfill and Waste Disposal Bans”, <sup>51</sup> may vary legislatively.	1995. <sup>52</sup>	35 waste streams, including all combustible and biodegradable waste, with TOC >5%. <sup>52</sup>	If TOC >5%, FW included in ban (no specific FW regulation).	The EEA reported that the Netherlands met its target by achieving 2% BMW landfilled in 2016, fulfilling the goal of reducing it to 35% of the generated amount in 1995. <sup>53</sup> It is reported that the successful outcomes are the result of both the landfill ban and landfill tax (1995), which has been marginally increasing since its implementation. <sup>53</sup>	Currently, there are over 60 waste streams captured in the organic ban to landfill. <sup>52</sup>
<b>Norway</b>	Waste Regulations (2004) – Chapter 9, Landfill bans for waste types (includes landfill ban on biodegradable waste – introduced 2009). <sup>34</sup>	2009.	All biodegradable waste streams with a TOC >10%. <sup>54</sup>	If TOC >10%, FW included in ban (no specific FW regulation). Up to 70% of municipalities offer separate collection of biowaste. FW collections are door-to-door. <sup>34</sup>	Despite the overall decline in landfilling, the waste generation and waste recycling rates have remained stable since 2008. Instead diversion to waste incineration has increased. <sup>34</sup>	The landfill ban joined the existing policy initiatives, landfill Tax (1999) and incineration tax (1999). The incineration tax was abolished a year after the landfill ban was introduced suggesting a mutual exclusivity. <sup>34</sup>

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<b>Poland</b>	Specific policy name not retrieved.	2013. <sup>44</sup>	All biodegradable waste collected separately. All combustible waste with > 5 % TOC, >8% LOI, Calorific value > 6MJ/kg (2016). <sup>44</sup>	If TOC >5%, LOI >8%, or Calorific value >6MJ/kg, FW included in ban (no specific FW regulation). <sup>55</sup>	The EEA reported that Poland met its target by achieving 13% BMW landfilled in 2016, fulfilling the goal of reducing it to 35% of the generated amount in 1995. <sup>55</sup>	Poland is at risk for not meeting the 2035 target to reduce the amount of municipal waste landfilled to 10% or less of the total amount of municipal waste generated. <sup>55</sup>
<b>Slovenia</b>	Decree on waste landfill (Official Gazette of the Republic of Slovenia, no. 10/2014 and 54/15). <sup>56</sup>	2011. <sup>57</sup>	All BMW streams based on calorific content and TOC. <sup>57</sup> (No mention of limits for calorific content and TOC)	FW included in ban (no specific FW regulation).	The EEA reported that Slovenia eventually met its target by achieving 15% BMW landfilled in 2019 (four-year derogation period), fulfilling the goal of reducing it to 35% of the generated amount in 1995. <sup>57</sup>	No additional comments
<b>Sweden</b>	Sveriges riksdag, 2001, Förordning (2001:512) om deponering av avfall (SFS). <sup>58</sup>	2005. <sup>59</sup>	All organic waste streams. <sup>59</sup>	Up to 85% of municipalities provide door-to-door collection services for FW, even in high-rise buildings, as part of their separate waste collection systems. <sup>60</sup>	The combination of the landfill ban and the landfill tax which was introduced in 1999 (including several increases) has fostered a successful diversion of waste from landfills. However, there remains a strong reliance on incineration to maintain this effect. <sup>60</sup>	In addition to the landfill ban, Sweden uses a landfill tax, incineration tax, producer responsibility measures, PAYT and mandatory separate collection systems to decrease the incentive for landfilling organic waste. <sup>2</sup>

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<b>Switzerland</b>	Ordinance on the Avoidance and the Disposal of Waste. <sup>61</sup>  (English translation)	2000. <sup>62</sup>	All combustible, including biodegradable waste streams. <sup>62</sup>	If combustible, FW included in ban (no specific FW regulation).	No MSW has been landfilled in the country since 2004. <sup>62</sup>	Although Switzerland is independent of the EU, the EEA have reported that their results have met the targets set by the landfill directive, including that of the 2016 target (see EU Landfill directive). <sup>62</sup>
<b>Scotland</b>	Landfill (Scotland) Regulations 2003, Regulation 11(3). <sup>63</sup>	2021. <sup>64</sup>	All BMW streams with a TOC >5%. <sup>65</sup>	If TOC >5%, FW included in ban (no specific FW regulation).	In December 2025, Scottish authorities are set to review the policy to evaluate and ensure future compliance. This review aims to introduce a biostabilisation criteria. <sup>66</sup>	Scotland is undertaking reflective measures on the local landfill ban and its multifactorial nature. Specific insights are made into the alternative treatment methods such as mechanical biological treatment (MBT) and incineration. <sup>67</sup>

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<b>South Korea</b>	Prohibition of Direct Landfilling of Food Waste. <sup>68</sup>	2005. <sup>68</sup>	Prohibits the disposal of all FW streams, with the exception of residues and contaminants from treatment facilities. <sup>69</sup>	The 2013 WBFWF extends the VBWF system, charging consumers based on the weight of their FW. Individuals reduce FW weight by dehydrating and removing excess water content from their food. <sup>68</sup>	South Korea's recycling rate of FW has increased from 2% in 1995 to 95% in 2019. <sup>70</sup> The prohibition of FW to landfill did not cause a significant decline in the amount of FW generated, but rather enforced other government supported/funded options for waste diversion. Increased FW treatment facilities caused odour issues for the local populations. <sup>69</sup>	Smart bins are high-tech FW recycling machines which enable the WBFWF. In Seoul, there are 6000 of these bins, and the World Economic Forum has credited the role of technologies such as this in South Korea's diversion results. Smart bins also result in more efficient and reliable tracking of food waste.  Government support of 80%-100% of start-up costs for urban farming has resulted in 170 hectares being used by locals daily. It is reported that this has created a stronger environmental community in these dense urban areas, creating long-term cultural changes to the attitudes of South Koreans toward FW. <sup>70</sup>
<b>United States</b>	While a number of states in the US have bans against disposal of yard waste; and some states – and some large cities—have taken the additional step of banning FW at various levels and generators, there is currently no supremacy clause to enforce a national standard. <sup>71</sup>					



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<b>Austin, TX (City)</b>  <b>(Commercial Ban)</b>	Austin Code of Ordinances § 15-6-91. <sup>72</sup>	2016. <sup>73</sup>	All food enterprises are required to hold a food permit which ensures that employees have access to services to collect and divert surplus food. <sup>73</sup>	A variety of diversion options are provided including donating unconsumed goods, sending leftovers to farms or composting organic waste. <sup>74</sup>	As of 2020, Austin is diverting 37% of waste generated. The composition of the residential curb side organics collection estimates only 10% of this to be food waste. <sup>75</sup>	Employees are also being given supplementary training on how to properly handle food waste with care for the environment. <sup>74</sup>
<b>Boulder, CO (City)</b>  <b>(Commercial Ban)</b>	Boulder Mun. Code 6-3-13-18. <sup>76</sup>	2016. <sup>73</sup>	Any business (including educational institutions and charitable or nonprofit orgs), residential property owner or manager, or special event permit holder.	City of Boulder has interactive, educational websites with tips for residents on reducing food waste. <sup>77</sup>	Boulder's diversion rates are calculated as reduction and diversion steps, greenhouse gases (GHG), 74%, and education and engagement steps, 67%. Overall 'total progress' being 70%. <sup>78</sup>	Comparatively to other cities within the boulder county, boulder city's total progress of 70% is significantly greater than the next best city boulder county, 50%, and the remainder sitting around 30%. <sup>78</sup>

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<b>California (State)</b>	SB 1383 Lara, Chapter 395, Statutes of 2016. <sup>79</sup>	2016. <sup>80</sup>	Businesses in California that generate at least 8 cubic yards (cy)/week of organic waste are required to recycle the organics on-site or subscribe to organics recycling services. This will decrease to 4 cy/week in 2017 and 2 cy/week in 2020. <sup>81</sup>	Government funded FW programmes such as UglyFruitandVeg and Savethefood.com have useful resources for locals to engage with. These include meal prep guides, 'guest-imators' for food portioning, food waste calculators and food storage tips. <sup>82</sup>	By 2025, SB 1383 requires that 20% (or 231,000 tonnes using a 2014 baseline) of still-edible food is diverted and redistributed. In the first half of 2022 about 117,000 tonnes was diverted, meaning the state is on track to hitting their target early. <sup>83</sup>	The increasing demand for high-grade compost is being driven by the state's agricultural sector, which seeks to enrich soil and reduce reliance on pesticides, fertilizers and irrigation. <sup>83</sup>

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<b>Connecticut (State)</b>	CONN. GEN. STAT. ANN. § 22A-226E; CT HB 6664. <sup>84</sup>	2014. <sup>84</sup>	Commercial food wholesalers or distributors, industrial food manufacturers or processors, supermarkets, resorts, or conference centres that generate over 26 tonnes of source-separated organic materials (SSOM) annually and are within 20 miles of an authorized composting facility. <sup>85</sup>	Legislation aims to incentivize the development of food residual recycling facilities to address the state's insufficient capacity to handle generated food waste. <sup>85</sup>	In 2014, the generated threshold of organic waste was 104+ tonnes per year (tpy). In 2020, this number decreased to 52+ (tpy). <sup>86</sup> Note that diversion results are relatively unrecorded for Connecticut.	Department of Energy and Environmental Protection (DEEP) has faced challenges in enforcing the state's commercial organics law because the law covers food establishments, entities over which DEEP traditionally has not had oversight because it is not the agency responsible for their permitting. <sup>73</sup>
<b>Hennepin County, MN (City)</b>	Hennepin County Ordinance 13. <sup>87</sup>	2018. <sup>73</sup>	Businesses that produce a significant amount of FW, including but not limited to restaurants, grocery stores, food wholesalers and manufacturers, hotels, and event centres. <sup>88</sup>	FW included in ban (no specific FW regulation).	Hennepin decreased its landfill use from 30% to 18% over a six-year period. <sup>89</sup>	Successful diversion results for the county have been attributed to the various waste reduction and recycling initiatives, along with successful reuse programs and waste prevention efforts. <sup>89</sup>

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<b>Maryland (State)</b>	House Bill 264/Senate Bill 483. <sup>90</sup>	2021. <sup>91</sup>	All persons who generate 2-tonnes a week of food residuals and 1 -tonnes a week of food residuals. <sup>88</sup>	Exemptions to FW law can apply for restaurants that serve the public and anyone that can prove either that diversion will result in a cost 10% more than sending it to landfill or are outside a 30-mile radius of an organic recycling facility. <sup>88</sup>	Limited results exist given the recent introduction however, compared to the 2035 target of recycling 60% of all food scraps, Maryland currently sits at 22.66%. <sup>92</sup>	Given the ban has been newly introduced, it is too early to draw conclusions for Maryland, especially given the data for short-term analysis does not currently exist.
<b>Massachusetts (State)</b>	310 CMR 19.000: Solid Waste Facility Regulations. <sup>93</sup>	2014. <sup>94</sup>	Commercial food/organic wastes from facilities generating one-half tonne or more of these materials per week are banned from disposal or transport for disposal. <sup>94</sup>	Food rescue efforts have grown by over 50%, while the number of businesses separating food scraps has more than doubled from 1,350 to 3,100. <sup>95</sup>	FW diversion increased from 100,000 tonnes (2022) to 360,000 tonnes (2023). Waste characterization data also shows improvement, with food waste decreasing from 26% of trash in 2016 to 21.6% in 2022. <sup>95</sup>	A comprehensive report by SSRN claims that there are three reasons for Massachusetts' success (relative to other states): affordability, simplicity, and enforcement. <sup>96</sup>

Place	Organic Ban Details				Diversion results of Organic Waste	Additional Instruments/Comments
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<b>Metro, OR</b>	Metro Code Ch. 5.10.410–470. <sup>97</sup>	2022. <sup>73</sup>	Businesses that cook, assemble, serve, or sell food, including but not limited to cafeterias, restaurants, retailers, hotels, correctional facilities, and colleges and universities.	No data found.	No data found.	A waste progress reported that there has been a significant amount of jobs created from the waste ban. They also note that not surprisingly, COVID-19, local wildfires and significant budget reductions had an impact on the region’s ability to implement the regional waste plan. <sup>98</sup>
<b>New York (State)</b>	NYS Food Donation and Food Scraps Recycling Law. <sup>99</sup>	2022. <sup>99</sup>	Businesses and institutions that generate an annual average of two tonnes of wasted food per week or more must: <ul style="list-style-type: none"> <li>• donate excess edible food; and</li> <li>• recycle all remaining food scraps if they are within 25 miles of an organics recycler (composting facility, anaerobic digester, etc).<sup>99</sup></li> </ul>	FW included in ban (no specific FW regulation).	Currently there are no state-wide results available with the DFSG (Designated Food Scraps Generator) annual report due 1 <sup>st</sup> March 2024. <sup>99</sup>	Food donation and food scraps recycling programmes are reported as off to a strong start. <sup>100</sup>

Place	Organic Ban Details				Diversion results of Organic Waste	Additional Instruments/Comments
	Name	Year Enacted	Target/Scope	Food Waste Specifics		
<b>New York City, NY (City)</b>	N.Y.C. Admin. Code § 16-306.1. <sup>101</sup>	2015.	Food service establishments in hotels with 150 or more rooms; arenas and stadiums with a seating capacity of 15,000 or more people; food manufacturers with a floor area of 25,000 sq. ft. or more; food wholesalers with a floor area of 20,000 sq. ft. or more; food service establishments with floor areas of at least 15,000 sq. ft.; food service establishments that are part of chains with at least 100 locations; and food retailers with floor areas of at least 25,000 sq. ft.	NYC has introduced over 400 smart bins, with many of them located in the most heavily populated places. This benefits data tracking of food waste. <sup>102</sup>	In 2019, only 5% of the organic waste volume theoretically available for diversion was being collected by DSNY as source separated organics for recycling, despite NYC's voluntary organic collection program being accessible to 3.5 million residents. <sup>103</sup>	While similar initiatives are already currently running, it has been recommended to NYC to engage in more community-level approaches when tackling the issue of organic waste collection. <sup>103</sup>

Place	Organic Ban Details				Diversion results of Organic Waste	Additional Instruments/Comments
	Name	Year Enacted	Target/Scope	Food Waste Specifics		
<b>Rhode Island (State)</b>	§ 23-18.9-17. Food waste ban. <sup>104</sup>	2014. <sup>104</sup>	Educational institutions that produce a minimum of 30 tonnes of organic waste annually and are within a 15 mile radius of a composting or anaerobic digestion facility capable of accepting such waste. <sup>104</sup>	FW included in ban (no specific FW regulation).	Since the ban was implemented Rhode Island has gone from composting less than 500 tonnes of food waste in 2014 to almost 4,000 tonnes in 2018. <sup>105</sup>	Limited data available on the diversion results of organic waste from landfills. Rhode Island’s legislation was passed without any additional dedicated funding, and as a result, the state can devote only a small amount of staff time to implementing the law. <sup>73</sup>
<b>San Francisco, CA (City)</b>	S.F. Env’t Code §§ 1901–1912. <sup>106</sup>	2009. <sup>73</sup>	Businesses, governmental entities, multi-family or commercial residences, and individuals. <sup>73</sup>	FW included in ban (no specific FW regulation).	In 2011, the city stated it had successfully diverted a total of 1 million tonnes of organics since the ordinance began. <sup>107</sup> As of 2018, the city diverts about 80% of its waste from landfills, or more than 1.5 million tonnes every year. <sup>108</sup>	A focus on source-separation and curbside collection has enabled such successful participation from local residents. <sup>109</sup> Additional economic instruments include mandatory citywide collection of food scraps and yard trimmings for composting and volume-based user fees, (PAYT) pricing arrangements. <sup>103</sup>

Place	<i>Organic Ban Details</i>				Diversion results of Organic Waste	Additional Instruments/Comments
	Name	Year Enacted	Target/Scope	Food Waste Specifics		
<b>Seattle, WA (City)</b>	Seattle Mun. Code 21.36.082–21.36.083. <sup>110</sup>	2015. <sup>73</sup>	All single-family and multi-family residences and commercial businesses. <sup>73</sup>	FW included in ban (no specific FW regulation).	Between 2007-2018, residential organics diversion was less costly than garbage. Organics diversion saved between \$9 and \$28 per tonne, averaging \$18 per tonne. This diverted waste from garbage collection to residential organics collection, reducing the average residential customer's solid waste collection bill by \$0.89 per month from 2007 to 2018. <sup>111</sup>	Savings declined over this period due to lower garbage disposal costs and increased composting expenses. <sup>111</sup> Additional economic instruments include mandatory organic waste separation and PAYT pricing arrangements. <sup>103</sup>



Place	<i>Organic Ban Details</i>				Diversion results of Organic Waste	Additional Instruments/Comments
	Name	Year Enacted	Target/Scope	Food Waste Specifics		
<b>Vermont (State)</b>	Universal Recycling Law (Act 148). <sup>112</sup>	2012. <sup>113</sup>	Implemented in phases, the food scraps ban has increasingly captured more sectors, from larger institutions, to smaller businesses, to households. <sup>113</sup>	Food scraps include pre- and post-consumer FW that is derived from processing or discarding of food and that can be used through one of the following options: food donation for people in need, animal feed, composting, or anaerobic digestion. <sup>114</sup>	Organic waste diverted from landfill is approximately 53,254 tonnes/year and an estimated greenhouse gas emissions reduction of 96,000 metric tonnes carbon equivalent by 2022. <sup>115</sup>	Food donations have increased by 40% between 2015 and 2016 due to phase two of the law taking effect, requiring that medium sized institutions (those that discard more than one tonne of food per week) cannot dump such material in landfills. <sup>115</sup>

Table 2: Overview of countries that plan to impose an organics ban to landfill

Place	Organic Ban Details				Diversion results of Organic Waste	Additional Instruments/Comments
	Name	Year Enacted	Target/Scope	Food Waste Specifics		
<b>Czechia</b>	Czech Republic, 2020, Waste Act. <sup>116</sup>	2030. <sup>117</sup>	Waste streams in which calorific value in dry matter is higher than 6.5 MJ/kg. <sup>117</sup>	In 2014, Czechia removed the 15% Value-Added Tax (VAT) on donated food. <sup>117</sup>	No current Legislation.	Currently policy instruments include PAYT, a landfill ban for separately collected waste streams and a landfill tax. <sup>117</sup>
<b>Italy</b>	Legislative Decree 36/2003. <sup>118</sup> Attempt to pass legislation unsuccessful.	No current legislation.	All waste streams that contain a calorific value exceeding 13,000 kJ/kg. <sup>118</sup>	FW included but not limited to ban. <b>Error! Bookmark not defined.</b>	A restriction on waste with Calorific value > 13,000 kJ / kg was introduced in the 2003 landfill law, for an implementation by 2007. This implementation was delayed 6 times, until 2016/2017 when the restriction was abrogated. <sup>118</sup>	No current legislation.
<b>Ontario (State)</b>	No current legislation.	No current legislation.	In 2018, Ontario planned to introduce a landfill ban by 2022. Political factors such as the Covid-19 pandemic and a conservative government have halted this progress. <sup>119</sup>	A 6% increase in Ontarios population from 2017-2022 is further cause for concern regarding the amount of FW generation. <sup>119</sup> <b>Error! Bookmark not defined.</b>	Current PAYT policy incentives have reduced the amount of FW reaching landfills but more action is required. <sup>120</sup>	No current legislation.

<i>Organic Ban Details</i>						
<b>Place</b>	<b>Name</b>	<b>Year Enacted</b>	<b>Target/Scope</b>	<b>Food Waste Specifics</b>	<b>Diversion results of Organic Waste</b>	<b>Additional Instruments/Comments</b>
<b>Western Cape (Province), South Africa</b>	No current legislation.	No current legislation.	In 2017, Western Cape set a goal for 2022, that businesses and municipalities will be required to divert up to 50% of all organic waste from landfilling, with the aim to increase this to 100% by 2027. <sup>121</sup>	Food rescue initiatives are specifically important in Western Cape with poverty and food insecurity being very prevalent. <sup>121</sup>	No current legislation.	No current legislation.

## Concluding Remarks – Insights from Global Organics Ban

Upon reflection of every country, state, and city that had some form of an organics ban to landfill, I can say that local conditions cause the political and social elements necessary to enforce a ban differ. Barriers to recycling often include infrastructure, lack of public awareness, contamination, high monetary costs, and several other logistical challenges. The countries listed in Table 1 demonstrate unique ways of overcoming these barriers, successful and unsuccessful, and differing scopes which result in varying results. Most countries with a successful ban will have a waste hierarchy. Not only are these great models for everyday users, but they establish a clear order of priorities, with 'prevention' being the optimum.

Differences in data measurements makes cross-sectional analyses difficult. Varying technologies, political prioritisation, resource management and recording, and languages meant that many of the quantities provided are estimates. These estimates are also subject to temporal biases. It may not be that recycling rates of organic waste is getting worse, but rather that the ways in which we are recording the data has improved to capture more activity. We must proceed with caution when making comparisons for reasons belonging to confounding factors such as this.

Stricter bans, defined as those with larger scopes and higher enforcement penalties, were proven to be more effective than those lesser than. While enforcement penalties, usually a fee, does serve a purpose in changing social behaviours and attitudes, South Korea's approach suggests more successful catalysts for change. Smart bins, biodegradable rubbish bags and urban farming (as described in Table 1) are striking examples of how powerful innovative technology and social attitudes are in igniting change. While it is often easy to forget about what happens to our food waste once it leaves our house, South Korea have developed a deep sense of connection to their natural environment, despite the dense urban culture. Conversely, Finland and many other sparsely populated rural countries struggle to offer curbside collection services to residents.

Diversion options such as incineration and MBT, while better alternatives to landfilling, are growing public concern. As some countries experience a strong deviation towards net-zero carbon emissions goals, once viable alternatives are becoming questionable. This shift has mostly been observed in the literature of European countries and that may be due to their bans targeting consumers. The US, on the other hand, engages in EPR focused bans.

While an organics ban to landfill often results in impactful change, it is often accompanied by other economic instruments: landfill tax, incineration tax, incineration ban, PAYT, VBWF, WBFWF, compost markets, education programmes and many more.

I hypothesize that the 'tidy kiwi' attitude toward already established recycling mandates and the existence of long-term education plans will positively contribute towards Aotearoa New Zealand implementing an organics ban to landfill. Potential barriers to implementation could be a lack of infrastructure and large rural areas for curbside collection, both requiring of significant fiscal investment. However, in order to reach set targets, it would be my recommendation for Aotearoa New Zealand to implement an organics ban to landfill.

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<sup>120</sup> *City considers new curbside garbage policy to divert waste from landfill*. (2023, May 5). *Bay Ward Bulletin*. <https://www.baywardbulletin.ca/city-considers-new-curbside-garbage-policy-to-divert-waste-from-landfill/>

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