

# Review of Separate Organics Collection Legislation

A submission to NSW Environment Protection  
Authority

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Mike Ritchie & Associates Pty Ltd trading as MRA Consulting Group (MRA)  
ABN 13 143 273 812  
Suite 409 Henry Lawson Building  
19 Roseby Street, Drummoyne NSW 2047  
AUSTRALIA  
P +61 2 8541 6169  
E [info@mraconsulting.com.au](mailto:info@mraconsulting.com.au)  
[mraconsulting.com.au](http://mraconsulting.com.au)

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## Executive Summary

Increasing the recovery of organic wastes is an important resource and climate issue. With more than 50% of organic waste in the residual waste bin destined for landfill in NSW, identifying systems that capture organic waste is critical.

To identify policies and mechanisms and determine their success in diverting food and or garden organic (FOGO) waste from landfill, the NSW Environment Protection Authority (EPA) commissioned this review focusing on organics collection legislation in American and European countries of comparable socioeconomic status. The review collated information from publicly available sources in English.

Western Australia is the only jurisdiction in Australia to have set a target for residential FOGO collections for local governments in Perth and Peel by 2030, to be enforced through legislation currently being drafted. Eleven states in the United States of America and two in Canada have implemented mandatory organics separation and collection for residents, businesses, or both. Seventeen European Union (EU) members have implemented mandatory organics source separated collections and processing. Most of these cover all residents and commercial food waste generators. The EU member policies were preceded by the EU Landfill Directive that progressively requires member states to reduce the volume of organics being landfilled.

Staged implementation of mandatory organics collection for businesses is a common theme. This allows time for development of recycling infrastructure and for waste generators and collectors to implement systems to divert organic waste. For example, in 2012 Scotland required all food businesses generating more than 50kg per week of food waste in non-rural areas to source separated for collection and processing. This was expanded to include all business generating more than 5 kg/week in 2016.

Mandated source separated organics are largely and effectively used as adjuncts to other policies and instruments (landfill bans, taxes, levies). Strong frameworks or policies are required to direct organics (and other wastes) towards higher order resource recovery routes requiring source separation. A successful example of mandatory source separation is Ireland, where mandatory source separation for businesses was instituted in 2009 and expanded in 2015 to include households. Organics disposal to landfill fell from 860,000 tonnes in 2010 to 190,000 tonnes in 2018.

Germany, Austria, Belgium and Denmark are examples of countries that landfill virtually no municipal wastes. Each of these countries use a combination of landfill bans, mandated source separation, landfill taxes and/or incineration taxes. In these cases, mandatory organics separation covers residential and commercial generators.

Source separation and collection of organics can drive expansion in composting and anaerobic digestion, and beneficial recovery of both organic and nutrient values from the wastes. Where the mandate has both commercial and residential coverage, greater recovery and acceptance has been achieved.

Implementation needs to be well-staged and heralded with a long lead time. Investments in infrastructure and industry development during the lead in time is required to ensure adequate collection and processing infrastructure is established when the compulsory separation commences.

With effective lead times and additional supporting policies and infrastructure, mandatory source separation of organics at a commercial and residential level are effective in increasing recovery of organic wastes.

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# 1 Introduction

The recovery of organic wastes is an important waste and climate management issue. The disposal of organics in landfill is both a waste of useful resources and a significant contributor to greenhouse gas emissions. Since organics are often more than 50% of the residual waste and the major jurisdictions in the world have increasing waste recovery targets or reducing waste to landfill targets, the diversion of residential and commercial organics are increasingly becoming a focus. Many municipalities across the world have increased efforts on reducing food and other organics going to landfill by providing organics collection and processing services. The organics are largely converted to composts or energy via anaerobic digestion. Diversion targets for organic wastes have been implemented by many countries in Europe and municipalities in North America and Canada with the aim of achieving better resource use by moving waste management away from landfill and up the hierarchy, towards prevention, reuse and recycling.

To that end, source-separated organics collection systems are usually implemented within a framework of existing policy measures, such as landfill bans, taxes and source separation infrastructure and processing facilities across households and businesses.

To identify such policies and mechanisms and determine their success in diverting food and or garden organic (FOGO) waste from landfill, the NSW Environment Protection Authority (EPA) commissioned this review study focusing on organics collection legislation in American and European countries of comparable socioeconomic status.

## 1.1 Methodology

A literature review and stakeholder engagement exercise was conducted by drawing on MRA contacts, reviewing published literature, government reports, and industry databases and information to identify relevant systems and policies.

To identify relevant policies, MRA relied heavily on desk based research of publicly available information on the internet. Government websites were given priority as more trustworthy sources of information while every effort was made to ensure that all sources were up to date. Information collected included the name and scope of relevant legislation, the process of introduction, the reception of the legislation by intended audiences and the outcome if known.

The information collected has been tabulated in a Microsoft Excel workbook for reference while the following sections provide an overview of the findings.

The scope of the report was limited to publicly available data.

## 2 Source-separated organics and related policies

In most of the jurisdictions reviewed, mandatory separation of organic wastes from other wastes have been implemented along with other waste management policies. In Europe these policies have been preceded by the EU Landfill Directive that progressively requires member states (MS) to reduce the volume of organics (variously referred to as biowaste, biodegradable municipal waste (BMW)) being disposed of in landfill.

In some countries a ban on organics to landfill is the sole mechanism used to drive source separation of organics. A ban can refer to policies that partially or fully restrict the amount of food waste and/or organics that certain generators or collectors can dispose, as well as policies that require of certain businesses (e.g. restaurants) to achieve a percent of diversion or to subscribe to a dedicated organics processing service. By placing restrictions on the disposal of organic waste, such bans can drive organic waste generators or collectors to explore more sustainable practices, such as source reduction, reuse, donation (for excess food), beneficial transformation through mulching, composting and anaerobic digestion (AD).

However, it appears that for many jurisdictions a landfill ban was not feasible, insufficient or considered too indirect to drive sustained organics recovery. Instead or in addition, source-separated organics collection and processing systems and been legislated. Mandatory source-separation systems take many forms. In a structural context, some are legislated and mandatory requirements placed upon all levels of the community, others are mandated with caveats that exclude small businesses or rural residents.

To account for jurisdictions that might not outright mandate source separation but might instead utilise other financial instruments to incentivise organics diversion, this report also provides information on other means that specifically target the organic fraction of waste. Many jurisdictions use a combination of measures to gain the desired outcomes.

Overall, the following policies could act as effective mandated organics separation:

- Landfill ban
- Taxes
- Producer responsibility measures (e.g. for restaurants or landscapers)
- Legislated obligations forcing higher waste hierarchy end-points
- Documentation and reporting obligations

The drivers behind mandated organics separation vary but are usually pursuant to waste hierarchies dictating higher resource management and out of concern for the environmental and human health impact of landfills. Typically, source separated organics collections are implemented to:

- Increase material recovery – collection of organics can increase the proportion of organic waste that is diverted from landfill to composting or AD;
- produce compost – suitable for use in agriculture and urban gardens;
- alleviate pressure on landfill capacity – every tonne of organics diverted is a tonne of landfill capacity saved, an important consideration in densely populated where the construction of new landfills are cost or spatially prohibitive;
- reduce GHG emissions to meet international and national agreements and targets

- reduce the adverse impact of landfills on the environment and human health – organics in particular produce significant amounts of methane when decomposing anaerobically in landfills and therefore contribute to global warming;
- increase the level of energy generated from waste material – through AD; and
- provide incentives for reducing the generation of waste material, and reducing the community’s dependency on landfill as a waste treatment option.

## 2.1 Organics covered

In different jurisdictions organics separation and collection systems may target different categories of organics. In 2010 in South Australia for example, “Vegetative matter collected by councils” is specifically banned from landfill. The waste types or categories included within the scope of landfill bans varies across jurisdictions. Our review identified the following organics categories:

- specific waste streams such as biodegradable municipal waste (BMW), kerbside organics, commercial/restaurant food waste;
- specific materials such as timber, yard trimmings (garden organics), organic agricultural waste, biosolids;
- specific properties of waste, such as Total Organic Carbon (TOC) value, organic waste that is recoverable or combustible;
- source separated biodegradable organic waste; or
- a combination of the above.

### 3 Source-separated organics collection around the world

#### 3.1 Australia

The Western Australian Waste Authority included in the recent Waste and Resource Recovery Strategy 2030 a target for all local governments in the Perth and Peel region to provide a 3-bin kerbside collection service that included food and garden organics (FOGO). This is the first authority in Australia to do so. The legislation is currently being drafted.

#### 3.2 North America

In the USA the states of California, Connecticut, Massachusetts and New Jersey have implemented state mandatory recycling of organics for commercial food generators. Similarly, city-wide mandatory organics separation and collection services are established in Vermont, San Francisco, New York, Portland, Seattle, Boulder and Austin. Of these, Vermont, Seattle, Boulder and San Francisco require compostables to be separated by all residents and businesses, whilst for the remainder it is only mandatory for businesses and for some, only for business above a certain level of generation. In March 2019 New York State announced the mandatory organics separation (and food donation) for larger businesses. In addition, as of 2010, twenty five states have specifically banned leaves, grass and/or brush from landfill disposal (Arkansas, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Iowa, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, New Jersey, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, South Dakota, Vermont, West Virginia, Wisconsin).

In Canada, Nova Scotia and Vancouver have implemented mandatory organics separation and collection to all residents and businesses.

**Table 1 Summary of organics-related legislative instruments in the USA and Canada**

Location	Instrument	Name	Year	Applicability	Coverage
<b>USA (Federal)</b>	Various	Farm Bill 2018	Farm Bill: 2018 Food Recovery Act: 2015	National	
<b>Vermont, US</b>	Mandated collection-with generation volume trigger	Universal Recycling Law Vermont State Ann.TIT 10, 6605k	Law introduced in 2012 garden waste, clean wood total ban effective JULY 2016 food wastes JULY 2020	City-wide	All residents and commercial generators
<b>Connecticut, US</b>	Mandated collection-with generation volume trigger	Sec. 22a-226e Solid Waste Management Plan, 2011	2014. Mandated organic recycling: 2011	State-wide	Commercial food waste generators

Location	Instrument	Name	Year	Applicability	Coverage
<b>Massachusetts, US</b>	Mandated collection-with generation volume trigger	310 Code of Massachusetts Regulation 19.017	Oct-14	State-wide	Commercial food waste generators
<b>Rhode Island, US</b>	Mandated collection-with generation volume trigger	Rhode Island General Laws Ann 23-18.9-17	2016	Restricted precinct (eg CBD)	Commercial food waste generators
<b>New Jersey, US</b>	Mandated collection-with generation volume trigger	An Act concerning food waste recycling and food waste-to-energy production, supplementing Titles 13 and 52 of the Revised Statutes, and amending P.L.1999, c.23. A3726/S1	2017	State-wide	Commercial food waste generators
<b>California, US</b>	Mandated collection/processing-no limit	California Pub. Res. Code 42649.81	2016	State-wide	Commercial food waste generators
<b>New York City, NY, US</b>	Mandated collection-with generation volume trigger	Local Law 146 of 2013 of the New York City Administrative Code	2005	City-wide	Commercial food waste generators
	Mandated collection-with generation volume trigger	New York State Excess Food Act A6750/S7254	in progress	City-wide	Commercial food waste generators
	Mandated collection-with generation volume trigger	Organics Recycling Mandate	2016	City-wide	Commercial food waste generators
<b>State of New York</b>	Mandated collection of food scraps	§ 2. Article 27 of the environmental conservation law	2020	State-wide	Commercial food waste generators
<b>San Francisco, US</b>	Mandated collection-with generation volume trigger	Mandatory Recycling and Composting Ordinance (No. 100-09) Alameda County landfill ban	2009	City-wide	All residents and commercial generators

Location	Instrument	Name	Year	Applicability	Coverage
<b>Portland, OR, US</b>	Mandated collection-with generation volume trigger	Business Solid Waste, Recycling and Composting (ARB-ENN-2.06)	2014	City-wide	Commercial food waste generators
<b>Metro Council, Portland, Oregon, USA</b>	Mandated collection-with generation volume trigger	Ordinance NO.18-1418,	2018	Restricted precinct (eg CBD)	Commercial food waste generators
<b>Seattle, WA, USA</b>	Mandated collection/processing-no limit	Seattle Municipal Code (SMC) sections 21.36.082 and 21.36.083	January 1, 2015	City-wide	All residents and commercial generators
<b>Boulder, Colorado, USA</b>	Mandated collection/processing-no limit	Universal zero waste ordinance	2015	City-wide	All residents and commercial generators
<b>Austin, Texas, US</b>	Mandated collection-with generation volume trigger	Universal Recycling Ordinance- URO (Austin Resource Recovery Chapter 15-6: Section 8.0)	2016 (2012 ordinance)	City-wide	Food permit businesses
<b>Nova Scotia, Canada</b>	Mandated collection/processing-no limit	Solid Waste-Resource Management Regulations (1995)	1996-1997	State-wide	Residential, industrial, commercial and institutional organics
<b>Vancouver, Canada</b>	Mandated collection/processing-no limit	Solid Waste By-law No. 8417	2015	City-wide	All residents and commercial generators

Please refer to accompanying MS Excel workbook for detailed information.

### 3.3 Europe

Most European countries are part of the European Union (EU) and as such are bound by the laws that are passed at the EU level .The EU Landfill Directive that sets targets to progressively reduce the biodegradable waste being sent for disposal in landfill has a profound impact on domestic and commercial waste management.

The main elements of the Landfill Directive 1999/31/EC and the EU Waste Framework Directive 2008/98/EC relating to bio-waste include:

- Recycling and preparing for re-use of municipal waste (including bio-waste) to be increased to 70 % by 2030;
- Phasing out landfilling by 2025 for all recyclable (including plastics, paper, metals, glass and bio-waste) waste in non hazardous waste landfills – corresponding to a maximum landfilling rate of 25%;
- Measures aimed at reducing food waste generation by 30 % by 2025;
- Introduction of separate collection of bio-waste across all waste sectors.

As such, and in order to comply with these targets, most member states have enacted laws and regulations (including bans in some cases) that directly or indirectly target organic waste and its diversion from landfill.

Of the 28 EU members, only 6 have implemented bans that directly name organic and/or FOGO waste. However, 17 have implemented mandatory organics source separated collection and processing systems. Most of these (except for The Netherlands) cover all residents and commercial food waste generators. Scotland, Northern Ireland and France have trigger levels for commercial food waste generation (>5kg/week for Scotland and Northern Ireland and 33 kg/day for France). All organics (or bio-waste) are generally included and the outputs typically flow to composting or anaerobic digestion.

Norway and Switzerland, which are not part of the EU, use more indirect means of arranging source separation. Norway uses a ban on organics to landfill to influence the municipalities to separately collect and compost or AD organics. Switzerland mandates that garden wastes be separately collected and processed, however that food waste (biogenic waste) is recovered for energy. The effect of this is that food waste becomes separately collected to ensure that it is fit for AD.

For most countries mandatory organics separation is coupled with other incentives encouraging diversion, including landfill bans and taxes. Of the 28 EU members, 23 have an active tax on landfilling. The landfill taxes commonly apply to all wastes although some countries charge more for combustible waste. Of the 28 EU members, only 6 have implemented bans that directly name organic and/or food waste. However, an additional 12 have implemented bans that often capture food waste indirectly as the banned streams include biodegradable and combustible streams (sometimes with specific TOC).

**Table 2 Summary of organics-related legislative instruments in Europe**

Location	Type of Instrument	Name of instrument	Year	Applicability	Coverage
<b>EU</b>	Mandated collection/processing- no limit	Articles 10(2) and 11(1) of Directive 2008/98/EC on waste (Waste Framework Directive)	2008, and amended 2018	Multi-jurisdictional (eg EU)	All residents and commercial generators
<b>Austria</b>	Mandated collection/processing- no limit	Austria Biowaste ordinance (1992) with 3 National waste codes;	1995	National	All residents and commercial generators
<b>Belgium (Brussels Capital Region)</b>	Mandated collection/processing- no limit	Waste Ordinance 2012 Article 40 to 45	2012	City-wide	All residents and commercial generators

<b>Belgium (Flanders)</b>	Mandated collection/processing- no limit	Besluit van de Vlaamse Regering to vaststelling van het Vlaams	1998, 2007	State-wide	All residents and commercial generators
<b>Belgium (Wallonia)</b>	Mandated collection/processing- no limit	10 mai 2012 - Décret transposant la Directive 2008/98/CE	2004	State-wide	All residents and commercial generators
<b>Czech Republic</b>	Mandated collection/processing- no limit	Waste Act regarding bio-waste collection No. 229/2014 Coll.	2015	National	All residents and commercial generators
<b>Denmark</b>	Mandated collection/processing- no limit	Danish Environmental Protection Act -Annex IV, cf. Article 29 of the Waste Framework Directive (Directive 2008/98/EC); Strategy on growth and resource-efficiency on food	1987	National	All residents and commercial generators
<b>Finland</b>	Mandated collection/processing- no limit	Waste Decree 179/2012  Government Degree on landfill 331/2013	2016	National	All residents and commercial generators
<b>France</b>	Mandated collection/processing- no limit	FR CdE2015: Code de l'environnement	2016 update d from 2013	National	All residents and commercial generators
	Landfill ban	Taxe Générale sur les Activités Polluantes (TGAP)	2001	National	All residents and commercial generators
<b>Germany</b>	Mandated collection/processing- no limit	Waste Management Act 2012	1993	National	All residents and commercial generators
	Mandated collection/processing- no limit	Ordinance on the Utilization of Biowaste on Agricultural, Forestry and Horticulturally Used Soils (Biowaste Ordinance - BioAbfV)	2010	National	Commercial food waste generators
<b>Italy</b>	Target	Legislative Decree 152/2006	2006	National	Residential

<b>Lithuania</b>	Landfill ban	Law on Waste Management	2016	National	All residents and commercial generators
<b>Netherlands</b>	Mandated collection/processing-no limit	Environmental Management Act (1993) Decree on a Ban of Landfill of Waste (1995)	1995	National	Residential
<b>Norway</b>	Landfill ban	Regulations relating to the recycling of waste (Waste Regulations)	2009	National	All residents and commercial generators
<b>Poland</b>	Mandated collection/processing-no limit	Act on Waste (2012) - Common waste segregation system	2013	National	All residents and commercial generators
<b>Slovakia</b>	Mandated collection/processing-no limit	Waste Act amendment 2010	2016	National	All residents and commercial generators
<b>Slovenia</b>	Mandated collection/processing-no limit	2010 Decree on Biodegradable Kitchen and Garden Waste Management	2010	National	All residents and commercial generators
<b>Sweden</b>	Mandated collection/processing-no limit	The Swedish Environmental Code  [SE 808 1998], 15, 9 and 11  Avfallsförordning (2011:927)	2005	National	All residents and commercial generators
<b>Switzerland</b>	Indirect	Waste Ordinance 2015	2000	National	All residents and commercial generators
<b>UK (Scotland)</b>	Mandated collection-with generation volume trigger	Waste (Scotland) Regulations 2012	2012	State-wide	All residents and commercial generators
<b>UK (England, Wales)</b>	Indirect	The Landfill Tax	1996	State-wide	All residents and commercial generators

<b>UK (Northern Ireland)</b>	Mandated collection-with generation volume trigger	The Food Waste Regulations (Northern Ireland) 2015	2015 1996 (tax)	State-wide	All residents and commercial generators
<b>Ireland</b>	Mandated collection/processing-no limit	Household food waste and bio-waste regulation 2015 (S.I No 430 of 2015)	2015	National	Residential
	Mandated collection/processing-no limit	S.I No 508 of 2009 Waste Management (Food Waste) Regulations+D2:N26	2009	National	Commercial food waste generators

Please refer to accompanying MS Excel workbook for detailed information.

### 3.4 Elsewhere

South Korea implements a *Volume-based Food Waste Fee System* that applies to households and other food waste generators.

South Africa’s Western Cape region is in the process of implementing a total ban on organic waste to landfill by 2027, with a half-way target of 50% by 2022.

Federally the Chinese government mandated source separation of waste for all the major Chinese cities. However, this has not been implemented or enforced. Attitudinal, logistical and lack of infrastructure are reported as significant barriers.

## 4 Implementation

Staged implementation of mandatory organics collection for business waste is a common theme. This allows time for the development of organic recycling infrastructure and for waste generators and collectors to implement systems to divert organic waste. For example, Scotland initially in 2012 required all food businesses generating more than 50kg per week of food waste in non-rural areas to have it separated for collection and processing. This was expanded in 2016 to include all business generating more than 5 kg/week. This coincided with a growth in AD infrastructure. Staged implementation also allows for targeted and bespoke education and engagement campaigns. The size of a business will influence the capacity to absorb additional costs and introduce new systems.

Mandated residential organics separation is however rarely phased in. More usually it is heralded ahead of time then implemented on a date. Residential source separation of food is promoted using universal messaging around the benefits of recovering food; “Recycle for Wales”

Your recycled food waste could power your children's computer games this weekend.  
Lucky over 70% of you recycle food waste.  
Discover what else you could power:<sup>1</sup>

Commercial source separation of food usually followed the implementation of residential separation and collection and did not occur in isolation. In some cases where systems were provided for residents, these were extended to businesses. For example, in Switzerland residents purchased food waste collection bags and these were deposited in a communal bin on the street, (known as a ‘bring system’). When the requirement was extended to businesses, they too purchased the food waste bags and used the same system.

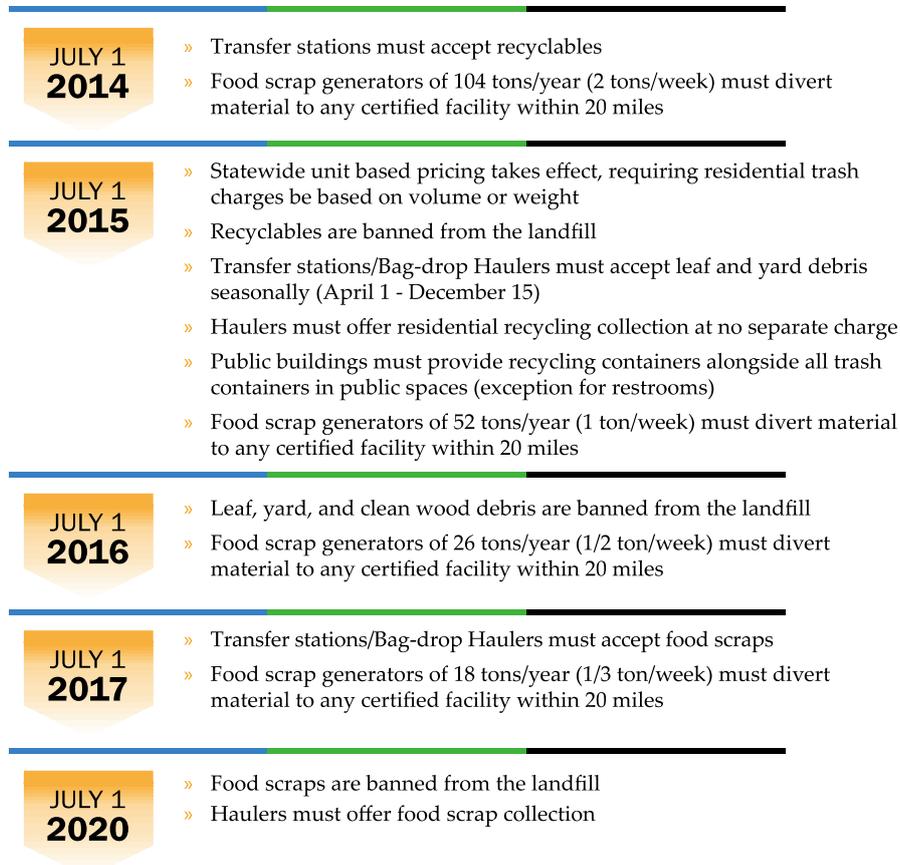
An example of a successful mandatory household source separation is Ireland, where mandatory source separation for businesses was instituted in 2009 and expanded this to include households in 2015. All households that produce food waste must source separate and either compost it at home, dispose of it via a dedicated collection system or deliver it to an authorised treatment centre. The implementation was supported by a funding scheme (€100,000 per council). These were grants for awareness programs, funding for additional enforcement and administration staff. Further to this the Environmental Protection Agency developed a dedicated website (<https://foodwastecharter.ie/irelands-food-waste/>). Organics disposal to landfill fell from 860,000 tonnes in 2010 to 190,000 in 2018.

Mandated separated organics collection and processing coupled with landfill bans is also a common implementation pattern. Vermont’s Universal Recycling Law that tackled recyclables, garden organics and food organics through a single law voted in 2012 had mandated separation interspersed with progressively tighter landfill bans. Two years following the law’s introduction large food waste generators had to divert this waste from landfill with smaller generators being captured over the following years. Garden waste was banned in 2016 while a total ban on food waste is scheduled for 2022 (Figure 1).

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<sup>1</sup> <https://www.recycleforwales.org.uk/>

Figure 1 Vermont’s 2012 Universal Recycling Law implementation timeline



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July 2018

Implementation of mandatory organics collections is usually supported with comprehensive resources for use by local authorities to raise awareness, educate and increase participation. Metro Vancouver that covers 21 municipalities is a typical example, with website material covering all aspects of the implementation.<sup>2</sup> The legislation is clearly outlined, with the responsibilities of all parties detailed. Background information, tools, tips and frequently asked questions provide support for businesses, households and property managers.

Much of the success of source separation is a result of the attitude of participating individuals and the culture of the community at large. There is a high degree of correlation with source separation and recovery. The European Commission, Directorate-General for the Environment surveyed European attitudes to waste management and resource efficiency<sup>3</sup> and identified that at least 70% of respondents in Belgium, Germany, Ireland, Austria and the UK sort all eight types of waste ( paper/cardboard,

<sup>2</sup> <http://www.metrovancouver.org/services/solid-waste/food-scrap-recycling/apartments-condos/Pages/default.aspx>

<sup>3</sup> [http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl\\_388\\_en.pdf](http://ec.europa.eu/commfrontoffice/publicopinion/flash/fl_388_en.pdf)

plastics, glass, hazardous, metal cans, e-waste, kitchen waste, garden waste). Conversely, respondents in Romania, Bulgaria, Latvia and Cyprus are least likely to sort their household waste.

The EEA also report that inclinations to sort more waste or sort more effectively were closely attuned to the perception and reassurance that waste is being effectively recycled. Respondents also reported that more and better recycling and composting facilities in their area and financial incentives would motivate them to sort wastes more.

Source separation of waste including food waste at home is well-established in many European communities and compliance is reinforced by community and cultural norms. It is interesting that in Europe, Germany, Austria, the Netherlands in particular, often due to housing density, the effort required to access the recycling systems for all wastes including organics waste can be comparatively high. The receptacles are often located collectively at a central point and rarely do households have individual collection services. This requires households to transport waste items and yet such are the cultural norms, recovery rates are high. In the UK a survey of residents in Exeter found that a structured kerbside recycling scheme and perceptions of the benefits were significant influences on recycling behaviour.<sup>4</sup>

Enforcement of mandatory organics collection services varies greatly, from very limited, to inspectors routinely surveying bins. In Seattlecity inspectors perform inspections of collection containers. At businesses where collection containers are found to have more than 10% food scraps the City will contact the account holder to address the non-compliant status. Initially, this might include leaving tags and informational flyers on the container, via the mail or presented in person. Fines for non-compliance may also result from inspections.

In Boulder, where business are required to separate food scraps, and have them composted this is enforced by City Manager inspectors. Building owners are liable for fines for violations, \$500 for the first non compliance, \$2,000 for subsequent breaches, and incarceration for 90 days for serious and repeated.

The coverage of mandatory source separation and organics collections differs between jurisdictions. Coverage in the US, is predominately only on commercial food waste generators, the exceptions being Vermont, Seattle, San Francisco and Boulder where there are also household collections. Whilst in Europe, mandatory source separation generally covers both residential and commercial organics generators, with the exception of Ireland and Italy.

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<sup>4</sup> [Barr, S., N. Ford, & A. Gilg, 2010. Attitudes towards Recycling Household Waste in Exeter, Devon: Quantitative and qualitative approaches. The International Journal of Justice and Sustainability, 8 \(4\) 2003 407-421.](#)

## 5 Discussion

Separate collection and processing of organics leads to higher recovery especially when accompanied by additional policies and initiatives that provide a management direction. In fact, the research has shown that mandated source separation rarely operates in isolation from other instruments.

For example, mandated source separation may operate in conjunction with a landfill ban, to underpin the need for source separation of organics (and other wastes). A landfill ban operates like an infinite tax. In doing so, it effectively excludes landfill as an option for managing waste, but it leaves all other options open. Where waste taxes or levies are low (in Germany for instance) the ban alone drives the switch away from landfill, and to alternative forms of management. The ban itself becomes the price effect and can also be expected to reduce waste generation. In Germany the ban on untreated organics in landfill has driven mandatory separation of organics, composting and digestion of those organics for energy and heat recovery and increased the number of MBT facilities.

Conversely, some jurisdictions successfully implement mandatory organics separation and collection without the underpinning of landfill bans. Rhode Island instituted city-wide organics separation for all businesses with generation in excess of 104 tons (94 tonnes) per year and within 15 miles (24 km) of a processing facility. Boulder, Colorado for example instigated compulsory recyclables and compostables separation, collection and processing for all resident and businesses. The main driver in Boulder is the target to generate new materials from 85% of waste by 2025.

In some countries that mandate the sorting of organic waste by households such as Austria, Germany and Holland there are also targets for the treatment of source-segregated organics to prevent organics management to simply switch from landfill to incineration. In Denmark 80% of all waste, including most food waste was being incinerated. More recently Denmark has recognised this as an inefficient use of resources and has decided to recycle 50% of all its waste, including organics, by 2022 under the slogan “Recycle more incinerate less”.

As discussed in section 2 the drivers for source separation differ widely. For source separation of organics to achieve many of these outcomes much also depends upon the relative costs of the alternative treatment routes and the policies in place supporting particular alternatives over others. Well implemented source separation and collection along with a requirement for higher order processing is likely to do more to foster composting over energy recovery because of the relative cost of infrastructure.

It is more common throughout the UK and Europe to have separate collections of food waste and garden waste rather than combined FOGO collections. Where food is collected separately the waste goes to AD and the garden waste to composting. WRAP UK have reported that separated collection of food waste results in higher recovery of food that combined FOGO collections.<sup>5</sup> AD receives strong public support throughout Europe.

### 5.1 Results of mandatory source separation

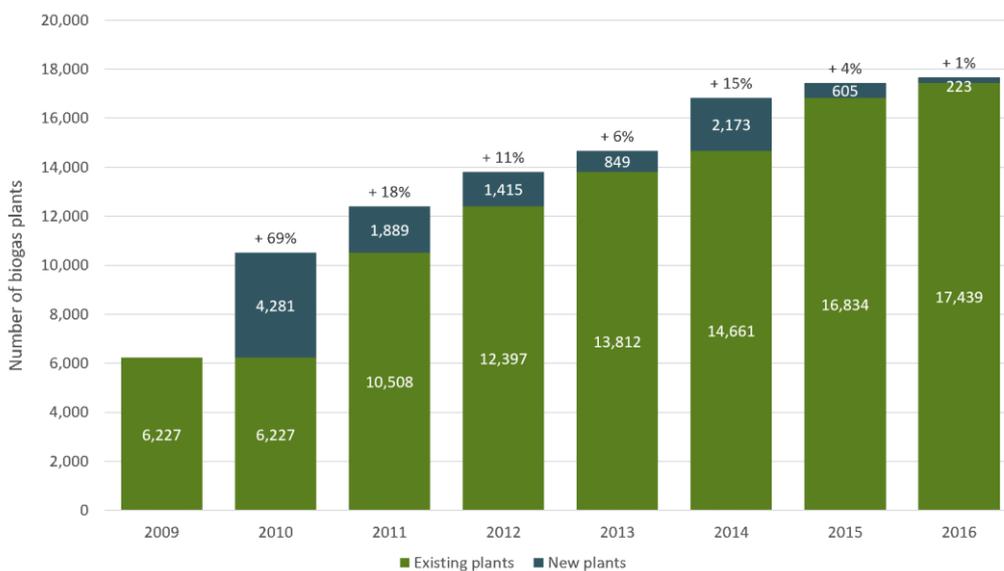
It is difficult to isolate the impact of mandated organics separation and collection from other waste management policies (in particular landfill bans, taxes and levies) and therefore inferring causality when diversion increases is risky. However, the empirical evidence suggests that, where enforced, landfill

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<sup>5</sup> [http://www.wrap.org.uk/sites/files/wrap/Food\\_Garden\\_Waste\\_Report\\_Final.pdf](http://www.wrap.org.uk/sites/files/wrap/Food_Garden_Waste_Report_Final.pdf)

disposal bans and mandatory source separation have facilitated increases in the tonnages of organic (and other) waste recovered and decreases in the rate of landfilling.

A striking effect has been the growth in the AD processing capacity across Europe since 2009. Between 2009 and 2016, the total number of biogas plants rose from 6,227 to 17,662 installations<sup>6</sup> (Figure 2). Not all this growth in AD is a result of enhanced residential and commercial organics collection however, it is also in part attributed to growth in recovery of agricultural organic wastes.



**Figure 2 Growth in Biogas plants in Europe 2009-2016.**

According to the European Environment Agency (EEA)<sup>7</sup> between 2004 and 2014 Germany, Austria, Belgium, Switzerland, The Netherlands and Sweden recycled at least 50% of the MSW.

For the higher performing countries (Germany, Austria, Belgium and Denmark) virtually no municipal wastes are landfilled. Each of these countries use a combination of landfill bans, mandated source separation, land fill tax and/or incineration tax and the mandatory separation coverage is over residential and commercial generators.

The increases reported for those countries coincide with the introduction of mandatory source separation of organics during those years.

<sup>6</sup> <http://european-biogas.eu/2017/12/14/eba-statistical-report-2017-published-soon/>

<sup>7</sup> European Environment Agency, 2018. Municipal waste management across European countries. <https://www.eea.europa.eu/themes/waste/municipal-waste>

## 6 Conclusions

Mandated source separated organics are largely and effectively used as adjuncts to other policies and instruments (landfill bans, taxes, levies) to increase resource recovery. Strong frameworks or policies are required that direct organics (and other wastes) towards higher order recovery routes that require source separated waste streams.

Source separation and collection of organics can drive expansion in composting and anaerobic digestion, and beneficial recovery of both organic and nutrient values from the wastes. Where the mandate has both commercial and residential coverage greater recovery and acceptance is achieved.

Implementation needs to be well-staged and heralded with a long lead time. Investments in infrastructure and industry development during the lead in time is required to ensure adequate collection and processing infrastructure is established when the compulsory separation commences.

With effective lead times and additional supporting policies and infrastructure, mandatory source separation of organics at a commercial and residential level are effective in increasing recovery of organic wastes.