



A TASTE OF WASTE

THINGS TO KNOW ABOUT WASTE AND RESOURCE RECOVERY

IN VICTORIA



METROPOLITAN
WASTE
MANAGEMENT
GROUP





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Accessibility

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This publication is also available in PDF format at www.mwmg.vic.gov.au

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This booklet has been produced by the Metropolitan Waste Management Group (MWMG) as an introduction to the waste and resource recovery sector in Victoria.

MWMG is a Victorian Government statutory body responsible for coordinating and facilitating the delivery of waste management across metropolitan Melbourne. We work with local councils to plan for and procure facilities and services, and to build capacity for them to support schools, businesses and the wider community.

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An interactive feast!

It may feel like you had a banquet rather than a taste, but while creating this feast of information MWMG wanted to ensure it was accessible, interactive and sustainable! So instead of printing thousands of copies, *A Taste of Waste* is available on the MWMG website at www.mwmg.vic.gov.au

Stacks of stats

Information is referenced where appropriate. Where there are references to data or statistics, the information has been sourced from the most reliable or recent source available. Where no reference appears, the information has come from our understanding of the waste and resource recovery sector.

INTRODUCING WASTE

It's a daily part of your life, and yet how often do you actually stop and think about the amount of waste you generate? "What waste? I don't litter, and I recycle!" you might say in response. Well there's more to it than you think.

Waste is a significant issue for our society. Every year Victorians generate over 12 million tonnes of waste, and the amount of material collected at the kerbside alone could fill the MCG 17 times over.

Think about what would happen to all of that waste if the garbage collectors just didn't come. What would your local community be like if there were no rubbish bins, no way to recycle used goods, and no technology to turn waste into energy? Dealing with waste is one of the most critical components of our society – it can't be ignored, it absolutely has to happen.

Enter the waste management sector – a complex, integrated network of organisations that work together to manage the flow of waste and resources in our community.



That's why we've put together this booklet – to give you a taste of waste. You'll find out what happens beyond the bin – the facts about recovering, reusing and recycling valuable materials that are thrown away, how your waste decomposes to produce greenhouse gases, converting waste to energy, and all the work that's being done to divert waste away from going to landfill. Find out who's who in waste management in Victoria, and most importantly, how you can play a vital role at every stage of the process.

Victorian Government's Draft Victorian Waste and Resource Recovery Policy 2012, page 5

THE WASTE LOW-DOWN

What is 'waste'?

Waste can be defined in a number of ways including:

- a material left over or no longer in use
- a misplaced or superfluous liquid or solid (human-made or natural)
- a resource with a yet to be determined use
- the act of using resources inefficiently, excessively or needlessly.

The act of wasting results in materials that are perceived to have little or no value and are therefore discarded. In many cases a material becomes waste because it is not socially acceptable, convenient or economically and environmentally viable for it to be avoided, re-used or recycled.

To really clarify things you can always refer to the definition used in the relevant state legislation, in this case the Victorian *Environment Protection Act 1970*.

When environment people talk about '**the Act**' they are often referring to this legislation and this document will also do so.

Waste is defined by the Act as:

any matter, whether solid, liquid, gaseous or radioactive, which is discharged, emitted or deposited in the environment in such volume, consistency or manner as to cause an alteration of the environment.

"Wow, that's a lot of stuff..."

CLASSIFYING WASTE

Many people find it useful to categorise waste according to the source of the material.

The three common waste sources (or ‘waste streams’) collectively referred to as solid waste, are:

- ① Municipal solid waste (MSW): waste from households, public places and council operations
- ② Commercial and industrial (C&I): offices, small, medium and large enterprises. This stream includes waste from many sectors including manufacturing, wholesale, service industries, retail and hospitality
- ③ Construction and demolition (C&D): waste materials from residential, civil and commercial construction and demolition activities.



Another way to describe waste is by referring to the physical characteristics:

INERT	PUTRESCIBLE	PRESCRIBED
Component of the waste stream that is largely non-organic, non-flammable and not chemically reactive. This includes bricks, cement, sand, soils and timber.	Component of the waste stream likely to decompose – including wastes that contain organic materials such as food and garden wastes or wastes of animal or vegetable origin, which readily bio-degrade within the environment. This includes household waste and anything likely to create an odour.	Component of the waste stream which, by its characteristics, poses a hazard, threat or risk to public health, safety or the environment. It includes waste materials from manufacturing, contaminated soils and toxic, explosive, flammable, corrosive or radioactive substances. Such wastes are generally treated before disposal and carry special handling, storage, transport and often licensing requirements.



“See, didn’t that clear things up for you?”

See the EPA website www.epa.vic.gov.au for more information on waste classifications.

THE WASTE HIERARCHY

The waste hierarchy is an internationally accepted approach to waste management. The most preferred option is to avoid producing waste and the least preferred option is disposal (i.e. dumping in landfill).



THE THREE 'Rs'

or is that two 'Rs' and an 'A'?!

Broadly speaking, these are any processes that prevent waste from ending up in landfill. If you're going to be taken seriously in the waste and resource recovery industry it's important to understand the huge amount of work in this area AND know your three Rs:

Reduce: Perhaps sometimes overlooked but definitely an important foundation of the hierarchy, **reducing** is now often referred to as **avoiding** (or sometimes minimisation!). Whatever we call it – reducing or avoiding the creation of waste in the first place saves a lot of energy and resources. It's worth highlighting that waste can also equal money. By reducing waste there are often economic as well as environmental gains. For example, a business that designs better products that require less resources or finds ways to avoid waste in the production cycle may also benefit with financial savings.

Reuse: This is when a used product or material (still potentially a waste) is used again but without having undergone any sort of physical or chemical processing. Reuse includes collecting empty jars to make jam, taking your old clothes to an op-shop or making notepads from paper that's only been used on one side. A report by online classified company Gumtree estimated Australia's second-hand economy (generated by people buying and 'reusing' the unwanted stuff of others) grew to \$18 billion in 2012.

Recycle: The technical definition of recycling is when a used product or material (as waste, if you must) undergoes some sort of physical or chemical processing such as crushing, boiling, sorting, sieving, granulating, chipping or shredding. This creates materials known as 'feedstock', such as pellets, flakes or pulp, for the production of something new such as street furniture or polar fleece.

Rethink!

If you consume a fair amount of **yoghurt** each week then buying a larger yoghurt container instead of small individual ones enables you to **reduce** packaging. If you use the yoghurt container to cultivate seedlings you **reuse** it, and when you send the yoghurt container off to be recycled, shredded and made into outdoor furniture, it's **recycling**!



REPLACE THESE...

WITH THIS

More on avoidance and reduction...

There are many ways to reduce or avoid waste, from the design and manufacturing stages right through to the level of consumption.

Some examples include:

- Designing a product to consider its environmental impacts including material consumption, how it is packaged, transported and disposed.
- Looking at industrial manufacturing processes and commercial systems to ensure these are delivering products in the most efficient way.
- Selecting products that can be reused. In the office this might mean giving staff a reusable mug for their soy decaf moccino and then encouraging them to use it. At home it might mean parents switching from disposable nappies to the cool new washable ones that look nothing like the terry-towelling squares from a generation ago.
- Making mindful decisions about what you buy. Food is great example. By planning meals you can avoid wasting food – what well-intentioned purchase is now past its use-by-date and lurking at the bottom of your fridge?
- And finally there are those things that go without saying: setting the office printer default to double-sided and taking reusable shopping bags instead of single-use plastic ones.

Note: It is still important to do your own research and keep up to date. As research, new technologies and ways of thinking change and evolve, what is the best option now may be less so later!

RECYCLING – THE FACTS!



Recycling is the act of taking a material or a product that would otherwise be destined for landfill and creating a new product from it.

Many in the sector will spend hours in a philosophical discussion about 'when' a material is technically considered to be recycled. Most agree it certainly isn't recycled when you put something in the right bin. Once you've put something in the kerbside bin it usually (but not always) heads to a materials recovery facility. Here, a series of conveyor belts, trommels, magnets and humans sort the 'recyclables'. The sorted materials are then baled or compacted and sold to those who process the materials into feedstock (e.g. pellets, flakes, pulp) which is then used to create new products. This is the end of the recycling chain, but that defining moment when a material is technically 'recycled'... well that's still up for discussion!

What can be recycled?

Many of the materials that we dispose of are recyclable. Victorian householders are relatively enthusiastic recyclers and the bin system for waste, commingled recycling and garden organics (for most councils) enables the diversion of approximately 43% of household waste from landfill.

Glass can be recycled indefinitely but it helps if the different types of glass, and the various colours, are kept apart. Bottles, window glass, wine glasses and light bulbs are all made from glass with totally different chemical compositions and this affects how they can be recycled, if at all. Some glass is now being recycled into road base or asphalt. This is a great solution in some contexts, however it may depend on the collection systems and technology available and transportation requirements that determine what is the best use for this material.



Metals have mostly high monetary values due to the difficulty (energy intensity) of getting new metals like aluminium and steel from raw ore. As a result there is generally a high demand for these materials to be recycled.



Paper and cardboard recycling is about saving water and energy. Making new paper and card from old paper and card takes away the need to chop down trees (sustainably managed with luck, but not always), to chip and dry out the wood, pulp it, mash it up, bleach it and then put it into the paper mill process.



Techie corner: conversion from a high to a low grade product is often referred to as 'down-cycling'. Of course where a material is converted into a new product of higher quality or value it is called up-cycling. Unfortunately this is not as common as down-cycling!



Plastic is a tricky one because there are so many different types with more emerging all the time. The favourite recyclable plastics (with a high dollar value) are PET (e.g. soft drink) and HDPE (e.g. milk and juice bottles) which have internationally recognised Plastics Identification Codes (PIC) 1 and 2 respectively. For other hard plastic containers with codes 3 – 7 that can be placed in the commingled kerbside recycling bin, if they remain in Australia for sorting and processing, they predominantly end up as lower end plastic products like bollards and street furniture. When they are exported overseas, mostly to Asia, they are either sorted by hand and then recycled or used for energy production.



Plastics:

For more information on types of plastics, their uses and recyclability, visit www.pacia.org.au/content/plasticsfacts

GET IT RIGHT ON BIN NIGHT

As recycling technology has evolved, so has the range of materials that can be recycled. Kerbside recycling has gone from bundles of newspapers, and crates of glass bottles and cans, to PET and HDPE plastics, through to a full range of metal, glass, paper, cardboard and plastic containers that are now accepted in wheelie bins.

Community research* shows people in Melbourne are enthusiastic recyclers with 89% saying they recycle "even if it requires additional effort". But community knowledge about recycling has not kept pace with the evolution of the industry, with only 61% of the same people saying they feel they have a very good understanding of what items can be recycled. Bin audits in 2010 found 20% of items in household garbage bins could have been recycled. This equates to a whopping 450,000 wheelie bins full of recyclables going into landfills across Victoria each week!

To address this problem, MWMG and Sustainability Victoria (SV) launched Get it Right on Bin Night in May 2012. Funded by the Australian Packaging Covenant, SV, MWMG and the 30 metropolitan councils, this was the first metropolitan-wide recycling campaign in Victoria.

Get it Right on Bin Night aims to provide simple information on what can and can't go into the recycling bin and what happens to material after it leaves the kerbside. Visit www.getitrightbinnight.vic.gov.au, check out the Facebook page 'Right on Bin Night' or follow '@onbinnight' on Twitter.

*source 'Kerbside Recycling in Metropolitan Melbourne' Sustainability Victoria 2011.

Materials like bricks, concrete, paving slabs, tiles, sand, gravel...

these items definitely don't go in the recycling bin but they can still be recycled. Victoria recycles approximately 97% of construction and demolition waste, such as concrete, bricks, metals and timber. C&D waste is recycled into things including new building materials, road base, drainage media and recycled bricks. The remaining residue is sent to landfill as it includes materials such as broken glass, soil, and mixed wastes and these materials have little or no value in the marketplace.



RECYCLING – THE FACTS!



More Recycling

Organics/composting: technically, composting organic matter such as food or plant waste is a type of recycling. Composting is a natural biological process where busy little microbes breakdown and stabilise organic matter. The end product is recycled organic material you can put back into the ground. Organic matter is the cornerstone of a healthy soil, helping it to hold more water, release nutrients more effectively, reduce erosion and generally grow better plants.

Recycled Organics

The recycled organics industry uses aerobic composting, a controlled biological process requiring the presence of oxygen and the right balance of nutrients and moisture to degrade organic materials. In Victoria the industry is changing, moving from open windrow (long rows of piled organic matter) to composting in enclosed tunnels. New technology can achieve better environmental controls and outcomes. The end products can be used in your own backyard, parks and gardens, sporting ovals, horticulture, agriculture and for land restoration.

Recycled organic products include composts, soil blends and conditioners, mulches, reactive filter media and bio-remediation products. Uses include soil improvement and rehabilitation, erosion control and stormwater improvement.

The benefits of recycled organics include:

- improving soil moisture retention, adding to water savings
- improving soil structure, resulting in less nutrient run-off and leaching
- reducing the need for chemical fertilisers through the addition of organic content to soil
- regulating soil temperature fluctuations that can inhibit plant growth
- enhancing biological activity to enable plants to use nutrients more efficiently
- storing carbon in the soil, providing a carbon 'sink'
- closing the loop on green organics recycling by buying back what's been collected for recycling.

HORTICULTURE



SPORTING OVALS



AGRICULTURE



DOMESTIC GARDENS



PARKS AND GARDENS



Other recyclable products and materials (where systems/programs exist)

There is a growing list of these. Recycling is largely dependent on economic markets, supply chain commitment, technology, materials scarcity and logistics to ensure materials can be handled correctly and efficiently.

Examples of other products where recycling programs exist in Victoria include:

- batteries (all sorts from car batteries to watch batteries)
- electrical equipment- computers and accessories, mobile phones, televisions, whitegoods and other appliances
- fluorescent tubes and light globes
- soft plastics (plastic bags and food packaging)
- expanded polystyrene (EPS)
- timber – including pallets and furniture
- tyres
- used cooking oil and used motor oil (not together – they're quite different).

Contamination

It is important for any recycling system that materials are correctly sorted. This facilitates effective resource recovery and processing. When the separation of materials is done correctly it reduces the cost, labour and energy required to sort materials and allows processing to occur unhindered.

The wrong products (especially hazardous ones such as toxic chemicals) put through the wrong recovery stream, can adversely affect recycling processes. This includes damage to machinery or equipment at recycling facilities, not to mention the health and safety of people working there. When contamination occurs it can impact on other correctly sorted materials, sometimes resulting in material ending up in landfill (for example the discovery of syringes or hazardous material in a load of garden organics). This is bad news for end-product markets and the environment.

Preventing contamination starts at home – what's in your bin now?



1300 763 768



To find out where to recycle many more products visit PlanetArk's RecyclingNearYou website, www.recyclingnearyou.com.au or www.businessrecycling.com.au

PRODUCT STEWARDSHIP

Product stewardship is a policy approach that ensures all those involved in the life cycle of a product share responsibility for reducing its health, economic and/or environmental impacts.

Product stewardship (PS) considers the environmental implications of a product at each point in its life, and can take many forms including sustainable design and manufacturing initiatives, supply chain initiatives and 'take back' programs. PS schemes can be voluntary, or supported by regulation. PS is often a preferred policy mechanism because it places obligations on those directly responsible for the environmental impacts of production and consumption. Generally speaking the producer bears the primary financial obligation involved in dealing with a product at the end of its useful life.

Some examples of product stewardship in Australia include:

- Australian Packaging Covenant
- drumMUSTER
- FluoroCycle
- MobileMuster
- National Television and Computer Scheme
- Packaging Stewardship Forum
- BatteryBack

For more information search for product stewardship on the EPA website – www.epa.vic.gov.au

The term Extended Producer Responsibility (EPR) is often used interchangeably with PS but strictly speaking is slightly different, placing a stronger emphasis on the responsibility of the producer or manufacturer of the product. In Australia, the importer is often called upon as a proxy for manufacturers based outside of the country. EPR generally applies to mandated requirements such as the **used oil scheme** which operates Australia-wide or the container deposit scheme in South Australia.

The Australian Government, under the
National Waste Policy: Less waste, more resources,

has agreed to develop and enact national legislation to support voluntary, co-regulatory and mandatory product stewardship and extended producer responsibility schemes. The legislation will provide a consistent approach to reducing the environmental footprint and health and safety risks of specified manufactured products and materials, during and at the end of their useful life. The first one to be established under the legislation is a National Television & Computer Product Stewardship Scheme.

For more information visit www.environment.gov.au/settlements/waste/ewaste/index.html

CASE STUDY

National Television and Computer Product Stewardship Scheme

Recovering valuable resources from unwanted TVs and computers

This is a co-regulatory program, meaning it is regulated by the federal government and funded and implemented by TV and computer manufacturers and importers. It is aiming to increase the recycling rate of TVs and computers from 30% to 80% by 2021-22.

Under the scheme, manufacturers and importers (liable parties) are responsible for recycling their market share of the TV and computer material they import or manufacture. Liable parties must sign with an approved co-regulatory arrangement.

CASE STUDY

The approved co-regulatory arrangements are responsible for collecting and recycling material on behalf of their liable parties. These approved arrangements undertake:

- setting up permanent collection sites and one-off collection events
- organising logistics for the collection and transport of material
- ensuring recycling of material
- reporting back to the federal government on behalf of their liable parties.

The arrangements must operate under the Australian/New Zealand standard for collection, storage, transport and treatment of end-of-life electrical and electronic equipment to ensure best practise is followed. More information on these arrangements, and the scheme in general, is available at:

www.environment.gov.au/settlements/waste/ewaste/



MobileMuster

There are over 30 million mobile phone subscribers in Australia, who on average upgrade or exchange their mobile every 18 to 24 months. It is estimated that there are more than 23 million old mobile phones sitting unused in cupboards and drawers around the country.

How it works: MobileMuster is a voluntary product stewardship program initiated by the Australian Mobile Telecommunications Association. It accepts all types and brands of mobile phones, batteries, chargers and accessories for recycling free of charge.

All mobiles and accessories are collected, dismantled and separated, with more than 90% of the materials in the phones being recovered.

Circuit boards are processed to recover precious metals, cobalt, lithium, other metals and plastics. The recovered materials are used to make jewellery, batteries and other products. Plastics are processed locally in Australia to make infrastructure such as fence posts. Batteries are sorted by type for nickel and cadmium and processed to make new batteries and stainless steel.

Between 1998 and March 2013, MobileMuster had collected and recycled 1.03 million kilos of handsets, batteries, chargers and accessories. This includes 7.5 million batteries and handsets. It is estimated that one tonne of mobile phone circuit boards (from 50,000 handsets) can yield the same amount of precious metals as 110 tonnes of gold ore, 123 tonnes of silver bearing ore and 11 tonnes of copper sulphide ore.

For more information on how recycling of mobile phones works visit www.mobilemuster.com.au

WHAT ABOUT RECOVERY OF ENERGY?

ARRTs... no, not something you hang on the wall!

When people in the waste sector talk about Advanced Resource Recovery Technologies (ARRTs), they are referring to the best practice technology for getting value out of waste, by producing useful materials and products instead of just throwing it away or 'letting it go to waste'.

One thing to love about ARRTs is that they can convert waste into energy. Here's how:

Thermal energy recovery – there are three systems:

- **Direct combustion/incineration** burns materials in waste (e.g. garden and food organics, paper, cardboard, plastics, textiles and timber) to produce heat and steam which drives steam turbines and generates electricity. Metals and other recyclables can be recovered prior to burning or from the ash after burning. While this is a proven technology, it is less efficient than other thermal systems because the moisture content in food organics reduces the fuel quality of the waste, along with efficiency losses due to the use of steam turbines. The current generation of thermal systems has very high levels of emissions controls.
- **Pyrolysis** turns waste into energy rich fuels by heating the waste to between 400°C and 800°C in the absence of oxygen to thermally decompose materials, driving off volatile gases and hydrogen. This process creates:
 - synthetic gas – used to generate electricity
 - pyrolysis liquid – used as a fuel or to make new products such as ethanol
 - solid biochar – a charcoal-based product rich in carbon used as a solid fuel or as a nutrient additive to improve soils.
 Pyrolysis technologies are still being developed for mixed garbage, but are more efficient than incineration as they can tolerate and use moisture as fuel, and the gas produced directly powers more efficient combustion turbines.
- **Gasification** is similar to pyrolysis in using heat, a low-oxygen environment and also steam to thermally decompose materials into a combustible gas. This gas can be used as a fuel, or to generate electricity via gas turbines. Residue from the process is an ash/slag rather than biochar.

Biological energy recovery

– this method uses:

- **Anaerobic digestion** is when a lot of organic matter is composted in a big vat without any air present. This produces methane (see page 16 for the low-down on methane), which can be captured and then burned to make electricity and heat. What's more, if you put good, clean organic material into the process, you can even compost what's left over. There are many variations on this theme – some process the organic matter as solids; others convert it into a 'soup' prior to digestion. Some landfills act as digesters, with very high levels of gas capture (but higher risk of leaking gas too). There are so many more variations, which are too numerous and technical for this booklet – after all, this is just a taste of waste!
- **Fermentation** is a method that biologically converts organics into ethanol, methanol and other organic compounds which can be used for fuel or in the synthesis of other hydrocarbon products. Residual organics can be treated further using other technologies or converted into organic soil additives.

There are so many ways of making energy from waste you could fill a completely separate book. Co-generation and tri-generation are some other interesting options for energy recovery. They have multiple benefits like power generation, heating and in the case of tri-generation, cooling by using waste heat to drive adsorption chillers. Through innovation and the right location, the use of waste heat from these energy recovery systems adds to the level of energy recovered.



DISPOSING TO LANDFILL

The total amount of waste generated in Victoria continues to increase, however this increase is offset to some degree by increased recycling activity.

So, while the total amount of waste continues to grow, the actual quantity going to landfill remains relatively constant. Currently the amount going to landfill in Victoria is around 4 million tonnes of waste each year.

More than 60% of waste ending up in landfill is biologically active, or organic waste. *The National Waste Report 2010** states over 13 million tonnes of organic waste was sent to landfill in 2006-07 of which over 7.5 million tonnes was food waste.... making up over a third of all waste in the average household garbage bin. That's a lot of unused meat and vegies...and it doesn't even include the food waste that's composted at home.

*For updates visit www.environment.gov.au/wastepolicy

More than just a 'tip'

Landfills in Victoria have changed dramatically over the last 30 years. They've moved away from the not so good old days of unlined holes in the ground to being highly regulated sites with adequate management systems for:

- the cell (what the waste gets disposed into)
- composite liners (typically a thick layer of clay with a plastic membrane)
- collection of landfill gas
- leachate (water that has come into contact with waste)
- the final cap that goes over the hole when it's full.

Victorian landfills are regulated by EPA Victoria's Best Practice Environmental Management Siting, Design, Operation and Rehabilitation of Landfills (2010), which gives guidance, direction and sets best practice standards for landfill operators in terms of siting and operational matters.

Landfills are classified by the different wastes they accept:

- Type 1 – prescribed industrial wastes such as residues from liquid waste treatment and other industrial processes.

- Type 2 – putrescibles, solid inert wastes and limited amounts of prescribed wastes such as soils with low levels of contaminants.
- Type 3 – solid inert wastes and fill material.

There are important environmental controls and planning considerations relating to the siting and operation of landfills, they key ones being:

Buffer distances: Usually there is a buffer distance of between 200m to 500m separating the landfill from any sensitive uses such as residential estates, schools and waterways. There are different buffer requirements for different types of landfills.

Leachate management: The leachate is the liquid collected from the base of the landfill and either discharged into the sewer or transported off-site after being treated. It can also evaporate from storage ponds on-site.

Landfill gas capture: Gases generated by the anaerobic decomposition of wastes are contained within the landfill lining system and removed via a landfill gas capture system. Gas is generally collected by drilling a series of 'wells' into the 'cap' of a finished cell. A large blower is used to

Australians throw out

more than \$8 billion worth of food per year, equating to \$1,036 per household!

(2013 www.foodwise.com.au)



draw the gas from these wells to an on-site generator for electricity generation. Where there is excess gas it is released or 'flared'. There are some places where methane can escape, these include:

- methane released prior to the cell being finished and the wells put in place
- gas that escapes around the edges or through cracks in the landfill cap
- after peak gas production there can continue to be gas produced which requires control systems and measures such as flaring.

Using landfill gas as a means to produce energy is deemed to be a renewable energy. All the larger landfill sites in Melbourne capture methane to produce electricity; smaller landfill sites use other control techniques to treat methane, e.g. flaring.

For more information and the latest on all things landfill, visit www.epa.vic.gov.au



THE NUTS AND BOLTS OF CARBON

By now you would have heard a lot about carbon prices and trading schemes – but what does this all really mean? And what has any of it got to do with waste?

Greenhouse gases

There are three major greenhouse gases – carbon dioxide (CO₂), nitrous oxide (N₂O) and methane (CH₄). CO₂ is the most common, accounting for about three-quarters of Australia's total emissions, with methane contributing a further 21%. Get the full gas low-down at www.climatechange.vic.gov.au

Methane is produced when organic matter decomposes in oxygen-free environments, such as at a landfill. (Also from animals digesting their food, but that's another story). The waste industry contributes approximately 2.5% to Australia's total greenhouse gas emissions with the majority being methane produced at landfills.

Under the *National Greenhouse Energy Reporting Act 2007 (NGER)*, methane has a CO₂e value of 21. This means that each tonne of methane emitted is considered equivalent to 21 tonnes of CO₂. Methane's CO₂e value will increase to 25 in 2017.

Targeting methane

The waste sector – and indeed everyone from the community through to all levels of government – is working hard to reduce the amount waste that ends up in landfill. Less waste in landfill means less methane produced. Another way to reduce methane emissions is to capture any that is produced at landfills and burn it off to produce energy.



Carbon price or carbon tax?

To address climate change, the Australian Government introduced the *Clean Energy Future Plan* in 2012, which put a price on carbon emissions. Some call it a carbon tax, but they are talking about the same thing.

It's a user-pays system...if a business sends greenhouse gases into the air beyond their allowance, it will pay for it by the tonne. Initially, the price per tonne was controlled by the government, but it's now moving towards a system where the government will set a (reducing) cap on the amount of gases allowed to be emitted and, through a carbon emissions trading system, the price will be determined by the market.

If a business can lower the amount of greenhouse gas produced, it will pay less. This creates an incentive for all businesses to reduce their greenhouse gases by investing in cleaner technology or finding more efficient ways of operating.

What has this got to do with waste?

Simple – landfills which emit 25,000 tonnes or more of CO₂e are subject to the carbon price. (In metropolitan Melbourne this means all landfills accepting municipal solid waste.)

The not-so-simple aspect is that a truckload of waste deposited today will decompose and emit methane for many decades. So with future carbon prices uncertain, how do you know what's a fair charge on the emissions from the waste deposited today?

Landfill operators are required to estimate their emissions using a complex formula that assumes different organic contents and decay rates for different waste materials.

And then remember how we said above that landfill operators collect methane and burn it to create energy? Well they can earn carbon credits from that....

It's all very detailed – you can read more at www.cleanenergyfuture.gov.au or www.cleanenergyregulator.gov.au. It's also very topical in the political arena, so know that things may change before you get to the end of this booklet.

THE OTHER HALF OF THE CARBON STORY

When it comes to waste, we've already told you that avoidance or reduction is better than creation (see page 6), and that also applies to carbon emissions.

As we've mentioned, reducing carbon emissions can happen by taking organics out of landfill and composting it instead. Composting produces carbon dioxide rather than methane, and the end result is an organic, nutrient-rich product you can use to fertilise soil.

Another way of reducing carbon emissions is by choosing recycled materials and products over raw.

Every product has a life cycle, and an environmental footprint. It's quite hard to calculate the footprint in today's globalised economy, but when you consider that each stage of a product's lifecycle – idea, design, creation, production, use, disposal, decomposition – uses resources, materials, energy, water and people-power, not to mention transportation and packaging too – that's a pretty big footprint. As waste is generated at every step of the way, so are carbon emissions.

We know that for most materials the activity of recycling requires less energy, water and other resources than to produce it from raw or virgin materials (extracting and processing raw ores or aggregates is often energy intensive).

The activity of collecting waste and processing it into new products still uses energy and resources, however recycling can achieve substantial economic and environmental savings throughout the life cycle process.



WASTE & RESOURCE RECOVERY IN VICTORIA!

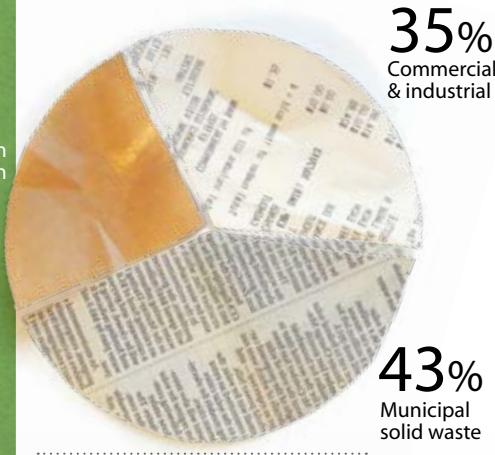
How much waste is produced?

A lot! Victorians produce over 12 million tonnes of material each year. Of this, the metropolitan Melbourne region generates approximately 71%, and in 2010-11, nearly 8.5 million tonnes was recovered, and the rest sent to landfill.

If you averaged out all the waste produced across all the sectors (including household waste), this has increased over this time from 1.56 tonnes per capita in 1999-2000 to over 2.15 tonnes in 2010-11.

The material sent to landfill includes:

22%
Construction & demolition



Solid waste generated in Victoria by weight, 2010-11

Source: SV Regional Waste and Resource Recovery Projection Model 2013 v 1.1

Recovering waste

In 2010-11, Victoria recovered 69% of waste. This figure has been increasing over the past decade with the total amount of waste being sent to landfill decreasing as recovery increases. The recyclables most commonly recovered from household waste includes glass, paper/cardboard, steel/aluminium, plastics and garden organics.

Year	Total landfill to waste (tonnes)	Total recovery (tonnes)	Recovery rate
01-02	4,583,000	4,123,000	47%
02-03	4,181,000	4,428,719	51%
03-04	4,452,379	5,142,672	54%
04-05	4,419,460	5,427,146	55%
05-06	4,076,813	6,194,543	60%
06-07	3,924,993	6,358,425	62%
07-08	4,013,634	6,277,505	61%
08-09	3,744,831	6,555,688	64%
09-10	3,808,000	7,516,000	66%
10-11	3,885,000	8,462,000	69%

Solid waste, recycling and recovery rate (%) in Victoria by weight, 2001–2011

SV Regional Waste and Resource Recovery Projection Model 2013 v 1.1

WHO'S WHO?

Everyone has a role to play in managing waste, from you, your family and friends, to the local shop owner and the big service providers.

Across government, there is a range of bodies responsible for developing waste and resource recovery policies, strategies, programs and services.

LOCAL

- Local government (councils)
- Victorian Local Government Association (VLGA)
- Municipal Association of Victoria (MAV)

STATE

- Department of Environment and Primary Industries (DEPI)
- Environment Protection Authority Victoria (EPA)
- Sustainability Victoria (SV)
- Metropolitan Waste Management Group (MWMG)
- Regional Waste Management Groups (RWMG)

FEDERAL

- Department of Sustainability, Environment, Water, Population and Communities

Outside of government, there's the **waste and resource recovery sector**, which provides collection, transport, sorting, processing, trade and export, disposal and infrastructure services, and **manufacturers** that produce recyclables and residual waste, and use waste materials as raw inputs to manufacturing processes.

There are also industry associations, not for profit and community groups playing their part. Here are just some of the bigger ones:

- Australian Council of Recycling
- Waste Management Association of Australia
- Compost Victoria
- Victorian Waste Management Association
- Community Recycling Network Australia

- Australian Landfill Owners Association
- Australian Packaging Covenant
- Australian Food and Grocery Council – Packaging Stewardship Forum
- Mobile Muster – Australian Mobile Telecommunications Association
- Australian Industry Group (AIG)

- Victorian Association for Environmental Educators
- Planet Ark
- Do Something!
- NACRO (National Association of Charitable Recycling Organisations)
- Keep Australia Beautiful
- Clean Up Australia

WHO'S WHO

LOCAL GOVERNMENT

Local government is considered the 'on-ground' manager of waste, especially municipal solid waste (MSW).

Waste and resource recovery at this level is largely derived from the *Environment Protection Act 1970*. (The *Local Government Act 1989* also outlines matters like contracts and council responsibilities). The on-ground work covers a wide range of activities that incorporate the collection, transportation and disposal of waste, the management of resource recovery and the public education and awareness that makes all of this function.

'Wheelie' bins

Officially known as mobile waste containers or mobile garbage bins, 'wheelie' bins come in a range of colours, shapes and sizes, usually with lids and solid rubber wheels. Believe it or not there is an Australian Standard for them too, which includes recommended colours (AS 4123.7-2006). Residential collections can be anything from 80L to 360L bins. Commercial and construction sites often use larger wheelie bins, skips, cages and compactors to collect and transport waste.

ORGANICS

RECYCLING

LANDFILL

Collecting waste and recycling

Local governments provide a range of waste management services and activities, including:

These include:

- general waste and recycling services
- organic waste removal and composting
- hard waste
- collecting litter from public places
- specialised recycling and transport services – i.e. electronic waste (e-waste).



Resource recovery centres

Transfer stations, which are evolving into **resource recovery centres**, exist to provide a place where waste can be dropped off by residents, commercial operators or local councils. Key materials are then sorted (often on-site) and bulk-hauled to either a landfill or a processor for recycling.

The types of products collected at resource recovery centres include:

- building waste
- car batteries
- concrete
- electronic waste
- garden organics
- gas bottles
- household chemicals
- household hard waste
- mattresses
- metals
- motor oil
- paints
- paper/cardboard
- plastics
- polystyrene
- timber
- white goods
- general rubbish

To find out more about the items that can be accepted and recycled at individual council managed resource recovery centres and transfer stations go to www.mwmg.vic.gov.au/find-a-dropoff-centre



Community Recycling Ventures!

A fantastic benefit of these centres is the potential for the development of social enterprises. The local tip shop can become a place where waste creates jobs and strengthens inclusion for disadvantaged people in our community. There are more than 50 recycling enterprises across Australia.

For more information go to
www.communityrecycling.com.au

WHO'S WHO

STATE GOVERNMENT

The Victorian Government is responsible for developing waste and resource recovery policy at state level. The *Environment Protection Act 1970* provides the framework for the management of waste and determines who's responsible for all things waste and resource recovery related.

The major players are:

- The Department of Environment and Primary Industries – provides policy planning, leadership, coordination and oversight of the environment portfolio
- Environment Protection Authority Victoria – controls pollution by setting and enforcing environmental standards for business and industry to achieve clean air, healthy water, safe land and minimal disturbance by noise and odour
- Sustainability Victoria – develops and implements statewide strategies and programs to promote and facilitate the sustainable use of resources
- MWMG and RWMGs – work with local government in order to plan and coordinate the management of waste across respective regions.

Three of the Victorian Government's significant responsibilities include:

- Policy – gathering data and information to understand waste and resource recovery challenges and opportunities. This work includes developing a vision and approach to position Victoria as a national leader in resource recovery.

- Planning and programs – working with local government and industry to plan the infrastructure and services needed to manage and recover our waste; and delivering programs that help us protect the environment and public health, and support economic prosperity.
- Regulation – controlling pollution by regulating and enforcing environmental standards to achieve clean air, healthy water, safe land and minimal noise and odour disturbances.

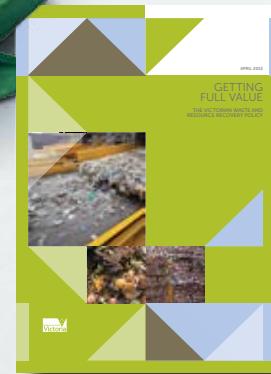
Policies, plans and Getting full value

The Victorian government has developed some key documents to take Victoria down the best path to waste management and resource recovery:

Getting full value: the Victorian Waste and Resource Recovery Policy (2013)

This provides the vision, goals and strategies to lead Victoria towards an integrated, statewide waste management and resource recovery system. It aims to:

- reduce waste generation and use resources efficiently
- build strong markets for recovered resources
- deliver a waste and resource recovery system that maximises the value of waste
- reduce the environmental and public health risks of waste
- reduce illegal dumping and littering.



The Statewide Waste and Resource Recovery Infrastructure Plan

This plan, which you may hear referred to by its shortened name of SWRRIP, is in development at the time of writing. Stemming from *Getting full value*, it will provide a statewide plan for all the infrastructure to manage waste and resource recovery in Victoria.

The Metropolitan Waste and Resource Recovery Strategic Plan

This plan, introduced in 2009 and which is reviewed every four years, focuses on the future management of all solid waste in metropolitan Melbourne. It also serves as a guiding tool and information resource for Melbourne's 30 councils. There are three parts:

Part 1 – The Metropolitan Plan assesses the current situation and sets the strategic framework for the management of all solid waste in metropolitan Melbourne.

Part 2 – The Municipal Solid Waste Infrastructure Schedule sets out a schedule of existing and required infrastructure for municipal solid waste.

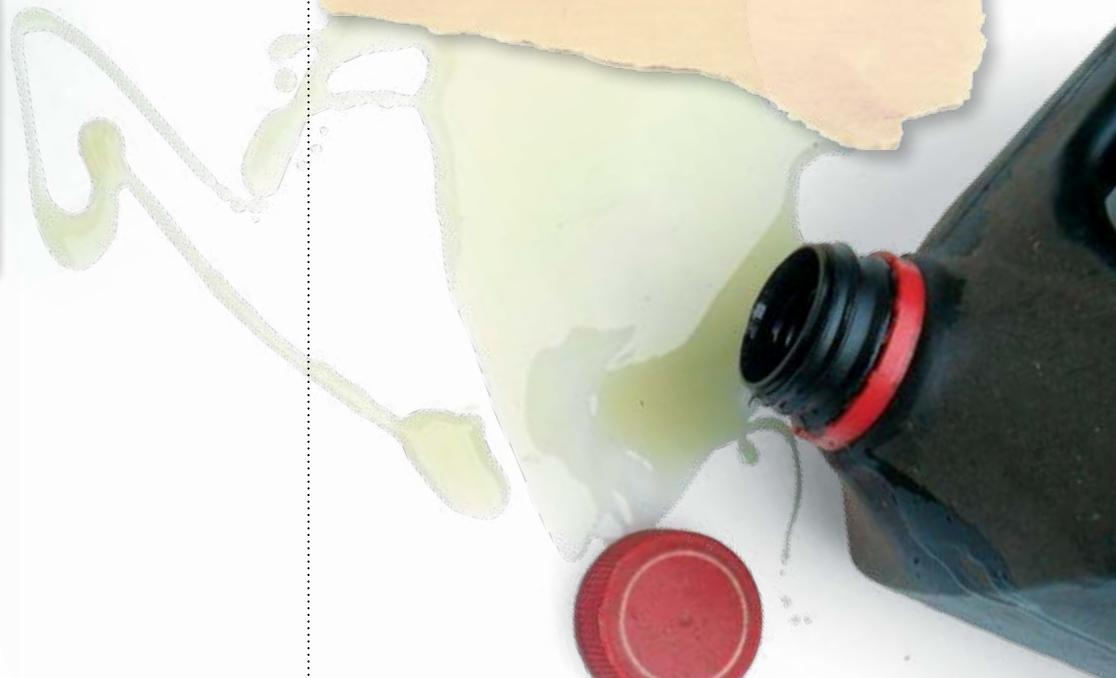
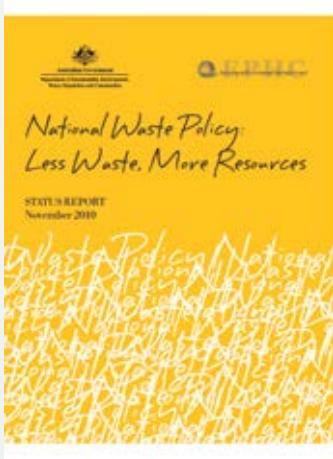
Part 3 – The Metropolitan Landfill Schedule sets a schedule identifying the location and sequence for the filling and operation of landfill sites.

FEDERAL GOVERNMENT

The federal government is responsible for preparing and coordinating the National Waste Policy (2010), which sets the direction for Australia's waste management and resource recovery over the next ten years. It covers six key areas:

- taking responsibility
- improving the market
- pursuing sustainability
- reducing hazard and risk
- tailoring solutions
- providing the evidence.

Further information is at
www.environment.gov.au/wastepolicy



INTERNATIONAL LEGISLATION

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal is a treaty that came into force in 1992 in response to the rise in exports of hazardous wastes from developed countries (with increasingly strict environmental laws and rising costs to dispose of hazardous waste) to less developed countries (where these same laws were often non-existent).

The Convention doesn't just cover toxic sludge being shipped overseas in mystery drums...there are many household items with the ability to be considered hazardous waste such dead batteries and e-waste.

It is a key international instrument that guides the responsibility of hazardous waste management for the 172 parties that have signed on. The key objectives include:

- minimising the generation of hazardous wastes in terms of quantity and hazardousness
- disposing of them as close to the source of generation as possible
- reducing the movements of hazardous wastes.

See www.basel.int for more information.

GET INTO WASTE!

Anyone can get into waste, no matter their age or stage of life. There are many ways you can learn about minimising the amount of waste you produce and disposing of it properly. You can even make a career out of it!

Learning at school

Gone are the days where learning about waste at school involved picking up papers at recess for having misbehaved.

Schools are a great place to learn about waste and recycling. While the message is spread amongst teachers, students, their parents and the community, the school can address its own waste management practices and reduce what it sends to landfill.

Many metropolitan councils support schools to do this, for example:

- providing infrastructure such as compost and recycling bins
- offering collection services
- organising tours of local recycling facilities
- running 'how to' sessions conducted by council officers at schools.

There are lots of teacher resources available on different websites – get started at www.mwmg.vic.gov.au/c2sen.

Learn in your local council area

More than just providing kerbside bins and rubbish collection, local councils play a role in working with the community to reduce waste through programs and activities such as:

- tours of recycling facilities, to understand how your waste is managed once it leaves your property
- workshops on composting and worm farming to reduce the amount of food waste you send to landfill
- seminars on 'green parenting' which can help your family reduce consumption and waste
- working with culturally and linguistically diverse groups to increase their awareness and understanding of rubbish disposal and recycling
- providing materials to help everyone in the community to Get It Right On Bin Night (page 9).

Check with your local council to find out what they offer.

Training is not a waste

It is estimated that Victoria's waste and resource recovery industry employs approximately 8,000 people and has an annual turnover of \$2.2billion.

A career in the waste management and resource recovery sector could lead you into many different areas including:

- operations – overseeing the running of a waste management facility and/or services. You could either be a client such as a local council, or as a waste service provider
- technical – these roles cover a broad range of engineering and scientific disciplines, from designing the next generation AART or landfill through to environmental performance management
- sales and marketing – for both waste management services and the end products of the resource recovery and recycling industry
- community education and engagement – there are a wide variety of waste education related roles available with local councils, not for profits and private organisations.

While there is no specific qualification that covers the waste sector, there are numerous ones that relate to different careers in waste management. The best advice is to keep your study options open, so you can change your career pathway as industry or your interests change.

Some areas you might start with include science, engineering, business or education. Of course sometimes on the job training can be the most valuable way of learning.

To find a training course, qualification or for some information, visit the Victorian Skills Gateway at www.education.vic.gov.au/victorianskillsgateway or the Waste Management Association of Victoria at www.wmaa.asn.au.

BUSINESS: MAKING BETTER USE OF RESOURCES

Any workplace can be in the business of making better use of their resources and minimising waste and it's all fairly simple.

No matter what size or sector, businesses can take simple steps to reduce the amount of waste they produce and send to landfill and at the same time, improve their cost efficiencies. For example:

- To cut the amount of waste an organisation produces, it first needs to understand what is wasted, where it comes from and where it goes. Undertake an audit to identify waste streams and quantities.
- Develop some reuse or recycling systems that are easy to use – get a recycling bin for drink containers (including take-away coffee cups!), and convert used paper into notepads.
- Engage and educate staff (and cleaners!) on best practice so they understand how to do the right thing – and why it matters!
- Make recycling at work easy – Planet Ark has lots of information to get you started at www.businessrecycling.com.au.

- Set waste reduction targets, monitor how you are going and aim to improve over time, and remember to celebrate your success along the way.
- Reducing waste and its related costs can increase profitability and productivity. Remember there is always a hidden cost to waste disposal up the chain. Visit www.sustainability.vic.gov.au for information on the Smart Resources, Smarter Business program.
- Buy green! Choosing recycled or sustainable products for your office reduces the need for raw materials and eliminates waste. Visit www.ecobuy.org.au for more.

Find out how other businesses have improved the waste management practices by reading some of the case studies at the bottom of this page: www.mwmg.vic.gov.au/business/waste-wise-melbourne-network

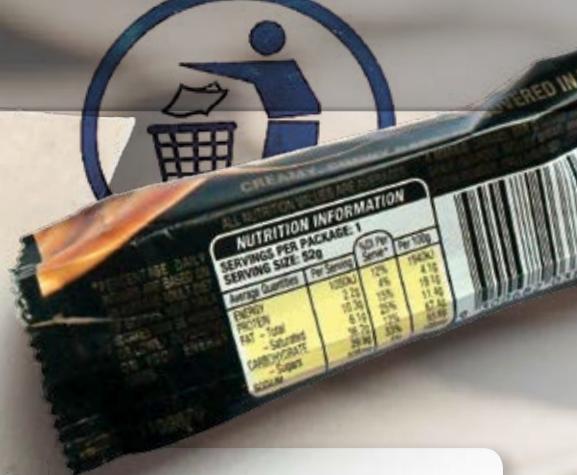
Join MWMG's Waste Wise Melbourne Network or sign up to be part of the Business Efficiency Program where you can share ideas and get the support you need to be waste wise at work!





LITTER... YES A PART OF WASTE!

Litter is a complex issue that requires everyone to work together to keep our spaces clean.



What exactly is litter?

Litter is the most visible sign of pollution and is defined as inappropriately depositing waste. This might include letting a napkin fly away in the wind, pouring your bucket of dirty water into the gutter or leaving your used cup under your seat at the football or cinema.

Littering can be:

- deliberate, e.g. when individuals and businesses dump waste in places like laneways, knowing it is illegal to do so
- accidental, e.g. when items 'escape' an inadequately covered skip or trailer.

For a more technical definition of litter and its various types, refer to the *Environment Protection Act 1970*.

Local government bears the main costs associated with litter. In 2009-10, Victorian councils spent more than \$78 million on litter management and clean up services.

The legal stuff

Under the Act, littering is illegal and it authorises regulators such as the EPA, local governments, and police to take action against offenders. These groups generally issue 'on the spot' fines, although the matter may end up in court.

Victoria has a system that allows members of the public to report people they see littering from motor vehicles. Visit www.epa.vic.gov.au/reportlitter for more information.

Tackling litter

For the greatest outcomes in litter prevention, you need the right mix of community education and participation, infrastructure (e.g. bins) and enforcement (issuing fines).

The Victorian Litter Strategy 2012-14 takes this into account, and outlines the government's approach to improve littering behaviour. Two excellent examples of this strategy in action are the MWMG's Lower Yarra Litter Strategy and the Cleaner Yarra and Port Phillip Bay Litter Hotspot Project, which are seeing government, businesses and the community unite for the greater good and prevent litter from polluting our waterways. Visit www.mwmg.vic.gov.au/local-government/litter for more.

There are many organisations dealing with litter related issues, including:

- Sustainability Victoria
- EPA Victoria
- Parks Victoria
- Melbourne Water
- MWMG and Regional Waste Management Groups
- Victorian Litter Action Alliance (VLAA)
- Keep Australia Beautiful Victoria
- VicRoads
- Clean Up Australia
- Community groups, e.g. Landcare
- You

WHAT NEXT?

Victoria's population is expected to increase to 8.7 million by 2051, with Melbourne's population expected to reach 6.5 million*. This growth will require more homes, resources, energy and food – all of which generate waste. Managing Victoria's waste to protect our environment is therefore fundamental, as is the need for everyone – including you – to play a part and make a real difference to the environment you live in.

Governments at all levels are committed to best practice in waste management and building effective relationships. Some of the challenges we can expect to face in the next few years include:

- the increasing quantity and complexity of waste being generated
- carbon pricing uncertainty and the impact on technology investment
- rises in the cost of collection, transportation and disposal of waste including for labour and equipment
- planning and investment for future waste and resource recovery facilities (including AARTs) where consideration must be given for locations, urban planning, growth, amenity and noise
- market fluctuations resulting in increased pressure on waste and recycling companies to keep prices down and variation in some commodities prices on recyclables in particular metals and mixed plastics
- supporting sustainable end markets
- regional provision of waste management services consistent with those available in metropolitan regions
- higher expectation from the community on the implementation of 'easier recycling and waste services'
- community reluctance to pay for improvements in waste management
- balancing occupational, health and safety obligations with concerns for environmental 'best practice'
- the availability of suitable personnel to work in the industry
- the need for training in the waste management area.

*Victoria in Future 2012 – the Victorian Government's official population and household projections

The future...

As you can see the waste and resource recovery sector is wide ranging and bustling with activity. Trying to include everything that goes on in great and elaborate detail could fill a library, which is why we chose to give you *A Taste of Waste*. We hope it has given you a good glimpse of what goes on beyond the bin. As emerging technology, infrastructure, programs and policies come into play and evolve over time, we hope you are inspired and ready to play your part.

Don't just watch this space... get active in it!



Want more information?

For those of you keen for even more information and clarification, or if you just want to talk about waste and resource recovery, please contact MWMG at metro.waste@mwmg.vic.gov.au or the many other organisations mentioned in this booklet.

ACRONYMS

This is a list of frequently used acronyms you might come across in the waste and resource recovery sector. It is not an exhaustive list but does aim to cover the essentials to get you started.

ACOR	Australian Council of Recyclers
APC	Australian Packaging Covenant
ARRT	Advanced resource recovery technology
AWT	Alternative waste treatment
BPEM	Best Practice Environmental Management: Siting, Design, Operation and Rehabilitation of Landfills
C&D	Construction & demolition
C&I	Commercial & industrial
CDL	Container deposit legislation
DEPI	Department of Environment and Primary Industries (VIC)
DTPLI	Department of Transport, Planning and Local Infrastructure (VIC)
EPA	Environment Protection Authority
EPR	Extended producer responsibility
IPCC	Intergovernmental Panel on Climate Change
LCA	Life-cycle assessment or life-cycle analysis
MGB	Mobile garbage bin
MRF	Materials recycling facility
MSW	Municipal solid waste
MWC	Mobile waste container
MWMG	Metropolitan Waste Management Group
OECD	Organisation for Economic Co-operation and Development
PS	Product stewardship
PSF	Packaging Stewardship Forum
RWMG	Regional Waste Management Groups
SME	Small to medium enterprise
SPG	Sustainable Packaging Guidelines
SIWMP	Solid Industrial Waste Management Plan
SV	Sustainability Victoria
WEEE	Waste electrical and electronic equipment
WMAA	Waste Management Association of Australia

GLOSSARY

With so many different areas in the waste and resource recovery sector, there is a lot of terminology to remember. This section includes commonly-used waster terms. You can always refer to links and sources mentioned throughout this booklet for anything you can't find here.

Advanced resource recovery technology (ARRT)	The ‘technologies’ are different ways that useful materials are recovered from waste, or how waste itself is converted into energy and/or useful by-products. See page 14 for more.
Airspace	The remaining capacity of landfill.
Aerobic	In waste management, aerobic refers to a process that is dependent on micro-organisms to break down organic matter, and which requires oxygen. The output is CO ₂ and compost.
Anaerobic	In waste management, anaerobic refers to a process that is dependent on micro-organisms to break down organic matter in the absence of oxygen. See Anaerobic digestion for more.
Anaerobic digestion	An organic treatment system where solid, semi-solid or liquid organic materials decompose in the absence of oxygen, converting part of the organic matter to CO ₂ and CH ₄ . Systems may take the form of covered lagoons or stabilisation basins, or completely enclosed agitated or non-agitated tanks.
Baler	A piece of equipment used to compress and form recycled material into bundles.
Best practice facilities	Facilities with high levels of environmental management consistent with EPA and Sustainability Victoria's Best Practice Environmental Management Guidelines. See page 15 for more.
Best practice landfill	Adoption of measures established in the EPA's Best Practice Environmental Management – Siting, Design, Operation and Rehabilitation of Landfills Guidelines, which gives direction on the main aspects of landfill management.
Bio-char	When you heat organic waste materials anaerobically at a high temperature (an ARRT process called pyrolysis), the end result is a charcoal-based product called bio-char. This can be used as a soil conditioner.
Bio-remediation	A process where microorganisms are stimulated to rapidly degrade hazardous organic contaminants to environmentally safe levels in soils, sub-surface materials, water, sludge and residues.
Biodegradable	An item or substance that is capable of being decomposed by biological processes. Also referred to as: compostable or decomposable.
Biomass	Total weight, volume or energy equivalent of organisms in a given area.
Biosequestration	Biological processes that capture and store carbon dioxide rather than letting it escape into the atmosphere. See Carbon sequestration for more.
Biosolids	Organic solids or semi-solids produced by municipal sewage treatment processes. Biosolids are commonly co-composted with garden organics and / or residual wood and timber to produce a range of recycled organics products.
Commercial and industrial (C&I) waste	Solid waste generated from trade, commercial and industrial activities by offices, manufacturing, factories, schools, universities, state and government operations and SMEs.

Construction and demolition (C&D) waste	Solid waste that is generated from residential and commercial building and demolition activities e.g. bricks and concrete.
Cap	A layer of impermeable material, such as clay, placed over a as the final layer on a landfill.
Carbon dioxide (CO₂)	Colourless and odourless gas that is not poisonous, heavier than air, and a by-product of aerobic and anaerobic decomposition that occurs in landfills. It is one of the most important greenhouse gases.
Carbon dioxide equivalent (CO_{2e})	This is a measurement unit used to indicate the global warming potential of greenhouse gases. Carbon dioxide is the reference gas against which other greenhouse gases are measured.
Carbon neutral	Carbon neutrality is a voluntary mechanism to encourage the reduction of emissions from sources which are currently not addressed, or only inadequately addressed, by climate policies (e.g. households, public administrations, most SMEs, air travel).
Carbon offset	This is something you or an organisation can do to counterbalance any carbon emissions generated, e.g. a person can make a donation to a green charity each time they take a plane flight or an organisation may choose to use solar or wind power.
Carbon sinks	Natural or human-made systems that absorb and store carbon dioxide from the atmosphere, including trees, plants and the oceans.
Carbon sequestration	Natural or human-made processes that remove carbon from the atmosphere and store it for extended periods of time or permanently. A store of sequestered carbon is known as a carbon sink.
Cleanfill	Material that will have no harmful effects on the environment. This material is a natural soil material and does not contain any other materials such as concrete rubble (See Fill material).
Co-generation	A highly efficient way of simultaneously converting gas into a number of usable forms of energy e.g. electricity and useable heat.
Commingled materials	Materials all mixed together, such as plastic bottles with paper, glass and metal containers. Commingled recyclable materials require sorting after collection before they can be recycled.
Composting	A process where microorganisms break down organic materials (in the presence of oxygen), which produces carbon dioxide, heat and organic residues that may be used as a soil additive.
Contaminant	A substance or matter that has adverse impacts on air, water, soil or in the case of recycling, on the ability to process one type of material into another product.
Decomposition	The process where organic matter or waste is broken down by micro-organisms to produce gas, liquid, minerals or a more stable organic matter Also referred to as: rotting or digestion.
Disposables	Products or items including packaging that are used once or very few times and then disposed.
Diversion rate	A percentage figure used in the sector to show how much waste material is reused or recycled, rather than going to landfill.
Drop-off box / centre	A container or area that allows individuals or businesses to deposit certain recyclable materials, such as batteries or e-waste.
e-waste or electronic waste	Commonly referred to as e-waste, these are electronic or electrical devices that have been discarded as waste, e.g. TVs, computers.
Ecological footprint	The impacts of human consumption on the Earth's ecosystem, expressed in terms of the area of land used to supply these resources.



End-of-life waste	Products such as cars that have reached the end of their useful life and become waste. This term is often used in the context of product stewardship responsibilities of manufacturers and brand-owners for waste discarded by consumers.
End use market	Markets for materials and products made out of waste.
Energy from waste	Processing technologies (see ARRTs) that use waste as a raw material (called feedstock) for generating energy, which can be used for heat or for producing electricity.
Environmental accounting	A discipline for measuring environmental costs that may be applied to the areas of accounting (management, financial and national).
Environmental management system (EMS)	A business tool for systematically measuring and improving environmental performance.
Feedstock	Materials (recycled or raw) that are used to manufacture products.
Fill material	Soil (e.g. clay, silt and sand), gravel and rock, all being naturally occurring materials, that have chemical contamination levels below that specified in Table 2 of EPA publication 448 and can be used to fill holes in the ground.
Flaring	The process of collecting methane from within a landfill and burning it so as to convert it to carbon dioxide).
Food organics	Food wastes from households or industry including food processing waste, out-of-date or off food, meat, fruit and vegetable scraps. Excludes liquid wastes.
Garden organics	Organics derived from domestic, industrial and commercial garden sources including grass clippings, woody garden organics, trees and limbs, stumps and roots. Also referred to as green waste or green organics.
Gasification	Advanced thermal technology that converts organic material into combustible gases by partial oxidation under the application of heat, leaving an inert residue.
Gate fee	The charge at a landfill facility to deliver waste.
Greenhouse gases (GHGs)	Trace gases controlling energy flows in the Earth's atmosphere by absorbing infra-red radiation. Some occur naturally in the atmosphere, while others result from human activities. The six main GHGs are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydro fluorocarbons (HFCs), per fluorocarbons (PFCs) and sulphur hexafluoride (SF_6).
Greenwash or greenwashing	The act of providing unjustified information to the public about the environmental value of a product, service, policy or act in an attempt to appear more sustainable or environmentally friendly.
Hard waste	The term applied to household garbage that is not usually accepted into mobile garbage bins by local councils, e.g. old fridges and mattresses.
Hazardous waste	Waste that has potentially dangerous characteristics or belongs to a group of materials deemed toxic or dangerous.
Humus	The dark or black, carbon-rich, relatively stable residue resulting from the decomposition of organic matter.
In-vessel composting	A controlled composting system using an enclosed chamber or vessel where the rate of mechanical aeration regulated.
Kerbside collections	Waste collection services provided by local councils to residential properties including garbage, commingled recyclables and garden organics (excludes hard waste).
Landfill	A site for the disposal of waste to land.

Landfill levy	A levy applied on all types of waste, including prescribed, that are disposed at licensed landfills in Victoria. Charges are by weight. See page 15 for more.
Landfill prohibition	Banning the disposal of certain materials at landfills (regulated by the State Environment Protection Policies – see www.epa.vic.gov.au for more).
Leachate	Liquid that accumulates in the landfill and must be monitored so that it does not exceed regulatory levels set by the EPA. It is collected from the base of the landfill and either discharged into the sewer, transported off-site after treatment or evaporated from leachate ponds.
Life-cycle assessment (LCA)	The process of determining the environmental impacts associated with a product, process, or activity over its life (which can start at concept and design and include raw material extraction, processing, manufacture, distribution, use, repair, maintenance, disposal and recycling).
Litter	The most visible form of pollution. See page 26 for the lowdown on litter.
Materials efficiency	'Achieving more with less' by using fewer resources, and generating less waste to supply products and services.
Materials recovery facility (MRF)	A centre for the receipt, sorting and transfer of materials recovered from the waste stream. Materials are sorted by type and treatment, which may include cleaning and compression.
Maturation	Final stage of composting where temperatures remain steady below 45°C, and the compost becomes safe to use with plants due to the absence of toxins. Also referred to as curing or stabilisation.
Methane (CH_4)	A colourless, non-poisonous, flammable gas that is generated by the anaerobic decomposition of organic matter. In landfills the gas accumulated is burned off using a flare or converted to energy.
Mobile waste containers	Also known as mobile garbage bins, these are the bins/containers with two wheels which have a capacity for up to 400L of waste or recyclables. In Australia this is by far the most common form of container used to collection waste and recycling from the community.
Mulch	Any product that has undergone composting for a period of not less than six weeks which is then suitable for placing on soil surfaces.
Municipal solid waste (MSW)	Solid waste generated from municipal and residential activities, and including waste collected by, or on behalf of, a municipal council. In this booklet, MSW does not refer to waste delivered to municipal disposal sites by commercial operators or waste from municipal demolition projects.
Off-cuts	Any untreated, uncontaminated wood segments produced by the milling of timber that are appropriate for collection and the use as feedstock materials for composting or in related biological treatment systems.
Open windrow composting operation	A process where incoming organic materials are shredded, mixed and managed so they decompose aerobically in windrows or piles that are fully exposed to the air.
Optical sorting	Plastics separation using machines that accurately sort plastics by their polymer type. The machine's optical sensor captures an item's reflection and generates a two-dimensional image, which in turn enables computer software to efficiently determine the type of plastic. It then blows the defined plastic onto a conveyor while the remaining material is further sorted or disposed.
Organic material	Chemical substances of plant or animal origin, e.g. grass clippings, tree prunings, food waste.
Packaging	Materials such as glass, metal, paper or plastic used to contain, handle, protect, and/or transport an item or product.
Pasteurisation	The process whereby organic materials are treated to kill plant and animal pathogens and weed propagules, resulting in a cleaner compost.

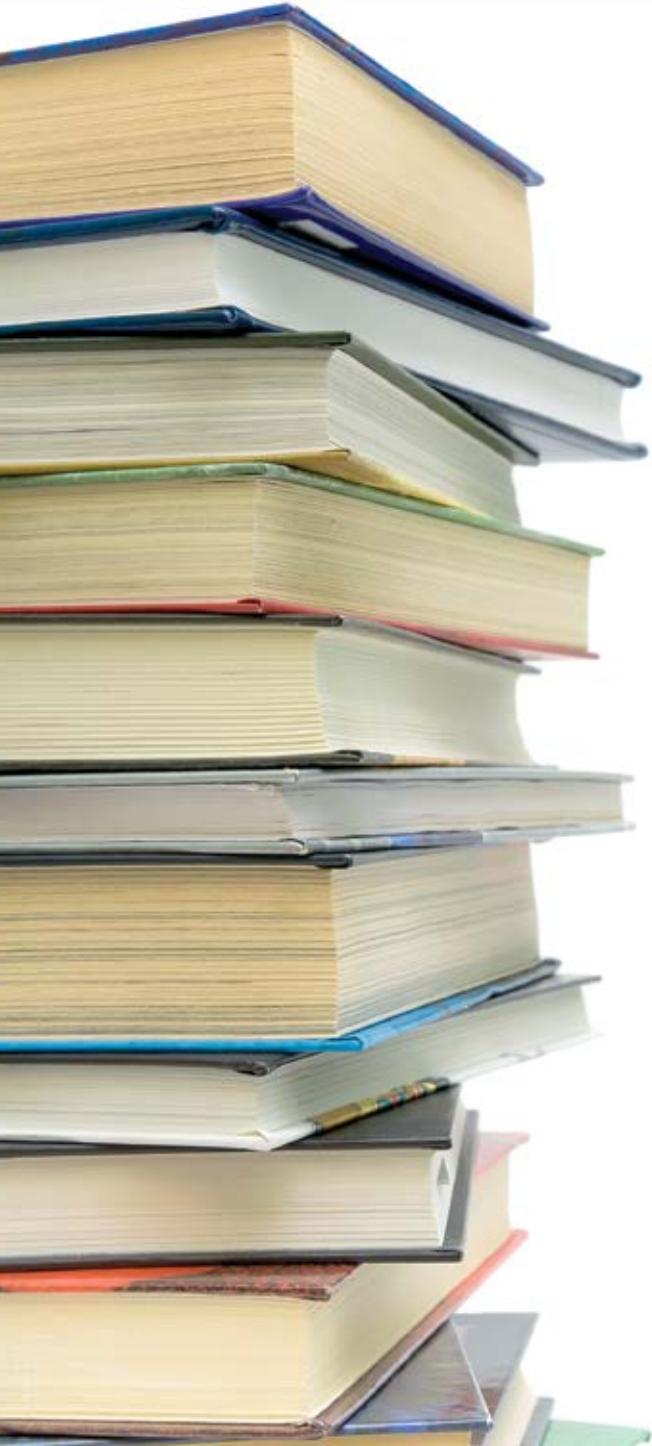
Plastics	Various chemically reactive compounds called polymers which can be moulded and cast into various products.
Plastics Identification Code (PIC)	An internationally recognised series of numbered symbols (1-7) identifying the most common plastics used in manufacturing. They are typically found on the bottom of containers and bottles and in Australia are supported by an Industry Code of Practice.
Prescribed industrial waste	Also known as hazardous waste and typically generated as part of commercial, industrial or trade activities.
Processing	Subjecting a substance to a physical, chemical or biological treatment or a combination of treatments. Plastic recycling and organic composting are forms of processing.
Processing facilities	Facilities which either receive materials directly from collection systems or from recovery facilities for further sorting and/or processing to provide material for use in the generation of new products.
Product stewardship	A concept of shared responsibility by all sectors involved in the manufacture, distribution, use and disposal of products.
Public place recycling	Bins found in public areas like parks, reserves, transport hubs, shopping centres and sport and entertainment venues that allow the community to recycle when away from home.
Putrescible	Waste that readily decomposes, including food waste and organic waste from gardens.
Pyrolysis	The thermal, anaerobic decomposition of organic compounds under pressure and at elevated temperatures.
Raw mulch	Organic material that may have undergone size reduction and be suitable for placing on soil surfaces as mulch, but may contain weed seeds and pathogenic microorganisms as it has not been subject to pasteurisation or composting.
Recyclables	While this term strictly applies to all materials that may be recycled, in this booklet the term is generally used to refer to the recyclable containers and paper/cardboard component of kerbside waste, i.e. it excludes garden organics.
Recycled organics	A generic term for a range of products manufactured from compostable organic materials (garden organics, food organics, residual wood and timber, biosolids and agricultural organics).
Recycling	A term that may be used to cover a wide range of activities, including collection, sorting, reprocessing and manufacture into new products.
Refuse-derived fuels	Fuels produced from stabilised organics and other residuals from mixed-waste AWT.
Renewable resource	Natural source of material that is capable of regeneration.
Reprocessing	Changing the physical structure and properties of a waste material that would otherwise have been sent to landfill in order to add financial value to the processed material. Without reprocessing, the beneficial use of waste materials would be lost.
Resale centre	A centre that enables the sale and subsequent reuse of good quality, saleable products and materials that were disposed of by their previous owner (also colloquially known as 'tip shops').
Residual waste	Waste that remains after any source separation of recyclable materials, including green waste.
Resource recovery	The process of removing materials that have re-use value from the overall waste streams. e.g removing glass, metals and plastics from rubbish bins, or recycling all the components of old mobile phones for their respective metals (e.g. gold, copper).



Reuse	The second-highest option in the waste hierarchy – recovering value from a discarded resources without processing or remanufacture, e.g. garments sold through opportunity shops area form of reuse rather than recycling.
Solid industrial waste	Solid waste generated from commercial, industrial or trade activities, including waste from factories, offices, schools, universities, state and federal government operations and commercial construction and demolition work. Excludes MSW, wastes that are prescribed under the Environment Protection Act 1970 and quarantine wastes.
Solid waste	Non-hazardous, non-prescribed, solid waste materials ranging from municipal garbage to industrial waste.
Source separation	The practice of segregating materials into different categories before they head to processing facilities.
Sustainable consumption/resource use	A change to society's historical patterns of consumption and behaviour that enables consumers to satisfy their needs with better performing products or services that use fewer resources, cause less pollution and contribute to social progress worldwide.
Thermophilic	This is a digestion process in which temperatures are kept above 45C, because it speeds up the growth of organisms, and in turn the rate of breakdown of materials.
Transfer station	A facility allowing the drop-off and consolidation of garbage and a wide range of recyclable materials. Transfer stations are an integral part of municipal waste management with regards to materials recovery and improving transport costs.
Triple bottom line	Describes the ideal that organisations are responsible for social and environmental as well as financial outcomes.
Trucks – collection	<p>There are three main types of vehicles used to collect materials from wheelie bins</p> <ul style="list-style-type: none"> Front loader: Designed for bigger bins from businesses such as hotels, offices, factories, shopping centres and distribution outlets. Rear end loader: Ideal for lightweight and small to mid-sized commercial and industrial wastes such as general office paper, cardboard, packaging, food and other perishables. Side loader: Used to collect residential general waste and recycling. A side arm lifts the wheelie bin easily from the kerbside.
Vermiculture	The cultivation of earthworms, especially in order to use them to convert organic waste into compost.
Walking floor	A way of unloading trucks that uses an automated, hydraulic-based moving floor, instead of a static system that then requires a tilted floor or tipping of the truck body in order to unload it.
Waste	Anything that is no longer valued by its owner and which is, or will be, discarded.



Waste avoidance	At the top of the waste hierarchy, avoidance works on the principle that the greatest gains result from efficiency-centred actions that remove or reduce the need to consume materials in the first place, but deliver the same outcome.
Waste generation	Creating unwanted materials, be it garbage or recyclables.
Waste hierarchy	A concept promoting waste management, using the following order of preference behaviour: avoidance, reuse, recycling, recovery of energy, treatment, containment and disposal. It's often referred to in community education campaigns as 'reduce reuse recycle'.
Waste industry or sector	Applies to those involved in managing waste, i.e. collectors, sorters, processors and landfill operators.
Waste minimisation	The concepts and strategies for waste generation to be kept to a minimum level in order to divert materials from landfill, thereby reducing the requirement for waste collection, handling and disposal to landfill.
Waste reduction	See Waste hierarchy.
Waste stream	A classification used to describe waste materials that are either of a particular type (e.g. timber waste stream) or produced by a particular source (e.g. C&I waste stream).



SOME EXTRA READING

Acts and regulations

- Best Practice Environmental Management – Siting, Design, Operation and Rehabilitation of Landfills 2010
- Clean Energy Future Legislation 2012
- Environment Protection Act 1970
- Environmental Partnerships 2012
- Getting full value – the Victorian Waste and Resource Recovery Policy 2013
- Local Government Act 1989
- National Greenhouse and Energy Reporting Act 2007
- National Waste Policy: Less Waste More Resources 2009
- Planning and Environment Act 1987
- Sustainability Victoria Act 2005
- Transport Integration Act 2010

Strategies and plans

- A Cleaner Yarra River and Port Phillip Bay 2012
- Metropolitan Waste and Resource Recovery Strategic Plan 2009
- National Waste Report 2010
- Victorian Litter Strategy 2012-14





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