NSW GOVERNMENT

Review of Waste Strategy and Policy in New South Wales

Report by the Steering Committee for the Review of NSW Waste Strategy and Policy

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DECCW 2010/1034

ISBN 978-1-74293-061-9

December 2010

Printed on recycled paper

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Background

Nationally, waste generation is growing at an average of 4.3% per year, driven by population growth (responsible for 3% of the growth in waste generation) and increasing per capita consumption (1.3% of the growth in waste generation). NSW has a significant challenge in managing its waste. In 2008–09, the Department of Environment, Climate Change and Water (DECCW) has estimated that approximately 16.3 million tonnes of waste were generated in NSW (or 2,329 kilograms per capita per year). Of that, 9.5 million tonnes were recycled (58%) and 6.7 million tonnes (42%) went to landfill.

For the purposes of this report, 'waste' is as defined as mainly solid waste from the three main streams. It is acknowledged that there are many broader waste-related issues, such as greenhouse gas emissions and waste from primary industries, but these have not been covered in this Review.

The *Waste Avoidance and Resource Recovery Strategy* (WARR Strategy), which is required by the *Waste Avoidance and Resource Recovery Act 2001* (WARR Act), has been effective in significantly increasing resource recovery across NSW, while protecting the environment. For example, the amount of materials recycled in NSW has increased by 80% since 2002–03. This represents an additional 4.2 million tonnes of materials collected in 2008–09 than were collected in 2002–03 (total recovery in 2002 was 5.3 million tonnes, while, as indicated above, in 2008–09 it was 9.5 million tonnes).

The *NSW State Plan 2010* (State Plan) has adopted the targets for municipal, commercial and industrial (C&I) and construction and demolition (C&D) waste in the WARR Strategy, which has given extra emphasis on driving improvement.

Much of the gains are directly attributable to the waste and environment levy and the DECCW's waste programs working in collaboration with local government and industry. The regulatory settings, including the Resource Recovery Exemption system, have played an important role in protecting the environment by recognising that not all reuse of materials is beneficial.

While recognising the strengths of the existing policy and regulatory settings, there is an opportunity to identify some areas that can be enhanced to provide stronger drivers for achieving the 2014 diversion targets in the WARR Strategy.

Steady progress is being made to achieve the targets. However, there remain significant challenges in achieving the 2014 targets of 66% diversion from landfill for municipal (household) waste and 63% for C&I waste in particular, while the C&D waste is already very close to the 76% target.

Purpose of the Review

The purpose of the Review of NSW Waste Strategy and Policy (the Review), as outlined in its terms of reference, was to:

- ensure that the policies applied to the generation, collection, separation, processing, and disposal of the waste stream are optimised so as to achieve, or better, the State Plan targets, and
- achieve greater community acceptance of the need for resource recovery, waste minimisation and recycling.

An independent Steering Committee was established in April 2010. It conducted workshops with the waste industry, councils and met with environment groups to gather views on possible waste reforms.

Review focus

As with most targets, the general rule of thumb is that the first 80% is easy, while the last 20% is much more difficult and costly to achieve. The reality is that for municipal waste in 2008–09 NSW was at around two-thirds of the way to meeting the target; for C&I waste NSW was around four-fifths of the way to meeting the target; and for C&D waste NSW had almost fully achieved the target. It has been estimated by DECCW that to achieve the targets an additional 1.3 to 1.7 million tonnes of materials in the municipal sector, and an additional 1.2 to 1.5 million tonnes of materials in the C&I sector need to be recovered over the period 2010–14.

The Steering Committee was advised of a range of specific initiatives which could assist in meeting the municipal and C&I targets. These include very specific actions aimed at recovering half of the dry recyclables that are currently still disposed of in kerbside red residual bins, recovering over half of the food waste currently still in the red residual bins, and mandating source separation of waste in the C&I sector. There were also suggestions for various forms of education programs for households and businesses, both general and highly targeted.

Aside from the very substantial lead times and potential cost of many of these initiatives, the Review's assessment is that, given experience to date with major changes, it would be a high risk to proceed with a package of individual initiatives without addressing the more fundamental problems that beset the waste sector.

Accordingly, on the one hand, the Review could suggest a concerted and accelerated attack on the targets with many particular elements which, theoretically, might ensure achievement of the targets, but are extremely high risk and possibly very costly. For example, achieving a higher level of compliance with separation of waste from the red residual bins could take many years. A more effective first step would be to promulgate and encourage models of best practice for various aspects of waste management.

Therefore the Review has taken the approach of suggesting a series of system enhancements, in concert with some specific initiatives, to guarantee continuous improvements that will work to achieve the targets. Consequently, the Review's emphasis is on immediate improvements between now and 2014 and particularly on positioning NSW over the longer term. The Review also found that a longer term

perspective on waste management will increasingly require more focus on the management of specific waste materials, rather than individual waste sectors.

Given that the C&D waste stream is currently performing well in relation to the targets, this stream has not been a focus of the Review.

Key issues and proposed enhancements

The Steering Committee found that the policy debate about waste management had moved on considerably since the WARR Strategy was updated in 2007. NSW is now moving towards a different paradigm, where the focus is not just on using the waste and environment levy as an economic instrument to minimise waste going to landfill, but on the urgent need to slow waste generation and to develop more sustainable and innovative options for managing waste as a resource. As indicated above, increasing the latter will require a stronger focus on specific materials within the three waste streams, such that the current three-stream framework may ultimately become redundant.

There is a continuing tension between direct NSW Government intervention in waste regulation and letting the market determine outcomes. Some stakeholders believe that the NSW Government has been too reluctant to intervene. Many people believe there is now a need for:

- a stronger NSW Government role in ensuring that good data on waste is available to help make sound policy decisions
- more engagement with industry and local government
- a more proactive NSW Government role in strategic waste planning, and
- incentives and mechanisms so that best-in-class technologies and infrastructure emerge from the market.

The Review's key findings in the municipal waste sector were that although the waste and environment levy does not have a direct impact on individual householders, it is having an impact on the waste accumulators (i.e. councils), and they are actively seeking alternatives to sending waste to landfill. The main issue in this sector is the need to remove more recyclables and food/organic waste from household red residual bins. This can be achieved by more source separation of waste by the householder, or by central sorting via alternative waste treatment facilities (AWTs). As the current lead time for the development of more AWT plants is very long, the short-term emphasis needs to be on improving source separation at the household level. This can be achieved by encouraging best practice models of bin configurations and volumes, collection frequencies and education.

In the C&I sector the Review found that the waste and environment levy is not having a direct impact on the sector's waste generators because the levy is usually effectively 'hidden' within waste collection contracts. While the actual collection of mixed waste within this sector is currently working very effectively, there are minimal incentives for source separation and recycling of waste. This sector is where the greatest challenges lie.

In the C&D sector, by contrast, the waste and environment levy has had a dramatic impact, and is working very effectively to minimise waste going to landfill.

From its research and stakeholder consultations, the Review's Steering Committee identified four broad themes and then a number of proposed enhancements to waste management under each of those themes. Accordingly, the Steering Committee recommends the following 23 enhancements:

Theme 1 – Overall adequacy of WARR strategy and targets

Enhancement 1 – WARR Strategy sub-targets

Use the 2010 WARR Strategy Progress Report to ensure there are the right signals to deter growth in waste generation and increase resource recovery, by establishing a number of sub-targets. These sub-targets would also help drive waste avoidance and recovery of particular materials, where cost effective improvement potential is identified. The sub-targets proposed are:

a annual 2011–12 and 2012–13 waste diversion targets for municipal, C&I and C&D sectors

b resource recovery targets for specific materials – in particular for food/garden organics and paper/cardboard (which link with Enhancements 5 and 7).

Enhancement 2 – WARR Strategy Implementation Plan

Use the 2010 WARR Strategy Progress Report to develop a WARR Strategy Implementation Plan outlining sub-targets, actions, timeframes and responsibilities, including the role that can be played by individual householders, community infrastructure (such as hospitals and schools), businesses and government organisations. The Implementation Plan should outline synergies between the municipal, C&I and C&D sectors and local, State and Australian governments.

Also use the Implementation Plan process to gain buy-in and joint ownership with key stakeholders, whose commitment and actions are essential for delivery of the Strategy targets.

Enhancement 3 – Better data on waste

Provide waste generation and resource recovery data that is accurate, transparent and timely by requiring all licensed waste processing and reprocessing facilities to report data as a licence condition. Consult with industry to develop a streamlined reporting process.

Enhancement 4 – DECCW's waste management capability

Require DECCW to improve its analysis, monitoring and communication of progress on the WARR Strategy, building on and supplementing the WARR Strategy progress reports.

Theme 2 – Waste management sector performance

Enhancement 5 – Best practice for managing municipal waste

Transition to best practice household resource recovery systems within three years by providing clear guidance and financial incentives to local councils (via Enhancements 12 and 16, and in line with Enhancement 1).

The components of a best practice system could include:

a achieving a 75% recovery rate of dry recyclables (e.g. paper, cardboard, glass and plastic) from households within three years through kerbside dry recycling services, as measured by councils' annual kerbside bin audits, and

b establishing systems to maximise recovery of food waste and garden organic waste from households through source separation and/or alternative waste treatment (AWT).

After a three-year transition period these best practice systems should be mandated, with councils being able to apply for exemptions if they are unable to meet the requirements due to being already locked into longer term contracts, or if they have already achieved the 66% municipal target through alternative strategies. In terms of future performance comparisons across councils, this should be done with due regard to the different socio-economic characteristics, or groupings, of the various local government areas (LGAs).

Enhancement 5 addresses the biggest challenges for this sector: optimising existing dry recycling systems and establishing systems to recover the food and garden organic waste (that makes up approximately 50% of the household waste currently going to landfill).

Enhancement 6 – Promotion and education

Develop and fund a well-targeted promotion and education campaign, in consultation with councils and industry, to better inform households and businesses about waste avoidance and waste separation at source (in particular food and other organic waste) – to address current confusion or apathy, or both, regarding recycling.

The campaign should be designed to mobilise householders and businesses to actively support waste avoidance and recycling initiatives and should include targeting non-English speaking background and diverse socio-economic groups and localities.

Enhancement 7 – Targeting priority wastes

Implement measures to ensure appropriate management of problem wastes and hazardous wastes, including materials that contaminate landfills or alternative waste treatment products (such as composts) or cause safety problems in waste processing facilities. This could include banning some wastes from landfill, household kerbside or C&I collection.

In addition to the existing materials identified as national priority wastes under the National Waste Policy (i.e. e-waste, tyres and fluorescent lamps), gas bottles, lead acid batteries and plastic bags should be considered a priority for analysis and action.

This enhancement will require the establishment of viable alternatives for households and businesses, e.g. collection or drop-off infrastructure, and targeted education

programs. This enhancement should also go hand-in-hand with progressing industry collection schemes via both national and state-based extended producer responsibility (EPR) schemes.

Enhancement 8 – Local infrastructure for collection of other wastes

Build and enhance the existing network of local waste collection points and schemes (including drop-off events) and progressively strengthen it. The network should be strengthened by establishing additional permanent collection sites or events and/or expanding existing ones, subject to the proposed Waste Infrastructure and Sustainability Fund (WISF) (as a component of existing waste and environment levy revenue) (via Enhancements 12 and 16), and by progressing industry collection schemes via EPR. This too should be designed to mobilise householders and businesses to actively support recycling initiatives.

This enhancement should include establishing additional collection facilities in Sydney, with a further staged assessment and implementation for regional and rural areas.

Enhancement 9 – Best practice for managing C&I waste

Transition to best practice C&I resource recovery systems within three years by providing clear guidance and financial incentives for businesses and the waste industry (via Enhancements 12 and 16, and in line with Enhancement 1).

The components of a best practice system could include:

a establishing resource recovery systems for large enterprises (such as shopping complexes, business parks and offices – above a certain threshold) that are at least as comprehensive as those provided for households (i.e. effectively a three-bin system and/or alternative waste treatment via a downstream resource recovery facility)

b establishing resource recovery systems for the remainder of the sector (i.e. small to medium enterprises (SMEs), community facilities such as schools and hospitals etc.) either by:

    i using existing municipal waste and recycling services where appropriate (e.g. small ‘orphan’ shops)

    or

    ii using source separation into dry recyclables (e.g. paper, cardboard, glass, plastic) and residual waste (i.e. effectively a two-bin system and/or alternative waste treatment via a downstream resource recovery facility).

After a three-year transition period these best practice systems should be mandated, with enterprises being able to apply for exemptions if they are unable to meet the requirements due to being already locked into longer term contracts.

Enhancement 9 addresses the biggest challenge for this sector: recovering resources from the largely unsorted, mixed waste stream.

Enhancement 10 – Place-based waste management

Investigate possible efficiencies in cross-sector and/or place-based (i.e. precinct) approaches to waste management, through developing new but competitive business models e.g. through the development of precinct contracts by groups such as chambers of commerce and/or through councils providing waste collection for SMEs on a fee-for-service basis. This should be progressed through the new Waste and Sustainability Industry Forum (Enhancement 19).

Enhancement 11 – Financial assurance policy

Finalise consultation about and development of a financial assurance policy for licensed waste facilities so there is an equitable and comprehensive framework for ensuring adequate provision of funds for environmental rehabilitation of waste facilities when companies fail.

Theme 3 – Resource allocations and pricing signals

Enhancement 12 – Funding better waste outcomes

Specifically link (via Enhancements 5, 8, 9 and 16) an appropriate component of the available waste and environment levy revenue (as per current levy settings) to improved waste reduction and management outcomes (including a link to greenhouse gas reductions) i.e. make access to available levy funds dependent on environmentally responsible waste management performance and transition to best practice systems.

Enhancement 13 – AWT output exemption

To give confidence to investment, immediately consider removing the current AWT exemption's 2013 time limit on the non-mine site use of AWT outputs, with appropriate safeguards for public health and environmental protection, while:

- maintaining the need for undertaking and completing (by 2013) independent scientific studies to identify environmental, agricultural and public health implications of such use
- maintaining a transparent commitment to review the conditions for the use of mixed waste AWT outputs on agricultural lands, based upon robust science (by July 2013).

Enhancement 14 – Exemption expert panel or peer review

Improve transparency and evidence-based decision making on Resource Recovery Exemptions by establishing a technically based expert panel (of relevant disciplines including public and environmental health) or peer review process, or both, to advise and assist DECCW and the Environment Protection Authority (EPA) Board on material suitability for exemptions. This would not be for all materials, but conditional on certain triggers.

Enhancement 15 – Energy from waste

Actively support energy from waste applications in line with international best practice, where these provide overall benefit to the environment (by reducing greenhouse gas emissions and landfill) and do not endanger human health through the emission of air

toxics. As a starting point, DECCW should develop a draft policy for public consultation on energy from waste.

Enhancement 16 – Waste Infrastructure and Sustainability Fund

Progressively dedicate a proportion of waste and environment levy revenue to a Waste Infrastructure and Sustainability Fund (WISF) for councils and industry, up to 2014, to transition to best practice waste management systems (as per Enhancements 5, 8, 9 and 12). The WISF should be used to leverage council and industry funding (and, where possible, Australian Government funding).

Enhancement 17 – Innovation and investment

DECCW, in collaboration with NSW Treasury and Industry & Investment NSW (I&I NSW, State and Regional Development), should develop a strategy to encourage innovation and investment in achieving enhanced waste targets beyond 2014, including development of appropriate business models and consideration of an expanded WISF consistent with the Waste Infrastructure Strategy (Enhancement 20).

Theme 4 – Government performance

Enhancement 18 – Coordination of DECCW's waste responsibilities

Establish clear accountability for waste within DECCW, and establish a waste coordination function within DECCW that integrates and provides leadership for DECCW's current waste and sustainability strategy, programs, policy and enforcement functions and resources, to ensure a consistent, evidence-based approach to waste policy and implementation of any decisions arising from this Review.

Enhancement 19 – Waste and Sustainability Industry Forum

Increase the dialogue about waste management and liaison between NSW Government, councils and industry by establishing a regular, independently chaired Waste and Sustainability Industry Forum, with a focus on problem solving and emerging waste management issues. The Forum's deliberations should be based on industry data and evidence (such as that contained in the appendices to this report). The purpose is to identify any barriers to attaining WARR Strategy goals and to cooperate in finding and implementing practical and cost effective solutions.

Enhancement 20 – Waste Infrastructure Strategy

Encourage development of waste management and recycling infrastructure through development of a whole-of-government Waste Infrastructure Strategy (led by DECCW in consultation with the NSW Department of Planning [DoP]) and by providing waste infrastructure and services procurement guidance and support to councils. Explicitly link an appropriate component of the waste and environment levy to this Strategy through the WISF.

The Strategy should clearly distinguish between DECCW's proposed new waste infrastructure strategic planning role and its independent regulatory role. The Strategy should guide DoP in developing or reviewing regional strategies (under the *Environmental Planning and Assessment Act 1979* [EP&A Act]), and guide industry in its investment decisions. The Strategy should outline waste requirement assumptions

and necessary lead times for construction of infrastructure. The priorities of the Strategy should be established with broad consultation.

Enhancement 21 – Land-use planning

Subject to consultation with the Minister for Planning, DoP should promote innovation in waste management and resource recovery, for example via conditions for new developments and building standards, and through planning for waste and resource recovery facilities. DoP will need to prepare a guideline or model conditions of consent to provide best practice advice for Joint Regional Planning Panels and councils in relation to their consent activities. This can cover matters such as:

- specifically requiring dedicated areas for waste recycling within buildings, including source separation
- minimising waste in construction
- improving management of waste from construction activities
- where appropriate, requiring major developments to achieve Green Star or similar sustainable development ratings which include consideration of waste reduction and recycling measures.

Enhancement 22 – New entrants to the infrastructure market

Subject to consultation with the Minister for State and Regional Development, Industry & Investment NSW (in consultation with DECCW) should assist new entrants into the waste infrastructure market by taking a ‘case management’ approach, helping them to negotiate their way through existing government regulations and planning processes and providing advice and assistance on market impediments to help deliver new solutions.

Enhancement 23 – National waste agenda

NSW should continue to support the delivery of the National Waste Policy and its Implementation Plan. It should drive the national waste agenda by taking a leadership role in issues requiring national coordination, particularly the acceleration of extended producer responsibility (EPR) schemes, agreement on a system for comparing waste data, and improving markets for recovered materials. In addition, NSW should promote the need for Australian Government funding and grants for major waste infrastructure.

1 Introduction

1.1 Purpose of the Review

Nationally, waste generation is growing at an average of 4.3% per year, driven by population growth (responsible for 3% of the growth in waste generation) and increasing per capita consumption (1.3% of the growth in waste generation). NSW has a significant challenge in managing its waste. In 2008–09, DECCW has estimated approximately 16.3 million tonnes of waste were generated in NSW (or 2,329 kilograms per capita per year). Of that, 9.5 million tonnes were recycled (58%) and 6.7 million tonnes (42%) went to landfill**.**

For the purposes of this report, 'waste' is as defined as mainly solid waste from the three main streams. It is acknowledged that there are many broader waste-related issues, such as greenhouse gas emissions and waste from primary industries, but these have not been addressed in this report. A list of acronyms and abbreviations and a glossary of terms used in this report are provided in Appendix Q.

The *Waste Avoidance and Resource Recovery Strategy* (WARR Strategy) and the *NSW State Plan 2010* (State Plan) have been effective in significantly increasing resource recovery across NSW, while protecting the environment. For example, the amount of materials recycled in NSW has increased by 80% since 2002–03. This represents an additional 4.2 million tonnes of materials collected in 2008–09 than were collected in 2002–03 (total recovery in 2002 was 5.3 million tonnes, while, as indicated above, in 2008–09 it was 9.5 million tonnes).

Much of these gains are directly attributable to the waste and environment levy and the Department of Environment, Climate Change and Water's (DECCW's) waste programs working in collaboration with local government and industry. The regulatory settings, including the exemption system, have played an important role in protecting the environment by recognising that not all reuse of materials is beneficial.

While recognising the strengths of the existing policy and regulatory settings, there is an opportunity to identify some areas that can be enhanced to provide stronger drivers for achieving the 2014 diversion targets in the WARR Strategy.

The 2000 baselines, the 2014 waste diversion targets and the steady progress being made are shown in the table below (waste diversion is the percentage of waste generated that does not go to landfill).

Table 1 – Progress towards waste diversion targets

Waste sector	2000 State Plan baseline	2002–03	2004–05	2006–07	2008–09 (provisional)	2014 State Plan target
Municipal	26%	30%	33%	38%	44%	66%
Commercial and industrial (C&I)	28%	34%	38%	44%	52%	63%
Construction and demolition (C&D)	65%	64%	62%	67%	73%	76%
Overall	–	45%	46%	52%	58%	

The Review of NSW Waste Strategy and Policy (the Review) is necessary for the following reasons:

- While the recycling of construction and demolition (C&D) waste is already very close to the 2014 target, there remain significant challenges in achieving the targets for municipal (household) and commercial and industrial (C&I) waste.
- Since the NSW Waste Strategy in 2007, there has been Ministerial agreement on a National Waste Policy (in November 2009), and a supporting Implementation Plan (in July 2010). There is now a need to ensure that the NSW waste policy framework is consistent with and promotes the agreed national waste agenda.
- The waste industry has been calling for waste policy reform in some areas – as indicated by the National Recycling Initiative. Waste separation, recycling and reuse in the C&I sector have been identified as requiring particular attention.
- In the municipal sector there are a wide range of waste management practices and a lack of state-wide strategic planning for infrastructure.
- Waste management is a dynamic and evolving area – both within Australia and overseas – and NSW needs to draw upon these experiences and innovations to improve its waste management. (A summary of best practice waste management around the world is detailed in Appendix C.)

1.2 Review focus

While acknowledging the steady progress being made to achieve the waste diversion targets, the Review agreed that there remain significant challenges in achieving the targets for municipal and C&I waste.

As with most targets, the general rule of thumb is that the first 80% is easy, while the last 20% is much more difficult and costly to achieve. The reality is that for municipal waste in 2008–09 NSW was at around 67% of the target; for C&I waste NSW was at around 83% of the target; and for C&D waste NSW was at around 96% of the target. It has been estimated by DECCW that to achieve the targets an additional 1.3 to 1.7 million tonnes of materials in the municipal sector, and an additional 1.2 to 1.5 million tonnes of materials in the C& I sector need to be recovered over the period 2010–14.

The Review was advised of a range of specific initiatives which could assist in meeting the municipal and C&I targets. These include very specific actions aimed at recovering 50% of the dry recyclables that are currently still disposed of in kerbside red residual bins, recovering over half of the food waste currently still in the red residual bins, and mandating source separation of waste in the C&I sector. There were also suggestions for various forms of education programs, both general and highly targeted.

Aside from the very substantial lead times and potential cost of many of these initiatives, the Review's assessment is that, given experience to date with major changes, it would be high risk to proceed with a package of individual initiatives without addressing the more fundamental problems that beset the waste sector.

Accordingly, on the one hand, the Review could suggest a concerted and accelerated attack on the targets with many particular elements which, theoretically, might ensure achievement of the targets, but are extremely high risk and possibly very costly. For example, achieving a higher level of compliance with separation of waste from the red residual bins could take many years. A more effective first step would be to promulgate and encourage models of best practice for various aspects of waste management.

Therefore the Review has taken the approach of suggesting a series of system enhancements in concert with some specific initiatives, to guarantee continuous improvements that work to achieve the targets. Consequently, the Review's emphasis is on immediate improvements between now and 2014 and particularly on positioning NSW over the longer term. The Review also found that a longer term perspective on waste management will increasingly require more focus on the management of specific waste materials, rather than individual waste sectors.

Given the relatively high performance of C&D waste, this stream has not been a focus of the current Review.

1.3 Future directions

The period from now to mid-2014 provides an opportunity to:

- enhance and consolidate the WARR Strategy along the specific lines recommended by this Review, particularly by adopting enhancements which are systemic in nature – either changing the governance and/or fundamental operations of the waste sectors
- lay the groundwork to prepare for the next phase of the WARR or similar strategy (i.e. beyond 2014) by adopting a more proactive approach to evidence collection, knowledge management, policy development and stakeholder relations, and
- strengthen NSW's role in advocating and, where appropriate, leading high priority issues on the national waste agenda.

1.4 Budget impact of recommendations

Most of the Review's recommendations for WARR Strategy enhancements (15 out of 23) should be achievable within existing resources, even where specific enhancements involve direct and immediate cost. The remaining eight enhancements are proposed subject to the development of appropriate business cases including cost benefit

analyses and consideration through the NSW Government's normal budgeting processes for possible funding allocations.

In respect of enhancements relating to future investment, and by implication the level and application of the waste and environment levy, these future investment enhancements are proposed to be addressed under Enhancements 12 and 18.

1.5 Immediate actions

The Minister for Climate Change and the Environment should start to progressively implement the 23 enhancements proposed by this Review, with the following sequencing (and timing contingent upon Ministerial approvals):

1.5.1 Immediately

1. Develop a comprehensive WARR Strategy Implementation Plan to achieve a more integrated approach to WARR implementation (Enhancement 2). This is to include new WARR sub-targets (Enhancement 1).

2. Establish a Waste and Sustainability Industry Forum to improve dialogue and coordination across the sector (Enhancement 19).

3. Establish clear accountability for waste through a waste coordination group within DECCW (Enhancement 18) with a mandate to upgrade DECCW policy, data and analytical capabilities (Enhancement 4) and drive the WARR Strategy and proposed Implementation Plan (Enhancement 2).

4. The DECCW waste coordination group should provide more specific policy and tailored advice to councils and industry on best practice, in particular opportunities to improve performance in the municipal and C&I sectors, linked to incentives (Enhancements 5 and 9).

5. Make a decision on removing the current AWT output exemption's 2013 timeline to provide for greater regulatory certainty for future investment (Enhancement 13) and establish a technically based expert panel or peer review process, or both, to assist in ensuring greater transparency for such reviews and decisions (Enhancement 14).

6. Clarify to stakeholders and the general community, via a draft policy statement for public consultation, that the NSW Government is prepared to positively support energy from waste as an appropriate and necessary approach to waste management in line with international best practice where there is overall benefit to the environment and human health is not endangered (Enhancement 15).

7. Enhance and strengthen the network of local waste collection points and schemes and provide better information, particularly to householders, on the location, nature and operating times of these facilities (Enhancement 8).

8. As part of the WARR Strategy Implementation Plan, and particularly in relation to public education and expansion of the waste collection network, commence detailed considerations of the most effective options for reducing priority

problem and hazardous wastes and the impact of contaminants in the various waste streams (Enhancement 7).

9. Recommend to the Minister for Planning a range of initiatives to promote innovation in waste management and resource recovery through the environmental planning and assessment system as outlined in this Review (Enhancement 21).

10. Recommend to the Minister for State and Regional Development a range of initiatives to assist new entrants into the waste infrastructure market by providing a 'case management' approach, helping them to negotiate through existing government regulations and planning processes and providing advice and assistance on market issues (Enhancement 22).

1.5.2 Subsequently

11. Consider implementing a range of regulatory enhancements including:
    - via a streamlined process, requiring all licensed waste processing and reprocessing facilities to report data as a licence condition (Enhancement 3)
    - various combinations of deterrent prohibitions or bans under the *Protection of the Environment Operations Act 1997* (POEO Act) to ensure appropriate disposal of hazardous wastes, including contaminating materials (Enhancement 7)
    - a financial assurance policy for all licensed waste facilities (Enhancement 11).

12. Through the Waste and Sustainability Industry Forum also encourage discussion and action in relation to developing:
    - possible efficiencies in cross-sector (i.e. waste streams) and place-based (i.e. precinct) approaches to waste management (Enhancement 10)
    - a whole-of-government Waste Infrastructure Strategy, led by DECCW (Enhancement 20).

13. Recommend for consideration by the NSW Government a range of additional enhancements proposed by this Review including:
    - developing a funded and well-targeted promotion and education campaign (Enhancement 6)
    - funding a Waste Infrastructure Strategy including phased expansion and enhancement of the network of local waste collection points and schemes (Enhancement 8)
    - targeting the application of waste and environment levy funds to improved waste outcomes and best practice (Enhancement 12)
    - developing an innovation and investment strategy to encourage innovation and achievement of the WARR targets (Enhancements 16 and 17)
    - NSW taking a stronger leadership approach in the national waste management agenda (Enhancement 23).

2 Background

2.1 Overview of terms of reference

The Review's terms of reference outlined the requirement to provide advice to the NSW Minister for Climate Change and the Environment and, in turn, the NSW Cabinet, on the combination of policy settings, regulation and programs being delivered through DECCW and DoP in relation to waste, recycling and land filling.

The objectives of the NSW Waste Policy are to:

1 minimise waste

2 maximise resource recovery from waste streams, and

3 minimise the environmental impacts of the waste stream.

Consistent with these objectives, the purpose of the Review was to:

- ensure that the policies applied to the generation, collection, separation, processing and disposal of the waste stream are optimised so as to achieve or exceed the State Plan recycling targets, and
- achieve greater community acceptance of the need for resource recovery, waste minimisation and recycling.

The policy and other instruments available in NSW which target the objectives listed above include:

- regulation and compliance by DECCW and local councils
- the waste and environment levy, which provides the economic driver to encourage waste minimisation and resource recovery
- minimisation of domestic waste through limiting the size of waste receptacles
- source separation of waste streams (especially for municipal waste)
- downstream waste stream separation
- alternative waste technologies, and
- recycling of components of the waste stream.

Although each component appears to be adding value to the achievement of the objectives stated above, there is doubt whether each is being used in an optimal manner with regard to other parts of the waste stream.

2.2 Steering Committee membership

A small Steering Committee was established to oversee and guide the Review; it comprised the following:

- David Richmond (Chair)
- Martijn Wilder, independent
- Ken Kanofski, waste sector
- Bob Verhey, local government
- Richard Pearson, NSW Department of Planning
- Zoe de Saram, Department of Environment, Climate Change and Water NSW.

2.3 Review methodology

The Steering Committee held regular meetings and commissioned background papers and presentations on key waste issues. Many of these are contained in the appendices to this report. The issues included:

- commercial and industrial waste sector – overview; options for waste separation vs. sorting
- municipal waste sector – overview
- waste and environment levy – overview; improving application and management; price signals
- funding of technology and infrastructure
- national e-waste scheme
- container deposit legislation
- National Waste Policy and Productivity Commission and Senate waste inquiries
- the legislative framework for waste management in NSW
- current market development activities undertaken by DECCW
- energy from waste
- the WARR Strategy beyond 2014
- food waste strategy
- land-use planning system and waste management
- planning waste management in new release growth centres
- conditions for meeting the WARR targets
- socio-economic drivers of council waste management performance
- contaminants in waste.

The Review was not undertaken as a full public review process. The Steering Committee consulted on an informal basis with targeted stakeholders (i.e. the waste industry, local government, other government agencies and environment groups) on

options for reform. Three workshops were held to cover government agencies, the C&I sector and the municipal sector and a meeting was held with key environment group stakeholders. A list of workshop and meeting participants is provided in Appendix P.

The Steering Committee commissioned advice from two external sources. It sought independent expert advice from a private consultant, Mike Ritchie, on possible options for waste reform. It also commissioned the Total Environment Centre (TEC) to examine the issue of 'problem' wastes that contaminate recycling materials and to prioritise practical solutions for overcoming problems being experienced in collection and reprocessing. The TEC's report on this issue is provided in Appendix O.

The Steering Committee also considered evidence on international best practice in waste management and resource recovery, obtained from desktop research by DECCW and the recent overseas trip by the Minister for Climate Change and the Environment. The Minister undertook an overseas trip (7–21 July 2010) to the United Kingdom, Europe and the United States of America to review the status and progress of key environmental programs and policies including waste management and energy from waste (www.environment.nsw.gov.au/whoweare/ostravel.htm).

2.4 Overview of waste streams

Waste materials are commonly broken down into three waste 'streams' as follows:

1 municipal

2 commercial and industrial (C&I)

3 construction and demolition (C&D).

Of the total waste generated (in tonnes) in 2008–09, 51% was from the C&D sector, 33% from the C&I sector and 26% from the municipal sector.

Of the total waste recovered (in tonnes) in 2008–09, 50% was from the C&D sector, 30% from the C&I sector and 20% from the municipal sector.

Of the total waste disposed (in tonnes) in 2008–09, 38% was from the C&I sector, 35% from the municipal sector and 26% from the C&D sector.

2.4.1 Municipal waste

Municipal waste composition

Municipal waste is that collected by, or for, councils including household garbage, recycling and organics and other materials collected as part of street sweeping, public place collections, clean-ups and drop-offs, and waste from council operations. 95% is household waste.

This waste stream is primarily made up of 57% mixed residual waste, 23% items sorted for recycling (paper and cardboard, glass, plastic, metal) and 16% sorted organics (food and garden waste). Of the mixed residual waste component approximately 51% is organics, 20% paper and cardboard and 10% plastic.

Municipal waste pathways

Figure 1 – Simplified municipal waste pathways

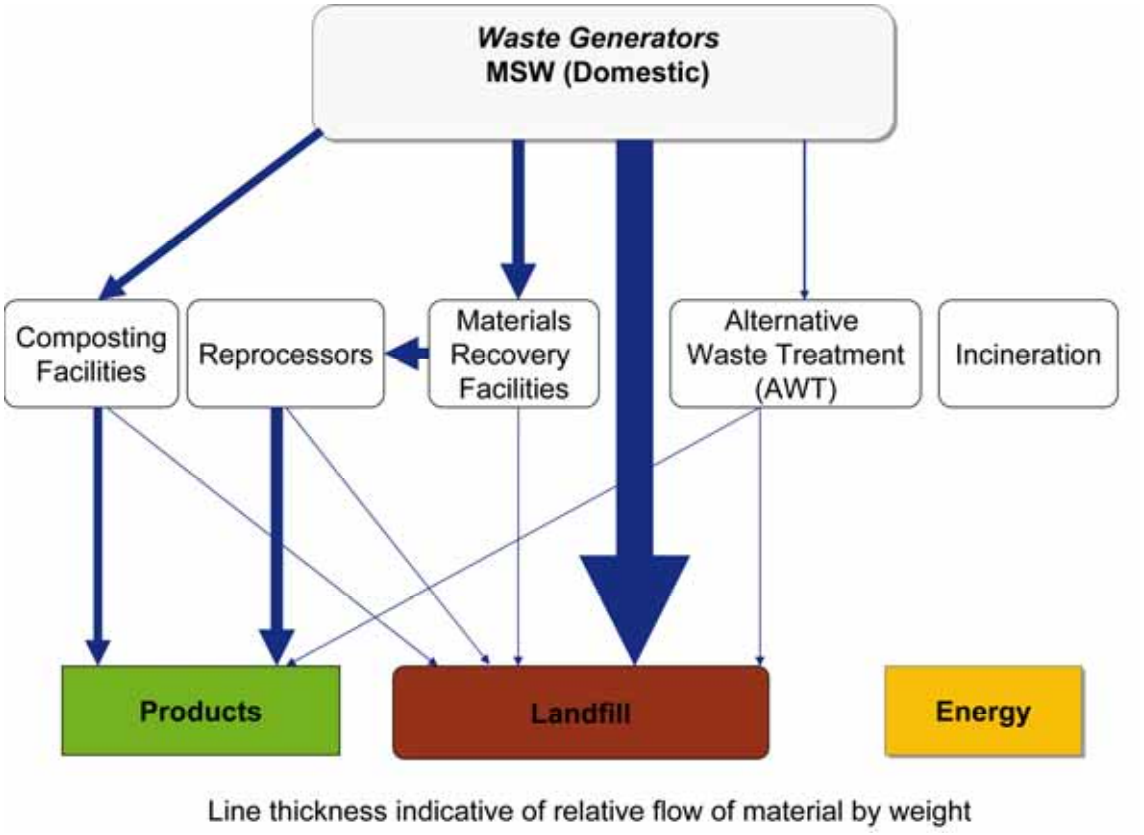


Figure 1 outlines the current complexity of the municipal waste pathway. It indicates that the largest amount of this waste is still going direct to landfill. Additional detailed information on the municipal waste sector is outlined in Appendix D.

2.4.2 Commercial and industrial (C&I) waste

C& I waste composition

These are waste materials generated from fixed point sources within a wide range of sectors and small to large businesses, including manufacturing; commerce and retail; registered clubs and not for profits; service providers such as healthcare, hospitality and government agencies, land managers and sites with high public visitation rates. 45% is generated by SMEs, 18% by manufacturers, 7% by retailers.

72% of this waste is generated in the Sydney Metropolitan Area (SMA), and 14% each in the Extended Regulated Area (ERA) and regional and rural areas of NSW. It is mainly transported using efficient bulk bins (33%) and front lift containers (31%).

Total C&I waste disposed is mainly made up of organics (17%), hazardous or special (14%), plastic (13%), wood (13%) – plus smaller components of paper, cardboard, textiles, C&D material etc.

The best waste recovery rates (i.e. > 50%) for this sector in 2008–09 were for ferrous metals (steel), non-ferrous metals (aluminium and copper), garden organics, paper and cardboard, and glass.

C&I waste pathways

Figure 2 – Simplified C&I waste pathways

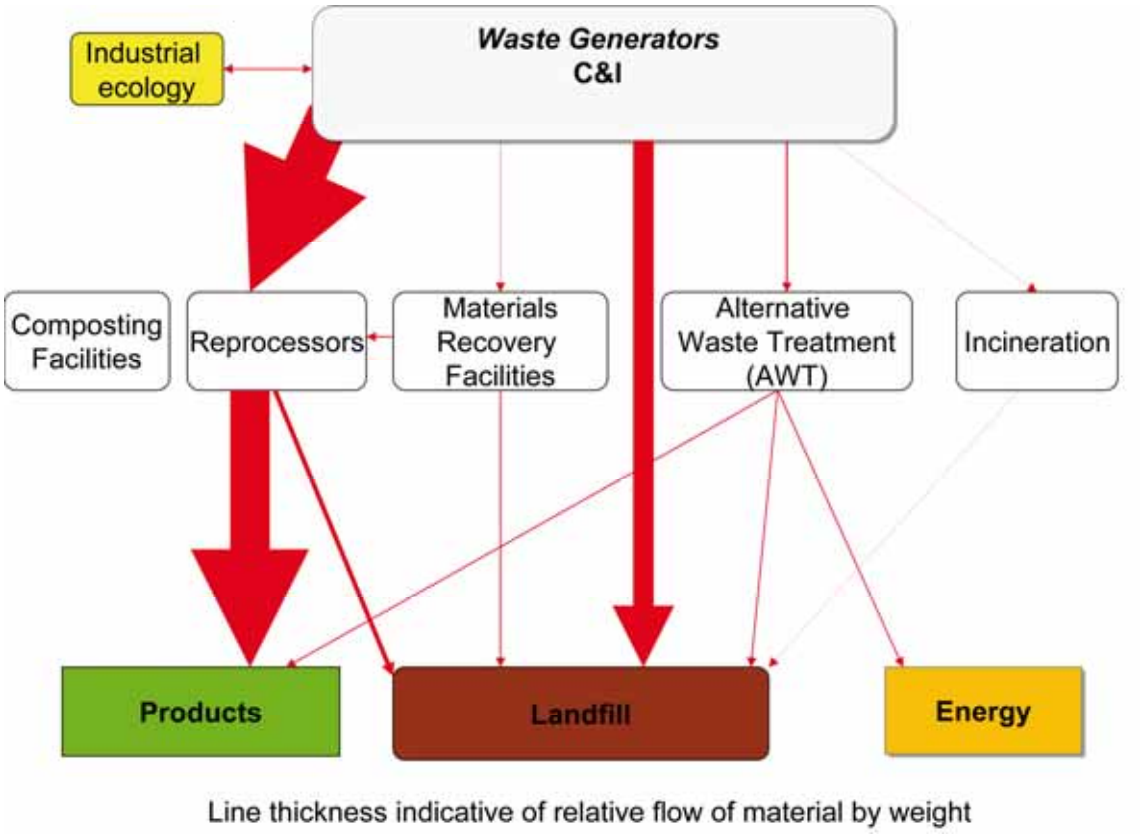


Figure 2 outlines the current complexity of the C&I waste pathway. It indicates that the largest amount of this waste is being reprocessed.

Additional detailed information on the NSW C&I waste sector is outlined in Appendix E.

2.4.3 Construction and demolition (C&D) waste

C&D waste composition

These are waste materials generated from construction and demolition activities (e.g. high rise, residential housing), in addition to materials from landscaping and other urban construction activities.

C&D waste pathways

Figure 3 – Simplified C&D waste pathways

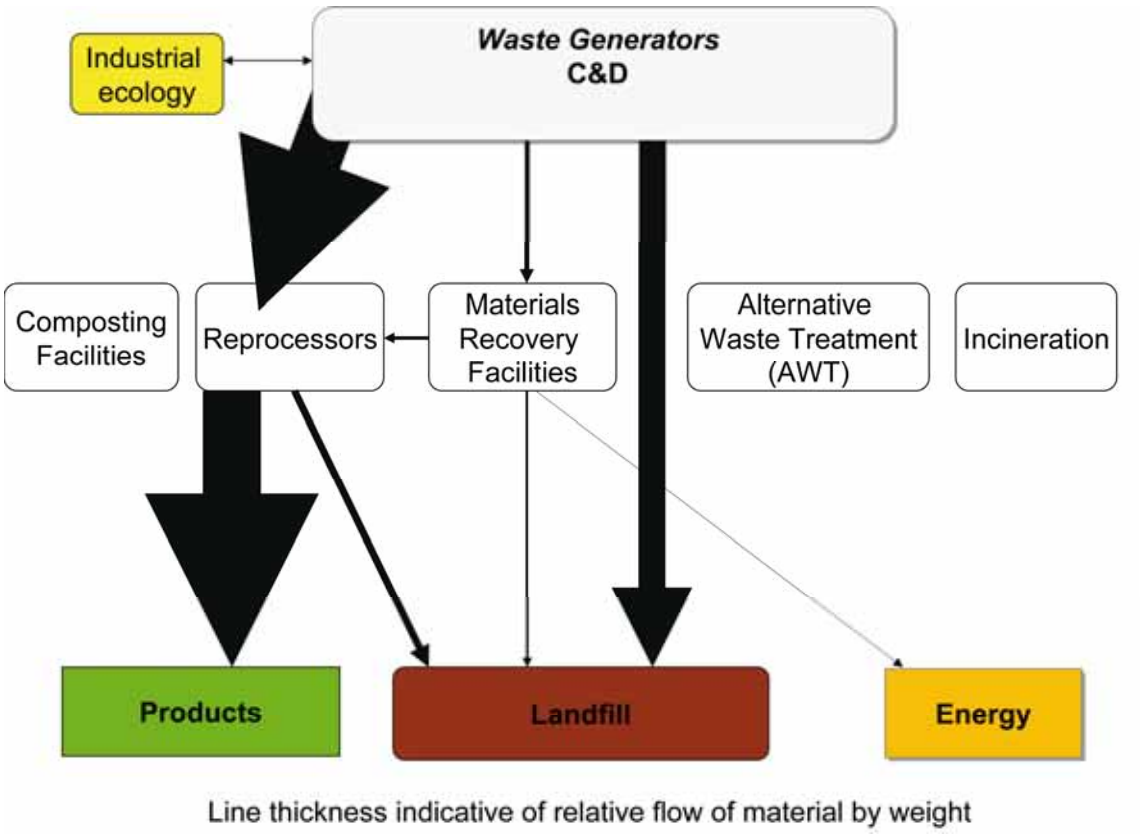


Figure 3 outlines the current C&D waste pathway. It indicates that the largest amount of this waste is being reprocessed.

2.5 Overview of policy and regulatory framework for waste

The following table provides an overview of the waste policy and regulatory framework.

Table 2 – Australian Government, NSW Government and local government waste frameworks

Tier	Legislation	Policy	Programs
Australian Government	**Product stewardship legislation** (proposed) – to regulate product stewardship schemes **Legislation regarding international obligations** e.g. *Hazardous Waste (Regulation of Exports and Imports) Act 1989*	**National Waste Policy 2009 (and Implementation Plan 2010)**: sets key directions and strategies: – taking responsibility (EPR) – improving the market – pursuing sustainability – reducing hazard and risk – tailoring solutions (e.g. Indigenous and remote communities) – providing evidence (data and reporting) **National Packaging Covenant 2005**: sets targets and requires reporting	
NSW Government	**WARR Act** – sets objectives and waste management hierarchy – requires WARR Strategy and reporting against targets **POEO Act & Regulations** – regulates environmental impacts – waste classification and licensing – establishes waste levy – Resource Recovery Exemptions **EP&A Act & SEPP (Infrastructure) 2007** – regulate land use and development of waste and resource recovery facilities	**WARR Strategy 2007** – sets recycling targets **State Plan** – adopts WARR Strategy targets **Waste Reduction and Purchasing Policy (WRAPP)–** for government agencies and state-owned corporations **EPR Priority Statement** – framework to encourage industries to manage priority wastes voluntarily **DECCW Best Practice Guidelines** (e.g. for landfills, council collection)	**WaSIP –** grants to local government for waste and sustainability improvements **Advice to local councils** **Business sustainability programs** **Market development activities** **Community education** **Compliance and enforcement activities –** includes resource recovery exemptions **Information and reporting**
Local government	***Local Government Act 1993*** – allows councils to charge rates for waste collection services etc.	**Individual council policies**	**Municipal waste collection** **Landfill management** **Operation of resource recovery facilities** (e.g. AWTs)

Additional information on the national and local government waste policy settings and the NSW land-use planning system is outlined in Appendices A and B.

2.6 NSW policy settings

2.6.1 Legislation and regulation

The *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) and the *Protection of the Environment Operations Act 1997* (POEO Act) provide the legislative basis for the regulation of waste in NSW. The WARR Act establishes the hierarchy for waste management to ensure that resource management options are considered against the following priorities, with avoidance the top priority and disposal the last resort:

1 avoidance – including action to reduce the amount of waste generated by households, industry and governments

2 resource recovery – including reuse, recycling, reprocessing and energy recovery, consistent with the most efficient use of the recovered resources

3 disposal – including management of all disposal options in the most environmentally responsible manner.

The WARR Act also requires the creation of a Waste Avoidance and Resource Recovery Strategy for NSW (the WARR Strategy) with targets for waste reduction and resource recovery, and reporting every two years against the targets.

The POEO Act provides the basis for the regulation of waste, including the licensing of waste and resource recovery facilities where there is a potential risk to the environment. The key objective of the legislation is to minimise environmental harm that may result from waste activities.

The POEO Act and the Protection of the Environment Operations (Waste) Regulation 2005 (Waste Regulation) provide a regulatory framework that covers:

- waste classification and licensing – the grouping of waste into classes that pose similar risks to the environment and human health and the licensing of waste and resource recovery facilities where there is a potential risk to the environment
- establishment of a waste and environment levy for waste disposal
- Resource Recovery Exemptions – to enable the reuse of waste or waste-derived materials as fill or fertiliser (land applications) or as a fuel or as an alternative raw material in thermal applications, and
- environmental offence provisions – to enforce handling, transportation and disposal of waste in NSW.

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and associated planning instruments regulate land use and development of waste and resource recovery facilities. State Environmental Planning Policy (Infrastructure) 2007 [SEPP (Infrastructure) 2007] has specific planning and approval provisions for different types of infrastructure including waste and resource recovery facilities and aims to ensure an appropriate balance between the development of landfills and resource recovery facilities.

2.6.2 NSW Waste Avoidance and Resource Recovery Strategy

The NSW Waste Avoidance and Resource Recovery Strategy 2007 (WARR Strategy) provides a framework for maximising conservation of our natural resources and minimising environmental harm from waste. It identifies goals in four key result areas:

1 preventing and avoiding waste

2 increasing the recovery of secondary materials

3 reducing toxicity in products and materials, and

4 reducing litter and illegal dumping.

It also includes the 2014 recycling targets for the three waste streams relating to the first two key result areas above, which have been picked up as State Plan commitments.

The WARR Strategy recognises the importance of the waste hierarchy to guide effective resource management and includes a range of actions and programs across the whole life cycle of goods and materials, including extraction, manufacturing, distribution, consumption and recovery for reprocessing or disposal.

The WARR Strategy also contains a list of programs in key action areas which will contribute to the outcomes of the Strategy. These include:

Providing a supportive policy and regulatory environment

- POEO Act regulations to enable exemptions for wastes or waste-derived materials used as fuel or applied to lands
- increased awareness activities
- guidance for councils about emerging waste management and technology issues, including food waste

Reducing commercial and industrial waste

- Sustainability Advantage partnerships with geographic and sectoral clusters of industry
- Sustainability Compacts with sector leaders to change their own practices as well as their supply chains' practices
- joint compliance and cleaner production work with licensed companies; information and training
- better market support and system changes through priority materials flow modelling
- partnerships with businesses, including waste transporters, to improve source separation and recyclables sorting systems
- a business planning and financial modelling tool to assist councils expand recycling services to SMEs
- research to solve systems and contamination problems
- auditing to measure composition of C&I waste being disposed of
- funding to support new market development for priority materials such as glass fines

- a streamlined electronic reporting system to convert waste contributions to savings in greenhouse emissions, energy and water
- increased use of government contracts to support recycled content products and reward responsible supplier recycling services
- transfer of good government practices in waste reduction and purchasing to other sectors

Reducing municipal waste

- performance payments for councils that improve their waste and recycling practices and results
- support to councils for sustainable purchasing practices
- tools for councils to support decisions on systems and technologies, plus education, resources and training
- easy-to-use standard contracts that reflect best practice performance
- assistance to improve waste and recycling practices in MUDs

Reducing litter and illegal dumping

- support to Regional Illegal Dumping Squads to deliver stronger compliance and enforcement programs
- support for councils to tackle illegal dumping in multi-unit dwellings (MUDs)

Supporting waste reduction in rural and regional NSW

- funding for eight voluntary regional waste groups covering 90% of rural and regional NSW

Reducing construction and demolition waste

- support to develop systems to identify non-recyclable timbers
- more ‘green specifications’ for major materials to increase reuse
- support for councils to implement Waste Not Development Control Plans (DCPs)

Improving other specific waste streams

- market development programs to encourage use of recycled organics
- a market study to identify opportunities for recycled organics
- scientific trials on the benefits of recycled organics
- strategies to tackle municipal and C&I food waste
- funding for the Household Chemical CleanOut program
- work with government departments to identify potential major users of virgin excavated natural material (VENM)

Promoting product stewardship and extended producer responsibility programs

- work to deliver national systems for agreed wastes of concern
- support for the National Packaging Covenant and enforcement action against non signatories
- work with sectors identified as ‘wastes of concern’ in the NSW EPR Priority Statements
- improved criteria and processes for identifying priority wastes

Promoting better knowledge and data

- an improved electronic data system for reporting and analysing recycling data
- an improved process for annual surveys of waste reprocessors
- new commercial and construction waste disposal audits
- improved data and information on products identified as wastes of concern

Promoting education

- help for sectors so they understand the links between waste and other environmental issues
- support for waste and sustainability educators throughout the community
- support for initiatives by ethnic communities, aboriginal communities and young people.

2.6.3 Waste and environment levy

The POEO Act establishes the waste and environment levy (the levy) which is payable by scheduled waste facilities (those requiring a licence) in the regulated area (see below) and statewide for intractable liquid waste. The levy applies to waste disposed to landfill or intractable liquid waste facilities.

The solid waste levy applies in the regulated area of NSW which is made up of the Sydney Metropolitan Area (SMA), the Extended Regulated Area (ERA – Illawarra and Hunter regions) and, as of July 2009, the Regional Regulated Area (RRA – including the Blue Mountains, Wollondilly and the area north of Port Stephens to the Tweed).

A flat levy is charged on solid waste regardless of the type of waste, but the rate varies across the three geographical regions. In Sydney, the levy commenced at $0.51 per tonne in 1971, is currently at $70.30 per tonne and is scheduled to increase annually until 2015–16 to about $120 per tonne in today’s dollars. The ERA rate is currently slightly lower but will catch up to the SMA rate, while the RRA will reach $70 per tonne in 2015–16.

The levy works by increasing the cost of waste disposal, thereby providing a strong economic incentive to reduce waste generation and promote resource recovery. The levy is designed to discourage landfill disposal and drive resource recovery investment in NSW to meet the WARR Strategy and targets. As the levy increases, it encourages waste generators to review their practices and makes recycling options more financially viable in comparison to landfill. Levy increases have driven and continue to drive significant investment in recycling infrastructure such as AWTs.

Recovery of C&D waste is particularly sensitive to the levy, and future levy increases are expected to further drive up the recovery rate. The levy does not currently provide the same incentive for disposal of C&I waste due to the much lower cost of disposal at non-putrescible landfills, but is expected to make more of a difference as it approaches the top rate. In the municipal sector the levy is passed on to householders but only in an annual fee which does not provide direct incentives to reduce waste. On the other hand it provides incentives to councils to invest in resource recovery.

The levy funds have enabled the NSW Government to deliver some of the State's longer term environmental priorities, namely the City and Country Environmental Restoration program ($439 million for five years from 2006–11) which includes waste and sustainability improvement payments to local government.

Additional information on the levy and a Local Government and Shires Associations of NSW (LGSA) paper on improving waste levy application and management are provided in Appendix H.

2.6.4 Resource Recovery Exemptions

In 2008, DECCW introduced Resource Recovery Exemptions under the Waste Regulation to enable the reuse of waste or waste-derived materials as fill or fertiliser (land applications) or as a fuel or alternative raw material in thermal applications. DECCW has published criteria and guidance information to assist industry in submitting applications for Resource Recovery Exemptions for a proposed waste-derived material to be applied to land or be used as a fuel.

The exemptions provide a mechanism for DECCW to encourage the recovery of resources from waste where this is beneficial and does not harm the environment or human health. Many waste-derived materials are not suitable to apply to land or use in thermal applications due to potential contamination to the land or pollution from air emissions.

Resource Recovery Exemptions can be general or specific exemptions. General exemptions are relevant to commonly recovered, high-volume, well-characterised waste-derived materials. Specific exemptions are approved in certain circumstances in recognition of intellectual property rights or where it is necessary to impose specific conditions on the use or application of low-risk waste-derived material. As at July 2010, DECCW had published 28 general, and more than 70 specific Resource Recovery Exemptions.

Regulatory uncertainty about the commercial use of AWT products has been addressed by the recent finalisation of the organic waste exemption, although the impact of this change is yet to be tested. Specifically, DECCW has issued an exemption for AWT organic outputs for mine site rehabilitation and for agricultural use. The limits for agricultural use will be reviewed in 2013, in the light of research to be undertaken to show what levels of broken glass and plastics in the outputs are appropriate for such use. The regulatory settings, including the exemption system, have played an important role in protecting the environment by recognising that not all reuse of materials is beneficial. Other Australian jurisdictions are looking to NSW for guidance on this issue as they set up their own specifications.

2.7 Economic and social factors in waste

The Productivity Commission Inquiry into Waste Management and Resource Efficiency (2006) concluded that waste policy should maximise net community benefits (as opposed to resource efficiency). Waste management can lead to negative 'externalities' – impacts on unrelated parties that are not reflected in the private financial costs of waste management. If these externalities are significant, the waste management option that imposes the lowest financial costs may not be the best outcome from the perspective of the community as a whole. The best outcomes for the community are achieved where all costs and benefits are taken into account, whether financial, social or environmental in nature, and where net benefits to the community are maximised.

For the municipal waste sector, household consumption and population are the likely economic drivers of waste. For the C&I waste sector, State Final Demand (SFD – expenditure on consumption and capital formation) is the likely economic driver. For the C&D waste sector the economic drivers are building approvals and value of work done.

In NSW, over the eight-year period from 2000–01 to 2008–09, there have been substantial declines in municipal and C&I waste received relative to their economic drivers. The relationship between waste received and the relevant economic drivers has changed due to increases in recycling, reuse and waste avoidance over time.

Increases in consumption of goods, and therefore waste generation, in NSW is also graphically indicated by the rapid growth of goods imported into NSW. For example, in the nine-year period 2000–01 to 2009–10, containerised imports into Sydney ports increased by 93% (i.e. almost doubled).

There are several socio-economic factors that could potentially have an impact on household waste generation and recycling in the different LGAs across NSW. These factors include the percentage of multi-unit dwellings (MUDs), population density and household income. Understanding the interplay of these factors may be important in formulating better waste management policies and strategies for NSW for the future.

A preliminary analysis found that relationships between waste and socio-economic characteristics are different in the SMA and the ERA in the sense that their effects are opposite. For example:

- as household income increases, recycling rates go up in the SMA but down in the ERA
- as the percentages of MUDs increases, recycling rates go down in the SMA but up in the ERA
- as population density increases, recycling rates go up in the SMA but down in the ERA.

Further analyses were undertaken to determine if it would be possible to cluster councils within both the SMA and the ERA, based on similarities in percentage of MUDs, population density and income, and then compare council waste performance within each individual cluster. Such a clustering would theoretically assist in determining more appropriate 'peer group' municipal waste benchmarks and best management practice.

This analysis was done on a sub-sample of about one-third of the LGAs in NSW. It was found that these LGAs in NSW could be clustered into four main groups:

- urban and high income LGAs
- urban and medium to low income LGAs
- rural and medium to high income LGAs
- rural and low income LGAs

Additional information on economic and social factors in waste is outlined in Appendix G.

3 Key themes, challenges, possible responses and proposed enhancements

The Review identified key issues arising from the terms of reference, its research and stakeholder consultation, across four broad themes. For each of the four themes, the key issues and significant current and emerging problems or challenges identified by the Review are summarised below. Proposed enhancements to the NSW waste framework identified by the Steering Committee are also listed below under each of the four themes.

3.1 Theme 1 – Overall adequacy of WARR strategy and targets

***Covering**:*

- *Effectiveness, efficiency and appropriateness of current NSW waste management objectives, strategies and targeted outcomes including consistency with national agendas.*
- *Relevance, appropriateness and adequacy of the major current targets within the NSW waste management policy/framework including State Plan targets.*

3.1.1 WARR Strategy challenges

Looking forward

While there is not a dramatic policy failure of the WARR Strategy, there are opportunities for improvement and there are competing agendas on the best way forward. Even if the 2014 WARR waste diversion targets are achieved, they are 'soft', that is they are expressed as percentages rather than absolute tonnages or volumes of waste. Therefore they can mask actual increases in waste generation and waste going to landfill. Because of their focus on resource recovery rates, the targets do not address key emerging waste management issues such as specific waste materials, alternative waste treatment (AWT), resource sustainability, climate change and energy from waste.

The development of sub-targets to support the main 2014 targets would assist in the difficult task of communicating the main goals of the WARR Strategy to industry and the community. Annual sub-targets would ensure there is an annual stocktake of progress. Sub-targets for specific waste materials such as food and organics, and paper and cardboard, will ensure there is a focus on these critical components in the waste streams. It will not be possible to achieve the WARR targets for the municipal and C&I sectors without addressing these materials. In addition, these materials have significant greenhouse gas impacts on landfills, so there is a clear benefit in reducing the amounts going to landfill.

The waste paradigm in NSW is now shifting from a focus on landfill technologies to far more complex resource recovery (including AWT and reuse technologies).

This means the current WARR Strategy may not provide appropriate drivers to equip NSW for the future. The WARR Strategy needs to be responsive to changing needs and circumstances. There is a need to give forethought to NSW Government waste policy directions and targets beyond 2014, to give more certainty to the waste sectors and to give appropriate lead times for investment in necessary waste infrastructure.

Waste generation and avoidance

Waste generation and waste going to landfill in NSW continue to grow, despite the WARR waste avoidance target to cap waste generation at the 2002 level and the 2014 waste diversion targets.

The WARR Strategy contained an 'aspirational' target for waste generation: to hold generation steady from 2002 to 2008. During that period waste generation increased 38% overall. On a per capita basis, it increased 31%. Over the same period, resource recovery increased by 80%. Despite this, the amount of tonnages going to landfill still increased by 3%.

We need to better understand what is driving the increase in waste generation (global economy, increased consumerism, increased packaging etc.), where the increase is occurring, barriers, and what opportunities exist to reduce it. Waste avoidance is a very complex issue and is very difficult to measure, and perhaps the NSW Government is not exerting enough pressure to avoid waste.

Strategic focus

There is a need to ensure the WARR Strategy operates as a 'strategic' document, rather than just a statement of intent. The WARR Strategy should provide the critical link between the targets and implementation actions. Currently, there is no detailed implementation plan for the WARR Strategy – outlining timing, roles or responsibilities etc.

The development of such an implementation plan would also provide an opportunity to foster more understanding and ownership of the Strategy from councils, commerce, the waste industry and the general community. Currently the WARR Strategy is viewed mainly as a NSW Government-developed and driven Strategy.

Importance of good data

Currently, we do not collect enough good waste-related data to make well-informed decisions in some areas. There is a need to establish a mechanism for DECCW to be able to access robust waste data in a timely manner, as well as increased resourcing of DECCW's data analysis capacity and more frequent and timely reporting. Future waste policy and infrastructure requirements need to be evidence- based.

There are problems with the data currently used to report on waste management performance against the WARR targets:

- Waste avoidance is very difficult to measure except at the macro level (overall waste generation), where it is very difficult to know if other factors in the economy are causing changes rather than waste avoidance efforts.
- Resource recovery is also difficult to measure fully, as it is dependent on voluntary, self-reported data. Resource recovery tonnages measured are limited to those tonnages that pass through licensed resource recovery facilities that voluntarily

report. Smaller unlicensed resource recovery centres (under 10,000 tonnes) do not record volume coming in and, as they charge by the cubic metre, their resource recovery figures are unlikely to be accurate.

- Tonnages that are recovered through unlicensed facilities or non-reporting facilities, or which are reused on site or pass directly from businesses to manufacturers (e.g. some source-separated steel, glass and paper in the C&I sector) are not counted.
- Mining and agricultural sectors also generate a lot of waste that is generally excluded from NSW waste data.

Landfill disposal data is the most reliable data, because it is audited and verified through the collection of the waste and environment levy.

Internationally there are similar challenges in obtaining good timely data that can be used to drive recycling and recovery strategies. France uses an interesting model: a non-government organisation (NGO) which is not aligned with either industry or environment groups is responsible for waste data. The Ile-de-France Region Waste Management Observatory (ORDIF) is an NGO responsible for collecting and publishing waste data as part of its broader waste management role in the region. Once its data is published there appears to be little dispute over the figures, unlike Australia's National Packaging Covenant model which would be the closest parallel.

3.1.2 Priority WARR Strategy enhancements

Enhancement 1 – WARR Strategy sub-targets

Use the 2010 WARR Strategy Progress Report to ensure there are the right signals to deter growth in waste generation and increase resource recovery, by establishing a number of sub-targets. These sub-targets would also help drive waste avoidance and recovery of particular materials, where cost effective improvement potential is identified. The sub-targets proposed are:

a annual 2011–12 and 2012–13 waste diversion targets for municipal, C&I and C&D sectors

b resource recovery targets for specific materials – in particular for food/garden organics and paper/cardboard, (which link with Enhancements 5 and 7).

Enhancement 2 – WARR Strategy Implementation Plan

Use the 2010 WARR Strategy Progress Report to develop a WARR Strategy Implementation Plan, outlining sub-targets, actions, timeframes and responsibilities, including the role that can be played by individual householders, community infrastructure (such as hospitals and schools), businesses and government organisations. The Implementation Plan should outline synergies between the municipal, C&I and C&D sectors and local, State and Australian governments.

Also use the Implementation Plan process to gain buy-in and joint ownership with key stakeholders, whose commitment and actions are essential for delivery of the Strategy targets.

Enhancement 3 – Better data on waste

Provide waste generation and resource recovery data that is accurate, transparent and timely by requiring all licensed waste processing and reprocessing facilities to report data as a licence condition. Consult with industry to develop a streamlined reporting process.

Enhancement 4 – DECCW's waste management capability

Require DECCW to improve its analysis, monitoring and communication of progress on the WARR Strategy, building on and supplementing the WARR Strategy progress reports.

3.1.3 Other possible WARR strategy enhancements

Issues which might be considered further include:

- Investigate any existing waste data collections that government does not currently use or cannot access, particularly data on resources recovered.
- Explore opportunities from National Waste Policy proposals for improved data collection.
- Mandate weighbridges on landfills above a specified capacity to ensure accurate collection of waste disposal data.
- Commit DECCW to releasing State waste disposal data annually, three months from the end of the financial year.

Any specific proposals will need to be subject to thorough business case analysis, including relevant cost benefit analysis.

3.2 Theme 2 – Waste management sector performance

***Covering**:*

- *The overall effectiveness and extent of coordination and alignment across the waste streams (e.g. commercial, household) and with key generators of demand in achieving policy objectives and outcomes.*
- *The opportunities available to improve performance in key functions or outputs such as waste avoidance, separation and processing, particularly by achieving improved outcomes in particular sectors (e.g. commercial, household) and the ability to stimulate innovation and investment to contribute to overall objectives.*

3.2.1 Waste sector challenges

Municipal sector

Recovery of municipal waste has increased from 30% in 2002–03 to 44% in 2008–09. To meet the WARR municipal diversion target of 66% in 2014, it has been estimated that an additional 1.3 million to 1.7 million tonnes of resources need to be recovered.

Waste avoidance strategies, although important in the long term, may not achieve the desired target, so efforts need to be focused on increasing resource recovery, particularly food and garden organics and dry recyclable materials. There will need to be significant improvements in source separation and /or processing of household waste (including construction of additional or enhanced AWT facilities, or new technologies including dedicated energy from waste facilities). In addition, ongoing, targeted education programs will be essential if the WARR targets are to be met.

In terms of best practice systems, councils that have the highest resource recovery rates in NSW (see Appendix D) have:

- dry recycling (for paper/cardboard and glass/plastic), and
- either combined or separate food and garden organics recycling (i.e. a three- or four-bin system), and/or
- send their residual waste to AWT facilities.

Potential improvements to municipal tonnages of waste and recyclables recovered could come from:

- recovering half of the dry recyclables that are currently still disposed in the kerbside red residual bins for all regulated councils (i.e. in the SMA, ERA and RRA). Dry recyclables made up 23% of the material in red residual bins in 2008–09. There is also significant variability in kerbside recycling effectiveness between councils, with high-performing councils achieving close to 70% recovery of dry recyclables (the best recovery rate is 88%), while poorer-performing councils are achieving recovery rates in the low 30% range. This would recover an additional 151,000 tonnes
- recovering half of the food waste currently in the red residual bins, to reduce the proportion of food waste to approximately 20%. Food waste comprises about 40% of household residual waste. This would recover an additional 264,000 tonnes
- recovering half the garden organics currently in the red residual bins, to reduce the proportion of organics to about 5.5%. Garden waste comprises an additional 11% of household residual waste. This would recover an additional 72,000 tonnes
- sending residual waste to an AWT. 19 councils in the regulated areas currently do this. There is potential for the remaining 52 regulated councils to send their waste to an AWT. At the AWT recovery rate of 54%, this would recover an additional 568,000 tonnes. (Note that this is unlikely to be realised in the next four years because this shift would depend on a number of factors including the cost and benefit of changing to an AWT for each council or group of councils, length of existing contracts, and the need to approve and construct more AWTs or increase capacity of existing AWTs).

If the top 20 Councils[1], ranked by highest waste-to-landfill tonnages, were successful in removing all the food (average 40%) and dry recyclables (average 15%) from their red residual bins, i.e. reducing their waste-to-landfill rate by 55%, this would result in approximately 420,000 tonnes diverted.

Since the data collection period of 2008–09, AWT processing of waste for Liverpool, Penrith, Macarthur group of councils (Campbelltown, Camden, Wollondilly and

[1] Top 20 councils by highest waste-to-landfill rates, 2008–09, are Bankstown, Blacktown, Canterbury, Fairfield, Gosford, Holroyd, Hornsby, Lake Macquarie, Liverpool, Newcastle, Parramatta, Penrith, Randwick Rockdale, Sutherland, Sydney, The Hills, Warringah, Wollongong and Wyong.

Wingecarribee) has come on line and thus will increase the amount of recovery from kerbside by an additional 75,000 tonnes. Other councils (e.g. Warringah and Newcastle) have commenced kerbside organic bin collections rather than tied and bundled. Conversion of all services in the regulated area would result in approximately an additional 112,000 tonnes recovered.

The potential improvements outlined above, if all successful, would collectively result in approximately 1 million to 1.2 million additional tonnes being recovered each year, thus bringing NSW close to the 2014 municipal target.

Lack of source separation and recycling of household waste may be due to apathy, confusion or insufficient bin capacity or emptying frequency, or a combination of these reasons. There are large variations in waste disposal per capita and recycling rates in specific LGAs, which may result from different approaches by councils to waste management or a lack of information.

As indicated in Appendix D, in 2008–09, there were 55 different ways that councils provided kerbside waste collection services in terms of differing bin configurations and collection frequencies.

It is debatable whether the NSW Government should be prescriptive about municipal waste collection services or rather adopt an outcomes-based approach to waste management, e.g. prescribe solutions whereby councils are required to achieve certain outcomes. There is a general feeling among councils that demographics (e.g. percentage of multi-unit dwellings, population density and household income) make a difference to what works, and one size will not fit all councils. Some councils feel that the availability of waste infrastructure is actually more important than different collection systems.

Many rural councils feel that they need extra attention in terms of access to basic recycling services, possible transport subsidies, and market development of local waste solutions.

International best practice

Findings from the Minister's overseas trip indicate a range of approaches to dealing with municipal waste and no 'one best way'. However some sort of source separation was a fundamental premise for all systems reviewed, with varying use of co-mingling.

Flanders had the highest recycling rate for municipal waste in Europe. Key features of its system included a collection system based on maximum source separation; a landfill ban for household waste; an innovative approach to waste infrastructure (where half of household recyclables are collected in 'recycling bring-back yards'); direct charging of householders for waste disposal; significant use of home composting (by 25% of households); producer responsibility schemes for household packaging and other wastes; and incineration of waste with energy recovery (25% of waste incinerated). As a result, only 1.1% of municipal waste ends up in landfill in Flanders.

San Francisco also achieves a high recycling rate, but in contrast to Flanders, its collection system is based on co-mingling. Its system includes other features in common with Flanders, such as variable rates for household kerbside collection, and the largest composting scheme in the United States.

Commercial and industrial sector

Recovery of C&I waste has increased from 34% in 2002–03 to 52% in 2008–09. In 2008–09 just over 2.8 million tonnes was recycled of the total 5.4 million tonnes of waste generated by business and industry in NSW. To meet the WARR C&I 63% waste diversion target in 2014 it has been estimated that an additional 1.2 to 1.5 million tonnes of materials will need to be recovered

The majority of the recovery from the C&I waste stream is metals, paper/cardboard, concrete/bricks, sand/soil/rubble and garden organics/other organics. These materials account for 2.5 million tonnes, or 89% of the total 2.8 million tonnes recovered in 2008–09. While paper/cardboard has scope to improve (currently only 53% is recovered), recovery of metals and concrete/bricks are already at over 90%. For the C&I resource recovery rate to achieve the 63% target, additional materials that are not currently recovered in significant amounts will need to be addressed, particularly paper/cardboard, plastics and timber. Little if any collection infrastructure exists for these materials and secondary markets will also need development.

Unfortunately the C&I sector is very disparate and there are no easy solutions. To meet the target there will need to be significant improvements in either source separation by C&I waste generators or processing, including construction of additional dirty material recovery facilities (MRFs), or other technologies including dedicated energy from waste facilities. Additional information on the issue of waste separation at source vs. centralised sorting in the C&I sector is outlined in Appendix F.

Approximately 78% of C&I waste is made up of mixed loads (i.e. collected from multiple businesses with differing waste profiles), leading to, for example, contamination of paper and cardboard by food waste. This makes downstream processing unviable. For many businesses, particularly small businesses, it is not economical to separate C&I waste by hand at source, due to space, access and labour constraints. There are therefore current financial barriers to businesses contracting for recycling services – it costs them time and money over and above a simple mixed-waste service.

However, even basic sorting by waste collectors into ‘dry’ runs and ‘wet’ runs could improve the viability of downstream sorting and improve recycling rates. Some materials are not collected because there are no markets for the material (e.g. MDF, wooden furniture) and therefore there is no point in encouraging businesses to source-separate them.

In terms of best practice systems, businesses and enterprises that source-separate or send their residual waste to AWTs or MRFs have the highest resource recovery rates.

There is potential to recover up to an additional 745,302 tonnes of materials a year from the C&I waste stream, by increasing the recovery of:

- wood from 16% (2008–09) to 80%; this would recover an additional 217,141 tonnes
- food waste from 18% (2008–09) to 50%; this would recover an additional 176,555 tonnes
- paper/cardboard from 53% (2008–09) to 76%; this would recover an additional 183,109 tonnes
- plastics from 8% (2008–09) to 45%; this would recover an additional 148,560 tonnes
- glass from 53% (2008–09) to 70%; this would recover an additional 19,937 tonnes.

Cross-sector

Currently, waste is managed as three discrete streams (municipal, C&I, C&D) but there are some overlaps that could mask key performance trends. For example, some very small businesses or shops may have a waste profile similar to households, while large multi-unit dwellings may have a waste profile similar to commercial enterprises.

The current arrangements for C&I collection, primarily at small to medium enterprise (SME) level, may need to be more flexible in future and linked to other waste collection activities in the relevant geographical area. Similarly the growth in multiple and higher density dwelling numbers may suggest a joining of collection functions across geographical areas targeting higher and multiple density dwellings. The current dichotomy between the municipal and C&I streams may not be efficient for waste collection.

Currently, C&I waste is collected by a diverse array of contractors, even within the some office block, shopping centre or business park. In future, councils could provide C&I waste collection services for SMEs, as part of their household kerbside collection service contracts. Councils could expand existing household kerbside waste collection services to SMEs without having to introduce a whole new system (although it would be important to avoid cross-contamination).

Industry groups (e.g. local chambers of commerce) could contract waste services on behalf of local businesses in the same way that regional organisations of councils do for councils. It should be cheaper for one contractor to service all buildings in a precinct rather than several trucks going to much the same destination. In addition, the waste could be ‘bundled’ (i.e. same term contract and known quantity and composition) making it easier to offer long-term supply contracts to companies investing in waste processing technologies.

A ‘precincts-type’ approach is taken in Melbourne where many businesses use the same waste collection contractor as the council and may enter into joint arrangements with neighbouring residential buildings or directly with the contractor.

International best practice

Examples of cross-sector approaches to waste management were found on the Minister’s overseas trip. For example, in San Francisco commercial organisations have the same three bins as households (for residual waste, dry recyclables and compostable waste). Businesses such as restaurants are required to compost. Chicago has evaluated the use of an exclusive franchise agreement which would grant a single private company the right to charge residents and/or businesses in a designated area for waste collection services.

Individual waste materials

Food/organic waste

Food and organic waste is a significant component of residual waste in both the municipal and C&I sectors, and needs to be addressed if we are to meet the WARR targets for these sectors. It is a particularly challenging problem for mixed waste from high-density housing areas and mixed C&I waste. The issues and strategies for reducing residual food waste are considered in more detail for both C&I and household food waste in Appendix L.

For the municipal sector the best thing to do would be to get more food and garden organic waste out of the residual bin. This could be achieved either by using a three- or four-bin system or by an AWT solution. However, some councils feel that the AWT solution is not viable as there is not a lot of competition in AWT facilities and therefore prices are high, plus there are insufficient AWT facilities to supply demand. Because of the lead time required to negotiate and put in place new AWT facilities (estimated to be five to seven years), the only currently available option is to separate out more food and organics at source.

Separation of food/organic waste and significant use of composting are key features of waste management systems in overseas countries achieving high recycling rates.

Priority wastes

There are some wastes that present a significant management issue from an environmental, resource or human health perspective. Such items potentially include gas bottles, lead acid batteries, e-waste, sharps, tyres, medicine residues, pesticides, paint residues, oils and mercury-containing lamps.

These wastes can be managed with a variety of policy tools ranging from education campaigns and EPR schemes to market-based instruments and upstream design modifications. Another regulatory option for managing these waste types is to introduce bans either at landfills, recycling facilities or from kerbside waste collections. However, bans should not be imposed without offering alternative solutions – such as enhanced collection or drop-off facilities or EPR schemes.

Collection and drop-off facilities and events for selected waste materials also vary considerably across NSW. While there are many drop-facilities that accept chemical drums, glass, and plastic bottles and containers, very few accept problem wastes such as batteries, fluorescent light globes or tubes, paint, e-waste, gas cylinders, oils or tyres (see the full list in Appendix D).

At the national level, significant work is currently underway to introduce schemes to tackle priority wastes identified in the National Waste Policy. These wastes include e-waste, tyres, packaging and mercury-containing lights. DECCW is already actively involved in assisting the Australian Government to develop national framework legislation for EPR and investigating container deposit legislation (CDL). The Environment Protection and Heritage Council (EPHC) agreed at its 5 July 2010 meeting to develop a consultation Regulatory Impact Statement, which will examine the costs and benefits of options to increase the recovery of waste packaging and reduce packaging-related litter, including CDL. These investigations need to be fast-tracked as much as possible. More detailed information on national e-waste programs and CDL proposals is outlined in Appendices M and N.

Gas bottles

Gas bottles are generated as waste from households, businesses and industry. Types of gas bottles range from the typical 9-kilogram barbeque gas bottle through to smaller gas bottles and butane canisters. Gas bottles are principally an issue for recyclers processing either mixed waste (such as AWT facilities) or recovered metal. The presence of gas bottles within a waste stream presents a serious occupational health and safety risk to both workers and equipment.

Discarded gas bottles often contain residual amounts of gas which, when processed, can cause explosions and ignite fires within facilities.

With the introduction of the gas bottle exchange ‘Swap ’n Go’ scheme the presence of 9-kilogram bottles in the residual waste stream has reduced considerably. However, other types of gas bottles still remain a problem.

Lead acid batteries

Lead acid batteries are principally used in automobiles. All used lead acid batteries contain lead, lead compounds or sulphuric acid, or both. These compounds are acutely and chronically toxic and can pose a significant risk to the environment and human health when disposed of inappropriately. Even when drained of acid, used batteries still present a risk due to the lead residues that remain.

The presence of lead acid batteries, particularly in mixed municipal waste, poses a substantial problem for resource recovery facilities. AWTs producing organic outputs from the processing of mixed municipal waste have identified significant spikes in lead contamination that correlate with the presence of lead acid batteries in the waste input stream.

Glass

Not all of the glass collected at kerbside for recycling is actually able to be recycled. This is largely because there is a need to keep the glass intact and to separate out clear, green and amber coloured glass. Glass fragments have a detrimental impact on AWT and MRF machinery and processes and also compromise final products (such as composts). For mixed waste streams it is definitely beneficial to remove glass at the source.

Unfortunately, glass as a commodity is currently worth little and is very heavy. It is cheaper to make new glass containers from raw materials rather than transporting recycled glass. Many AWTs and MRFs are stockpiling glass waiting for the price to increase. Therefore more local solutions for reuse of crushed glass are needed.

Plastic bags

In NSW, both degradable and non-degradable plastic bags are in use. This may result in potential cross-contamination of this particular waste stream i.e. non-degradable bags mixed in with degradable (compostable) bags can lower the quality of the compost products by not decomposing, while degradable bags mixed in with plastics recycling can affect the integrity of the recycled plastic material and make it unusable.

TEC Report

The Total Environment Centre (TEC) has examined the issue of ‘problem’ wastes that contaminate recycling materials. It has identified the main contaminating materials, ranking them by impact, and suggested policies and practices to address each of the priority contaminants. TEC has identified lead acid batteries and glass as the most significant contaminants. In response, it has recommended a ban on the disposal of lead acid batteries in general waste collection and CDL as the most effective way to

overcome problems being experienced in collection and reprocessing of waste containing glass.

In relation to other priority contaminants, TEC recommends a ban on the kerbside collection of gas bottles, increased compliance activities to enforce the current ban on asbestos, and a possible ban on non-degradable plastic bags from organics collections. Other possible actions suggested for plastic bags include developing a standard to ensure plastic bags are biodegradable, mandating biodegradable bags and using public education to reduce the use of plastic bags around recyclables. The TEC's full report is provided in Appendix O.

International best practice

The Minister found a range of approaches to dealing with priority wastes overseas. Common features of successful schemes included a good network of drop-off or collection points and EPR schemes, coupled with bans in some countries for disposal of specific wastes. For example, in Belgium batteries can be disposed of at 'Bebat collection points' in major department stores, schools and other official pick-up points.

Overseas experience indicates that there is no 'one best way' for dealing with glass in waste. For example, while European systems visited on the Minister's trip were based on glass separation (including colour separation) as a fundamental premise, San Francisco is achieving high recycling rates through a co-mingling approach (i.e. without separating out glass from other recyclables).

Landfills and other waste infrastructure

Landfill operations need to be managed to high levels of environmental performance. All waste sites can be high risk, with a potential for expensive ongoing environmental impacts including fire, groundwater and surface water contamination and greenhouse gas emissions. In the past, waste facilities that have been abandoned or become insolvent have been difficult to manage in the absence of financial assurance funds, or such funds have been inadequate compared to the actual cost of clean-up.

A financial assurance policy would ensure that where licensees fail to manage their sites appropriately, or disappear from the site, DECCW has the funds to render a site safe for human health and the environment. A financial assurance policy is needed to provide a consistent calculation of the quantum of financial assurance required that reflects the risk presented by the facilities and the comprehensive application of the assurances to all licensed waste facilities.

3.2.2 Proposed waste sector enhancements

Enhancement 5 – Best practice for managing municipal waste

Transition to best practice household resource recovery systems within three years by providing clear guidance and financial incentives to local councils (via Enhancements 12 and 16, and in line with Enhancement 1).

The components of a best practice system could include:

a achieving of a 75% recovery rate of dry recyclables (e.g. paper, cardboard, glass and plastic) from households within three years through kerbside dry recycling services, as measured by councils' annual kerbside bin audits, and

b establishing systems to maximise recovery of food waste and garden organic waste from households through source separation and/or alternative waste treatment (AWT).

After a three-year transition period these best practice systems should be mandated, with councils being able to apply for exemptions if they are unable to meet the requirements due to being already locked into longer term contracts, or they have already achieved the 66% municipal target through alternative strategies. In terms of future performance comparisons across councils, this should be done with due regard to the different socio-economic characteristics, or groupings, of the various LGAs.

Enhancement 5 addresses the biggest challenges for this sector: optimising existing dry recycling systems and establishing systems to recover the food and garden organic waste (that makes up approximately 50% of the household waste currently going to landfill).

Enhancement 6 – Promotion and education

Develop and fund a well-targeted promotion and education campaign, in consultation with councils and industry, to better inform households and businesses about waste avoidance and waste separation at source (in particular food and other organic waste) – to address current confusion or apathy, or both, regarding recycling.

The campaign should be designed to mobilise householders and businesses to actively support waste avoidance and recycling initiatives and should include targeting non-English speaking background and diverse socio-economic groups and localities.

Enhancement 7 – Targeting priority wastes

Implement measures to ensure appropriate management of problem wastes or hazardous wastes, including materials that contaminate landfills or alternative waste treatment products (such as composts) or cause safety problems in waste processing facilities. This could include banning some waste from landfill, household kerbside or C&I collection.

In addition to the existing material identified as national priority wastes under the National Waste Policy (i.e. e-waste, tyres and fluorescent lamps), gas bottles, lead acid batteries and plastic bags should be considered for priority analysis and action.

This enhancement will require the establishment of viable alternatives for households and businesses, e.g. collection or drop-off infrastructure, and targeted education programs. This enhancement should also go hand-in-hand with progressing industry collection schemes via both national and state-based EPR schemes.

Enhancement 8 – Local infrastructure for collection of other wastes

Build and enhance the existing network of local waste collection points and schemes (including drop-off events) and progressively strengthen it. The network should be strengthened by establishing additional permanent collection sites or events and/or expanding existing ones, subject to the proposed Waste Infrastructure and Sustainability Fund (WISF) (as a component of existing waste and environment levy revenue) (via Enhancements 12 and 16), and by progressing industry collection schemes via EPR. This too should be designed to mobilise householders and businesses to actively support recycling initiatives.

This enhancement should include establishing additional collection facilities in Sydney, with a further staged assessment and implementation for regional and rural areas.

Enhancement 9 – Best practice for managing C&I waste

Transition to best practice C&I resource recovery systems within three years by providing clear guidance and financial incentives for businesses and the waste industry (via Enhancements 12 and 16, and in line with Enhancement 1).

The components of a best practice system could include:

a establishing resource recovery systems for large enterprises (such as shopping complexes, business parks and offices – above a certain threshold) that are at least as comprehensive as those provided for households(i.e. effectively a three-bin system and/or alternative waste treatment via a downstream resource recovery facility)

b establishing resource recovery systems for the remainder of the sector (i.e. small to medium enterprises (SMEs), community facilities such as schools and hospitals etc.) either by:

   i using existing municipal waste and recycling services where appropriate (e.g. small 'orphan' shops**)**

   or

   ii using source separation into dry recyclables (e.g. paper, cardboard, glass, plastic) and residual waste (i.e. effectively a two-bin system and/or alternative waste treatment via a downstream resource recovery facility).

After a three-year transition period these best practice systems should be mandated, with enterprises being able to apply for exemptions if they are unable to meet the requirements due to being already locked into longer term contracts.

Enhancement 9 addresses the biggest challenge for this sector: recovering resources from the largely unsorted, mixed waste stream.

Enhancement 10 – Place-based waste management

Investigate possible efficiencies in cross-sector and/or place-based (i.e. precinct) approaches to waste management, through developing new but competitive business models e.g. through the development of precinct contracts by groups such as chambers of commerce and/or through councils providing waste collection for SMEs on a fee-for-service basis. This should be progressed through the new Waste and Sustainability Industry Forum (Enhancement 19).

Enhancement 11 - Financial assurance policy

Finalise consultation about and development of a financial assurance policy for licensed waste facilities so there is an equitable and comprehensive framework for ensuring adequate provision of funds for environmental rehabilitation of waste facilities when companies fail.

3.2.3 Other possible waste sector enhancements

Issues which might be considered further include:

Municipal waste

- Instigate awards for best performing councils.
- Require councils to provide more collection points or collection pick-up services for key waste materials. For example, there could be a certain number of recycling collection points or collection pick-up services per capita and public-place recycling above a threshold size.
- Undertake further research on recyclables 'leakage' to residual garbage and whether it is due to bin capacity constraints.
- Accelerate EPR schemes on tyres, batteries, paint and pesticides.
- Investigate increasing the type of materials collected in the yellow or blue recycling bin e.g. textiles, e-waste.

Commercial and industrial waste

- Implement mandatory food waste collection systems for restaurants and food outlets.

Cross-sector

- Undertake a staged implementation of standard waste bin colours for NSW within and between the municipal and C&I sectors.
- Enable councils to require businesses to have a waste collection contract (that includes recycling).

Priority wastes

- Make a decision on mandating biodegradable or recyclable plastic bags and/or consider other ways to address the plastic bag issue, e.g. higher rates of reuse or financial incentives at shop checkouts.

Landfills and other waste infrastructure

- Mandate methane gas capture and energy production for all landfill sites, or new landfill sites above a certain threshold, or require all degradable materials (food, garden organics, paper, cardboard, timber) to go to putrescible landfills that have gas capture.
- Mandate post-closure remediation conditions (based on a remediation period of 30 years after care) for all landfill sites, or new landfill sites above a certain threshold.
- Ban biodegradable (organic) waste in landfill or set a biological stability standard to ensure pre-treatment, subject to investment in alternatives.

Any specific proposals will need to be subject to thorough business case analysis, including relevant cost benefit analysis.

3.3 Theme 3 – Resource allocations and pricing signals

***Covering**:*

- *Overall effectiveness of current resource levels and funding arrangements to achieve current policy objectives, and, in particular, to create incentives for improved performance.*
- *The contemporary relevance, appropriateness, efficiency and effectiveness of the NSW waste and environment levy having regard to its overall impact and any variable impact on specific policy objectives.*

3.3.1 Resource allocations and pricing signal challenges

Waste and environment levy

The purpose of the waste and environment levy is threefold – to drive resource recovery, better environmental outcomes, and to avoid landfills. The levy has been successful in sending a clear price signal to the market to examine landfill alternatives, especially in the municipal and C&D sectors, but less so in the C&I sector.

The levy is driving AWT recycling (and associated infrastructure) in the municipal and C&D sectors, but will not have an impact on the C&I sector until 2015. Currently, increases in the levy are diluted by different pricing mechanisms for businesses and transporters – businesses pay for bin lifts regardless of how full the bins are, while transporters pay landfill gate fees based on tonnages. Due to the high cost of commercial services, it is still cheaper for the C&I waste sector to landfill.

There needs to be an analysis involving an economic assessment of the levy, and the likely market responses along the current levy trajectory, to show us where the levy settings need to be. There is also a need for a retrospective analysis of the actual market responses to past levy settings to show where the market failures are – places where analysis indicates that the levy should have been sufficient but the market has not responded. A specific analysis needs to be done for each waste stream, and, potentially, each significant waste type. The WARR Strategy and Implementation Plan can then be directly linked to the levy settings and programs to address identified market failures.

There is a need to link levy expenditure to improved waste outcomes at both state and local government levels. For example, Waste and Sustainability Improvement Payments (WaSIP) and other incentive payments should be linked to delivery of best practice systems.

Additional recycling rebates could be used to increase recycling at different points of the waste stream. For example, metal recyclers could receive a rebate for metal coming out of recycling and there could also be a rebate for country cars recycled in Sydney (this would also need a tracking and docketing system).

Investment in infrastructure and improved waste outcomes

While some European countries are portrayed as best practice waste managers, it must be recognised that the government dollars invested in the industry and infrastructure to achieve this are massive. For example, the Department for the

Environment, Food and Rural Affairs in the United Kingdom has invested significant funding through the establishment of the Private Finance Initiative (PFI) and the Waste Infrastructure Delivery Program to help local authorities accelerate investment in large-scale infrastructure. To date £2.8 billion in PFI credits has been allocated to 39 local authority waste infrastructure projects.

An overview of possible models for the funding of technology and infrastructure is provided in Appendix I.

Waste infrastructure investment has always posed a challenge in NSW, in both the C&I and municipal sectors. Industry is reluctant to invest in AWT technology without the correct price signal, a known site with appropriate planning approvals, and a long-term supply contract for waste feedstock.

The NSW Government wants companies to step in now with new waste infrastructure, but the barriers to new infrastructure development need to be identified. Some claim that the uncertainty surrounding the timeframe of the current AWT output exemption is hindering investment in waste infrastructure. The current exemption is temporary until more research is undertaken to provide better evidence. The intention is to provide a permanent exemption from 2013.

There is a perception in the waste industry that the NSW Government has too much of a rigid, regulatory focus, and an associated lack of transparency of process. This may be having unintended impacts on innovation and investment in the waste industry. We need to ensure that the regulatory system stays in touch with innovation (e.g. new technologies) and up-to-date science.

Councils also need to be able to aggregate to a ‘critical mass’ level to better procure services and infrastructure in non-rural areas. Currently, councils are diverse in their practices and cannot guarantee longer term volumes or composition of waste. Infrastructure decisions need to last seven to ten years, but there is a need for flexibility within contracts associated with unpredicted changes in the composition of waste, i.e. waste will change in the future.

Some councils are also calling for NSW Government assistance with joint procurement and collective tendering processes i.e. cross-boundary arrangements, waste characterisation and input specifications, appropriate risk allocation and sharing, development of standard AWT tender specifications, and technology advice. Unfortunately, several recent joint council proposals to procure waste infrastructure services have failed.

However, some councils are promoting new models of contracting based on shared risk, e.g. ‘alliance contracting’. Under such arrangements councils would use their accumulated funds to act as a buffer to take on more risk rather than locking into long-term contracts (essentially underwriting the debt of new AWTs).

Energy from waste

The recovery of energy from waste has the potential to deliver good environmental outcomes in relation to resource conservation, including less waste to landfill, significant reductions in greenhouse gas emissions and contributing to the NSW energy supply. However, combustion of waste also has the potential to produce air emissions above acceptable environmental and human health levels and to generate waste feedstock demands that may run counter to resource recovery objectives.

The Minister's overseas trip found significant use of energy from waste options in Europe in particular, in facilities with state-of-the-art pollution control equipment. For example, approximately 40% of municipal waste in France is treated by energy from waste applications. Energy recovery was also an important feature of waste management systems in Flanders and the United Kingdom. In the United States, California is an established market leader in bio-energy, which involves the recovery of electricity from the burning of forestry, agricultural and urban biomass (organic wastes).

Currently there are no dedicated energy from waste facilities in NSW. A signal is needed from the NSW Government supporting energy from waste options where facilities can operate to deliver good environmental outcomes. Energy from waste can be beneficial by reducing greenhouse gas emissions, which are significantly higher from landfills compared to energy from waste processes. Energy from waste can also be beneficial in promoting resource conservation. For example, biochar (industrial charcoal which is produced from either waste or products) has significant potential for positive outcomes in terms of soil health, carbon sequestration and renewable bioenergy production.

The NSW Government will need to carefully 'sell' a more supportive approach to energy from waste options to the community, given historic perceptions that energy from waste is simply incineration and inherently bad. However, local government and environment group stakeholders consulted by the Steering Committee were not opposed to increasing use of such options, subject to strict environmental controls.

The existing guidance for non-standard fuels provides the regulatory framework for enabling energy from waste. The guidance currently precludes the combustion of mixed wastes as fuels, due to the potential contaminants in mixed waste feedstock which increases variability of potential emissions and the composition of the residual ash. There may be scope to revise the guidelines to enable energy from single waste streams that has been appropriately extracted from mixed waste (e.g. timber) and waste that is comprised of a few known waste types (e.g. residuals from co-mingled recycling), providing the quality processes are adequate and ongoing waste stream monitoring is undertaken.

More information on energy from waste options is outlined in Appendix K.

3.3.2 Proposed resource allocation and pricing signal enhancements

Enhancement 12 – Funding better waste outcomes

Specifically link (via Enhancements 5, 8, 9 and 16) an appropriate component of the available waste and environment levy revenue (as per current levy settings) to improved waste reduction and management outcomes (including a link to greenhouse gas reductions) i.e. make access to available levy funds dependent on environmentally responsible waste management performance and transition to best practice systems.

Enhancement 13 – AWT output exemption

To give confidence to investment, immediately consider removing the current AWT exemption's 2013 time limit on the non-mine site use of AWT outputs, with appropriate safeguards for public health and environmental protection, while:

- maintaining the need for undertaking and completing (by 2013) independent scientific studies to identify environmental, agricultural and public health implications of such use
- maintaining a transparent commitment to review the conditions for the use of mixed waste AWT outputs on agricultural lands, based upon robust science (by July 2013).

Enhancement 14 – Exemption expert panel or peer review

Improve transparency and evidence-based decision making on Resource Recovery Exemptions by establishing a technically based expert panel (of relevant disciplines including public and environmental health) or peer review process, or both, to advise and assist DECCW and the EPA Board on material suitability for exemptions. This would not be for all materials, but conditional on certain triggers.

Enhancement 15 – Energy from waste

Actively support energy from waste applications in line with international best practice, where these provide overall benefit to the environment (by reducing greenhouse gas emissions and landfill) and do not endanger human health through the emission of air toxics. As a starting point, DECCW should develop a draft policy for public consultation on energy from waste.

Enhancement 16 – Waste Infrastructure and Sustainability Fund

Progressively dedicate a proportion of waste and environment levy revenue to a Waste Infrastructure and Sustainability Fund (WISF) for councils and industry, up to 2014, to transition to best practice waste management systems (as per Enhancements 5, 8, 9 and 12). The WISF should be used to leverage council and industry funding (and, where possible, Australian Government funding).

Enhancement 17 – Innovation and investment

DECCW, in collaboration with NSW Treasury and Industry & Investment NSW (State and Regional Development), should develop a strategy to encourage innovation and investment in achieving enhanced waste targets beyond 2014, including development of appropriate business models and consideration of an expanded WISF consistent with the Waste Infrastructure Strategy (Enhancement 20).

3.3.3 Other possible resource allocation and pricing signal enhancements

Issues which might be considered further include:

- Increase the waste and environment levy differential for biodegradable (organic) waste and dry (inert) waste going to landfill, or restrict where biodegradable materials can be landfilled – which would increase the cost of landfilling these materials, without having to differentiate the levy.
- Introduce a differential levy for residuals from recycling facilities.
- Introduce a landfill levy rebate scheme for recycled cars brought to Sydney from outside the SMA.
- Develop incentives for mine rehabilitation to use more recycled organic or stabilised waste that is appropriate and fit-for-purpose.

- Introduce transport assistance and incentives to move composts to agricultural areas outside urban areas.
- Fund research and trials into the sequestration benefits of compost and biochar to soil.
- Develop a new energy efficiency scheme under the NSW Energy Savings Scheme to encourage recycling, i.e. based on the percentage of recycled product used in manufacturing, using Australian-sourced recycled materials.

Any specific proposals will need to be subject to thorough business case analysis, including relevant cost benefit analysis.

3.4 Theme 4 – Government performance

***Covering**:*

- *The appropriateness and effectiveness of the current mix of policy and strategic elements used to achieve objectives, outcomes and targets.*
- *The adequacy and effectiveness of the current regulatory system in guiding and enforcing good behaviour and also in stimulating policy-consistent market-based initiatives.*
- *The adequacy of NSW whole-of-government research and policy development capacity to monitor, anticipate and address trends in supply and demand particularly in relation to the structure of demand and the impact of technology on both demand and supply.*
- *The adequacy and effectiveness of coordination at state and local government level and opportunities for further coordinated and integrated national initiatives.*

3.4.1 Government challenges

Coordination

Currently, the lead waste management agency, DECCW, does not have a coordinated or integrated approach to waste management and policy. While NSW has more people working on waste management than any other jurisdiction, responsibilities are spread between programs and enforcement.

There is a policy gap that arises from the separation of regulatory policy and policy relating to the levy from the WARR Strategy development. This historical anomaly could be fixed by nominating a couple of relevant policy staff from each area to do the necessary analysis and policy development to deliver an integrated strategy for environment protection, waste avoidance and resource recovery.

For example, there is a need for convergence and alignment around policy settings such as the timing and duration of exemptions in respect of AWTs, and the expected impact of the waste levy price point which is very important, particularly after 2014.

A high level of collaboration between everyone involved in waste management will promote maximum resource recovery. Unfortunately, the NSW Government is perceived by some in the industry as having an ‘us’ and ‘them’ approach, with no

formal structures for collaboration or cooperation between industry and government. There is therefore a need for better coordination between the three tiers of government and the waste industry.

Waste infrastructure strategic planning and land-use planning

One of the biggest challenges in waste management in NSW is securing sufficient investment in waste and resource recovery infrastructure to ensure there is sufficient capacity for waste sorting and processing to achieve the targets. This is critical to both the municipal and C&I waste sectors.

We lack a robust system for planning, funding and procurement of new waste infrastructure. There is no strategic planning for waste infrastructure – either in Sydney or other parts of NSW. All other states have some form of planning strategy for waste infrastructure or are developing one. Such a strategy needs to outline waste requirement assumptions and necessary lead times for the construction of infrastructure. It should be developed in close consultation with the community, councils and the waste industry.

In terms of land-use planning there are no identified waste infrastructure zones or specific planning guidelines for waste reduction and recycling in new developments, such as office blocks. There also needs to be an ability to differentiate waste facilities vs. resource recovery and recycling facilities in land-use planning. Resource recovery activities are currently caught under the same planning controls as landfills and transfer stations.

Other government responsibilities

Government needs to set an example and further improve its own waste generation and management practices, by using more recycled product and by reducing its consumption. We need to look at a whole-system approach to waste — for example, governments at all level should be using waste-derived and recycled products such as compost and paper.

The development of markets for potentially recyclable materials is essential to activate decision-makers at the various stages of the recycling supply chain; without markets there is no viable recovery. Market development is already an important component of government initiatives to improve recycling; DECCW's current market development initiatives are outlined in Appendix J. It is important that the government further foster and promote market development activities.

Government should play a more active role in promoting and assisting new entrants to the waste infrastructure market, as is done for other major developments. Taking a 'case management' approach should help new players understand and negotiate government regulations and planning processes and promote innovative waste infrastructure solutions.

3.4.2 Proposed government enhancements

Enhancement 18 – Coordination of DECCW's waste responsibilities

Establish clear accountability for waste within DECCW and establish a waste coordination function within DECCW that integrates and provides leadership for DECCW's current waste and sustainability strategy, programs, policy and enforcement functions and resources, to ensure a consistent, evidence-based approach to waste policy and implementation of any decisions arising from this Review.

Enhancement 19 – Waste and Sustainability Industry Forum

Increase the dialogue about waste management and liaison between the NSW Government, councils and industry by establishing a regular, independently chaired Waste and Sustainability Industry Forum, with a focus on problem solving and emerging waste management issues. The Forum's deliberations should be based on industry data and evidence (such as that contained in the appendices to this report). The purpose is to identify any barriers to attaining WARR Strategy goals and to cooperate in finding and implementing practical and cost effective solutions.

Enhancement 20 – Waste Infrastructure Strategy

Encourage development of waste management and recycling infrastructure through development of a whole-of-government Waste Infrastructure Strategy (led by DECCW in consultation with DoP) and by providing waste infrastructure and services procurement guidance and support to councils. Explicitly link an appropriate component of the waste and environment levy to this Strategy through the WISF.

The Strategy should clearly distinguish between DECCW's proposed new waste infrastructure strategic planning role and its independent regulatory role. The Strategy should guide DoP in developing or reviewing regional strategies (under the *Environmental Planning and Assessment Act 1979*), and guide industry in its investment decisions. The Strategy should outline waste requirement assumptions and necessary lead times for construction of infrastructure. The priorities of the Strategy should be established with broad consultation.

Enhancement 21 – Land-use planning

Subject to consultation with the Minister for Planning, DoP should promote innovation in waste management and resource recovery, for example via conditions for new developments and building standards, and through planning for waste and resource recovery facilities. DoP will need to prepare a guideline or model conditions of consent to provide best practice advice for Joint Regional Planning Panels and councils in relation to their consent activities. This can cover matters such as:

- specifically requiring dedicated areas for waste recycling within buildings, including source separation
- minimising waste in construction
- improved management of waste from construction activities
- where appropriate, requiring major development to achieve Green Star or similar sustainable development ratings which include consideration of waste reduction and recycling measures.

Enhancement 22 – New entrants to the infrastructure market

Subject to consultation with the Minister for State and Regional Development, Industry & Investment NSW (in consultation with DECCW) should assist new entrants into the waste infrastructure market by taking a 'case management' approach, helping them to negotiate their way through existing government regulations and planning processes and providing advice and assistance on market impediments to help deliver new solutions.

Enhancement 23 – National waste agenda

NSW should continue to support the delivery of the National Waste Policy and its Implementation Plan. It should drive the national waste agenda by taking a leadership role in issues requiring national coordination, particularly the acceleration of EPR schemes, agreement on a system for comparing waste data, and improving markets for recovered materials. In addition, NSW should promote the need for Australian Government funding and grants for major waste infrastructure.

3.4.3 Other possible government enhancements

Issues which might be considered further include:

- Encourage co-location of municipal and C&I waste infrastructure.
- Plan the future of hazardous liquid waste facilities for NSW.
- Government and industry can adopt a more catalytic role in the market development of some specific recyclables and products e.g. biochar.
- Require formal waste licensing for large waste generators, i.e. they would require a plan outlining waste minimisation and final waste destination.
- Promote accelerated tax depreciation of new waste infrastructure with the Australian Government.

Any specific proposals will need to be subject to thorough business case analysis, including relevant cost benefit analysis.

4 Influencing the national waste agenda

NSW is a strong proponent of national action on environmental issues that are nationally significant and where national solutions offer the greatest opportunity for delivering efficient and effective outcomes. On waste issues, national action has traditionally focused on product stewardship initiatives, particularly where industry sectors operate in national markets and where state-based actions have had the potential to result in inefficiencies and unnecessary costs to business. NSW has played a leading role on a number of national product stewardship initiatives, such as televisions and computers, mobile phones, newsprint, tyres and beverage containers.

On 5 November 2009, Australia's Environment Ministers, through the EPHC, endorsed the *National Waste Policy: Less Waste, More Resources* (the National Waste Policy), which substantially broadened the scope of waste issues addressed at the national level. The NSW Government supports the new National Waste Policy and has agreed to take a leadership role on a number of new issues, as well as remaining involved at the national level in product stewardship issues.

The aims of the National Waste Policy are to avoid the generation of waste; reduce the amount of waste (including hazardous waste) for disposal, manage waste as a resource and ensure that waste treatment, disposal, recovery and reuse is undertaken in a safe, scientific and environmentally sound manner. In acknowledgement of the potential to achieve wider community objectives, the National Waste Policy also aims to help reduce greenhouse gas emissions, improve energy conservation, raise water efficiency and enhance productivity of the land.

The National Waste Policy establishes Australia's waste management and resource recovery agenda across six key directions for the period to 2020:

1 **Taking responsibility** – shared responsibility for reducing the environmental, health and safety footprint of products and materials across the manufacture-supply-consumption chain and at end-of-life

2 **Improving the market** – efficient and effective Australian markets operate for waste and recovered resources, with local technology and innovation being sought-after internationally

3 **Pursuing sustainability** – less waste and improved use of waste to achieve broader environmental, social and economic benefits

4 **Reducing hazard and risk** –reduction of potentially hazardous content of wastes with consistent, safe and accountable waste recovery, handling and disposal

5 **Tailoring solutions** – increased capacity in regional, remote and Indigenous communities to manage waste and recover and reuse resources

6 **Providing the evidence** – access by decision-makers to meaningful, accurate and current national waste and resource recovery data and information to measure progress, educate and inform the behaviour and the choices of the community.

Sixteen priority strategies that build on these key directions and give focus to the work of individual jurisdictions are also identified.

4.1 Driving NSW waste outcomes through the National Waste Policy

At the July 2010 EPHC meeting, Ministers endorsed the National Waste Policy Implementation Plan, which included actions to be undertaken in each of the 16 strategy areas over the next five years. The Implementation Plan also grouped these strategies into seven clusters and assigned primary responsibility for leading each cluster to specific jurisdictions. NSW has agreed to co-lead two of the clusters:

- Cluster 2: Markets and Standards, with Victoria, and
- Cluster 7: Data, with the Australian Government.

NSW will also participate in other cluster groups, particularly in the Product Stewardship cluster, where NSW has extensive experience in leading the national agenda.

4.1.1 Improving markets

The Markets and Standards cluster's work is primarily aimed at improving markets for recovered materials. NSW is well-placed to take a leadership role in this area. DECCW has extensive experience in promoting sustainable procurement within government agencies and in business and local government, as well as experience in developing markets for recovered materials through various programs and in providing certainty in those markets through the waste regulations and Resource Recovery Exemption system.

4.1.2 Data

The Data cluster's work is aimed at developing a national waste data system. A number of attempts have been made in the past to develop a national data system, but all have failed – largely due to 'overblown' expectations of what the system would deliver without properly understanding the costs or complexities involved. Good quality data is expensive and difficult to gather. For a national data system to be successful, the benefits of the system, in terms of providing relevant, fit-for-purpose information, must outweigh the costs of developing and maintaining it.

NSW is a strong proponent of a practical and appropriate national data system that will deliver data that is cost effective and fit for purpose. DECCW has extensive experience in data collection and a strong interest in improving the comparability of jurisdictional data. NSW also has a strong interest in ensuring this work does not end up failing as similar initiatives have done in the past.

4.1.3 Product stewardship

NSW will also continue to take a strong interest in national action on product stewardship. This cluster is being led by the Australian Government, which is appropriate given that it has committed to implement national framework legislation for supporting product stewardship initiatives. The proposed legislation will cover voluntary, co-regulatory and regulatory approaches.

A national scheme for the collection and recycling of televisions and computers is proposed to be the first product stewardship scheme to be covered by the legislation.

NSW led the national work on televisions and computers for a number of years and was instrumental in gaining the commitment from the Australian Government to implement legislation to support this scheme. NSW continues to be involved on the television and computer scheme, working with the Australian Government and industry to work out the details, including targets and key performance indicators, roll-out timeframes, recycling requirements, etc.

NSW also remains involved in a number of other national product stewardship initiatives that have been picked up under the National Waste Policy, including tyres, fluorescent lamps, biodegradable plastic bag standards and packaging.

Further details of the National Waste Policy and its Implementation Plan are outlined in Appendix A.

There is also an opportunity for NSW to investigate Australian Government funding and grants mechanisms for major waste infrastructure – an issue which is currently not on the National Waste Policy agenda.

Appendix A – National and local government waste policy frameworks

1 National policy settings

Under the Australian Constitution, the management of waste is primarily the responsibility of state and territory governments. The Australian Government's role and responsibilities flow from the suite of international agreements applying to wastes, such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. The Australian Government also has unique tax and border control powers that are essential for any mandatory product stewardship measures.

The EPHC also provides a level of nationally coordinated action on waste. This includes the power to establish National Environment Protection Measures (NEPMs) which aim for nationally consistent regulatory action implemented in each state and territory. There are several waste-related NEPMs including the National Environment Protection (Used Packaging) Measure. While the Australian Government has driven the development of the National Waste Policy, it has been agreed through EPHC and endorsed by the Council of Australian Governments (COAG). The Australian Government is implementing the national product stewardship framework legislation, but many of the other strategies will be implemented through coordinated action under EPHC.

The National Waste Policy sets six key directions and identifies a number of policy strategies for each direction that would benefit from a national or coordinated approach. The six directions are:

1 Taking responsibility

2 Improving the market

3 Pursuing sustainability

4 Reducing hazard and risk

5 Tailoring solutions

6 Providing the evidence.

An Implementation Plan for the six key directions in the National Waste Policy was approved by Environment Ministers at the July 2010 EPHC meeting. The Implementation Plan contains 16 strategies under the six key directions which can be briefly summarised as:

Key direction 1 – Taking responsibility

Strategy 1 – Establish a national framework for product stewardship and extended producer responsibility – legislation (2011); TV and computer product stewardship scheme (2012); tyre product stewardship scheme (2011); FluoroCycle (mercury-containing lamps) scheme (2010)

Strategy 2 – All governments, as significant procurers of goods, services and infrastructure to promote sustainable procurement principles and practices –

national information exchange (2013); guidance on major infrastructure and office fit-out (2013); jurisdictional reporting (from 2012)

Strategy 3 – Better manage packaging – Australian Packaging Covenant (2010); national standards for biodegradable plastic in home composting (2010), other packing standards 2012); community survey of willingness to pay for improved packaging and reducing litter (2010); choice modelling report (2010)

Key direction 2 – Improving the market

Strategy 4 – National definitions and classification systems for wastes (defining when a material ceases to become a waste) – establish baseline (2011); nationally consistent classifications (2014)

Strategy 5 – National principles, specifications, best practice guidelines and standards for effective markets for potential wastes – national standards and specifications for recycled construction and demolition and recycled organic waste (2015); national principles for safe reuse of waste (2012)

Strategy 6 – Knowledge and expertise sharing in sustainable procurement and business practices – sharing of information between governments (2014)

Key direction 3 – Pursuing sustainability

Strategy 7 – Phase down biodegradable material sent to landfill – develop markets for biodegradable waste through development of national standards (see Strategy 5).

Strategy 8 – Manage safety and health risks from landfill gas emissions – national guidance on risk management (2015)

Strategy 9 – Support a future Carbon Pollution Reduction Scheme – scope beneficial and/or innovative use of organic waste to increase land productivity, provide energy and reduce greenhouse gas emissions (2011)

Strategy 10 – Improve waste avoidance and reuse in the commercial and industrial waste stream – national scoping (2011); analysis of systemic impediments (2012); diagnostic to supply and demand (2012); future work program (2014)

Strategy 11 – Best practice waste management and resource recovery for construction and demolition projects – document impediments and best practice (2014)

Key direction 4 – Reducing hazard and risk

Strategy 12 – Meet international obligations concerning hazardous waste – managing risks of chemicals in the environment (2014); model of hazardous chemicals in landfills (2015) and inventory for safe handling, disposal and storage of hazardous waste products (2014); monitoring hazardous substances (from 2010)

Strategy 13 – Reduce hazardous substances in products sold in Australia – methodology for identification (2011); labelling system (2012); legislation controlling imports (2013)

Key direction 5 – Tailoring solutions

Strategy 14 – Capacity building in regional and remote communities to manage waste and recover and reuse resources – best practice network experience shared (2015)

Strategy 15 – Audit of waste infrastructure in remote Indigenous communities – jurisdictional review of standards etc. (2010); funding and service provision roles and responsibilities (2012)

Key direction 6 – Providing the evidence

Strategy 16 – Three-yearly current and future trends waste and resource recovery report – data needs and purpose agreed (2011); diagnostic of existing data (2012); improvements identified (2013); agreed approach (2015).

How does NSW compare to other jurisdictions?

The EPHC's *National Waste Overview 2009* compared waste diversion and disposal rates across Australia, noting there are jurisdictional differences in definitions, classifications and methodologies for measuring waste data which may also cover different materials. This report effectively created a 'league table' using incompatible and largely poor quality data. One of the aims of the National Waste Policy is to improve the quality of waste data and improve its comparability between jurisdictions.

NSW waste data tends to underestimate recycling rates compared to other jurisdictions. For example, NSW measures actual amounts of landfill daily cover materials used (around 10% of disposal) whereas Victoria does not measure daily cover but assumes it is 15% of materials disposed to landfill. If NSW used the same rate, landfill disposal figures would be reduced by 5%, which would in turn boost recovery rates.

Nevertheless, according the EPHC's 2009 report, NSW's recycling rate of 52% in 2006–07 was equal to the national rate and compared to 47% in Queensland, 62% in Victoria and 66% in South Australia.

There is a general commitment by states and territories to increasing resource recovery through use of targets and other measures. A number of jurisdictions have publicly committed to move towards 'zero waste' including Victoria, South Australia, Western Australia and the ACT.

All jurisdictions fashion their policies around the waste hierarchy from prevention and avoidance through to disposal.

Most Australian jurisdictions have, or are proposing, a waste disposal levy. Recently Victoria has increased its levy significantly and Queensland has announced the introduction of a new levy.

2 Local government policy settings

Local councils have the statutory ability to provide domestic waste management services under the NSW *Local Government Act 1993*. This sits under the broader responsibility (under section 8, The council's charter) 'to properly manage, develop, protect, restore, enhance and conserve the environment of the area for which it is responsible, in a manner that is consistent with and promotes the principles of ecologically sustainable development'.

The Act states (section 496): 'A council must make and levy an annual charge for the provision of domestic waste management services for each parcel of rateable land for which the service is available.'

The Act also states (section 504(3)) that 'Income obtained from charges for domestic waste management must be calculated so as to not exceed the reasonable cost to the council of providing those services.'

With regard to C&I waste, councils can choose to offer this service on commercial terms, in a competitive marketplace with other private corporations.

Most councils offer a domestic recycling service, whether kerbside, drop-off or a combination of both. While this is not a mandatory role for councils, a combination of environmental benefits, community expectations and the waste and environment levy have, over the past 15 years, created a strong impetus for councils to provide recycling to the household sector.

Local councils also have a regulatory role under the POEO Act to regulate activities that involve the generation, transport and disposal of waste. Councils can issue notices (clean-up, prevention and cost recovery) and penalty notices for illegal actions. Larger operations and premises and councils themselves are regulated (and in some cases licensed) by the EPA (within DECCW).

This paper was prepared by the Department of Environment, Climate Change and Water NSW and the Local Government and Shires Associations.

Appendix B – Land-use planning system and waste management

Strategic policies

DoP has several long-term (to 2031) planning strategies in place which include guidance on the future provision of waste infrastructure and services in the context of rising population, growing environmental constraints and continually evolving community expectations. These strategies are designed to be consistent with and promote the policy objectives of other key government agencies. They are also reviewed regularly to ensure that they remain up-to-date and relevant.

Most notable of these are the Sydney Metropolitan Strategy 2005 (currently under review) and the associated regional and sub-regional strategies in other parts of the State. Actions and recommendations included in these strategic planning documents are framed around the WARR Strategy. Issues highlighted include declining landfill capacity and the need to promote better resource recovery and new treatment technologies.

Waste facilities

There are two key environmental planning instruments which relate to the assessment of proposals for waste management facilities and landfill operations:

- State Environmental Planning Policy (Major Development) 2005 (the MD SEPP)
- State Environmental Planning Policy (Infrastructure) 2007 (the I SEPP)

The I SEPP provides a framework for the efficient delivery of private and public infrastructure across the State, and prescribes qualitative and quantitative assessment criteria for all types of infrastructure. These criteria determine the assessment process and requirements for gaining approval (including the identification of development that does not require consent).

The I SEPP was amended on 9 July 2010 in relation to mandatory requirements for consideration by consent authorities in assessing and determining applications for waste facilities. The previous assessment criteria, under clause 123 of the I SEPP, were based on 'justifiable demand'. They have been replaced with a new set of criteria reflecting the impact of the waste and environment levy and the contemporary objectives and resource recovery targets of the WARR Strategy. The new criteria of clause 123 of the I SEPP are targeted at best practice landfill site selection, design and waste minimisation, and are:

> '123 Determination of development applications (Waste or resource management facilities)
>
> (1) In determining a development application for development for the purpose of the construction, operation or maintenance of a landfill for the disposal of waste, including putrescible waste, the consent authority must take the following matters into consideration:
>
> (a) whether there is a suitable level of recovery of waste, such as by using alternative waste treatment or the composting of food and garden waste, so

that the amount of that waste is minimised before it is placed in the landfill, and

(b) whether the development:

(i) adopts best practice landfill design and operation, and

(ii) reduces the long-term impacts of the disposal of waste, such as greenhouse gas emissions or the offsite impact of odours, by maximising landfill gas capture and energy recovery, and

(c) if the development relates to a new or expanded landfill:

(i) whether the land on which the development is located is degraded land such as a disused mine site, and

(ii) whether the development is located so as to avoid land-use conflicts, including whether it is consistent with any regional planning strategies or locational principles included in the publication *EIS Guideline: Landfilling* (Department of Planning, 1996), as in force from time to time, and

(d) whether transport links to the landfill are optimised to reduce the environmental and social impacts associated with transporting waste to the landfill.

(2) In this clause:

putrescible waste means general solid waste (putrescible) within the meaning of clause 49 of Schedule 1 to the *Protection of the Environment Operations Act 1997*.'

The MD SEPP contains a range of threshold tests for establishing the consent authority and assessment regime for new waste proposals.

- Waste facilities which meet the criteria of clause 27 of the MD SEPP are Part 3A projects (major projects under Part 3A of the *Environmental Planning and Assessment Act 1979*) for which the Minister is the consent authority. These criteria are:

'27 Resource recovery or waste facilities

(1) Development for the purpose of regional putrescible landfills or an extension to a regional putrescible landfill that:

(a) has a capacity to receive more than 75,000 tonnes per year of putrescible waste, or

(b) has a capacity to receive more than 650,000 tonnes of putrescible waste over the life of the site, or

(c) is located in an environmentally sensitive area of State significance.

(2) Development for the purpose of waste transfer stations in metropolitan areas of the Sydney region that handle more than 75,000 tonnes per year of waste.

(3) Development for the purpose of resource recovery or recycling facilities that handle more than 75,000 tonnes per year of waste or have a capital investment value of more than $30 million.

(4) Development for the purpose of waste incineration that handles more than 1,000 tonnes per year of waste.

(5) Development for the purpose of hazardous waste facilities that transfer, store or dispose of solid or liquid waste classified in the *Australian Dangerous Goods Code* or medical, cytotoxic or quarantine waste that handles more than 1,000 tonnes per year of waste.

(6) Development for the purpose of any other liquid waste depot that treats, stores or disposes of industrial liquid waste and:

(a) handles more than 10,000 tonnes per year of liquid food or grease trap waste, or

(b) handles more than 1,000 tonnes per year of other aqueous or non-aqueous liquid industrial waste.'

- Designated development, which includes waste management facilitates as identified in clause 32 of Schedule 3 of the Environmental Planning and Assessment Regulation 2000, is development to be determined by Joint Regional Planning Panels, which have been in operation since July 2009.

Designated development requires the preparation of an environmental impact statement, and proposals which meet the criteria of clause 32, whether they are Part 4 development applications or Part 3A projects, are subject to third-party appeal rights.

The thresholds for designated development are provided in Attachment 1.

The effect of this is that councils now only determine proposals for small-scale waste facilities. All other waste proposals are either referred to the relevant Joint Regional Planning Panel or Part 3A assessment process. This is a significant initiative in promoting depoliticised, merit-based decisions and providing the industry with increased certainty surrounding investment in the facilities required to meet the WARR Strategy targets.

For applications to be assessed under Part 3A, DoP provides Director-General Requirements (DGRs) to the proponent for the preparation of an environmental assessment. In the case of waste applications one of the foremost DGRs is a 'detailed discussion of the measures that would be implemented to ensure that the project is consistent with the aims, objectives and guidance in the WARR Strategy'.

The recent revisions to the I SEPP reflecting the WARR Strategy goals and emerging policy (e.g. methane capture and energy conversion) represent a significant step forward in this regard.

Local environmental plans (LEPs) guide council land-use planning decisions primarily through zoning and development controls. Although the assessment criteria for all waste or resource management facilities are those included in the I SEPP, some LEPs include land-use and other zoning restrictions that discourage or prohibit the carrying out of development in certain areas.

These prohibitions have largely been overcome through the introduction of the I SEPP. The standard LEP Instrument does not include these types of restrictive zoning limitations, and where they currently exist, these will be removed as councils prepare their comprehensive LEPs. However, this does not remove the need for a full merit-based assessment, including an assessment of potential land-use conflicts which are still fundamental to the consideration of waste facility projects.

As an example, the revised Orange Waste Project addressed land-use conflicts and impact mitigation, and the approval was considered to demonstrate leading practice in

waste management. Along with an array of stringent environmental controls (e.g. detailed groundwater monitoring and contingency plans), the conditions of approval included:

- council to undertake a community education program to promote the resource recovery activities provided at the site, the community benefits of composting food and garden organics and the importance of food organics recovery from the C&I sector
- baled waste to be wrapped in plastic before despatch
- blended biosolids, food and garden organics to be stored in a composting tunnel or covered at all times in such a way as to exclude access by foraging bees
- no pesticide and agricultural chemical wastes to be received, and
- measures to separate food wastes from C&I wastes from the inception of the project.

These conditions demonstrate that influencing waste management at a highly specific level is a key strength of the development assessment process. Nonetheless, there is a very real potential to discourage future applications and investment from the private sector by imposing too many, or highly onerous, conditions carrying significant costs for compliance.

Other projects

The planning system is concerned with projects as a discrete land use, and the management of that land use in a manner that minimises impacts to the immediately affected environment and community. This is distinct from the approach of the POEO Act and DECCW, which is more concerned with the management and licensing of waste at each stage of a process. Nevertheless, where waste is produced as a by-product of a process and reused in some manner, this is treated as an ancillary but fundamentally important part of the principal land-use function, and will often be dealt with through conditions of approval.

There are many other types of projects, particularly major infrastructure and mining, that are approved with waste performance conditions, as well as management plans to cover aspects such as minimisation, storage and disposal. For example:

- Part of the Waste Management Plan condition for the Integra Coal Project in the Hunter Valley requires the proponent to ‘estimate the various waste streams generated during the life of the project and to describe and justify the proposed strategy for disposal’.
- The approval for the Wellington Gas-fired Power Station in the NSW Central West includes a condition to ‘maximise the treatment, reuse and/or recycling on the site of any waste oils, excavated soils, slurries, dust and sludge associated with the project, to minimise the need for treatment or disposal of those materials outside the power station’.

Residential and commercial projects also include conditions to address waste minimisation in building design and during construction, as well as in the storage and disposal of waste material.

Part 3A major project approvals will typically require conditions aimed at the minimisation of waste in construction and in the provision of adequate waste storage facilities for residential, retail and commercial developments. However, these conditions have been of a general nature, with few examples of specific requirements tailored to the likely significance of the waste generation capacity of the proposed development.

It is evident that scope exists to increase specificity in the content of waste conditions, to place clearer obligations upon proponents which are aimed at particular waste management outcomes. Potentially, projects which provide a commitment to attain a minimum 4-star rating, as defined by the Green Building Council of Australia, would strongly encourage the use of construction materials with a significant recycled content and the provision of dedicated storage areas for the separation, collection and recycling of business wastes and good access for all building occupants and for collection by recycling companies.

At the local level, many councils have development control plans (DCPs) detailing waste policy and control at all levels (household, C&I and C&D). DCPs often include measures for maximising reuse and recycling, construction and design standards, and provide advice to applicants on developing waste management plans as part of undertaking their development proposals. However, there is a lack of available data directly reporting on the effectiveness of these provisions.

Council waste policy goals are principally driven by controls contained in local DCPs and targeted policies. For example, City of Sydney's policy Waste Minimisation in New Developments 2005 contains wide-ranging requirements for residential, commercial and mixed developments, such as requiring that all retail businesses hold a valid and current contract with a licensed collector for waste and recycling collection and disposal. Although not a mandatory requirement under this policy, such contracts are encouraged to include provisions for the collection and recycling of a number of office-related recyclable resources from the waste stream as part of their waste contract. Other areas covered by this policy include capacity, access and amenity considerations. Development consents issued by City of Sydney regularly contain conditions that require applicants to comply with the relevant parts of this policy.

Many large retail proposals incorporate and detail the provision of waste management facilities within the development, and waste management measures will be augmented by conditions of consent to improve waste storage and resource recovery outcomes. In other examples council conditions have been well-intended but onerous overall and outside the powers of planning authorities. For example, Manly Council imposed a condition on a new supermarket prohibiting the use of plastic bags, which was later overturned by the Land and Environment Court.

There is value in ensuring that councils across NSW provide appropriate conditions of consent and that these are consistent across council areas. DoP can play a lead role in providing improved guidelines either in general or on a specific issue, such as minimising waste and providing for enhanced recycling.

Land-release planning

Growth Centre and other land-release planning strategies are predominantly focused on the size and nature of employment growth, with very little material on non-residential growth and nothing explicit in relation to waste policy. However, the Metro Strategy[1] – Environment & Resources, Section E3.4.1, includes four areas for action under the objective 'Guide investment in alternative waste infrastructure by strategically identifying appropriate locations for new technologies and coordinating waste facilities across all classes of waste'.

These are:

I The Government will develop a strategic framework to implement the commitment to waste avoidance, recycling and reuse. This will include the use of the Waste Levy as a price signal to encourage increased diversion from landfill and the further development of alternative waste technologies.

II The Government will continue to work with the private sector on successful alternative waste facilities such as the innovative UR3R facility at Eastern Creek.

III The private sector will be encouraged to invest in sustainable alternative waste infrastructure. Investment will be assisted by strategically identifying appropriate locations and alternative waste technologies to deal with all classes of waste.

IV A Sydney Metropolitan Waste Infrastructure Strategy will also be developed to provide a framework for resource recovery, transfer, processing and transport infrastructure.

There is no specific strategic planning developed for waste facilities within Growth Centres, although some precinct plans do identify appropriate land uses for certain sites, e.g. landfill for existing or disused quarries. However, the new Metro Strategy is looking to further develop and strengthen the consideration of waste facilities at the strategic level.

Summary

There is a relatively high level of consistency between the relevant strategic planning policies at both state and local level and the resource recovery targets in the WARR Strategy and NSW waste policy overall. This has the effect that decision-making in relation to land-use planning and future development generally helps to facilitate key NSW waste policy objectives. Impediments in the area of restrictive zoning requirements are being removed through the I SEPP and the standard LEP.

Substantial opportunities exist 'on the ground' through the development assessment and approval process, via the application of conditions which are more prescriptive in relation to specific WARR Strategy outcomes, rather than generalised qualitative improvements which lack the tangible compliance incentives that come with quantified performance measures. Furthermore, since the development assessment process moves faster than the strategic planning process, there is scope to make incremental improvements on a project-by-project basis that incorporate any recent changes to the

[1] The NSW Government's Metropolitan Strategy, *City of Cities, A Plan for Sydney's Future*, NSW Department of Planning

policy environment. In this manner, best practice for waste management can be actively promoted on a regular and ongoing basis.

With this understanding, there is no need for further high-level control on waste management in the planning system. Improved waste management outcomes can be best achieved through the approach presently taken by DoP and many councils through their local policies and DCPs and by imposing appropriate conditions of consent. These can be further enhanced by a standardisation of conditions of approval by DoP and councils. Guidelines could be issued by DoP, and other agencies as appropriate, to support actions currently being taken within the planning system to minimise waste generation.

Options for improvement

- Every opportunity should be taken to increase the alignment between relevant strategic planning policies and the contemporary NSW policy framework for waste management, particularly the aims of the WARR Strategy.
- Stronger assessment criteria to help impose conditions on new waste facilities will assist in achieving the NSW waste recovery targets.
- New and revised LEPs should be closely scrutinised before gazettal to ensure that they do not contain restrictions that might unreasonably discourage development of waste facilities and infrastructure.
- DoP is currently reviewing the criteria for designated development to align the thresholds for designated development with licensing requirements under the POEO Act. This will ensure a greater level of consistency.
- Consultation should occur with DECCW to improve standard conditions of approval concerning waste management for all types of major projects (e.g. conditions on extractive industry projects to investigate the use of compost output products in rehabilitation).
- Adopt a life-of-project approach to approvals for waste facilities, rather than a piecemeal approach with conditions applying only to discrete stages (e.g. during construction, during operations).
- Introduce conditions to require more detailed reporting of waste management, including identifying the various streams and the resource recovery and recycling rates within these streams. Reporting should also include justification for the rates of disposal, recovery and recycling in the context of contemporary waste policy objectives.
- Standard requirements for content and level of rigour in waste management plans could be strengthened to include quantitative performance measures for recycling, recovery and disposal, focusing on the specific use and its waste generating capacity. This is particularly relevant to retail and commercial facilities which have a high potential to capture recycled material and to split waste streams.

This paper was prepared by the NSW Department of Planning.

Attachment 1

Schedule 3, clause 32 of the EP&A Regulation – Designated Development

32 Waste management facilities or works

(1) Waste management facilities or works that store, treat, purify or dispose of waste or sort, process, recycle, recover, use or reuse material from waste and:

(a) that dispose (by landfilling, incinerating, storing, placing or other means) of solid or liquid waste:

(i) that includes any substance classified in the *Australian Dangerous Goods Code* or medical, cytotoxic or quarantine waste, or

(ii) that comprises more than 100,000 tonnes of 'clean fill' (such as soil, sand, gravel, bricks or other excavated or hard material) in a manner that, in the opinion of the consent authority, is likely to cause significant impacts on drainage or flooding, or

(iii) that comprises more than 1,000 tonnes per year of sludge or effluent, or

(iv) that comprises more than 200 tonnes per year of other waste material, or

(b) that sort, consolidate or temporarily store waste at transfer stations or materials recycling facilities for transfer to another site for final disposal, permanent storage, reprocessing, recycling, use or reuse and:

(i) that handle substances classified in the *Australian Dangerous Goods Code* or medical, cytotoxic or quarantine waste, or

(ii) that have an intended handling capacity of more than 10,000 tonnes per year of waste containing food or livestock, agricultural or food processing industries waste or similar substances, or

(iii) that have an intended handling capacity of more than 30,000 tonnes per year of waste such as glass, plastic, paper, wood, metal, rubber or building demolition material, or

(c) that purify, recover, reprocess or process more than 5,000 tonnes per year of solid or liquid organic materials, or

(d) that are located:

(i) in or within 100 metres of a natural waterbody, wetland, coastal dune field or environmentally sensitive area, or

(ii) in an area of high watertable, highly permeable soils, acid sulphate, sodic or saline soils, or

(iii) within a drinking water catchment, or

(iv) within a catchment of an estuary where the entrance to the sea is intermittently open, or

(v) on a floodplain, or

(vi) within 500 metres of a residential zone or 250 metres of a dwelling not associated with the development and, in the opinion of the consent

authority, having regard to topography and local meteorological conditions, are likely to significantly affect the amenity of the neighbourhood by reason of noise, visual impacts, air pollution (including odour, smoke, fumes or dust), vermin or traffic.

(2) This clause does not apply to:

(a) development comprising or involving any use of sludge or effluent if:

(i) the dominant purpose is not waste disposal, and

(ii) the development is carried out in a location other than one listed in subclause (1) (d), above, or

(b) development comprising or involving waste management facilities or works specifically referred to elsewhere in this Schedule, or

(c) development for which *State Environmental Planning Policy No 52 – Farm Dams and Other Works in Land and Water Management Plan Areas* requires consent.

Appendix C – Examples of best practice waste management around the world

Oslo, Norway	
Municipal waste	Annual charge of between US $150–370 per household to finance kerbside recycling. Kerbside recycling for paper and drinking cartons. Glass, metal, plastics and packaging must be delivered by householders to 537 local collection sites across the city.
Commercial & industrial waste	Responsibility of the producer. Producers must pay an authorised carrier to collect waste.
Construction & demolition waste	It is estimated that between 25% and 50% of the C&D waste stream is recycled. Composition: • brick 50% • concrete 18% • wood 13% • miscellaneous 19%.
Overview of waste disposal etc.	Norway (2007): • landfilling 18% • energy recovery incineration 36% • recycling and composting 49% (of which 17% is composting).
Container deposit or cash back schemes	Amount of tax on beverage containers is determined by the return (reuse, recycling) rate. The full product charge is applied to containers with return rates below 25%. Return rates between 25% and 95% are charged a tax that is inversely proportional to the return rate. Containers reaching return rates above 95% are tax exempt Additional charge for one-way beverage containers regardless of return rate. 9,000 return sites and 3,000 reverse vending machines.
EPR or product stewardship schemes	Producers are responsible for providing the means by which the goods they produce are collected and recycled at the end of their lives. As result of the policy, recycling companies have been established via cooperation among participants in an industry. Products covered: • packaging • lubricants • recovered oils • electrical goods • batteries • automobiles.

Oslo, Norway	
Management of landfills	2009 ban on landfill of biodegradable waste. Exceptions apply for waste with a total organic carbon content not exceeding 10% and waste with loss on ignition not exceeding 20%. Ban implies that biologically degradable waste such as paper, wood, textiles and food waste must be disposed of in alternative ways. Tax on landfilled waste is differentiated, with a lower tax rate for waste with a high environmental standard, and a higher tax rate for waste with low environmental standards.
Waste infrastructure	At present, tax on incinerators varies on the degree of energy utilisation. If no energy is produced, then the tax is equal to landfill of waste with high environmental standards.
Energy from waste	Oslo: landfill gas from earlier deposits is collected and fed into waste-to-energy plants for district heating and production of electricity. Two waste-to-energy plants incinerate residual waste from the city, with a capacity of 260,000 tonnes per year. Energy is used for district heating (hot water) and electricity and meets the needs of 10% of households in the city.

Copenhagen, Denmark	
Municipal waste	Municipal waste recycling rate of 48%. Strict agreement with waste contractors to ensure only separated waste is removed. Collection schemes provided for: • household waste • bulky waste • garden waste • newspapers and periodicals • glass • hazardous household waste • household bio-waste (currently a test scheme) • syringes • waste food from restaurants and other facilities • healthcare. Composition (2005): • paper and cardboard 27% • organic materials 29% • plastics 1% • glass 5% • metals 6% • textiles and others 32%.
Commercial & industrial waste	Only separated wastes are removed. Producers are responsible for their waste and must pay a registered carrier to remove it.

Copenhagen, Denmark	
Construction & demolition waste	85% of Copenhagen's building waste is recycled. Regulation sets requirements for source separation into the following fractions: • clean stone materials • clean, unglazed tiles • clean concrete • mixtures of clean stone materials, clean, unglazed tiles and clean concrete • asphalt • mixtures of concrete and asphalt • iron and metal. Composition: • concrete 25% • soil and stone 22% • asphalt 19% • tiles 6% • other demolition waste 11% • other waste 8% • other recyclable waste 6% • not suitable for incineration 3%.
Overview of waste disposal etc.	Denmark (2007): • landfilling 5% • energy recovery from incineration 54% • recycling and composting 48%.
Container deposit or cash back schemes	Beer and soft drinks may only be marketed in refillable packaging approved by the Danish Environmental Protection Agency. Imported drinks may be sold provided a system of return and deposit has been set up. Statutory systems are in place where deposits have to be paid on all cans and bottles containing beer, cider, soft drinks, alcopops and energy drinks. Return rate of 85% for bottles for recycling and nearly 100% for bottles designed for reuse. Level of deposit is set by the Danish Ministry for the Environment.
EPR or Product Stewardship Schemes	Legislation ensures all automotive manufacturers take vehicles back from the consumer at the end of the vehicle's life, regardless of whether the returning owner is the original purchaser. Denmark has chosen not to establish one separate management system for packaging waste.
Management of landfills	Denmark banned landfilling of high calorific power waste, and also organic waste, in 2003. Denmark has one of the highest landfill taxes – 50 Euros per tonne. A general state tax on waste is differentiated so that it is most expensive to landfill waste, cheaper to incinerate it and tax exempt to recycle it. 'Green' tax applies to packaging, plastic bags, disposable tableware, batteries.
Waste infrastructure	State subsidies and grants are available for projects that aim to solve waste problems e.g. developing new forms of waste treatment.
Energy from waste	39 % of all material the city collects is incinerated in waste-to-energy plants.

Copenhagen, Denmark	
Other	**Data** – Waste carriers have to monitor the correct sorting of waste. They must keep records of each waste transport, containing information on the type and amount of waste collected and the locations it was moved from and to. The receiving station or treatment plant also has to register the amount and type of waste received. This information is used as a central element in waste management and planning in Copenhagen.

Flanders, Belgium	
Municipal waste	Each inhabitant should not produce more than 150 kilograms of residual waste per year. Householders are charged for their residual waste by: • number of rubbish bags or • bins with electronic chips that charge by weight or volume. Mixed household wastes are more expensive to dispose. Kerbside collection covers: • mixed waste (charged) • plastic bottles, metal packaging and drinking cartons (charged) • paper and cardboard (free) • glass bottles (free) • vegetable, fruit and garden waste (charged) • bulky waste (charged). Civic amenity sites are also available to drop off pre-sorted waste. 25% of households compost. In 2007, 72% of household waste was collected in separated fractions, 25% of was incinerated, 1.1% went to landfill. Belgium municipal waste composition: • paper and cardboard 17% • organic material 39% • plastics 5% • glass 7% • metals 3% • textiles and others 29%.
Commercial & industrial waste	Companies have a legal obligation to separate at source. Companies maintain contacts with specialised, regional government institutions to manage their C&I waste.
Construction & demolition waste	In 2006, 15% of industrial waste was landfilled or incinerated. The remaining 85% was recycled, composted, reused or conditioned for the purpose of further treatment.
Overview of waste disposal etc.	Belgium (2006): • landfilling 5% • energy recovery with incineration 36 % • recycling and composting 59%.
Container deposit or cash back schemes	For beer and soft drink containers.

Flanders, Belgium	
EPR or product stewardship schemes	For the following products, producers are financially responsible for the collection and treatment of their products once they become waste: • printed paper • batteries • waste pharmaceuticals • end-of-life vehicles • tyres • electric and electronic appliances • lighting • cooking oils. Collection of these waste streams is organised through civic amenity sites, but the costs are covered by producers through collective companies. The Flemish Government uses a cost model which works out the cost of all the civic amenity sites in Flanders, and then the costs of recovering particular waste streams, and then calculates a lump sum per inhabitant per year for dealing with those streams, which producers then have to pay.
Management of landfills	Landfilling is banned in Flanders. However, as incineration capabilities are inadequate, a limited number of dispensations are allowed. Landfilling costs are higher than for incineration. It is prohibited to landfill the following: • household wastes • unsorted household and industrial waste • wastes that were selectively collected for the purpose of recovery • combustible residues from the sorting of household waste or comparable industrial waste • pharmaceuticals.
Waste infrastructure	Separation of recyclables has been achieved through environmental 'covenants' or agreements with municipalities in exchange for subsidies towards selective collection infrastructure (including doorstep and bring systems). Municipalities that launch waste prevention initiatives (e.g. the promotion of reusable diapers, the installation of drinking fountains in schools and the promotion of lunch boxes) can get government subsidies. Companies that invest in techniques that contribute to waste reduction are also entitled to government subsidies.
Energy from waste	The following waste-to-energy methods are used: • use of landfill gas (methane) • incineration with energy recovery of household and commercial waste • anaerobic digestion • capture of biogas in waste water treatment.

Germany	
Municipal waste	Glass, paper, old clothes, compost and bio-waste, packaging, bulky waste and specialist waste are collected separately. Composition: • paper and cardboard 34% • organic 14% • plastics 22% • glass 12% • metals 5% • textiles and other 12%.
Commercial & industrial waste	Industrial waste is the responsibility of the producer. On average, 45 million tonnes of C&I waste is produced a year – the majority is mixed waste.
Construction & demolition waste	Specific fractions must be kept separate and recycled. 86 % of construction waste is recovered. Composition (2002): • excavated material 66% • road demolition waste 8% • building and demolition waste 24% • construction site waste 2%.
Overview of waste disposal etc.	Landfilling continues to be the most widely used form of treatment if inert construction and demolition waste is taken into account. Treatment breakdown of municipal waste, Germany (2005): • recycled 33% • composted 17% • incinerated 24% • landfilled 18% • other 7%.
Containers deposit or cash back schemes	There are two beverage deposit-return systems: • refillable bottles have a deposit placed on them by manufacturers • in 2003, as result of decreasing use of refillables, non-refillable containers were also forced into a deposit return system by the government. Both schemes are managed by manufacturers. From consumers' point of view they operate together seamlessly. Larger deposit on non-refillables has increased use of refillable containers.
EPR or product stewardship schemes	All producers and distributors have equal responsibility to take back used packaging. German packaging Ordinance allows for a not-for-profit Producer Responsibility Organisation (PRO). Producers and distributors pay an annual fee to the PRO to carry out their take-back and recycling obligations. Licence fees are based on the amount and type of packaging. All licensed products carry a green dot.

Germany	
Management of landfills	Since 2005, only municipal waste having undergone pre-treatment (mechanical and biological treatment, incineration and co-incineration) and containing less than 5% organic material can be landfilled. There is no federal landfill levy but most state laws stipulate that the disposal of waste (including incineration) is subject to a levy. Levy exemptions cover: • waste to be recovered • waste generated in the course of soil decontamination • waste generated in the course of waste treatment operations • waste generated in the course of research into new waste disposal methods.
Energy from waste	Energy recovery from incineration and methane capture from landfills is common

Ile-de-France Region, France	
Municipal waste	There are special collections for bulky wastes. Majority of municipalities have separate collections for: • glass • dry matter (newspapers, magazines, packaging material etc.) • bio-waste. 62% of domestic waste collected was recovered in 2005.
Commercial & industrial waste	No mandatory requirement to report data – except for hazardous wastes.
Construction & demolition waste	Estimated that of 20 million tonnes of building waste in 2005: • 67% was recovered (31% in situ, 11% on other sites and 18% as filling material) • 33% was not recovered (22% in landfill sites for inert waste and 10% in other landfill sites).
Overview of waste disposal etc.	France municipal waste: • landfilling 36% • energy recovery incineration 33% • recycling and composting 31%.
Containers deposit or cash back schemes	France has a CDL model for reusable containers, but re-growth for reusable bottles is low.
EPR or Product Stewardship Schemes	Managed through not-for-profit cooperatives. Corporations pay a fee to cooperatives to look after their collection and recycling obligations. A green dot system, similar to that used in Germany, is used to identify packaging assigned to a cooperative scheme. Since 2006, electrical and electronic goods manufacturers and distributors are required to be listed in a register. Distributors must also take back obsolete or used equipment from consumers.

Ile-de-France Region, France	
Energy from waste	Isle-de-France has 19 incinerators of which 18 recover energy such as heating or electricity. Approximately 40% of municipal waste in France is treated by waste-to-energy procedures.
Other	**Data** – European Union target for recycling of packaging waste is 75% by 2010, and 60–65% for organics. Local authorities have to report data to ADEM, the French environmental agency. France uses an interesting model: data is captured by a non-government organisation rather than by industry or environment groups. Once the data is published there appears to be little dispute over its accuracy.

San Francisco, California, USA	
Municipal waste	Kerbside collection is charged at a variable rate. Average monthly bill is US $19 but can be reduced to US $14 for an active recycler. Householders are provided with bins for dry recyclables, organic waste and non-recyclables. Separation into these bins is mandatory. The city has pioneered commingled recycling collection (paper, bottles and cans together) among private homes, apartments, businesses and city government locations on the same route. There are drop-off sites for latex paint, fluorescent tubes and bulbs, household batteries. San Francisco established the first and largest urban food scraps composting collection in the United States. The program, available to all 335,000 households and serving over 2,000 businesses citywide, collects almost 300 tons per day. Most of the resulting certified organic compost is used locally. Composition: • paper 20% • glass 2% • metal 4% • electronics 1% • plastic 9% • other organics 49% • inerts and other 11% • special waste 2% • mixed residue 3%.

San Francisco, California, USA	
Commercial & industrial waste	Pay-as-you-throw schemes for business to help recycling and composting. Separation is mandatory. Commercial organisations have the same three bins as households: 1 non recyclables 2 compostable waste 3 recycling. Plastic bags were banned from all major supermarkets two years ago. Use of polystyrene foam is also banned. Restaurants are required to compost. C&I waste composition: • paper 21% • glass 1% • metal 5% • electronics 1% • plastics 11% • other organics 30% • inert and other 28% • special waste 3%.
Construction & demolition waste	All C&D materials must be recycled. Recycled materials must be used in public works constructions. C&D debris (such as wood, metal, concrete, asphalt and sheetrock) taken off a site must go to a registered construction recycling facility that can process mixed C&D debris and divert a minimum of 65% of materials from landfill. Composition: • recyclable aggregates 27% • recyclable wood 15% • recyclable metal 4% • other recoverable material 20% • rock, dirt and sand 8% • other municipal solid waste 26%.
Overview of waste disposal etc.	San Francisco achieves a recycling rate of 73% across all waste sectors, without any incineration.
Container deposit or cash back schemes	Mandatory deposit applies to many types of beverage containers. Beverage containers must be returned to a certified collection centre for a deposit refund. California Redemption Value is paid into the Redemption Value Fund by distributors on every beverage container offered for sale in California. Distributors are reimbursed the Redemption Value when they sell their beverages to retailers. Retailers then charge consumers a deposit, the Redemption Value, at the point of purchase. A network of 1,100 grocery store recycling centres covers the deposit redemption obligations of all retailers in California. This substantially reduces the amount of handling fees, enabling the system to be entirely self-sustaining.
EPR or product stewardship schemes	No current laws but a number of voluntary schemes operate.

San Francisco, California, USA	
Management of landfills	California prohibits placing electronic waste, fluorescent tubes, consumer batteries and mercury thermostats into landfill.
Waste infrastructure	The state environment agency provides up to $600,000 annually in zero waste grants to non-profit organisations to support innovative reuse, recycling, composting, market development and education that will cost effectively increase waste diversion. Grants of up to US $1 million are available for projects that will help the city move towards its 75% waste diversion goal, especially in relation to education.
Energy from waste	Methane capture from landfills is common.
Other	San Francisco's waste system is very centralised – all collection contractors have to provide services for all waste streams.

Owen Sound, Ontario, Canada	
Municipal waste	Bi-weekly kerbside recycling: over 30 items are recycled including Tupperware, metal pots and pans, cutlery and kitchen utensils and plastic containers. Garbage bags containing recyclables are left at the kerb with tags attached that notify the residents. Recyclables must be sorted in the following streams: • bottles and cans • paper • paperboard and craft paper. Pay-as-you-throw program: residents are required to attach $2 tags to all bags of garbage. Limited waste disposal: no more than four bags of garbage per collection per household. Recyclables, e-waste and garbage can also be taken to local transfer stations. Leaf and yard waste has to be taken to the city-operated outdoor windrow compost site. The city promotes a variety of waste reduction and diversion programs to compensate for its lack of organic collection services, including subsidised backyard composters and kitchen containers.
Commercial & industrial waste	All C&I organisations and business must submit waste audit reports and waste reduction plans. The city distributes recycling carts to the companies and provides support materials on its website. The city provides free weekly recycling services for all multi-family buildings, institutions and commercial establishments. Composition: • paper 23% • glass 5% • metal 11% • plastic 3% • wood 21% • organic 11% • other 26%.

Owen Sound, Ontario, Canada	
Container deposit or cash back schemes	Ontario's system of deposit refunds for beer bottles, through 'The Beer Store' (owned by three Ontario brewers), has close to a 100% return rate. The bottles can be cleaned and reused 15 to 20 times. Since 2007 Ontario's container deposit has applied to wine and spirits too but these bottles may only be returned for deposit refund at The Beer Store.
EPR or product stewardship schemes	Waste Diversion Ontario (WDO), a non-profit organisation, oversees the industry funding organisation Stewardship Ontario, which contributes 50% of municipal costs to operate residential recycling programs. Funding formulas for calculations are based on regional sales data reported by stewards (manufacturers or producers) to Stewardship Ontario. Only stewards that generate Ontario sales equal to or greater than $2 million, or generate more than15 tonnes of 'blue box' wastes in Ontario, are required to be part of the program. Ontario Electronic Stewardship waste electronics program has 500 approved collection points for safe disposal of used, broken or unwanted electronic equipment.
Management of landfills	Owen Sound does not have an operating landfill and the province plans to ban shipments to Michigan by 2011. A by-law prohibits the landfill disposal of a wide range of materials, including blue box recyclable materials, used electronic waste, household hazardous waste, and leaf and yard waste.
Energy from waste	Proposals are being developed, but there is nothing concrete as yet.

This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix D – Municipal waste overview

Composition of municipal waste

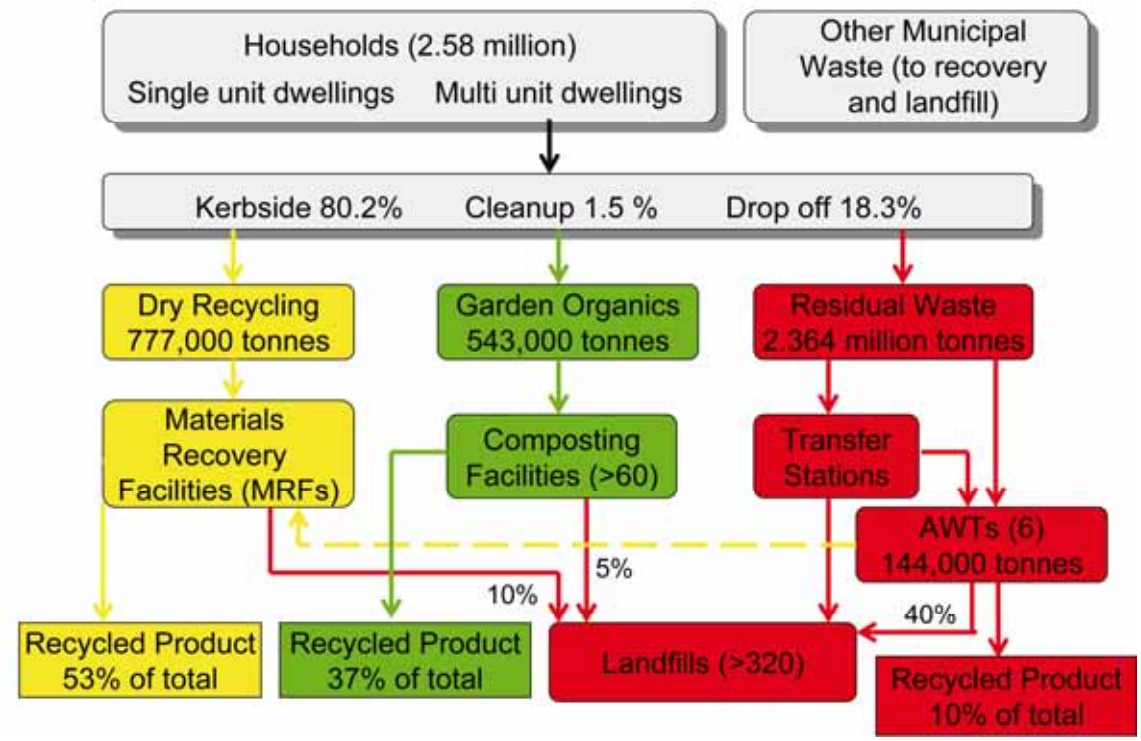
Municipal waste is waste collected by, or for, local councils. It includes:

- solid waste from households (domestic waste) including recycling, organics and waste from:
  - kerbside collections
  - clean-up collections
  - drop-off facilities
- solid waste collected by councils from:
  - municipal parks and gardens
  - street sweepings
  - public places
  - council engineering works.

It does not include hazardous, clinical or related wastes. 95% of municipal waste is household waste.

This waste stream is primarily made up of 57% mixed residual waste, 23% items sorted for recycling (paper/cardboard, glass, plastic, metal) and 16% sorted organics (food and garden waste). Of the mixed residual waste component, approximately 51% is organics, 20% paper/cardboard and 10% plastic.

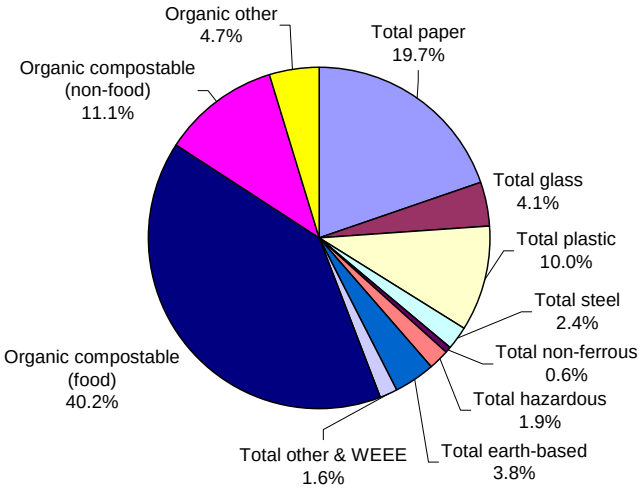
Figure D1 – Municipal (domestic) waste stream



In Figure D1 above:

- Recycled products from MRFs include paper and cardboard, plastics (PET, HDPE, PVC, LDPE, polypropylene), glass (clear, amber, green), aluminium, steel and liquid paperboard.
- Recycled products from composting facilities include Australian Standard AS4454 (2003) composts, mulches, soil conditioners, blended soils, top dressing, horticultural products and potting mixes
- Recycled products from AWT facilities include AWT-derived organic rich fraction (AWTDORF: products subject to the POEO (Waste) Regulation 2005 – General Exemption: 'Organic outputs derived from mixed waste exemption 2010') with restricted use until June 2013 for mine site rehabilitation, plantation forestry, non-contact agriculture, broadacre agriculture.

Figure D2 – Composition of waste in the red residual waste bin



On average, more than 51% of the contents of NSW red residual waste bins is a combination of compostable garden and food organics.

Figure D3 – Potential to recover additional recycling from the red residual bin

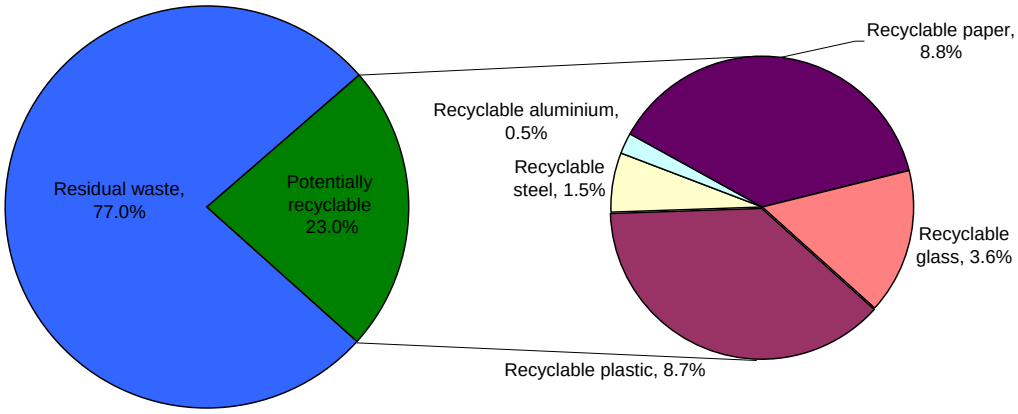


Table D1 – Main domestic materials recovered (2008–09)

Materials recovered for recycling	Tonnes recovered
Paper and cardboard	421,943
Plastic	223,702
Glass	186,413
Ferrous metal	207,029
Non-ferrous metal	25,823
Garden organics	477,435
Food organics	62,351
WEEE (e-waste)	3,894
AWT outputs	85,191

Types of collection systems

Figure D4 – Domestic recycling: proportion by collection system type

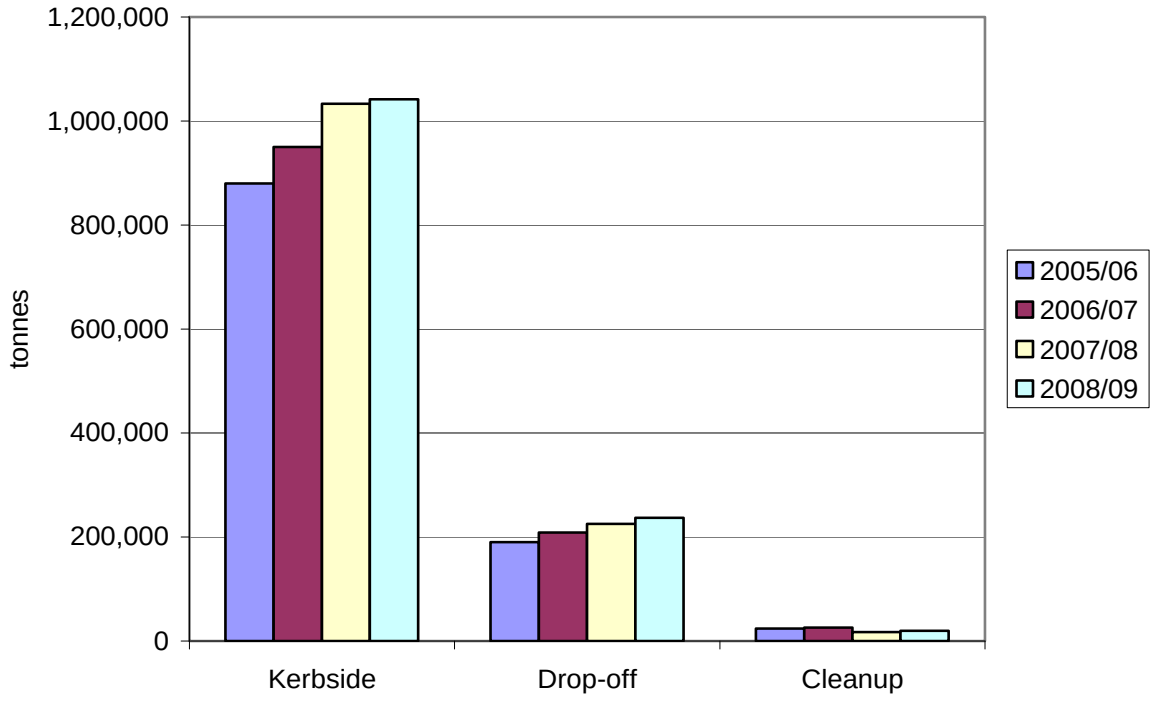


Table D2 – Kerbside collection systems for each council in NSW (2008–09)

Across NSW local councils there are 55 types of kerbside collection system, i.e. each type listed here represents a different configuration.

Key – *Configuration*: W= weekly, F= fortnightly, M = monthly, C = collected for fee, Q = quarterly, 2Q = twice quarterly, T&B = tied & bundled.
Region: ERA = Extended Regulated Area, NRA = Non-regulated Area, RRA = Regional Regulated Area, SMA = Sydney Metropolitan Area

Type	Council	Region	Waste	Recycling	Organics
1	Gosford	ERA	120L W	240L F	240L F
	Wollongong	ERA	120L W	240L F	240L F
	Ashfield	SMA	120L W	240L F	240L F
	Auburn	SMA	120L W	240L F	240L F
	Bankstown	SMA	120L W	240L F	240L F
	Burwood	SMA	120L W	240L F	240L F
	Canada Bay	SMA	120L W	240L F	240L F
	Hurstville	SMA	120L W	240L F	240L F
	Kogarah	SMA	120L W	240L F	240L F
	Strathfield	SMA	120L W	240L F	240L F
	Sutherland	SMA	120L W	240L F	240L F
	Wollondilly	RRA	120L W	240L F	240L F
	Wagga Wagga	NRA	120L W	240L F	240L F
2	Port Macquarie–Hastings	RRA	120L W	240L F	240L W
3	Ku-ring-gai	SMA	120L W	240L F	360L F
4	Shoalhaven	ERA	120L W	240L F	T&B C
5	Berrigan	NRA	120L W	240L F	
	Greater Taree	RRA	120L W	240L F	
	Gundagai	NRA	120L W	240L F	
	Harden	NRA	120L W	240L F	
	Junee	NRA	120L W	240L F	
	Narrabri	NRA	120L W	240L F	
	Tumut	NRA	120L W	240L F	
	Upper Lachlan	NRA	120L W	240L F	
	Wakool	NRA	120L W	240L F	
6	Camden	SMA	120L W	240L W	240L W
7	Mosman	SMA	120L W	2x120L F	T&B M
8	Leichhardt	SMA	120L W	2x120L W	240L F
9	Woollahra	SMA	120L W	Crate +120L W	240L W

Type	Council	Region	Waste	Recycling	Organics
10	Sydney	SMA	120L W	Crate W	240L F
11	Liverpool Plains	NRA	120L W	Crate W	
12	Tenterfield	NRA	120L W		
13	Lismore City	RRA	140L F	240L F	240L W
14	Tumbarumba	NRA	140L F	240L F	
15	Gunnedah	NRA	140L W	120L W	240L F
16	Waverley	SMA	140L W	140L W	240L F
17	Kiama	ERA	140L W	240L F	240L F
	Baulkham Hills	SMA	140L W	240L F	240L F
	Campbelltown	SMA	140L W	240L F	240L F
	Canterbury	SMA	140L W	240L F	240L F
	Hornsby	SMA	140L W	240L F	240L F
	Marrickville	SMA	140L W	240L F	240L F
	Parramatta	SMA	140L W	240L F	240L F
	Randwick	SMA	140L W	240L F	240L F
	Ryde	SMA	140L W	240L F	240L F
	Albury	NRA	140L W	240L F	240L F
	Queanbeyan	NRA	140L W	240L F	240L F
18	Bega Valley	NRA	140L W	240L F	240L M
	Goulburn Mulwarree	NRA	140L W	240L F	240L M
19	Byron	RRA	140L W	240L F	
	Coolamon	NRA	140L W	240L F	
	Glen Innes Severn	NRA	140L W	240L F	
	Moree Plains	NRA	140L W	240L F	
	Palerang	NRA	140L W	240L F	
	Yass	NRA	140L W	240L F	
20	Wyong	ERA	140L W	240L W	240L F
21	Willoughby	SMA	140L W	240L W	240L W
22	Young	NRA	140L W	240L W	
23	Armidale Dumaresq	NRA	140L W	55L W	240L F
24	Guyra	NRA	140L W	55L W	
25	Bombala	NRA	140L W	Crate W	
26	Muswellbrook	RRA	140L W		
	Murray	NRA	140L W		

Type	Council	Region	Waste	Recycling	Organics
27	Great Lakes	RRA	240L W	240 W	
28	Tweed	RRA	240L W	240 W	240L F
29	Shellharbour	ERA	240L F	240L F	240L F
30	Bellingen	RRA	240L F	240L F	240L W
	Coffs Harbour	RRA	240L F	240L F	240L W
	Nambucca	RRA	240L F	240L F	240L W
31	Coonamble	NRA	240L W	120L F	
32	Blue Mountains	RRA	240L W	140L W	
	Boorowa	NRA	240L W	140L W	
33	Cessnock	ERA	240L W	240 F	
	Lake Macquarie	ERA	240L W	240 F	
	Maitland	ERA	240L W	240 F	
34	Clarence Valley	RRA	240L W	240L F	240L F
	Kempsey	RRA	240L W	240L F	240L F
35	Hunters Hill	SMA	240L W	240L F	240L M
36	Newcastle	ERA	240L W	240L F	T&B Q
37	Hawkesbury	ERA	240L W	240L F	
	Port Stephens	ERA	240L W	240L F	
	Blacktown	SMA	240L W	240L F	
	Fairfield	SMA	240L W	240L F	
	Holroyd	SMA	240L W	240L F	
	Penrith	SMA	240L W	240L F	
	Rockdale	SMA	240L W	240L F	
	Ballina	RRA	240L W	240L F	
	Dungog	RRA	240L W	240L F	
	Gloucester	RRA	240L W	240L F	
	Singleton	RRA	240L W	240L F	
	Upper Hunter	RRA	240L W	240L F	
	Bathurst	NRA	240L W	240L F	
	Blayney	NRA	240L W	240L F	
	Cabonne	NRA	240L W	240L F	
	Cootamundra	NRA	240L W	240L F	
	Corowa	NRA	240L W	240L F	
	Forbes	NRA	240L W	240L F	
	Gilgandra	NRA	240L W	240L F	
	Greater Hume	NRA	240L W	240L F	

Type	Council	Region	Waste	Recycling	Organics
	Griffith City	NRA	240L W	240L F	
	Gwydir	NRA	240L W	240L F	
	Inverell	NRA	240L W	240L F	
	Leeton	NRA	240L W	240L F	
	Orange	NRA	240L W	240L F	
	Parkes	NRA	240L W	240L F	
38	Cowra	NRA	240L W	55L/80L W	
39	Dubbo	NRA	240L W	Bag F	
40	Narromine	NRA	240L W	Bag W	
41	Botany Bay	SMA	240L W	Crate +120L W	T&B W
42	Liverpool	SMA	240L W	Crate F	
	Snowy River	NRA	240L W	Crate F	
43	Tamworth Regional	NRA	240L W	Crate W	240L F
44	Lithgow	NRA	240L W	Crate W	T&B Q
45	Mid-Western	NRA	240L W	Crate W	
	Uralla	NRA	240L W	Crate W	
	Walcha	NRA	240L W	Crate W	
	Warrumbungle	NRA	240L W	Crate W	
46	Cooma–Monaro	NRA	240L W	Crate/140L F	
47	Broken Hill	NRA	240L W		240L F
	Lachlan	NRA	240L W		240L F
48	Kyogle	RRA	240L W		
	Richmond Valley	RRA	240L W		
	Balranald	NRA	240L W		
	Bland	NRA	240L W		
	Bogan	NRA	240L W		
	Bourke	NRA	240L W		
	Brewarrina	NRA	240L W		
	Carrathool	NRA	240L W		
	Central Darling	NRA	240L W		
	Cobar	NRA	240L W		
	Deniliquin	NRA	240L W		
	Hay	NRA	240L W		
	Jerilderie	NRA	240L W		
	Lockhart	NRA	240L W		
	Murrumbidgee	NRA	240L W		

Type	Council	Region	Waste	Recycling	Organics
	Narrandera	NRA	240L W		
	Oberon	NRA	240L W		
	Temora	NRA	240L W		
	Urana Shire	NRA	240L W		
	Walgett	NRA	240L W		
	Warren Shire	NRA	240L W		
	Weddin	NRA	240L W		
	Wellington	NRA	240L W		
	Wentworth	NRA	240L W		
49	North Sydney	SMA	55L W	120L W	T&B F
50	Pittwater	SMA	80L W	140L W	T&B 2Q
51	Eurobodalla	NRA	80L W	240L F	240L M
52	Wingecarribee	ERA	80L W	240L F	T&B C
53	Lane Cove	SMA	80L W	2x120L F	T&B M
	Manly	SMA	80L W	2x120L F	T&B M
54	Warringah	SMA	80L W	2x120L W	T&B M
55	Conargo	NRA			

Table D3 – Council collection and drop-off facilities for various waste materials

Material	SMA	ERA	RRA	NRA	Total
Aluminium	11	2	7	24	44
Asbestos	2			4	6
Batteries (rechargeable)	5	1	5	8	19
Batteries (disposable)	5	1	5	8	19
Compact fluorescent light globes/tubes				1	1
Construction and demolition	2	3	3	14	22
Cars	1	1		1	3
Chemicals		1	2	1	4
Paint	9		2	2	13
Cardboard	10	2	8	18	38
Chemical drums	14	11	32	159	216
Computers and e-waste		1	1	2	4
Furniture		1	2	3	6
Garden organics	10	1	7	12	30
Gas cylinders	9		3	5	17
Glass	52	22	34	143	251

Material	SMA	ERA	RRA	NRA	Total
Liquid paperboard	8	1	8	7	24
Metals	6	2	7	18	33
Mobile phones				1	1
Motor oil	4	2	6	17	29
Cooking oil		1	5	16	22
Paper	11	2	8	17	38
Plastic bottles and containers	52	24	38	185	299
Polystyrene	7			4	11
Tyres	9	1	1	11	22
Whitegoods	6	1	1	16	24
Household hazardous waste		2	2	1	5

Councils that send material to an AWT (2008–09)

Blacktown, Fairfield, Camden, Campbelltown, Wollondilly, Wingecarribee, Holroyd, Hunters Hill, Lane Cove, Willoughby, North Sydney, City of Sydney, Penrith, Liverpool, Leichhardt, Port Stephens, Coffs Harbour, Nambucca, Bellingen, Port Macquarie–Hastings.

Performance analysis of councils

Figure D5 – The 15 highest waste generating councils

The local communities of the 15 highest waste generating councils generate more than 37% of the total amount of domestic waste generated in NSW.

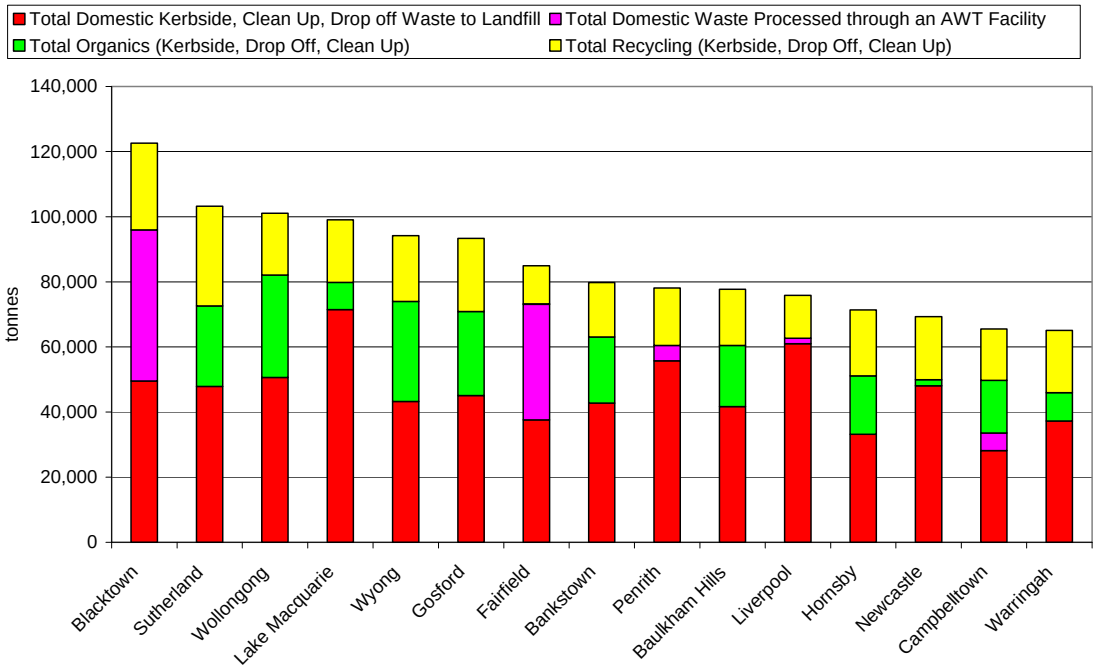


Figure D6 – The second 15 highest waste generating councils

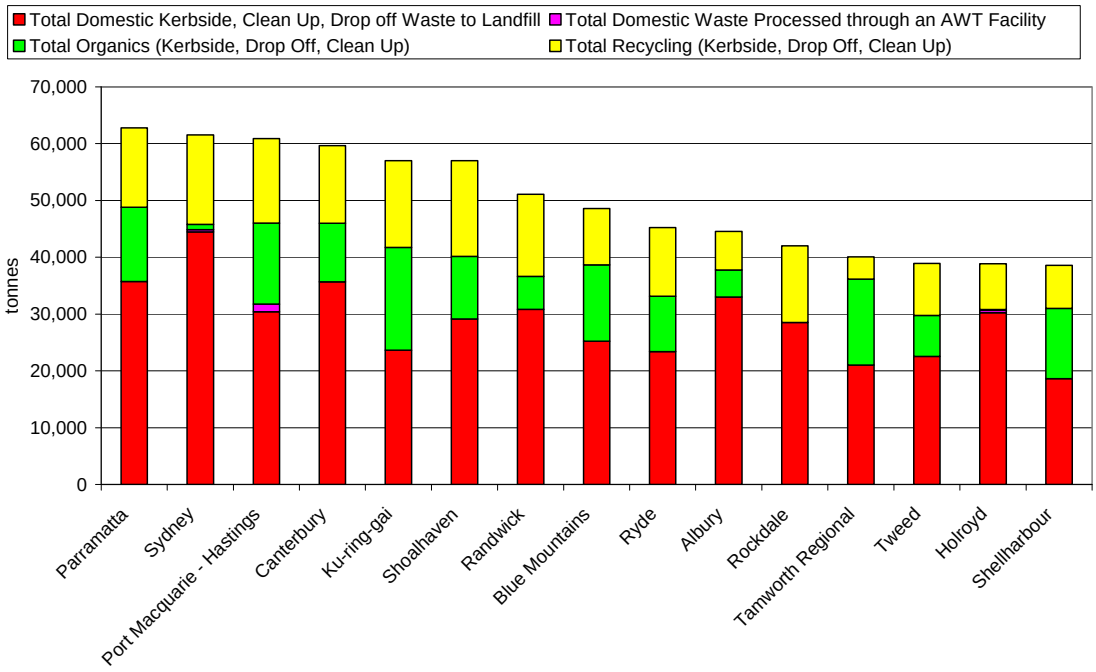


Figure D7 – The 30 highest waste generating councils sorted by waste disposal method

The waste disposed to landfill by the 30 highest waste generating councils represents 58% of the total domestic waste disposed to landfill in NSW.

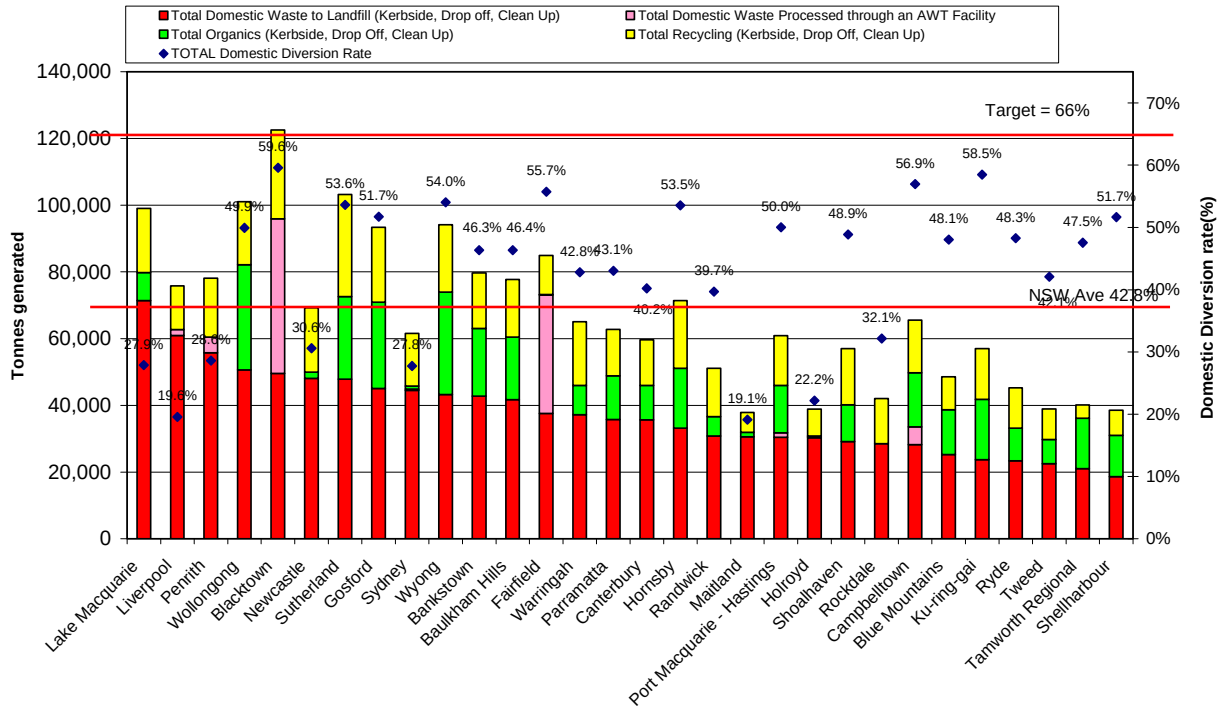
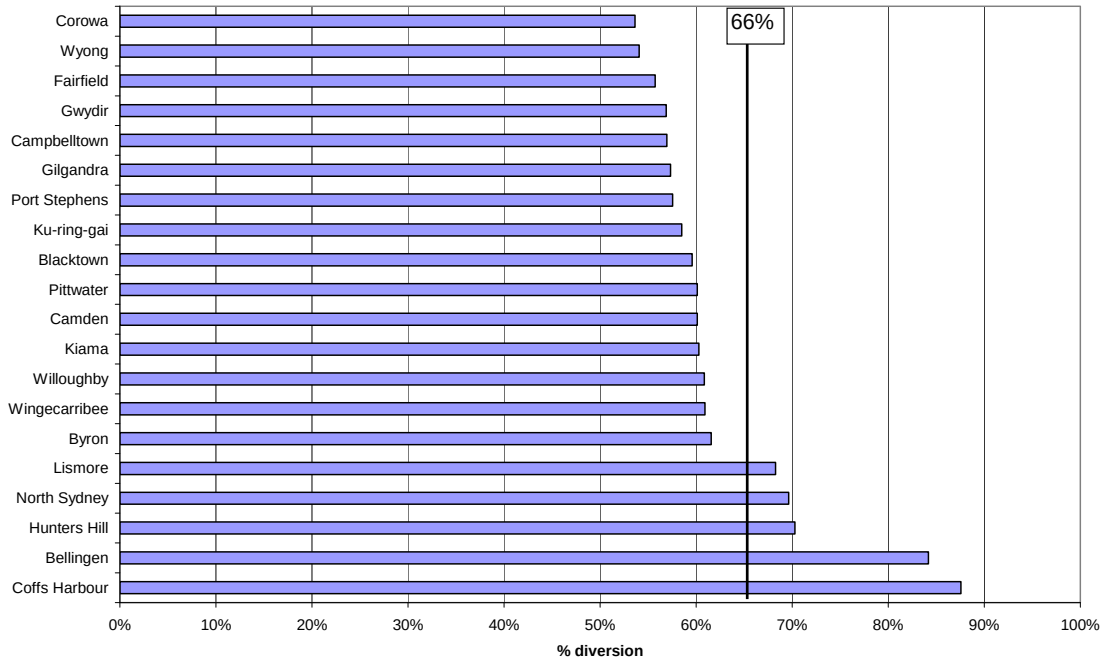


Figure D8 – Councils' resource recovery performance: best 20 (2008–09)



The discussion below attempts to derive the preferred council household resource recovery services. The analysis is based on council dry recycling, organics and waste collection services and the 2008–09 data from the annual council data survey.

When considering this analysis it is important to flag the potential limitation that all domestic waste material may not be captured by the individual council's data survey. This is likely to be particularly evident for councils in the Sydney Metropolitan Area where householders transport (self-haul) material to transfer stations; this material is not directly linked back to the LGA. However, the data should be captured in the regional and state data analysis.

An example of this is North Sydney Council, one of the top performing councils (ranked fourth based on the 2008–09 data) with a diversion rate of 69.6%. North Sydney's 2008–09 service is based on the following:

- 120-litre weekly commingled recycling collection
- 55-litre weekly residual waste collection (processed through an AWT facility with 54.4% recovery), and
- fortnightly tied and bundled garden organics collection.

Analysing the data suggests that North Sydney has an unusually low garden organics recovery rate (0.8 kilograms per household per week). By comparison, Willoughby Council has a 240-litre fortnightly garden organics collection and recovers 4.5 kilograms per household per week. North Sydney's 55-litre residual waste bin leaves little capacity to dispose of garden organics with the residual waste and it is likely that residents self-haul garden organics to a transfer station, employ a mowing or gardening contractor or arrange for a commercial collection (i.e. skip bin). Organic material disposed of in this manner is not included in the annual council data and performance analysis.

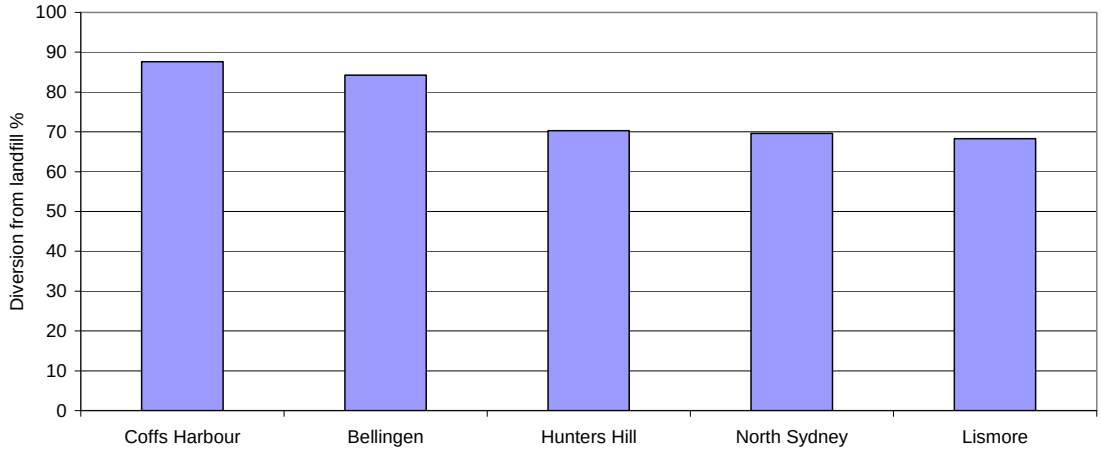
Another potential variation when analysing performance is whether just the regular kerbside recycling, garden organics and residual waste collection service is considered or whether the total domestic collection service that includes clean-up and drop-off services or facilities is considered.

In addition to the above, the better performing councils, based on the council data, are typically councils in the greater Sydney Metropolitan Area or larger regional centres (Bellingen, Coffs Harbour, Hunters Hill, Lismore, North Sydney) whereas the lower performing councils are typically smaller rural councils (Balranald, Deniliquin, Leeton, Lockhart, Wellington).

This analysis typically focuses on single-unit dwellings (SUD) and low-rise multi-unit dwellings (MUD) that have individual SUD-type services.

Likely success factors of the best-performing councils

Figure D9 – Top five councils by diversion from landfill



The ‘best performing’ councils were selected on the basis of having achieved the WARR Strategy target of 66%.

Each of the five best-performing councils collect and process dry recycling, food and/or garden organics and process the majority of their residual waste through an AWT facility.

Coffs Harbour, Bellingen and Lismore provide a co-collected 240-litre food and garden organics collection and have made this the primary weekly collection. Dry recycling (240-litre bin) and residual waste (240-litre bin for Coffs Harbour and Bellingen and 140-litre bin for Lismore) are collected on an alternate fortnightly basis.

Hunters Hill provides a weekly 240-litre residual waste collection (processed through an AWT), a fortnightly 240-litre dry recycling collection and a monthly 240-litre garden organics collection. Hunters Hill has a below-average proportion of dry recycling in the residual bin (18.5%). The average (for SMA/ERA) based on the 2007–08 audit report is 23%.

North Sydney provides a 55-litre weekly residual waste collection, a weekly 120-litre dry recycling collection and a fortnightly tied and bundled garden organics collection.

North Sydney also has a below-average proportion of dry recycling in the residual bin (20.5%).

This example demonstrates that the critical success factors for maximising diversion from landfill are the processing of food and garden organics through both source-separated collections and AWT, underpinned by best practice resident recycling behaviour, i.e. low contamination rates in the bins.

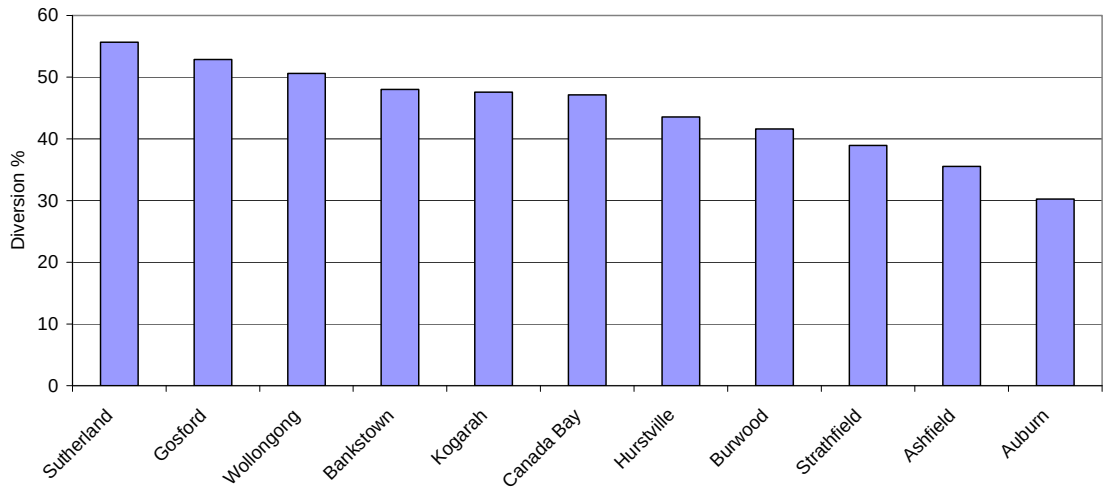
Preferred resource recovery practices

In 2006 DECCW published *Preferred Resource Recovery Practices by Local Councils* providing a guide to the preferred minimum service levels for kerbside resource recovery and residual waste collections for SUDs. The preferred minimum service standard is:

- 80, 120 or 140-litre bin residual waste collection
- Either 2 x 120-litre bins (one for paper/cardboard and one for containers) each collected fortnightly on alternate weeks, or a 240-litre bin fully commingled fortnightly recycling collection
- 240-litre bin fortnightly garden organics collection for high garden organics generation areas, or a tied and bundled garden organics collection for low garden organics generation areas.

This service type may also provide the basis for useful analysis. The diversion rates of councils described below are for their kerbside services only and therefore these rates should not be compared to the municipal target of 66%.

Figure D10 – Selected SMA or ERA councils with a three-bin household service



Eleven SMA or ERA councils provide this configuration of service, with diversion performance ranging from 30.26% to 55.67%. These figures report kerbside collection service only (i.e. do not include clean-up or drop-off figures).

Figure D11 – SMA or ERA councils with a three-bin household service: recycling (yellow), garden organics (green) and food (red) in the residual bin

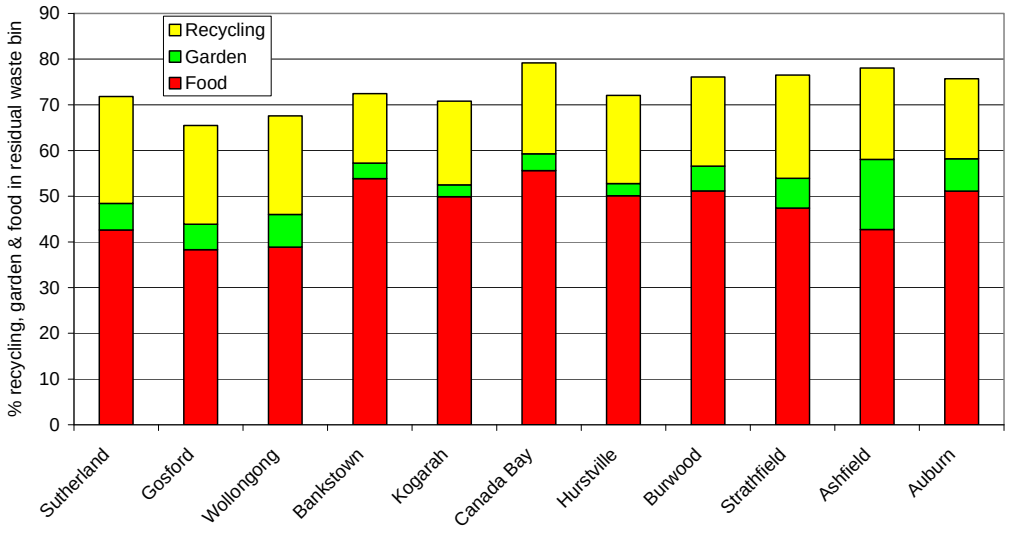


Figure D11 shows that a high proportion of the contents of the residual bin for these council services is food organics (38.34% to 55.62%, compared to the SMA and ERA average of 40%) and dry recycling (15.2% to 22.6%, compared to the SMA and ERA average of 23%).

Despite these councils meeting the minimum standards for bin waste and recycling services, these figures are less than ideal.

Each of the five councils shown in Figure D12 provides a 240-litre weekly residual waste collection and a fortnightly 240-litre recycling collection with no kerbside organics collection service. This system results in low diversion rates.

Figure D12 – Selected councils with a two-bin household waste and recycling service

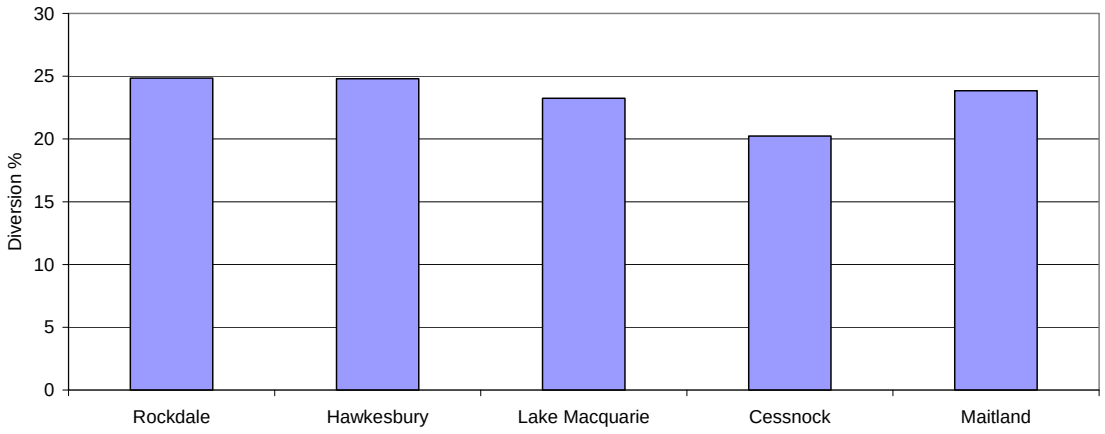


Figure D13 – Selected councils with a two-bin household waste and recycling service: recycling (yellow), garden organics (green) and food organics (red) in the residual bin

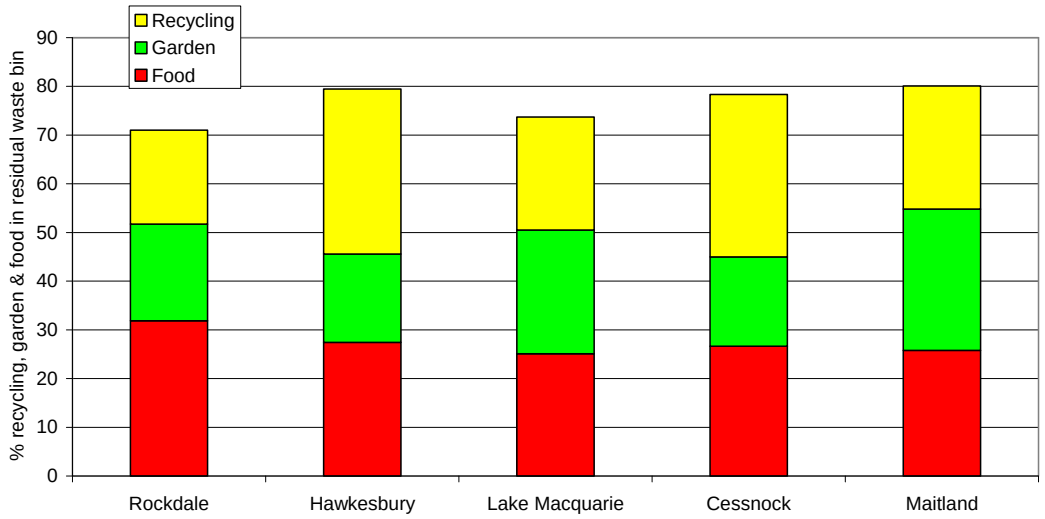
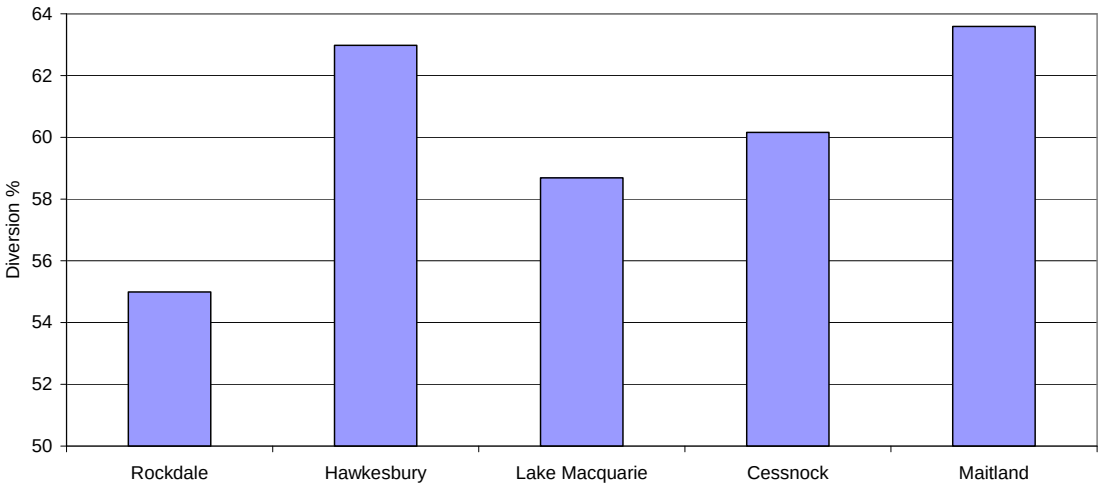


Figure D13 shows that a high proportion of the contents of the residual bin for these council services is food organics (25.1% to 31.9%) and dry recycling (19.3% to 33.9%). This fraction of food organics and dry recyclables is potentially recyclable – it could be recycled if an organics collection service was introduced and attention was given to recycling behaviour and performance.

Figure D14 indicates the potential performance increase if these councils introduced an organics collection service and recovered all but 10% of the dry recycling, all but 5% of the organics and 50% of the food organics. This would potentially recover an additional 66,042 tonnes of dry recycling, food and garden organic material.

Figure D14 – Potential diversion from landfill of selected councils, from improved recovery of dry recycling, food and garden organics



Socio-demographic factors

The 2008–09 domestic kerbside waste and recycling data report showed that single-unit households divert more recyclable materials than those living in multi-unit dwellings. The SUD average resource recovery rate was 71.5% compared to the MUD rate of 57.0%. However, it is interesting to note that recycling contamination levels between MUD and SUD households are not different. These results confirm the need for better collection and processing of waste and recycling from MUDs, through a combination of source separation where possible and AWT.

Analysis of the relationships between waste generation and recycling and some socio-demographic indicators shows some statistically significance differences, which cannot be explained readily.

The SMA has a higher proportion of MUDs, higher population densities and higher household income, compared to the ERA.

The relationship between waste generation and these characteristics is weak.

Recycling on the other hand, exhibits different relationships. In the SMA, the higher the income, the greater the recycling rate. This is opposite to the effect in the ERA, where the higher the income, the lower the recycling rate. The strength of relationship was large.

The analysis also showed an opposite relationship (of medium strength) with MUDS. In the SMA, the more MUDs, the less recycling and in the ERA, the more MUDS, the more recycling.

Finally, there was a small positive effect of population density in the SMA, i.e. the greater the population density, the more recycling, but a small negative effect in the ERA, i.e. the higher the population density, the less recycling.

These results should be considered when designing interventions to improve household resource recovery rates.

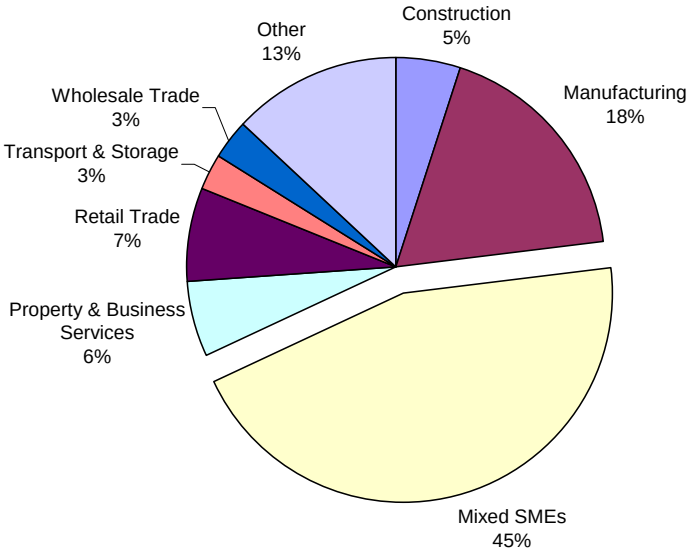
This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix E – Commercial and industrial waste overview

What is commercial and industrial waste?

C&I waste is waste arising from a wide range of sectors including commerce and retail, registered clubs and not-for-profit organisations, service providers of all types including healthcare, hospitality, finance and government agencies, manufacturing, substantial land managers and sites with high public visitation. Businesses ranging from small to large are included.

Figure E1 – Mixed C&I loads by industry sector



C&I waste is diverse, making it technically difficult and expensive to sort and recover materials. In addition, half the C&I waste stream is biodegradable. This has an impact on greenhouse gas emissions for NSW while presenting a potential for carbon capture (through composting for example).

The C&I waste stream continues to be the hardest stream to tackle as it has so many players of different sizes and across different areas, with often diverse and ad hoc recycling systems. Among the industry sectors generating C&I wastes in Sydney, mixed SMEs are the largest contributor (45%) followed by manufacturing (18%), retail trade (7%), property and business services (6%) and construction activity (5%).

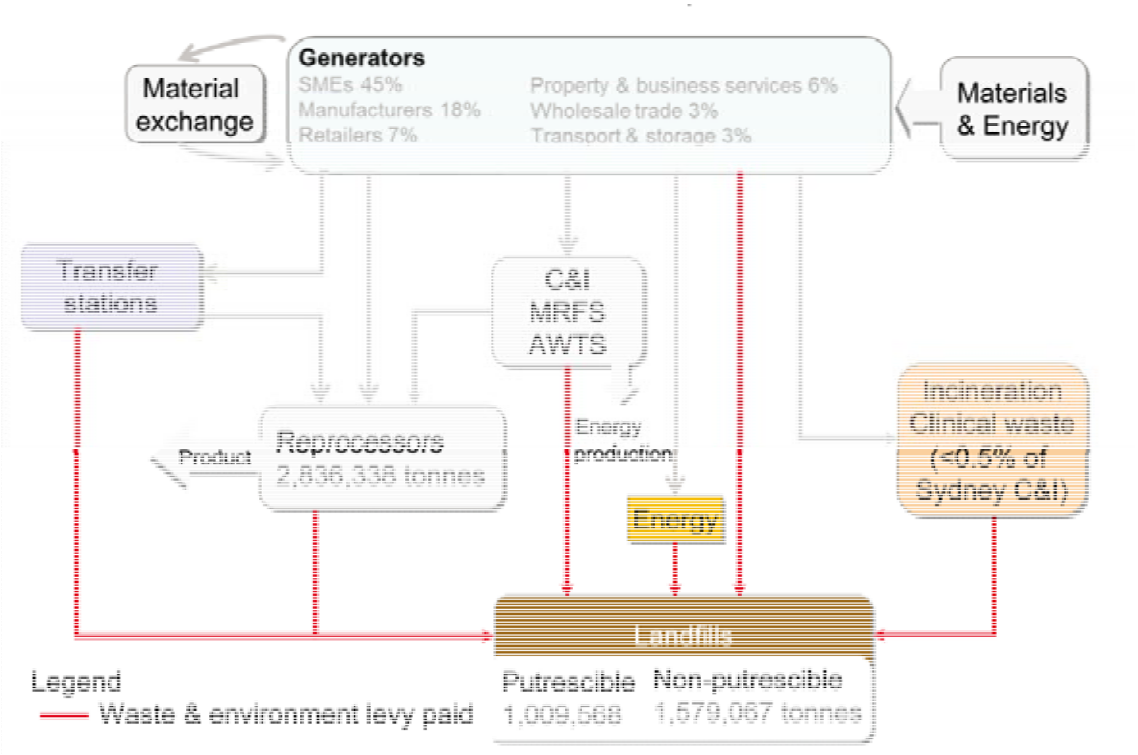
What happens to C&I waste currently?

78% of C&I waste is made up of mixed loads, i.e. it is not separated before being transported for either landfilling or reprocessing. This makes it very difficult to reprocess or recycle under the current systems.

There are many different ways in which C&I waste is currently handled, depending on the type and quantity of waste, the location where it arises and the level of mixing of

different waste streams. Figure E2 below illustrates the typical flows of C&I waste to either landfills or to reprocessing facilities.

Figure E2 – NSW C&I waste stream



Typically C& I waste loads are transported either in large bulk bins (33% of waste) or are compacted in front-end loading compactor vehicles (31% of waste). The remainder is transported by numerous small and large vehicles and bin combinations. On-site shredding may be provided for paper waste.

Much of the waste collection work is carried out by private contractors, although in some cases local councils provide the collection service for C&I waste. Some loads are delivered to sorting centres in preparation for recycling (e.g. to C&I material recovery facilities) or may be delivered directly to recyclers. Loads that contain putrescible[2] materials that are not to be recovered are deposited at class 1 (putrescible) landfill sites. Wastes classified as inert can be deposited at class 2 (inert) landfill sites. Currently, approximately 40% of C&I waste is delivered to class 1 sites and 60% to class 2 sites, with less than 1% of material going to specialist incineration or liquid waste disposal sites.

[2] Putrescible waste means food or animal matter (including dead animals or animal parts), or unstable or untreated biosolids.

What are the flows of C&I waste for landfill and recycling?

Total generation of C&I waste in NSW for 2008–9 was 5.425 megatonnes. Of this, 2.836 megatonnes (52%) was recycled, and the remaining 2.589 megatonnes (48%) was disposed of to landfills. These amounts are distributed between the SMA, ERA and NRA[3] as follows:

- SMA: 1.854 megatonnes disposed, 1.817 megatonnes recycled
- ERA: 0.358 megatonnes disposed, 0.547 megatonnes recycled
- NRA: 0.376 megatonnes disposed, 0.473 megatonnes recycled.

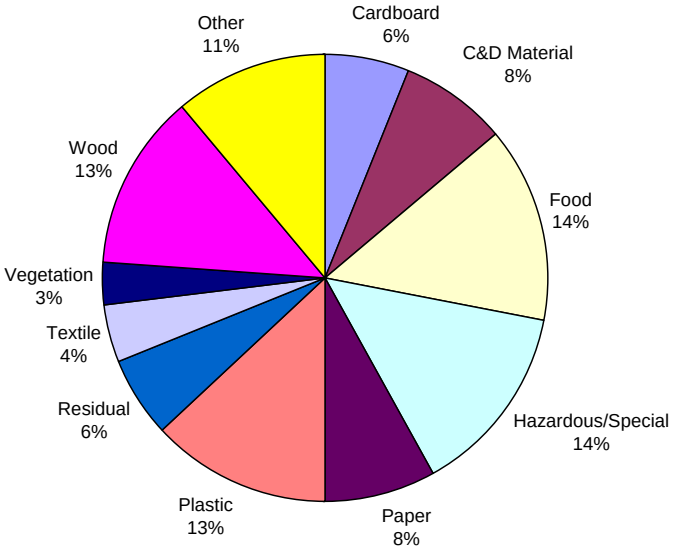
The main materials recycled from the C&I stream in NSW (as indicated in Table E1 below) are paper and cardboard, ferrous metals and garden organics.

Table E1 – C&I waste recovery: breakdown by key materials (2008–09)

Material Processed for recovery	Tonnage recovered (Tonnes)	Recovery Rate (%)
Metal - Ferrous	**525,254**	**94**
Metal – Non ferrous	**88,315**	**92**
Garden organics	**326,641**	**78**
Paper/cardboard	**424,556**	**53**
Glass	**61,588**	**53**
Timber	**52,581**	**16**
Plastic	**34,596**	**8**
Food	**99,336**	**18**

A detailed survey of the composition of C&I waste sent to landfill in the SMA was carried out in 2008 (see summary below).

Figure E3 – Total C&I waste disposal (2008), composition by weight (%)



[3] Data is for NRA defined as at 2008–09.

The study found the following breakdown of C&I waste by type (measured by weight):

- Loads may be single loads (i.e. a full load of a single type of waste) or mixed loads (i.e. a load made up from a combination of different types of wastes).
- Single material loads are mainly made up of contaminated soil (55%) and residues from processing sites (28%). Smaller quantities of non-contaminated soil, glass, hazardous or special material and vegetation also are delivered in single material loads.
- The main materials contained in the mixed C&I loads are food (17.4%), wood (16.7%), paper and cardboard (17.4%), plastic (16.9%), construction and demolition material (9.8%), textiles (5%) and vegetation (3.3%). 18.7% of the mixed waste arises contained in garbage bags, the remainder is loose.
- The logistics and success of recovery systems will vary depending on how the materials are presented. For example, the 'paper and cardboard' consolidated category in mixed C&I waste consists of dry cardboard (56%), office paper (27%), wet cardboard (10%) and other paper (7%); wood is mainly in the form of pallets (49%), MDF/chipboard (27%) and furniture (13%); plastics are mainly bags and film (46%), 'hard' plastics (29%), containers (7.5%) and polystyrene (3.5%); food waste often arises in its packaging.

The level of detail available on materials recycled varies depending on the type of material. For example, access to data from the glass sector makes it possible to develop a good profile of glass recycling. Of the 251 kilotonnes of glass recovered in 2008–09, 186 kilotonnes is from municipal sources, 62 kilotonnes from C&I and 3.3 kilotonnes from C&D sources. The material collected is reused in NSW (109 kilotonnes), reprocessed in NSW (84 kilotonnes), sent interstate for reprocessing (57 kilotonnes) or sent overseas for reprocessing (<1 kilotonne). In other cases, such as the metals industry, voluntary provision of data from recyclers is much more limited or completely absent.

This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix F – Recycling in the C&I sector: separation at source vs. centralised sorting

What are the differences between separation at source and centralised sorting?

Within NSW there are primarily only two operational approaches to recycling in the C&I sector:

1 the collection of recyclables that have been separated at source by waste generators and delivered directly to reprocessors (sometimes via transfer stations)

2 the separation (centralised sorting) of recyclables from waste at MRFs or AWTs.

Source-separated C&I waste

Currently a significant portion of C&I recycling in NSW occurs through the collection of source-separated recyclables, for example, the collection of source-separated cardboard from business sites by a vehicle operating a dedicated cardboard round. This material would then typically be delivered directly to a reprocessing company or, sometimes, to a bulking site for onward transfer to a reprocessor. For example, AMCOR provides collections of source-separated cardboard and paper to businesses and delivers to their mill operation either directly or via a network of transfer stations.

Sites generating sufficient quantities of materials such as cardboard, paper and plastics may bale these materials on site and store them in compacted form ready for collection.

Glass bottles are typically collected from hotels and clubs for recycling in a dedicated stream. About 250 venues in Sydney use the ‘BottleCycler’ system that crushes glass bottles on site. The glass is then sent to Visy Recycling for sorting by colour type. About 85% of this sorted material is used to produce new glass bottles.

A variety of source-separated streams may be generated by a business depending on the nature of its operations. Resource management companies offer dedicated collections for discrete streams of material as appropriate. For example, Veolia offers separate collections of untreated timber, bottles and cans, paper and cardboard, and metals. Collections of source-separated materials are more prevalent from larger enterprises that may have larger quantities of waste and more storage space for separate containers.

Unseparated C&I waste

Unseparated C&I waste is predominantly collected by compaction vehicles, and this substantially limits the ability for this material to be recycled. While the majority of this compacted C&I waste goes directly to landfill, a portion is delivered to one of a limited number of C&I MRFs in the Sydney area. Due to the mixture of different types of waste and the potential for cross contamination, especially with wet waste, these facilities – sometimes termed ‘dirty MRFs’ – currently only achieve quite low recovery rates of recyclables: between 20 to 50% recovery is typical.

What determines how recyclables are collected and handled?

The main factors that determine whether and how recyclables will be handled include:

- **Availability of space for bins** – businesses may have insufficient space for multiple bins (internally or externally) to source separate materials or to aggregate separate streams of material. In these cases, other than direct disposal at landfill, the only option if available is to sort recyclables from waste material at a C&I MRF. Figure 1 illustrates a range of typical collection site handling arrangements.
- **Price signals** – businesses may be deterred by the cost of recycling. This includes not only the lift price[4] but also perceived costs associated with source segregations compared to the use of a single mixed-waste bin. This is believed to be particularly true in the SME sector, which accounts for almost half of C&I waste disposal.
- **Types of waste generated** – the composition of the waste generated by a business will determine the kind of recycling system provided.
- **Variable service offering** – different waste contractors may have access to different infrastructure and this will affect the nature of the service they can offer.
- **Other non-price barriers** – around a quarter of businesses do not have source separation bins for paper. As these are currently offered at a very low price it would appear that the lift price is not a primary barrier: inertia, transition costs (including education, administration and space constraints) appear to be the most likely obstacles.

[4] i.e. the charge made per collection bin or container emptied.

Figure F1 – Examples of collection systems for C&I waste and recyclables

(a) Wheel bins of varying sizes – rear-lift serviced

(b) Front-end loader serviced containers

(c) Bulk bin serviced by hook lift

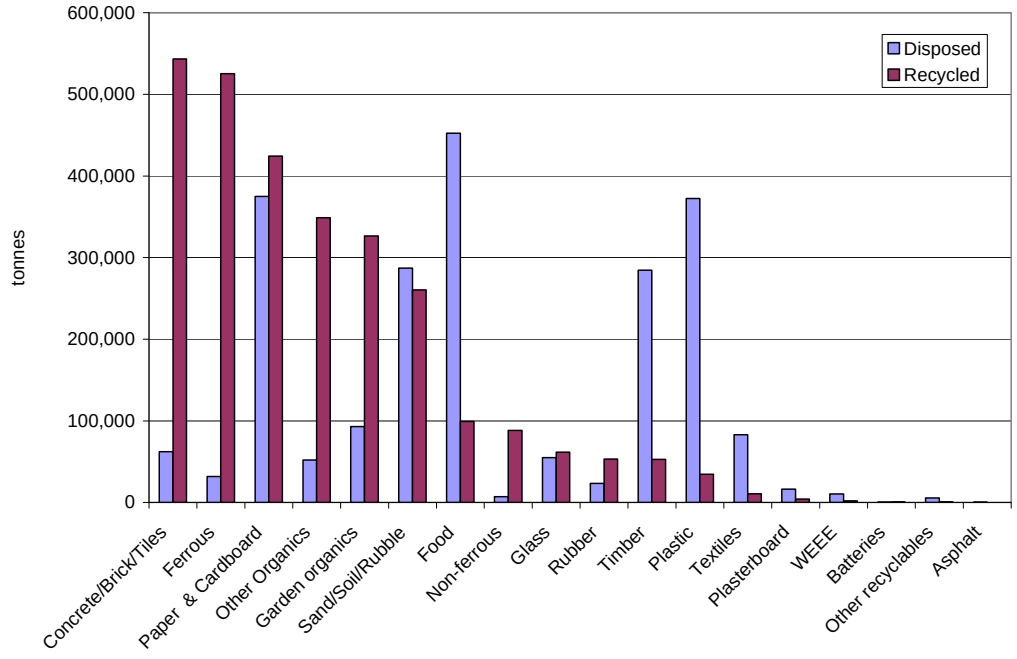
(d) Compactor skip

(e) On-site baling

What facilities are currently available in NSW?

Figure F2 shows the provisional 2008–09 levels of recycling and disposal of C&I waste in NSW by main material type, in tonnes.

Figure F2 –C&I waste and recycling levels (provisional 2008–09 data)



Source separation accounts for a significant proportion of the material recycled shown in Figure 2. For example, ferrous and non-ferrous metals are handled in a separate, discrete stream to organics.

Some streams of recyclables may be partly source-separated and then transferred for further sorting. For example, businesses may be serviced with a collection of commingled containers in a single bin – similar to domestic kerbside collections. In these cases the waste generator separates glass, plastic, steel and aluminium containers into a single bin. This mixed stream is then delivered to a MRF for separation into individual streams. Visy Recycling offers collections of source-separated containers (a mix of glass, plastic, steel and aluminium) and use their MRF to separate these different dry streams.

For those recyclables that are not source-separated, there are currently three MRFs for C&I waste operating in NSW: SITA has operations at Camellia and Wetherill Park; Galloway operates a site at Seven Hills. These sites use a combination of mechanical sorting (for example, magnets to remove steel, trommels to size-separate different materials) and manual picking (sorting plastic bottles and film from the mixed stream on a conveyor belt by hand).

The combined capacity of these sites is limited in comparison to the volume of tonnes disposed at landfill but additional capacity will be considered by the operators providing the market demand is present and they are permitted expansion within their current development consents.

In addition to the SITA and Galloway C&I MRFs, the Earthpower site at Camellia processes food waste which contains a low level of contamination (i.e. plastics). Earthpower, owned by Veolia and TPI, is processing food waste at a rate of 40 kilotonnes per annum using anaerobic digestion; it generates electricity from the methane released by the digestion process and also produces liquid and organic fertilisers.

What parts of the C&I waste stream should be targeted for maximum gains in recycling?

The majority of larger enterprises (those employing more than 200 employees) tend to manage their waste streams effectively and, as a result, achieve substantial recycling rates. However, the SME sector has generally not engaged sustainable management of waste primarily due to the factors previously outlined. Half of C&I waste generated is by SMEs. Due to their large numbers (in excess of 300,000 in NSW) SME waste is a difficult portion of the C&I waste stream to divert to beneficial applications.

This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix G – Economic and social factors in waste

Productivity Commission inquiry

The Productivity Commission Inquiry into Waste Management and Resource Efficiency (2006) concluded that waste policy should maximise net community benefits (as opposed to resource efficiency). Waste management can lead to negative 'externalities' – impacts on unrelated parties that are not reflected in the private financial costs of waste management. If these externalities are significant, the waste management option that imposes the lowest financial costs may not be the best outcome from the perspective of the community as a whole. The best outcomes for the community are achieved where all costs and benefits are taken into account, whether financial, social or environmental in nature, and where net benefits to the community are maximised.

Landfills that are poorly located and managed can impose significant external costs through emissions of leachate and greenhouse gases and loss of amenity to nearby residents. However, the Productivity Commission found that government planning and regulation has reduced the external impacts of landfills to low levels.

The Commission's findings were contentious and not generally accepted by government. A particular concern was that the Commission did not recognise the greenhouse implications of landfill or acknowledge the community's express desire for waste reductions and resource recovery.

Economic drivers of waste

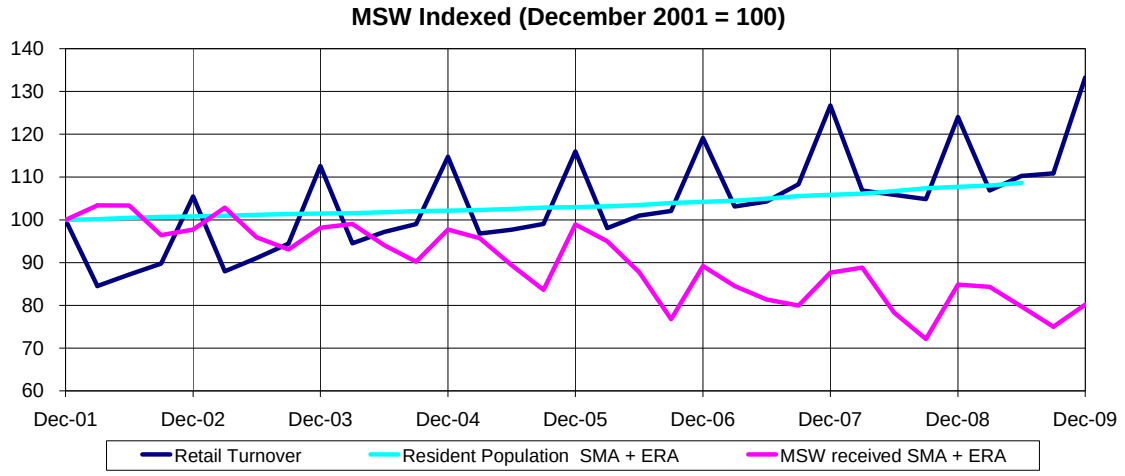
Over the period 2001–09 there have been substantial declines in municipal and C&I waste received relative to their economic drivers. The relationship between waste received and the relevant economic drivers has changed due to increases in recycling, reuse and waste avoidance over time.

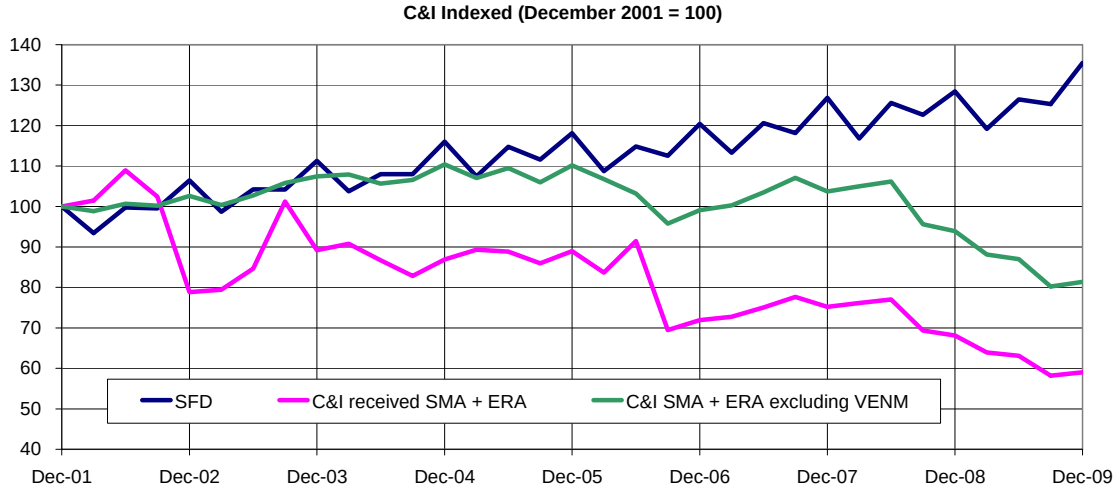
For the municipal waste sector, household consumption and population are the likely economic drivers. Municipal waste received relative to either household goods consumption (household final consumption – a component of State Final Demand – excluding services) or population has fallen by about 30 to 40% over the past decade.

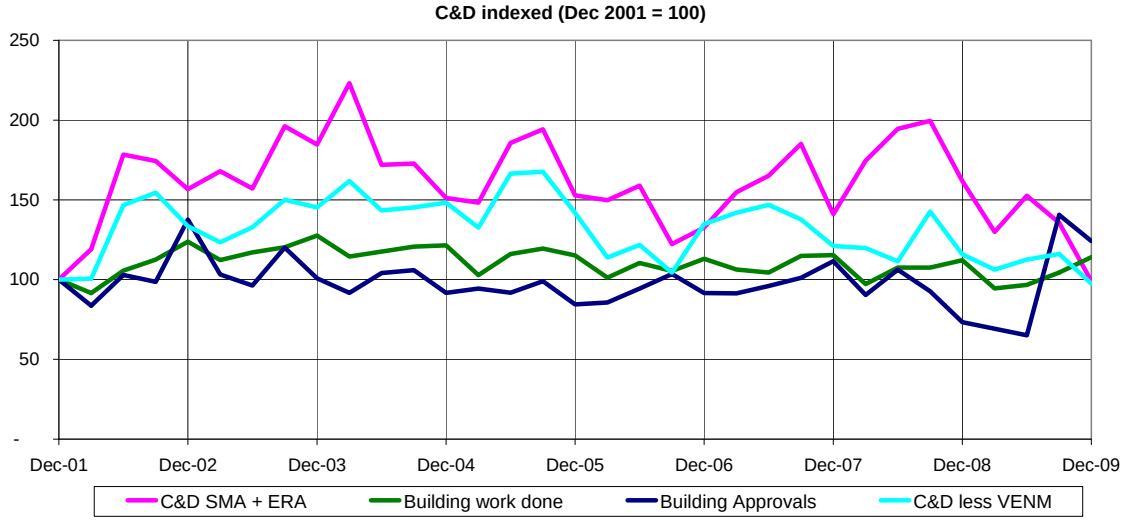
For the C&I waste stream, the trend in total waste received to landfill was slightly down or flat over the period December 2001 to June 2006. The ratio of C&I waste to State Final Demand (SFD – expenditure on consumption and capital formation) has fallen by almost 60% in the past decade.

For the C&D waste stream, it is expected that the bulk of C&D waste is generated in the early stages of construction. However, available economic drivers of 'building approvals' and 'value of work done' don't adequately reflect generation of C&D waste. There was a rapid increase in C&D waste, both absolutely and relative to building activity drivers, in 2002. C&D waste relative to drivers oscillated around this higher level until late 2008. It is not clear why the decline in absolute C&D waste generation (or disposal) during the global financial crisis (2008) would also lead to a reduction relative to drivers.

Figures G1, G2 and G3 – Municipal solid waste (MSW), C&I and C&D trends in waste received vs. economic drivers







Note: All waste figures are waste received for the period – this makes no allowances for exempt, deducted or transported waste.

Goods imported into NSW

Another factor involved in the increase of waste generation in NSW is the increase in goods being imported into NSW. As Table G1 (below) indicates, Sydney is the second biggest port in Australia for imported goods (after Melbourne) and the volume of goods imported is increasing rapidly. In the nine-year period 2000–01 to 2009–10, containerised imports into Sydney Ports increased by 93% (i.e. almost doubled).

Table G1 – Containerised imports in TEUs – Ports Australia data
TEU = twenty-foot equivalent units, a measure used for capacity in container transport

Port	Import TEUs 1976–77	Import TEUs 2000–01	Import TEUs 2008–09	% Australian total 2008–09
Melbourne	144,243	571,177	980,422	36
Sydney	138,493	491,689	876,113	32
Brisbane	18,582	153, 486	377,763	14
Freemantle	11,650	136, 494	255,765	9

The actual make-up of the goods imported into Sydney is shown in Table G2, below. Many of these goods or their packaging, or both, will eventually end up in the NSW waste streams.

Table G2 – Containerised imports by commodity – Sydney Ports data

Commodity	Import TEUs 2009–10
Machinery and transport equipment	206,357
Miscellaneous manufactures	196,433
Chemicals	122,805
Paper products	77,946
Textile fabrics	56,339
Non-metallic minerals	43,787
Food preparations	40,611
Iron and steel	26,393
Beverages and tobacco	21,082
Timber	14,992
Others	144,282
Totals	951,027

Socio-economic factors in the municipal waste sector

There are several socio-economic factors that could potentially have an impact on household waste generation and recycling in the different LGAs across NSW. These factors include the percentage of MUDs, population density and household income. Understanding the interplay of these factors may be important in formulating better waste management policies and strategies for NSW.

A preliminary analysis was done to compare LGAs in the SMA and ERA (which includes the Hunter, Illawarra and Central Coast). The RRA (which includes the Blue Mountains, Wollondilly and councils north of Port Stephens) has not been included because no statistically significant relationships were found between recycling and waste generation, and MUDs, population density and income.

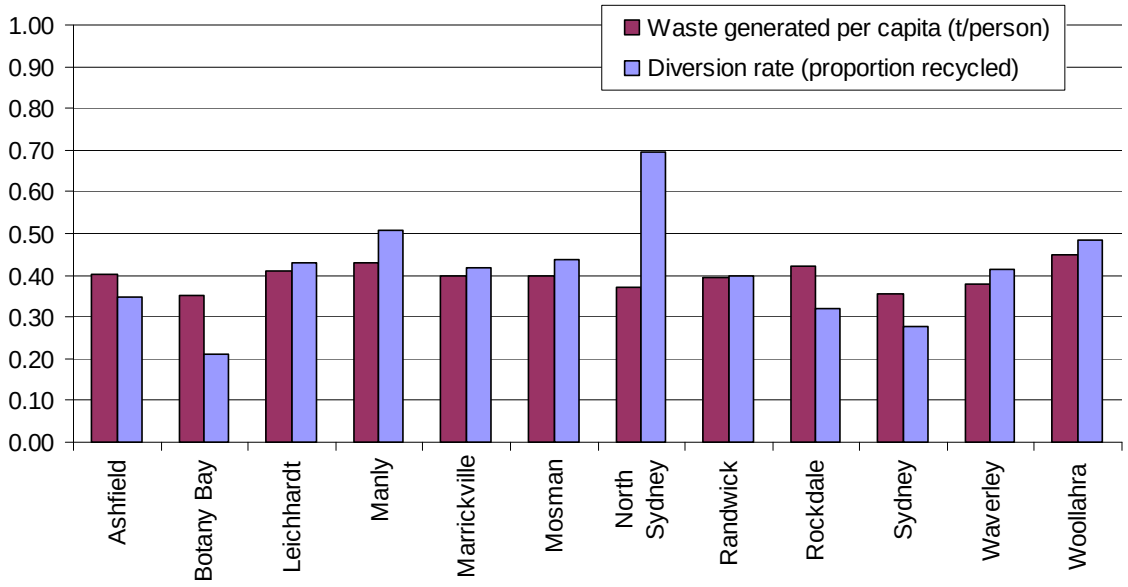
The analysis found:

- relationships between waste and socio-economic characteristics are different in the SMA and the ERA in the sense that their effects are opposite. For example, as household income goes up, recycling rates go up in the SMA but down in the ERA.
- there is a large positive effect of household income on recycling in SMA (higher income means substantially more recycling), but a large negative effect in ERA (higher income means substantially less recycling)
- there is a medium negative effect of percentage of MUDs in SMA (more MUDs, less recycling), but medium positive effect of percentage of MUDs in ERA (more MUDs, more recycling)
- there is a small positive effect of population density in SMA (greater population density, more recycling), but small negative effect in ERA (higher density, less recycling).

Further analyses were then undertaken to determine if it was possible to cluster councils within both the SMA and the ERA, based on similarities in percentage of MUDs, population density and income, and to then possibly compare council waste performance within each individual cluster. This was done on a sub-sample of about one-third of the LGAs in NSW. Such a clustering would theoretically assist in determining more appropriate 'peer group' LGA waste benchmarks and best management practice.

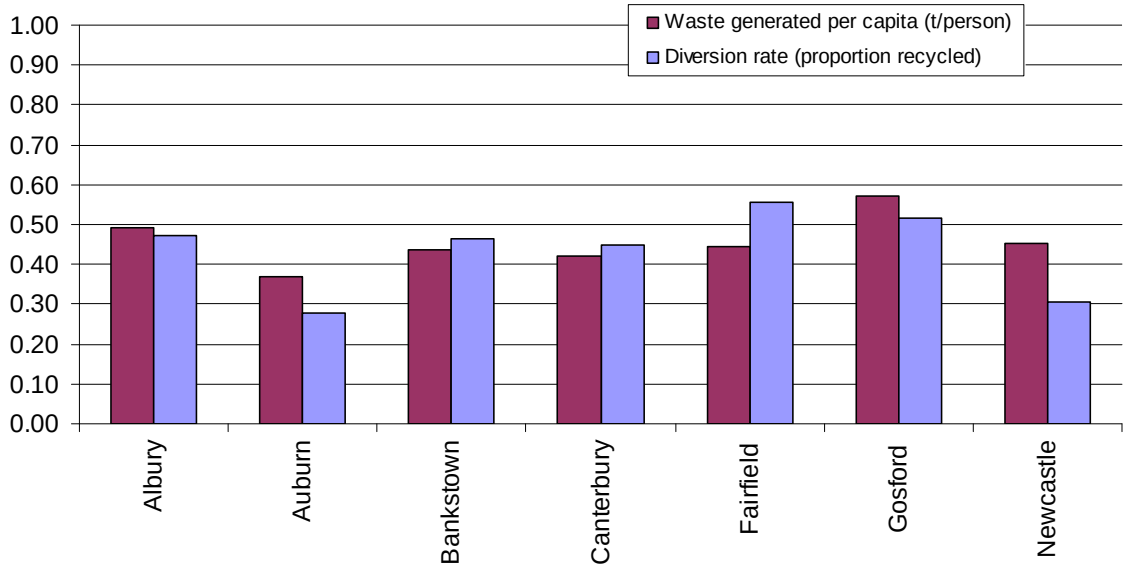
The results of this analysis are outlined in the figures below:

Figure G4 – Cluster 1: Urban and high income LGAs



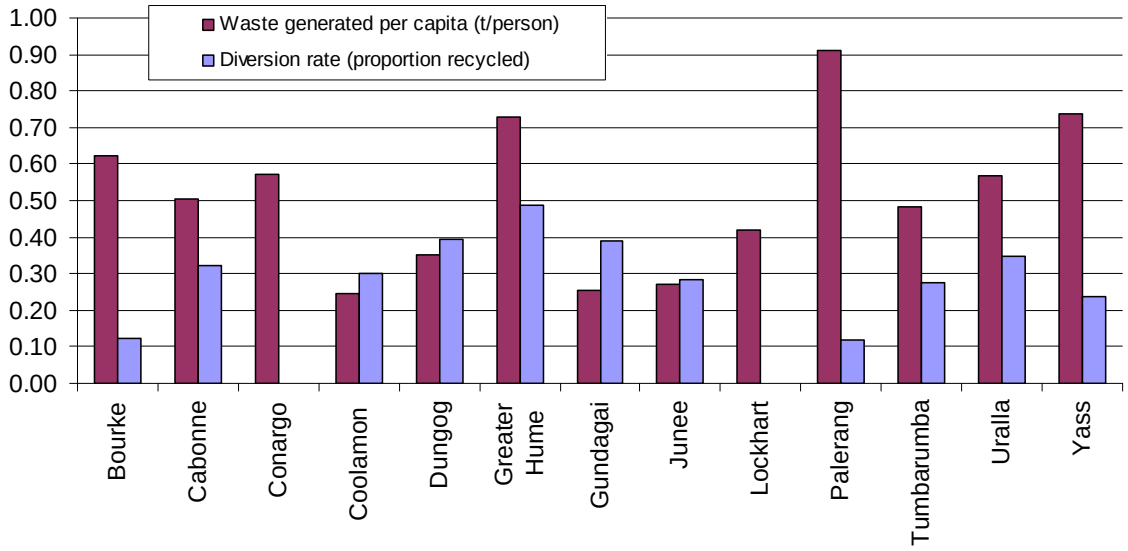
Criteria	Level	Measure
Population density	High	> 1,000 persons per square kilometre
Proportion of MUDs	High	> 50% of total dwellings
Income	High	> $1,000 gross weekly household income

Figure G5 – Cluster 2: Urban and medium to low income LGAs



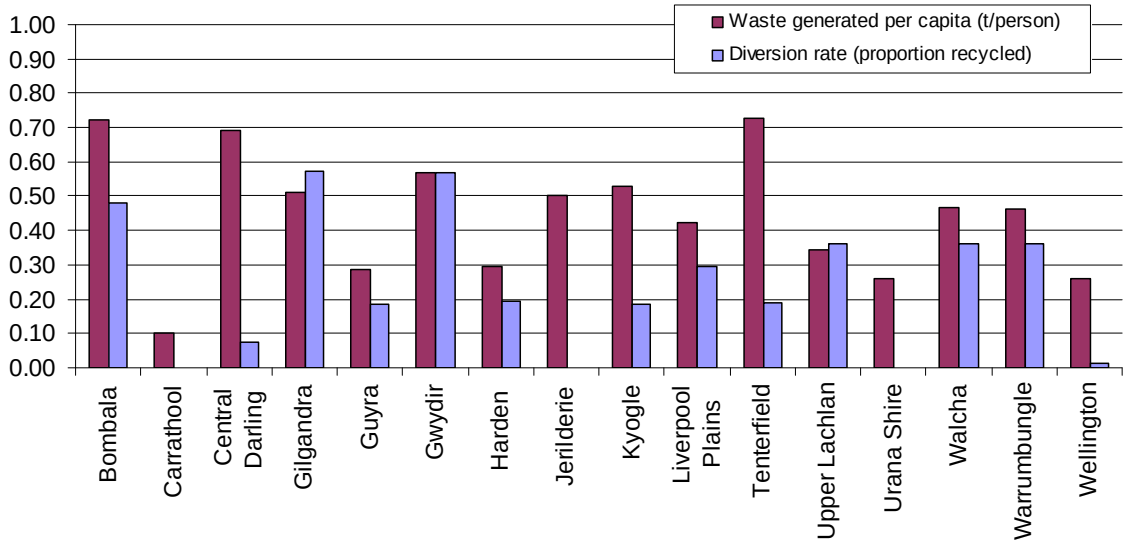
Criteria	Level	Measure
Population density	Med to high	> 100 persons per square kilometre
Proportion of MUDs	Med to high	> 20% of total dwellings
Income	Med to low	< $1,000 gross weekly household income

Figure G6 – Cluster 3: Rural and medium to high income LGAs



Criteria	Level	Measure
Population density	Low	< 5 persons per square kilometre
Proportion of MUDs	Low	< 5% of total dwellings
Income	Med to high	> $700 gross weekly household income

Figure G7 – Cluster 4: Rural and low income LGAs



Criteria	Level	Measure
Population density	Low	< 5 persons per square kilometre
Proportion of MUDs	Low	< 5% of total dwellings
Income	Low	< $700 gross weekly household income

This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix H – Waste and environment levy

Part 1 – About the waste and environment levy

What is the levy?

The waste and environment levy (the levy) is one of the key policy tools used in NSW and many other jurisdictions around the world to drive waste avoidance and resource recovery. Section 88 of the POEO requires the occupier of a licensed waste disposal facility (or treatment facility in the case of liquid waste) to pay the levy on all waste received at certain waste facilities. Deductions apply for all waste that is lawfully taken off-site for recycling or reuse. Details regarding the timing, manner and amount of payment are specified in the Protection of the Environment Operations (Waste) Regulation 2005.

The levy works by increasing the cost of waste disposal. It sends an important price signal to different parts of the waste market that dumping waste in landfills is the least preferred waste management option. It encourages waste generators to review their practices so as to decrease their costs attributable to the disposal of waste. It encourages waste generators to minimise generation of waste and seek recycling options for their waste or be prepared to pay more. It also encourages the resource recovery sector by making resource recovery alternatives more viable.

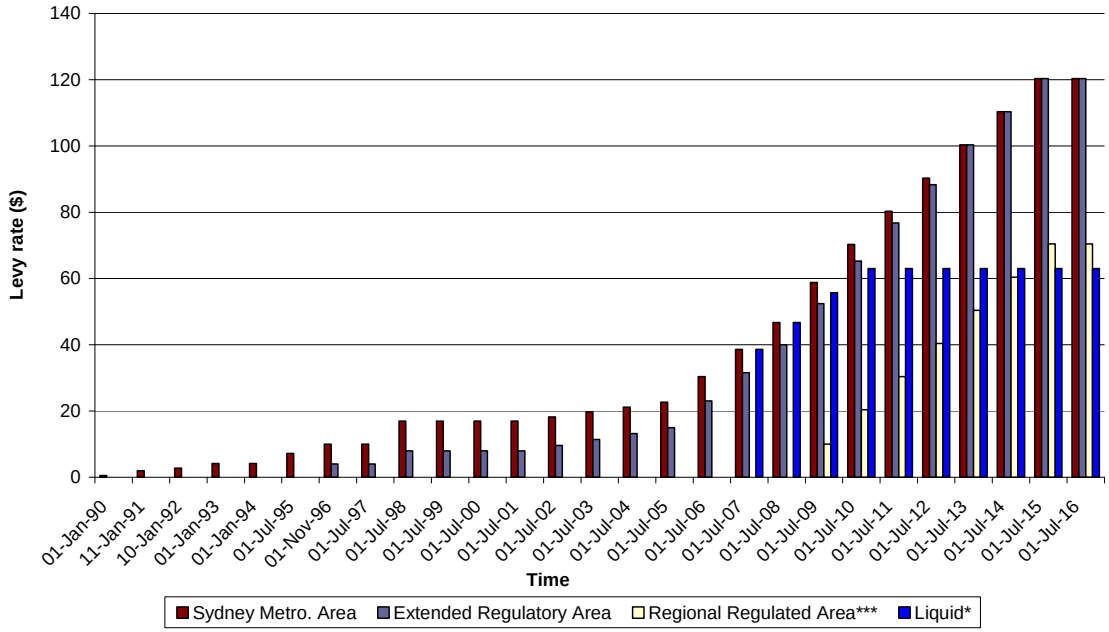
How much is the levy?

In Sydney, the levy commenced at $0.51 per tonne in 1971. The levy is scheduled to increase annually until 2015–16, by which time the levy will have reached about $120 per tonne in today's dollars in the Greater Sydney Region. Figure 1 below presents the actual increase in levy rates from 1989 through to 2010–11 and scheduled increases to 2016–17 in today's dollar terms – for the SMA, the ERA (which includes the Hunter, Illawarra and Central Coast), the RRA (which includes the Blue Mountains, Wollondilly and 19 councils in the north-east of NSW), and for liquids.

In NSW, a flat levy rate is charged on solid waste regardless of the type of waste. However, the rate differentiates across these three geographical regions. The levy rates for 2010–11 are $70.30 per tonne in the SMA, $65.30 per tonne in the ERA and $20.40 in the RRA. The levy rates are scheduled to rise progressively to about $120 per tonne in today's dollars in the SMA and ERA, and $70 per tonne in the RRA by 2015–16. The waste levy on trackable liquid waste applies statewide and has peaked at $63 per tonne in 2010–11; it will only be adjusted for inflation.

Figure H1 below shows the levy rate history and projected increases to 2016.

Figure H1 – Waste and environment levy rate: 1989 to 2016 (history and projected, without CPI from 2011–2012)



How does the levy work as an economic instrument?

The levy works as an economic instrument by increasing the cost of waste disposal. Without a disposal levy, the environmental and social costs associated with landfilling would be ignored, leading to an under-pricing of landfill disposal. The externalities associated with landfill include:

- harm to the environment – leachate pollution of ground and surface waters, greenhouse emissions
- amenity or proximity issues – leaking explosive methane emissions, odorous landfill gas, litter, traffic, devaluation in property values
- loss of resources – embodied energy, water, metals etc. that is 'lost' to society through landfill disposal.

Not only has the lack of accounting for externalities made landfilling too cheap, that price failure has also been exacerbated by commercial landfill price cutting that is not always rational.

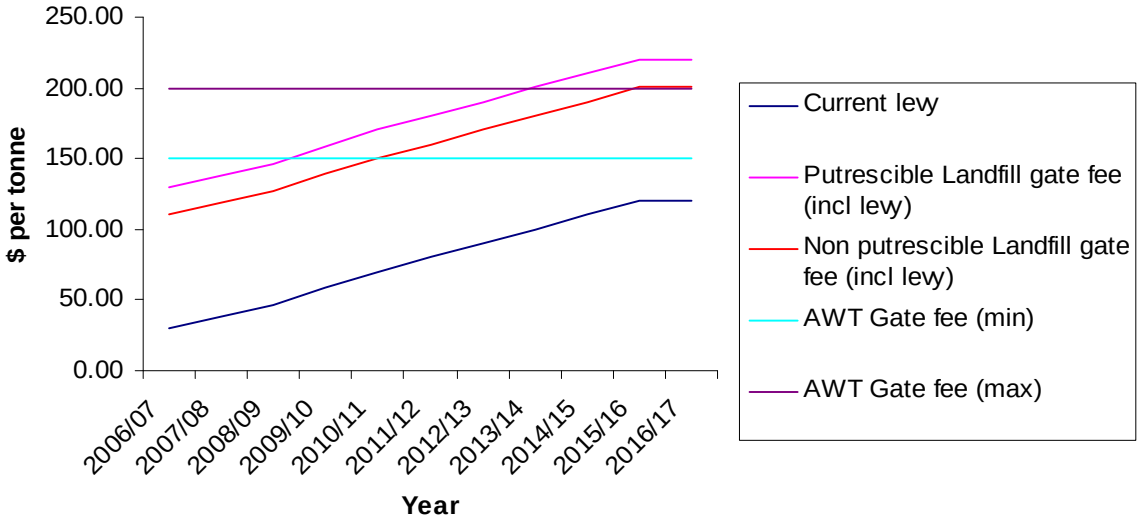
One view is that waste disposal is a benign indicator of productivity. For example, the Productivity Commission was of the view that the cost of these externalities was minimal and could be largely addressed through better landfill management. That view was not accepted by Australian governments.

The levy is also needed to enable the NSW community to meet the WARR Strategy targets. The levy settings are aimed at raising the cost of landfills to a level that delivers sufficient investment in waste avoidance and resource recovery to meet the WARR Strategy and its targets. Despite the levy rate increases that commenced on 1 July 2006, industry had strongly indicated to the NSW Government that there remained a significant pricing gap for the bulk of waste streams. This pricing gap meant that landfilling still remained relatively cheap when compared to recycling costs, despite the

then levy rate. Effectively, industry was not prepared to invest in resource recovery infrastructure, particularly for commercial waste, when it was still cheaper to dispose of that waste to landfill.

Figure H2 below shows how lower landfill prices have a significant cost advantage in the market place against resource recovery for both municipal and C&I waste.

Figure H2 – Relationship between landfill gate fees (including the annual legislated waste levy and CPI increases) and AWT gate fees

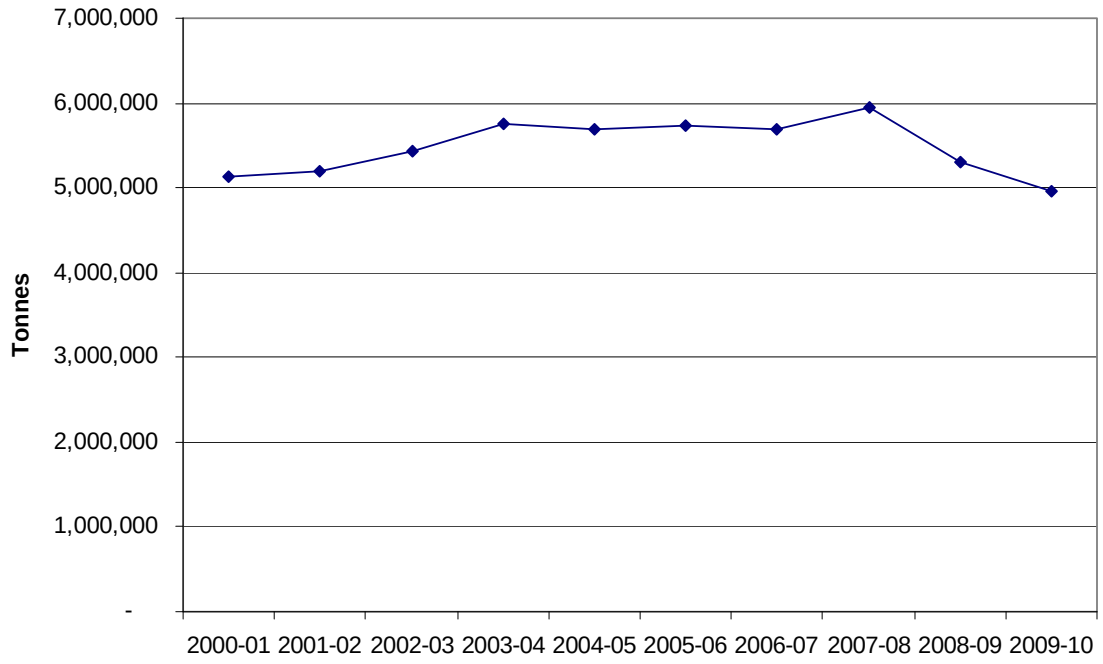


The waste levy increases have been designed to address this market failure. As the levy increases, more recycling technologies should 'come online' as waste disposal costs reach a level which makes them cost-competitive against landfills. The scheduled increases in the levy have provided industry with the security to invest in resource recovery infrastructure and new systems.

The reality – is the levy working to increase waste avoidance and resource recovery?

Overall waste disposal is declining. Figure H3 below shows that waste disposal costs reached a plateau after 2003–04 and have declined since 2007–08.

Figure H3 – Total waste disposal 2000–01 to 2009–10



However, other factors also influence waste avoidance and resource recovery from waste, including population change and economic activity which have an impact on waste generation. Economic activity, commodity prices and the cost of finance influence investment in and viability of waste avoidance and recycling infrastructure.

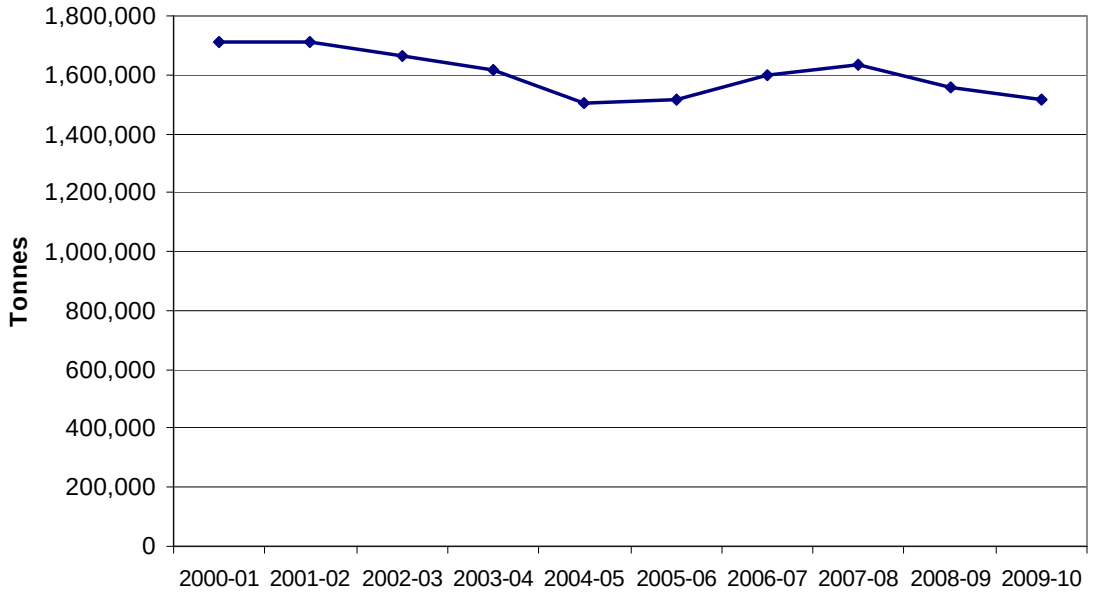
Another complication in evaluating success is that the waste avoidance and resource recovery outcomes cannot be readily evaluated due to lack of reliable data. However, waste disposal is a useful but indirect and inverse surrogate indicator of waste avoidance and resource recovery, i.e. a low level of waste disposal indicates a high level of waste avoidance and resource recovery. As a result of the levy and legislative reporting requirements for waste disposal facilities, NSW has the most robust waste disposal data of any of the Australian jurisdictions. The data shows that total waste disposal has declined slightly over the past ten years, down 3% since 2000–01, despite growth in population and economic activity. (In this discussion, waste disposal data excludes VENM and includes only the Greater Sydney Region, comprising the SMA and ERA.)

Does the levy work in each of the waste streams?

Figures H4, H5 and H6 below show the trends in disposal for the three main waste streams. Waste disposal in the municipal and C&I sectors has declined since 2000 despite increases in population growth and State Final Demand. While C&D waste increased significantly from 2000–01 up until 2003–04, it has more recently declined at the same time as recycling rates have increased dramatically.

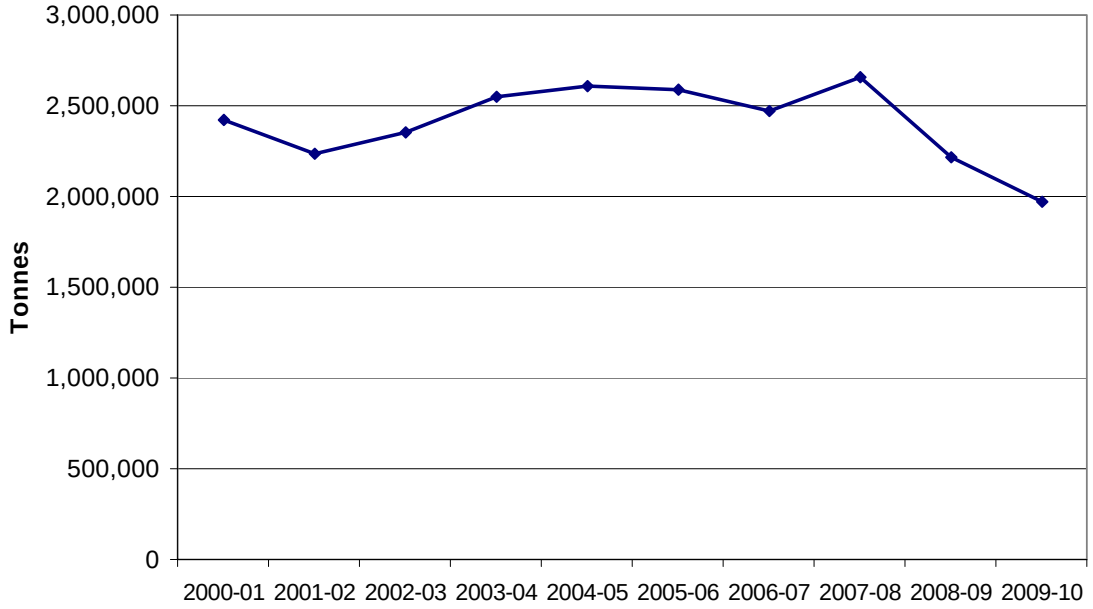
Municipal: Waste disposed to landfill from the municipal sector (Figure H4) has declined since 2000 by over 10%, despite growth in population between 2000–01 and 2008–09 of 9% and an increase in household final consumption expenditure of 30% (adjusted for CPI) in the same period.

Figure H4 – Municipal solid waste disposed to landfill



Commercial and Industrial: C&I waste disposed to landfill (Figure H5) has declined almost 20% between 2000–01 and 2009–10, despite an increase in State Final Demand (all government, private sector and household final consumption expenditure and gross fixed capital formation) of over 30% between 2000–01 and 2008–09 (adjusted for CPI).

Figure H5 – Commercial and industrial waste disposed to landfill



Construction and Demolition: C&D waste disposed to landfill (Figure H6) has increased by almost 50% since 2000–01. However, estimated recovery rates in 2008–09 were 73% (the target in the WARR Strategy is 76%), where recovery rates = estimated recovery tonnages / (waste disposal tonnages + estimated recovery tonnages).

Figure H6 – Construction and demolition waste disposed to landfill

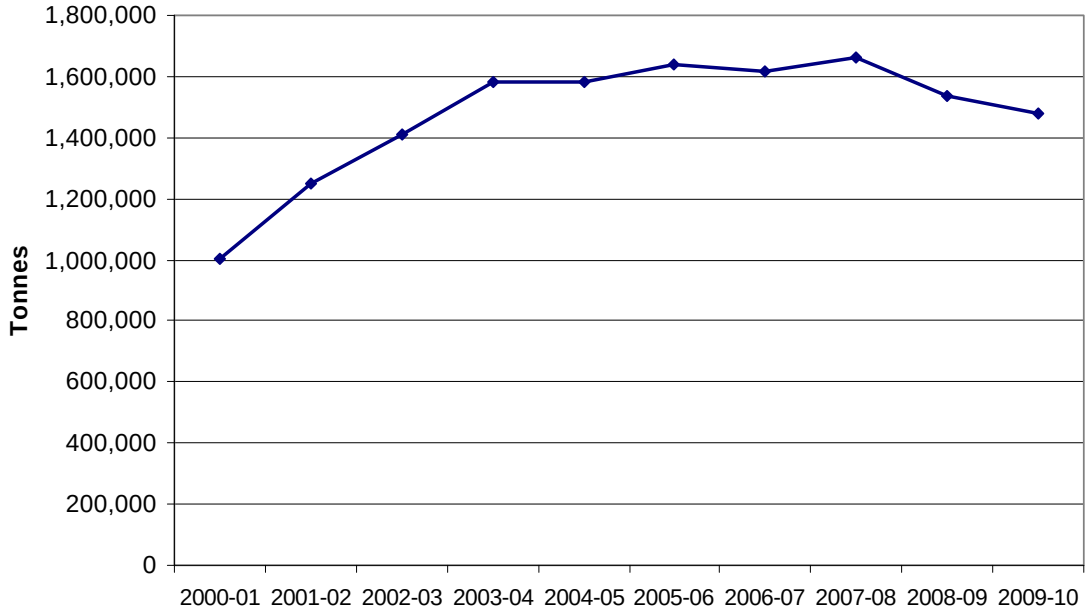
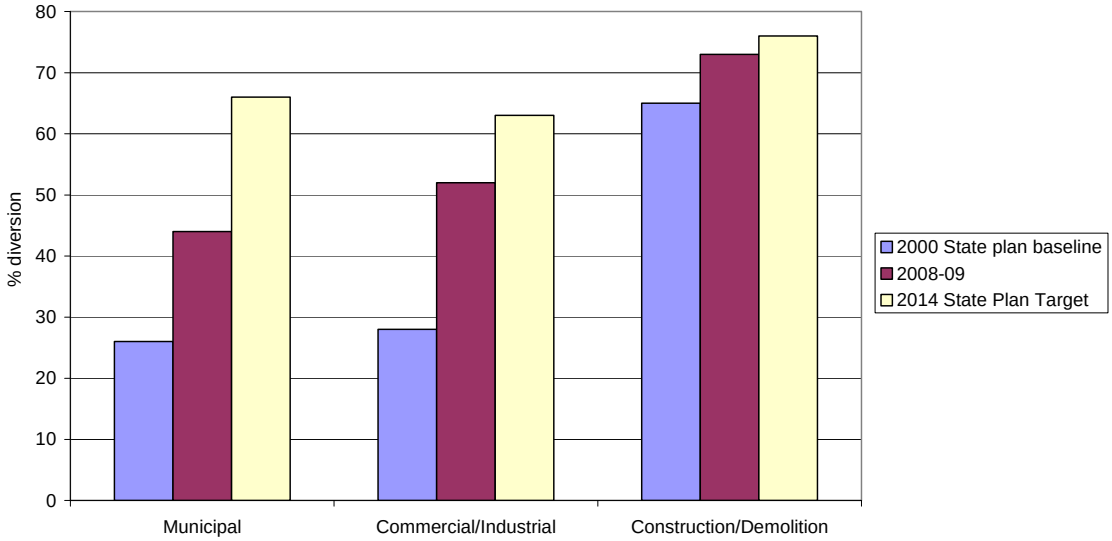


Figure H7 shows recycling rates for the three main waste streams against the WARR Strategy targets (State Plan targets).

Figure H7 – Recycling rates and targets for the three waste streams



How is the levy signal passed on in each waste sector?

The effectiveness of the levy is premised on the basis that there is a direct relationship between the amount of waste disposed of by waste generators and recyclers, and the cost of disposing of that waste. Another factor is the relative importance of waste disposal costs to a particular business. If waste disposal is a trivial cost to a business, it might not be worthwhile to make an effort through waste avoidance or resource recovery action.

In the C&D sector both factors work to reduce waste disposal. Waste is a relatively high cost to this sector. That is partly due to the relatively high bulk density of the waste. There is an incentive for waste generators to use as much material as possible on site before waste is 'generated'. Waste contractors servicing this sector have an incentive to divert waste away from landfill through resource recovery.

The C&I sector is more variable. Some industrial sectors have a strong incentive for waste avoidance and resource recovery, but waste can be relatively unimportant for individual businesses, particularly commercial (who are focused on running their enterprises rather than improving their waste practices). Despite being of minor importance to individual businesses, the quantity of waste across this sector can be considerable due to the sheer size of this sector. The levy is expected to make more of a difference as it approaches the top rate.

In the municipal sector, the levy on MSW is fully passed on to householders but only in an annual fee which is independent of the quantity of waste disposed, but with some variation based on the size of the bins. That is not likely to give much incentive to householders to reduce waste. At best, it may encourage worm farming and home composting. Charging householders by weight with lockable bins for each residence occurs in some European countries but may be problematic in Australia.

Despite the poor signal to householders, the economic signal works at the council level where councils can either choose to pay the levy on disposal or pay for resource recovery action (up to the same level as disposal without needing to charge their ratepayers more). Councils are encouraged by the levy to either actively promote recycling or invest in recycling infrastructure in an effort to keep council rates as low as possible. For example, conservative estimates place the proportion of household waste attributable to compostable organic food waste at 35%. Councils may therefore decide to initiate waste strategies and undertake programs such as:

- encouraging worm farms or home composting to drive organic material out of the waste stream and reduce costs associated with the disposal of household waste
- engaging directly or through contractors in either:
  - source-separated collection of kitchen and garden waste and composting for largely unrestricted use
  - AWT processing of mixed wastes, or
  - a combination of both (e.g. Coffs Harbour).

What happens to the revenue collected by the levy?

Levy funds have enabled the NSW Government to deliver some of the State's longer term environmental priorities, namely, the City and Country Environmental Restoration Program ($439 million for five years from 2006–2011).

This Program has already supported:

- establishment of two new marine parks
- waste and sustainability payments for local government
- $105 million to buy back water for the environment
- $80 million in urban sustainability grants for local government, in partnership with local businesses and communities
- $18 million for a major crackdown on illegal dumping
- $13 million for purchase of perpetual Crown leases on land with a high conservation value
- the Native Vegetation Assistance Package, providing innovative socio-economic assistance to help farmers adjust to land-clearing laws.

Specific benefits of levy revenue to councils

The LGSA and the NSW Government are committed to the City and Country Environmental Restoration Program, including the levy framework. A Memorandum of Understanding (MOU) regarding the levy was signed in May 2006 and again in early 2009 between the Associations' Presidents and the then Environment Ministers. The MOU includes arrangements for direct sustainability improvement payments to councils, totalling $256 million over seven years. Payments are made to councils in the levy paying areas that commit to improving waste management and recycling service performance.

In 2009–10, the NSW Government has provided over $49 million to councils and local community groups for environmental measures, including:

- $21.2 million for waste and sustainability improvement payments and environmental sustainability outcomes ($29.4 million in 2010–11)
- $19.7 million to councils for local Urban Sustainability Projects, awarded through a competitive grant program
- $4 million for local community and local government environment restoration and community education
- more than $2 million to local government regional waste groups and anti-dumping squads
- $1.5 million for household chemical clean-ups conducted with councils
- more than $600,000 for local Aboriginal land and community clean-ups, local small business programs, guidance on sustainable purchasing and organic recycling support.

Would a differential levy be better?

A differential levy could theoretically provide additional incentives for waste reduction for, or within, a particular waste stream and was considered as an option as part of the 2008 waste levy increases.

One problem that a differential levy could address would be the amount of organic (food and garden waste) that is lost to landfill in the municipal and the C&I waste streams. It could clearly improve the viability of AWT facilities by providing a differential (lower) levy on the disposal of non-putrescible waste generated by such facilities. While these facilities are not levied on the waste they receive, their residual waste is levied when it goes to landfill. At present, where that waste has been rendered to be non-putrescible, it can go to commercially cheaper non-putrescible waste landfills, but still attracts the full levy. The levy is designed to encourage such facilities to maximise the organic output stream and thus minimise the residual waste stream to avoid landfill and levy costs. Unfortunately, that not only encourages efficiency and innovative recovery systems but may also have led to high levels of contaminants in the organic outputs.

At a superficial level, a differential levy initially appeared to be attractive as a means of further differentiating the price signals between municipal, C&I and C&D wastes. However, on further consideration a number of practical barriers to such an approach were identified.

In particular, a differential levy would be difficult to enforce. For example, in the municipal sector there are many small waste generators, all serviced by one company. At the same time, the waste collector at kerbside pick-up has little knowledge of what householders place in their bins. There is also the opportunity for householders to place 'non-accepted' wastes in their neighbour's bins. A differential levy, for example between municipal waste that contains organics (food and garden waste) and one that doesn't would be extremely hard to regulate, has significant opportunities for rorting for financial gain and could result in significant additional costs to either local councils or specific rate payers due to contamination of non-organic loads with organic waste materials.

Furthermore, the more variation within a levy scheme, the more opportunities there are for unscrupulous practices such as finding ways to evade the levy. In 2002 the Independent Commission Against Corruption (ICAC) identified the waste industry as a high corruption risk. The substantial amount of money to be made from operating outside the law and exploiting legal loopholes provides a strong case for simplicity in the waste regulatory framework to enable enforceability. A simple levy system is an enforceable system while a complex levy system will provide an opportunity to exploit the system for financial gain.

Over recent years, DECCW has made several amendments to the Protection of the Environment (Waste) Regulation 2005 to close loopholes that were being exploited by landfill operators to avoid payment of the levy. For example, there are now strict limitations on the use of waste at landfills for operational purposes as some operators were 'using' waste to undertake unnecessary infrastructure works on site (such as excessive cover or noise mounds) to avoid the levy.

Some other practical barriers to a differential levy include that it could:

- allow 'double dipping', as AWT facilities already benefit from the levy at the gate because the levy already makes them more competitive with landfills
- open opportunities for misclassification and levy evasion. Even without a levy differential, the commercial price difference between putrescible and non-putrescible landfills means that the DECCW needs to actively police compliance

- favour AWT facilities rather than the source-separation and composting of kitchen and garden waste by households. This is because the mixed waste stream after source separation is likely to still contain enough organic material to be classified as putrescible.
- reduce the incentive to maximise recycling, if it reduced the levy on the residual waste after AWT processing
- potentially need to be extended to other waste streams e.g. shredder floc from metal recyclers
- substantially reduce levy revenue. However, a cost neutral scheme could be considered in which the rate was increased for some waste streams (e.g. putrescibles) and reduced for other waste streams (e.g. non-putrescibles). That would impact most directly on ratepayers in councils areas that do not take action and there may be demographic factors that influence the ability of some councils to take action.

Part 1 of this paper was prepared by the Department of Environment, Climate Change and Water NSW.

Part 2 – Improving waste levy application and management

Background to the levy

A waste levy has existed in NSW since 1971. Initially applied only in the SMA, it was extended to the Hunter, Illawarra and Central Coast regions (the ERA) in 1996–07 and more recently to north-eastern NSW plus Wollondilly and the Blue Mountains (the RRA) in 2009–10. Table H1 below shows the growth of the levy since 1993.

Table H1 – Increases in the waste and environment levy since 1993

Year	**SMA rate** ($/tonne)	**ERA rate** ($/tonne)	**RRA rate** ($/tonne)
1/1/93	4.20	Nil	Nil
1995–96	7.20	Nil	Nil
1996–97	10.00	4.00	Nil
1998–99	17.00	8.00	Nil
2002–03	18.20	9.60	Nil
2003–04	19.80	11.40	Nil
2004–05	21.20	13.20	Nil
2005–06	22.70	15.00	Nil

Year	**SMA rate** ($/tonne)	**ERA rate** ($/tonne)	**RRA rate** ($/tonne)
2006–07	30.40	23.10	Nil
2007–08	38.60	31.60	Nil
2008–09	46.70	40.00	Nil
2009–10	58.80	52.40	10.00
2010–11	70.30	65.30	20.40
2011–12	80.30 plus CPI	75.30 plus CPI	30.40 plus CPI
2012–16	Further increases of $10 per tonne per year, indexed for CPI		

Impact of the levy

The waste and environment levy has been described by the NSW Government as 'one of the key policy tools used in NSW and many other jurisdictions around the world to drive waste avoidance and resource recovery'. It is designed to send 'an important price signal to different parts of the waste market' (DECCW background paper for the Steering Committee).

However, it is worth examining the relative impact of the levy on the different waste stream sectors. Information was provided to the Steering Committee, at its second meeting, showing that this impact varies between the three waste streams.

There are challenges in attempting to assign 'cause and effect' relationships between the increasing levy and disposal trends in the three waste streams. There are other factors involved, including economic conditions and growth etc. However, it seems apparent that the municipal waste stream has, in the past ten years, displayed the most stability and least elasticity or reaction to increases in the levy and other market forces.

It is therefore questionable whether, in the absence of any other initiatives or drivers, further increases in the levy will lead to any appreciable reduction in the municipal waste stream, which makes up a significant proportion (26 to 35%) of total waste disposed to landfill (% figure taken from DECCW PowerPoint presentation *NSW Waste Strategy – Commercial & Industrial Waste Stream*).

Further, current budget estimates indicate the NSW Government does not envisage any fall in the total levy income during the next four years, as illustrated in Table H2 below, sourced from *NSW Budget Papers 2010–11*. Based on budget estimate forecasts (highlighted in blue), annual rises of between 3.6% and 26.2% per annum are forecast for total income.

Table H2 – NSW Government income from levies 2008–09 to 2013–14

	2008–09	2009–10	2009–10	2010–11	2011–12	2012–13	2013–14
	Actual	Budget	Revised	Budget	Forward estimates		
	$m	$m	$m	$m	$m	$m	$m
Other revenues							
Health insurance levy	133	137	139	145	152	160	169
Insurance protection tax	67	69	69	69	…	…	…
Parking space levy	50	100	101	105	107	111	113
Emergency services contributions	572	591	591	626	617	619	635
Waste and environment levy	245	348	305	385	447	472	489
Government guarantee of debt	179	246	408	544	659	741	796
Private transport operators levy	16	14	13	11	11	11	11
Pollution control licences	46	48	48	50	51	52	54
Other taxes	662	519	357	494	525	542	557
	1,970	**2,072**	**2,031**	**2,429**	**2,569**	**2,708**	**2,826**
Total tax revenue	**17,855**	**18,011**	**18,754**	**20,194**	**21,450**	**22,409**	**23,668**
Annual per cent change	-3.8%		5.0%	7.7%	6.2%	4.5%	5.6%

The two factors at work here to produce these forward estimate figures are the increasing rate of the levy per tonne, and the reduction in the tonnages on which that rate is based. In colloquial terms, 'the rate goes up, the tonnes go down, and the net result is that total revenue increases as per the forecasts'. However, it seems clear that of the three waste streams, municipal waste will be less responsive (if at all) to increasing levy rates per tonne. The net effect of this is that municipal waste will contribute an increasing proportion of total levy payments in the future.

The policy dilemma

We are faced, to some extent, with an unintentional conflict in government objectives:

- the maintenance of income to NSW Treasury from the waste and environment levy (as clearly demonstrated by budget estimates) and
- the reduction of waste, on which that levy depends, in accordance with the NSW Government's WARR targets.

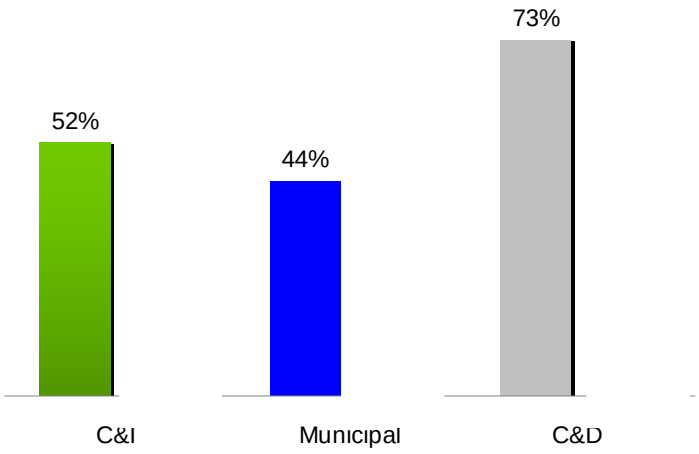
The solution may be to either restructure or disburse (hypothecate) part of the levy in such a way that it:

- maintains the net income to NSW Treasury, and, simultaneously

- reduces waste in those streams where opportunities exist to create a more discernable downward trend.

The municipal waste stream, comprising 26 to 35% of the total waste stream, is a sector where there could be significantly more investment to bring about a reduction in waste and greater diversion rates, and where the increasing levy is having no apparent effect. The data provided to the Steering Committee at meeting #2 (see Figure H8 below) shows that recovery rates for municipal waste, at 44%, are significantly lower than other streams, at 52% (C&I) and 73% (C&D).

Figure H8 – Recovery rates from the three waste streams (2008–09)



Current rates of hypothecation and investment for initiatives to address the municipal waste stream

The amount of funding hypothecated to local government from the waste levy is in two parts: statutory and discretional. Firstly, it involves a statutory commitment to distribute Waste and Sustainability Improvement Payments (WaSIP) in accordance with the Protection of the Environment Operations (Waste) Regulation 2005 as amended in late 2008:

Table H3 – Waste and Sustainability Improvement Payments

	SMA/ERA($m)	RRA ($m)
2009–10	19.8	1.4
2010–11	26.6	2.8
2011–12	32.8	2.0
2012–13	36.2	2.5
2013–14	38.8	3.0
2014–15	40.5	3.5
2015–16	42.6	3.9

These WaSIP payments to councils must be applied to waste and sustainability-related initiatives, as determined by DECCW in consultation with LGSA.

Source: POEO (Waste) Regulation 2005 as amended.

Secondly, it involves a discretionary amount, consisting of funding programs which are available to local councils and community groups.

Based on municipal waste contributing approximately 26%–35%, say 30% of the total waste levy income of $305 million (i.e. $91.5 million), these total payments of $49 million ($21.2 million WaSIP payments and $27.8 million discretionary payments) to councils and community groups in 2009–10 represent a hypothecation rate for municipal waste levies of 53.5%.

Future options

The paper provided to Steering Committee meeting #2, *Preliminary Paper on the Waste and Environment Levy,* explored in some detail the potential for differential levies on different waste streams. It is acknowledged that a source-based differential waste levy does present some challenges, due to a number of factors including the lack of clear delineation, in some circumstances, between, for instance, municipal and C&I waste.

However, there may be merit in further exploring the potential for differential levies based on waste composition rather than source, which may, for example, act as a significant driver for garden waste diversion from the municipal waste stream. A lower levy rate on waste which is 'uncontaminated' by garden waste for instance would act as an incentive for councils to establish and maintain high quality garden waste collection services. A similar principal could theoretically be applied to encouraging food waste diversion. However, the practicalities of this type of differentiation need to be explored with councils and the waste industry. These types of incentives and sanctions can only be workable where there are practical options available to address them.

A higher rate of hypothecation of the levy collected on municipal waste (up from its current 53.5%) may be worth exploring. Taking the hypothecation rate for municipal waste from 53.5% to 100%, for example, would involve an additional financial commitment from the NSW Government of $45 million (on top of the current $49 million outlined above).

In order to ensure 'cost neutrality' for NSW Treasury (i.e. maintenance of income as per budget estimate forecasts), there would need to be offsets in other areas of waste program expenditure. Further, as the waste reduction programs funded by this level of hypothecation begin to bear fruit (through lower waste tonnages), there may need to be further adjustments to the levy rate on the declining residual waste stream to ensure ongoing income 'neutrality' to NSW Treasury.

The additional $45-million investment would allow further initiatives, such as the following, to be explored in the municipal waste sector:

- research into collection and processing systems for food waste and garden waste and trialling of these systems
- seed and investment funding for regional recovery facilities (AWTs)
- educational programs focusing on behaviour, to reduce waste 'at source' and improve community consumption and recycling behaviour
- investment in recycling infrastructure (local council and joint venture) along the lines proposed by the National Recycling Initiative (NRI).

Any such additional funding would need to be ‘tied’ to waste and sustainability-related initiatives with a demonstrated sustainability (waste reduction) outcome.

Conclusion

The waste and environment levy in its current form is a blunt instrument whose real effectiveness as a waste reduction tool is variable across the different sectors of the waste stream. By applying a greater level of sophistication to its design (possibly through differential application) and management (through judicious hypothecation for targeted waste streams and initiatives), it may be able to be made a great deal more effective at achieving its primary aim (an economic incentive to reduce and divert waste) while still ensuring it maintains an income stream to NSW Treasury to fulfil the NSW Government’s broader environmental and social objectives.

Part 2 of this paper was prepared by the Local Government and Shires Associations of NSW.

Appendix I – Funding of waste technology and infrastructure

There are a variety of market and non-market mechanisms that can be used to directly fund, or drive funding of, the technology and infrastructure which is necessary to stimulate waste (resource) recovery.

Direct funding mechanisms (other than direct commercial investment) include:

- grants funded by government from consolidated revenue, or via levies or 'green bonds'
- other government financial incentives
- public–private partnerships and joint procurement or contracting models.

Mechanisms that could potentially drive additional funding include:

- landfill bans
- tradeable permit schemes.

Government grants

Government grant programs can be used to develop new infrastructure. For example, in 2007–08, Sustainability Victoria's Towards Zero Waste Commercial and Industrial Resource Recovery Infrastructure Grants Program, funded from a waste levy, provided grants of up to 33% of capital costs to a maximum of $500,000 for any single project. In March 2010 the Victorian Government announced a $53.7-million program to address waste, funded from a waste levy over the next five years.

The South Australian Government has provided $800,000 for the Recycling at Work grants program (with funding from the National Packaging Covenant) which provides support for collection containers and pays a per-tonne subsidy for each tonne of recyclables recovered. South Australia also ran the Metropolitan Infrastructure Grants program in 2008–9 with a $700,000 fund financed by Zero Waste SA, which is fully funded by a waste levy.

The NSW Waste Management Association of Australia has tabled a proposal for a $20 million per year fund for three years to address C&I sector recycling in NSW. The National Recycling Initiative (NRI) has proposed that $20 to 40 million per year for five years is required for investment in the Australian recycling industry.

Mechanisms such as 'green bonds' could also be used to finance capital investment in environmentally sound waste management infrastructure. A variety of green bond schemes have been used to finance environment-related programs in the US and Europe and similar instruments could be applied to waste recovery operations.

Other government financial incentives

There are a number of government financial incentives that could be applied to help fund technology and infrastructure such as accelerated depreciation, subsidised loan interest rates and residual value guarantees on leased equipment.

These mechanisms have been used successfully in other countries, e.g. the WRAP program in the UK which offers residual lease value guarantees for recycling infrastructure under its eQuip scheme.

Landfill bans – European Union examples

Legislated bans on waste to landfill do not directly fund new waste treatment options, but act to drive investment in them because resource management companies can invest in alternatives to landfill with confidence in the economic availability of input waste. Bans on the landfilling of biodegradable waste have been in force in Europe since the 1990s, with resulting sharp decreases in quantities of waste landfilled.

Landfill bans are supported by ancillary legislation, which includes mandatory source separation of organic wastes and recyclable waste fractions, and regulations controlling the quality and applications of compost derived from source-separated organic waste.

The European Union's (EU) Landfill Directive issued in 1999 was a milestone in EU waste policy, introduced to address concerns about landfill capacity and growing awareness of landfills' environmental impacts, notably emissions of methane and other gases, and pollution of groundwater, surface water and soil. The Landfill Directive set targets for progressively reducing the amount of biodegradable municipal waste (in the EU context this includes commercial waste as well) landfilled in the period to 2016. Member states have widely implemented regulations for mandatory separation at source and collection of recyclable waste materials, in order to meet their obligations.

These regulations generally mandate municipal authorities to provide the infrastructure and services necessary to separately collect specified recyclable waste materials from households and commercial enterprises within the municipal jurisdiction. In several countries, separation at source is further encouraged through regulations on the type of waste material that can be received at pre-treatment facilities – e.g. no recyclable materials. These regulations are enforced through monitoring and fines targeted at facility operators.

Under the Landfill Directive, all waste must be treated before being landfilled and there are landfill restrictions and bans on biodegradable waste. Member states were required to reduce the amount of biodegradable municipal waste going to landfill:

- to 75% of the total amount of biodegradable municipal waste generated in 1995 by 2006, and
- to 50% of 1995 levels by 2009

and are required to reduce this to 35% of 1995 levels by 2016.

To comply with the provisions of the EU's Landfill Directive, countries have introduced various measures to increase the cost of landfilling, resulting in substantial increases in landfill gate fees. However, there have been unexpected outcomes of EU landfill bans including sham recovery operations, the export of wastes across national borders and landfill bans used to ensure incineration profitability.

Tradeable landfill permit schemes – United Kingdom example

The Landfill Allowance Trading Scheme (LATS) is England's main mechanism for diverting biodegradable municipal waste (BMW) from landfill, and therefore also acts to

drive investment in infrastructure and technology. Under LATS, landfill allowances are allocated to each waste disposal authority (WDA) at a level which will enable England to meet it targets, as a contribution to the UK targets under the EU Landfill Directive. One allowance represents one tonne of BMW that can be landfilled. Allowances convey the right to landfill a certain amount of BMW in a specified year. WDAs may bank their allowances or borrow from their future years' allowances (with restrictions), or buy from and sell allowances to other WDAs to comply with targets. WDAs that dispose of more waste than their allowance and do not buy allowances to offset this are fined a £150/tonne (approximately AUD $260/tonne) fixed penalty for each tonne that is disposed over their allocation limit.

There has been a downward trend in the amount of BMW sent to landfill since the introduction of the LATS in April 2005. In 2007–08, 10.6 million tonnes of BMW were landfilled, and all WDAs held sufficient allowances to cover their landfilled BMW. This suggests that England will meet its first target (that BMW landfilled should not exceed 75% of BMW produced in 1995) in 2009–10.

Public–private partnerships and joint procurement and contracting models

This is one mechanism for local authorities to procure infrastructure assets in partnership with the private sector. These would involve long-term fixed price contracts with private sector contractors to deliver services to specified performance standards. The risk is transferred to the private sector in return for these guaranteed long-term contracts.

The United Kingdom's Private Finance Initiative [5]

In the UK, local authorities have statutory responsibility for municipal waste disposal. The Department for the Environment, Food and Rural Affairs (Defra or 'the Department') has a national strategy for waste disposal which includes plans for meeting the EU Landfill Directive targets in England. To meet the targets, local authorities need to invest in new waste infrastructure.

Local authorities decide the form of procurement for their waste infrastructure projects. The Private Finance Initiative (PFI) is one of the main mechanisms through which local authorities can procure assets in a value-for-money way in partnership with the private sector. It is a procurement methodology for asset-based services. Long-term fixed price contracts are entered into with private sector contractors to deliver services to specified performance standards.

Where authorities procure projects under the PFI, central government financial support, known as PFI credits, is available for approved projects. The PFI credit is an undertaking that central government will give annual grants to the value of the PFI credit to help local authorities service the cost of the projects.

So far, 18 local authorities have signed PFI contracts with a combined capital value of £1.6 billion. Defra has allocated around £750 million of PFI credits and in the Comprehensive Spending Review 2007 it received a further provisional allocation of £2 billion for waste projects.

PFI contracts are expected to cover around 80% of the waste processed by new infrastructure coming into operation by 2013. However, some local authorities use other types of procurement for these projects. For instance, more generally – not just in the UK – there are other opportunities for local authorities to cooperate at a regional scale to jointly procure services and infrastructure through joint negotiations and contracting with larger infrastructure service providers, or by jointly funding infrastructure. These other procurements account for most of the UK deals expected to close in 2008–09 and 2009–10 in the UK. In the UK, the non-PFI procurements are mainly small capacity projects, but PFI continues to be used for the larger projects.

The Defra Waste Infrastructure Delivery Programme (WIDP), a sponsored team of expert advisers, helps local authorities buy the best services and facilities in the most cost effective way (including use of the PFI). They have access to high quality, dedicated support to advise them throughout the complex process of procuring major infrastructure – e.g. on technology choice, funding mechanisms, procurement processes and contract negotiations. The team is also encouraging new entrants to the waste management market. The flow of large transactions is handled in an orderly fashion, so that procurement takes place in as competitive an environment as possible.

The scale of procurement of residual waste infrastructure takes account of changes in expected waste arisings and recycling levels while ensuring that meeting England's share of Landfill Directive targets can be safely assured.

[5] The information contained in this part of the paper has been drawn from the UK Government website – www.defra.gov.uk/environment/waste/localauth/funding/pfi/ – text is reproduced substantially in the same form.

Integral to WIDP's objective of accelerating the delivery of residual waste infrastructure is a comprehensive package of guidance relating to the delivery of PFI waste projects. This includes planning guidance (published in August 2007) and the development of the WIDP residual waste procurement pack.

A previous National Audit Office report *Reducing the Reliance on Landfill in England* (HC1177 2005-06) examined Defra's initial response to the EU Directive.

Local authorities are subject to inspection by the UK Audit Commission which published in September 2008 *Well disposed: Responding to the waste challenge*. The Audit Commission's report focused on the local authorities' approach to the problem of BMW being sent to landfill.

UK Audit Commission findings

Managing the programme

1 *The risks faced by waste infrastructure projects are different from those found in other PFI infrastructure projects***.** They include: uncertainty over the volume of future waste throughput; planning permission difficulties due to concern by residents about the nature of the facilities being proposed; the risks of different types of waste treatment technology; and finding markets to sell products from waste treatment. PFI projects require interfaces between central and local government and sometimes between neighbouring local authorities. The supply side of the market was relatively undeveloped until recently and mainly focused on waste collection and landfill.

2 *The Department initially responded too slowly to these challenges.*

The EU Directive in 1999 created a need for a strategy for significantly increasing diversion of waste away from landfill. Before 2003 the Department's strategies lacked practical plans for reducing reliance on landfill. Only then did the Department start to address the complex issues involved in building new waste treatment infrastructure. As a result, the market for waste infrastructure projects developed slowly. Only two of the new waste infrastructure projects developed since the EU Directive (1999) have completed construction of all planned assets.

3 *The Department has improved* its *approach to building a market for new waste infrastructure projects***.** In July 2006, the Department established a delivery unit, the Waste Infrastructure Delivery Programme (WIDP), to accelerate the delivery of waste infrastructure and to provide greater support to local authorities undertaking the projects. WIDP comprises staff from Defra, Partnerships UK and 4ps, who are managed as a single unified team led by the Defra Programme Director. WIDP currently has around 30 staff. The WIDP team has made considerable progress since 2006 in developing the market, including an increasing focus on energy from waste solutions. It has also sought to achieve value for money through agreeing with the market PFI contract terms relevant to waste projects and by improving oversight of the projects.

4 *The actions implemented by WIDP have accelerated the rollout of new, larger projects with more contractors interested in bidding for these projects.*

Nine new contracts were signed in the two years to March 2008. At the time of our audit, June 2008, the Department had a pipeline of 19 other projects to be advertised in the next three years. The Department has been focusing on larger projects. Projects currently in procurement will, on average, process over twice as much waste as past contracts. The Department has also encouraged local authorities to secure economies of scale by promoting joint projects between neighbouring authorities. There was initially a small number of bidders but the Department's actions have helped stimulate bids from companies not previously involved, including overseas companies.

5 *The cost of finance reflects the risks of waste projects and, in recent times, uncertainties in the financing markets*. The risk margin for debt finance is higher for waste PFI projects than other PFI projects such as hospitals or schools. This margin reflects the complex risks of the waste projects. Also, lenders are not yet able to draw confidence from a flow of successful operational projects. In addition, all PFI projects have been facing higher financing costs in 2008 because of the uncertainties in the financial markets. In the longer term, there may be opportunities for the private sector to secure refinancing gains if these risks reduce. The Treasury has introduced a sliding scale whereby the public sector is now entitled to up to 70% of refinancing gains on all PFI contracts signed during the current disruption to the credit markets compared with the previous normal arrangement of 50%.

Delivering projects

6 *There are long lead times for developing projects and bringing the assets into operation***.** It takes five to nine years to develop projects and bring assets into operation. Delays can occur prior to contract award and in bringing the new facilities into operation. Prior to contract award, PFI projects have been delayed by an average of 19 months compared to the original timetables. Some delays occur because projects need to improve their business cases to gain central government approval. The current difficulties in the financing markets are also delaying large deals. Some projects have, however, been funded by contractors out of existing financial resources giving the prospect of faster deal closure. After contract award, delays have occurred because some projects have encountered difficulty in obtaining planning permission.

Oversight of projects to ensure value for money

7 *The Department has improved the oversight and support available to local authorities***.** The Department, through WIDP, has strengthened its oversight of projects. This action is aimed at reducing delays and achieving better deals. The Department has developed a range of guidance. WIDP is providing practical support by placing experienced commercial staff (known as Transactors) in procurement teams. The Department has also strengthened its quality assurance processes for scrutinising and challenging authorities' projects.

8 *There is now pressure on the fulfillment of the EU landfill targets.* The Department's slow start to programme management and the long timescales

needed for bringing these complex projects into operation has created pressure on the EU landfill diversion targets.

Based on current data:

a) it is likely that the 2010 target for landfill reduction will be met.

b) the 2013 target is challenging. It will not be met if there continue to be programme delays or the infrastructure built does not work as efficiently as expected. If the 2013 target is missed the EU is expected to levy fines on the UK, although the EU has yet to announce the rate of such fines. Central government has said that it will levy a fine of £150 per tonne if local authorities fail to meet their 2013 landfill targets.

c) It is harder to assess whether the 2020 target will be met. The likelihood of meeting the target will depend on two factors: success of the PFI investment programme; and efforts by local authorities and consumers to produce less waste and recycle more.

d) Achievement of the landfill targets is also dependent on bringing into operation the increasing proportion of projects which local authorities are carrying out under non-PFI procurements. As central government funding support is not given to these projects there is at present no requirement for local authorities to submit information about these to the Department. Without this information the Department's ability to monitor progress is limited.

Our value for money conclusion

9 *The Department has allocated around £750 million worth of PFI credits to local authorities undertaking PFI waste infrastructure projects and in the Comprehensive Spending Review 2007 it received a further provisional allocation of £2 billion*. Achieving value for money from this commitment depends on whether: enough PFI facilities are delivered to meet EU landfill targets; the deals give the prospect of value for money; and the projects are subsequently managed well in operation. The Department was initially slow to address these issues and prior to 2006 few new PFI facilities were delivered. Since 2006, the Department has adopted a programme management approach which has developed the market and achieved a more rapid flow of new and larger PFI contracts. It has strengthened its arrangements for oversight of, and support to, local authorities who enter into waste PFI contracts. England is likely to meet its 2010 landfill reduction targets but to meet the 2013 target the Department will need to reduce substantially the time taken to procure projects and bring them into operation.

Recommendations

We make the following recommendations to help the Department accelerate the successful delivery of waste management PFI projects.

I *The Department is engaged in taking forward a challenging programme of procurements of projects which have complex risks*. To help evaluation of the programme and the identification of areas for improvement, the Department should build on its existing management information and develop Key Performance Indicators. The Department should then publish annual performance

statistics for the projects which it approves. These statistics should include:

a. project delivery timescales, including separate monitoring of project approval, procurement and construction periods
b. ownership of contract management policies and strategy
c. the extent of price changes after selection of preferred bidder
d. authority satisfaction with support received from WIDP, and
e. whether the services in operational projects are being delivered in line with the contract.

II *Local authorities would value greater access to benchmarking information and data that could help them plan procurements effectively*. The Department should complete its current work in compiling benchmarked costs of infrastructure for different types of waste project. This information will help local authorities to plan projects and to evaluate bids. The Department should also supplement its existing guidance by collating the following information and making it available to authorities to assist in the development of projects:

a. internal and external resource requirements for different types and size of project including appropriate budgets for the use of external advisers
b. a standard set of assumptions for authorities to use in project plans on key variables such as waste growth. Local authorities may still wish to carry out sensitivity analysis based on alternative assumptions
c. information on how to handle the interfaces within the waste management system where waste collection is excluded from the PFI contract.

III *The financing costs for waste PFI projects are higher than many other types of PFI projects and, like other PFI projects, are affected by the current uncertainties in the financing markets*. The Department should:

a. check that the cost of finance for waste PFI projects can be shown to be reasonable for the risks borne either through a funding competition or benchmarking
b. analyse trends in the differential between the cost of finance for PFI waste projects and other types of PFI project to establish the scale of, and reasons for, the difference, and
c. set out the assessment local authorities should undertake where a contractor proposes to finance construction through its own resources. This form of financing may avoid delays or price uncertainties in raising project finance in the current financing markets. Authorities should, however, not see faster deal closure as the main reason for choosing a contractor but should weigh this alongside other value for money considerations.

IV *To date the Department's support to local authorities has mainly focused on project development and procurement*. *It is now beginning to consider contract management*. The Department should increase its oversight of projects after contract award and particularly during the construction phase by:

a. building on its existing model of providing experienced individuals to assist with project development and procurement and making sure input is available after contract award if required

b. establishing minimum standards for resourcing contract management and encouraging local authorities to plan for the handover from procurement to operational contract management, and

c. increasing the frequency of monitoring returns from local authorities during the construction phase to at least quarterly, rather than six monthly, from contract award until asset construction is complete and all facilities are operational.

V *Gaining planning permission for new waste treatment facilities is a challenge for local authorities. There is often concern by residents about the nature of the facilities being proposed, resulting in objections which can cause substantial delays to the Department's programme*. The Department should encourage local authorities to consult early with residents to identify issues which residents are likely to raise about different types of technical solution. The Department should complete its planned communications toolkit to assist authorities.

VI *The achievement of the EU landfill targets will be dependent on local authority projects using forms of procurement other than PFI*. The Department should obtain sufficient information from local authorities in the form of business cases and progress reports to enable the Department to assess the deliverability of these projects within the forecast timetables. The Department's oversight disciplines for PFI projects, for example its review of business cases and the involvement of Transactors as a support to project teams, may also be helpful to local authorities using other forms of procurement.

This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix J – Market development activities

Part A: Garden organics market development

Background – NSW Government support for marketing composted organics

When the NSW Government first announced a proposed future ban of garden organics to landfill in 1992, councils started to change organics management. Increasingly, source-separated collections were instituted and separate areas at landfills were designated for garden organics only.

The encouragement to divert from landfill led to a large supply of composted material being made available to a market which had no real previous experience of it as a product. This 'novelty' of product, combined with a market accustomed to established players such as the fertiliser producers, has meant that compost products have faced marketing challenges.

To help overcome this partial market failure and to encourage more diversion, the EPA worked with the compost processing industry and the (then) Department of Primary Industries and established an Expert Reference Group. The main aim of the Group was to research and open up markets for compost products. This group continued to inform waste boards and government organics programs.

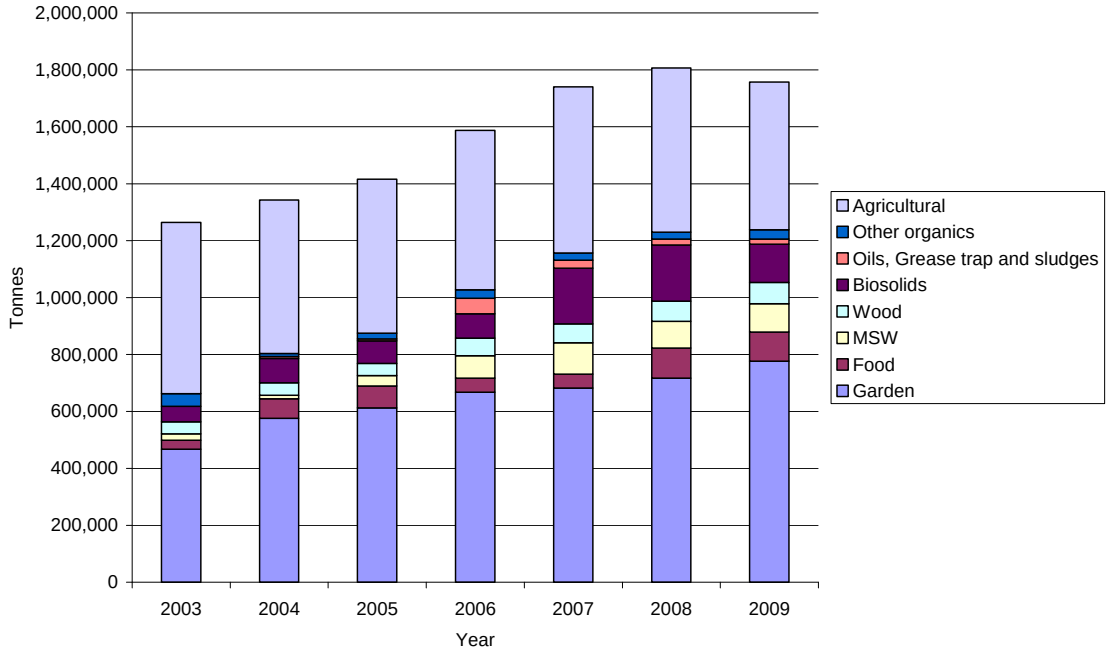
As a result of these studies, the NSW Government has invested in, among other things, market development trials for composted products in catchment rehabilitation, roadside landscaping, mine site rehabilitation, playing field maintenance and restoration, vegetable growing in the Sydney Basin, and viticulture in the Central West and the Hunter. DECCW has funded a Market and Industry Development Officer (MIDO) for a three-year period (2008–09 to 2010–11). The MIDO works within the industry association, Compost NSW, which is a part of the Waste Management Association of Australia.

Market performance

1.75 million tonnes of organic material were diverted from landfill in 2009 (including 777,000 tonnes garden, 102,000 tonnes food, 75,000 tonnes wood, and agricultural organics including 519,000 tonnes of manure). This is a 39% increase in diversion since 2003, when comprehensive data was first collected.

As shown in Figure J1 below, there was a small decrease in overall diversion in 2009 due to the drop in biosolids and manure diversions. These changes were brought about by a change in biosolids contracts and management in the north of the State and the global financial crisis. The global financial crisis led to the shutting down of several major feedlots in the west of the State, which in turn reduced the input into RIVCOW, the State's major composted manure producer.

Figure J1 – Input diverted into compost processing facilities (tonnes)

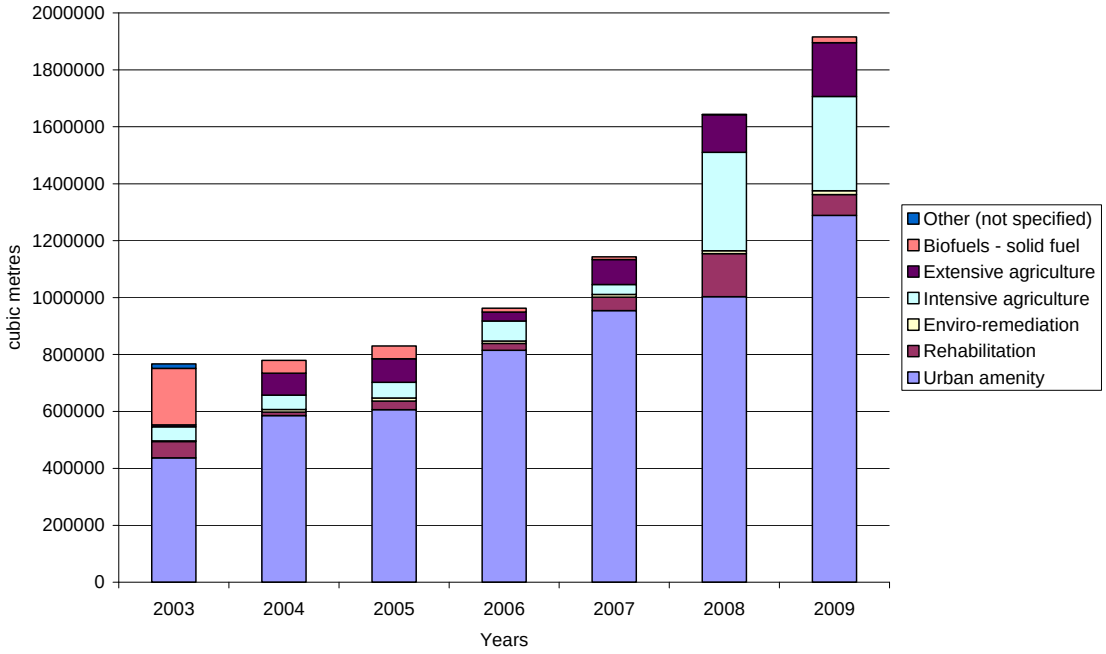


Despite market predictions, sales in some markets have continued to grow. In the past two years, increases were seen in product sold of:

- 350,000 cubic metres (m^3) in the urban amenity market
- 300,000 m^3 in intensive agriculture, and
- 150,000 m^3 in extensive agriculture.

As shown in Figure J2 below, a total of 1.9 million m^3 was sold in 2009, including 1.3 million m^3 in the urban amenity market. The urban amenity market's growth has been bolstered by the sale of soil conditioners into the manufactured soils segment to partially replace the rapidly diminishing resource of mined river sands.

Figure J2 – Volume of product sold (cubic metres)



Inventories on site

At the end of each financial year DECCW contracts a survey of the inputs, outputs and inventories of the NSW compost processors. The inventories report the amount of stock on hand in processing facilities. In the absence of any other measure, the inventory provides an estimation of the over-supply or congestion in the system.

Reported inventories stabilised in 2009, with 655,000 m^3 reported in 2008 and 660,000 m^3 reported in 2009. This amount of stock on hand is material in addition to the 1.9 million m^3 sold during 2009.

Projections based on increased organics recovery

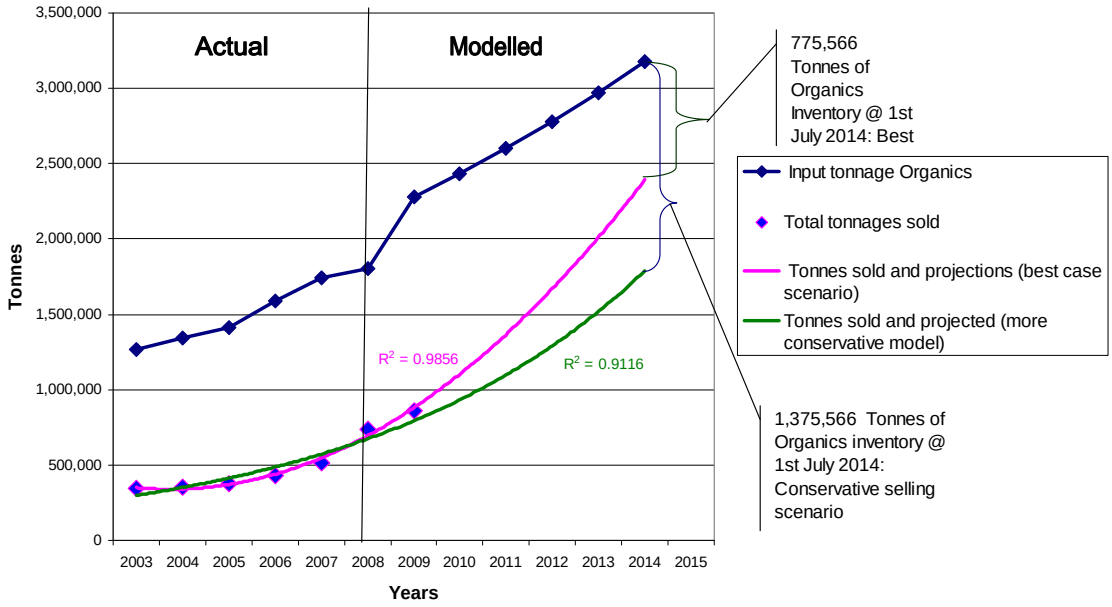
The supply of organics is measured in tonnes over the weighbridge into facilities but is measured in cubic metres leaving the facility (truck volumes). These industry norms in measurements provide a challenge to comparing input or 'supply' and sales. Figure J3 below converts the sales into tonnes using a standard approximation of 0.45 tonnes per cubic metre.

These figures are modelled for the years 2009–14. The modelling has been based on assuming that all SMA and ERA (Illawarra and Hunter) councils introduce the collection of garden organics and food, and on assuming a diversion of 50% of organics currently landfilled.

Best case scenario modelling leads to possible inventories at 2014 of 775,566 tonnes of product (15% more than reported in 2009), while a conservative approach results in inventories of 1,375,566 tonnes.

Figure J3 – Organics input compared to sales (tonnes)

Figures are actual to 2008, modelled to 2014.



Market opportunities

Vegetables in the Sydney Basin

DECCW's investment in vegetable trials using compost led to the granting of $2 million to the River Recovery project from the federally operated Water Safe program. This project resulted in a greater understanding of the benefit of compost products (compared to chicken manure and artificial fertilisers) in reducing nutrient flows into rivers and other benefits. This driver will also assist in opening up the market.

Viticulture in the Hunter

The MIDO has been working with the viticulture industry in the Hunter to change the whole nature of viticulture practice in the Hunter. Targeting water savings, improving soil health and improving grape quality will assist in converting viticulturists from what is predominantly a bare-under-vine management regime to one incorporating compost.

Playing fields

Through partnerships with councils, research into the use of compost products in renovating and maintaining sporting fields has been conducted. Traditionally, sporting fields have been top dressed with material derived from non-renewable sources such as river deposits. This traditional top dressing material typically has a low water holding capacity and is prone to compaction. DECCW studies in sporting fields and golf courses have found that when soils have compost incorporated into them, they are less prone to compaction, and are therefore more able to capture and store rainfall. Results also found compost is an excellent source of phosphorus and micronutrients. The program aims to work with Sydney Water and councils to conduct training workshops for council employees to assist in up-take of the research findings.

Carbon market

DECCW has made some initial investments in preparing the compost industry for the carbon market. This has been undertaken to help the overall marketability of compost products but also to assist in quantifying the contribution of compost to mitigating climate change.

The diversion from landfill of organics means 277,000 tonnes $CO_{2\text{-}e}$ was saved from being emitted as methane, whilst carbon sequestration resulting from compost application was approximately 500,000 tonnes of $CO_{2\text{-}e}$ (over the Kyoto period of 100 years). DECCW is continuing with the sampling, testing and quantification required to assist in developing appropriate carbon models and to input into models such as Roth-C.

Part B: Resource recovery programs

The development of markets for *potentially* recyclable materials is essential to activate decision-makers at the various stages of the recycling supply chain; without markets there is no viable recovery. There are many factors influencing the emergence and establishment of markets for recovered materials.

These factors include:

- awareness of recycled materials business opportunities
- recovery and recycling processes
- security of recovered material supply and recycled product demand
- legislative obligations for processors and customers of recycled products
- confidence in the performance of recycled products
- possible market advantage and financial benefit
- corporate philanthropy.

Government commitment

Market development is an essential component of government initiatives to improve recycling. The Government's commitment to supporting market development is implicit throughout the 2003 WARR Strategy, particularly in Chapter 3 'Framework for Action'. The Australian Government's National Waste Policy includes in its six key directions for the period to 2020:

2. Improving the market—efficient and effective Australian markets operate for waste and recovered resources, with local technology and innovation being sought after internationally.

DECCW's current engagement with market development initiatives

1 Partnerships with businesses and other government agencies allow DECCW to add value to existing recycled resource use initiatives, generate broader publicity and create confidence in the outcomes. Recent examples include:
   - contributing funds for Fairfield Council's demonstration of suburban road maintenance using high proportions of recycled demolition material

- joining with the Roads and Traffic Authority NSW (RTA), Australian Food and Grocery Council, the Institute of Public Works Engineering Australia and Waverley Council to demonstrate the use of recovered crushed glass as a sand replacement in road reconstruction
- undertaking physical and chemical testing on crushed recycled glass prior to its use as a sand replacement for pipe embedment by Sydney Water, and
- facilitating the establishment of a centralised wood waste processing location at a pallet manufacturer to supply clean biofuel for the NSW Sugar Milling Co-operative's cogeneration plants.

2 Support for the development of standards and procurement programs for recycled content products, creating confidence in the technical and performance characteristics of recycled content or recyclable products in the market:
- technical advice for the development of the draft Australian Standard *DR AS 5810 – Biodegradable Plastics suitable for home composting*
- funding to support Sustainable Choice, the sustainable procurement program for local government
- project support for field trials underpinning Sydney Water's engineering product specification for blended recycled glass granulates and Benedict Recycling's quality control procedure for the supply of crushed glass as a construction sand replacement, and
- input about recycled material to the development of the RTA's revised specification *3051 – Granular Base and Subbase Materials for Surfaced Road Pavements*.

3 Production of guidelines for recycled materials handling for industries that generate or reprocess recyclable materials:
- preparing, in conjunction with the Institute of Public Works Engineering Australia, the Civil Contractors Federation and the Waste Management Association of Australia, the *Specification for Supply of Recycled Material for Pavements, Earthworks and Drainage*
- contracting the Timber Development Association to write *Protocols for Recycling Redundant Utility Poles and Bridge Timbers in New South Wales*, and
- updating and re-publishing earlier versions of house deconstruction fact sheets, showing the demolition industry profitable methods of house dismantling as an alternative to total demolition and disposal.

4 Coordination of the NSW Government's Waste Reduction and Purchasing Policy, requiring other state government agencies to reduce waste, increase purchases of recycled content products and provide baseline and performance data for both.

5 Provision of information about recycled materials markets to assist those in the recycling industries to make current, accurate and better informed decisions when undertaking business planning:
- completing annual, statewide Resource Recovery Industries Surveys to obtain financial year data on the estimated quantities of recycled materials being reprocessed and reused in markets across NSW

- engaging consultants to undertake material-specific waste stream analyses to inform internal strategic and project planning, including:
  a. 'The Market Analysis for Recoverable Wood'
  b. 'Characteristics of Post-consumer Wood Packaging' along with associated packaging industry educational material
- developing an online Waste Diagnostic Tool to assist SMEs measure quantities of waste, how to recycle it and demonstrating the economic and environmental benefits of recycling (soon to be launched), and
- developing, with Planet Ark, the recently launched Business Recycling website, specifically designed to help businesses find national and local reuse and recycling options for cardboard, food scraps, plastics, packaging, construction waste and electronics, plus additional resources and information: www.businessrecycling.com.au.

6 Financial risk sharing for new market development ventures:

- DECCW has part-funded a variety of market development initiatives carried out under the National Packaging Covenant program. This has enabled businesses to undertake projects that develop new, or expand existing, market opportunities for recyclable packaging. Examples include work to establish new markets for glass and plastics. Such market development work may range from scoping research to establish key market data through to part-funding the implementation of new technology or systems that are expected to deliver additional tonnes of recycled outputs. This kind of sharing of investment risk with commercial enterprises helps to both bring forward and improve the targeting of investment in recycling.

7 Training opportunities to increase market knowledge and understanding:

- engaging a training organisation to design and deliver a professional development program, with related resources, for workers at waste and resource recovery facilities to increase the quality and quantity of materials recovered for markets, and
- collaboration with the Institute of Public Works Engineering Australia to design a training program to explain and promote the *Specification for Supply of Recycled Material for Pavements, Earthworks and Drainage* to government and business civil engineering stakeholders.

This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix K – Energy from waste

The recovery of energy from waste (EfW) has the potential to deliver good environmental outcomes in relation to resource conservation. However, the combustion of waste also has the potential to produce air emissions above acceptable environmental and human health levels and to generate waste feedstock demands that may run counter to resource recovery objectives.

Background

Technologies and processes

Waste can be converted to energy by thermal conversion or biochemical conversion.

Thermal conversion includes combustion (e.g. incineration of mixed waste or co-firing of refuse-derived fuel), pyrolysis (heating in the absence of oxygen to make gas and char) and gasification (heating with a controlled amount of oxygen to make gas). These processes can manage organic wastes (wood, paper, garden waste and food) and inorganic wastes (metals and plastics). The feedstocks can be mixed.

Biochemical conversion uses micro-organisms to convert organic waste to methane or ethanol, including anaerobic digestion and fermentation. These processes are used to manage organic wastes. Biochemical conversion also happens in landfills that contain organic waste and the gas can be captured and used for energy. The efficiency of landfill gas capture is very variable and is significantly less efficient than managed processes of anaerobic digestion and fermentation.

There are currently no dedicated EfW facilities in NSW.

Current regulatory and policy framework

As part of the changes to the POEO waste regulation that commenced on 28 April 2008, a new scheduled activity of ‘energy recovery’ was introduced that sets the regulatory platform for dedicated energy recovery facilities in NSW. The regulation provides a broad framework that is supportive of industry investment in EfW, allowing DECCW the ability to apply environmental controls that are commensurate with specific details of any proposals received.

Under the current DECCW policy position, EfW is supported provided that a proposal meets the conditions specified in *Guidance Note: Assessment of Non-Standard Fuels* (DEC 2005). This guidance note has been in place since 2005 and covers the combustion of homogenous, well-defined waste-derived materials at licensed facilities where the material represents a genuine energy recovery opportunity rather than a means of waste disposal. This document delivers a policy position that was relevant at the time and successfully sets the framework to facilitate the use of chemically and physically homogenous waste as fuel.

However, *Guidance Note: Assessment of Non-Standard Fuels* essentially precludes the combustion of heterogeneous or mixed wastes as fuels due to the range of potential contaminants present in mixed waste feedstock, which increases the

variability of potential emissions and the composition of residual ash produced from a facility.

Greenhouse gas emissions

Landfills create significantly higher greenhouse gas emissions than energy from waste processes. This is because waste creates methane when it is disposed in landfill and carbon dioxide when it is used for thermal conversion to energy. Methane has over 20 times the global warming potential of carbon dioxide.

Potential contribution to NSW energy supply

Waste that currently goes to landfill could contribute to NSW's energy supply, however the proportional contribution will remain insignificant. The Clean Energy Council has estimated the absolute maximum energy that could be generated by urban waste at 4,320 gigawatt hours per annum[6]. This is much less than 1% of NSW's annual electricity consumption.

Potential benefits

Less waste to landfill

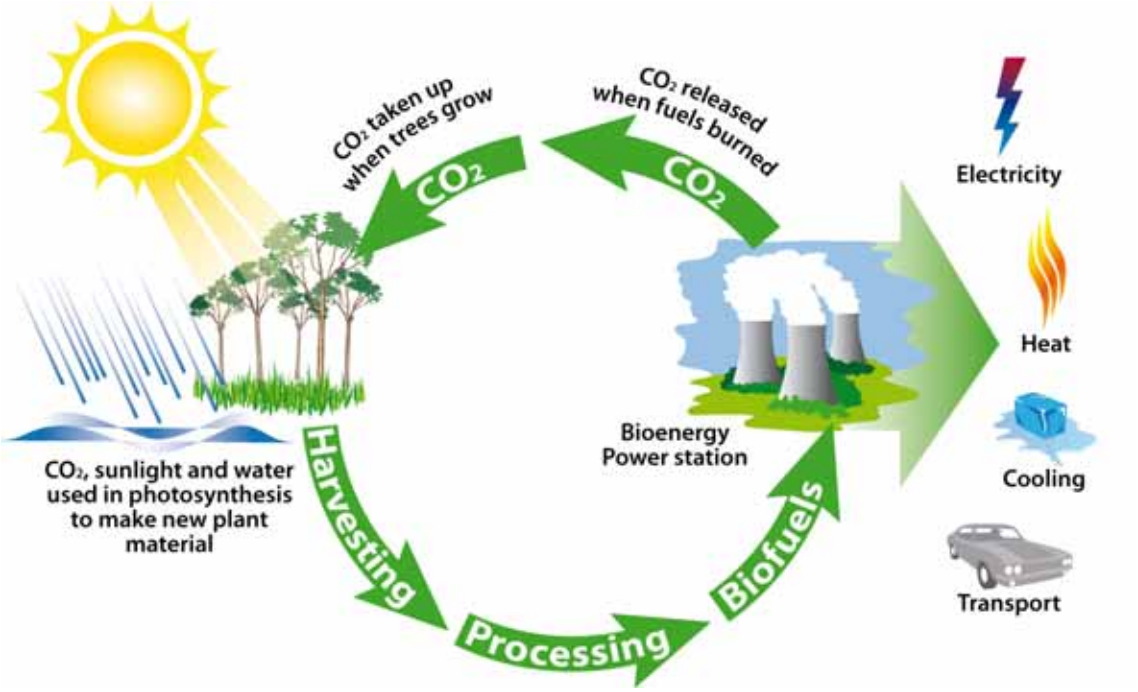
Energy from waste represents a significant opportunity to reduce the quantity of waste going to landfill, particularly for mixed waste processing residues from facilities such as AWT plants, because there is very little opportunity to physically recover additional resources or materials from these high-calorific process residues, which would otherwise be disposed at landfill.

Significant reduction in greenhouse gas emissions

Given the difference in global warming potential between methane (generated by waste in landfills) and carbon dioxide (generated by waste when combusted), energy from waste represents an opportunity to significantly reduce the greenhouse gas emissions generated from landfilling waste. It is worth noting that new, state of the art gas capture and management infrastructure at landfills can also deliver significant greenhouse gas abatement when compared with landfills that have no gas capture infrastructure.

The diagram below shows how potential reductions in greenhouse gas emissions are significant in EfW developments as emissions associated with disposal to landfill are reduced:

[6] Clean Energy Council 2008, Biomass Resource Appraisal.



Contribution to NSW energy supply

Although the potential for waste to contribute to total annual NSW electricity consumption is relatively minor, waste nonetheless contains a large amount of embodied energy that is not fully utilised through current management systems. EfW technologies represent an opportunity to utilise a considerable proportion of this embodied energy prior to final disposal.

Environmental issues

Air quality

From an air emissions perspective, there is a significant risk of harm to the environment and human health if the combustion of mixed waste streams is not managed appropriately. On the input side it is necessary to understand the nature and composition over time of the feedstock material to inform a mass balance of pollutant loads in air emissions. On the output side it is important to ensure that suitable pollution control infrastructure is in place to capture and manage any environmental contaminants in the air emissions from a facility.

Hazardous ash residues

Any combustion process generates a residual ash stream (fly ash and bottom ash), which in the case of mixed waste, has the potential to contain a diverse range of environmental contaminants. Any contaminants present in the mixed waste inputs will be effectively concentrated in the residual ash stream, potentially generating a more hazardous waste residue that would require more stringent management and disposal controls.

Dependence on waste to support technology investment

Investment in EfW technology at the level necessary to construct and operate dedicated facilities, and the return on investment for significant infrastructure development, runs the risk of creating a 'need' for waste over the longer term that may not align with broader government waste reduction targets.

Lost opportunities for higher value reuse or recycling

The scale of dedicated EfW infrastructure and technology will create a demand for waste feedstock supply that could represent a lost opportunity to gain higher order reuse or resource recovery outcomes from the management of some waste materials. An example of this could be paper and plastic in mixed waste streams that may be easier and more cost effective to divert to EfW applications rather than further separation and quality control to ensure that the material is reprocessed back into paper and plastic products. This could create a situation where EfW facilities deliver outcomes that run counter to broader government resource recovery objectives.

Ideas that have been suggested in this area

Widen the regulatory gateway for non-standard fuels

The POEO licensing and exemption framework sets the regulatory platform for purpose-built infrastructure at energy recovery facilities in NSW.

In order to provide a policy setting that facilitates EfW outcomes under these arrangements it would be necessary to broaden the scope of the current non-standard fuels guidance to incorporate heterogeneous or mixed waste streams, while maintaining the ability to distinguish genuine energy and resource recovery opportunities from waste incineration.

In considering broader EfW proposals it would be necessary to consider and further investigate the greenhouse gas benefits of combustion of waste vs. long-term storage in landfill.

Grants for EfW infrastructure

The development of EfW infrastructure in NSW could be supported and driven by grant or industry seed funding. Although a grants approach may pose its own specific management and administrative challenges, it would likely be viewed as a positive step by the government in supporting EfW development in NSW.

The waste and environment levy

NSW differs from a number of overseas jurisdictions that use EfW technologies in that NSW has successfully used the waste and environment levy to drive higher order resource recovery outcomes from waste. People have questioned if and how the levy could or should apply to EfW facilities that combust waste for energy recovery purposes.

Bioenergy

The Government could support more use of bioenergy in NSW, both as a waste solution and a means of promoting resource conservation and recovery of energy.

Biochar

Biochar is industrial charcoal produced from either waste or products, with significant potential for its application to have positive outcomes through carbon sequestration in soil, improved soil health and renewable bioenergy production.

More detail on bioenergy and biochar options is outlined below.

Bioenergy

What is biomass and bioenergy?

Biomass is any organic material which has stored sunlight in the form of chemical energy. As a fuel it may include wood, wood waste, straw, manure, sugar cane and many other by-products from a variety of agricultural processes.

Bioenergy is the term used to describe the recovery of useful energy from biomass feedstocks. Thus electricity, heat or liquid fuels for transport can be derived from:

- wood and wood waste
- agricultural products and their wastes
- post-consumer waste, including municipal solid waste, used cooking oil, sewage and wood waste from industry and from construction and demolition activities.

The Clean Energy Council considers that bioenergy has a vital role to play as part of Australia's clean energy future. The Australian Bioenergy Roadmap notes that bioenergy currently provides some 0.9% of Australia's electricity generation. The Roadmap reports that bioenergy could potentially provide from 19.8% to as much as 30.7% of Australia's electricity requirements by 2050.[7]

Greenhouse gas benefits of bioenergy

Generally, as with all forms of renewable energy, bioenergy can replace fossil fuels and thereby potentially reduce carbon emissions associated with electricity generation and transport. However, the reduction of carbon emissions is not 100% because the production of bioenergy also requires the consumption of energy and that energy generally comes from fossil fuels or involves fossil fuels in its production.

Analysis of the relative benefits of renewable energy over energy from fossil fuels is generally achieved via life cycle assessments.

[7] Australian Bioenergy Roadmap: www.cleanenergycouncil.org.au/cec/resourcecentre/reports/bioenergyroadmap.html

Table K 1 below shows the results from a study by the UK Department of Trade and Industry[8], comparing the life cycle emissions of carbon dioxide for various conventional and renewable energy technologies. This review focused on electricity generation. On a life cycle basis, greenhouse gas emissions of bioenergy systems are project specific, but typically in the range 4 to 50 grams CO_2 equivalent/kilowatt hour, which is greater than wind and lower than solar PV.

Table K1 – Life cycle emissions of carbon dioxide for various electricity generation technologies

Technology	g/kWh CO_2
Brown coal – current practice	1100–1300
Bituminous coal – best practice	955
Gas – combined cycle	446
Diesel – embedded	772
Onshore wind	9
Hydro – existing large	32
Hydro – small-scale	5
Decentralised photovoltaic (PV) – retrofit	160
Decentralised PV – new houses	178
Decentralised PV – new commercial	154
Bioenergy technologies:	
Bioenergy – poultry litter – gasification	8
Bioenergy – poultry litter – steam cycle	10
Bioenergy – straw – steam cycle	13
Bioenergy – straw – pyrolysis	11
Bioenergy – energy crops – gasification	14
Bioenergy – forestry residues – steam cycle	29
Bioenergy – forestry residues – gasification	24
Bioenergy – animal slurry – anaerobic digestion	31
Landfill gas	49
Sewage gas	4

Current use of bioenergy and potential for further development

Bioenergy contributed approximately one quarter (approximately 1,800 gigawatt hours per annum) of the new renewable electricity generated in Australia under the Mandatory Renewable Energy Target (MRET)[9], which was in force from 2001 until

[8] New and Renewable Energy: Prospects in the UK for the 21st Century – Supporting Analysis, page 202. UK Department of Trade and Industry, March 1999

[9] www.orer.gov.au

2010, and was designed to provide 2% of Australia's total electricity generation in 2010.

An average selling price of 8 cents per kilowatt hour (allowing for the value of the electricity and a typical value for a Renewable Energy Certificate [REC]) corresponded to $80,000/gigawatt hour. The value for electricity from bioenergy under MRET in 2007 was therefore approximately $144 million per year. Bioenergy generation under MRET was primarily from landfill gas and bagasse-fired power stations at sugar mills.

The expanded Renewable Energy Target (RET) came into force on 1 January 2010 and mandated that 20% of Australia's projected electricity supply is to come from renewable sources by 2020. Modelling of the RET scheme suggested that bioenergy technologies are likely to benefit from the scheme, particularly bagasse, municipal solid waste, and wood and wood waste.[10]

In 2007–08, in NSW, biomass accounted for 7% of renewable energy produced. The Australian Bureau of Agriculture and Resource Economics (ABARE) estimates that NSW (including the ACT) could produce 43 megawatts of electricity generation from wood waste. This represents less than 0.5% of NSW's current electricity generation.

I&I NSW estimates that bioenergy (including sugar cane, landfill gas and other materials) could supply 1,500 megawatts of power; however, no details of this estimate have been provided as yet.

There is significant research on bioenergy being undertaken at state and national level which DECCW could access through its existing links with experts in other government organisations in NSW (I&I NSW) and at the national level (CSIRO and the Australian Government Rural Industries Research and Development Corporation (RIRDC))

I&I NSW is co-task leader of the International Energy Agency's IEA Bioenergy collaborative research group on greenhouse gas balances of biomass and bioenergy systems. This group has developed a standard methodology for the calculation of life cycle climate change impacts of bioenergy projects.

CSIRO's bioenergy activities have included technology development (controlled carbonisation, small-scale gasifiers), sustainability investigations, plant and microbial genetics, and appraisals of biomass for use as bioenergy feedstocks. RIRDC has, for the past ten years, initiated and co-sponsored a wide variety of research into various aspects of bioenergy. RIRDC has a research and development program – Bioenergy, Bioproducts and Energy.

Biochar

Biochar is a type of charcoal which results from the thermal treatment (heating) of natural organic materials (e.g. crop waste, wood chip, municipal waste or manure). There is significant potential for biochar (industrial charcoal) production and application to have positive outcomes through carbon sequestration in soil, renewable bioenergy production and improved soil health. However, use of charcoal for this purpose is still in its infancy and further research is required.

NSW has an extensive research program, supplemented by Australian Government funding, to further develop biochar. For example, NSW is currently running the world's

[10] MMA, *Benefits and Costs of the Expanded Renewable Energy Target*, January 2009

largest demonstration of biochar, including laboratory trials seeking to measure the carbon sequestration potential of biochar and to assess its benefits as a soil amendment.

The 2008 Low Carbon Innovation Study commissioned by the former NSW Department of State and Regional Development (now part of I&I NSW) concluded that biochar is a promising low-carbon innovation. However it also identified significant uncertainties relating to the economic and greenhouse performance of biochar, in particular variability in the amount and quality of char produced by different feedstocks.

One of the key limitations to industry expansion is the availability of feedstock. Other major considerations are land, water and the cost of infrastructure. Also based on past experience (in particular Australian Silicon Pty Ltd's 2002 proposal to build two plants to produce industrial charcoal at Gunnedah and Mogo in NSW), we know that environmental groups will oppose charcoal plants where a potential to impact on native forests is perceived. Another possible approach would be the creation of charcoal plants as cooperatives in rural areas, where farmers can make charcoal that they put back into their soils to sequester the carbon and improve soil quality.

This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix L – Food waste impacts, avoidance and recovery systems

Introduction

In NSW more than 1.14 million tonnes of food is sent to landfill annually. This is made up of approximately 800,000 tonnes of food waste (or 275 kilograms/household/year) in household waste and 340,000 tonnes of food waste from C&I sources. Food is the single largest component (approximately 40% by weight) of the domestic kerbside residual waste stream in NSW and is the second largest waste category in the C&I waste stream, making up approximately 13% of C&I waste disposed at landfill, 70% of which is pre-consumer.

This level of waste has significant economic and environmental impacts. It is estimated that NSW households throw away more than $2.5 billion worth of edible food annually. For every NSW household $1,036 of food is thrown away each year. The decomposition of food waste (together with other organic materials) in landfill is a contributor to greenhouse gas emissions across the State. For every tonne of food waste diverted from landfill, 0.9 tonnes of $CO_{2\text{-}e}$ is saved. Furthermore, 23% of Australia's greenhouse gas emissions result from the food supply system, so food waste signals a significant loss of supply chain resources.

The best practice management of food waste is commonly based on the waste hierarchy of avoid, reduce, reuse, recycle, disposal. Avoidance is key to effecting change. This means working with householders and business to avoid and reduce generation of food waste through awareness and education campaigns that encourage a revaluing of food.

Even with good food management some food waste is unavoidable. There are three broad options for recycling that apply both to domestic and C&I food waste:

- source-separation of food waste for on-site processing (e.g. worm farms)
- source separating for off-site processing (e.g. composting, anaerobic digestion)
- processing of mixed waste containing food at AWTs.

Source-separated food in domestic waste is normally commingled with garden organics as existing infrastructure is normally in place: e.g. green lid bins. However, this does increase costs of processing which are offset by the reduction in disposal costs. An additional option for C&I waste is for businesses to donate quality, edible food to food charities such as OzHarvest.

These issues are considered in more detail below for both C&I and domestic food waste.

Definition and description of food waste

Household food waste is waste that results from the preparation, cooking and consumption of food – it includes food preparation waste, excess food cooked and food that is not consumed following purchase.[11]

Food waste from the C&I sector is food waste that results from all parts of the food supply chain including food production (agriculture and fisheries), food processing and manufacturing, wholesaling, transport and storage, retailing and all food service activities.

Food waste can be divided into two forms: 'avoidable' and 'unavoidable' food waste.

- 'Avoidable' domestic food waste includes food that:
  - gets wasted because too much food is purchased
  - goes out of date before it is used
  - is disposed of because too much food is prepared.
- 'Unavoidable' domestic food waste is food waste that cannot usually be consumed – e.g. pineapple skins, teabags and potato peelings. This portion of the food waste stream can be recycled as an alternative to landfill disposal, through on-site systems (e.g. worm farming or composting) or off-site recycling systems (e.g. composting, anaerobic digestion, or in an AWT).

It is estimated that some 60% of domestic food waste is avoidable. Reducing the amount of 'avoidable' food waste generated can result in significant cost savings and reduced impact on the environment.

Sources of food waste

Household

Food represents 40% of domestic kerbside residual waste by weight in NSW. This is by far the largest single material type in kerbside residual waste.

Commercial and industrial

Manufacturers, shops and businesses of all sizes and varieties are some of the many sources of C&I waste. The majority of C&I waste that ends up in landfills in NSW is made up of organic, degradable materials that emit greenhouse gases as they break down (e.g. wood, paper, cardboard, food).

[11] Food waste specifically may contain :
- fruit and vegetable material
- meat and poultry
- fats and oils
- seafood (including shellfish, excluding oyster shells)
- recalcitrants (large bones >15 mm diameter, oyster shell, coconut shells etc.)
- dairy (solid and liquid)
- bread, pastries and flours (including rice and corn flours)
- food-soiled paper products (hand towels, butter wrap etc.)
- biodegradeables (cutlery, bags, polymers)

An audit of C&I waste delivered to six landfills and six transfer stations in Sydney between June and August 2008, conducted by DECCW, indicated that 17% of all mixed C&I waste disposed of in the Sydney Metropolitan Area was food (or 13% of the total C&I waste stream).

The survey found that 74% (225,000 tonnes) of the total C&I food waste in Sydney is pre-consumer: wastes that are generated by the food supply chain before the product is purchased and consumed (e.g. food transport, processing, manufacturing, wholesaling and retailing). The balance, comprising 26% of the food waste stream, arises from post-consumer sources (e.g. food that is served to consumers and is not recoverable for consumption; this may comprise packaged and unpackaged food).

Of the pre-consumer food received from various industry sectors, the survey found that mixed SMEs generate 67% of all pre-consumer food waste (or ≅ 150,000 tonnes) in Sydney. Mixed SMEs also generate some 71% of all post-consumer food waste as well (or ≅ 56,000 tonnes). Combined, mixed SMEs generate almost 206,000 tonnes or 68% of all food waste generated in Sydney from the C&I sector.

Food manufacturers are the second largest generators of food waste, comprising ≅ 15% of all pre-consumer food waste generated in Sydney, or ≅ 33,000 tonnes of food waste per year. This food may be wasted due to incorrect labelling, packaging damage or quality control failures.

Current system for disposal and recovery of food waste for composting and energy production

1.75 million tonnes of organic material were diverted from landfill in 2008–09, including 102,000 tonnes of food, 777,000 tonnes of garden organics, 75,000 tonnes of wood, 519,000 tonnes of agricultural organics (such as manure, sawdust, bark, animal mortalities), 134,000 tonnes of biosolids and 150,000 tonnes of other organics.

Once generated, food waste can be handled in a variety of ways. Source-separated food waste can be processed on site, e.g. using a worm farm or compost bin; where on-site recycling is not available source-separated material can be collected (sometimes mixed with a wider range of organics, such as garden organic waste) and delivered to a site for recycling. For C&I food waste, commercial-scale composters and vermiculture units are available. A range of technologies are available for on-site food waste processing and depackaging, for example technologies that produce animal feed, macerating and dewatering abattoir and dairy waste.

Food waste is typically recycled either using enclosed aerobic windrow composting along with other biodegradable materials, including garden vegetation; or, through anaerobic digestion (food only excluding garden vegetation), for example at the Earthpower facility in Sydney which generates electricity and fertiliser from the process.

Where source separation is not carried out, food may be processed into pasteurised and biologically stabilised organic outputs for use as compost or soil amendment material, providing prescribed conditions are met. This takes place at various AWT sites in NSW.

Currently there are limited AWT options available in the SMA for generators of food waste. Facilities currently available are SITA's SAWT facility, and UR-3R and ArrowBio (operated by WSN Environmental Solutions) which recover recyclable matter and

compost. Outside Sydney a number of facilities have been established under contract by the private sector for councils, such as Tryton Worm Farm in Lismore, Biomass Solutions in Coffs Harbour, Remondis in Port Macquarie and SITA's Bedminster Composting Plant in Port Stephens. Other councils with food waste recovery systems include Penrith City Council, Bellingen Shire Council, Nambucca Shire Council, Camden Council, Wollondilly, Liverpool City Council and Lane Cove Municipal Council.

Examples of source-separated food waste collections from households show that these can contribute to high recycling rates. For example, Coffs Harbour and Lismore councils have included food in a weekly green organics collection in 240-litre 'green' bins. This is in addition to a separate 'yellow bin' fortnightly collection for paper, cardboard and containers. Coffs Harbour achieves an overall recycling rate of 87.6% and Lismore 68.5%.

Barriers to food waste minimisation

There are several obstacles to food waste minimisation. For domestic food waste the challenges to food waste minimisation include changing food use behaviour to avoid waste generation, providing a convenient recycling facility – through either source separation with green waste or collection of food in mixed waste and treatment by AWT – and establishing appropriate recycling habits once recycling facilities are provided.

Infrastructure limitations for C&I businesses relate to handling requirements on the waste generation site e.g. the need for separate food waste collection bins, storage space, and safety requirements. Additional primary barriers include: inertia caused by existing systems which require zero management, transition concerns (e.g. education and administration) and the previously mentioned space constraints. Solutions to these and other non-price barriers will be realised once attitudes have changed and the food waste management system is made more convenient (e.g. having a single food waste collection bin). Pre-consumer food waste poses a particular challenge as around three-quarters of this is presented in packaging. Special considerations that relate to SMEs include the lack of in-house expertise to develop better practice, lack of time and financial resources to make improvements, and a lack of knowledge about the true environmental cost of their actions.

Strategies for reducing residual food waste

There are a variety of strategies for reducing residual food waste: avoiding, reducing, reusing and recycling. To minimise residual food waste to landfill there is a strong emphasis on achieving behavioural changes. The strategies below illustrate the roles of awareness campaigns, support for collection systems and technology, and policy settings in changing the approach of users to food, leading to less waste.

1 Awareness campaigns

To establish a culture of food waste minimisation and management, an effective education and communication program needs to be developed. Awareness campaigns to promote food waste avoidance and good practice in food waste management are necessary to reduce waste generation levels. Examples of key messages would be the need to plan food requirements effectively and to store food appropriately, as well as highlighting the costs of food wastage. These campaigns would need to be targeted for

both domestic and commercial audiences. The promotion would also include advising targeted audiences of existing programs of which they may not be aware: for example highlighting the opportunity to donate to food charities would be appropriate for a section of the commercial audience.

2 Incentive-based initiatives for increased and improved collection and processing

Financial incentives could be used to accelerate take-up of food waste recycling. For the household stream, for example, South Australia has recently launched the Kerbside Performance Plus (Food Waste Incentives) initiative. This program provides funds to South Australian councils to help implement food waste systems. The Incentives Program has an indicative budget of $1.112 million in grants to be allocated in the 2010–11 funding round, with up to $6.1 million available over four years. For businesses, the incentives proposed could be delivered as rebates directly paid to the generator or discounts for receipt and transport of material to recycling facilities.

Capital investment funding could be granted to commercial investors who can offer food processing technology, e.g. processing to capture material currently destined for landfill due to contamination or lack of a facility to receive the food waste.

Currently eight NSW councils have accessed WaSIP funding to a total value of $842,201 to enable development of food waste recovery schemes.

3 Regulatory intervention

Restrictions or bans on biodegradable waste disposal to landfill could be used to drive an increase in the recovery of food waste, as well as other biologically active materials. Such a prohibition would stimulate investment in alternative recovery systems driven by the new certainty of a supply of waste for treatment.

4 Market development

The development of markets for potentially recyclable materials is essential to stimulate ‘demand pull’ and encourage investment in collection and processing infrastructure for food and other biodegradable waste. DECCW has invested in market development initiatives for organics including food.

5 Leveraging partnerships and policies – Sustainable Soils

Composting of food waste could be viewed in a wider strategic context and linked to other policy areas, such as the development of a Sustainable Soils policy. This would use the return of organics to land as the catalyst to develop a long-term strategy ensuring sustainable soil management. This would have benefits such as secure food supplies, water and greenhouse gas emissions savings and reduction in chemical fertiliser use and eutrophication of key waterways.

Existing DECCW programs

Support for local council group-contracting arrangements

This includes working with councils to encourage contracting of organics kerbside collections that include food waste. For example, DECCW is working with the Inner Sydney Waste Management Group on joint contracting.

'Love Food Hate Waste'

The Love Food Hate Waste education program launched in May 2010 by the Minister for Climate Change and the Environment aims to increase knowledge and awareness of the economic and environmental impacts of wasteful consumption of food, and to help in the transfer and adoption of more sustainable behaviours surrounding food planning, preparation and storage to minimise food waste at the household and business level in NSW.

The program includes:

- a dedicated website – www.lovefoodhatewaste.nsw.gov.au
- promoting the distribution of edible food to those who need it most
- promotional campaigns to motivate the community to avoid food waste
- strategic partnerships with food retailers, manufacturers and key industry and local government associations
- strategies for increasing food composting at the household, commercial and council levels.

Co-Collection of Domestic Food Waste and Garden Organics – the Australian experience – DECCW report

To help develop a knowledge base of good practice, DECCW has researched and published an examination of food waste and garden organics collections in Australia with additional international case studies. Other reports on food and organics management have been commissioned.

City to Soil

The 'City to Soil' campaign promotes the idea that what we do in urban areas has importance for the wider environment, and it is this wider environment which then sustains urban life – hence 'City to Soil'. The 'City to Soil' pilot program was developed to collect household organic waste, and process this into high quality compost in Queanbeyan, NSW. Its success became the basis for a wider trial, Groundswell.

The Groundswell project, under the management of the Goulburn Mulwaree Council is focused on the source separation of food and green waste from households. Through the management of this project, Groundswell has also been involved in the design of a new composting process which reduces mechanical inputs while producing a high quality product. Many regional councils have taken on this composting process and trails are now occurring in several sites as a precursor to establishing the City to Soil collection system. Trials are operational or have been completed in Goulburn,

Condobolin, Bathurst, Wagga Wagga, Cooma, the Kosciusko National Park, Armidale, Shoalhaven, Great Lakes and Galong.

Summary

Over 1.14 million tonnes of food waste is landfilled annually in NSW. There are a variety of strategies that can be used concurrently to both reduce the initial generation of food waste and to divert food waste away from landfill. A combination of awareness campaigns appropriately targeted at both households and businesses, incentive-based initiatives, regulatory intervention to reduce or ban biodegradable material to landfill, support for market development, and whole-of-government approaches to sustainable soils management would have a significant impact on food waste management. The current Love Food Hate Waste initiative could be extended to support delivery of some of these areas.

This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix M – National e-waste scheme

What is e-waste?

'E-waste' is a term used for all waste electrical and electronic products. Most of the attention on e-waste has focused on computers and televisions.

Why is e-waste a problem?

E-waste contains non-renewable materials with high levels of embodied energy. Some e-waste also contains a number of hazardous materials, such as lead, mercury, antimony and brominated flame retardants.

Community concern about e-waste is high and local government is under pressure from residents to offer e-waste recycling services based on a perception that:

- landfilling e-waste is a waste of valuable resources, and
- the hazardous materials will leak out of landfill, causing environmental and human health impacts.

Monitoring of landfill leachate in NSW indicates there is little evidence of hazardous substances escaping from NSW landfills at the present time.

It is estimated that, across Australia, approximately 1.2 million televisions reached end of life in 2007–08, with only 1% of these being recycled[12]. In the same year approximately 15.7 million computers and computer products reached end of life with 10% being recycled. In all, 84% (by weight) of all televisions and computer products were sent to landfill in 2007–08. Taking into account trends in both increasing ownership and decreasing life spans of these products, it is estimated that in 2027–28 Australia will generate around 44 million end-of-life units.

What happens to e-waste at the moment?

There are a number of recyclers offering services directly to business and the general public, as well as indirectly through partnerships with, for example, local government. Original equipment manufacturers such as Apple organise community collection events, while others offer collection services for a fee, such as Dell. Social enterprise and some charities also offer refurbishment and reuse services in addition to recycling. The Planet Ark website has a complete listing of e-waste recycling services (www.recyclingnearyou.com.au).

What is happening internationally?

Pressure for more industry action to better manage and recover their products at end of life is occurring worldwide. EPR regulations have been implemented in Asia, Europe and North and South America. In Europe, this has been driven through the EU Waste Electrical and Electronic Equipment (WEEE) Directive, which sets targets for take-back

[12] Decision Regulatory Impact Statement: Televisions and Computers. Environment Protection and Heritage Council, October 2009.

and recycling of products for specific types of equipment. In the US and Canada, regulatory action has been taken at the state and province level rather than nationally.

What is happening at the national level?

History

The NSW Government's *Extended Producer Responsibility Priority Statement* (2004) provided one of the first frameworks to encourage industry to manage e-waste voluntarily. The statement (updated in 2005–06 and 2007) effectively puts the listed industry sectors on notice to undertake an EPR scheme for their wastes.

In 2002 EPHC (Environment Ministers from all Australian jurisdictions) agreed to act on televisions and computer products as a first priority due to their higher levels of hazardous components relative to other e-waste, and the lost opportunity for conserving the non-renewable materials contained within them. NSW and the Australian Government have been the lead jurisdictions since that time in addressing the problem.

In 2004 EPHC agreed to develop nationally consistent regulation to support a product stewardship scheme for televisions and computers under a National Environment Protection Measure (NEPM). The proposed NEPM was designed to provide a generic framework under which different product groups could be captured. NEPMs require each state and territory to implement consistent regulation to ensure national consistency.

In the process of preparing a Regulatory Impact Statement for the proposed NEPM, it was found that Australian Government regulation would be far more efficient and cost effective than each jurisdiction implementing and enforcing regulation separately.

Current position

In early 2009, the Australian Government signalled a willingness to consider regulation. At the same time, the Australian Government proposed to develop a new National Waste Policy, which was agreed by all Ministers at the November 2009 EPHC meeting.

The National Waste Policy includes six key themes and 16 strategies. The proposed national product stewardship framework is the most important from a state and territory perspective, because it provides a national legislative framework for the Australian Government to regulate product stewardship schemes.

The Australian Government has committed to implement the national product stewardship framework and e-waste regulations by early 2011. The proposed television and computer scheme will be the first captured under it. The national scheme will provide a free drop-off service to consumers across Australia funded by the television and computer industries**.**

The NSW Government is an active member of the Implementation Work Group (IWG), which includes the Australian Government, Queensland, Victoria and representatives from the television industry (PSA – Product Stewardship Australia) and IT industry (AIIA – Australian Information Industry Association). The IWG is currently working through a number of issues including:

- refining the threshold (which sets the number of units under which the importing company will not be subject to the EPR regulation)
- key performance indicators, targets and milestones
- risk assessment
- governance, and
- minimum environmental performance standards.

On this last point, the intention is to have an Australian Standard for e-waste recycling, which will take about 18 months to develop. In the interim, the IWG is working with key stakeholders to develop a Code of Practice for e-waste collectors, transporters and recyclers.

These negotiations are being undertaken in parallel with the development of the new Australian Government legislation and regulations. This work is progressing well, with industries currently expecting their schemes to be ready to go by the time the regulations are implemented, on the proviso that the Australian Government provides the legislation, regulation, accreditation details and assurance on strong compliance in good time.

Is there anything more NSW could do on e-waste?

NSW supports a national approach to e-waste to ensure consistent management of potential environmental impacts across state borders and a level playing field for Australian manufacturers and importers of electronic products. NSW's ability to unilaterally drive changes in producer responsibility is limited because a large proportion of consumer goods are imported and many companies selling product in NSW sell throughout Australia and overseas.

The first priority is to have Australian Government legislation in place and the industry schemes operating.

In this (2009–2010) financial year, the NSW Government provided funding of $21.2 million to local government under the Waste and Sustainability Improvement Program, approximately $715,000 of which is currently being spent on e-waste initiatives. The NSW Government established the Voluntary Regional Waste Group collaborative program which provides government assistance to rural and regional areas for waste and recycling programs. 36 of these councils are running, or plan to run e-waste collections in 2010. Over the past two years the rural and regional councils have kept approximately 220 tonnes of e-waste from going to landfill due to these collections.

Are there other problematic wastes that could be dealt with by a similar approach?

The national television and computer scheme is the first scheme to be developed under the new product stewardship legislation and, assuming it is successful, could be extended to cover other consumer electronic and electrical equipment.

Are there other successful examples of product stewardship that could be adopted?

Prior to the EPHC decision to support Australian Government legislation, a Regulatory Impact Statement was prepared that examined a wide range of alternative options for reducing the landfilling of e-waste and increasing its recycling. The option that is currently being implemented was considered to be the most efficient.

Other options considered included public education, government collection schemes, mandatory import licences and design standards, deposit refund schemes, tradeable permit schemes, landfill bans and subsidies for collection recycling.

This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix N – Container deposit legislation

What is CDL and what is it trying to do?

Container deposit legislation (CDL) places a monetary value on used beverage containers to provide an incentive for consumers to return them to collection facilities for recycling. CDL aims to:

- prevent the disposal of beverage containers to landfill
- increase resource recovery of beverage container materials (such as plastic, glass, aluminium and liquid paper board), and
- reduce litter.

Why is packaging (including beverage containers) a problem?

Waste packaging makes up a significant proportion of the municipal and C&I waste going to landfill. Beverage containers represent approximately 25% of packaging waste (by weight) and 4% of the municipal and C&I waste streams.

Packaging is also found in litter. Beverage containers are estimated to make up approximately 3% of items in the litter stream and approximately 19% of litter by volume.

Nationally around 53% of beverage containers are currently recycled. Comprehensive local council audits of household waste and recycling bins indicate that the NSW household recovery rate is around 71%.

Where is CDL in place?

South Australia is currently the only Australian jurisdiction with container deposit legislation. The Northern Territory is currently developing a container deposit scheme based on the South Australian model. Container deposit-type schemes are also in place in some parts of Europe, the United States and Canada.

In 2001, the NSW Government commissioned an investigation of container deposit legislation in this State. The Stuart White report, as it was called, found that CDL would increase resource recovery in NSW, although other options would achieve similar outcomes.

What is happening nationally on CDL?

The proposal for national container deposit legislation is a perennial issue that has been raised on a number of occasions.

The EPHC launched the most recent national investigation in 2008. The investigation focused on national options to increase the recovery of packaging and reduce packaging-related litter, including beverage containers. In particular, the investigation aimed to explore the merits of a national container deposit system, taking into account the experience of the South Australian scheme and the results of recent investigations undertaken for possible schemes in Western Australia and Tasmania.

EPHC commissioned the consultants BDA Group and Wright Corporate Strategy to undertake a cost effectiveness assessment of national measures (additional to those in the National Packaging Covenant – see below*)* to manage the impacts of used packaging, including beverage containers. This resulted in the *Beverage Container Investigation Report* (BDA report), which EPHC considered in 2009.

Subsequently, EPHC agreed to undertake a survey to assess community willingness to pay to increase the recycling of packaging and decrease packaging-related litter. The results of this work were presented to EPHC at their meeting on 5 July 2010 and subsequently released.

EPHC agreed on 5 July 2010 to develop and consult on a Consultation Regulatory Impact Statement which would consider not only CDL, but also a limited number of other options which may have a positive cost benefit and a tangible impact on recovery rates.

In parallel, EPHC negotiated and endorsed the Australian Packaging Covenant, which replaced the National Packaging Covenant on 1 July 2010. EPHC also agreed to update the National Environment Protection (Used Packaging Materials) Measure, which provides a regulatory underpinning to the Covenant. The new Covenant aims to increase the recovery of all forms of consumer packaging and reduce litter.

What is the cost of CDL?

The BDA report estimated that shifting to a national CDL system would result in a net cost to the economy of $680 million per year, including 'inconvenience costs' of about $223 million per year (2 cents per container). The inconvenience cost estimate is contested by a range of stakeholders as either too high or too low.

Based on the BDA costs and existing NSW beverage container recovery figures, the potential impact of a national CDL scheme in NSW would be a net cost to the NSW economy of $190 million per year.

And what is the willingness of the community to pay?

In 2009, EPHC commissioned PricewaterhouseCoopers (PwC), to conduct a choice modelling study to determine the community's willingness to pay (WTP) for increasing the recovery of packaging waste and reducing litter. The study was designed to quantify non-market benefits, which could then be combined with the findings in the BDA report to determine if there would be an overall potential community benefit for CDL.

The choice modelling study found that the community is willing to pay around $18.4 million per year nationally for each percentage point increase in recycling, so around $184 million for a 10% increase in recycling. Willingness to pay for litter reduction was found to be higher – $276 million per year nationally for a noticeable reduction in litter (nominally around 10%) and $552 million for a significant reduction (around 20%).

If the BDA options and WTP values for recycling are combined (not including WTP for litter), a national CDL scheme would deliver an estimated 8% increase in the national packaging recycling rate (broader than beverage container recycling) at an estimated net cost of more than $533 million per year nationally. The community's WTP for litter

reduction has not yet been included in the analysis at this stage as further work is needed to determine how the values should be applied.

It should be noted that the Total Environment Centre's (TEC's) early July media release urging EPHC to agree to implement CDL was based on figures which are incorrect and inconsistent with the independent study data. In particular, TEC has not factored in the $223 million of inconvenience costs and has added $52 million of benefits not included in the study and incorrectly attributed community WTP figures to container deposits alone.

What alternatives are there to CDL and how do the costs and benefits compare?

There are a number of options to encourage the recycling of beverage containers other than CDL. Existing resource recovery systems, dominated by municipal kerbside collection, were reviewed by BDA and found to be highly effective.

The BDA report considered a number of options to encourage recycling. Based on BDA projected estimates of the amount of packaging that would be recovered under each of the options, Table N1 below gives a snapshot of the potential net cost or benefit to the community that could result. Clearly, CDL was the most expensive option considered. Unlike the other options which focus new investment only on the additional packaging and containers to be recovered, a national CDL scheme in Australia would require significant changes to collection and handling systems for all beverage containers, including those already being more cost effectively recovered through municipal kerbside systems.

Table N1 – Costs and benefits for a range of container recovery options (BDA Group)

Policy measure	BDA estimated increased recovery rate	BDA estimated financial cost ($m/yr)	WTP for increased recovery ($m/yr)	Net community cost/benefit (litter values not included)
Container deposit scheme (CDS)	8%	-680	147	-533
*CDS excluding inconvenience cost**	*8%*	*-457*	*147*	*-310*
Extended kerbside/drop-off	2%	-30	37	6
Public place recovery	0%	-6	0	-6
Events recovery	0%	-11	0	-11
Hospitality/retail/institutions recovery	2%	-2	37	35
Workplace recovery	10%	-6	184	178
Residual waste processing systems	1%	-72	18	-54
Advance disposal fee (ADF)	14%	-42	258	216
Voluntary glass levy	1%	-9	18	10

* Note: The figures in Table N1 are the findings in the BDA Group report. The CDS measure is presented with and without the BDA estimated inconvenience cost of $223 million per annum, which is disputed by some stakeholders.

The BDA report did not include options specifically targeting litter reduction. However, the significantly higher WTP for litter reduction found by choice modelling indicates a need to do more analysis of other litter reduction options.

This paper was prepared by the Department of Environment, Climate Change and Water NSW.

Appendix O – Contamination and resource recovery

TOTAL ENVIRONMENT CENTRE

Contamination and Resource Recovery in Australia

A report for the
Department of Environment Climate Change and Water
August 2010

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EXECUTIVE SUMMARY

The project examined claims by the recycling industry that there are problems with contaminated waste deliveries that prevent reprocessing into usable product; and appropriate solutions. The research involved:

- A survey and discussions with recyclers, councils and waste collectors about their key problems and suggested solutions;
- Developing a typology of impacts and where possible, estimates of the scale of the problems and future risks;
- Proposing a range of solutions suitable to the problems/risks.

Measuring contamination

It is not sufficient to measure contamination simply by weight in the waste stream as the impacts are of a different multiplying nature.

- *Reputation of the desired new product:* The impact of the contaminant on the public and wholesale purchaser perceptions of the quality of the product can have wide-reaching economic impacts by excluding markets and sales.
- *Domestic economy impacts:* If as a result of contamination the industry produces low quality recyclate then it is often more attractive to export the material and the economy loses the benefits of energy and pollution savings.
- *Cost burdens on recyclers: R*ecyclers incur additional treatment costs such as labour to spot problem materials and wear and tear on machinery. They also face OH&S issues and even when they can remove contamination to the best possible level, they will face an impost from the landfill levy if it has to be dumped.

Main contaminating materials

Lead Acid batteries: leakage from one broken battery during transport and at the MRF can contaminate 20-30 tonnes of organics.

Glass: broken containers create significant fibre and organic contamination and wear and tear on MRF and paper recycler machinery. We also found that a 2009 report by Industry Edge into this issue appears to have seriously understated the problem. Collection systems for glass can also result in contaminated (mixed colour and ceramics) glass material.

Plastic bags: containers placed in a plastic bag before disposal in recycling bins are not recycled as they cannot be removed by technology and labour is too costly. Plastic bags are a major contaminant of organics. They also foul machinery causing mechanical shutdowns.

Gas bottles: the larger 9 kilo bottles are now insignificant as a problem due to the advent of the 'swap and go' replacement system but the smaller gas bottles and butane canisters however remain a problem. Their possible presence in recovered metals from AWT's lowers the value of these metals as shredders are reluctant to accept this material with the OHS and machinery risk of exploding bottles in their facilities.

Asbestos: occasionally asbestos and construction materials are dumped in bins. DECCW data has found significant portions contaminating the waste stream.

Medical waste: cafeter bags and other medical waste from nursing homes and other sources are an OHS risk to waste processing staff.

All the contaminating materials reported to us were ranked high, medium or low, according to a combination of the three impacts.

See table next page for a full list of contaminating materials.

Proposed policies

Lead Acid Batteries: the simplest approach would be to ban with appropriate penalties, the disposal of lead acid batteries in waste collections. An alternative collection service already exists (see http://www.recyclemybattery.com.au/) and government could increase support for and public education of its capacity to link to the used battery stream not currently being responsibly disposed.

Glass: a Container Deposit System is the best and quickest way to remove most glass containers from the organics stream and produce colour separated material as well as avoid ceramic contamination.

Plastic bags: it is necessary to ensure plastic bags are biodegradable according to an acceptable standard. We understand that development of an appropriate standard is advanced and trials are underway with the SITA collection service in Penrith. Depending on the success of the trial and how the public adapt to such bags - government will need to make a choice between mandating biodegradable bags; or banning them from organics collections. Additionally public education in rate notices and on the yellow bins would assist with reducing the use of plastic bags around recyclables.

Gas Bottles: gas bottles of all types should be banned from the kerbside collection system with appropriate penalties. A public education program explaining the dangers would gain some traction and sympathy with the public, linked to an expanded collection system covering the smaller canisters which to date have not received sufficient attention on the basis it is 'too hard'.

Asbestos: clearly asbestos is a material of concern and a well known public health risk. It is of course already banned from kerbside collections with heavy penalties. The main solution is to increase compliance activities.

Medical waste: specialised collection services already exist for such waste, for example by SITA. Jurisdictions such as South Australia have licensed facilities (above a certain size) to dispose of their waste in particular ways including a ban on landfill; and voluntary drop-off to pharmacies has also been a feature of arrangements for households in various states. Given the reported problems with such waste it would appear sensible for NSW to bring certain sized generators of the waste (for example nursing homes) under single control to prevent them from using the waste collection services that dump the waste in landfill via MRFs and AWTs.

Major contaminants	Overview		Degree of impact (low, medium, high)			Total	Rank
Item	Environmental impact	Cost Issues	Reputation new product	Domestic economy impacts	Cost burden on recylers		
Glass	Loss of organic material and increased GHG emissions	OHS risk; low value organics; low value recyclate; impact on AWT machinery; increased processing; storage of contaminated material or landfill charges	High	Low	High	7	High
Lead Acid Batteries (LAB) and household batteries	Loss of organic material and increased GHG emissions; one LAB vs 25 tonne organics	Reduced value of organic material; fewer markets; spotting/sorting labour	High	Low	Medium	6	High
E-waste (note: national recycling scheme should assist significantly)	Can pollute organic materials as the lead in solders can leach into materials. Loss of resources and a pollutant in landfills	Slightly reduced value of organic material. Spotting/ sorting	Medium	Low	Medium	5	Medium
Gas bottles	Minimal. Loss of resources	Major OHS risk; spotters; lowers value metals recycling	Medium	Low	High	6	High
Plastic bags	Loss of additional resources. Pollutes organic materials	Spotting, sorting and separating from other materials; low value compost; machinery damage/ repairs	High	Low	High	7	High
Paints	Loss of resources In organics	Disposal	Low	Low	Low	3	Low
Asbestos/ building materials	Can be a pollutant in all waste streams	OHS, spotting, sorting, disposal	Medium	Low	High	6	High
Sharps	Can be a contaminant in recycling streams	OHS, spotting, sorting, disposal	Medium	Low	High	6	High
Medical waste	Can be a contaminant in all waste streams	OHS, spotting, sorting, disposal	Medium	Low	High	6	High
CFL's	Release of methyl mercury to surrounding environment and ultimately the food chain	OHS, spotting, sorting. disposal	Low	Low	Medium	4	Medium
Plastics re aluminium	Loss of materials and embodied energy	$500 v's $1400 a tonne	Low	High	Low	5	Medium
Ceramics, mixed colours in glass	Loss of materials and embodied energy	Separation (if possible), exploding bottles on assembly line	High	Low	High	7	High
Miscellaneous (nappies, textiles, shoes, dead animals, pesticides, plastic film, etc) *	Contaminants in all waste streams	OHS, spotting, sorting, disposal	na	na	na	na	na

**no ranking as materials too varied for specific attention*

(Note: Page 5 of TEC report has been omitted because it was blank.)

CONTAMINATION AND RESOURCE RECOVERY IN AUSTRALIA

List of Figures and Tables

1 INTRODUCTION

The NSW Department of Environment, Climate Change and Water (DECCW) commissioned Total Environment Centre (TEC) to undertake a review of the challenges created for recycling by contaminants in various waste streams. The project brief agreed by TEC and DECCW stated:

> 'The recycling industry regularly reports problems with contaminated waste deliveries that prevent reprocessing into usable product. From batteries to fluoro lights to non-degradable plastic bags – there is a significant challenge particularly as the practice of commingled waste spreads.
>
> The solutions are separation at source, collection systems, product redesign, banning landfilling of certain products or improved technology at the recycling plant.
>
> This project will:
>
> - Examine the current 'priority products' list produced under the WARR Act and their potential to contaminate;
> - Survey and hold discussions with recyclers, councils and waste collectors about their key problems and suggested solutions;
> - Develop estimates of the scale of the problems and future risks;
> - Propose a range of solutions suitable to the problems/risks.'

Contamination is an issue not only of state concern but also national. The 2010 National Waste Report found:

> 'Contamination of waste streams significantly reduces the material that can be recycled or the quality of the recycled end product, which in turn affects end markets and the confidence of potential users of the recycled product.' [p169]

NSW has some challenging recycling targets and the 2007 Waste Avoidance and Resource Recovery Strategy aims for, 'an increase in recycling of municipal waste from baseline 26% to 66% in 2014; (and) increased recycling of commercial and industrial waste from baseline 28% to 63% in 2014.' The following table from the 2008 Progress Report indicates achievement so far:

		2002-03	2004-05	2006-07	2014 Recycling Target
NSW	Municipal	30%	33%	38%	66%
	C&I	34%	38%	44%	63%
	C&D	64%	62%	67%	76%
	Overall	45%	46%	52%	

Table 1: Progress towards the NSW recycling targets, by waste stream and region

Only C&D materials which are comparatively simple wastes are progressing well toward their recycling target, while MSW and C&I with their more complex materials mix have the biggest challenges ahead. Our review will assess the impact of contaminants in the resource recovery sector including an indication of types of costs (processing, damage to equipment etc), loss of material value and if greater removal of contaminants in the various resource recovery streams would play a role in improving recycling outcomes.

2 IS THERE A PROBLEM?

The quantity and type of contaminants vary depending on - the waste stream; how it is stored at the household or business; the method of collection; technological capacity of the treatment facility; and existence of product stewardship schemes that provide special collection systems. For example commingled waste is more likely to be contaminated than separated waste such as household kitchen waste; and disposal of a contaminating product by one household can cause problems for all the material in the collection truck. Recycling plants can use new technology to extract contaminants such as metals and small batteries.

It was also reported to us that contamination can vary depending on socio-economic factors. One respondent to our survey stated, 'I can tell just by looking at a load of recyclables which council region these materials came from', with lower socio-economic demographics exhibiting higher rates of contamination. In relation to another demographic, DECCW report that there is little difference with contamination between single and multi-unit dwellings[1] .

Under the NSW Waste Avoidance and Resource Recovery Act a number of potentially contaminating products have been identified in the EPR Priority Statements (2005-6) including chemicals, paint, batteries, and packaging.

Available data on contamination rates varies considerably. For instance, the Western Australian government is attempting to reduce rates of contamination in that state's recycling bins from their current 25% to 10%[2]; Moreland Council in Victoria reported bin audits showing on average 28% of the recycling bins contained contamination[3]; and the National Packaging Covenant reports rates of contamination in kerbside recycling collections of between 3% and 11%[4]

In 2010 DECCW reported on audits of the Sydney and extended regulated area of households across 52 local areas and found 3.4% contamination in the residual waste stream red bin), 5.4% contamination in the dry recycling waste stream (yellow bin) and 3.3% contamination in the garden organics waste stream (green bin). The main contaminants in the residual waste and dry recycling streams are asbestos/ building materials, electrical items and household chemicals. In the garden organics bin the main contaminants are organic compostable food, other organic and total earth based material and plastic. See the pie figures below for an overview of the results[5].

1 Department of Environment, Climate Change & Water, Domestic Kerbside Waste and Recycling in NSW. Report on the results of waste audits of household kerbside collection systems 2007-2008, July 2010, p. 18

2 http://www.zerowastewa.com.au/documents/WasteAuthority_DraftWasteStrategy_2009.pdf

3 http://www.moreland.vic.gov.au/about-council/news-media/media-releases/media-releases-2009/recycling-contamination.html

4 National Packaging Covenant Mid Term review 2008, P.18,
http//www.packagingcovenant.org.au/documents/File/National_Packaging_Covenant_Mid_term_Review_10.11.08.pdf

5 Department of Environment, Climate Change & Water, Domestic Kerbside Waste and Recycling in NSW. Report on the results of waste audits of household kerbside collection systems 2007-2008, July 2010, p. 16-22,44

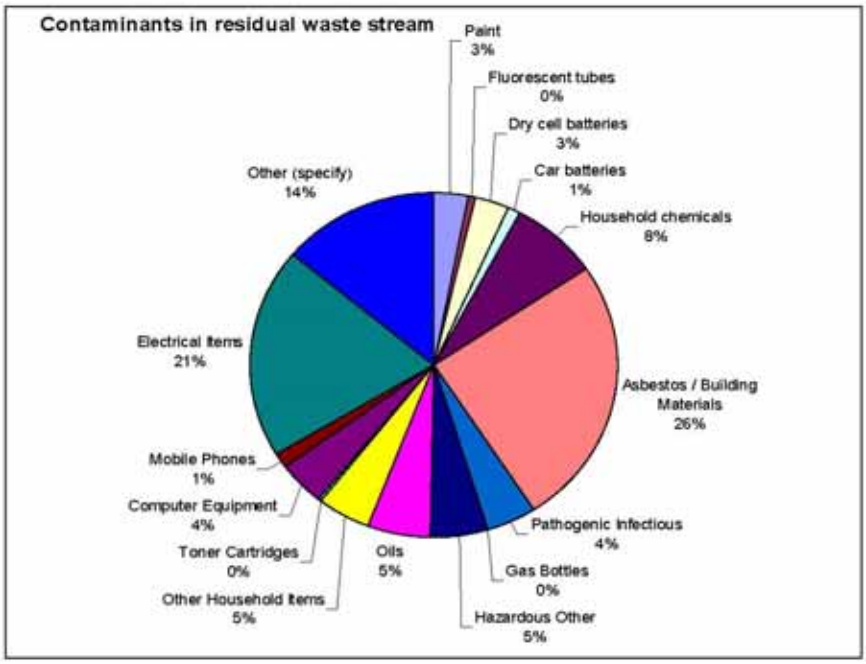

Figure 1: Contaminants in the residual waste stream (red bin)

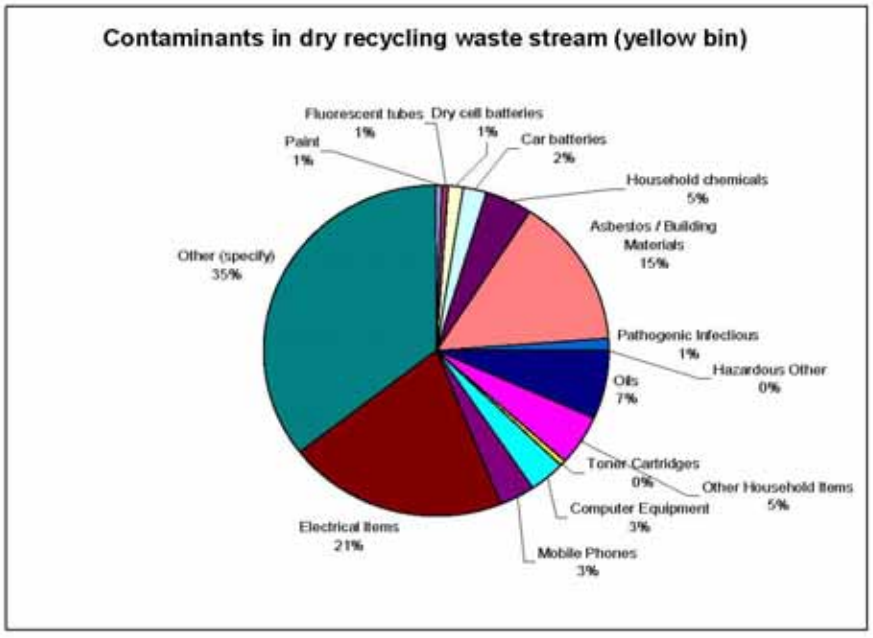

Figure 2: Contaminants in dry recycling waste stream (yellow bin)

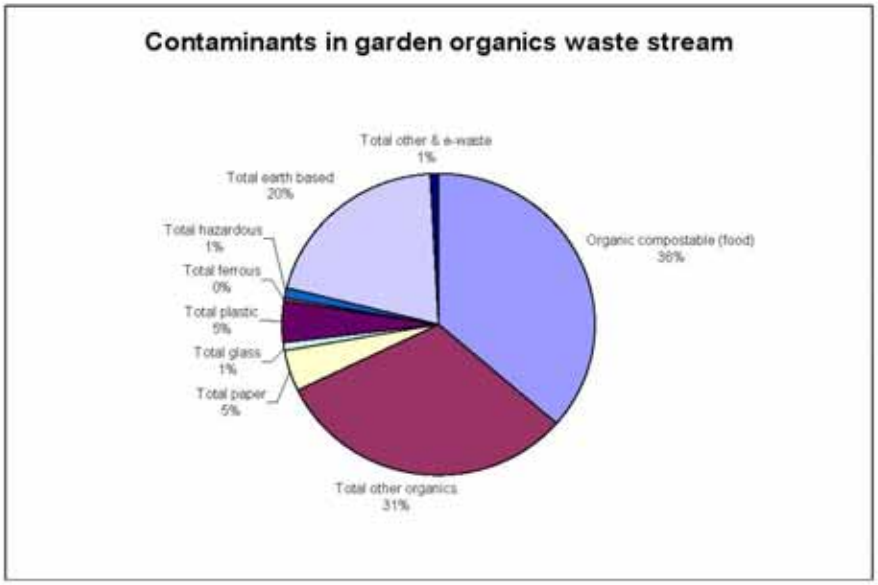

Figure 3: Contaminants in the garden organics waste stream (green bin)

However the figures from a range of sources as conventionally reported only reflect the extent of contamination by weight and do not necessarily demonstrate the impacts of contamination. An important feature of the analysis contained in this report is an emphasis on the material itself as the source of the problem rather than the quantities of it. This report also distinguishes between contaminants and contaminated material. The former being items or materials (e.g. car batteries, paint or broken glass) that contaminate additional material and the latter being material that has been rendered non-recyclable due to it being contaminated with some other material (e.g. PET covered in food waste or dirty pizza boxes).

A single lead acid battery weighing 14 kilos can render between 20-30 tonnes of compostable organic material unusable. Contaminants in the household green bin, supposedly made available for garden organics, can be contaminated with used garden implements, such as hoses and spades, as people can assume any garden 'related' waste should be disposed of through this bin. Glass fines from shattered beverage containers, jars etc, can spread through paper recyclate significantly reducing quality.

Our project has sought to provide a clearer picture of the extent of the problem and its ramifications across the waste generation, collection and reprocessing cycle.

2.1 Methodology

The following review was undertaken over a six week period between June and July 2010. Our analysis entailed a written survey as well as face to face or telephone interviews with eight companies operating in the resource recovery sector. In addition, interviews with three local government waste managers were also held and additional advice obtained from other experts in the waste and resource recovery sectors.

The companies interviewed included large global environment service providers representing tens of thousands of employees and billions of dollars of investment and turnover in Australia as well as smaller Australian operators. The information was provided by senior executives and other representatives of the companies and subsequently verified with each respondent. The companies interviewed were:

- SITA Environmental Services – operators of Alternate Waste Treatment (AWT) facilities, Material Recovery Facilities (MRF's) and landfills in Australia, owned by one of Europe's largest waste/ resource recovery companies
- Visy Recycling – one of Australia's largest manufacturers and recyclers of packaging with a turnover of around $3bill pa
- Peats Soil and Composting – processors of green waste and household organics for agricultural composts based in South Australia
- Alcoa Australia Rolled Products – Australia's largest aluminium canned sheet manufacturer and reprocessor of around 11,000 tonnes of used aluminium beverage containers
- Resource Co – South Australian operator diverting 10m tonnes of C&D material from landfill for construction materials and Resource Derived Fuels (RDF's) with joint ventures in production with SITA and Adelaide Brighton Cement as a consumer of Resource Co's RDF's
- Global Renewables – a pioneer AWT operator in NSW
- WSN Environmental Solutions – major operator of MRF's, AWT's and landfills mainly in Sydney
- One-Steel – large processor (shredder) of used steel, in particular end of life vehicles

The councils interviewed were:

- Penrith Council
- Willoughby Council
- Randwick Council

2.2 The Nature of Contamination

Contaminants can be placed into two broad categories of physical occurence, persistent and random and an outline of these broad themes is discussed below. They can also be classified according to their degree of their impact and this is further reviewed in Section 4.

2.2.1 Persistent Items

Persistent contaminants are items or materials that consistently and regularly appear in the various waste streams. They include glass, plastic bags, batteries, household waste such as nappies, textiles, sharps as well as pizza and waxed boxes.

Two important examples of persistent items are lead acid batteries and glass bottles. Both of these appear in all three of the residential waste collection streams (residual, organics and recycling), though glass is most likely to be present in either household residual garbage or recycling streams and is in fact present in each on a daily basis. Lead acid batteries can appear in any of the three household waste streams though they are not as ubiquitous as glass or plastic bags. Both items invariably begin to break and contaminate other materials from the moment they are collected and indeed at the point of disposal by the consumer. Broken bottles are also non-recyclable. Lead acid batteries break down as soon as they are dumped in trucks and begin to leach acids from that moment if not earlier as well as along sorting lines at a MRF or AWT.

2.2.2 Random Items

Random contaminants are items or materials that would be considered oddities but which continue to be present in the waste stream. These include such things as animal carcasses and garden hoses and other garden implements disposed of in the green waste bin or shoes in the recycling bin.

2.2.3 Cost and Value Impacts

While most of the focus on contamination issues revolves around the environmental impact of lost materials for recycling due to their loss of quality; there is another important element in the consideration of contaminants, namely the cost burden these materials place on the reprocessing sector that can in turn make the production of secondary materials marginal or uneconomic.

Visy for instance, cited receipt of contaminated loads of waste and the fact they pay around $36M pa for post recovery residual materials to be landfilled - as a driver for refusing to try to extract recyclables from heavily contaminated waste streams. The burden of this residuals cost means while Visy may be able to extract some additional material from a certain waste stream they may decline to do so because the residuals liability is greater than the return from the extracted materials.

The costs of staff sorting materials at MRF's and AWT's as well as technology and capital equipment also make processing contaminated resources more expensive. Visy for instance during busy periods at their MRF's, employ six full time spotters on 24 hour rotations to try to ensure contaminants are extracted as efficiently as possible. Staff and technology to manage contaminants add millions of dollars to Visy's cost of recovering secondary materials.

GRL estimate the cost of contaminants at between $15-25 per tonne. This figure is based on the requirement to have six full time staff on their pre-sort as well as the technological demands associated with sorting at an AWT. GRL also note they receive only $500 a tonne for recovered aluminium while a MRF (with potentially lower levels of contamination will receive $1400 a tonne for this material). Similarly, the possible presence of discarded gas bottles in a metals stream reduces the value of this material from an AWT. Metal reprocessors are cautious of the likely presence of gas bottles and any possible resulting explosion and OHS risks at their plants if one were to enter their crushers. Sims and others therefore pay less than for 'clean' streams of material. Also as noted in paragraph 2.3.1, GRL face financial losses from glass contamination in a myriad of ways including that they no longer produce bio-energy at their plant for sale to the electricity market, in part because of glass fine damage to their equipment.

2.3 Major Contaminants and Contaminated Material in the Waste Stream

2.3.1 Glass

Glass makes up around 26% of the dry recycling stream and 3.6% of the residual waste stream[6]. GRL estimate 5-6% of the feedstock into their AWT is glass and at around $75 per tonne this material is virtually worthless. WSN confirmed that around 20% of the inputs to their MRF are glass and 70% paper. The Packaging Stewardship Forum recently estimated that around 140,000 tonnes of glass beverage containers are broken during transportation and processing and are therefore unable to be recycled; and that there is an estimated 500,000 tonnes of glass sitting in stockpiles around Australia[7].

Glass is one of GRL's top three problem materials contaminating organic composts and lowering the value of this material as it confines this compost to low value applications. For instance, wineries refuse to accept organic composts from AWT's due to the aesthetic pollution risk arising from public visitation[8]. The quality of this material is continually called into question.

WSN went so far as to recommend a glass only (as a starting point) container deposit scheme at a recent National Recycling Initiative (NRI) forum so great is the impact of glass fines on their recovery of paper and other materials for recycling.

GRL also state glass fines as a major cause of wear on their processing equipment. Conveyor belts, rollers and bearings are all negatively impacted by this material. Light weighting of glass bottles has not helped this situation. GRL's on-site biodigester has now been shut down for two primary reasons - the collapse in the price of Renewable Energy Certificates (REC's) resulting in a drop in the value of the energy they produce; and excessive abrasion of the unit from glass fines coming through their

6 Department of Environment, Climate Change & Water, Domestic Kerbside Waste and Recycling in NSW. Report on the results of waste audits of household kerbside collection systems 2007-2008, July 2010, p. 16-17.

7 Presentation by Trish McGee (PSF) to Enviro 2010

8 Personal communication July 2010 Peats Soil and Composting

AWT. Maintenance costs were similarly cited by WSN as arising from glass fines on their processing equipment adding further costs and reducing the value of this recovered material for re-pulping.

GRL lament that that despite progress across many waste streams toward EPR (electronics, tyres, vehicles etc) major glass producers seem no longer to care that their product causes problems for recovery and recycling operations and described glass as 'an awful material and a shocking contaminant that should be banned'.

In regard to recovery of glass and problems caused by collection methods WSN noted that from a MRF perspective limiting compaction of loads assists in reducing contamination of paper but the majority of glass still breaks and is uneconomical to sort for on-sale to glass bottle manufacturers. They stated that is why the recycling rate (for recovered glass into glass bottle manufacture) in NSW has dropped from 130,000t/annum in the mid 1990's to currently 50,000t/annum. Ceramics have also been mentioned as an issue when mixed with glass collections as when it forms part of new glass material it can shatter during filling causing extensive damage on the bottling line.

WSN report they have a glass storage and market problem with a current 25,000 tonne 'glass mountain' at their Chullora site in western Sydney for which they have no market. This glass pile is of mixed color and is contaminated with plastics that have come through WSN's MRF. WSN stated that glass fines can embed in recovered paper and cardboard at their plant and that extracting this material is expensive. Visy have also recently been dealing with a 'glass mountain' which was as much as 200,000 tonnes, though they have subsequently found markets for this material and the stockpile is now around 25,000 tonnes. Fifty percent of this is contaminated.

Visy are able to color separate 70% of the recyclable (unbroken) glass they receive. The remaining 30% is mixed cullet and only useable for low value products such as road base. Ten to twenty percent of Visy's inputs are non-recyclable due to contamination, a proportion of which is from glass.

All those interviewed cited glass as an OHS risk to their staff. A broken glass bottle contained inside a plastic bag with other recyclables may be difficult to see and operators are at risk of glass injuries during the sorting process.

South Australian based organic composter, Peats Soil and Composting suggested glass was of no major concern in their operations [ie, container deposits reduces the problem significantly].

A 2009 report by Industry Edge for the Packaging Stewardship Forum which focused on the impact of glass contamination on packaging and non-packaging material, rather than organics, concluded that glass contamination was of little concern to most of the industry.[9] Our analysis and the response from the sector including four of whom had been interviewed by Industry Edge differed from the conclusions in this document. It appeared to us there was a strong preference that it be reduced significantly.

In order to check on any reasons for the disparity between Industry Edge and our findings we re-interviewed four companies with the results as follows:

In terms of machinery damage:

> VISY: Glass is an issue for machinery maintenance, it does wear out seals etc.
>
> SITA: Glass fines significantly reduce the operational life of equipment in SITA's ARRT facilities.
>
> GRL: Glass wears out GRL machinery adding to costs and reducing operational life.
>
> WSN: Glass impacts MRF machinery. It is abrasive and adds significantly to the wear of a MRF. We know that they (AMCOR & Visy) do not appreciate glass as it does add to considerable wearing of machinery.

9 Industry Edge (2009), Assessment of the Significance of Contamination by Glass in Recovered Fibre Packaging and Non-Packaging Material In Australia

In terms of contamination affecting fibres:

VISY: Glass does impact recycling of used fibre depending on rates of compaction. If compaction is too high, especially during summer months when there is a lot more beer drinking at home etc, then glass will be impregnated and the fibre unrecyclable. Low rates of compaction means the sorting equipment can shake the glass fines out. Visy have an ongoing dispute with collectors about compaction rates and penalty clauses are built in for over-compacted materials. Visy have also started to look at separate collections for glass with some of their contracts.

A price is based on an assumption about some level of contamination and the price doesn't vary after that point but is likely to be lower than it would otherwise be from a clean source of material.

GRL: Material is accepted and valued accordingly on the basis of its contamination and GRL has not had material rejected.

WSN: Glass impacts "packaging fibre" recovery and all MRFs are aware of it. Without glass in the recycling bin paper, recovery would increase particularly now that a large number of people operate home offices.

SITA: could not comment on paper recovery as all their organic material is composted.

2.3.2 Lead Acid and Household Batteries

GRL stated they will receive around 10,000 car batteries through their AWT plant in 2010. A graph of GRL's past data appears below:

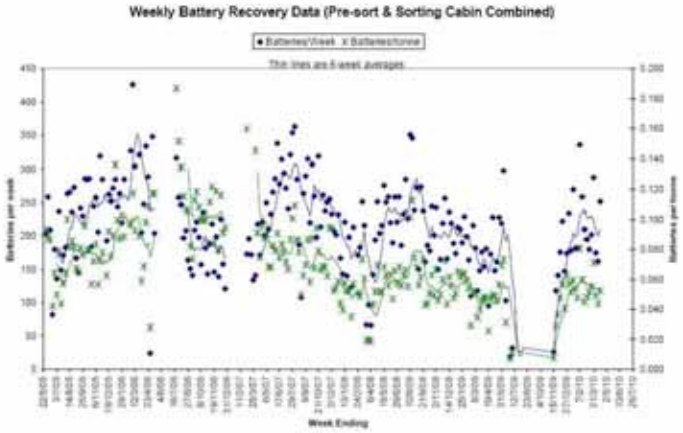

Figure 4: Weekly battery recovery data from GRL's AWT plant

One car battery can destroy for composting 20-30 tonnes of organic material as the acids from a used car battery leach into these organic materials. Car batteries are a problem from the point of collection through to sorting.

Visy estimate they receive a pallet full of car batteries every quarter. SITA states that car batteries are their number one problem in terms of contamination as they attempt to process organics and other materials for reuse. WSN suggest 0.02-0.05% of inputs are car batteries and stated, 'by the time they get to the AWT acids are everywhere.'

An October 2007 analysis by Warnken ISE for the TEC outlined part of the environmental case for removing lead acid batteries from the waste stream.

'One used lead acid battery (ULAB) disposed of incorrectly into a municipal solid waste collection system, and not removed prior to entering a resource recovery facility for mixed MSW, could contaminate 25 tonnes of MSW and prevent the recovery of the organic resources within this waste (estimated at 25 per cent of the waste inputs, or 6.5 tonnes) because of lead levels in excess of 500 mg/kg.

> The contaminated product would have to be landfilled because of elevated lead content, contributing to an associated greenhouse gas liability from the decomposition of degradable organic carbon into landfill gas.
>
> The Australian Greenhouse Office estimates that the landfilling of one tonne of MSW has a greenhousegas liability of 1.14 tonnes of carbon dioxide equivalent (CO2e) from the landfill gas that is generated by the organic fraction in MSW.1 This arguably translates to a greenhouse impact of 7.4 tonnes of CO2earising from one used lead acid battery that prevents recycling of 6.5 tonnes organic material through elevated lead levels.
>
> While this is not necessarily a direct causal link, it serves to highlight that although the recycling of 100 batteries (nearly one tonne of lead) will avoid 1.3 tonnes of CO2e, the presence of one battery in household garbage collections could cause up to of 7.4 tonnes of CO2e emissions from landfill gas by making the organic fraction of MSW un-recyclable. Given the Stern Review estimate of $110 for the 'per tonne' social cost of greenhouse gas emissions, a social cost of $814 could be attributed to a single ULAB in MSW.'

The Australian car battery industry has traditionally claimed lead acid batteries achieve 96% recycling rates and as a result there is no problem with these items in the waste stream. In fact the data for recovery and recycling is as outlined in the Warnken ISE briefing extremely imprecise. The Australian Battery Recycling Initiative is currently attempting to quantify rates of recycling for all battery types and suggests for instance that there is no data on quantities of items that are exported during periods when offshore lead prices might be high or on the distinction between residential and industrial (e.g. forklift) vehicle batteries.

Whether or not recycling rates for batteries are high as claimed elsewhere it is not simply the quantity of batteries that present in the waste stream but the enormity of their impact that is the concern for the resource recovery industry.

While household batteries are not as ubiquitous in AWT inputs (and may also be present in organic and recycling streams) they are not a contaminant in the same way as lead acid batteries. Household batteries do break down in landfill and contain toxic heavy metals. However, they do not leach acids during collection and sorting at an AWT and can be readily extracted by magnets at the plant and therefore removed from the composting process.

2.3.3 E-Waste

If not extracted in the pre-sort, e-waste can pollute organic materials as the lead in solders can leach into materials. Cords and wires are caught up in machinery causing cost impacts. In general however, e-waste represents a loss of resources and a pollutant in landfills more than a contaminant.

2.3.4 Gas Bottles

It is estimated that in 2007 190,000 cylinders were disposed of in Victoria and 245,000 in NSW and that between 80 and 100 explosions occur at metal-shredding operators' facilities in NSW and Victoria per annum combined. [10] GRL capture around 1000 gas bottles per year in their facility.

The larger 9 kilo bottles are now largely insignificant as a problem due to the advent of the 'swap and go' replacement system operating out of petrol retailers and hardware stores. Smaller gas bottles and butane canisters however remain a problem for recyclers. Their possible presence in recovered metals from AWT's lowers the value of these metals as shredders are reluctant to accept this material with the OHS and machinery risk of exploding bottles.

10 http://www.ecor.org.au/pdfs/Inside%20Waste%20July%202008%20on%20Gas%20Bottle.pdf accessed 16/8/10

2.3.5 Plastic Bags

Containers placed by dutiful consumers in a plastic bag before disposal in their recycling bin are in fact not recycled. These items cannot be removed by technology and the inconvenience cost of their removal by hand from the bag at a MRF means they are in fact discarded and dumped in landfill.

Within the organics waste stream plastic bags are a major contaminant. They contaminate the dry recycling waste stream as well.

Plastic bags also represent a significant cost to AWT and MRF operators from staff processing costs and machinery fouling causing mechanical shutdowns.

2.3.6 Paints

Paint seems to be regarded as a problem for some councils, such as Willoughby. It is viewed as expensive and difficult to dispose of, costing around $25 a litre and needs to be sent to a transfer station.

2.3.7 Asbestos and building materials

Occasionally asbestos and construction materials are dumped in bins. DECCW data noted above found significant portions contaminating the waste stream. However Willoughby, Randwick and Penrith Councils do not believe they have a serious problem. Nevertheless recyclers treating the residual waste stream are concerned, especially about asbestos.

2.3.8 Sharps

One MRF operator records between 10-20 needle-stick injuries p.a. and of necessity all their staff are immunized for hepatitis and other blood born viruses. These items represent a significant OHS risk to AWT, MRF and other waste processing staff. Sharps can also make their way into organic composts which again significantly reduces the perceived and actual quality of these products, reducing their value.

2.3.9 Medical Waste

Cafeter bags and other medical waste from nursing homes are an OHS risk to waste processing staff. WSN reports a 0.01% contamination rate caused by medical waste in the general waste stream and notes that it is also a problem in their MRF plant.

2.3.10 CFL's

CMA Ecocycle is the only recycler of compact florescent lights and tubes in Australia. CMA estimate they receive only around 5% of discarded products pa with the remaining 95% of discarded lights going to landfill. Since 2003 some 24 million CFLs have been distributed as part of the Greenhouse Gas Abatement Scheme in NSW and increasing numbers will find their way into household bins causing a growing OH&S issue. There is no current separation program and the Federal government's Fluorocycle voluntary scheme only targets commercial and industrial fluorescents.[11]

In the process of breaking, either in collection or disposal, these items release methyl mercury to their surrounding environment and ultimately the food chain. This is a hazardous waste with significant OHS implications for waste managers. There are reports of CFL manufacturing workers in China being hospitalized with mercury poisoning.[12]

2.3.11 Aluminium

Contamination rates at Alcoa's Rolled Products (AARP) plant in Yennora in western Sydney can be as high as 11% and average 1.7%, while 30% of the bales arriving at Yennora are contaminated, with plastics making up a large percentage of this contaminant material. As a result of this

11 Some 90% of fluorescents are used in the commercial and industrial sector. Nevertheless the significant household stream needs to be attended to.

12 http://en.wikipedia.org/wiki/Mercury_(element)

contamination as well as inflated prices for cleaner materials only around 33% of aluminium is recycled in Australia and the remainder is exported.[13]

AARP suggest rates of contamination of aluminium container bales out of South Australia are significantly lower than the national average being only as high as 0.27% and averaging 0.01%. AARP pay an undisclosed premium for SA material which is cleaner due to that state's container deposit system.

2.3.12 Ceramics, mixed colours in glass

Small amounts of ceramics in a large volume of recovered glass can produce a weak new glass fabric which can explode under certain compaction conditions. When this occurs on a filling assembly line, a large number of bottles are also contaminated and broken. Visy reports ceramics are a significant contaminant. In regard to mixed colours arising from the collection system, this significantly reduces the value and future uses of the glass.

13 Personal communication July 2010 with AARP

3 CRITERIA/ PRINCIPLES USED TO DEVELOP WASTE POLICY

This chapter focuses on how several jurisdictions - New South Wales, South Australia and the European Union - have used different criteria and instruments to assist them in developing waste policy. We then assess their relevance to contamination and its effects.

3.1 Policy Criteria: New South Wales

Rising waste volumes have been identified by the NSW Government as a problem for many years, with the depletion of resources, mounting pressure on landfills and litter being key drivers.

DECCW's 2007 Waste Strategy recognises the importance of the waste hierarchy to guide effective resource management. Principles that are cited are:

- the precautionary principle
- inter-generational equity
- polluter pays
- full life cycle costing
- market incentives
- shared responsibility
- system integration
- sustainable production and consumption
- public involvement in decision-making
- economic development
- continuous improvement
- contribute to other environmental sustainability issues[14]

To date NSW has relied almost solely on its landfill levy to divert waste and increase recovery and recycling, as well as the community's willingness to participate in kerbside recycling and more recently organics recovery.

As part of its 2007 review of EPR programs and participation in the EPR Expert Advisory Committee, Total Environment Centre proposed a number of specific criteria to trigger action on priority products:

- toxicity
- volume
- litter
- contaminant
- no effective EPR program or alternative environmentally sustainable system in place

We noted recycling operations can be compromised by certain products that can injure the public and employees (such as gas bottles), damage equipment and products, contaminate the outputs from recycling activities (for example, lead in compost) and inappropriately impose a financial burden on recyclers (for example, shredder floc).[15] As such they form a barrier to recycling operations.

14 Department of Environment and Climate Change NSW. Waste Avoidance and Resource Recovery Strategy 2007. October 2007. P. 30-31

15 Such as lead-acid batteries, gas cylinders, smoke alarms, fluorescent lights, fridges etc.

3.2 Policy Criteria: South Australia

South Australia seeks to achieve its targets for reducing waste to landfill through meeting both the waste management hierarchy and the principles of sustainability[16].

The Environment Protection (Waste to Resources) Policy 2010 [in fact a regulation] bans a number of items from landfill over a number of time periods – immediate, transitional and on 'a date to be set'. To direct their policy thinking they developed several categories:

- Materials which had already been aggregated for resource recovery – as the effort had already been expended, there should be a market for these materials, making disposal to landfill a less-preferred option in any business case
- Existing bans for hazardous wastes – on grounds of environmental risk and/or harm
- Items or materials with a market value exceeding the cost of collection and disassembly, such as scrap metal
- TVs and computers – given that a national product stewardship scheme is coming
- Other e-waste –this may require measures such as the provision of financial support from government or additional costs to industry which would likely be passed on to consumers, perhaps through further national product stewardship schemes[17].

The Policy is quite comprehensive and it is instructive to reproduce the materials affected here:

3.2.1 Schedule 4—Prohibited landfill waste

"For the purposes of clause 12 (Disposal of prohibited landfill waste), the waste identified below is prohibited landfill waste for the specified area.

Waste		Area
Risk-based		
(1)	Hazardous waste	All of the State
(2)	Lead acid batteries	All of the State
(3)	Liquid waste	All of the State
(4)	Medical waste	All of the State
(5)	Oil	All of the State
(6)	Tyres—whole tyres other than earth mover tyres and tyres that have been exposed to radioactive materials through mining operations	All of the State
(7)	On and after the first anniversary of the day fixed by the Governor for this policy to come into operation—vehicles	All of the State
Aggregated recoverable materials		
(8)	Cardboard and paper waste aggregated for resource recovery separately from other waste	All of the State
(9)	Glass packaging aggregated for resource recovery (whether alone or with other recyclables)	All of the State
(10)	Metals—aluminium, copper, steel or iron or a blend or alloy of any such metals aggregated for resource recovery (whether alone or with other recyclables), other than metal products with components of different metals that cannot be readily separated	All of the State
(11)	PET or HDPE plastic packaging aggregated for resource recovery (whether alone or with other recyclables)	All of the State

16 Government of South Australia. Zero Waste. South Australia's Waste Strategy 2005-2010. August 2005. P. 19

17 Pers comm. email from Susan Churchman, Director People, Policy and Systems, Environment Protection Authority to Jeff Angel, Total Environment Centre. 28 June 2010.

Waste		Area
(12)	Vegetative matter aggregated for resource recovery and collected by a council by a kerbside waste collection service operated as a separate collection service for such waste, other than such waste collected from within a quarantine area declared under the *Fruit and Plant Protection Act 1992*	All of the State
(13)	On and after the first anniversary of the day fixed by the Governor for this policy to come into operation—PP or LDPE plastic packaging aggregated for resource recovery (whether alone or with other recyclables)	All of the State
(14)	On and after the second anniversary of the day fixed by the Governor for this policy to come into operation—PVC or PS plastic packaging aggregated for resource recovery (whether alone or with other recyclables)	All of the State
Other		
(15)	On and after the second anniversary of the day fixed by the Governor for this policy to come into operation—fluorescent lighting and any other lighting that contains mercury	Metropolitan Adelaide
(16)	On and after the third anniversary of the day fixed by the Governor for this policy to come into operation—fluorescent lighting and any other lighting that contains mercury	All of the State, other than Metropolitan Adelaide
(17)	On and after the second anniversary of the day fixed by the Governor for this policy to come into operation—computer monitors and televisions, including components, subassemblies and consumables that are part of the equipment when discarded	Metropolitan Adelaide
(18)	On and after the third anniversary of the day fixed by the Governor for this policy to come into operation—computer monitors and televisions, including components, subassemblies and consumables that are part of the equipment when discarded	All of the State, other than Metropolitan Adelaide
(19)	On and after the first anniversary of the day fixed by the Governor for this policy to come into operation—whitegoods	Metropolitan Adelaide
(20)	On and after the first anniversary of the day fixed by the Governor for this policy to come into operation—whitegoods	All of the State, other than Metropolitan Adelaide
(21)	On and after the third anniversary of the day fixed by the Governor for this policy to come into operation—electrical or electronic equipment not referred to above	Metropolitan Adelaide
(22)	On and after the third anniversary of the day fixed by the Governor for this policy to come into operation—electrical or electronic equipment not referred to above	All of the State, other than Metropolitan Adelaide
(23)	On and after the second anniversary of the day fixed by the Governor for this policy to come into operation—whole earth mover tyres	Metropolitan Adelaide
(24)	On and after the second anniversary of the day fixed by the Governor for this policy to come into operation—whole earth mover tyres	All of the State, other than Metropolitan Adelaide

Table 2: Prohibited landfill waste South Australia

3.3 Policy Criteria: European Union

The EU increases recycling by applying four conditions to establish if waste streams should cease to be considered waste, namely:

a) the substance or object is commonly used for specific purposes
b) a market or demand exists for such a substance or object
c) the substance or object fulfils the technical requirements for the specific purposes and meets the existing legislation and standards applicable to products, and
d) the use of the substance or object will not lead to overall adverse environmental or human health impacts.[18]

Six selection criteria have been derived from these conditions:

18 Directive 2008/98/EC of 19 November 2008 on waste, Article 6.

1. No marginal waste stream (amounts and value)
2. Potential for increasing recycling and recovery through better waste management
3. Higher resource substitution; current recycling effectiveness (raw material substitution)
4. Environmental benefit of recovery/recycling (energy and GHG emission savings)
5. Control of product quality and processing technology
6. Legal compliance (in the EU and in waste definition of international shipments).[19]

3.4 Particular policies and products

There are a range of policy levers which in the right combination can achieve high recycling and reduced contamination rates including:

Communications/ Information

1. Awareness raising programs
2. Technical support and training
3. Research (research programs regarding materials and waste data acquisition)
4. Green public procurement

Economic

5. Environmental taxes and charges
6. Extended Producer Responsibility
7. Economic supports and grants

Regulatory

8. Restrictions and bans
9. Agreements and covenants
10. Industrial permits and licenses

3.4.1 Batteries

An example of action on a contaminating product is the 'EU Batteries and Accumulators and Waste Batteries and Accumulators Directive' (2006/66/EC). The EU Directive incorporates a number of policies from outright ban on sending certain types of batteries to landfill or incineration.

The intention of the Batteries Directive is to improve the environmental performance of batteries and of the activities of all economic operators involved in the lifecycle of batteries. Single-life batteries and "accumulator" (rechargeable) batteries are targeted in the Directive.

The Battery Directive leaves considerable freedom to Member States and their national legislation with respect to collection systems and voluntary or mandatory producer responsibility.

Outside Europe, North American policy has tended to focus on voluntary programs and outright bans, while South America and parts of Asia have developed policy more in line with the EU. South Australia is going to ban lead acid batteries from landfill from 1 September 2010.

Deposit refund systems are used as well – for instance in Sweden and for car batteries in Germany[20]. In such programs consumers pay a deposit on a battery at the time of purchase. When properly disposed consumers will get a refund, which is typically set equal to the initial cost or incorporates an initial handling fee.

3.4.2 Packaging

Policy mechanisms used for packaging include mandated Deposit Refund Systems, Recycling Targets (that if high enough require a deposit to achieve recycling rates, e.g. Austria, Belgium) and differential taxes on materials to encourage high rates of return (e.g. Norway) and Advanced Disposal Fees (ADF's) across all packaging.

19 Villanueva, Allejandro et all. Study on the Selection of Waste Streams for End-Of-Waste Assessment. European Union, 2010, p. 4

20 Eunonia and others .International Review of Waste Management Policy. Annexes to Main Report, 29 September 2009 p. 297

3.4.3 Paints

Across North America, a levy on new paints is applied in a number of localities. Specifically a charge can be found in California; and in British Colombia, Alberta, Saskatchewan, Nova Scotia and New Brunswick in Canada. In California, the 'ecofee' on spray cans is used to fund graffiti cleanup activities.

In Canada the fee is applied to whole host of household paints and is collected as part of Extended Producer Responsibility schemes. The Product Care scheme is a not-for-profit producer responsibility scheme which manages product stewardship programs for household hazardous and special waste on behalf of its members across Canada. The scheme manages stewardship programs in British Columbia for paint, flammable liquids, pesticides and gasoline, and in Nova Scotia, Saskatchewan and New Brunswick for paint only[21].

3.4.4 Plastic bags

Policy options used to minimise plastic bags in the waste streams are banning, taxes and levies. Reasons for these policies vary from country to country or region to region, but are often related to issues like litter and soil degradation rather than contamination of the organic waste stream. However the banning of plastic bags (in particular non-biodegradeable) may reduce their appearance around kerbside materials as householders will have less of them on hand.

In the Netherlands, Belgium and Denmark packaging taxes apply, which include polythene packaging. In Denmark plastic bags usage has decreased with 66% as a result of a levy.

In Ireland there has been a levy of €0.15 per plastic bag since 2002 resulting in a 90% reduction. The policy also results in €10 million per year that is spent on environmental projects.

3.5 Best practice case study in separating waste: Belgium/ Flanders[22]

The population size of Flanders is similar to NSW although its population density is four times that of NSW. The waste strategy of Flanders follows a hierarchy which aims to prevent the generation of waste first, then recycle as much of the waste as possible, with the residual waste first going to incineration with energy recovery and finally landfill if no other option is appropriate.

A wide range of different policy levers are used in Flanders, ranging from legislative, economic/fiscal, agreements, to information provision.

Flanders has set a target for the amount of residual waste that should be produced per capita at 150 kg of residual waste per inhabitant per year. One of the economic instruments used is the Pay-By-Use (PBU) scheme, which is based on higher charges for the residual fraction, lower charges for packaging and organic waste and no charges for other selectively collected waste streams (other recycling). Underpinning this scheme is a principle of source separation to reduce contaminants and increase recycling and the value of the material.

A PBU is based on a polluter pays principle and is implemented at three levels through three different tariff structures:

1. Prevention - at no cost or subsidised
Home composting equipment is made available for a reduced price, stickers urging against unsolicited mail, yearly education and communication actions, training programs for 'compost masters' are offered, composting demonstration sites set up in schools and recycling centres, etc.

2. Selective collection - at a partial cost
Low charge for waste flows that can be avoided, such as bio-waste and plastic packaging.

21 Eunonia and others .International Review of Waste Management Policy. Annexes to Main Report, 29 September 2009 p. 529-532

22 Fogarty, Helen, et al. International Review of Recycling Policies. The Scottish Government. 2008, P.38-41

Seventy percent segregation of household waste is achieved through door-to-door collections and local drop-off methods. The overall cost of the extended system of separation and collection amounts to €220 per year per average family of 2.4 people. Of this €36 is paid through producer responsibility price increases and €184 is paid for direct charging for waste, a fixed residual waste tax per household and a general tax related to household income.

3. Residual waste - charged at full cost
Waste charge covers the costs of the disposal. The average price of a 60l waste bag is €2. Some regions have established maximum tariffs with the objective of ensuring minimal dumping.

The table below shows the separately collected fractions of household waste in Flanders.

Fraction	Collection method
Household waste	Bi-weekly door-to-door collection
Bulky waste	CA (Civic Amenity site)/ bring sites, door-to-door collection, collection on demand
Vegetable, fruit and garden waste	Door-to-door collection or home composting
Paper and cardboard waste	Door-to-door collection and CA sites
Glass waste (glass cullet)	Bottle bank – two-colour separations, CA sites, sometimes door-to-door collection
PMD-waste (plastic bottles and flasks, metal packaging and drink cartons)	Door-to-door collection
Textile waste	Civic Amenity site, door-to-door collection, separately placed containers
Construction and demolition waste containing asbestos	Civic Amenity site
Stone debris -inert	Civic Amenity site
Pruning	Civic Amenity site, sometimes door-to-door collection
Fine garden waste and grass	Civic Amenity site
Metals, discarded iron	Civic Amenity site
Wood waste	Civic Amenity site
Tree trunks	Composting facility, sometimes door-to-door collection
Small hazardous waste (all fraction) + injection needles	Civic Amenity site or door-to-door collection or district collection
Old and expired medications/ drugs	Pharmacist
Waste electrical and electronic equipment (WEEE)	Civic Amenity site and re-use centres, conform the acceptance requirement
Re-usable goods	Door-to-door collection on demand, re-use centre
Gas bottles	Businesses part of the FeBuPro (Federation of Butane and Propane). Also for filling. Approximately 300 sites. For some bottles consumers pay a deposit[23].

Table 4: Separately collected fractions of household waste in Flanders (Belgium)

The current targets are a maximum of 3% contamination for vegetable, fruit and garden waste and paper and cardboard waste, 5% for wood and glass waste, 15% for construction and demolition waste, and 5 to 15% for textile waste.

There are also direct landfill and incineration bans and landfill is forbidden for:

- unsorted household waste

23De Openbare Vlaamse Afvalstoffenmaatschappij (OVAM) http://www.ovam.be/jahia/Jahia/pid/1339

- waste collected for the purpose of recovery
- waste that is, due to its nature, quantity and homogeneity, fit for recycling
- incinerable sorting residues from household and comparable waste
- old and expired medication

Incineration is forbidden for:

- selectively collected waste fit for material recovery or recycling, with the exception of some types of biowaste if they have a calorific value above 11.5 MJ/kg and are used for the creation of renewable energy
- unsorted industrial waste
- unsorted household waste

The Flemish landfill and incineration levies are one of the most complex systems in the EU, with 37 different regimes and tariffs. Illegal landfill and incineration is suppressed with an indexed levy of €150 euro/ tonne.

Belgium also has a voluntary deposit-refill system and a mandatory tax on beverage containers that are not refilled. All containers not meeting the following requirements are taxed:

- the container must be reusable at least 7 times
- the container must actually be refilled
- the container must carry a deposit
- the container must show an indication of refillability and the amount of the deposit

Refillables comprise the following percent of market share:

- Beer 93%
- Soft Drinks 40%
- Soda Water 40%

Average trippage rates are:

- Alcohol (glass) 6.0 trips per year for 7 years
- Soft Drinks (glass) 4.5 trips per year for 7 years

4 ASSESMENT OF IMPACTS AND POLICIES

The development of policy solely based on the proportion of contamination by weight in the waste stream is inappropriate. There are more complex issues that multiply impacts and these are discussed below.

4.1 Reputation of the desired new product

The impact of the contaminant on the public and wholesale purchaser perceptions of the quality of the product can have wide-reaching economic impacts by excluding markets and sales. Thus if a compost derived from garden and kitchen waste is regarded to be of low quality because of a reputation that it is contaminated by plastic and chemicals – the potential for value and sales is diminished. Additionally even if it is of high quality, this may not be sufficient to counter the general reputational problem of such composts and low returns will result. For instance, as stated elsewhere in this document wineries refuse to handle this material. Similarly the possible presence of gas bottles in metal recyclate adversely affects the value of the metals supplied by a MRF.

Clearly these issues can have a negative impact on the profitability of a product and the capacity of industry to invest in appropriate technology to develop products and remove contamination. Dumping may be preferred.

4.2 Domestic economy impacts

If as a result of contamination the industry produces low quality recyclate then it is often more attractive to export the material. This has a detrimental impact on the resource efficiency of the domestic economy. For example, as noted in Section 2 some aluminium is exported partly because of the level of contamination. The recycling of aluminium in Australia has very significant energy and greenhouse pollution reduction benefits as indicated in the DECCW (2010) publication, 'Environmental Benefits of Recycling', which should be maximized for the domestic economy. The greater the amount of material recycled the less mining of raw materials occurs and energy required in the manufacturing process.

4.3 Cost burdens on recyclers

As has been noted in the review of contamination in Chapter 2, recyclers incur additional treatment costs such as labour to spot problem materials and wear and tear on machinery. They also face OH&S issues and even when they can remove contamination to the best possible level, they will face an impost from the landfill levy. As the rate of levy rises in NSW this cost can become a serious disincentive to invest in further technology and effort to produce recyclate.

4.4 Ranking materials and impacts?

The next task in evaluating contamination and appropriate policy is to assess the relative importance of impacts in relation to various materials. The funding for this project prevents a comprehensive approach (for example, a full picture of the quantities of materials that are adversely affected; full costings; or the economy- wide impacts) and instead the three researchers involved in this project undertook a joint ranking.

There are three types of impact valued equally for the purposes of this exercise on the assumption that a combined impact is more important than one single impact:

- Reputation: it was felt that if a new product does not have wide public and business acceptance about its quality then its prospects to contribute to increased recycling can be significantly marginalised and the profitability of the recycler seriously harmed.

- Domestic Economy: increasing resource recovery and reducing pollution in particular greenhouse gas emissions and energy use, are high priority public policy objectives.
- Cost Burden: damage to machinery and OH&S issues have been important and need to be taken into account. While they do not appear to have been a crippling burden on recycling operations; the problem appears to be of significant concern. It would be preferable that recyclers do not have to incur these cost burdens, in order to assist recycling to increase its competitiveness.

Contamination rankings arise from adding the degree of impact judged by us (high = 3, medium = 2 and low =1) and resulting scores greater than 5 = high; greater than 3 = medium; and 3 and below = low. Those ranked high have recommendations for effective policy and are discussed below

Major contaminants	Overview		Degree of impact (low, medium, high)			Total	Rank
Item	Environmental impact	Cost Issues	Reputation new product	Domestic economy impacts	Cost burden on recylers		
Glass	Loss of organic material and increased GHG emissions	OHS risk; low value organics; low value recyclate; impact on AWT machinery; increased processing; storage of contaminated material or landfill charges	High	Low	High	7	High
Lead Acid Batteries (LAB) and household batteries	Loss of organic material and increased GHG emissions; one LAB v's 25 tonne organics	Reduced value of organic material; fewer markets; spotting/sorting labour	High	Low	Medium	6	High
E-waste[24]	Can pollute organic materials as the lead in solders can leach into materials. Loss of resources and a pollutant in landfills	Slightly reduced value of organic material. Spotting/ sorting	Medium	Low	Medium	5	Medium
Gas bottles	Minimal. Loss of resources	Major OHS risk; spotters; lowers value metals recycling	Medium	Low	High	6	High
Plastic bags	Loss of additional resources. Pollutes organic materials	Spotting, sorting and separating from other materials; low value compost; machinery damage/ repairs	High	Low	High	7	High
Paints	Loss of resources In organics	Disposal	Low	Low	Low	3	Low
Asbestos/ building materials	Can be a pollutant in all waste streams	OHS, spotting, sorting, disposal	Medium	Low	High	6	High
Sharps	Can be a contaminant in recycling streams	OHS, spotting, sorting, disposal	Medium	Low	High	6	High
Medical waste	Can be a contaminant in all waste streams	OHS, spotting, sorting, disposal	Medium	Low	High	6	High

24 national recycling scheme should assist significantly

CFL's	Release of methyl mercury to surrounding environment and ultimately the food chain	OHS, spotting, sorting. disposal	Low	Low	Medium	4	Medium
Plastics re aluminium	Loss of materials and embodied energy	$500 vs $1400 a tonne	Low	High	Low	5	Medium
Ceramics, mixed colours in glass	Loss of materials and embodied energy	Separation (if possible), exploding bottles on assembly line	High	Low	High	7	High
Miscellaneous (nappies, textiles, shoes, dead animals, pesticides, plastic film, etc) [25]	Contaminants in all waste streams	OHS, spotting, sorting, disposal	na	na	na	na	na

Table 5: Major contaminants in residual waste streams, their issues and ranking

4.5 Policies

While it would be impossible to remove all contaminants, we recommend priority action on a number of 'high' contaminating materials to safeguard and improve the ongoing viability of the recycling industry. Improving cost and market perception issues assists in establishing a viable basis on which to expand recycling of materials such as glass and organics. Industry and government do need to be vigilant and have programs in place as a number of adverse reports in the media could do significant damage to both the acceptability of recyclate and public support for existing and increased recycling.[26]

4.5.1 Plastic Bags

Contamination of the environment is caused by plastic bag litter; but the focus here is plastic bags in the organics waste stream that prevent high quality organics recycling. It is not a matter of banning supermarket lightweight bags (which may eventually occur) but of ensuring plastic bags are biodegradable according to an acceptable standard. We understand that development of an appropriate standard is advanced and trials are underway with the SITA collection service in Penrith. Depending on the success of the trial and how the public adapt to such bags - government will need to make a choice between making biodegradable bags mandatory; or banning plastic bags from organics collections.

Additionally public education in rate notices and on the yellow bins would assist with reducing the use of plastic bags around recyclables.

4.5.2 Glass

Glass is of concern both as a contaminant and where the collection system causes contamination of it. With the emergence of commingled collections and ongoing commercial mixed waste collections, the role of glass as a contaminant has increased.

The key common approach would be to separate organics and fibre material from glass; and to improve colour separation and ceramic avoidance methods. This could be achieved by a separate organics collection system (for example, for kitchen waste as currently being trialed in South Australia; and commercial operations separating organics) or another kerbside container for glass containers or 'bottle banks' around neighbourhoods. However, this is an ad hoc process and also separating glass from the commercial sector waste stream through such systems would pose a

25 No ranking as materials too varied for specific attention

26 There is already anecdotal evidence that some in the community believe that material collected for recycling is dumped.

great challenge. A sufficient degree of take-up by the municipal and commercial sectors is unclear and would in any event be a slow process.

It would be better to adopt a system that quickly results in the maximum diversion of glass from being mixed with organics and the mixing of colours and with ceramics (and as well attracting commercial sources of glass containers and other container materials).

Clearly this is a container deposit system (CDS) with likely returns at 80-90% (depending on the deposit level and spread of convenient collection points). A CDS such as through use of reverse vending machines, separates glass not only from organics and fibres but also segregates it from other container materials and avoids mixing of colours, leading to a clean, more valuable recyclate that can be used for glass manufacture. Further a CDS can be self funding and reliant on the private sector as opposed to bottle banks which are usually funded by government or incentivised by a tax on the beverage industry.

4.5.3 Lead Acid Batteries and household batteries

The simplest approach would be to ban with appropriate penalties, the disposal of lead acid batteries in waste collections. An alternative collection service already exists (see http://www.recyclemybattery.com.au/) and government could increase support for and public education about its capacity to link to the used battery stream not currently being responsibly disposed. While household batteries are a lesser problem in terms of leakage, the public could be encouraged to separate them for disposal at drop-off centres or in a special brightly coloured bag provided for kerbside collection. A pilot drop-off program is currently underway in Victoria[27].

4.5.4 Gas Bottles

Similarly gas bottles of all types should be banned from the kerbside collection system with appropriate penalties. A public education program explaining the dangers would most likely gain traction and sympathy from the public. This should be linked to an expanded collection system covering the smaller canisters which to date have not received sufficient attention on the basis it is 'too hard'. Further action is required.

4.5.5 Asbestos

Clearly asbestos is a material of concern and a well known public health risk. It is of course already banned from kerbside collections with heavy penalties. The main solution is to increase compliance activities.

4.5.6 Medical waste

Specialised collection services already exist for such waste, for example by SITA. Jurisdictions such as South Australia have licensed facilities (above a certain size) to dispose of their waste in particular ways including a ban on landfill; and voluntary drop-off to pharmacies has also been a feature of arrangements for households in various states.

DECCW advised us that:

> Previously nursing homes that generated more than 10 tonnes of clinical waste per year; and dental or doctors surgeries, hospitals etc that generated more than 2 tonnes of clinical waste per year were required to hold a 'waste activities' Environment Protection Licence.
>
> As part of the major waste reforms in April 2008, the broad 'waste activities' licensing category was removed from the schedule and replaced for certain industry types with licensing that better reflected the activity generating that waste (e.g. paper or pulp production). However, many premises such as those generating clinical waste, as a result of the change are no longer required to be licensed.

27 see: http://www.resourcesmart.vic.gov.au/for_households_3797.html

> This decision to remove the requirement for generators of clinical waste to hold an environment protection licence was made on the basis that these facilities are generally regulated by a number of other health authorities. Moreover requirements for managing clinical waste, including the requirement for the development of clinical and related waste management plans, were added to the *Protection of the Environment Operations (Waste) Regulation 2005*.
>
> Although premises that previously triggered the licensing category of 'waste activities' for the generation of clinical waste are no longer required to hold an environment protection licence, the DECCW remains the appropriate regulatory authority for those facilities.[28]

Given the reported problems with such waste it would appear sensible to bring certain sized generators of the waste (for example nursing homes) under active control in NSW to prevent them from using the waste collection services that dump the waste in landfill via MRFs and AWTs.

28 Jenny Birchmore, pers comm. 19 August 2010

APPENDIX: INTERVIEW QUESTIONS

Qualitative (face to face or by phone)

- What recoverable materials is your company concentrating on?
  - Any other materials planned for the future?
- What are the developments of the value of these recoverable materials?
- What is the current process/ system used to collect recoverable materials beyond your operations?
- What do you consider as contamination?
  - In particular, what percentage of contamination is unacceptable to your operation
- What is the influence of the external collection system used on the amounts and level of contaminants received?
- What kind of contamination do you find and why (what is happening)?
- What are the steps/ processes from the discarded product to a reusable product and where does your organisation fit?

- What are the steps/ processes being undertaken to redress the contamination within your operations? (Eg: Manual sorting, specialised infrastructure, finding markets for contaminated output)
  - What are the current challenges/ problems within these steps? (Eg: costs, labour, time, space, infrastructure, efficacy)
  - Do you see any opportunities to improve? (e.g: new infrastructure)
  - What are the challenges and opportunities beyond your own operations within those steps/processes?
- What other challenges/ problems do you see in this market?
  - Design, collection system, treatment/ sorting, policy, or other?
- Can you suggest any solutions to get the contaminants in your recovery streams removed?
  - Design, collection system, treatment/ sorting, policy, or other?
  - Criteria for state government to be used to select problem products for schemes – which products would you suggest?
- What do you see as international leading examples/ products/ systems? Why?
- [If in Sydney] do you want to be involved in our roundtable discussion to get feedback on our conclusions so far? It will be held on the 15th of July from 15:00 to 17:00
- Can you suggest other organisations/ people of interest to speak to in regards to these issues?

Quantitative (or estimation)

CONTAMINATION ISSUES – PLEASE NOTE THE FOLLOWING FIGURES MAY BE ESTIMATIONS ONLY IF PRECISE DATA IS NOT AVAILABLE	
Nature of contamination (chemical/physical & products eg, glass fines, lead acid batteries, plastic bags, etc – list separately if multiple materials/ items)	
Quantities (per tonne or number of items) and percentage of throughput of contaminant materials	Total tonnes :
	% of recovered:
Economic impact of contaminant materials / items on your operations per annum (including, e.g. OH&S costs, lost or lower value recyclate, machinery damage, landfill charges, new avoidable technology costs, labour , legal etc)	

Questions Councils

- What are the recyclable materials/ products in your council area?
  - Any other materials planned for the future?
- Do you have an estimate of the value of these recoverable materials?
- What is the current waste management organisation and system used by your council?
  - In particular the process/ system used to collect the recyclable materials?
  - Any other plans for the future?
- Do you receive information about contamination types and quantities?
  - In particular, what percentage of contamination occurs rendering recyclate unable to be processed?
  - Is your council charged for contamination of recyclables?
- How does your council try to prevent contamination and increase recycling rates, eg, education, fines?
- Do you know what is the influence of the collection system on the amounts and level of contaminants received?
- What kind of contamination do you find and why is this happening?
- What challenges/ problems do you see in the recycling/ waste management market?
  - Design, collection system, treatment/ sorting, policy, or other?
- Can you suggest any solutions to get the contaminants in your recovery streams removed?
  - Design, collection system, treatment/ sorting, policy, or other?
- What do you consider as leading council areas? Why?
- What do you see as (inter)national leading examples/ products/ systems? Why?
- [If in Sydney] do you want to be involved in our roundtable discussion to get feedback on our conclusions so far? It will be held on the 15th of July from 15:00 to 17:00
- Can you suggest other reports/ organisations/ people of interest to speak to in regards to these issues?

Appendix P – Stakeholder workshops and meetings

Workshop 1 for government agencies – 16/7/2010

Name	Organisation	Attending
David Richmond	Steering Committee (SC)	Yes
Martijn Wilder	SC	No
Ken Kanofski	SC	Yes
Richard Pearson	SC	No
Bob Verhey	SC	Yes
Zoe de Saram	SC	Yes
Jenny Burchmore	SC Secretariat	Yes
Janet Dawson	SC Secretariat	Yes
	Division of Local Government	No
Lindsey Williams	NSW Treasury	Yes
Bill Stanhope	NSW Treasury	No
Minh Nguyen	NSW Treasury	Yes
Mark Piggott	NSW Treasury	Yes
Victor Yuen	NSW Treasury	Yes
Shane McMahon	Department of Premier and Cabinet (DPC)	Yes
Shayne Watson	DoP	Yes
Rohan Tayler	DoP	Yes
Gary Eisner	I&I NSW	Yes
Graham Levitt	I&I NSW	Yes
Bernard Carlon	DECCW	Yes
Steve Beaman	DECCW	Yes
Tony Hodgson	DECCW	Yes
Steve Hartley	DECCW	Yes
David Godden	DECCW	Yes
John Smith	DECCW	Yes
Jane Moxon	DECCW	Yes
Danyelle Carter	DECCW	Yes
John Harley	DECCW	Yes
Catherine Johnson	WSN Environmental Solutions	Yes

Workshop 2 for C&I waste sector – 29/7/2010

Name	Organisation	Attending
David Richmond	SC	Yes
Martijn Wilder	SC	No
Ken Kanofski	SC	Yes
Richard Pearson	SC	Yes
Bob Verhey	SC	No
Zoe de Saram	SC	Yes
Bernard Carlon	DECCW	Yes
Jenny Burchmore	SC Secretariat	Yes
Janet Dawson	SC Secretariat	Yes
Doug Dean	CEO, Veolia Environmental Services	Yes
Eric Gernatt (sending delegate)	CEO, SITA	Yes
Dean Naudi	General Manager, TPI/Cleanaway	Yes
Ron Wainberg	President, Waste Management Association of Australia (WMAA)	Yes
Peter Schmigel	Australian Council of Recyclers (ACOR)	Yes
Mike Ritchie	Director, Mike Ritchie & Associates	Yes
Tony Khoury	Executive Director, Waste Contractors and Recyclers Association	Yes
Ross Smith	NSW Recycling Manager, AMCOR Recycling	No
Terry Martin	General Manager, Brandown Pty Ltd	Yes
Robert Eastment	Director, IndustryEdge	No
Peter Bury	Director – Industry Development, Plastics, PACIA	No
Mohan Selvaraj	Remondis	Yes
Jason Whittaker	NSW General Manager ,Sims Metals	No
Colin Sweet	Thiess Services Pty Ltd	Yes
Stephen Mitchell	Sustainability Program Manager, Timber Development Association	No
Veena Sahajwalla	Associate Dean (Strategic Industry Relations) Faculty of Science, UNSW	No
Andrew Johnston	NSW General Manager, Visy	No
Garbis Simonian	Managing Director, Weston Aluminium	Yes
Patrick Soares	Managing Director, Australian Native Landscapes	No
Armineh Mardirossian	Group Sustainability Manager, Woolworths	Yes
John Lawson	Global Renewables	Yes

Name	Organisation	Attending
Anthony Johnson	URM	No
Clive Young	Dial A Dump Industries	Yes
Toni Georgakopoulos	Owens Illinois	No

Workshop 3 for municipal waste sector – 13/8/2010

Name	Organisation	Attending
David Richmond	SC	Yes
Martijn Wilder	SC	No
Ken Kanofski	SC	Yes
Richard Pearson	SC	Yes
Bob Verhey	SC	Yes
Zoe de Saram	SC	Yes
Jenny Burchmore	SC Secretariat	Yes
Janet Dawson	SC Secretariat	Yes
Bernard Carlon	DECCW	Yes
Steve Beaman	DECCW	Yes
Mark Gorta	DECCW	Yes
Steve Fedorow	Manager – Environmental Health, Lane Cove Council	Yes
Fiona Stock	Waste Services Manager, Kogarah Council	No
Miles Lochhead	Waste Manager, Wingecarribee Council	Yes
Les McMahon	General Manager, Wollondilly Council	No
Allan Willing	Waste Services Manager, Leichhardt Council	Yes
Ron Smith	Waste Manager, Sutherland Shire Council	No
David Hojem	Waste Manager, Shoalhaven City Council	Yes
Robert Bailey	Waste Manager, Port Macquarie–Hastings Council	No
Ken Wilson	Manager Environmental Services, Clarence Valley Council	No
James Carey	Sustainable Development Manager, Bankstown Council	No
Glenn Wilcox	Director Planning and Environment, Gloucester Shire Council	No
Jeff Swiks	Marrickville Council	No
Paul Macdonald	Campbelltown Council	No
Wayne Carter	Rockdale Council	Yes
Tom O'Hanlon	Woollahra Council	Yes
Geoff Brown	Penrith Council	No

Name	Organisation	Attending
Nicole Greenwood	Blacktown Council	Yes
Tracey Chalk	Strathfield Council	No
Anne Prince	ACOR	No
Paul Howlett	Wright Corporate Strategy	Yes
Greg Freeman	Impact Environmental	Yes

Meeting 4 for Environmental Groups – 17/8/2010

Name	Organisation	Attending
David Richmond	SC	Yes
Jenny Burchmore	SC Secretariat	Yes
Janet Dawson	SC Secretariat	Yes
Jane Moxon	DECCW	Yes
Mark Gorta	DECCW	Yes
Jeff Angel	Total Environment Centre (TEC)	Yes
Irmine van der Geest	TEC	Yes
Don White Kimberly Lam (University of Sydney)	Nature Conservation Council of NSW (NCC)	Yes
Dave West	Boomerang Alliance	No
Ian Kiernan	Clean Up Australia	No
Terrie-Ann Johnson	Clean Up Australia	Yes
Janet Sparrow	Planet Ark	Yes

Appendix Q – Waste acronyms, abbreviations and glossary of terms

Acronyms and abbreviations

AWT Alternative waste technology/treatment

BMW Biodegradable municipal waste (UK)

DORF Derived organic rich fraction

C&D Construction and demolition

C&I Commercial and industrial

CCERP City and Country Environment Restoration Program

CDL Container deposit legislation

COAG Council of Australian Governments

CPRS Carbon pollution reduction scheme

DCP Development control plan

DEC *(former)* Department of Environment and Conservation (NSW)

DECCW Department of Environment, Climate Change and Water NSW

DGR Director-General requirements (DoP)

DoP NSW Department of Planning

EfW Energy from waste

EP&A Act *Environmental Planning and Assessment Act 1979*

EPA Environment Protection Authority (part of DECCW)

EPHC Environment Protection and Heritage Council

EPR Extended producer responsibility

ERA Extended Regulated Area (includes the Hunter, Central Coast and Illawarra regions)

EU European Union

I&I NSW Industry and Investment NSW

I SEPP State Environmental Planning Policy (Infrastructure) 2007

IWG Implementation Work Group

LEP Local environmental plan

LGA Local government area

LGSA Local Government and Shires Associations of NSW

MBT Mechanical biological treatment

MD SEPP State Environmental Planning Policy (Major Development) 2005

MRET Mandatory Renewable Energy Target

MRF Materials recovery facility

MSW Municipal solid waste

MUD Multi-unit dwelling

NEPM National Environment Protection Measure

NPC National Packaging Covenant (became the Australian Packaging Covenant in July 2010)

NRA Non-regulated Areas – the remaining NSW councils not included in the Section 88 levy

NRI National Recycling Initiative

ORRF Organic resource recovery facility

PFI Private Finance Initiative (UK)

POEO *Protection of the Environment Operations Act 1979 and* Protection of the Environment Operations Regulations

REC Renewable Energy Certificate

RET Renewable Energy Target

RIRDC Rural Industries Research and Development Corporation

RRA Regional Regulated Area (in the Section 88 levy) – includes coastal councils from the Upper Hunter to the Queensland border, including Wollondilly, Blue Mountains, Gloucester and Bellingen LGAs

RTA Roads and Traffic Authority NSW

SEPP (Infrastructure) State Environmental Planning Policy (Infrastructure) 2007

SMA Sydney Metropolitan Area (in the Section 88 levy)

SME Small to medium enterprise

SUD Single-unit dwelling (house, townhouse, semi-detached, terrace)

TEC Total Environment Centre

VENM Virgin excavated natural material

WARR Waste and Resource Recovery

WaSIP Waste and Sustainability Improvement Payment program

WDA Waste disposal authority (UK)

WEEE Waste electrical and electronic equipment

WIDP Waste Infrastructure Delivery Programme (UK)

WISF Waste Infrastructure and Sustainability Fund

WRAPP Waste Reduction and Purchasing Policy

WTP Willingness to pay

Glossary of terms

Note that definitions that are derived from legislation are denoted by an *.

All other definitions have been compiled from informal sources for the purpose of this document only.

Advance disposal fee A fee levied at the point of production to support recovery or safe disposal of the product.

Anaerobic digestion is where organic materials (food and garden waste) are converted into methane or 'biogas' and compost in the absence of oxygen. These processes take place in an enclosed building and involve the breakdown of organic material in a sealed vessel called a digester. This allows the biogas to be generated.

Avoidance Eliminating the generation of waste at its source**.**

Biodegradable A process by which large, complex organic molecules are broken down to smaller organic molecules through the action of microorganisms.

Biological stabilisation A process whereby waste undergoes managed biological transformation.

Biomass A renewable energy source; biological material derived from living, or recently living, organisms such as wood, waste, and alcohol fuels. Biomass is commonly plant matter grown to generate electricity or produce heat. For example, forest residues (such as dead trees, branches and tree stumps), yard clippings and wood chips may be used as biomass. However, biomass also includes plant or animal matter used for production of fibres or chemicals. Biomass may also include biodegradable wastes that can be burnt as fuel. It excludes organic material such as fossil fuel which has been transformed by geological processes into substances such as coal or petroleum.

Bioreactor (landfill) A specific type of landfill in which the decomposition of organic materials to methane and humus is accelerated by the recirculation of leachate, often supplemented with other water sources, through the waste. In such bioreactors, the methane generated is often converted into electrical or heat energy, or both.

Biosolids* The organic product that results from sewage treatment processes (sometimes referred to as sewage sludge).

Cap and trade scheme A cap is set on emissions that will be covered by the scheme, permits are issues up to the amount of this emissions cap and the permits are able to be traded.

Clean Up Kerbside collection service provided to households for the removal of large, bulky items

Combustion The burning of (in this case) wastes. This is an umbrella term that covers both the combustion of waste to produce heat and electricity using steam turbine generators and the combustion of waste for destruction or incineration purposes.

Co-mingled recycling A method for household and commercial recycling in which all paper fibres and recyclable plastic, steel, aluminium and paperboard containers are deposited together into a common collection system and collected together by truck or by other means, instead of being sorted at the source and handled separately throughout the collection process.

Commercial and industrial waste Waste generated by commercial businesses, institutions and industry.

Compost The product of the aerobic or anaerobic biological conversion of organic waste.

Compostable organics Generic term for all organic materials appropriate for collection and use as feedstock for composting or related biological treatment systems (residual food organics, garden organics, wood and timber, biosolids and agricultural organics).

Construction and demolition waste Materials in the waste stream which arise from construction, refurbishment or demolition activities.

Contamination of recycling occurs when incorrect, contaminated or unacceptable items are placed in recycling bin.

Contaminated site A site at which a substance occurs at concentrations above the concentration at which the substance is normally present in soil from the same locality and where an assessment indicates it presents a risk of harm to human health or the environment.

Disposable Any product or material that is designed to be thrown away after one use.

Diversion The recycling or reprocessing of materials that would have otherwise been disposed of in landfill.

Domestic waste Waste generated from households, both urban and rural.

Drop-off recycling facilities/Community drop-off centres Recycling bins in the community where residents can come and deposit their recyclables, usually free of charge.

Dry goods collection Collection from premises or households of large, bulky items.

E-Waste Electronic waste, including all secondary computers, entertainment device electronics, mobile phones, and other items such as television sets and refrigerators, whether sold, donated, or discarded by their original owners.

Energy from waste Technologies that convert materials such as organics, tyres and plastics into heat and electricity using processes such as combustion, gasification or pyrolysis.

Environment protection licence DECCW issues licences to the owners or operators of various industrial premises under the POEO Act. Licence conditions relate to pollution prevention and monitoring, and cleaner production through recycling and reuse and the implementation of best practice.

Food waste* means waste from the manufacture, preparation, sale or consumption of food but does not include grease trap waste (POEO Act).

Garden waste* means waste that consists of branches, grass, leaves, plants, loppings, tree trunks, tree stumps and similar materials, and includes any mixture of those materials (POEO Act). Often generically referred to as ‘green waste’.

Gasification The efficient conversion of solid fuel to gaseous fuel. The gas made can produce heat and electricity using gas engine generators.

General solid waste landfill A landfill licensed under the POEO Act to accept disposal wastes classified or assessed as general solid waste in accordance with the Waste Classification Guidelines. These landfills are categorised into general solid waste (putrescibles) and general solid waste (non-putrescible) landfills.

Hazardous waste Strictly defined as any waste that is classified or assessed as hazardous in accordance with the Waste Classification Guidelines. Hazardous waste cannot be disposed of to landfill unless treated to remove or immobilise the contaminants. Certain wastes have properties that make them hazardous or potentially harmful to human health or the environment. Other wastes may be hazardous in relation to the activity being carried out with the waste (e.g. transport and handling).

Household hazardous waste A substance which is explosive, corrosive, flammable, reactive, contagious or toxic, as well as the products used to contain the substance. This waste originates from domestic sources (households). Such materials include paints, cleaning liquids, oils and varnishes, as well as syringes and home-generated medical waste.

Illegal dumping is the unlawful deposit of waste larger than litter onto land. It includes waste materials that have been dumped, tipped or otherwise deposited onto private or public land where no licence or approval exists to accept such waste. Illegal dumping varies from small bags of rubbish in an urban environment to larger scale dumping of waste materials in isolated areas, such as bushland.

Illegal land filling Waste used as fill material with the consent of the owner or occupier of the land but without the necessary council or DECCW approvals.

Inert waste Prior to April 2008 ‘Inert waste’ was a waste class under the NSW Waste Classification Guidelines. In April 2008 the waste classification system was overhauled and ‘Inert waste’ was abandoned as a waste classification. This was partly because of the implicit assumption that the term carried with it, that the waste is not chemically or biologically reactive and therefore presents no risk of harm to the environment. This term should be used with care, particularly given its historical regulatory function to qualitatively define a waste’s risk of harm. As such this term no longer has any regulatory validity.

Landfill A facility designed and operated to dispose of waste (not including beneficial application to land). Landfills are engineered differently depending on the class of waste they receive.

Landfill gas Gas generated as a result of the decomposition processes in decaying wastes deposited at a landfill. It comprises mainly methane and carbon dioxide, but includes a range of other components.

Leachate The liquid released by waste, or water that has percolated through waste, and which contains dissolved or suspended liquids, solids or gases (or a combination of these). Leachate may contain environmentally harmful substances derived from the material deposited in the landfill.

Litter* includes:

(a) any solid or liquid domestic or commercial refuse, debris or rubbish and, without limiting the generality of the above, includes any glass, metal, cigarette butts, paper, fabric, wood, food, abandoned vehicles, abandoned vehicle parts, construction or demolition material, garden remnants and clippings, soil, sand or rocks, and

(b) any other material, substance or thing deposited in or on a place if its size, shape, nature or volume makes the place where it is deposited disorderly or detrimentally affects the proper use of that place.

Mechanical biological treatment system A form of waste processing facility that combines a sorting facility with a form of biological treatment such as composting or anaerobic digestion. MBT plants are designed to process mixed household waste as well as commercial and industrial wastes.

Mixed waste refers to waste that has not been source-separated. In a municipal waste context this primarily refers to residual household waste that contains putrescible organics or waste from litter bins that are collected by or on behalf of local councils.

Municipal solid waste The solid component of the waste stream arising from household waste placed at the kerbside for council collection and waste collected by council from municipal parks and gardens, street sweepings, council engineering works and public council bins.

Organics* means natural organic fibrous materials of waste and non-waste origin, including:

(a) putrescible organics (such as meat, fish, poultry, fruit, vegetable and their cooked or processed products, biosolids and animal materials), and

(b) non-putrescible organics (such as timber, garden trimmings, agricultural, forestry and crop materials, and natural fibrous organic and vegetative materials).

Organic outputs can refer to an organic waste generated from any process but is primarily associated with outputs from AWT facilities. Organic outputs as defined under the AWT Resource Recovery Exemption means the pasteurised and biologically stabilised organic outputs produced from the mechanical biological treatment of mixed waste.

Putrescible waste is a form of general solid waste generally characterised by materials that readily decay under standard conditions, emit offensive odours, and attract vermin or other vectors (such as flies, birds and rodents). It includes household waste containing putrescible organics, and food and animal waste.

Pyrolysis The production of a carbon-rich solid fuel and a hydrocarbon-rich gas by heating a biomass feedstock in the absence of oxygen, such as used to produce charcoal from wood.

Recovery Reuse of waste materials in an altered form, i.e. material recovery, or recovery of the energy content of waste materials, i.e. energy recovery.

Recyclable Able to be recovered, processed and used as a raw material for the manufacture of useful new product through a commercial process.

Recycle Reuse of waste materials in such a manner that the original products lose their form or identity but their material value is maintained.

Reduction Elimination of waste being produced at the source.

Residual waste Waste left from any type of process, whether that process is a waste activity or other business activity.

Residue waste* a regulatory term applied to any of the following substances (and includes any substance incorporating, mixed with or made from any of the following substances):

(a) fly ash or bottom ash from any furnace

(b) lime or gypsum residues from any industrial or manufacturing process

(c) residues from any industrial or manufacturing process that involves the processing of mineral sand

(d) substances that have been used as catalysts in any oil refining or other chemical process

(e) foundry sands and foundry filter bag residues

(f) residues from any industrial or manufacturing process that involves the refining or processing of metals or metallic products

(g) any substance that is hazardous waste or restricted solid waste.

Residue waste is prohibited from application to land for the purpose of growing vegetation without an exemption.

Resource Recovery Exemption An exemption issued by DECCW that exempts a person from the regulatory requirements associated with the use of a waste in land application or as a fuel (such as the requirement to hold a licence, pay the levy etc.). The exemptions enable the lawful reuse of waste-derived materials as fill or fertiliser (land application) or as a fuel or alternative raw material in thermal applications, where this is beneficial and does not harm the environment or human health.

Reuse Multiple use of a product in its existing form.

Source-separated recyclable household waste means household waste from kerbside waste collection services that has been separated for the purpose of recycling.

Sharps* means those things:

(a) that have sharp points or edges capable of cutting, piercing or penetrating the skin (such as needles, syringes with needles or surgical instruments), and

(b) that are designed for the purpose of cutting, piercing or penetrating the skin, and

(c) that have the potential to cause injury or infection.

Transfer stations Facility for the collection and transfer of waste and recyclables. Materials are brought from businesses and households to the transfer station and from here they are transferred to the appropriate disposal or recycling facilities.

Total waste stream The combined waste, recycling and garden organics streams.

Trackable waste The transport of some wastes presents a high risk to the environment. These wastes must be tracked when transported into, within or out of NSW. The waste consignor, transporter and receiving facility all have obligations to ensure that the waste is properly tracked.

Waste* includes

(a) any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment, or

(b) any discarded, rejected, unwanted, surplus or abandoned substance, or

(c) any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, processing, recovery or purification by a separate operation from that which produced the substance, or

(d) any processed, recycled, re-used or recovered substance produced wholly or partly from waste that is applied to land, or used as fuel, but only in the circumstances prescribed by the regulations, or

(e) any substance prescribed by the regulations to be waste.

A substance is not precluded from being waste for the purposes of the POEO Act merely because it is or may be processed, recycled, re-used or recovered.

Waste classification The classifying of wastes into groups that pose similar risks to the environment and human health to facilitate their management and appropriate disposal. There are six current waste classes: special waste, liquid waste, hazardous waste, restricted solid waste, general solid waste (putrescible), general solid waste (non-putrescible).

Waste facility* Any premises used for the storage, treatment, processing, sorting or disposal of waste (POEO Act).

Waste infrastructure includes receptacles for the collection of waste materials, landfills, material recovery facilities, transfer stations, reprocessing facilities, alternative waste treatment plants and recycling storage containers.

Waste hierarchy A system of prioritising ecologically sustainable waste solutions, based on the maximum conservation of resources. The hierarchy stresses avoidance and reprocessing, with waste disposal as the last option.

Waste minimisation Application of activities such as waste avoidance, reduction, reuse, recycling and behaviour modification to minimise the amount of waste that requires disposal.

Weighbridge Large scales that are usually permanently mounted on a concrete foundation weighing scale, used to weigh entire vehicles and their contents. By weighing the vehicle both empty and when loaded the load carried by the vehicle can be calculated.