

International Waste Strategy Benchmarking

Prepared for:
NSW Environment Protection Authority

© State of NSW and Environment Protection Authority

The views expressed within are not necessarily the views of the NSW Environment Protection Authority (EPA) and may not represent EPA policy.

Sinclair Knight Merz
ABN 37 001 024 095
710 Hunter Street
Newcastle West NSW 2302 Australia
Postal Address
PO Box 2147, Dangar NSW 2309 Australia
Tel: +61 2 4979 2600
Fax: +61 2 4979 2666
Web: www.globalskm.com

LIMITATION: This report has been prepared on behalf of and for the exclusive use of Sinclair Knight Merz (Europe) Limited's Client, and is subject to and issued in connection with the provisions of the agreement between Sinclair Knight Merz and its Client. Sinclair Knight Merz accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

Contents

Executive summary	1
1. Introduction	6
1.1. Aim of Waste Strategy Review and Benchmarking Report	6
1.2. Review Process	6
2. New South Wales Strategic Waste Context	8
2.1. Review of the NSW WARRS 2007	8
2.2. The WARR Act 2001	8
2.3. Richmond Review 2010	9
2.4. Reducing Waste: Implementation Plan 2011-2015	10
2.5. NSW 2021: A plan to make NSW number one.	10
2.6. The NSW waste levy and regulatory provisions	10
2.7. The NSW WARRS 2007	11
2.8. A future Waste Strategy for NSW	16
3. Findings from the Review of Waste Strategies	17
3.1. Overview of Waste Strategies	17
3.2. Waste Strategy Key Themes and Targets	19
3.3. Reducing Toxicity in Products and Materials	37
3.4. Reducing Litter and Illegal Dumping	39
3.5. Wider Environmental Themes	41
3.6. Key Waste Sectors	45
3.7. Measuring Performance	47
4. Benchmarking Findings	49
4.1. The Waste Hierarchy	49
4.2. Waste Prevention	49
4.3. Recovery and Reuse	50
4.4. Reducing Toxicity in Products and Materials	50
4.5. Reducing Litter and Illegal Dumping	51
4.6. Wider Environmental Aspects	51
4.7. Waste Sectors	52
4.8. Measuring Performance	53
4.9. Key Drivers for Action	53
5. Conclusions	54

Executive summary

This report summarises the results of a benchmarking exercise undertaken in August 2012 to support the New South Wales Environment Protection Authority (NSW EPA) in the development of a new Waste Avoidance and Resource Recovery Strategy.

The NSW EPA is currently updating its Waste Avoidance and Resource Recovery Strategy (WARRS) 2007 in accordance with the requirements of the Waste Avoidance and Resource Recovery Act 2001 (the WARR Act). As part of the development of the new Strategy, the NSW EPA is required to review current national and international waste strategies to ensure that the development of the new strategy is comparable to others and in line with best practice.

The specific objectives of this project were to undertake a review of 20 waste strategies from Australian state/territories and a mix of international sources that were comparable to NSW in status and economy (the benchmark group) and to determine:

- the latest trends and thinking in waste and resource management strategies
- understand key drivers for action
- compare targets for recycling, recovery and disposal (and how these are being measured and reported)
- based on progress to date and current initiatives, the applicability of these to a NSW context.

The review has been framed by the current themes within the WARRS document; preventing and avoiding waste, recovery and use of secondary products, litter and illegal dumping, reducing toxicity in products and materials. As well, the review has considered additional themes such as wider environmental themes, the waste sectors covered in the strategy and the measurement of performance.

It is important to keep in mind that the review has looked at targets and published strategies across the benchmark group, rather than actual performance in each jurisdiction against targets. The publication of a desired waste outcome does not guarantee that outcome will be met.

The strategies reviewed included:

Australian State and Territory	International Countries	
Queensland	New Zealand (National)	England (National)
Victoria	Seattle (State)	Wales (National)
Western Australia	New York (State)	Scotland (National)
South Australia	Nova Scotia (Province)	Northern Ireland (National)
Tasmania	Vancouver (City)	Copenhagen (City)
Australian Capital Territory (ACT)	Netherlands (National)	Finland (National)
	Sweden (National)	Flanders (Region – Belgium)

The above strategies are referred to throughout the report as the 'benchmarking group'.

Key themes from the benchmarking group

The Waste Hierarchy

The waste hierarchy, in its various formats underpins all of the strategies reviewed, with greater or lesser emphasis placed on activities in the hierarchy. Goals and targets within waste strategies are also often defined according to the hierarchy. 'Zero waste' is used extensively as a concept in the benchmarking group and the main process of achieving this is to move waste policies away from the bottom of the hierarchy (disposal) to the top (prevention) as this is ultimately the most effective way to aspire towards a zero waste goal.

The waste hierarchy is defined in NSW legislation but this is not carried through into the WARRS 2007 document itself as strongly as some of the strategies reviewed where the waste hierarchy frames action plans and provides justification for action.

Key waste sectors

The majority of waste strategies cover a range of waste types, including Municipal Solid Waste (MSW), Commercial & Industrial (C&I) and Construction & Demolition (C&D) waste. There has been an evident move away from focusing on household or municipal waste only (for example the Scottish, English and Welsh waste strategies in 2002/3 focused on municipal waste and more recent strategies include C&I and C&D waste). The NSW WARRS has covered MSW, C&I and C&D waste since 2003.

In comparing the NSW strategy with the other strategies, it is important to note that the term 'Municipal Solid Waste' has the most variation across the strategies assessed and can encompass waste from different sources. Comparisons need to take these differences into account and this is discussed at section 3.6.

Preventing and Avoiding Waste

All of the waste strategies reviewed highlight waste prevention as a priority covering municipal solid waste (MSW), Commercial and Industrial (C&I) and Construction and Demolition (C&D) waste streams. However, less than half (9 of the 20) had set a target for waste prevention/reduction. These were either based on absolute levels (by weight) or took into account external factors such as population growth by basing the target on a weight per capita performance metric.

It is difficult to make direct comparisons between the targets as they are all based on different performance metrics, different timeframes and different baseline levels. Including a target for waste prevention gives a clear priority to this issue.

Of the strategies that did not set targets the key reason mentioned for this was the difficulty of measuring progress in this area. Where no targets were set, the strategies often contained a significant focus on waste prevention activities.

Increasing recovery and use of secondary products and materials

The review of strategies demonstrates that the following themes are common in relation to increasing recovery and the use of secondary materials:

- promoting material recycling
- material/energy recovery

- focusing on the diversion of waste from landfill.

The majority of the strategies reviewed include a target relating to each or one of these themes. The approaches taken to meet these targets vary between the strategies due to differing overarching drivers, objectives, existing performance and a spectrum of influencing economic and environmental conditions. In summary, the strategies generally set targets within the following key areas:

- recycling and composting (either combined or separately measured)
- recovery of the waste via treatment or recycling
- diversion of waste from landfill
- limit on the tonnages permitted to landfill
- limit on the tonnages of specific materials/compositions to landfill
- a target set for specific waste sectors in the above areas.

The targets are often cited as a percentage increase/tonnage increase in recycling, recovery or diversion of waste reported against an established baseline year.

The strategies that did not set targets mainly related this to a focus in the strategy on a waste prevention or landfill diversion target, or a lack of data to set meaningful, achievable and realistic targets in this area.

In NSW the approach to increasing recovery has been to focus on recycling targets from the MSW, C&I and C&D waste streams. WARRS 2007 has in place similar actions and programmes to those implemented in other strategies to support the recycling/recovery targets. NSW engages with different sectors through various programmes and also has key fiscal drivers to encourage the diversion of waste from landfill. NSW has not set a target in relation to waste diversion from landfill, however, this was not seen as the norm across the other strategies, and where this was a target, this was often seen to complement the recycling/recovery targets.

A key difference between some other strategies and NSW appears to be the focus on landfill bans, and to a lesser extent the implementation of voluntary agreements/sector plans. These are particularly evident in the UK and Wales specifically, where landfill bans are being considered for recyclate and biodegradable waste, and where a number of voluntary agreements with industry has been set up to promote their commitment to reducing waste and increasing the recovery/recycling of materials. Wales is also developing several sector specific plans to focus on engagement with the sectors and ensure long term deliverability.

A recurring theme in a number of the strategies is the lack of built infrastructure to deliver the required diversion. This issue is usually linked to implementation plans regarding how to encourage large investments into waste treatment technologies and links to planning issues.

Reducing toxicity in products and materials

In WARRS 2007, this theme relates to reducing problem wastes and product stewardship schemes for priority wastes such as e-waste. Priority substances identified in the WARRS 2007 in addition to e-waste included PVC, batteries, fluorescent tubes and shredder floc. It also focused on participation in national programs for reducing toxic components such as mercury, lead cadmium and hexavalent chromium in electrical and electronic products.

Since 2007, NSW has also focused on 'problem wastes', that present management issues from an environmental, material handling, resource recovery or human health perspective (see *Reducing Waste: Implementation Strategy 2011-2015*). These included gas bottles, lead acid batteries, mattresses, pesticides, paints, oils and mercury-containing lamps. NSW has also continued its close involvement in national product stewardship action for priority wastes identified at a national level.

The review of the benchmark group found that the policies and implementation plans which underpin this theme are present in the majority of the strategies, but that the theme itself does not form a core part of the strategies. The main reason for the difference is suggested to be the fact that legislation is in place in other jurisdictions (concerning landfill bans and producer responsibility) so there is less need for it to be a focus in the jurisdiction's strategy. It is noted that since late 2011, Australia has had national legislation providing for product responsibility schemes – the *Product Stewardship Act 2011*. This could influence the shape of the next NSW WARRS.

Illegal dumping and litter

11 out of 20 waste strategies consider littering and illegal dumping as a key priority area in their waste strategy. Six of these strategies provided either targets or detailed information on the actions they would take to address littering and illegal dumping. The targets include specific reduction targets (e.g. to reduce by x %), a general statement to reduce incidents/tonnages or a comparison target to be the cleanest city or have the lowest levels of litter compared to others. The strategies contain similar actions to NSW including enforcement, awareness campaigns and education, with some strategies highlighting the need to review waste collection services for their link to incidents of littering and illegal dumping. This issue has been given more focus than many of the other strategies in the benchmarking group with the NSW WARRS 2007 having a target for littering and illegal dumping supported by a range of enforcement and awareness raising activities. Additional and complementary targets for litter and illegal dumping have also been included in *NSW 2021: A plan to make NSW number one*, the NSW Government's overarching strategic plan for the state.

Wider environmental aspects

The majority of the other waste strategies (14 of the 20) consider waste as part of a broader environmental target and not a standalone issue. The key focus is the impact of waste management on climate change, through the increase in greenhouse gas emissions as a result of resource extraction, energy and water use to produce materials, and the emissions of methane from waste disposal to landfill. In this approach, waste is considered as part of:

- commitments for climate change impacts and adaptation
- commitments for carbon and greenhouse gases reduction, or
- calculation of an ecological footprint (examination of the environmental impact in terms of the area of land required to support an activity).

All the strategies that consider the climate change impacts of waste management make reference to the country/state target for reducing greenhouse gas emissions and highlight the contribution that waste management will make to achieve this target.

Key Conclusions from the Benchmarking Exercise

It was evident from the review that the NSW WARRS 2007 is comparable with those developed by the benchmark group against a number of the areas identified for comparison, including in relation

to the scope (e.g. sectors covered) and levels of performance (e.g. % recovered) required by the recycling/recovery targets. However, there are a number of areas for consideration in the future development of the strategy and where NSW is not keeping pace with international good practice. These can be summarised as:

- **The Waste Hierarchy** underpins all good practice waste strategies and is prominent within it. It is important that the hierarchy is clearly defined within the waste strategy document and related waste policy. While the NSW strategy makes reference to the waste hierarchy and it is defined in the WARR Act, other strategies make stronger references using it as a framework for action.
- **Waste Prevention** – NSW has had a previous target for waste prevention, which extended until 2008 and has not been replaced. Of the benchmark group, 9 of 20 had set a numerical target related to waste prevention. Waste prevention activity and policies is a focus of many strategies, in particular those that are underpinned by the European Union (EU) Waste Framework Directive. It should be noted that the larger part of the benchmark group did not set targets. It is widely considered difficult to track progress of specific activities and measure outcomes, especially as the activities are often related to behaviour change and softer implementation techniques. Despite no targets being set, these strategies still contained a clear objective to reduce, prevent and avoid waste.
- **Landfill Bans** – Many countries are adopting landfill bans for general material streams (such as biodegradable or recyclable wastes) – not just specific hazardous or difficult materials (such as clinical waste or tyres). These bans go beyond the scope of existing landfill bans in NSW. Landfill bans or restrictions are typically employed as one instrument in a range of interventions to move waste away from landfill and encourage alternate treatment to be developed.
- **Voluntary Commitments and Sector Plans** – many strategies suggested that key to achieving success in sectors such as C&D and C&I was to develop specific plans for non municipal waste streams and even waste sub-sectors (such as food retail or hospitality) and engage the sector through a variety of means including voluntary commitments as a preference to legislative drivers.
- **Greenhouse Gas and Climate Change** – A clear development in national and international waste strategies is the waste management link to climate change and to greenhouse gas emissions. 14 of the 20 strategies reviewed contained specific targets in this area, often linking to state or national targets for greenhouse gas reduction (and the part that waste management has to play in achieving these targets).

Finally, a common issue noted with many of the strategies is the difficulty in gathering good quality data to underpin the strategy. Examples have been provided of good practice and comprehensive waste data collection systems in operation which enable achievement of targets to be assessed more accurately, progress to be demonstrated and achievement celebrated. For the countries in the benchmark group no one system provides a complete solution for all waste streams.

1. Introduction

This is a national and international waste strategy review and benchmarking report for the New South Wales Environmental Protection Authority (NSW EPA). NSW EPA is currently reviewing its 2007 Waste Avoidance and Resource Recovery Strategy (WARRS 2007) in accordance with the requirements of the *Waste Avoidance and Resource Recovery Act 2001* (the WARR Act). As part of the development of a new WARR Strategy, the NSW EPA needs to review current national and international waste strategies to inform the development of its strategy and ensure that it is comparable to others in terms of scope and targets.

1.1. Aim of Waste Strategy Review and Benchmarking Report

The specific purpose of this review is to gain evidence from a national and international review of strategic approaches to solid waste management, referencing policies and targets implemented to manage solid waste in order to inform the development of the new NSW Waste Avoidance and Resource Recovery Strategy. This approach allows the NSW EPA to benchmark its current thinking and approaches to managing solid waste, and will help to ensure that it considers current good practice in its adopted approaches and the final policies and targets that are set. The review process has focused on the following:

- the high level themes of each of the strategies
- the scope and extent of the targets within each strategy e.g. the waste sectors covered and detail of the target
- details on related implementation methods which are available either from the strategy or from limited additional research outside of the main strategy documents.

1.2. Review Process

A total of 20 different waste strategies have been reviewed providing both a balance between Australian and international strategies, and a mix of national and regional/state/municipal area strategies. Figure 1 lists the waste strategies reviewed.

Figure1: List of Countries/States or Territories waste strategies reviewed

Australian State and Territory	International Countries	
Queensland	New Zealand (National)	England (National)
Victoria	Seattle (State)	Wales (National)
Western Australia	New York (State)	Scotland (National)
South Australia	Nova Scotia (Province)	Northern Ireland (National)
Tasmania	Vancouver (City)	Copenhagen (City)
Australian Capital Territory (ACT)	Netherlands (National)	Finland (National)
	Sweden (National)	Flanders (Region – Belgium)

The international strategies are from countries that were selected on the basis that the status of the country and economy are broadly aligned to NSW and Australia. A range of European Union countries/regions were selected that are achieving a high level of diversion from landfill (e.g. Flanders, Netherlands and Copenhagen). All of the United Kingdom (UK) strategies (namely

England, Wales, Northern Ireland and Scotland) were selected, as they have all developed in different directions due to different internal drivers.

The waste strategies selected contain a range of different drivers, targets and implementation techniques intended to provide the NSW EPA with a broad spectrum of the current state of international waste strategy focus and ambition. This information will be used as a benchmark for NSW.

The waste strategy documents for each of the regions formed the main focus of the review, however, where required (and where timescales allowed) further information was gathered in terms of regulatory processes or known implementation techniques, identified by the reviewers from a range of additional sources. An overview of each waste strategy can be found in Appendix B.

Subsequent chapters in this document provide:

- An overview of the key themes to the current NSW waste strategy and its implementation (section 2)
- Findings from the review of national/international waste strategies (section 3)
- Benchmarking results – identifying key areas of difference and similarity between NSW and selected national/international strategies (section 4)
- Summary of key findings to consider as part of the strategy review process (section 5).

2. New South Wales Strategic Waste Context

2.1. Review of the NSW WARRS 2007

A new WARR Strategy is currently being developed by the NSW EPA. The NSW WARR Strategy is revised and updated every 5 years in accordance with the requirements of the WARR Act 2001. The current WARR Strategy was published in 2007, following the first Strategy in 2003. At the time of release in 2003, the NSW WARR Strategy was the first of its kind in Australia to set targets for preventing and avoiding waste, increasing recovery and reducing the toxicity of waste.

2.2. The WARR Act 2001

The NSW WARR Act sets out the legal requirement to produce a NSW waste strategy (section 12):

(1) The Director-General is to develop a waste strategy for the State.

(2) A waste strategy:

(a) is to be based on continuous improvement and benchmarked against international best practice, and

(b) is to include targets for waste reduction, resource recovery and the diversion of waste from landfill disposal, developed by an expert reference group appointed by the Director-General.

The requirement to develop a waste strategy sits within the framework of the WARR Act, which provides the objects of the Act and in particular an understanding of the 'waste hierarchy'.

The objects of the Act (section 3) are:

(a) to encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development,

(b) to ensure that resource management options are considered against a hierarchy of the following order:

(i) avoidance of unnecessary resource consumption,

(ii) resource recovery (including reuse, reprocessing, recycling and energy recovery),

(iii) disposal,

(c) to provide for the continual reduction in waste generation,

(d) to minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste,

(e) to ensure that industry shares with the community the responsibility for reducing and dealing with waste,

(f) to ensure the efficient funding of waste and resource management planning, programs and service delivery,

(g) to achieve integrated waste and resource management planning, programs and service delivery on a State-wide basis,

(h) to assist in the achievement of the objectives of the Protection of the Environment Operations Act 1997.

Together with a waste strategy, the WARR Act requires regular reporting on the programs and progress towards targets in the Waste Strategy (section 24):

(1) The Director-General must prepare and deliver to the Minister a report every 2 years on the following matters:

(a) the volumes of waste avoided, produced, recycled or reused in New South Wales during the reporting period,

(b) how those volumes compare with target volumes established by any current waste strategy,

(c) a description of the strategies and programs being implemented by the Director-General and the degree of success achieved by them.

The most recent report is the *Waste Avoidance and Resource Recovery Strategy Progress Report 2010* (Progress Report 2010), with another report expected in 2012.

2.3. Richmond Review 2010

In 2010 an Independent Steering Committee chaired by David Richmond was established to provide a Review of Waste Strategy and Policy in NSW (the "Richmond Review"). The terms of reference were to ensure that waste policies were optimised to achieve the targets in the WARR Strategy 2007. The Review found that the WARR Strategy 2007 had been effective in significantly raising recycling rates, in tandem with the NSW waste and environment levy and regulatory settings under the Protection of the Environment (Operations) Act 2005. However, the Review also found that significant work was required to achieve the Municipal Solid Waste (MSW) and Commercial and & Industrial (C&I) recovery rates and to tackle waste generation. The Review identified 23 enhancements, which are listed below for completeness under four headings (as set out in the Richmond Review) in the box below.

Overall adequacy of WARR strategy and targets

- **Enhancement 1** – WARR Strategy sub-targets for 2010-11 and 2011-12 for all sectors
Resource recovery targets for specific materials – in particular for food/garden organics and paper/cardboard
- **Enhancement 2** – WARR Strategy Implementation Plan
- **Enhancement 3** – Better data on waste
- **Enhancement 4** – Department of Environment Climate Change and Water's (DECCW) waste management capability

Waste management sector performance

- **Enhancement 5** – Best practice for managing municipal waste. Providing clear guidance and financial incentives to local councils to implement best practice, such as:
 - a) Achieve 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) Establish systems to maximise recovery of food waste and garden organic waste from households through source separation and/or alternative waste treatment (AWT).
- **Enhancement 6** – Promotion and education

- **Enhancement 7** – Targeting priority wastes
- Materials identified as national priority wastes under the National Waste Policy (i.e. e-waste, tyres and fluorescent lamps), NSW also identified gas bottles, lead acid batteries and plastic bags as potential materials.
- **Enhancement 8** – Local infrastructure for collection of other wastes
- **Enhancement 9** – Best practice for managing C&I waste
- **Enhancement 10** – Place-based waste management (i.e. precincts)
- **Enhancement 11** – Financial assurance policy

Resource allocations and pricing signals

- **Enhancement 12** – Funding better waste outcomes (e.g. environmental levy)
- **Enhancement 13** – Alternative Waste Treatment (AWT) output exemption (i.e. remove exemption of outputs from AWT)
- **Enhancement 14** – Exemption expert panel or peer review
- **Enhancement 15** – Energy from waste (actively support)
- **Enhancement 16** – Waste Infrastructure and Sustainability Fund
- **Enhancement 17** – Innovation and investment (look at investment to support targets beyond 2014)

Government performance

- **Enhancement 18** – Coordination of DECCW's waste responsibilities
- **Enhancement 19** – Waste and Sustainability Industry Forum
- **Enhancement 20** – Waste Infrastructure Strategy (pan government strategy to provide guidance to ensure waste infrastructure development)
- **Enhancement 21** – Land-use planning (working with the Department of Planning to create guidance and best practice for reducing waste)
- **Enhancement 22** – New entrants to the infrastructure market (provide support to new entrants)
- **Enhancement 23** – National waste agenda (NSW support National waste agenda)

2.4. Reducing Waste: Implementation Plan 2011-2015

Following the recommendations of the Richmond Review, an implementation plan was developed in 2011 - *Reducing Waste: Implementation Plan 2011-2015*. The Plan focused on key areas identified in the Richmond Review to improving waste outcomes, particularly around municipal and C&I waste streams as well as litter and illegal dumping.

2.5. NSW 2021: A plan to make NSW number one

More recently in 2011, the NSW Government adopted a statewide strategic plan, *NSW 2021: A plan to make NSW number one*, which has specifically committed to a number of waste-related targets and actions, including the resource recovery targets established in WARRS 2007. The inclusion of waste-related priorities in *NSW 2021* can be seen to be an indication of the importance of the issue in NSW. Particular targets and priorities are referred to below in the discussion of the WARRS 2007.

2.6. The NSW waste levy and regulatory provisions

The Richmond Review recognises that the WARRS 2007 and the programmes directed at achieving the Strategy outcomes are part of a broader framework of waste management that includes the NSW waste levy, which requires licensed facilities in the Sydney, Illawarra, Hunter and some regional areas to pay a contribution for each tonne of waste received. The levy is a key market-based instrument that aims to reduce the amount of waste being disposed of and promote

recycling and resource recovery. Levy compliance activities and regulation of licensed facilities under the Protection of the Environment (Operations) Act 2005 (POEO Act) aim to ensure the integrity of the levy system and strengthen the impact of the levy on diversion of waste from landfill.

In addition, the resource recovery exemption process has been established under the POEO Act to open recovery pathways for waste used on land or for fuel where this is a bona-fide, fit for purpose, reuse opportunity that causes no harm to the environment or human health, rather than a means of waste disposal.

The NSW Government is currently considering the report of the international firm KPMG, which was commissioned to review the operation of the levy and its impact in increasing recycling and reducing waste to landfill.

2.7. The NSW WARRS 2007

The underlying policy driver to the WARR Strategy 2003 was to conserve natural resources and minimise the environmental impacts from waste management. Landfill capacity in NSW was a particular concern and the Strategy's targets were underpinned by data tracking disposal of materials to landfill.

In the WARR Strategy 2007 these drivers continue to be acknowledged, and the importance of the waste hierarchy continues to be recognised. However, these factors are also overlaid with the need to promote efficient resource use. Further, waste impacts are seen as part of a broader sustainability agenda where environmental impacts should be considered throughout the life cycle of goods and materials. There is a focus on waste reduction and resource recovery and recognition that action in this area can also have a knock on effect in other resource areas, such as water, energy, raw materials, habitats, etc.

2.7.1. Themes and Targets from the NSW WARRS 2007

The NSW Strategy (WARRS 2007) is underpinned by the waste hierarchy and has 4 'key result areas' with associated targets to achieve, these are:

1) Preventing and avoiding waste

The WARRS 2007 states the main target to achieve this theme is "***to hold the level of total waste generated for 5 years from the release of the Waste Strategy 2003***".

This target effectively ceased in 2008 (i.e. 5 years following 2003) and the Progress Report 2010 reported that this target was not met. The Progress Report also pointed out the difficulty in measuring waste avoidance activities. There is no further target in WARRS 2007. 'Waste avoidance' is defined in the 2003 Strategy but not in the 2007 Strategy, however it is assumed the same understanding continues. It includes (i) 'strict avoidance' actions to eliminate material use or hazardous materials, (ii) minimising material use or hazardous materials and (iii) product re-use.

The key initiatives implemented to achieve prevention and avoidance of waste include a focus on training and awareness and education campaigns, training, and building on the engagement activities with industry. A few examples of waste prevention programmes are shown below:

- **Love Food Hate Waste campaign** – focusing on partnerships with food retailers, health organisations and government to provide tips and tools to reducing food waste at home.
- **Training of Local Government** – to build capacity of local authority officers to develop and implement action plans that address prevention, infrastructure, education and enforcement.

- **Sustainability Advantage** - focuses on resource efficiency for businesses including preventing and/or avoiding the waste in the first instance.
- **Extended Producer Responsibility (EPR)** - designed to reduce waste from consumer goods and their impact on the environment.

2) Increasing recovery and use of secondary products and materials

The WARRS 2007 sets targets for increasing recovery and use of secondary materials across three core waste generating sectors:

- **Municipal - to increase recovery and use of materials to 66%**
- **Commercial & Industrial – to increase recovery and use of materials to 63%**
- **Construction & Demolition – to increase recovery and use of materials to 76%.**

Targets are set to be delivered by 2014 and are compared to a 2000 baseline. These targets have also been taken up in NSW 2021 under Goal 23.

Significant progress has been made in delivering against these targets, and this is summarised below:

■ Municipal waste	26% in 2000	52% in 2010/11
■ Commercial & Industrial	28% in 2000	57% in 2010/11
■ Construction & Demolition	65% in 2000	75% in 2010/11

Recovery methods currently employed in NSW include composting, recycling of dry materials, processing through waste treatment facilities. Broadscale waste to energy processes are not currently employed in NSW. Success is measured by focusing on the tonnages recycled rather than any other metric of resource recovery, such as energy recovered or greenhouse impacts.

This progress shows that the target for the C&D sector has almost been met, and that NSW is making good progress against achieving the other targets by 2014, although continued focus is needed particularly in the municipal and commercial and industrial streams.

There has been a wide range of policies and programmes implemented to progress toward these targets. These include (but are not limited to):

- Support for regional solutions to divert waste and increase recycling through RENEW NSW (voluntary rural regional waste groups)
- Training and building capacity in councils and businesses to increase recycling
- Developing tools and information that help the community, councils and businesses to make good decisions
- Providing funding for councils to make changes to collection systems to achieve best practice
- Supporting recycling infrastructure through project funding assistance
- Developing markets for recycled materials such as organic materials, timber, glass and construction materials including through development of product/ process standards
- Work with medium to large businesses to increase resource recovery
- Work with producers and other governments to establish product stewardship arrangements to enable producers of goods to take responsibility for the impacts of their products, including at end-of-life
- Providing regulatory pathways for environmentally sound recycled materials to reach market

- the Waste and Environment Levy – a market-based instrument that puts a charge on the disposal of waste to landfill to promote diversion of material for recycling.

The WARR Strategy 2007 lists materials that are a priority area for focus through these programmes. For the C&I waste sector the key focus is on paper, glass, plastics and timber. There is also a focus on increasing food waste collection and developing markets for organic waste across both the C&I and municipal sectors. These focus areas are reiterated in the *Reducing Waste: Implementation Strategy 2011-2015*. Within the C&D sector a key focus is asbestos and treated timber. The Strategy also specifically mentions the focus on Virgin Extracted Natural Materials (VENM) and identifies opportunities for the reuse of this material.

3) Reducing toxicity in products and materials

The WARR Strategy 2007 target is **“By 2014 or earlier, to phase out priority substances in identified products as a first choice or, if not possible, to achieve maximum recovery for re-use”**.

Priority substances as stated in the WARRS 2007 include potentially hazardous substances in relation to computers, televisions, other consumer electronics, PVC, batteries, fluorescent tubes and shredder floc. These mirror priority materials listed in the *NSW Extended Producer Responsibility Statement 2010*. More recently, further priority materials have been outlined in *Reducing Waste: Implementation Strategy 2011 - 2015*, as they present a significant management issue from an environmental, materials handling, resource or human health perspective. These include: gas bottles, lead acid batteries, e-waste, mattresses, plastic bags, sharps, tyres, treated timber, medicinal residues, pesticides, paint residues, oils and mercury-containing lamps.

The WARRS 2007 target is addressed through two main avenues:

Accelerating product stewardship schemes

NSW, like all states and territories in Australia, is constrained by national market requirements when dealing with product content requirements. While it has published its own *Extended Producer Responsibility (EPR) Priority Statement NSW 2010* that lists priority materials for industry product stewardship action, NSW has sought to drive consistent action at a national level to implement product stewardship schemes. NSW has strongly supported the Commonwealth’s recent *Product Stewardship Act 2011* which sets up a national framework for product stewardship schemes for any material or product. A number have been established, both within and outside the *Product Stewardship Act* that deal with priority materials listed in the WARR Strategy 2007 including:

- Computers and TVs – is the first scheme established under the *Product Stewardship Act* and has begun rollout in 2012.
- PVC – Vinyl Council’s Product Stewardship Program, that has successfully phased out or minimised the use of a number of heavy metals and hazardous materials in PVC manufacture.
- Fluorescent tubes – the Fluorocycle program, managed by the Lighting Council of Australia seeks to reduce mercury in the environment through recycling commercial and public lighting.

Reducing problem wastes through collection and recycling/sound disposal

NSW runs the Household Chemical CleanOut program, together with local councils, and which collects, recycles or disposes of potentially hazardous household materials, including chemicals, fluorescent lamps, paints, batteries and oils. In addition to maximising the recovery

of these materials, removal reduces the contamination of the municipal waste stream and maximises the potential for recovery from this source.

4) **Reducing litter and illegal dumping**

Within the NSW strategy (WARRS 2007) there are two targets related to reducing litter and illegal dumping. These are to:

- Reduce total amount of litter reported annually (measured through the National Litter Index)
- Reduce the total tonnages of illegally dumped material reported by regulatory agencies and Regional Illegal Dumping (RID) squads annually.

This target does not have a quantifiable target (for example “reduce by 10% year on year”) as it is understood that the data is not robust enough to quantify total tonnages of litter and illegal dumping.

In *NSW 2021*, there are additional more specific targets:

- Reduce the incidence of large scale (greater than 200m³ of waste) illegal dumping detected in Sydney, the Illawarra, Hunter and Central Coast by 30% by 2016
- By 2016, NSW will have the lowest litter count per capita in Australia

NSW 2021 includes priority actions to achieve these targets, which include -

For Litter:

- Revised national methodology for measuring litter
- Revitalising anti-littering efforts
- Capacity building of local government.

For Illegal Dumping:

- Regional Illegal Dumping Squads (RID) – RID Squads work across local government and state agency boundaries to tackle illegal dumping on a regional basis.
- Aboriginal Lands Clean-Up Program – annual grants to local Aboriginal land councils to clean up and prevent illegal dumping on Aboriginal owned land.
- Eyes in the Sky – An aerial surveillance program to detect illegal dumping sites and develop mapping of ‘hot spots’ for on-going monitoring.
- Asbestos Disposal – The handling and storage of asbestos waste at worksites is regulated solely by WorkCover NSW under the current provisions of the Occupational Health and Safety Regulation 2001 (OH&S Regulation). The transportation and disposal of asbestos waste is regulated by the Protection of the Environment Operations (Waste) Regulation 2005 and enforced by the EPA. The EPA has a strong waste compliance and enforcement program to combat the illegal dumping of waste, including asbestos waste.

2.7.2. Wider environmental themes

The NSW Strategy (WARRS 2007) has a focus on wider environmental issues and makes several linking statements throughout the strategy to the contribution that waste management, and in particular waste reduction and recycling, can make to conserving virgin materials, reducing greenhouse gases, saving water and saving energy. The strategy also makes specific reference to

the fact that due to increasing community interest in environmental issues, the benefits and contribution from waste reduction and recycling to these issues is included in the strategy for the first time.

Despite this, there is not a standalone environmental/sustainability/carbon-based theme or any associated targets within the WARR Strategy 2007. Rather, carbon pricing and related initiatives are dealt with at a national level. From July 2012, a national carbon pricing mechanism has been established which provides a framework for driving carbon reduction targets through price and funding initiatives. Landfills emitting over 25,000 tonnes of carbon dioxide equivalent (CO₂ equivalent) per year are captured under the scheme.

2.7.3. Waste sectors covered

WARRS 2007 covers three different sectors/sources that generate waste including:

- Municipal Waste Stream (MSW) – including solid and inert waste generation from the four sub-streams of kerbside collected domestic waste, other council waste (municipal parks and gardens, road making, street sweepings, council tidy bins and drop off centres) and garden organics.
- Commercial and Industrial (C&I) waste stream - waste generated by businesses and industries (including shopping centres, restaurants and offices) and institutions (such as schools, hospitals and government offices), excluding construction and demolition waste and municipal waste.
- Construction and Demolition (C&D) waste stream - waste generated from construction and demolition works and includes: building and demolition waste, asphalt waste and excavated natural material.

It is understood that NSW needs to gain a greater understanding on the composition of the waste currently collected and defined as MSW. There is a very good understanding of material collected from households through kerbside recycling and residual collection systems, but there is no information on other local council waste within MSW (including construction waste and parks and garden waste amongst other sources, and some commercial and industrial waste). High-level tonnages for these materials are available but no definition on what it is (or how it can be reduced). Further, information on the composition of materials in the C&I and C&D waste streams is not at all comprehensive and in the case of C&D is based on older audit data.

2.7.4. Measuring Performance

Within the NSW strategy (WARRS 2007) there is an overview of performance against targets for the different waste sectors. NSW measures performance in terms of:

- total waste generated (tonnes)
- total waste generated per capita (kg per capita) and broken into waste sector
- tonnes of waste disposed, recycled and total generated per waste sector
- tonnes of garden organics generated and recycled
- Annual dry recyclables collected at kerbside (kg per capita)
- Litter counted by item and volume through the National Litter Index.

NSW does not have a formal reporting system for waste generation at local authority level, although waste compositional audits and reporting from local authorities (which is of mixed quality) is currently used to assess progress. The NSW Strategy already identifies that “*rural and regional NSW data remains quite limited*” as there is an inconsistent approach. The Strategy also contains a

section on 'Data for waste strategy 2007', highlighting that the measurement of disposal tonnages has improve greatly through the new electronic reporting system. This system has enable the capture of data on additional tonnages of materials going to landfill, and allowed for a number of specific waste streams to be accurately measured for the first time.

The Richmond Review in 2010 identified the requirement for "better waste data" as a key enhancement to the NSW strategy and this is an area constantly in development.

2.8. A future Waste Strategy for NSW

A new Waste Strategy for NSW is currently being developed; however it is still envisaged to work around the same four key themes set out in the WARRS 2007 and to cover the three main waste generation sectors of:

- Municipal Waste
- Commercial and Industrial Waste
- Construction and Demolition Waste.

The new Waste Strategy will also consider the 23 enhancements proposed by the Review 2010 Steering Committee along with key findings from this Benchmarking Report (and a project being undertaken simultaneously by SKM to model the likely diversion rates achievable for the municipal, commercial and industrial and construction and demolition waste streams).

3. Findings from the Review of Waste Strategies

This chapter provides a summary of the review of waste strategies and considers how international strategies address the key themes and targets of the NSW WARRS 2007. It also identifies issues that are not covered by the NSW Strategy or are addressed differently.

The NSW WARRS themes and targets are as follows:

- Preventing and avoiding waste
- Increasing recovery and use of secondary products and materials
- Reducing toxicity in products and materials
- Reducing litter and illegal dumping

3.1. Overview of Waste Strategies

It is clear from review of the waste strategies that local circumstances, legislation, political will and historic situation with regard to waste management, all influence and drive their development. Whilst there are differences (which are discussed in this report) there are frequently common themes, targets and waste sectors incorporated in the waste strategies.

To provide a useful overview, Figure 2 summarises the waste sectors included and key themes/targets within the waste strategies. For ease the following traffic light system has been used to highlight the level of detail included within the waste strategy using the key below.

KEY			
Waste Sectors		NSW themes included and targets	
Detailed coverage of waste sector included	D	Theme included with target	✓✓
Limited coverage of waste sector included	L	Theme included but no target	✓
		Limited/no coverage of the theme	×

It should be noted that this table is a subjective assessment of the information reviewed. If there is a red tab within the table, for example litter/ illegal dumping, it does not mean the strategy has excluded any discussion of litter/illegal dumping. The red tab means there are no clear targets or easily identifiable chapters or sections within the strategy that focus on litter/illegal dumping.

Figure 2 Summary of Waste Strategy Content

Waste Strategy	Waste Sectors covered			Themes and Targets set in Waste Strategies					
	MSW	C&I	C&D	Waste avoidance / Prevention	Recycled / recovered	Diversion of Waste	Toxicity in products and materials	Litter/ illegal dumping	Wider Environmental
NSW	D	D	D	✓	✓✓	✓	✓✓	✓✓	✓
Australia and New Zealand									
Queensland	D	D	D	✓✓	✓✓	✓✓	✓	✓	✓✓
Victoria	D	D	D	✓✓	✓✓	✓	✓	✓✓	✓
Western Australia	D	D	D	✓	✓✓	x	x	✓	x
South Australia	D	D	D	✓✓	✓	✓✓	✓	✓✓	✓✓
Tasmania	D	D	D	✓	✓	✓	x	x	✓✓
Australian Capital Territory (ACT)	D	D	D	✓	✓✓	x	✓	✓✓	✓✓
New Zealand (national)	D	D	D	✓	✓	✓	x	x	✓
Europe									
England (national)	D	D	L	✓	✓✓	✓✓	x	✓	✓✓
Wales (national)	D	D	D	✓✓	✓✓	✓✓	✓	x	✓✓
Scotland (national)	D	D	D	✓	✓✓	✓✓	x	x	✓✓
Copenhagen (city)	D	D	L	✓✓	✓	✓	✓	✓	✓✓
Northern Ireland (national)	D	D	D	✓	✓✓	✓	✓	x	x
Flanders (regional)	D	L	L	✓✓	✓✓	✓✓		✓	x
Finland (national)	D	L	D	✓✓	✓✓	✓✓	✓	✓	x
Netherlands (national)	D	D	D	✓✓	✓✓	✓	✓	x	✓✓
Sweden (national)	D	D	D	✓	✓✓	x	✓✓	x	✓✓
USA and Canada									
Vancouver Canada (city)	D	D	D	✓✓	✓✓	✓✓	x	x	✓✓
New York (State)	D	D	D	✓	✓✓	✓✓	✓	✓✓	✓✓
Seattle (state)	D	L	D	✓	✓✓	x	✓	✓	x
Nova Scotia (province)	D	D	D	✓	✓✓	x	✓	✓	x

Figure 2 provides an overview to the themes and targets reviewed and highlights the differences and similarities across the waste strategies at a glance. For example, it can be seen that all strategies specifically address MSW (all rows are green), while fewer strategies address toxicity in products/materials (mostly orange and red rows). As an overview the following statements can be made:

- the waste prevention/avoidance and recycling and recovery themes are covered by all strategies
- diversion of waste is covered by the majority of strategies as a main theme
- the themes of “reducing toxicity in materials and products” and “litter and illegal dumping” are not covered as a main theme by all the other strategies
- wider environmental issues such as climate change and resources scarcity are covered as a specific theme in a number of other waste strategies.

Further details of all aspects of the waste strategies are discussed within this chapter.

3.2. Waste Strategy Key Themes and Targets

This section is structured around the themes as presented in the NSW waste strategy (WARRS 2007) in order to facilitate a more direct comparison with the selected 20 benchmark waste strategies. Areas of benchmarking outside of these themes, for example wider environmental themes and waste sectors covered by the strategy are discussed in sections 3.5 to 3.7.

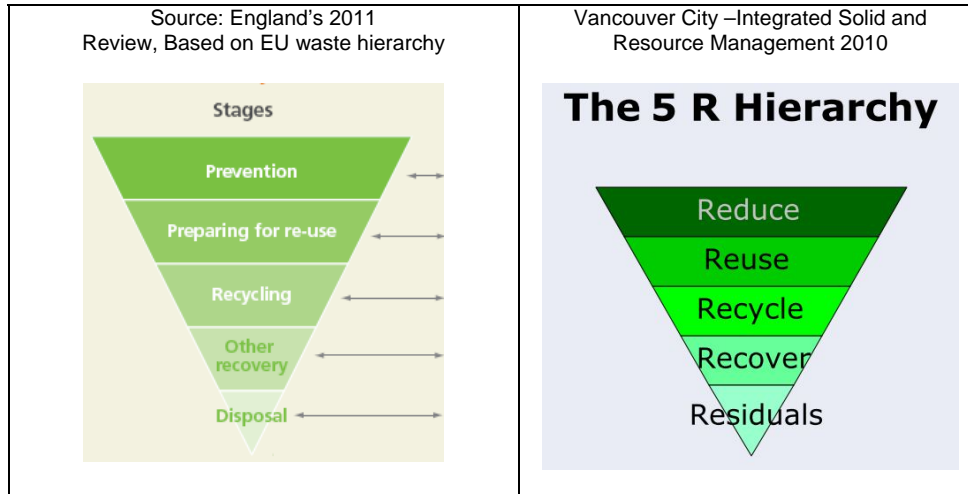
3.2.1. The Waste Hierarchy

The review of the waste strategies shows that each has a range of themes and principles that underpin the strategy documents and policies and which appear to differ greatly. However, on closer inspection, similarities are evident as they are all based on a similar approach; the waste hierarchy. Some examples are provided in Figure 3 below, showing the hierarchy used in the English national and Vancouver metro strategies. The NSW WARR Act also defines its approach to the waste hierarchy although this is not contained within the WARRS 2007 document itself.

There are often subtle differences in the titles used within the waste hierarchy concept, for example the first step can be referred to as prevention, reduction and in some cases avoidance, all of which mean subtly different things in terms of the actions required to achieve the goal/aim. The EU Waste Framework Directive also provides definitions of the terms. Preparing for reuse is a term introduced by the revised EU Waste Framework Directive to relate to activities that allow an item that has become waste to be reused, through cleaning or repair without the need for reprocessing. Reuse applies to an item before it becomes a waste, e.g. reuse is considered to be a waste prevention activity, such as selling second hand clothes.

However all the waste strategies reviewed covered all the key steps of the waste hierarchy, whether as separate chapters or grouping a couple of steps together (e.g. diversion from landfill by reuse, recycling, recovery / treatment.) The priority being to first stop waste being produced and then recycling or recovering value from as much of the waste as possible before final disposal.

Figure 3: Example waste hierarchy approaches



The EU Waste Framework Directive states that:

“When applying the waste hierarchy Member States shall take measures to encourage the options that deliver the best overall environmental outcome. This may require specific waste streams departing from the hierarchy where this is justified by life-cycle thinking on the overall impacts of the generation and management of such waste. Member States shall ensure that the development of waste legislation and policy is a fully transparent process, observing existing national rules about the consultation and involvement of citizens and stakeholders. Member States shall take into account the general environmental protection principles of precaution and sustainability, technical feasibility and economic viability, protection of resources as well as the overall environmental, human health, economic and social impacts,”

The waste hierarchy, in its various formats therefore underpins all of the strategies reviewed, with greater or lesser emphasis placed on activities in the hierarchy. Goals and targets within waste strategies are also often defined according to the hierarchy. ‘Zero waste’ is used extensively as a concept in the benchmarking group and the main process of achieving this is to move waste policies away from the bottom of the hierarchy (disposal) to the top (prevention) as this is ultimately the most effective way to aspire towards a zero waste goal. Use of zero waste terminology also puts waste reduction at the centre of the document, and therefore in theory activity.

The ‘forward looking’ and more ambitious waste strategy targets focus on preventing waste, as any saving here maximises the amount of raw material saved and prevents further loss of energy through additional reprocessing. This is phrased in various ways through strategies:

- The Netherlands looks at the whole waste hierarchy as a chain. It acknowledges that one area of strategy is not isolated from the others and intervention early on in the chain can have the greatest impact, either in a positive or negative manner. *‘A further reduction in the environmental impact of waste is envisaged by means of a chain approach within waste policy. Intervention points earlier in the chain are sought, such as during product development’*

- Scotland focuses on the top of the hierarchy and closed loop approaches. *'The Strategy gives priority to waste prevention', a movement 'to "closed loop" resource management which captures, reuses and recovers resources in line with the approach of the waste hierarchy.'*
- New York State similarly states that it is 'important to manage waste at the highest possible point in the hierarchy within the facility's service area'

The key stages of the waste hierarchy are discussed in section 3.2.2 to 3.2.4.

3.2.2. Preventing and Avoiding Waste

All the strategies reviewed incorporated the first step of the waste hierarchy that addresses waste reduction, prevention or avoidance, and has the overall objective to reduce the total amount of waste generated. This was a key area for all strategies with many highlighting it as a priority area for waste management. For example the England and Scotland strategies make a clear statement of the importance of this area:

"Develop a range of measures to encourage waste prevention and reuse, supporting greater resource efficiency" – England Waste Review 2011.

"Encourage waste prevention as a top priority across all resource streams, to reduce Scotland's overall resource use, reduce climate impacts, and increase resource efficiency." - Scotland's Zero Waste Plan.

Across all the strategies there is a variety in terminology used to describe this first step of the waste hierarchy and these include waste reduction, waste prevention and waste avoidance. This is highlighted in Figure 4, with the coloured box indicating the main term used in the strategies, and the lined box highlighting other terms also used within the strategies.

Figure 4: Terminology used in waste strategies to describe the first stage of the waste hierarchy

Strategies	Waste Reduction	Waste Prevention	Waste Avoidance	Less Waste
Australia and New Zealand				
NSW				
Queensland				
Victoria				
Western Australia				
South Australia				
Tasmania				
Australian Capital Territory (ACT)				
New Zealand				
Europe				
England (national)				
Wales (national)				
Scotland (national)				
Copenhagen (city)				

Sweden (national)				
Northern Ireland (national)				
Flanders (regional)				
Finland (national)				
Netherlands (national)				
USA and Canada				
Vancouver (city)				
New York (state)				
Seattle (city)				
Nova Scotia (province)				

Figure 4 above shows that the majority of strategies refer to ‘waste prevention’ when discussing the first stage of the waste hierarchy, closely followed by ‘waste reduction’. Categorising these trends across country groupings it can be seen that the following terms are predominantly used:

- Australia & New Zealand **Waste Avoidance**
- Europe **Waste Prevention/Reduction**
- USA and Canada **Waste Prevention/Reduction**

Similar terminology may be used within the strategies, but these may have a different definition or scope of activities which are included. The reviewed strategies, however, did not consistently contain detailed definitions of the above terms, so it is difficult to assess whether these terms referred to waste prevention/reduction ‘at source’ or waste prevention/reduction of waste entering the waste stream.

An example of this for municipal waste is when waste prevention activities include the promotion of home composting of organic waste (including food waste). This would not be considered waste prevention ‘at source’, as the organic waste is still being generated, however, this activity does clearly prevent this waste from entering the municipal waste stream. This aspect should be considered when comparing strategies in this area, as some strategies look to reduce waste at source, as this prevents the waste from being generated in the first place. However, this information not was available in the strategy documents so does not currently form part of this discussion.

Targets

Figure 5 below sets out the range of targets which have been set in relation to waste prevention/reduction. This table highlights what the target is, the key year to achieve the target, the waste types covered and the metric used to measure progress.

Figure 5: Key targets for waste prevention

Strategies	Target year	Target	Waste Sectors	Metric
Australia and New Zealand				
NSW		No target		
Queensland	2014	To achieve a 5% reduction of waste per capita by 2014	MSW, C&I & C&D	Reduction in % (Tonnes per capita)
	2017	To achieve 10 % reduction of waste per capita by 2017		
	2020	Reduce generation of waste by 15% per capita by 2020		
Victoria	2014	1.5 million tonnes reduction in the projected quantity of solid waste generated	MSW, C&I & C&D	Reduction in tonnes
Western Australia		No target		
South Australia	2015	Reduction of 5% in waste generation per capita	MSW, C&I & C&D	Reduction per capita
Tasmania		No target		
Australian Capital Territory (ACT)		Growth in ACT waste generation is less than the rate of population growth ¹		
New Zealand		No target		
Europe				
England (national)		No target		
Wales (national)	2050	To reduce waste by around 1.5% (of the 2007 baseline) each year across all sectors	MSW, C&I & C&D	Reduction in % (year on year)
Scotland (national)		No target		
Copenhagen (city)	2012	Reducing growth in waste generation by 10% (corresponding to prevention of 2,500 tonnes of waste in MSW, C&I & C&D Copenhagen)	MSW, C&I & C&D	Reduction in % (year on year)
Northern Ireland (national)		No target		
Flanders (regional)	2015	Maximum annual production of 560 kilograms of waste per capita	MSW	Limit set for total waste per capita
Finland (national)	2016	To achieve a decline in the amount of municipal waste by the year 2016	MSW	Decrease in growth
Netherlands (national)	2015	Total waste not greater than 68 Mt	MSW, C&I &	Limit set for total

¹ ACT does not have a specific numerical target, but is included in the table above as it is a measurable comparison.

Strategies	Target year	Target	Waste Sectors	Metric
	2021	Total waste not greater than 73 Mt	C&D	waste
Sweden (national)		No target		
USA and Canada				
Vancouver (city)	2020	90% or less of 2010 volumes of waste by 2020	MSW, C&I & C&D	Reduction % (volume)
New York (state)		No target		
Seattle (state)		No target		
Nova Scotia (province)		No target		

The table shows the following in relation to the targets:

- Nine out of the 20 strategies reviewed have set waste prevention/reduction targets.
- The majority of targets relate to 'all waste' and include the MSW, C&I or C&D waste sectors.
- The targets have various end dates and this is generally beyond 2012 (and up to 2050 for Wales), with the majority between 2014 and 2020.
- The strategies with targets use a range of different metrics and have different baseline years. These range from a reduction by weight or volume as a percentage for a whole time period or year on year, to providing a maximum weight per capita. Queensland, South Australia and Flanders have a per capita reduction target and the remainder have a weight or volume based reduction target. The Netherlands, Victoria and Copenhagen set targets for waste prevention that related to total waste generated as an absolute figure.
- The three strategies with targets for waste prevention on a per capita reduction specifically target the link between external factors such as population growth and waste generation.
- It is difficult to make a comparison between the benchmark strategies as they use different targets as a measure of performance and different baseline years.
- All of the above targets are examples of possible ways to set waste reduction targets and by having a target in place it is easier to measure if waste generation levels are reducing and if the links between waste generation and economic activity continue to be important.

The 11 strategies that did not set specific waste reduction/prevention targets highlighted the complexity in monitoring and measuring the success of the specific activities implemented as a key reason for not doing this. It is widely considered difficult to track progress and measure outcomes, especially as the activities are often related to behaviour change and softer implementation techniques that are very difficult to capture. Despite no targets being set, these strategies still contained a clear objective to reduce, prevent and avoid waste.

Implementation of Waste Reduction/Prevention Activity

All the strategies provide information on the actions that they would implement to address waste prevention and reduction. The level of detail varies, but overall key implementation techniques listed are:

- **Campaigns, Education and Awareness** to change behaviour among householders, consumers and other waste producers
- Provide support/more options for **reuse** (from exchange centres for householders or a specific sector, information and advertisements about reuse websites and exchange centres)
- Provide **support to businesses** to consider the whole supply chain and resource efficiency
- **Product Stewardship/Producer Responsibility** - initiatives and support to promote the designing out of waste in the development phase.

For European countries the Waste Framework Directive requires countries to develop 'national waste prevention programmes' by 12 December 2013. These are currently in development and are required to set out clearly how each country will address waste prevention and reduction.

3.2.3. Increasing Recovery and Use of Secondary Products and Materials

The review of strategies demonstrates that the following themes are common in relation to increasing recovery and the use of secondary materials:

- promoting material recycling
- material/energy recovery
- focusing on the diversion of waste from landfill.

The majority of the strategies reviewed include a target relating to each or one of these themes. The approaches taken to meet these targets vary between the strategies due to differing overarching drivers, objectives, existing performance and a spectrum of influencing economic and environmental conditions. In summary, the strategies generally set targets within the following key areas:

- recycling and composting (either combined or separately measured)
- recovery of the waste via treatment or recycling
- diversion waste from landfill
- limit on the tonnages permitted to landfill
- limit on the tonnages of specific materials/compositions to landfill
- a target set for specific waste sectors in the above areas.

The targets are often cited as a percentage increase/tonnage increase in recycling, recovery or diversion of waste reported against an established baseline year.

The strategies also vary in methods for structuring the targets. Some have stand-alone targets for each element (e.g. a recycling target and a separate landfill target) and others incorporate combined targets (e.g. a combined recycling and recovery target).

In order to analyse the various targets, it is important to understand the scope of the different definitions used in the strategies:

- Recycling is when waste materials are converted into a useable material or a new product, it includes organic processing but not energy recovery
- Recovery is the process of removing or extracting materials or energy for use or reuse from the waste. Recovery includes the use of waste treatment facilities to recover the materials/or generate energy from the waste, such as Energy from Waste (EfW).

It should be noted that recycling is a form of recovery and therefore a standalone “recovery” target could be achieved through recycling alone. However, a “recycling” target cannot be met by using recovery processes such as energy from waste.

A combined recycling and recovery target can be achieved through using both waste treatment facilities and increasing recycling. Generally, the targets do not tend to specify the proportions of how much waste should be recycled or how much should be recovered through energy from waste facilities.

- Energy from Waste (EfW) - this is a term used to cover a number of processes that all work to recover energy (either heat, power or both) from waste material. Generally these are thermal processes (e.g. incineration with energy recovery) but there are also biological processes (such as anaerobic digestion) that could be included.
- Diversion from landfill – means activities that divert waste from landfill and can include reuse, recycling, recovery activities.

Some of the strategies focus more heavily on diverting the waste from landfill, as opposed to increasing recycling and/or the recovery processes. There are also some strategies that highlight the importance of waste as an energy source rather than a separate recovery target, such as in Finland, where targets have been set for 30% of waste to be utilised as energy, and in the ACT’s strategy which has a target to double energy generated from waste by 2020.

The majority of the strategies reviewed establish separate targets relating for both recycling or recovery and diversion of waste from landfill. The following sections discuss each of these aspects in more detail.

3.2.3.1. Recycling and Recovery

Figure 6 provides a summary of the recycling and recovery targets currently included in the strategies. An indication of the current performance against these targets is also provided where it has been possible to obtain this information. The information is for a variety of years and is also based on the variety of ways in which waste targets are measured. This does not allow for ready comparison between jurisdictions except in the broadest of terms.

The targets set in the European strategies are highly influenced by the targets set out in the EU Waste Framework Directive (WFD). The Northern Ireland strategy (2006) was published prior to the formalisation of the WFD targets and it is expected that any updates to this strategy will take into account the need to meet these EU targets.

Figure 6: Key targets for recycling or recovery

Region	Target year	Target (recycling and/or recovery)	Indication of Current Performance
Australia and New Zealand			
NSW	2014	<p>By 2014, to increase recovery and use of materials from the municipal waste stream to 66%</p> <p>By 2014, increase recovery and use of materials from the commercial and industrial waste stream, to 63%</p> <p>By 2014, increase recovery and use of materials from the construction and demolition sector to 76%</p>	<p>MSW 52% in 10/11</p> <p>C&I 57% in 10/11</p> <p>C&D 75% in 10/11</p>
Queensland	2020	<p>Increase recycling of construction and demolition waste - 75%</p> <p>Increase recycling of commercial and industrial waste - 60%</p> <p>Increase recycling of regulated waste - 45%</p> <p>Increase recycling of municipal solid waste – 65% (relates to 150kg per person per year)</p> <p><i>Targets for recycling have also been set to be achieved in the intermediate years of 2014 and 2017.</i></p>	<p>The 2008 baseline is 35% for C&D waste, 18% for C&I, 30% for regulated waste, 23% for MSW (or 64kg per person per year)</p>
Victoria	2014	<p>Increase recovery rate by weight by 2014:</p> <ul style="list-style-type: none"> ■ MSW – 65% ■ C&I – 80% ■ C&D – 80% ■ All solid waste streams – 75% <p><i>* Recovery rate = recovered for reuse, recycling and energy generation.</i></p>	<p>In 2009/10 MSW was 48%, C&I 65%, C&D 80% and all solid waste streams 66%²</p>

² <http://www.sustainability.vic.gov.au/www/html/1344-towards-zero-waste.asp>

Region	Target year	Target (recycling and/or recovery)	Indication of Current Performance
Western Australia	2016 2020	<p>Achieve the following recovery rates:</p> <ul style="list-style-type: none"> ■ Municipal waste (metropolitan Perth) – 50% by 2015 and 65% by 2020 ■ Construction & Demolition waste – 75% (statewide) by 2020 ■ Commercial & Industrial waste – 70% (statewide) by 2020 At least one facility for processing commercial and industrial waste will be established by 2016 and a second by 2020. <p>Strategy targets are presented in terms of extra tonnes to be recovered above that achieved in 2009/10. Percentages calculated for ease of comparison with other strategies.</p>	<p>2009/10 – MSW in Perth Metropolitan region – 36%</p> <p>Other regions - 15%</p> <p>C&I – 46% statewide</p> <p>C&D – 29%³statewide</p>
South Australia		No recycling or recovery targets	
Tasmania		No recycling or recovery targets	
Australian Capital Territory (ACT)	2025	<p>The rate of resource recovery increases to over 90% by 2025</p> <p>Targets have also been set for 2015 and 2020 for all waste sectors.</p>	Over 70% recovery since 2003/4 ⁴
New Zealand		No recycling or recovery targets	
Europe			
England	2020	<ul style="list-style-type: none"> ■ To recycle at least 50% of waste from households by 2020. ■ To recover at least 70% of construction and demolition waste by 2020. <p><i>Note both these targets are taken directly from the EU Waste Framework Directive and are referenced in the strategy.</i></p>	<p>In 2010/11 41.5% of hhd waste was recycled</p> <p>68% C&D recycled in 10/11, 11% reclaimed</p>
Wales	2025	<ul style="list-style-type: none"> ■ All sectors in Wales will be recycling at least 70% of their waste this includes businesses, households and the public sector by 2025. ■ Construction sector will be expected to reuse and recycle 90% of its wastes by 2020. 	<p>MSW 45% in 2010/11</p> <p>C&D 84% reuse and recycling in 05/06⁵</p>
Scotland	2025	<ul style="list-style-type: none"> ■ 70% recycling for all waste generation in Scotland by 2025. Other targets have been set for 2013 and 2020. 	2010/11 MSW recycling was 38%

³ Opening speech for the Waste Strategy

⁴ From the Waste Strategy (http://www.environment.act.gov.au/_data/assets/pdf_file/0008/238994/EDS_ACT_Waste_Strategy_Policy_23AUG2012_Web.pdf)

⁵ Draft Construction and Demolition Sector Plan

Region	Target year	Target (recycling and/or recovery)	Indication of Current Performance
Copenhagen		<i>No specific targets are set, but reference is made to EU Waste Framework Directive to recycle at least 50% of waste from households by 2020, and recover at least 70% of construction and demolition waste by 2020.</i>	2009 data suggests 25% of household waste was recycled and 87% of building and construction waste was recycled. ⁶
Northern Ireland	2020	<ul style="list-style-type: none"> ■ 60% of Commercial and Industrial Waste to be recycled by 2020. ■ 75% of Construction, Demolition and Excavation Wastes to be recycled or reused by 2020. ■ Combined Recycling and Composting of Household Wastes to be at: <ul style="list-style-type: none"> ■ 35% by 2010 ■ 40% by 2015 ■ 45% by 2020 	In 2010/11 37.3% of MSW was recycled 33% for C&D 25% in 04/05 ⁷
Flanders	None cited.	75% of household waste needs to be collected selectively (i.e. sorted at the kerbside).	In 2006 71% of household waste was separately collected ⁸
Finland	2016	<ul style="list-style-type: none"> ■ 50 % of all municipal waste is recycled ■ At least 70 % of all construction waste will be used as material and energy ■ 100 % of all municipal sludge will be recovered, either to be used as energy or for soil conditioning. 	33% recycling of MSW in 2010 ⁹ 38% C&D material and energy recovery in 2005 ¹⁰

⁶ <http://www.kk.dk/sitecore/content/subsites/cityofcopenhagen/subsitefrontpage/livingincopenhagen/climateandenvironment/copenhagensgreenaccounts/waste/wastetreatment.aspx>

⁷ A New Recycling Policy Consultation, DOE Northern Ireland

⁸ http://scp.eionet.europa.eu/facts/factsheets_waste/2011_edition/biodegradablemunicipalwaste/bycountry?country=BE

⁹ Statistics Finland

¹⁰ National Waste Plan for 2016, Ministry of the Environment

Region	Target year	Target (recycling and/or recovery)	Indication of Current Performance
Netherlands	2015	<ul style="list-style-type: none"> ■ All waste - increase in recovery to 85% 2015 ■ Household Waste - increase in recovery to 60% in 2015 ■ trade and government waste - increase in recovery to 60% by 2015 ■ Industrial – at least maintain the percentage already achieved in 2006 of 90% recovery ■ C&D – at least maintain the percentage already achieved in 2006 in the Netherlands of 95% recovery by 2015 	<p>All waste 83% recovery in 2006</p> <p>HHD waste 51% in 2006</p> <p>C</p> <p>Trade 46% in 2006</p> <p>Industrial 90% in 2006</p> <p>C&D was 95% in 2006¹¹</p>
Sweden	2020	Recycling of non-hazardous construction and demolition waste shall be at least 70 percent.	2011, 32.8% household waste recycling
USA and Canada			
Vancouver Canada	2015	Increase the recycling rate from an average of 55% to a minimum of 70% by 2015.	55% in 2010
New York State		Increase recycling to 11.5 million tons/year	15% recycling in 2011. In 2011 approx 10,500 tons were collected each week.
Seattle	2022	<p>Increase recycling of the following:</p> <ul style="list-style-type: none"> ■ MSW 70% by 2022 ■ C&D 70% by 2020 	<p>MSW recycling 53.7% in 2010</p> <p>C&D recycling 61.4% in 2010 (65.5% overall landfill diversion)</p>
Nova Scotia		No recycling or recovery targets	

¹¹ National Waste Management Plan, Directorate General for Environmental Protection
SINCLAIR KNIGHT MERZ

The strategies for South Australia, Tasmania, New Zealand, Nova Scotia and Copenhagen make no reference to any specific or binding targets for recycling or recovery, but do include themes that cover the concept of recycling. When looking in more detail the reason for a lack of a target in this area is either due to the strategy focusing on another target e.g. reduction of overall waste, or diversion from landfill (as in South Australia), or it is due to the fact that there is not enough data to set meaningful, achievable and realistic targets.

Where targets have been included they are typically long term, with the majority setting target end dates between 2014 and 2020. Four of the strategies set targets beyond 2020, Seattle cite 2022 as the target year and ACT, Scotland and Wales have until 2025 to meet targets.

In relation to the scope of the targets, the strategies either set targets for each sector (MSW, C&I and C&D) or set a target for all waste. Six of the strategies provided separate targets for MSW, C&I and C&D waste, three of these strategies are outside of Australia.

As mentioned above several of the strategies set targets that go beyond 2014, with ACT, Scotland and Wales setting recycling and/or recovery targets beyond 2020. With the exception of Seattle these targets to **all waste**, and include:

■ Seattle	MSW	70% recycling	by 2022
■ Australian Capital Territory	all waste	90% recovery	by 2025
■ Scotland	all waste	70% recycling	by 2025
■ Wales	all waste	70% recycling	by 2025

The highest levels of recycling/recovery targets are generally seen within the C&D sector, with an average recycling/recovery rate of 77%, and the highest levels set at 95% (e.g. the Netherlands). The targets set within the MSW and C&I sectors are on average to recycle/recover 60% of waste, with the highest levels for MSW set at 70% recycling (e.g. Wales and Scotland) and for C&I at 80% recovery (Victoria).

Due to the differences in target dates and waste streams covered it is difficult to make comparisons across the targets to determine which is the most ambitious. However, the strategies which set the highest recycling and recovery targets with the shortest timeframes will present the biggest challenge. For example, Western Australia set a 70% MSW recycling target to be achieved by 2016 compared to the Scotland recycling target of 70% (for all streams) by 2025.

From the research it appears that the current NSW targets are in line with the majority of strategies in relation to the scope of the targets across the sectors and the levels of recycling/recovery set to be achieved. Target end dates are guided by the age of the strategy, its review cycles and targets set in any accompanying regulations, such as the EU Waste Framework Directive which sets a minimum position for European countries.

3.2.3.2. Diversion from Landfill

In addition to improving levels of recycling and recovery, another significant aspect of the majority of the strategies is the drive to minimise the quantity of waste disposed of to landfill. In some cases this is influenced by legislative and fiscal drivers and in some the focus is on remaining landfill capacity and environmental considerations, or a combination of these factors. The recycling and recovery targets discussed in the previous section will in themselves contribute to the diversion targets. What is important to bear in mind is that there is an appropriate balance between recycling,

recovery and landfill diversion in the targets that support the key strategic aims of a strategy. If high recycling is the preferred method of landfill diversion compared to recovery options such as energy from waste then the strategy policies and targets should reflect this, for example Scotland are limiting the use of energy from waste to materials that cannot be recycled or reused more economically or in an environmentally beneficial way. This can be compared to the Netherlands and Finland who achieve landfill diversion by a mix of recycling and energy from waste. The focus of the EU landfill directive is the diversion of biodegradable waste from landfill, there is therefore more benefit in focussing recycling effort on organic material streams in order to meet this target.

Of the Australian states reviewed only Queensland has both recycling and diversion targets compared to all of the EU countries reviewed who have both targets. This is due to the impact of the EU landfill directive targets in these countries. Vancouver and New York target recycling performance and diversion from landfill.

Figure 7 provides a summary of the key diversion targets currently within the strategies reviewed and again demonstrates that there is a range of approaches employed to deliver the overall objective.

Figure 7: Key targets for diversion from landfill

Region	Key year	Target	Metric
Australia and New Zealand			
NSW		No landfill diversion target	
Queensland	2014	Reduce landfill disposal by 25 % based on 2008 disposal levels	Reduction by %
	2017	Reduce landfill disposal by 40 % based on 2008 disposal levels	
	2020	Reduce landfill disposal by 50 % based on 2008 disposal levels	
Victoria		No landfill diversion target	
Western Australia		No landfill diversion target but aspirational reductions in total tonnages by 2015 and 2020 are provided that are compared to landfill diversions achieved in 2009/10	Reduction by weight
South Australia	2020	35% reduction in landfill disposal from 2002-03 level by 2020 Strategy also sets diversion targets for the Adelaide metropolitan area for MSW, C&I and C&D up to 2015 <ul style="list-style-type: none"> ■ MSW – 70% diversion from landfill ■ C&I – 75% diversion from landfill ■ C&D – 90% diversion from landfill Non-metropolitan areas to maximise diversion to extent practically achievable	Reduction by %
Tasmania		No landfill diversion target	
Australian Capital Territory (ACT)		No landfill diversion target	

Region	Key year	Target	Metric
New Zealand		No landfill diversion target	
Europe			
England	2020	EU Landfill Directive target to reduce the amount of biodegradable municipal waste (BMW) going to landfill to: <ul style="list-style-type: none"> 2010 – 75% 2013 – 50% 2020 – 35% Based on 1995 levels.	BMW diversion
Wales	2025	<ul style="list-style-type: none"> Municipal - maximum levels of municipal waste sent to landfill of 10% by 2020 and 5% by 2025. C&D – reduce amount of C&D waste produced in Wales that was landfilled (in comparison to the 2007 baseline) by 50% in 2015/16 and by 75% in 2025 C&I – no specific target in strategy, mentions further reducing the landfilling of biodegradable wastes through the development of the sector plans. Residual waste will be the material that cannot be recycled feasibly, and it will decrease to a maximum of 30% by 2025 (therefore further treatment required). 	Capped % of waste sent to landfill.
Scotland	2020	EU Landfill Directive targets on the diversion of biodegradable municipal waste from landfill in 2013 and 2020 (see above for England).	BMW diversion
	2025	Maximum 5% to landfill for ALL waste in Scotland by 2025	Capped % allowed in landfills
Copenhagen		No landfill diversion target	
Northern Ireland		Makes reference to EU landfill diversion targets (see above)	BMW diverted.
Flanders		No landfill diversion target	
Finland	2016	Municipal waste - a maximum of 20% ends up at landfills	Capped % allowed in landfills
Netherlands		Makes reference to EU landfill diversion targets (see above)	
Sweden		Makes reference to EU landfill diversion targets (see above)	
USA and Canada			
Vancouver Canada	2015	<ul style="list-style-type: none"> Increase the regional diversion rate from an average of 55% to a minimum of 70% by 2015 Following approximate diversion rates by sector: <ul style="list-style-type: none"> Multi-family 30% Single-family 65% Institutional, commercial and industrial 70% 	Increase diversion %

Region	Key year	Target	Metric
		<ul style="list-style-type: none"> Demolition, land clearing and construction 80% 	
	2020	An aspirational target to achieve 80% diversion for all waste (<i>assuming there will be sustained markets for all diverted material</i>)	
New York State	2030	Reducing disposal to 0.6 pounds (0.27kg) per person per day by 2030	Reduction pounds per day
Seattle		No landfill diversion target	
Nova Scotia		No landfill diversion target	

The table shows that just over half of the strategies (11 of the 20) incorporate some form of target in relation to diversion of waste from landfill. Seven of these strategies set specific targets for reducing the amount sent to landfill, and this is reflected either as a 'reduce by x%' or as a '% diversion' of a particular waste stream (e.g. South Australia refers to diverting 70% of MSW from landfill in the Adelaide metropolitan area). The targets which refer to an overall % reduction often refer to all waste (e.g. Queensland commits to reducing landfill disposal by 50% by 2020). Other targets include a cap on the amount that can be sent to landfill (e.g. Scotland refers to a maximum of 5% of all waste going to landfill by 2025). Finland also uses this type of target, but relates this to the municipal waste stream only (maximum of 20% to landfill by 2016). The targets were generally set to be achieved between 2015 and 2020, with New York setting its target for 2030.

In relation to EU strategies, these focus mainly on achieving the aims of the Landfill Directive to reduce the amount of biodegradable municipal waste sent to landfill to 35% by 2020. Some EU strategies go further and set targets in relation to specific sectors (e.g. Wales), or set a limit of the overall waste that can be sent to landfill (Scotland, Wales and Finland).

Due to the varying nature of the targets (performance metric, baseline levels and target dates), it is difficult to make comparisons to establish the average levels of diversion quoted. It is also difficult to establish the strategies that are the most challenging. However, it is suggested that the ones which set specific targets for different sectors, and those which set an overall limit on the waste to landfill, are the most ambitious. With this in mind, the Scottish waste strategy target of 5% of all waste going to landfill is perhaps the most ambitious. This target is combined with a 70% recycling target (highlighting waste prevention), and energy recovery of the remaining 25%.

Implementation for targets

The strategy review process has highlighted numerous activities that the other strategies are implementing to assist in achieving targets of recycling, recovery and diversion from landfill. From limited additional research, these strategies are being implemented through a variety of means, including:

- Landfill bans
- Levies/taxes as fiscal driver to make recycling/recovery a more attractive option
- Encouraging and developing the markets for recycled materials (use of protocols/standards regarding the outputs)

- Supporting infrastructure requirements
- Development of sector specific plans
- Engaging with different sectors to encourage recycling, recovery and diversion through a variety of programmes and voluntary agreements.

More details and examples from the strategies on these are provided below:

Landfill Bans - The European Union (EU) has legislation that drives all the related European countries' waste strategies and waste management. With regard to waste management, the EU has banned several materials from landfill (e.g. tyres, mattresses, waste electrical and electronic equipment (WEEE)), via a series of EU Regulations. This is proving to be a key driver to divert waste from landfill.

In addition, some European countries have taken this further and introduced national laws to ban certain waste materials from landfill. For example in Scotland there is a commitment to introducing landfill bans for recyclable materials and biodegradable waste. This is implemented alongside a range of other initiatives to promote the separate collection of recyclates and food waste, and also to restrict the amount of waste sent to incineration, so that this material stream does not simply end up being diverted into incineration. In the Netherlands, there is a ban on reusable or combustible waste in landfill, and therefore only residual waste that is not reusable or cannot be incinerated can be landfilled. In Australia, South Australia has waste policies in place to ban 21 materials from landfill state-wide. Victoria bans tyres and batteries and ACT bans computers, TVs, tyres and mattresses.

Landfill bans or restrictions are typically employed as one instrument in a range of interventions to move waste away from landfill, e.g. landfill taxes, or mandatory separate collection of recyclables, incineration taxes and moratoriums. Where landfill bans are in place there needs to be alternative treatment routes developed or in place for the banned materials, e.g. incineration, biological treatment, material recovery. From a practical perspective there needs to be a lead time to allow business, landfill operators, government to prepare, a transition period and enforcement of the system. Other practicalities that are important for systems to operate successfully include; a simple compliance scheme, public acceptability, resources to enforce, an effective enforcement system, a clear view of the purpose of the ban.¹²

In Scotland landfill bans are being phased in based on an agreed timetable. The regulations were introduced in 2011 and local authorities must offer separate collection of dry materials by end of 2013 and food waste by 2015. The ban on the landfill of biodegradable material will take effect in 2020 to allow sufficient time for recycling collections to become established and for infrastructure for non-recyclable waste to be developed.

The process of introducing the regulations has also involved consultation with industry regarding timescales and aspects of the implementation plan.

Landfill fines and levies/taxes - EU legislation sets binding targets for all European countries to divert biodegradable municipal waste (BMW) from landfill. Through the inclusion of fiscal measures and accurate reporting systems, this has proven to be effective. The other significant driver to implement diversion within England, Wales and Scotland specifically is the landfill tax (equivalent in concept to the NSW Waste and Environment Levy).

¹² Defra research paper, Landfill bans and restrictions in the EU and US, 2008.

The combination of these taxes and levies results in recycling and recovery streams becoming more financially viable compared to landfilling waste. It has also encouraged investment in additional waste treatment infrastructure as alternatives to landfill. Treatment technologies such as mechanical biological treatment and energy from waste plants have been and are being developed across Europe to treat this diverted waste and further enhance the recycling and energy recovery.

Infrastructure - A recurring theme in a number of the strategies is the lack of built infrastructure to deliver the required diversion and how to develop that infrastructure. These issues are usually linked to implementation plans regarding how to encourage large investments into waste treatment technologies and links to planning issues. This appears to be a common concern with the exception of Flanders which looks to send residual waste outside the region boundary, where there is a surplus of capacity and in Sweden which only sends 1% of waste to landfill due to infrastructure already in place.

Market development and support for different sectors – The majority of strategies make reference to the need to develop the recycling market for all waste streams through appropriate infrastructure and through research and development into alternative uses for materials. In ACT, one of the key factors affecting the recycling opportunities for C&I waste is the lack of infrastructure. In order to maximise the recovery of waste from the commercial sector the ACT government is facilitating the establishment of a mixed commercial waste Material Recovery Facility (Commercial MRF). The Commercial MRF is expected to recover between 40,000 and 70,000 tonnes of waste resources from the commercial sector, substantially reducing the waste this sector would normally send to landfill.

The Seattle Waste Strategy addresses the development of the reuse market for business and industrial waste through a program called 'By-Product Synergy Northwest'. The program provides direct exchange between producers of by-products and companies that can use them. This is also a mechanism used in the UK through the National Industrial Symbiosis Programme (NISP).

A further method to increase the confidence in the markets for the materials is to develop "standards" that redefine the materials so that they are no longer considered waste. Finland has been active in developing national standards. Wales, England, Scotland and Northern Ireland have also been developing "British Standards" referred to as "protocols" for numerous materials through the Waste and Resources Action Programme. The key aim in relation to these standards is to develop market confidence in the outputs from various processes such as compost from composting facilities or aggregate from construction and demolition works.

Sector-specific Plans – the strategies reviewed highlighted the need for the appreciation of local conditions and in particular the access to recycling and recovery markets. Most of the Strategies mentioned the need for a local plan, with some going further to develop plans for specific sectors. In Wales the strategy sets out the development of sector specific plans in the following areas:

- Municipal Waste Sector Plan - addresses waste that the local council collects and includes household waste and recycling
- Collection, Infrastructure and Markets Sector Plan - addresses what happens to the waste once it has been put out for collection and how Wales deals with its waste without sending it to landfill
- Food, Manufacture, Service and Retail Sector Plan - addresses food waste and packaging in Wales and how to reduce it within the food and manufacturing industry

- Construction and Demolition Sector Plan - addresses the waste produced in the building industry and how to manage this
- Commercial and Industrial Sector Plan - addresses waste in business, retail and manufacturing and how to reduce and manage this
- Public Sector Plan - addresses waste produced by the public sector and how to reduce and manage it.

Voluntary Agreements with industry – These are particularly evident in the UK as the Waste and Resources Action Programme (WRAP), funded by the four UK government administrations, has implemented several voluntary agreements/commitments for the non-municipal sectors. Some examples include:

- *Courtauld Agreement (retail)* – a voluntary agreement aimed at improving resource efficiency and reducing the carbon and wider environmental impact of the grocery retail sector. Currently there are approximately 50 signatories to the agreement. The agreement sets out a series of targets that signatories work towards. These include a requirement to reduce weight, increase recycling and recycled content of grocery packaging by 10%; reduce household food and drink waste by 4%; and reduce traditional grocery packaging in the supply chain by 5%.
- *Halving waste to landfill commitment (construction & demolition)* - this voluntary commitment asks the C&D sector to sign up to committing to reduce C&D waste to landfill by half by 2012. Tools and good practice guidance are provided to assist signatories in working towards achieving the target. This currently has over 600 signatories which represent all parts of the construction supply chain.

NSW has a number of similar programmes to support the achievement of its recycling/recovery targets. A key difference between some other strategies and NSW appears to be the focus on landfill bans, and to a lesser extent the implementation of voluntary agreements/sector plans. These are particularly evident in the UK and Wales specifically, where landfill bans are being considered for recyclate and biodegradable waste, and where a number of voluntary agreements with industry has been set up to promote their commitment to reducing waste and increasing the recovery/recycling of materials. Wales is also developing several sector specific plans to focus on engagement with the sectors and ensure long term deliverability. Where landfill bans have been used there is a recognition that a ban in itself cannot work in isolation to other programs and that infrastructure, enforcement policies, etc are required that will work to support the ban.

3.3. Reducing Toxicity in Products and Materials

The majority of strategies reviewed do not have a separate section dedicated to this theme, but the issues involved are typically included within the waste strategy in the following related areas:

- encouraging consideration of product life cycle and the reduction/elimination of problem materials in products (as part of Product Stewardship and Producer Responsibility)
- targeting and reducing problem wastes, e.g. through providing infrastructure that assists with the management and removal of hazardous waste (including banning problem materials from landfill and finding alternative solutions).

Product stewardship is a common term used within all of the Australian waste strategies, with the concept also being included in the majority of other international strategies, being termed slightly differently or having a different focus (e.g. life cycle assessment, resource efficiency or producer responsibility). Wales and Scotland in particular, look at a holistic solution to waste and these

concepts are clearly included within its waste strategy. Often the product stewardship concept is addressed within a “preventing and avoiding waste” theme (see section 3.2.2 for previous discussion). Another example of this is the Seattle strategy which highlights that its planned waste prevention programme is:

“to reduce waste volumes from households and businesses and seek to reduce toxic substances in goods purchased by people, institutions and businesses.”

The “Reducing toxicity in products and materials” theme also links to producer responsibility schemes where product manufacturers are designated as being responsible for waste associated with disposal of their product at the end of its life. This concept underpins the majority of waste legislation identified in other strategies. For example in Europe producer responsibility legislation is in effect focussing on various waste streams including waste packaging, batteries, waste electrical and electronic equipment (WEEE). This legislation ensures that the producer takes responsibility for, and funds any treatment and recycling schemes for these waste types, which are generally classified as a hazardous waste. Copenhagen is within the European Union and as such producer responsibility legislation applies. The Copenhagen strategy identifies several specific actions to reduce hazardous waste generation and also entering the landfills. Examples include education campaigns regarding WEEE, battery collections, recycling compliance schemes and the separation of hazardous waste in multi-storey buildings.

Nova Scotia also feeds into the Canada-wide ERP Plan and conducts actions in line with the plan. The initial focus is on the following materials: packaging, printed materials, mercury containing lamps, other mercury-containing products, electronics and electrical products, household hazardous, special wastes and automotive products. There are a variety of activities associated with the ERP Plan including policies and legislation which include (among others): restrictions on toxic substances, green procurement policies, disposal bans and disposal surcharges, eco-labelling, product standards, waste/packaging reduction strategies, recycled content standards and regulations.

With regard to the management of hazardous waste, this is not highlighted by the other strategies as a key theme, i.e. with a separate chapter dedicated to it. However, the Seattle strategy focuses specifically on moderate risk waste (MRW), which is hazardous waste generated by residents and in small quantities by businesses and institutions. An output from Seattle’s strategy is the development of the Local Hazardous Waste Management Program (LHWMP) to manage the MRW.

Another method of managing hazardous waste is banning materials from landfill through legislation. Such legislation is in place in Europe and this includes bans on materials such as tyres, WEEE, paint and other hazardous items. Banning hazardous materials from landfill is seen by the other strategies as standard practice already in implementation and it is evident that bans on materials being landfilled are seen as an important implementation action to drive the strategy forward.

The research found that this NSW theme is addressed by the waste management practices of the majority of countries reviewed even though not specifically included within the strategy documents or identified as a specific theme within the waste strategy. NSW implements similar activities such as extended producer responsibility schemes and has some landfill bans on hazardous materials.

Some strategies make mention of specific waste streams that are to be targeted by the strategy, due to their high volume, lack of activity to date or contribution to carbon targets which could be interpreted as being ‘priority waste streams’. These include packaging waste, organic waste, wood waste, plastic bags, textiles, metals, plastics. In NSW, the *Reducing Waste Implementation Plan*,

as well as the WARRS 2007, lists priority wastes for tackling through producer responsibility schemes and/or collection from households.

A few of the strategies mention the need to focus on soil as a priority material. This is mentioned in the ACT strategy and relates to working with industry to ensure that contaminated sites are rehabilitated so that they are suitable for new development. This would include a review of how contaminated soils can be treated to provide a material beneficial for reuse on development sites. It should be noted that although a few strategies mention this as a key focus, this is not the norm across the majority of waste strategies.

3.4. Reducing Litter and Illegal Dumping

Of the 20 strategies reviewed 12 make reference to littering and illegal dumping (see Figure 2). The level of detail provided in these strategies in relation to the targets and actions to address these aspects of waste management is varied, and the following strategies are highlighted as ones which clearly reference littering and illegal dumping as a key priority in their strategy.

- Victoria – sets a target for a ‘25% improvement from 2003 levels in littering behaviour by 2014’ and provides details on specific actions and programmes to help to achieve the target. These actions are set out in the Victoria Litter Strategy¹³ (which covers both littering and illegal dumping activities).
- South Australia – sets a target to ‘implement litter reduction and public place recycling’ and aims raise awareness of the impact of these activities on the environment provides details on actions to achieve target
- Australian Capital Territory (ACT) – sets a target and provides details on actions to achieve target. The target is ‘to lead Australia in lower litter and incidents of illegal dumping’.
- Copenhagen – sets a target to be the ‘cleanest capital of Europe’ and that waste must be removed from public streets within 8 hours. A separate Cleaning Strategy supports this target.
- Seattle – no target set, but provides details of action programmes in place to address illegal dumping, litter, graffiti, etc.
- England – no specific target is set, the strategy addresses illegal dumping through reference to ‘supporting fly tipping enforcement powers’ and from a litter perspective ‘recycling on the go’ is a current priority for action along with combining anti-littering messages with recycling on the go.

Along with the NSW strategy, four of the above strategies set specific targets:

- A percentage reduction target in relation to littering based on a baseline performance is set in Victoria
- A target to reduce incidents of littering or illegal dumping is set by NSW (see section 2.3.1), Australian Capital Territory (ACT) and South Australia.

¹³ Creating Cleaner, Safer Places, Working together to remove litter from Victoria’s environment

- A performance comparison target with other cities/states is used by Copenhagen and ACT, e.g. Copenhagen aims to be the cleanest city in Europe, while ACT aims to have the lowest levels of litter in Australia.

The majority of the specific targets identified above relate to littering rather than illegal dumping with only the ACT target covering both litter and illegal dumping in the same target. Seattle and England make reference to action to address littering and illegal dumping in conjunction with other anti-social behaviour but do not include specific targets.

The target set by Victoria relates to demonstrating an improvement in littering behaviour. According to the Towards Zero Waste (TZW) Strategy Progress Report this target focuses on the prevention of litter rather than its clean up, and results are based on data obtained from the Victorian Litter Report. To date, the Victorian Litter Report has been conducted every two years but from 2010–11 will be conducted annually to align with other TZW reporting. Littering behaviour is assessed using a standardised Clean Communities Assessment Tool (CCAT) which gives a score based on an assessment of factors such as litter prevention performance, ground litter counts, litter hot spots, rate of public littering, and litter types.¹⁴

The vision in the Victoria strategy is also one to *'move away from cleaning up litter, to preventing it occurring in the first place'*. This is a contrast to Copenhagen which states that in order to achieve their target to be cleanest city in Europe that it will have *'more bins and more staff to keep the city clean'*.

Both littering and illegal dumping are often referred to together in the strategy documents because both involve illegal behaviour in relation to waste disposal but are at different ends of the spectrum, i.e. littering involves small volumes of materials and illegal dumping involves much larger amounts of waste material and is a way of avoiding disposal costs. Both issues require addressing by activities that relate to education, behavioural change and also legislation and enforcement activity by environmental regulators. Despite the similarities, both incidents are typically recorded separately on registers or databases and addressed separately in terms of action programmes. NSW has programmes to address both littering and illegal dumping, along with many of the other Australian states. In England littering offences are typically dealt with by local authorities whereas illegal dumping (termed fly tipping) is usually dealt with by the Environment Agency. Incidents are recorded through the 'fly capture' database system.

All of the strategies highlighted above provide information on the type of actions that they propose to implement to address illegal dumping and litter. The level of detail varies, but overall the key themes of the implementation were:

- **Improved Reporting of Incidents & Enforcement** (relevant to both littering and illegal dumping) – increasing penalties for defined offences and effective training of enforcement officers; providing public reporting systems and databases that record and quantify both litter and illegal dumping)
- **Awareness Campaigns and Education** (relevant to both littering and illegal dumping) – high profile media campaigns, development of brochures, leaflets for schools, local government and key stakeholders, and targeted campaigns. In England's strategy the Government has committed to developing a national awareness campaign through Keep Britain Tidy's initiative 'Love where you live'. This provides a framework to implement a series of actions on

¹⁴ The Victorian Litter Report 2010

supporting local communities, business, schools and local government in reducing litter and organising clean-ups.

- **Infrastructure** (relevant to both littering and illegal dumping) – exploring the links between waste collection services and littering/illegal dumping and introducing new infrastructure to reduce this such as establishing bulky waste collections, improved collections for green waste and e-waste (relevant to illegal dumping), and improving ‘recycling on the go’ services in public places (relevant to littering), especially at events.

In delivering these actions two of the strategies make reference to specific target groups and materials that they would like to focus on. These included hospitality sector, buildings sector, agriculture/farming (Victoria), take-away food establishments, public places, events and car parks of major retail areas (South Australia).

Further to the specific actions and target areas, the strategies also (to varying degrees) make reference to the links between littering and illegal dumping and the following:

- Product stewardship – highlighting the key role that business has to play in reducing waste at source through designing out waste (e.g. packaging)
- Plastic bags ban – highlighting the important role that the plastic bag ban in many countries has and can contribute towards reduced littering
- Building sector – highlighting the importance of working with the buildings sector to promote the effective design of buildings and public spaces to reduce littering
- Disposal levy – highlighting the concerns about the impact that any increases of the disposal levy will have on the incidents of illegal dumping.

Three Australian strategies (Victoria, South Australia and ACT) make reference to how they are going to measure and report on the progress against littering and illegal dumping. This is mainly through the use of the National Litter Index. The Victoria strategy measures performance using the Clean Communities Assessment Tool as described above. Monitoring in South Australia is monitored and reported by Keep South Australia Beautiful (KSAB). This involves a litter count at 151 sites, a littering database that helps inform litter reduction strategies.

The NSW strategy has targeted both littering and illegal dumping supported by a range of enforcement and awareness raising activities. This issue has been given more focus than many of the other strategies in the benchmarking group.

3.5. Wider Environmental Themes

The review of waste strategies highlights that the majority of the waste strategies considered waste management as part of the wider environmental and sustainability agenda. As an example, the South Australian strategy highlights the following:

‘we understand that the environmental challenges of waste management are linked with challenges in population growth, consumption of materials, availability of resources, waste and energy use, climate change and carbon reduction’.

A key focus of this wider environmental agenda relates to the impact of waste management on climate change, through the increase in greenhouse gas emissions as a result of resource extraction, energy and water use to produce materials, and the emissions of methane from waste

disposal (especially organic waste) to landfill. This was a key feature of 14 of the 20 waste strategies reviewed, with the following strategies making a strong link between how the climate change impacts of waste management have shaped their strategy:

- **England** - One of the key principal commitments in the strategy is to 'prioritise efforts to manage waste in line with the waste hierarchy and reduce the carbon impacts of waste', with the strategy acknowledging that carbon acts as a good proxy for the overall environmental impacts of waste. The strategy also uses carbon as an identifier for priority materials (e.g. those with high carbon impacts such as food, metals, plastics and textiles). The strategy further suggests the development of a 'carbon metric' to facilitate a move away from weight-based targets to carbon-based targets.
- **Scotland** – The strategy makes a clear reference to the important role that waste management has to play in achieving the target to reduce Scotland's greenhouse gas emissions by 80% by 2050. This will primarily be through reducing the demand on primary resources and reducing overall waste disposal to landfill. This clear vision in the strategy is also supported by the commitment to develop a 'carbon metric' to monitor and report against progress in this area, and also to identify a 'carbon' focus for future waste management policies/practices.
- **New York** – The strategy makes the link between the climate impacts of waste management and the waste hierarchy and promotes the treatment of waste at the top of hierarchy. It also acknowledges the important role that energy from waste has to play in reducing greenhouse gases through a diversion of waste from landfill and as a contribution to renewable energy sources. The strategy provides a significant amount of detail on the scientific evidence behind the climate impacts of waste management and makes an assessment of how the different treatment methods (prevention, recycling and disposal) contribute towards greenhouse gas emissions.
- **Australian Capital Territory (ACT)** – One of the four outcomes of this strategy is to develop a 'carbon neutral waste sector' and to double energy generation from waste by 2020. This is one of the only strategies with a waste sector specific carbon target, which demonstrates the state's commitment to developing waste management practices based on carbon.
- **Wales** – The Welsh strategy takes a wider view of the impacts of waste management and views this from an 'ecological footprint' and one planet living perspective. An ecological footprint is an assessment of environmental impact (including greenhouse gases) converted to an area of land required to support the activity. For example, a sustainable global ecological footprint would be equivalent to, or less than, the surface of the earth. The strategy highlights that this approach will reduce the impact of climate change from waste activities, achieve sustainable consumption and production, help sustain the economy and manage and conserve the planet's resources.

All of the strategies which mention the relationship between climate change and waste management highlight the important role that energy from waste has to play in reducing greenhouse gas emissions, either for those materials that have a high calorific value and little monetary value in the recycling market, or through the treatment of organic waste (e.g. anaerobic digestion for food waste). Three of the strategies (Wales, Victoria and South Australia) highlight the consideration that should be given to adapting to climate change, as a different climate will generate different types and tonnages of waste (and present challenges for disposal infrastructure). This will require approaches to waste management to be updated to reflect this. For example, Victoria's strategy mentions the following:

'lower and less reliable rainfall, less winter rainfall, more frequent extreme rainfall events in spring and summer, and warmer winters and hotter summers. The main potential effects of this will be on the quantities of garden organics generated and the demand for recycled organic products'.

In relation to targets, all of the 14 strategies make reference to the greenhouse/carbon reduction target of the country/state, and highlight the contribution that the waste strategy will make to achieve these targets (Figure 8). Further to the state target (40% reduction in greenhouse gas emissions by 2020), the ACT strategy has a target specifically for its waste sector that aims for it to be carbon neutral by 2020, with energy generated from waste doubling by 2020. No further details are provided in the strategy as to what is defined as 'carbon neutral', but this appears to be an ambitious target. The Welsh strategy also promotes the concept of 'ecological footprint' and sets a target for Wales to reduce their ecological footprint to the global average availability of resources - 1.88 global hectares per person.

Figure 8: Other targets

Waste strategy	Key year	Targets details
Australia and New Zealand		
Queensland	2020	Cut Queenslanders' carbon footprint by a third by 2020
Victoria		No target
Western Australia		No target
South Australia	2050	Greenhouse gas emissions to be reduced by 60% by 2050 based on 1990 levels
Tasmania	2050	Greenhouse gas emissions to be reduced by 60% (from 1990 levels)
Australian Capital Territory (ACT)	2020	To have a carbon-neutral waste sector by 2020
New Zealand		No target
Europe		
England	2020 and 2050	Reduce emissions by at least 34% by 2020, and 80% by 2050, below the 1990 baseline
Wales	2050	Reduce greenhouse gas emissions by 3% a year from 2011 in those areas where we have devolved competence Reduce ecological footprint to the global average availability of resources - 1.88 global hectares per person by 2050
Scotland	2020	Greenhouse gas emissions to be reduced by 42% by 2020
	2050	Greenhouse gas emissions to be reduced by 80% by 2050 based on 1990 levels
Copenhagen	2015	Reduce CO _{2e} emissions by 20% (compared to 2005) by 2015
Northern Ireland		No target
Flanders		No target
Finland		No target
Netherlands	2020	Greenhouse gas emissions to be reduced by 30% (from 1990 levels) by 2020
Sweden	2020	Reduce emissions of greenhouses gases by 40% compared to 1990 by 2020

Waste strategy	Key year	Targets details
USA and Canada		
Vancouver Canada	2020 & 2050	Reduce greenhouse gas emissions by 33% by 2020 and by 80% by 2050. From a baseline in 2007 of Greenhouse gases emission of 68 million tonnes CO ₂
New York State	2050	Reduce GHG emissions 80% below 1990 levels by 2050
Seattle		No target
Nova Scotia		No target

As noted in the table these targets all have long timeframes and range from 2020 to 2050. In relation to the country/state greenhouse gas emissions target, England, Scotland and New York all appear to have the most ambitious targets of reducing GHG emissions by 80% by 2050 (based on 1990 levels). The level of ambition, however, cannot be accurately assessed without understanding start and end points, and the steps needed to achieve the target. The need to achieve these targets is reflected in the scope of the strategies as highlighted above.

To achieve/contribute towards the carbon/greenhouse gas reduction targets, the following waste-related actions are listed in the strategies.

- Improve the **capture of methane** from landfill sites – to reduce fugitive emissions of GHGs
- Increase the **use of energy to waste technologies** to generate renewable energy (e.g. anaerobic digestion) – utilise renewable energy to offset the use of fossil fuels conventionally used to produce energy
- Increase the **diversion of organic waste** from landfill and redirect to composting or renewable energy – organic waste has a high organic carbon content and therefore has the potential to release high quantities of methane when decomposing anaerobically. By redirecting this to composting or renewable energy this methane can be avoided or captured and utilised in energy production (e.g. anaerobic digestion).
- Promote **waste prevention and increase recycling** – avoiding the energy to extract raw materials and produce new products
- Improved **product and packaging design** - promote a focus on material management, designing out waste at source and using fewer materials
- Promote **sustainable procurement** - encourage the use of products with low embodied carbon and/or recycled content to avoid the energy used in extracting raw materials.

Note that all 14 strategies covering this topic address the top five actions above, with ACT, Tasmania, Victoria and Wales also making a specific reference to the role of sustainable procurement. The other strategies did in most cases make reference to sustainable procurement, but did not make the specific link to the climate change impacts of waste management.

Further to ‘diversion of organic waste’ identified as an action above, the strategies also make reference to the focus of these activities on those materials that have a high embedded carbon content (i.e. carbon associated with extraction and manufacture of the original product. For example, textiles have a relatively low tonnage/volume in the waste stream, but as a material they have high embedded carbon content due to the more complex and energy intensive manufacturing processes they must go through during production. This was particularly evident in the England

strategy, which states that carbon has been used as the identifier for the priority materials food, metals, plastics and textiles, rather than basing this prioritisation on weight.

The majority of the strategies which made reference to a carbon/greenhouse gas reduction target did not provide any further detail on how this would be measured and reported. As these targets formed part of a wider policy on climate change, progress is likely to be reported on a national level, taking data from a wide range of activities and incorporating this into a greenhouse gas emission figure. The strategies where further details were provided on monitoring and reporting include:

- **ACT** – Greenhouse gas emissions from the ACT waste sector will be monitored as part of the annual ACT Greenhouse Gas Inventory. The emissions avoided by generating energy from waste will be counted towards the achievement of a carbon neutral waste sector.
- **England and Scotland** – Both strategies commit to developing a ‘carbon metric’ to measure and report against the carbon emissions of municipal solid waste. These are currently being developed and will be made available through the online waste data system, ‘WasteDataFlow’. Both of the metrics will use approved carbon factors for the UK.
- **New York** – As mentioned previously the New York strategy provides a significant amount of detail on measuring the greenhouse gas emissions from waste management. The strategy provides tables of approved carbon factors, and proposes to use these in measuring the progress of the strategy in this area.
- **South Australia** – Under the heading ‘Measurement, analysis, evaluation and reporting to support targets and assess the adequacy of the Strategy’ the strategy makes reference to ‘measuring outcomes as they relate to carbon, water and ecological footprint’. However, no further details are provided on how this will be monitored.

Whilst NSW has not set state-based targets for the carbon performance of its waste avoidance and resource recovery system, the carbon pricing mechanism enacted under the Clean Energy Futures Act means that certain waste management activities will be exposed to a carbon price. Landfilling of wastes is included in the carbon price where facilities trip the threshold (25kt CO₂ equivalents for an individual facility). This Federal legislation affects all Australian States and Territories.

3.6. Key Waste Sectors

This section looks specifically at the waste covered by each of the strategies reviewed to determine whether there are any significant differences from the coverage of the WARRS 2007.

As shown in Figure 2 the majority of waste strategies cover a range of waste types, including Municipal Solid Waste (MSW), Commercial & Industrial (C&I) and Construction & Demolition (C&D) waste. This shows that there has been an evident move away from focusing on household or municipal waste only (for example the Scottish, English and Welsh waste strategies in 2002/3 focused on municipal waste and more recent strategies include C&I and C&D waste). Furthermore, the strategy for New Zealand covers some additional materials over and above MSW, C&I and C&D, and the strategy cites the reason for this as helping to avoid policies that might encourage transfer of waste from one disposal medium to another. The materials covered by the New Zealand waste strategy includes:

- Solid waste - common household waste, kitchen and garden wastes, as well as a range of industrial and commercial wastes, such as construction and demolition wastes, organic wastes from agriculture and food processing, and mining.

- Liquid Waste – generated as liquids or disposed of into a liquid waste stream as suspended solids. For example domestic food wastes, washing water and toilet wastes, as well as chemical and process wastes from industry in wastewater.
- Gaseous waste – consist of gases and small particles emitted from open fires, incinerators, agricultural and industrial processes, and vehicles.

It is also understood that Queensland are looking to include a focus on the management of waste from natural disasters in their future strategies. They are currently assessing waste flows associated with natural disasters and aim to disassociate this from waste with other streams. However, this was the exception rather than an approach commonly adopted in other strategies.

In comparing the NSW strategy with the other strategies, it is important to note that the term 'Municipal Solid Waste' can encompass waste from different sources within the different strategies. The key differences relate to whether municipal waste includes the following:

- Household waste collected from kerbside (e.g. Flanders)
- Household waste and waste collected from other council operations such as street sweepings, parks and gardens waste, litter bins and recycling drop off/collection sites (e.g. NSW)
- Other waste which are similar in nature and composition to household waste (e.g. commercial and industrial wastes). This is the European definition of municipal waste.
- All waste collected by a local authority regardless of its source. This is currently the definition used in the strategies for England, Scotland and Wales. However, please note that the interpretation of the term municipal waste has recently been reviewed and now refers to '*other waste which are similar in nature and composition to household waste*'. However, for the purposes of the strategy municipal refers to all waste collected by the local authority. This would include some C&I and C&D tonnages, if collected by the local authority (as is the case in NSW).
- All wastes originating within the municipality (e.g. Vancouver).

The definitions of Commercial and Industrial Waste (C&I) and Construction and Demolition waste were found to be broadly similar across all the strategies. The NSW definitions include:

- Commercial and Industrial - "*waste generated by businesses and industries (including shopping centres, restaurants and offices) and institutions (such as schools, hospitals and government offices), excluding construction and demolition waste and municipal waste*"
- Construction and Demolition Waste (C&D) "*waste sourced from construction and demolition works and includes: building and demolition waste, asphalt waste and excavated natural material*".

This highlights that it is the definition of municipal waste that has the most variation across the strategies assessed. This may be due to the varying roles that local government has in collecting wastes, defining everything it collects as 'municipal' regardless of source, and defining C&I wastes and C&D wastes according to private waste collection operations. It should be noted that the strategy documents reviewed often do not contain this information.

The issue that this raises is in the comparison of waste strategy targets – both absolute and relative target ambition can only be judged with an understanding of what the target relates to.

3.7. Measuring Performance

This section looks specifically at how performance will be measured, including the metrics used.

The majority of strategies highlight measuring performance as a common concern in terms of collating reliable waste data and reporting, across all waste sectors. Achievement of targets can only be assessed based on accurate data. Therefore all the strategies that contain targets need to be able to measure performance with regards to the levels of avoidance and prevention of waste, recycling, composting and recovery and/or diversion from landfill. Key to ensuring that this performance can be accurately monitored and reported is the availability and robustness of the data. Across the strategies, there are various systems being employed to collect and collate data, however the majority of waste strategies noted that data was a key area for improvement. The following extracts from the strategies provide evidence for this:

South Australia - We will underpin our work with our increasing knowledge and data on waste, recycling and resource recovery.

Queensland - Feedback on the draft strategy highlighted the relatively poor quality of Queensland's waste data. Despite improvements in recent years, there are still issues with the completeness and reliability of the information.

Tasmania - There are currently no complete datasets for the total amount of waste diverted from landfill through recycling, re-use, or resource recovery. In order for Tasmania to be able to benchmark resource recovery and recycling rates with other States, it is crucial to improve the coordination and extent of data collection systems in Tasmania.

England - Government and industry to work together to improve the data available on commercial and industrial waste.

New Zealand - Limited information on the size and nature of our waste problems hinders good policy-making and target-setting. We know more about waste disposal than we do about waste generation, but we need standardised measuring systems to establish baseline data and trends. We must also get a better understanding of production and consumption trends, which are closely correlated to how much waste we generate.

From the review of other waste strategies the general trend seems to suggest that data regarding municipal waste sources is more robust when compared to the other waste sectors. Central data systems also supported the robustness of the data. In England, Wales, Northern Ireland and Scotland the national municipal waste database utilised is called WasteDataFlow, where all municipal waste data is entered quarterly by the local authorities including details of recycling, composting, recovery and landfill tonnages by collection technique (e.g. kerbside or a recycling centre) and reprocessor. The level of detail includes contamination (e.g. reject rates) entering a process and generated during a process (e.g. the materials that are rejected are reported at the point of collection, the gate of the reprocessor and from the treatment process). This system also includes a central team which validates the data and provides training and auditing to ensure data consistency and high standards of accuracy. The system is used to monitor the performance of each local authority against national recycling indicators and the diversion of biodegradable waste from landfill. This method of centralising and standardising the data provides a strong basis to determine areas of success and failure against targets. It also allows for comparisons to be made between authorities, as well as informing future policy and national strategy development.

Local authorities and municipalities in the benchmark group have had the longest history of organised waste data collection and hence the best opportunity for collection of data. However waste generation from other waste sectors appears to be not as robust and in most cases the other waste sectors are identified via the end destination of material through annual surveys and reporting.

New Zealand is an example of the concerns surrounding robust waste data collection, specifically for waste sectors other than municipal waste. Within New Zealand, municipal waste landfills accept a mix of household, commercial and industrial waste and are owned and operated by a mix of municipalities and commercial organisations. The majority of high quality waste data is collated via the municipal waste landfills (via weighbridge data). Data for waste streams other than MSW and which fall into the waste strategy remit are not collated. Examples include:

- industrial wastes disposed of to dedicated landfills (e.g. melter slag, pulp waste treatment sludge)
- C&D waste (disposed of to MSW landfills and dedicated C&D waste landfills)
- cleanfill (disposed of as cover/construction material to MSW landfills and to dedicated cleanfills).

Waste generation from other sectors other than the municipal waste sector appears therefore to be unreliable across the benchmark strategies, perhaps due to the lack of historic requirement for this data. A fully robust system is not yet in place (or clearly identified within the waste strategies) for the non-municipal waste for most of the countries reviewed.

4. Benchmarking Findings

Section 3 summarised the main findings of the review of waste strategies and gave initial consideration to the areas where the NSW waste strategy and supporting programmes are similar to international practice and perhaps goes beyond or is different to international strategies. Following this review, areas of key difference and similarity between NSW and the benchmark group are summarised below.

4.1. The Waste Hierarchy

The waste hierarchy is a key concept in all waste strategies reviewed and it is good practice to focus efforts on activity that moves waste up the waste hierarchy and where the strategic focus is on waste prevention rather than treatment or disposal. A 'zero waste' approach has been adopted by a number of strategies and puts waste reduction as the focal point of the strategic approach.

The waste hierarchy is defined in NSW legislation but this is not carried through into the strategy document itself as strongly as some other strategies reviewed, e.g. the Scottish and Welsh strategies. European strategies from the benchmarking group use the waste hierarchy to frame action plans within the strategy along with justification for action.

4.2. Waste Prevention

Overall the NSW strategy has a clear focus on preventing and avoiding waste within many supporting implementation programmes, and this is in line with the majority of other waste strategies. In comparing the NSW strategy to the benchmark group, the following can be summarised:

- The NSW strategy is comparable with other strategies in relation to its definition of waste prevention, and in the way it gives this issue priority in the current strategy.
- There is currently no numerical target set regarding waste generation for NSW past 2008, Nine of the strategies reviewed set a specific target for waste prevention/reduction (i.e. reduce overall waste generated), so it would appear that NSW is aligned with the majority of strategies from a target setting perspective. The decision not to include waste prevention targets is partly driven by the difficulty of measuring progress in a number of countries. Despite not always having a specific target all strategies acknowledged the desire to reduce the amount of waste generated and the importance of doing so.
- The more ambitious strategies look to reduce waste "at source" as this prevents waste from being generated in the first place. This needs to be distinguished from other initiatives along the use chain (e.g. home composting which prevents waste entering the municipal waste stream but does not reduce the amount of waste generated).
- Several strategies consider waste growth for different waste sectors and waste streams as part of the strategy development process as without an understanding of the change in how much waste is being generated it is more difficult to plan for and provide waste management infrastructure.
- The implementation methods identified in the NSW strategy are comparable with the other strategies including a focus on awareness and education campaigns such as Love Food Hate Waste, engaging with businesses to reuse and reduce their waste, and promoting product stewardship to promote the designing out of waste at the point of production. The Scottish strategy commits to introducing waste prevention programmes for all waste streams which is a strong commitment and one not made by the NSW strategy.

- A review of the Waste Prevention Programmes from the EU is due in 2013 and may hold useful additional learning that can be taken for implementation in NSW.

4.3. Recovery and Reuse

The review of the waste strategies highlighted the common themes in this area to be promoting material recycling, material/energy recovery and a focus on the diversion of waste from landfill. The majority of the strategies set targets in one or each of these areas, and these targets varied in their approach in relation to different performance metrics, different target years and different baseline levels.

The majority of the strategies set a target for the recycling/recovery of materials, with the European strategies being influenced by the requirements of the Waste Framework Directive. The difference in performance metrics, baseline years and target dates make it difficult to compare the strategies and to identify the ones that are the most ambitious. However the most ambitious strategies set specific targets for different sectors, and set an overall limit on the waste to landfill (e.g. Wales, Scotland and Finland). The targets set were typically long term, up to 2025, with the majority between 2014 and 2020.

Six of the strategies provided separate targets for recycling/recovery within the separate waste sectors (e.g. MSW, C&I and C&D), with the highest levels of target set within the C&D sector. On average:

- targets set for the C&D sector required 77% of materials to be recycled/recovered, with the highest being 95%
- MSW and C&I sectors had a lower average level of 60% recycled/recovered, with the highest for MSW at 70% and C&I at 80%
- the most ambitious strategies in this area were those that set long-term targets up to 2025 for all waste in relation to recycling (70%) and recovery (90%).

The review of the waste strategies shows that NSW strategic ambition is comparable with the majority of strategies in relation to the scope (e.g. sectors covered) and levels of performance (e.g. %) required by the recycling/recovery targets. NSW has not set a target in relation to waste diversion from landfill, however, this was not seen as the norm across the other strategies, and where this was a target, this was often seen to complement the recycling/recovery targets.

Of the Australian states reviewed only Queensland has both recycling and diversion targets compared to all of the EU countries reviewed who have both targets. This is due to the impact of the EU landfill directive targets in these countries.

NSW also has in place broadly similar actions to promote recycling and recovery to those already in practice in other countries. NSW engages with different sectors through various programs and also has key fiscal drivers to encourage the diversion of waste from landfill.

Points of difference to NSW from the other strategies include the focus on landfill bans for materials beyond those of a hazardous nature, and the implementation of voluntary agreements and sector plans with both the C&I and C&D sectors to promote activity and the ability to meet targets.

4.4. Reducing Toxicity in Products and Materials

This theme relates to reducing problem wastes and product stewardship schemes for priority wastes such as e-waste. The review determined that the policies and implementation plans which

underpin this theme are present in the majority of the strategies, but that the theme itself does not form a core part of the strategies. The reason for the difference is suggested to be the fact that legislation is in place (concerning landfill bans and producer responsibility) in the majority of strategies that tackle this issue. With legislation driving this theme, there is no need for it to be such a strategic focus. Product stewardship is considered in all strategies (including NSW) to differing levels. The EU countries reviewed also have a range of producer responsibility legislation in place that is driving activity on waste streams such as e-waste, packaging, batteries, etc.

It is also noted that the national legislation for product stewardship has now been introduced in Australia with the Product Stewardship Act 2011 commencing in November 2011. The first national scheme under the legislation has been introduced – for end of life TVs and computer equipment.

In comparing the NSW strategy to others it can be seen that the priority materials identified by NSW align with the key materials identified in other strategies, e.g. with regard to hazardous and organic wastes and those materials for which the recycling market needs to be developed. In relation to implementation, NSW has a similar focus to the other strategies.

4.5. Reducing Litter and Illegal Dumping

The NSW strategy sets targets which look at reducing the tonnages of litter and illegal dumping reported annually. To implement these targets the waste strategy has a focus on enforcement and balances this well with a comprehensive series of campaigns/training for waste transporters, asbestos handlers and local authority officers. The NSW Government NSW 2021 Plan also contains specific targets to reduce large-scale illegal dumping by 30% by 2016 and have the lowest litter count per capita in Australia by 2016. This plan also contains specific programmes for improving litter measurement, illegal dumping cleanup programs, training of enforcement officers, and anti-littering campaigns.

In comparing the NSW strategy to the benchmark group, the following can be summarised:

- In relation to the other strategies, NSW's targets give a greater focus to littering and illegal dumping, with Victoria's strategy considered to be an example of good practice by setting a specific percentage reduction for littering and illegal dumping.
- The implementation methods recommended in the NSW strategy are comparable to the other strategies including a focus on enforcement and awareness and education campaigns, with particular strengths in relation to enforcement through the RID Squads.
- The NSW Strategy 2007 does not provide specific details on how targets will be monitored, in common with many of the benchmark group strategies. Instead this is set out in separate strategies for litter, e.g. Victoria has a separate Litter Strategy and South Australia monitors litter activity on an annual basis through the work of Keep South Australia Beautiful. In England the Keep Britain Tidy Group is involved in litter reduction activity. There is a general awareness that data on litter and fly tipping is needed in order to monitor any change in behaviour or performance improvement.

4.6. Wider Environmental Aspects

Following a review of the NSW strategy against the other strategies, it is clear that although NSW consider the wider environmental impacts of waste, including a focus on waste prevention, recycling and product stewardship, other strategies take this further to include a reference and commitment to contributing towards national/state greenhouse gas reduction targets.

Other strategies include a standalone environmental/sustainability/carbon-based theme and make reference to any national/state greenhouse gas reduction targets to demonstrate a joined up approach and acknowledge the role that waste management plays in generating greenhouse gases.

Some have gone as far as reviewing the risks of climate change and potential adaptation requirements of waste collection and disposal methods and infrastructure.

All the strategies that consider the climate change impacts of waste management make reference to the country/state target for reducing greenhouse gas emissions and highlight the contribution that waste management will make to achieve this target. The ACT strategy further commits to a waste sector specific carbon target of being 'carbon neutral by 2020'. This is the only strategy to make a direct target for carbon and waste management. The NSW strategy does not make this specific link to national or state targets and activity.

The countries/states with the highest greenhouse gas reduction targets (e.g. England, Scotland and New York) also have ambitious waste strategies that are clearly driven by greenhouse gas reduction. This is particularly evident in their focus on priority materials that are based on the content of embedded carbon (e.g. food waste, textiles, plastics) as opposed to being based on the weight of materials.

Some strategies, such as the Scottish strategy includes a carbon metric. NSW has suggested that a carbon metric is unlikely to form a key part of the NSW strategy going forward.

Targets related to carbon reduction, greenhouse gas emission reduction and ecological footprint reduction area included in 13 of the strategies reviewed but none of these appear in the current NSW strategy. The Welsh strategy introduces the concept of ecological footprints and one planet living.

The English and Welsh strategies make specific reference to the impact that priority materials / products have on the carbon and ecological footprint, and this has been a key driver for these countries to identify and focus on these materials and or products. Life cycle assessment is a tool often used to aid decision making in the European countries reviewed.

Following a review of the NSW strategy against the other strategies it is clear that although NSW considers the wider environmental impacts of waste, other strategies take this further to include a reference and commitment to contributing towards national/state greenhouse gas reduction targets along with a wider consideration of the impact of waste management on climate change and resource sustainability.

4.7. Waste Sectors

The NSW strategy addresses MSW, C&I and C&D waste sectors, and provides clear guidance on what these classifications include. This is consistent with the majority of other strategies reviewed.

An important point to note is the differences in the classification of municipal solid waste across the strategies. Some definitions include a wider scope of wastes (e.g. commercial and industrial waste collected by local authorities) over and above the domestic waste and waste from other council operations e.g. street sweepings, litter bins, parks and gardens. Therefore comparison between strategy targets for municipal waste need to be made with care.

The definition of MSW is the one that varies the most amongst the strategies examined and makes comparisons difficult. C&I and C&D definitions are broadly similar across all the strategies.

Comparison of targets between states, territories and countries is therefore difficult when there is ambiguity in the definition of what is included in the targets. Targets should be set based on what is achievable according to the definitions used locally rather than through direct comparisons.

There has also been a trend in more recent strategies, particularly in Scottish, English and Welsh strategies to move away from a focus on household and municipal waste streams to include C&I and C&D waste. Wales makes an additional commitment to these waste streams by developing 'Sector Plans' which includes the aspiration to set targets for a range of priority materials. The

NSW strategy does not have specific waste sector plans or implementation plans that would help to consolidate action.

4.8. Measuring Performance

The NSW strategy has already identified the need for “better waste data” in the 2010 review and this appears to be a consistent issue identified within the other strategies. The ability to measure performance against targets and thus the overall impact of a strategy is governed by the quality and quantity of data available to support the strategy.

There are examples where a centralised waste data system (such as WasteDataFlow in the UK or the EU Eurostat survey on a range of environmental indicators) helps provide a consistent approach to data reporting and one that is auditable and accessible over time. Waste data reporting for other sectors is not as robust as the municipal sector. Commercial and industrial and construction and demolition data have historically been collected in the UK via a national survey, requiring representative samples to be derived. However the scale of the effort required to gather this information means that this cannot easily be carried out on an annual basis. In many countries commercial and industrial and construction and demolition data is hard to find or out of data and no central system for recording this is in place.

4.9. Key Drivers for Action

The NSW high level strategy drivers are identified as being the conservation of resources and the desire to minimise environmental damage due to waste management.

The primary drivers in the benchmarking group include:

- environmental protection and health
- ensuring the sustainability of scarce natural resources and minimising resources depletion
- climate change.

The first two drivers are broadly consistent with the NSW strategy; however it is the final driver relating to climate change that is not fully addressed. It is also useful to link any specific objectives and targets within the strategy back to the key drivers as part of the justification for action and in order to support education and behavioural change programmes. These links are not directly made in the NSW strategy.

5. Conclusions

This report has summarised the current state of play of 20 waste strategies representing a mixture of 20 national and international states, territories, countries and cities (the benchmark group). This has been compared with the current WARRS 2007 and the development of the new WARRS to determine whether there are any particular areas that NSW should consider in moving forward with the strategy development process, in particular are there any areas that are underdeveloped in NSW or are there key drivers that have not been fully considered.

Key Conclusions from the Benchmarking Exercise

It was evident from the review that the NSW WARRS 2007 is comparable with those developed by the benchmark group against a number of the areas identified for comparison. However, there are a number of areas for consideration in the future development of the strategy and where NSW is not keeping pace with international good practice. These can be summarised as:

- **The Waste Hierarchy** underpins all good practice waste strategies and is prominent within it and it is important that the hierarchy is clearly defined within the waste strategy document and related waste policy. The NSW strategy makes reference to the waste hierarchy and it is defined in regulations, however stronger links with the hierarchy could be made in the strategy along with using it as a framework for action.
- **Waste Prevention** – While NSW has had a previous target for waste prevention, one does not currently exist. Of the benchmark group, 9 of 20 had set a target related to waste prevention and waste prevention activity and policies is a focus of many strategies, in particular those that are underpinned by the EU Waste Framework Directive.
- **Landfill Bans** – Many countries are adopting landfill bans for general material streams (such as biodegradable or recyclable wastes) – not just specific hazardous or difficult materials (such as clinical waste or tyres). These bans go beyond the scope of existing landfill bans in NSW.
- **Voluntary Commitments and Sector Plans** – many strategies suggested that key to achieving success in sectors such as C&D and C&I was to develop specific plans for non municipal waste streams and even waste sub-sectors (such as food retail or hospitality) and engage the sector through a variety of means including voluntary commitments as a preference to legislative drivers.
- **Greenhouse Gas and Climate Change** – A clear development in national and international waste strategies is the waste management link to climate change and to greenhouse gas emissions. 14 of the 20 strategies reviewed contained specific targets in this area, often linking to state or national targets for greenhouse gas reduction (and the part that waste management has to play in achieving these targets).
- **Waste Data** - A common theme of many of the strategies reviewed is a need to gather good quality data to underpin the strategy, and the difficulty in achieving this. There are examples of good practice and comprehensive waste data collection systems in operation which enable achievement of targets to be assessed more accurately, progress to be demonstrated and achievement celebrated. For the countries identified no one system provides a complete solution for all waste streams.