



# **Personal & Domestic Waste Management in NSW**

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## **ABSTRACT**

Due to the rapid economy growth in Australia, the amount of waste we produce has increased proportionally. We must protect our environment and manage our waste in order to maintain our quality of life. Although the Australian community is concerned about the environment and committed to domestic waste management, we still create more waste per person than almost any other country. Meanwhile, there is a substantial increase in the cost of waste disposal over the past decade that has not curbed the total waste generation. Consistent with the Waste Avoidance and Resource Recovery Act 2001, there are different strategies that are implemented in NSW but most of them focus highly on managing the waste that has already been produced such as increasing the efficiency of existing collection systems. But there are other options that we can do to minimise waste by applying the 3Rs, i.e. Recycle, Reduce and Reuse.

This thesis explores the current issues, problems and challenges that people are encountering toward domestic waste management and the different way of waste minimisation that can be implemented. Meanwhile, the government strategies will be reviewed by focusing on the performance and effectiveness of the schemes. Accordingly, overseas examples will be examined by concentrating on their approaches toward waste management. For example, Hong Kong has developed a strategy to manage waste by using the paying waste disposal principle. Surveys have been taken and the aim is to understand the behaviours of people toward household waste management in the different areas of Sydney.

## **ACKNOWLEDGEMENT**

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Note: The cover page for Chapter 7 is the cover page of “A Policy Framework for the Management of Municipal Solid Waste (2005-2014)” by the Hong Kong Environment Protection Department.

## **LIST OF ABBREVIATIONS**

<b>EPR</b>	Extended Producer Responsibility
<b>EPA</b>	Environmental Protection Authority
<b>DEC</b>	Department of Environment and Conservation
<b>POEO</b>	Protection of the Environment Operations
<b>WARRA</b>	Waste Avoidance and Resource Recovery Act
<b>WARRS</b>	Waste Avoidance and Resource Recovery Strategy
<b>WRAPP</b>	Waste Reduction and Purchasing Policy
<b>ANZECC</b>	Australia and New Zealand Environment and Conservation Council
<b>NEPC</b>	National Environment Protection Council
<b>NEPM</b>	National Environment Protection Measure
<b>SWAP</b>	Strategic Waste Action Plan
<b>WMF</b>	Waste Management Facilities
<b>LGA</b>	Local Government Area
<b>ERA</b>	Extended Regulated Area
<b>TPA</b>	Tonnes Per Annum
<b>ESD</b>	Ecologically Sustainable Development
<b>WMP</b>	Waste Management Plan
<b>PLGC</b>	Premier's Local Government Council
<b>DPIWE</b>	Department of Primary Industries, Water and Environment
<b>HK</b>	Hong Kong
<b>MSW</b>	Municipal Solid Waste
<b>PRSs</b>	Producer Responsibility Schemes
<b>P2</b>	Pollution Prevention
<b>WTE</b>	Waste to Energy
<b>BMW</b>	Biodegradable Municipal Waste



## **CHAPTER 1**

### **INTRODUCTION**

## **INTRODUCTION**

We are living in a world of expanding population and this puts a lot of pressure on our natural resources and environment. Due to the rapid growth of economy in Australia, we have been encouraged to consume more products and materials which cause significant impact to the society. Although Australians are concerned about the environment and committed to recycling, we are still creating more waste per person than almost any other country (Local Government and Shires Associations of NSW 2005, p.26). The good news is that almost all of the waste we generate can be avoided in the first place and the next step would be reused or recycled. There are numerous approaches that the community, government and industry can take to solve the problem by changing our attitudes, habits and behaviours toward waste management.

In fact, Australia has the second highest rate of waste generation per person in the world (Local Government and Shires Associations of NSW 2005, p.26) and kerbside recycling plays a significant role in NSW. This includes recycling for paper, plastic, glass and other metal containers. Notwithstanding, this is not the most effective way to manage waste because we are creating waste faster than we can recycle. Therefore, only recycling does not help to reduce the waste we create. Additionally, kerbside recycling is expensive as it relies on ratepayer and the council to operate the recycling service. Practically, almost all packaging and container materials consumed are disposed from home and office. Therefore, the remaining waste goes directly to landfill. As a result, the most efficient way is to reduce the waste we produce and this should be put in the first priority beyond recycling.

The main focus of this thesis is to examine the efficiency and effectiveness of the current domestic waste management in NSW and the flexibility in envisaging the different problems and challenges with waste. The thesis seeks to provide a discussion on the statement, “The rapid increase of waste is creating pressure on our landfill capacity and this influences people’s attitude and behaviour toward waste disposal. Therefore, we should use our landfill as a final repository only for the unavoidable waste after waste treatment”. The consumption is made that other than landfill, there are other useful waste

treatment methods which can enhance the flexibility and mobility of waste management. For example, incineration and power generation have been implemented successfully in Japan in the past few years.

In Sweden and Germany, the government and industry are committed heavily to waste minimisation and have developed policies to ensure producers are more responsible for their waste and the production chain (Local Government and Shires Associations of NSW 2005, p.27). For example, throughout the European Union, automakers must pay for the reuse and recycling of cars at the end of their life. In South Australia, a deposit and refund system doubles the recovery rate of used beverage containers. This is to ensure that the producers take responsibility for the returned containers by refilling or recycling (Local Government and Shires Associations of NSW 2005, p.27). This is a flexible and effective system because it gives the pressure and responsibility of the packaging waste to the producers rather than the local government.

Packaging is another crucial component to be emphasised because in today's society, natural resources have been used at an unsustainable rate which is damaging the environment. The different government strategies, plans and policies will be discussed and the areas to be focused are the principles, development approach and the implementation of the schemes. This is vital because we have to be aware of the work that the government is doing to solve the waste problems that we are envisaging in the moment. This includes promoting extended producer responsibility, monitoring and reporting on waste and material flows and improving resource recovery. We need to have a closer interaction with our local councils by understanding the different approaches and actions that are to be taken to manage the waste issues in the local community.

Additionally, the thesis seeks to discuss the knowledge and performance of household waste management among the people who live in the different house type and geographical location in Sydney. Thus, questionnaires were conducted in a face-to-face mode which gave me an insight of people's manner toward waste management. Hence, it helps the participants to raise their awareness and concerns regarding their attitudes of

waste disposal. It is assumed that everyone has a fundamental knowledge of recycling and apartment residents will have a lower rate of composting than house residents. The reason is that apartment residents do not have yard for them to compost their food waste and worm farming is not that popular either. This issue will be further discussed in Chapter 6. After completing the survey, the feedback from the respondents is positive and they said that it has increased their knowledge of household waste treatment. Meanwhile, they have started to change their habits such as using reusable shopping bags instead of plastic bags for shopping and compost any appropriate waste in the garden.

### **Aims & Objectives**

This thesis aims to provide an understanding of the different options of domestic waste management and the approaches that can be implemented to improve the environment. This is achieved by reducing the amount of waste we create and protect the natural environment so it does not harm our health and environment in a long term perspective. Meanwhile, by carrying out the survey, it gives us a critical analysis of people's awareness and attitude in waste treatment which is a positive way to inform the importance of waste management to the public. Certainly, public awareness is one of the key factors in improving the performance of waste management because it helps to reduce littering and illegal dumping adequately. Simultaneously, the thesis also concentrates on the different options that have applied successfully overseas by examining the effectiveness and flexibility of the different strategies.

### **The five main objectives of the thesis are:**

1. Provide an understanding of the importance in waste treatment and the damage that can be caused to the environment. Hence, it furnishes an opportunity for people to have a positive action and approach toward recycling so that our natural environment can be saved and protected.
2. Discuss the different current issues and challenges of domestic waste management and the solutions that can be applied to solve these problems such as waste avoidance/reduction.

3. Explore the various strategies, plans and policies of waste minimisation that are implemented by the state and local government. Meanwhile, it emphasises on how these strategies can improve and promote “the message of waste reduction” to the public.
4. Analyse and evaluate the knowledge, performance and attitude of people toward household waste management in the different areas of Sydney. This gives us an understanding and insight of people’s behaviour toward waste treatment and the actions that have been taken to minimise waste directly.
5. Recommend and advise the different options and ways that can be utilized to avoid and prevent waste. In fact, we will examine how the options can be applied to every individual and organization. We will also demonstrate how the strategies can be integrated to our daily life and become sustainable continuously.

### **Methodology**

This thesis involves a combination of literature reviews that explore the different domestic waste management issues, preparing and conducting a questionnaire. The idea explored in the thesis focuses on the discussion of waste treatment and how it corresponds to the relationship of environment and community. The findings are based on the texts, journal articles, internet resources and other government publications. The aim of this study is to understand the essential knowledge and raise people’s concern and perception of waste management. In fact, it is vital for us to know the consequence if we do not take care of our environment. This may jeopardize other environmental issues in the same time, i.e. global warming and air pollution.

The objective of the questionnaire is to provide a better understanding of people’s performance toward household waste management in different areas of Sydney. The questionnaire will reflect the rate of people’s recycling knowledge and their action toward waste treatment. It gives us an idea of how we can increase the use of renewable and recovered materials at households. The thesis also comprises overseas approaches and implementations toward waste management. The aim of this section is to investigate how other countries manage waste and the different actions that have been taken to solve

the problems. For example, Hong Kong will implement the “user-pays principle” and “landfill disposal bans” to reduce the volume of waste for disposal.

### **Structure & Chapter Outline**

**Chapter 2** – It explores the different methods of waste management and the challenges and issues that we are encountering toward waste treatment. Various solutions will be discussed to reduce and avoid waste drastically.

**Chapter 3** – It concentrates on the waste strategies, plans and policies that are implemented by the federal and state governments. It focuses on the effectiveness of the plans and the development of the strategies.

**Chapter 4** – It provides a better understanding of the waste treatment in councils. This chapter outlines the different strategies that are prepared by the local councils and the different types of waste services that are provided to the local communities.

**Chapter 5** – This chapter reveals other effective approaches and actions that have been taken by other countries. This concentrates on their way of waste treatment and the challenges that they envisage with domestic waste management such as the impact of waste to landfill and the heavy operation cost of waste technology.

**Chapter 6** – The questionnaire presents a detailed investigation and analysis of household waste management in Sydney. It outlines the people’s performance, knowledge and behaviour toward waste management which provide us a better understanding of the public’s viewpoint in waste minimisation.

**Chapter 7** – It concludes with a final reflection and review of the findings that have been gathered in the chapters. It reveals the different things and thoughts that I have learnt and experienced during the research of this thesis.



## **CHAPTER 2**

# **WASTE & SUSTAINABILITY**

## **WASTE & SUSTAINABILITY**

The current resource consumption and pollution are unsustainable because it has exceeded the rate at which resources can be regenerated and absorbed by the Earth's natural systems (Gertsakis & Lewis 2003, p.6). Sustainability requires new radical way of thinking to achieve significant change in the production and consumption system. This required an indepth understanding of interaction between the different environmental impacts. Meanwhile, its advancement focuses on continuing innovation rather than the incremental change (Gertsakis & Lewis 2003, p.6). Sustainability also incorporates the different social issues such as access, equity and justice along with economic and environmental aspects of sustainability. The key strategies for sustainability include the improvements in eco-efficiency; the closing of material and waste cycles (eliminating waste) and a shift from products to services, i.e. dematerialization (Gertsakis & Lewis 2003, p.6). Waste management has impacts on a number of environmental impacts, for example the air emissions from the garbage and recycling trucks that collect waste and water used in the reprocessing process (Gertsakis & Lewis 2003, p.10).

This chapter concentrates on the challenges and difficulties that we are envisaging toward domestic waste management. This includes the waste management hierarchy, waste reduction methods and the packaging issues that are affecting our environment and society. This helps us to reflect on our way of waste disposal and the actions that we can take to save the environment.

### **What is Waste?**

Municipal solid waste (MSW) includes waste arising from private households to that collected by or on behalf of local authorities from any source. Therefore, MSW includes a portion of commercial and non-hazardous industrial waste. It can be defined as the household waste, waste collected for recycling and composting. Meanwhile, the following items can also be classified as waste: household hazardous wastes; bulky wastes derived from households; street sweepings and litter; parks and garden wastes; wastes from institutions, commercial establishments and offices (Hester & Harrison 2002, p.2).

All this waste can be separated into four main categories:

***Paper Wastes***

- General office paper; photocopy paper; computer paper; communications paper including publication, letterheads and envelopes; and office stationery including binders, manilla folders, files, correspondence files, shorthand pads, writing pads, exercise books, index cards, fax papers, labels, post-it notes and telephone message pads.
- Magazines and newsprint.
- Packaging and cardboard.
- Discarded telephone directories.

***Office Equipment Wastes***

- Toner cartridges recyclable and non-recyclable.
- Printer ribbons: from printing, photocopying and facsimile machines.

***Vegetation Wastes***

- Vegetation wastes include leaves, tree clippings, prunings, woody wastes, lawn clipping etc. They do not include food scraps or other food wastes.

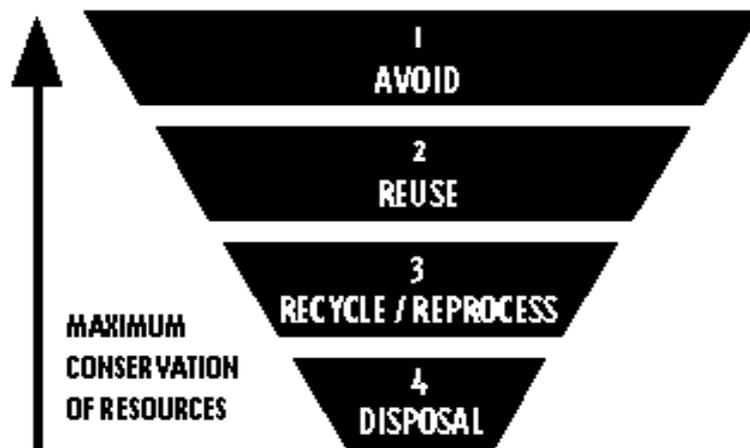
***Construction Wastes***

- Waste concrete: generated during construction or demolition.
- Excavated rock and earth: including soil and sand removed from a construction or demolition site during excavation.

(Source: Waste Reduction & Purchasing Policy –A Guide For Agencies, p.2, cited in EPA 1997)

## Waste Management Hierarchy

There are different ways that we can minimise the amount of waste we produce each day. The waste management hierarchy is a guideline that explains how the waste material can be managed in order to reduce waste as much as possible. Figure 2.1 shows the different options that can be implemented and 'waste avoidance' is the top preference in the hierarchy, following by reuse, recycle and disposal.



*Figure 2.1 Waste Management Hierarchy (Source: Environmental Protection Authority 1997, p.3, cited in Developing Waste Reduction Strategies)*

The most effective way to minimise waste is to avoid producing it in the first place and the responsibility is passed to consumers and producers. Producers can ask whether a particular waste generation can be avoided or substituted with a more sustainable material. As a consumer, we can avoid waste in many ways, e.g. buying in bulk can avoid extra packaging or refuse plastic bags when shopping, particularly if only a small product has been purchased (Healey 1999, p. 22). Thus, the five main steps of waste management hierarchy are avoid, reuse, reduce, recycling and safe disposal.

**1. Avoid:** Waste avoidance is a good example of waste reduction among other methods because it reduces pollution and maintains resource conservation. It includes landscaping that creates mulched gardens in place of lawn and it uses crates instead of pallets to avoid the need for shrink wrap. Waste avoidance also comprises of the removal of

unnecessary packaging from a product. The change of product design can also reduce material consumption accordingly. For example, less material should be used by the product design and only use wrapping or packaging material when required.

**2. Reduce:** Reducing waste at its source includes all the measures which lead to the reduction of materials that may eventually become solid waste. This includes redesigning packages to consume less material to replacing the disposable products with durable alternatives (Healey 1999, p. 22). Meanwhile, Clean Up Australia has developed the Waste Reduction Accreditation Program to work with retailers around the nation to reduce the enormous amount of waste that are dumped to landfills. This is because Australians produce 18 million tonnes of waste annually which is equivalent to one tonne per capita (Healey 1999, p.32).

Thus, the requirement to be accredited as the Official Waste Reduction Accreditation Program Partner is that the retailers must reduce plastic bags used by their store and the waste produced. Meanwhile, the campaign has promoted recycling to customers and developed initiatives to improve the environmental performance. Additionally, Coles has provided \$150,000 in funding to commence the campaign, while the Federal Government contributed a \$50,000 grant through its Natural Heritage Trust (Healey 1999, p.32). As a result, Coles is the first retailer to implement the program because it has highly promoted recycling in the store by providing reuse plastic bags collection bins for the customers. Consequently, this approach has reduced the amount of plastic bags consumed and minimised the environmental problem that is caused by plastic bags.

**3. Reuse:** Reuse involves using a product more than once in its original form. This enables a resource to remain in use and avoids the need for the additional energy and resources associated with new production or reprocessing. This avoids the need for re-manufacture to further consume energy or any other additional raw materials associated with that process.

Thus, reuse is different from recycling because products and materials are not reprocessed in a manufacture cycle. Healey (1999, p. 22) provided examples of refillable drink containers, exchanging of used clothing and reusable shipping pallets, dismantling goods to recover usable components, minimal processing – from wood into wood chips. Simultaneously, the environmental impact of reuse bottles consists of collection, transportation, washing and refilling. As a result, this process consumes more work, energy and raw materials than those bottles intended for single use. Hence, glass needs to be stronger, heavier which is more cost effective in term of the economic aspects of transport. Nevertheless, reuse is one of the most environmental and sustainable ways of waste minimisation.

**4. Recycling:** Recycling involves using secondary materials in the production of new items. The most common materials are woodfibre, metals, glass and plastics. Recycling also includes composting and it is a form of reprocessing organic waste materials into a product (compost) which can be used in various applications. It consists of the natural breakdown of kitchen scraps and garden wastes to a substance that supplement the soil and reduce erosion and water loss. Hence, it can be used to enrich the garden, pot plant and lawn (Healey 1999, p. 20). On the other hand, worm farm is a simple home composting system by making the worm as the "rich soil conditioner" that eats the fruit and vegetable scraps (BHSC 2006).

Composting with worms is more versatile than other composting methods because it can be conducted indoors (e.g. in your laundry or garage) or outdoors (e.g. on a patio or under shade cloth). Therefore, it also suits the people who live in apartments and townhouses as it produces a nutritious soil conditioner using kitchen and garden waste (BHSC 2006). Hence, worm farming and composting are the two major methods of recycling which are broadly implemented by local councils. The benefit of composting is to recycle organic waste and reduce the amount of waste going to landfill. It helps to reduce the emissions of the greenhouse gas methane that is produced from rotting organic waste in landfill sites. Meanwhile, composting helps the nutrients return to the soil which improves plant growth and the soil's capacity to hold water.

Therefore, this method of waste management is more feasible, environmental and economical than other methods because it can be implemented alone as a gardening activity frequently. Conversely, the environmental impacts that we need to be aware of include the energy consumption for transportation of recycled material and the resource conservation through material recovery. The economic impacts of recycling initiatives include the capital and operating costs of the recycling services and technology. This correlates with the community education costs, the income from sale of materials and the savings in waste disposal costs (Healey 1999, p.3). Although there are some disadvantages but comparing to the primary resource, recycling still provides an active way for the waste to be collected and processed efficiently.

**5. Disposal:** After all the above options have been exhausted, the disposal of waste to landfill is the final option for waste management. The remaining waste may result from recycling processes or the organic materials that cannot be reused or recycled (Healey 1999, p. 23). But the major problem of landfill is the high cost and the availability of land for the establishment of new landfills. Thus, the main objective of the waste management hierarchy is to reduce the amount of residual waste for disposal and the potential environmental impacts of the landfills, recovery materials and energy (Hester & Harrison 2002, p.7).

At the end, if all these objectives can be achieved, the overall waste management cost can be minimised which are both economical and money-saving because the government can contribute that part of cost to other categories such as education and health care. Hence, taxpayers can pay less to their councils regarding their waste and recycling services. Ultimately, most of the taxpayers will be benefited if the hierarchy can be operated efficiently and successfully. Obviously, we should strive to maximise the amount of waste prevention at source and the amount recycled or composted, and only then burn or bury the rest to minimise the amount of waste we create (Schall 1992).

As a result, we need to focus more intensively on prevention strategies rather than waste reduction or recovery. This is an important issue to be considered because “to prevent” means to avoid in the first place and before the potential for the waste has been created (Gertsakis & Lewis 2003, p.9). On the contrary, “to reduce” means that the waste has already been created and we have to find ways to decrease the amount that has been produced (Gertsakis & Lewis 2003, p.9). This is the difference but most of the current effort is still on recycling programs, which are important but not as effective as prevention or reduction strategies in achieving sustainability (Gertsakis & Lewis 2003, p.9).

### **Sustainability**

Certainly, the production process is sustainable but our consumption is unsustainable due to the large amount of goods we consume and create. Waste avoidance is the first option to be considered for sustainability because it does not cause any impact to the landfill and the entire product life cycle. In sustainability terms, it enables us to ‘do more with less’ and improves the use of resource efficiently (Gertsakis & Lewis 2003, p.11). Donella Meadows and her co-authors in the text, “Beyond the Limits” supports this point as they argue that people have consumed many essential resources and this causes a serious pollution problem to the society. Thus, it has surpassed the rate of physical sustainability and we need to increase the efficiency in our utilization of materials and energy drastically. Meadows recognises that recycling is an essential tool in achieving sustainability:

*“Separating and recycling materials after use is a step toward sustainability. It begins to move materials through the human economy the way they move through nature - in cycles. In nature the waste from one process becomes an input to another process. Whole sectors of ecosystems, particularly in the soils, work to take nature’s waste materials apart, separate them into usable pieces, and send them back into living creatures again. The modern human economy is finally developing a recycling sector too.”*

(Meadows 1992, p.82-83)

For the recovery options, we should aim to eliminate waste by closing cycles thus maximising the value of materials in both environmental and economic terms at all times. Meanwhile, energy recovery should only be used for materials that have no higher end use than to be converted to energy. Other environmental impacts may include greenhouse gas generation, water consumption and waterborne wastes. But there are barriers to achieve sustainability in waste management as it includes both of the public and private sectors in the waste industry. Thus, this may take a longer time for consultation and discussion in the decision making process. Virtually, the current approach is an encouraging step towards sustainability but it is essential that every one of us work together to achieve a better environment for our future generation.

### **Advantages of Waste Minimisation**

Waste minimisation programs create an opportunity for individuals to participate in a program that has major environmental benefits (Healey 1999, p.26). There are different activities to achieve waste avoidance and this includes targeting consumer behaviour, purchasing choices and promoting cleaner production initiatives for industry. It can be also achieved by reusing resources and recycling programs for households and industry.

#### ***1. Environmental Benefits of Waste Minimisation***

Reduce food and green waste can also minimise the level of pollution proportionally. The reason is that it decreases the risk of contamination to the surrounding soil and nearby water resources with nutrients and chemicals. Hence, the amount of landfill gas is reduced and this helps to improve the air quality in the vicinity. Simultaneously, it minimises the virgin substance that translates to the mining and refining material. This can be further investigated in Figure 2.2 as it reveals the different methods that can be applied to enhance the amenity of the environment.

<b>Opportunities To Improve The Amenity of The Environment</b>
<ul style="list-style-type: none"> <li>• Improved control of wastes before disposal should lead to better management of existing landfills and long term liability from potentially contaminated sites;</li> </ul>
<ul style="list-style-type: none"> <li>• Minimising waste will extend the life of existing landfills and reduce the need for new landfills (with a consequent reduction in the potential loss of amenity); and</li> </ul>
<ul style="list-style-type: none"> <li>• Development of a waste minimisation plan should improve land use planning by reducing the demand for waste disposal areas within the council/regional boundaries.</li> </ul>

***Figure 2.2 Opportunities to Improve the Amenity of the Environment (Source: Healey 1999, p.26, cited in Benefits of Minimising Waste)***

### ***2. Economic Benefits of Waste Minimisation***

Although waste minimisation consists of clean up, monitoring and maintenance costs but it creates employment and provides opportunities for value adding to recovered materials through reprocessing and manufacturing. Meanwhile, an effective waste minimisation program could reduce the amount of waste being collected for disposal by 50 to 60 percent (Healey 1999, p.26). Other economic benefits include the efficient use of land for non-landfill activities because the absence of landfills can increase land values directly. Additionally, it helps to reduce pollution in natural resources and minimises clean up costs by enhancing people’s environmental knowledge.

### ***3. Social Benefits of Waste Minimisation***

Firstly, it increases the community awareness through effective waste management but it requires the cooperation of the communities to reinforce the waste development programs. Meanwhile, it increases the unity and communication between the local communities which enhance the harmony within the local area. By involving the residents to participate in the different waste minimisation programs, it encourages them to do more work to protect and value the environment. As a result, it reduces littering and roadside dumping in a long term perspective.

Correspondingly, waste minimisation is one of the ways to conserve resources and atmospheric degradation from mining and landfill activities (Healey 1999, p.27). The risks of landfills include public health risks and diseases because bacteria produce in areas that associated with landfill gas, water contamination and litter (Healey 1999, p.27). Therefore, it reduces the risks to our health by having fewer landfills. Meanwhile, it creates employment because the material recovery is labour intensive and more people will work for jobs that relate to waste management such as kerbside recycling and garbage services.

### **Packaging**

The Packaging Council of Australia argues that packaging is essential in a contemporary society and waste management strategies have been introduced by the packaging industry to reduce the impact of packaging to the environment. Thus, packaging must preserve and protect the product as a communication device by providing the details of the product such as the contents, recyclable or non – recyclable (Healey 1999, p.16). But in today's business society, packaging is significant and essential to attract more buyers to purchase the product by maintaining its high quality and appearance. Therefore, it is crucial for us to understand that by reducing the amount of packaging material, it also reduces the waste going to landfill proportionally (Healey 1999, p.17).

Another vital issue is the cost that we need to pay for the collection and management of waste. It is important to draw our attention in reducing the level of packaging material. On the other hand, the Packaging Council of Australia's chief executive officer, Gavin Williams stated that there are two main factors that are working against reducing packaging. The first is the impact of publicised food tampering and the extortion incidents that have led to greater consumer demand for products that are safe and can be seen to be safe (Healey 1999, p.19).

*“It now costs Australian ratepayers \$100 million a year more to recycle waste than to dump it in landfill tips; this cost is known as the recycling ‘gap’ ”*

(Healey 1999, p.19)

The second factor is the social and demographic change because there are smaller family units and more single-person households are working longer hours. This increases the demand for smaller packages of products such as single serves of pre-cooked meals. Another factor is the imported goods and overseas manufacturers are not bound by the local agreements on waste reduction. Therefore, it is suggested that industry should try to minimise packaging to reduce the production and distribution costs (Healey 1999, p.19). As a result, the NSW Government has developed a second National Packaging Covenant Action Plan which is prepared as part of the NSW Government’s ongoing commitments as a signatory to the National Packaging Covenant (DEH 2006). This Action Plan covered an eighteen-month period to 30 June 2003 (EPA 2003, p.1) and it introduced initiatives that continue to improve packaging waste management. This will be further discussed in Chapter 3 – Waste Strategies Managed by the Government.

### **Current Issues**

According to Issue 10 of WME Environment Business Magazine 2006 (WME 2006), the NSW Waste Levy will jump to \$7 a year for the next five years, from \$22.70 per tonne to \$56.70 in the Sydney region by July 2010 (WME 2006, p.3). The EPA deputy director Simon Smith said that it is designed to make landfill more competitive and to raise \$445 million over five years for environmental and waste projects (WME 2006, p.3). The Local Government Association of NSW offered “conditional support” but the five years commitment to council rebates (i.e. \$80 million) and urban sustainability grants (i.e. \$80 million) are regulated under the legislation (WME 2006, p.3). Thus from next year, four cents will be added to every household in the waste management costs weekly but it will not rise to less than 20 cents by 2011.

This demonstrates that it is vital for us to do more work on waste management. Otherwise, there are not enough landfill sites to accommodate our needs in the future. Additionally, it increases our financial pressure in waste treatment and causes different problems to our health and environment. Hence, landfill disposal is definitely our final repository of waste treatment and we must implement the waste minimisation options to avoid the different environmental problems that we are envisaging in the moment, i.e. global warming, hazardous waste, ozone depletion and air/water pollution.

### **Chapter Review**

Effective Waste Management is an action that has to be taken by everyone. Otherwise, the environment cannot be saved. In this chapter, different methods of waste management have been explored (i.e. waste reduction, waste avoidance, recycling) but there are still other issues that can make a huge difference to our natural environment. Essentially, waste can be minimised by encouraging the use of products and materials that can be reused with minimal processing, for examples, durable packaging, product reuse and materials reuse. But in fact, the most important component is to encourage everyone to participate the different ways of waste minimisation and enhance the awareness of waste management. As a result, Baulkham Hills Shire Council has distributed pamphlets to the local residents to raise their concern in composting (See Appendix A – Invitation to Participate - Composting for further details).

Notwithstanding, the form of packaging is decided from the manufactures and producers but under the National Packaging Covenant Action Plan (NPCC 2005), the government is responsible for developing and implementing laws and policies about waste reduction and management. Thus, the NSW Government administers a Waste Fund to provide resources for a wide range of waste minimisation and management initiatives. Therefore, the government provides a lead to the community by requiring its own agencies to reduce waste and purchase recycled materials. The following chapter will explore the different examples of strategies and plans that are managed by the government. It focuses on the flexibility of the different approaches and the effectiveness of the implementations in NSW.



**CHAPTER 3**  
**WASTE STRATEGIES MANAGED**  
**BY THE GOVERNMENT**

## **WASTE STRATEGIES MANAGED BY THE GOVERNMENT**

This chapter explores the different strategies and plans that are being implemented by the government and the effectiveness of these strategies. It is important for us to understand the general approaches of these strategies so that we can integrate the different approaches in order to enhance the quality of the environment holistically. This chapter will examine four example strategies that are managing waste treatment in NSW. These are:

- Waste Reduction and Purchasing Policy 1995 (EPA 1997)
- Waste Avoidance and Resource Recovery Strategy 2003 (Resource NSW 2003)
- Protection of the Environment Operations (Waste) Regulation 2005 (DEC 2005)
- The National Packaging Covenant 2005 (NPCC 2005)

These four strategies have been selected because of their high significance in NSW waste management. Additionally, they are broadly supported by the different sectors as they identify the priorities, actions and opportunities for stakeholders. These consist of industries, community groups, environment groups, individuals, state and local government. This section explores the three main themes that are common among these four strategies. These can be classified as Waste Reduction Options, the Different Challenges and Stakeholders in Achieving Change. It highlights and identifies how the different schemes influence us as individual and the actions that we can take to achieve environmental living permanently.

### **Understanding the Strategies**

The current Waste Avoidance and Resource Recovery Act (WARRA) 2001 has repealed and replaced the previous Waste Minimisation and Management Act 1995 (EPA website, 2006) in October 2001. The main aim for WARRA is to promote the avoidance of waste and resource recovery where possible. More than that, it also acts as a scheme to encourage extended producer responsibility in the waste reduction plans and the waste funding programs. As a result, Resource NSW has established for the role is to develop state-wide frameworks and strategies for regional and local programs for waste recovery practices.

Correspondingly, Resource NSW developed the Waste Avoidance and Resource Recovery Strategy (WARRS) in 2003, thus making NSW the first state to set targets and take action for the Strategy. Additionally, the Waste Reduction and Purchasing Policy (WRAPP) announced on 25 July 1995 and it was commenced on September 1997 (DEC 2005, p.1). It requires all NSW State Government agencies, except State-owned corporations to adopt and be responsible for waste reduction and purchasing practices.

Subsequently, the Protection of the Environment Operations (Waste) Regulation 1996 (POEO) was repealed on 1 September 2005 and the POEO (Waste) Regulation 2005 has been made to carry over all the provisions of the 1996 Regulation on March 2006 (EPA website, 2006). The new Regulation proposes a new system for tracking waste and it has changed the requirements that relate to the waste levy contribution, waste storage and transportation. Meanwhile, The National Packaging Covenant was signed by the Australian and New Zealand Environment and Conservation Council (ANZECC) in 1999. It consists of strategies, guidelines and agreements that correspond to the Intergovernmental Agreement on the Environment and the National Strategy for Ecologically Sustainable Development (NPCC 2005, p.9).

### **Waste Reduction Options**

#### **1. Waste Avoidance**

WRAPP defines waste avoidance as “the simplest and most cost-effective way to avoid waste. It is to avoid unnecessary consumption of a product in the first place” (EPA 1997, p.4). It is different from the other waste reduction options as the waste has not yet been created. The approach of this policy is focused on agencies in term of the publications, practices, production processes, purchasing and inventory practices by identifying the opportunities for waste avoidance measures. This concentrates on the change of awareness and behaviour of employees and employers by involving waste reduction as part of their routine activities. Some of the examples includes doubled-side photocopying and printing, written material to be submitted or distributed electronically via email.

Compared to WRAPP, WARRS (Resource NSW 2003) focuses in a similar direction but it consists of various waste avoidance components by introducing strict avoidance and reduction at source. This is understandable because the target group for WRAPP is mostly agencies but WARRS mainly concentrate on the government, community, consumers and waste industry. Therefore, it provides other effective methods and choices that have not been mentioned in WRAPP. Simply speaking, strict avoidance relates to the elimination of the hazardous substances by reducing material or energy intensity in production, consumption and distribution (Resource NSW. 2003, p.30). This can be easily achieved through the elimination of interim packaging for toothpaste and cosmetics. Thus, it links to the key objective of the National Packaging Covenant (NPCC 2005) by reducing the packaging volume and weight in a limited amount. Consequently, the packaged product will still maintain a significant level of safety and hygiene to the consumers which will not affect the quality of the product at all.

Reduction at source can be applied effortlessly through the minimisation of material and energy consumption such as reducing foil thickness and using chlorinated solvents as cleansing agents. Meanwhile, this relates to our daily routine and every individual can bring into practice. I personally believe that waste avoidance is an excellent way of waste reduction because it allows us to take responsible action before the product or material is considered as waste (Resource NSW. 2003, p.29). Thus, it is environmentally sustainable for us to implement in a long term perspective by consuming less natural resources and reducing the high cost in waste management. Meanwhile, it minimises the health impacts from waste and lessens the community concern on reprocessing facilities.

## **2. Reuse**

WRAPP describes reuse as “using a product again for the same or similar applications, usually at the same location and with minimal reprocessing” (EPA 1997, p.5). This can be applied smoothly because it only involves the product itself so everyone can take action directly. The policy has suggested various techniques that can be implemented in the workplace, i.e. reuse office/ vegetation wastes for composting.

For example, paper can be used double-sided, rebinding surplus or outdated letterhead or leaflets to make notepads. Also, the use of on-site shredders to process prunings as mulch around trees is a valuable way of re-using vegetation wastes (EPA 1997, p.6). On the other hand, WARRS (Resource NSW 2003) has portrayed reuse as not only for its original use but also for an alternative use. In fact, reuse does not require other additional energy or materials and by using shopping bags or containers more than once can reduce raw material and resources proportionally. It is substantial for the manufactures to produce goods that are durable and efficient because by having long lasting products, we can reuse the items to “the end of life” and less waste will be created. Therefore, manufacturers and producers have a significant impact and role in making positive attitude and manner toward waste prevention which is one of the key components that cannot be neglected.

This leads to the National Packaging Covenant (NPCC 2005) because it requires an efficient design for the reusable packaging to minimise the environmental life cycle. Hence, it encourages consumers to maximise the use of reusable bags. Meanwhile, WARRS has also emphasised the use of renewable and recovered materials that have not been mentioned in the other three strategies. It focuses on the use of material recovered from the post-consumer and manufacturing processes as a feedstock to a new product (Resource NSW. 2003, p.31). This approach consumes less non-renewable resources in the extraction process and less pollution will be generated. As a result, it reduces the damage to the environment and it can be implemented by every one of us which is a viable way of waste treatment. Some of the methods are by reprocessing the glass jars and bottles into new glass containers; leftover food, garden and wood waste into compost; plastic milk bottles into plastic agricultural pipes.

### **3. Recycling**

WRAPP (EPA 1997) provides different methods of recycling that can be conducted in the workplace. Conversely, WARRS (Resource NSW 2003) stresses kerbside recycling and new collection systems. It encourages and motivates more people to use recycled products or purchase products that consist of recycled content.

Obviously, a lot of work and effort have been put in to encourage people to take action but it is crucial to start now so that it is not too late for us to save the environment. According to WARRS, a national study of kerbside recycling estimated that the net benefit is \$68 per household per year or \$226 million per year nationally (Resource NSW 2003, p.20). Additionally, the preliminary data in 2002 indicates that almost nine out of ten household (i.e. 89%) are within a council area that has a kerbside recycling service so the average participation rate is up to 78 percent in NSW (Resource NSW 2003, p.23).

Unfortunately, there are many parts of regional NSW that are not viable for the kerbside recycling service. This may be due to the small population, limited rate revenue and the distance to certain areas/towns. Therefore, a number of councils offer drop off facilities at transfer stations and landfills which is a positive approach to facilitate the people to participate the recycling services as a daily duty. It helps the community by raising their environmental awareness about waste management which benefit not only to the community but also to the overall environment and society.

#### **4. Other Waste Reduction Methods**

##### ***~ Reduce Toxic Products***

In WARRS (Resource NSW 2003), there are other types of waste reduction methods that have not been revealed in the other strategies and this includes reducing toxicity in products and materials and reducing litter and illegal dumping. Undoubtedly, we must avoid using chemicals that have certain level of impact and risk to our health and environment. Therefore, it is essential to replace these substances with a more beneficial material. By reducing the harmful substances, it ensures that we can recover our resources for reprocessing and this can be easily applied through composting. For example, the food waste is mixed with waste that contains batteries in the compost so the heavy metals are transferred and passed through the plants which lead to the contamination of food chain (Resource NSW 2003, p.32).

### ***~ Reduce Illegal Dumping***

Meanwhile, litter and illegal dumping are important issues that cannot be overlooked because it causes major impact and damage to our environment. Also, it affects the opportunity for us to keep the materials in a reprocess manner which influence the productivity of waste reduction in recycling and reuse. On the contrary, the National Packaging Covenant (NPCC 2005) draws our attention to the aspect of product stewardship. It accentuates on the design, production, distribution, recycling and reprocessing of the product. This is a different approach to WARRS because it concentrates on the community primarily, whereas the Covenant focuses more on the distribution and the environmental responsibilities of packaging. For example, it indicates that the packaging supply chain process is provided by the data on the quantities of packaging recovered and the design issues that affect the material recoverability. Additionally, different reports will be conducted through the utilization of recovered material by secondary markets and the disposal of residual packaging waste to landfill (NPCC 2005, p.14).

### ***~ Waste Tracking***

POEO (Waste) Regulation 2005 (DEC 2005) demonstrates the different waste tracking issues that have not been discussed in the other strategies. This regulation provides us with an understanding of the waste levy, waste storage and transporting issues. It is crucial for us to be aware of these components as it relates to us as local residents. Since in the future, the waste levy must be paid in respect of waste generated outside the Sydney Metropolitan Area and Extended Regulated Area (ERA). Obviously, this influences waste generators and councils that located outside the ERA but if they are not willing to pay the levy, they could direct their waste to landfills outside the ERA (DEC 2005, p.32). Simultaneously, the high disposal and transport costs will eliminate waste from outside the ERA to dispose within the ERA. Waste storage is to be treated in an environmentally sensible manner in respect of the spill management and guidance through clearer production initiatives and environmental audits (DEC 2005, p.46). Certainly, vehicles that transport waste are to be kept in a clean condition to fulfil the requirement of hygiene and productivity.

It is important to implement this action because it reduces the harm of infective diseases or any bacteria that will cause health problems during the waste disposal process. Finally, all these waste reduction methods have a common objective which is to achieve the performance targets set in WARRS (Resource NSW 2003). But all these rely on each individual, organization, public and private sector to participate and contribute to make a difference. The aim includes holding the waste generation level for the next five years and increasing the recovery rate of the municipal sector from the current 26% to 66% in 2014 (Resource NSW 2003, p.36), Figure 3.1 and 3.2 refers.

FROM	CURRENT RESOURCE RECOVERY	AGGRESSIVE SCENARIO RECOVERY (BY 2014)
Municipal	26%	66%
Commercial	28%	63%
Construction	65%	76%

**Figure 3.1 Resource Recovery Targets (Source: Resource NSW. 2003, p.38, cited in Framework for Action)**

OUTCOME AREA	TARGET
Preventing and avoiding waste	To hold level the total waste generated for the next 5 years
Increasing recovery and use at secondary resources	By 2014, to: <ul style="list-style-type: none"> <li>• Increase recovery and utilisation of materials from municipal sector from the current 26% to 66%</li> <li>• Increase recovery and utilisation of materials from the commercial &amp; industrial sector from the current 28% to 63%</li> <li>• Increase recovery and utilisation of materials from the construction &amp; demolition sector from the current 65% to 76%</li> </ul>
Reducing toxic substances in products and materials	By 2014 or earlier: <ul style="list-style-type: none"> <li>• To phase out priority substances in identified products as a first choice or if not possible to achieve maximum recovery for re-use and;</li> <li>• where identified products containing these priority substances require disposal as a last resort, the permitted "leachability" of the substances will be reduced to the levels that are permitted for inert waste.</li> </ul>
Reducing litter and illegal dumping	<ul style="list-style-type: none"> <li>• Reduce total volume and tonnages of litter reported annually.</li> <li>• Reduce the total tonnages of illegally dumped material reported by regulatory agencies and Regional Illegal Dumping squads annually.</li> </ul>

**Figure 3.2 Performance Targets (Source: Resource NSW. 2003, p.36, cited in Framework for Action)**

### **The Different Challenges**

Actually, over six million tonnes of waste were disposed of to landfill in NSW in 2000 (Resource NSW 2003, p.2). Thus, we are encountering an enormous challenge because the increase of economic activity results in the increase of waste generation. In WARRS (Resource NSW 2003), the prevention of waste aims to hold waste generation level for the next five years. It is challenging but it gives us enough time to prepare and activate the strategy instead of holding them steady. The reduction of toxic substance target can cause serious environmental damage and the difficulties are to achieve maximum recovery for reuse, identify products that contain substances for disposal. Therefore, further assessment has to be conducted to measure the effectiveness of the different strategies that deal with illegal dumping and littering.

#### ***1. Waste Generation Levels & National Approaches***

Due to the change of domestic sector, product stewardship and extended producer responsibility (EPR) programs have been introduced to help solve our waste problems. EPR is a scheme where the producer's responsibility for a product (including physical or financial responsibility) is extended to the post-consumer stage of the product's life cycle (Resource NSW 2003, p.96). Product Stewardship is the whole product chain sharing the responsibility for the products' life cycles. It includes the environmental impact of the product from the extraction of virgin raw materials, to manufacturing and consumption and through to the ultimate recovery or disposal (Resource NSW 2003, p.96). This is an effective approach to be implemented because every sector should be responsible for their resource and waste which helps to enhance the resource recovery of the different products.

This corresponds to the National Packaging Covenant (NPCC 2005) because it is a voluntary agreement that includes the different government sectors and the packaging supply chain. The challenges comprise of the continuous improvement in recovery and the reprocessing of used packaging materials to meet the commitment in the National Environment Protection Measure (NEPM) for Used Packaging. Therefore, it is crucial to implement by each state to assure that there is interaction between the sectors.

Otherwise, the system can not be implemented and operated appropriately and efficiently. Virtually, I believe that the key challenge that has been discussed in WARRS (Resource NSW 2003) is the diversion of organic material (e.g. food and garden materials) because it consists of a large proportion of municipal wastes in the Sydney Metropolitan area. This is an important issue that has not been mentioned in the other three strategies because it reinforces that our landfill capacity is already reached to the limit and we must find an appropriate way to overcome these challenges in the coming years.

Therefore, waste assessment guidelines and waste regulations have been developed by introducing new scheme for tracking hazardous and industrial wastes to solve the environmental problems that we are currently envisaged. Simultaneously, the different reporting methods and methodology used to collect data are the difficulties when making valid comparisons in assessing waste performance (Resource NSW 2003, p.26). Thus, it is essential to develop a common regulatory framework in jurisdiction in assessing performance measures in waste management and resource recovery.

## ***2. Estimating Quantities of Waste & Environmental Factors***

WRAPP (EPA 1997) outlines the problems and difficulties to obtain information on waste generated and disposed reused or recycled because it depends on the nature of waste being assessed. This is because the quantity of waste generated each year need to be estimated on the most relevant basis for each type of waste and the information may be obtained from one or more source, i.e. waste contractor receipts and contract documents (EPA 1997, p.2). Hence, there might be some variation of figures for the EPA to conduct assessment which will influence the type of waste strategy to be implemented in the region directly. Conversely, POEO (Waste) Regulation 2005 (DEC 2005) has examined a different perspective by emphasizing the waste tracking issues such as the increase of hazardous waste dumping and the spills of waste material during transportation.

Additionally, other different problems that will arise if the regulation is not implemented adequately are the rapid increase of emissions of offensive odours and toxic gases. This will lead to the contamination of surface and groundwater system. Meanwhile, it negatively impacts the amenity in the surrounding areas and results in illegal dumping in national parks or other high value reserve areas (DEC 2005, p.8). Comparing to other strategies, the challenge of POEO (Waste) Regulation 2005 (DEC 2005) is more definite and explicit because without the reporting of the tracking system, it would be difficult for us to identify the responsibility of illegal dumping or other inappropriate form of waste disposal. As a result, it is necessary to implement the regulation to reduce the high level of waste disposal that depletes our natural resource and environment radically.

### **Stakeholders in Achieving Change**

WRAPP (EPA 1997) applies to all NSW Government agencies except State-owned corporations and it requires the government, industry and community to seek alternative ways for waste disposal. It consists of purchasing recycling paper or other related products which is implemented in EPA and RTA. On the contrary, WARRS (Resource NSW 2003) is a partnership approach that focuses mainly on the state government agencies and the role is to manage regulatory and policy frameworks that affects resource recovery and waste management. It concentrates on the numbers of parties such as state government agencies, businesses, householders and education providers.

An example is that, Resource NSW establishes a framework for all waste avoidance, reduction and recovery programs that are implemented by the NSW community. It comprises of new waste hierarchy framework for disposal and sets targets that relate to the principles of Ecologically Sustainable Development (Resource NSW 2003, p.14). The business and waste industry will also take the initiative to participate the WARRS and the different actions to be conducted include adopting the Cleaner Production Techniques, Extended Producer Responsibility (EPR) and Product Stewardship on the life cycle of products which have been discussed earlier.

The most important stepping stone is to invite everyone to join and gain ownership to the strategy because there is no other method that is better than everyone takes part in it. It is crucial that participants work and contribute together to achieve the prevention of waste and reduction in renewable resources. For example, householders can reduce food wastage and reuse products by reviewing their purchase habits. As retailers, they can improve the stock management or introduce systems to encourage the reuse of packaging, i.e. reduce the consumption of plastic bags (Resource NSW 2003, p.48).

POEO (Waste) Regulation 2005 (DEC 2005) stresses waste tracking and the main target group is waste producers and transporters. This is different from the other three strategies because of the greater focus on the government agencies and business sectors. Thus, POEO (Waste) Regulation concentrates on the industries that produce trackable waste and this consists of industrial plants (i.e. steelwork, oil refineries and chemical plants), mid-sized factories (i.e. metal casting and electroplating) and other small businesses (i.e. smash repair shops, service stations and dry cleaners) (DEC 2005, p.6). This regulation affects about 680 licensed and non-licensed producers and 550 transporters (DEC 2005, p.6) who send trackable waste to NSW for treatment or disposal.

On the other hand, the stakeholders for the National Packaging Covenant (NPCC 2005) are the Covenant Council, National Projects Group, Jurisdictional Projects Groups and other packaging agencies that have signed the agreement to manage the environmental impacts of packaging. Comparing to the other three strategies, the stakeholders of this Covenant recognise the need to maintain a mechanism for regular discussion and consultation. Meanwhile, it monitors and operates material recovery issues to coordinate with the industry's responsibilities under the Covenant (NPCC 2005, p.17). This is a cooperative approach between the industry and the government to achieve a consistent and efficient system of consumer packaging and paper recycling in NSW.

As a result, this Covenant mainly targets mainly at manufacturers while the other strategies concentrate on state government agencies, consumers and householders which give us an opportunity to examine waste management from a different angle and perspective. This provides us an insight and understanding of the different obligations and responsibilities that are carried out by each of the sectors. Meanwhile, it has demonstrated how the different groups coordinate and interact with each other to achieve the best performance exhaustively.

### **Chapter Review**

This chapter explores the different strategies and approaches of waste management. As observed, each of them have their own characteristics and it is crucial that we understand the strategies thoroughly and do our best to participate in them. Although we have to reduce the quantity of waste and increase our recycling rate continuously. We are envisaging an enormous challenge as we are creating waste faster than we can recycle. Thus, we must reduce, reuse and recycle waste to maintain the quality of the environment and life for people to enjoy and appreciate.

Landfill disposal is definitely not the only way of waste treatment. There are other effective waste management schemes. These include product stewardship and the extended producer responsibility. The following chapter will reinforce how different local councils promote and implement their strategies to reduce the amount of waste we create daily. It will discuss the main local issues including zero waste, waste and recycling services, alternative waste treatment, education and communication programs.



**CHAPTER 4**  
**EFFECTIVE WASTE**  
**MANAGEMENT BY COUNCILS**

## **EFFECTIVE WASTE MANAGEMENT BY COUNCILS**

This section explores the different strategies and action plans that are implemented by the local councils. It is vital to understand these strategies because it affects our living, lifestyle and habits. The different types of issue that will be discussed are the zero waste strategy, waste and recycling services, alternative waste treatment, education and communication within the local council and the community.

The four latest strategies will be examined and it consists of the Resource Recovery Strategy 2004 by Willoughby City Council (Psaila 2004), Strategic Waste Action Plan 2005 by Blue Mountain City Council (BMCC 2005), Future Waste Disposal Strategies by Gosford City Council (GCC 2003) and Zero Waste Strategy by Manly Council (Manly Council 2005). These strategies have been selected because of their regional and metropolitan characteristics since they represent the Northern Beaches, Northern Suburbs, Blue Mountains and the Central Coast areas. Thus, it gives an overall picture of the local waste treatment strategies in Sydney which assists us to have a better understanding of the NSW waste management system.

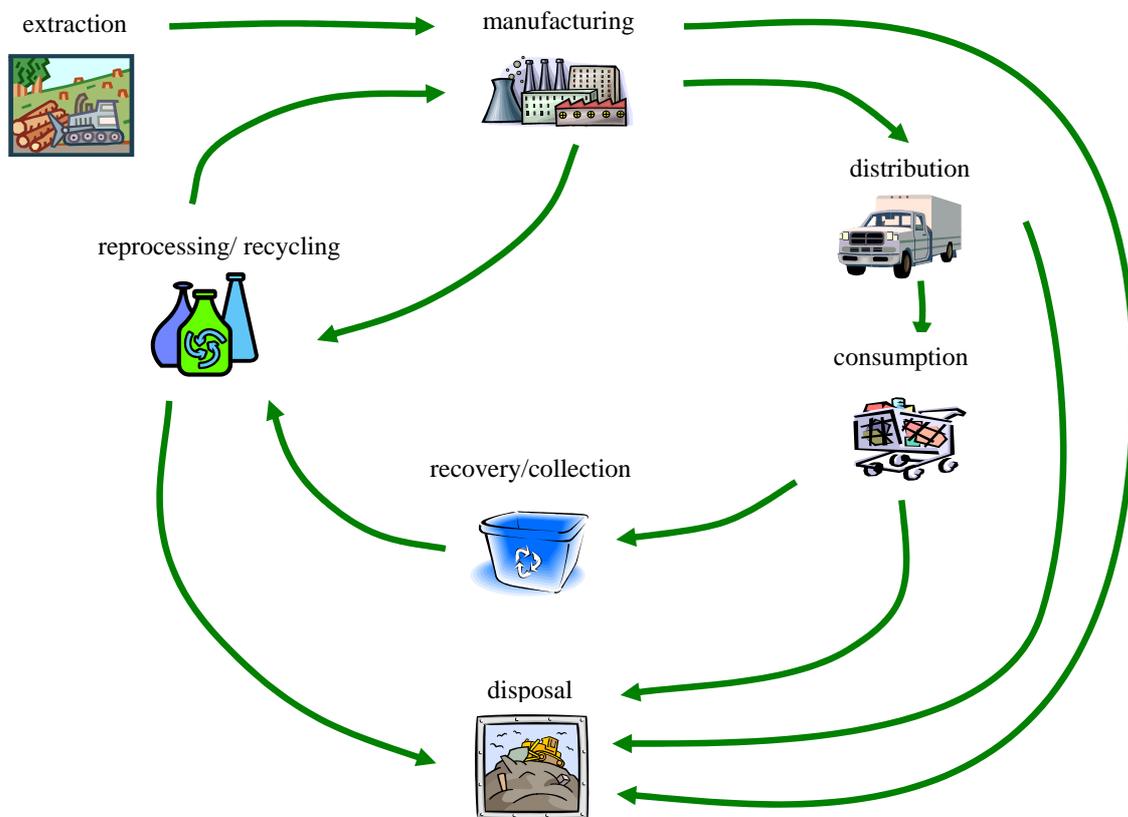
### **Zero Waste**

Firstly, Manly Council and Willoughby City Council will implement the Zero Waste approach but Manly Council's strategy is more focused to the concept. This is because it outlines how the Zero Waste concept corresponds to other local government plans internationally and nationally, i.e. Manly Council Corporate Plan, the Manly Council Sustainability Strategy and the National Strategy. Additionally, it coordinates with the United Nations by recognising education as a major part of the Zero Waste Strategy. This is a crucial approach because education is an effective tool that helps the society to achieve a sustainable future (Manly Council 2005, p.10). Simultaneously, this correlates with the National Strategy for Ecologically Sustainable Development because it has an intensive impact on the community's ability and behaviour in waste reduction (Manly Council 2005, p.6)

The aim of the National Strategy is to “improve the efficiency of resource use and reduce the impact on the environment of waste disposal” (Manly Council 2005, p.10) which is in line with Manly Council’s strategy as both of them possess the same objective, i.e. empower and encourage individuals and communities to contribute to the continuing reduction of waste and allow the public to participate in the waste elimination process (Manly Council 2005, p.7). Meanwhile, Manly Council’s strategy relates to WARRS by providing a framework to reduce waste so that we can use our resources effectively through the recycling process. On the other hand, there is only a brief outline about the Zero Waste concept in Willoughby Council’s Resource Recovery Strategy. Thus, it is not that highly focus to the concept but rather, it has emphasised on other form of waste reductions such as charging system and user-pays system.

Therefore, Manly Council’s Zero Waste Approach is more understandable because it defines the overall strategy development thoroughly by identifying the need of the strategy and analyzing the relevant strategies and plans through consultation. Again, Zero Waste is not only about recycling and diversion of waste from landfill but it also involves waste avoidance through the restructuring of production and distribution system (Figure 4.1 refers). Practically, the Zero Waste concept is not easy to achieve because it needs to change people’s attitude by recognising waste as a valuable resource. Therefore, a lot of work and effort has to be put in to change the society’s perspective toward waste. Zero Waste New Zealand Trust has defined “Zero Waste” as:

*“A whole-system approach to addressing the problem of society’s unsustainable resource flows. Zero Waste encompasses waste elimination at source through product design and producer reasonability and waste reduction strategies further down to the supply chain such as cleaner production, product dismantling, recycling, re-use and composting. Communities that implement Zero Waste strategies are aiming to switch from wasteful and damaging waste disposal methods to value added resource recovery systems that will help build sustainable local economies.”* (Zero Waste New Zealand Trust 2006, p.2)



**Figure 4.1 Life Cycle of Goods and Materials** (Source: Resource NSW, December 2003, p.9, cited in Local Government Action Plan – Contributing to Waste Reduction and Resource Recovery in NSW: Consultation Paper)

Manly Council’s Zero Waste Strategy also links to the implementation of the Corporate Plan and Sustainability Strategy by identifying the importance of reducing and managing waste, i.e. “Work towards a zero waste target, consistent with sound sustainability practice” (Manly Council 2005, p.5). The difference between the two Zero Waste Strategies is that Manly Council provides a more definite and explicit approach as it consists of the different objectives, performance targets and stakeholders that are correlated with the national approach. Thus, it is a strategic direction towards Zero Waste by encouraging the community to participate in the development of Council’s environmental policies and initiatives (Manly Council 2005, p.6).

## **Waste & Recycling Services**

### ***1. Waste Disposal***

Currently, 180,000 tonnes per annum (tpa) are generated by the Gosford LGA and within that, 52,000 tpa are recycled from the municipal and business sectors (GCC 2003, p.5). Of the remainder, 50,000 tpa represent municipal waste destined for disposal and 78,000 tpa represent business waste destined for disposal (GCC 2003, p.5). Therefore, there are 78,000 tpa of business waste that the Council has no control over. Comparing to Blue Mountains, it produces 13,500 tpa of commercial and industrial waste to landfill which is 64,500 tpa less than Gosford but the quantity of waste in Blue Mountains has already risen around 6.5% per year over the last 5 years (Blue Mountains City Council 2005, p.8). The reason is that most of the commercial and industrial businesses in the Blue Mountains LGA are tourism and hospitality industry which is very likely that the waste can be recovered potentially.

Meanwhile, Gosford generated more business waste than Blue Mountains because there are a lot of offices and industrial sites located in Gosford, i.e. regional headquarter office or loading freight. The reason is that Gosford has the advantage for its accessibility because it is only within 80km of Sydney and Newcastle. Therefore, by considering all these reasons, it has attracted businesses to Gosford and the commercial waste has also increased proportionally. However, the building and demolition waste of Blue Mountains for disposal is 11,200 tonnes yearly but over the past five years, this quantity of waste has fallen by around 2.8% per year (BMCC 2005, p.9).

According to the Blue Mountains Council's landfill data in 2003- 2004, household produces 807 kg of waste per year and up to 63.8% of the household garbage was compostable; 14.4% was recyclable; 21.8% of the residual waste was disposed to landfill (BMCC 2005, p.9) (See Figure 4.2). Comparing to the waste stream of Willoughby Council in 2003, 27% was recyclable which was 12.6% higher than Blue Mountains but only 19% was compostable, i.e. 44.8% less than Blue Mountains (Psaila 2004, p.12). The 50% of the remaining waste was garbage containers and only 4% was for clean up (Psaila 2004, p.12) (See Figure 4.3).

This is an interesting point because apartments, townhouses, units and duplexes are a high proportion of Willoughby City. Therefore, there is only a limited yard area for apartment residents leading to a reduction in the number of gardening and composting activities in Willoughby City council area. Conversely, houses occupy most of the Blue Mountains and the proportion of apartments is relatively less than Willoughby. Thus, most of the Blue Mountains residents can use their food waste for composting.

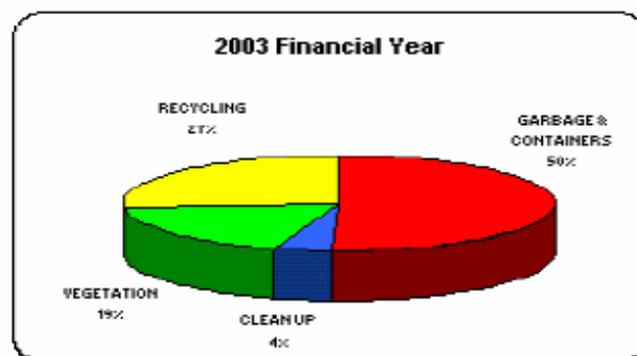
This indicates that the type of dwellings that we reside in have a significant influence on the household garbage composition because it affects the waste treatment domestically such as compost, recycle or landfill disposal. This is a crucial issue and it will be further discussed in Chapter 6 by conducting questionnaires to the people who live in the different metropolitan area (i.e. Northern/Eastern Sydney) and house types (i.e. Townhouse, Apartment, Duplex, House) in Sydney. The aim of the questionnaire is to understand the knowledge, performance, behaviours and attitudes of people toward waste management in Sydney. Meanwhile, it is to investigate how the different types of houses that we reside in influence our household waste management, i.e. compost and recycle. All these issues will be explored in Chapter 6 – Research Design.

## ***2. Kerbside Recycling***

Blue Mountains City Council provides different recycling services. This includes kerbside recycling, drop-off recycling, household organics chipping service and household hazardous chemical collection. There are about 75 percent of the households participating in the recycling service which has decreased by 4.1 percent comparing with 79.1 percent in 2002 (BMCC 2005, p.13). Although the quantity of recyclable materials recovered has fallen slightly over the past years in Blue Mountains, i.e. -1.5 percent (BMCC 2005, p.13) but this could be due to a numbers of reasons such as low consumption and the change of packaging.

Potential Recoverability	Waste Component	Proportion
Compostable 63.8%	Food Waste	21.6%
	Garden Organics	37.5%
	Contaminated Paper	4.7%
Recyclable 14.4%	Paper	7.9%
	Glass	2.9%
	Steel	1.9%
	PET	0.5%
	HDPE	0.4%
	Polypropylene	0.4%
	Liquidpaperboard	0.2%
	Aluminium	0.2%
Residual 21.8%	Dirt, Dust, Rock, Inert	3.5%
	Nappies	3.1%
	Plastic Film	3.1%
	Hazardous	3.0%
	Textiles, Clothing, Leather, Footwear	2.7%
	Kitty Litter	1.4%
	Other Plastics	1.2%
	Wood	1.0%
	Other Plastic Containers	0.6%
	Polystyrene	0.3%
	Cooking / Engine Oil	0.2%
	Other Miscellaneous	1.7%

*Figure 4.2 Domestic Garbage Composition by Recoverability (Source: Blue Mountains City Council 2005, p.10, cited in Current Waste Management Services and Programs – Residential Waste Disposal)*



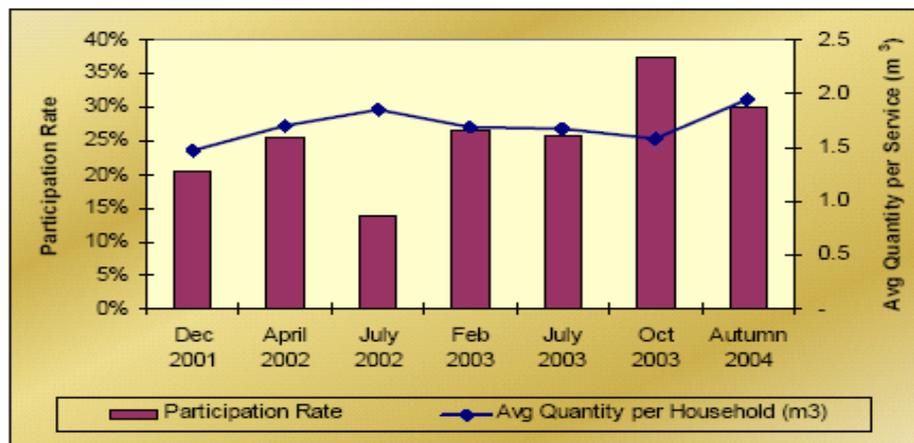
*Figure 4.3 Willoughby City Council Waste Stream in 2003 (Source: Psaila. 2004, p.12, cited in the Composition of Waste and Recycling in Willoughby)*

Conversely, Willoughby Council has recognised that the wheelie bin is a viable system that will increase the quantity of material collected for recycling. However, an audit of recycling bins undertaken in November 2003 shows that the level of contamination in the sample group was 5.65 percent (2.08% was waste fines and glass less than 10mm) (Psaila, 2004, p.21). Hence, it reveals that the Willoughby residents know what materials to place into their recycling bins but it is essential to educate and remind residents about what can and cannot be recycled to increase the recycling recovery rate holistically.

### ***3. Household Organics Chipping Service***

Household Organics Chipping Service is a type of recycling service that was introduced in Blue Mountains Council area in 2001 (BMCC 2005, p.14). It has not yet been implemented in Willoughby Council, Manly Council and Gosford Council areas. It is a kerbside chipping service for the resident by placing their greenwaste on the kerbside and the council contractors will mulch the material by placing the processed material back on the kerbside for residents to use in their gardens (BMCC 2005, p.14). This is a direct and positive approach because it utilizes the reuse principle by using the greenwaste and transforming it to a material that is beneficial to the gardens. It is environmentally friendly because it does not contain other additional chemical or mechanical processes. It is purely natural so it will not harm our health and environment at all.

Meanwhile, the greenwaste can also be mulched and used on site for embankment stabilization and landscaping projects (BMCC 2005, p.14). Figure 4.4 indicates the participation rate of chipping service in Blue Mountains has risen from 25% to 37% between July 2003 and October 2003. Notwithstanding that there is a slight decrease to 30% in autumn 2004, it demonstrates that the participation rate will continue to rise as the awareness and satisfaction of the services increases. It can be used as a guide or an indicator to encourage other councils to implement and apply this chipping service as part of their recycling services due to the fact that it enhances the resource recovery rate and reduces the amount of waste to landfill significantly.



**Figure 4.4 Participation Rate VS Average Quantity of Material Processed (Source: Blue Mountains City Council 2005, p.15, cited in Household Organics Chipping Service)**

#### **4. Household Hazardous Chemical Collection**

In 2004, 811 Blue Mountains residents used the household hazardous collection service and 26,294 kg of hazardous chemicals were collected and sent for safe recovery or disposal (BMCC 2005, p.15). But on the other hand, Willoughby City Council has a different approach to household hazardous waste which is to encourage the residents to use the Chemical Clean Out collection service that is operated by Waste Service NSW and the DEC. According to the Chemical Clean Out campaign, 17,164 kg of hazardous material has been collected from the entire northern suburbs regions (Psaila. 2004, p.27).

The most important issue is to avoid using the chemicals in the first place and Willoughby City Council will operate workshops for non-toxic cleaning to encourage people to avoid using chemicals products at home. These approaches are adequate to accommodate the needs of different people by promoting the message of “chemical waste avoidance” at home. This action has not been raised in the other two strategies (i.e. Future Waste Disposal Strategies by Gosford City Council and Zero Waste Strategy by Manly Council) but it is essential to promote this message to other councils. It reduces the hazardous effect and pollution to our health and environment.

### ***5. Variable Charging System or User Pays System***

The common strategic action for Blue Mountains and Willoughby Council is to provide smaller garbage bins and charging systems for the waste collection services. Blue Mountains Council has developed programs for introducing smaller garbage bins (i.e. 140l or smaller) and home composting kits to the local residents for recyclables and garden organics (BMCC 2005, p.5). Meanwhile, Willoughby Council has introduced a variable rate charging for the bin sizes in terms of the bin-based system, weight based system, bag or tag system and the frequency based system (Psaila. 2004, p.19).

Firstly, the bin-based system offers a variety of bin sizes with residents paying different charges depending on the size of the bin they choose. Therefore, the residents will have to pay a premium charge if they choose the largest bin. For the weight based system, residents are charged on the actual weight of the waste collected which is similar to the electricity service by paying the amount they consume. With the bag or tag system, the council will sell the bag or tag to the resident which indicates to the collector that the service has been paid for (Psaila. 2004, p.19). Finally, the frequency-based system involves making payments on a regular basis such as weekly or fortnightly and once the bin is full, it will be emptied upon request. Conversely, Blue Mountains Council emphasises more on the price disincentive for residents who select the larger bins, i.e. 240L (BMCC, p.5). Thus, the charging system of Willoughby Council is more flexible and mobile than Blue Mountains Council because Willoughby provides the four bin systems which give a variety of options for residents to choose from. Further assessment has to be conducted to investigate the effectiveness of the charging system and bin sizes in reducing waste to landfill accordingly.

Notwithstanding, the variable rate charging systems have only been introduced for single residential dwellings in the Northern Suburbs but Willoughby Council is considering expanding the system to multi-occupancy units in terms of vegetation, recycling and clean up collections (Psaila. 2004, p.19). This is an appropriate approach but further measurement and assessment are needed to examine the concept of a charging system such as the effectiveness, performance and other relevant issues.

## ***6. Waste Not DCP***

Additionally, the “Waste Not DCP” was adopted by Blacktown City Council on 2 November 2001 and came into effect on 1 January 2002 (BCC 2006). It supplements the provisions contained within the Blacktown Local Environmental Plan (LEP) 1988 and Blacktown Development Control Plan (BDCP) 1992 and any other relevant Council Policy (BCC 2006). The “Waste Not DCP” identifies the performance criteria for the six development categories (i.e. Subdivision with Engineering Works, Demolition, Single residential, Multi-unit residential, Commercial & Industrial, Rural & Other).

Meanwhile, a Waste Management Plan (WMP) is required to be submitted with the development application, before a Development Consent or Complying Development Certificate is issued (BCC 2006). The “Waste Not DCP” is definitely an operative and effective approach to reduce the construction and demolition waste during building projects and the operational phase of projects. Other councils can consider adopting this DCP to facilitate the separation of materials and waste collection services in the Sydney Metropolitan area holistically.

### **Alternative Waste Technologies**

Waste technology is another form of waste management and the advantage includes reducing the quantity of material for final disposal, stabilizing the material to reduce gas formation and leachate pollution (Psaila 2004, p.28). In the Gosford and Willoughby City Council strategies, the different alternative waste technologies were discussed. These comprises of Mechanical Biological Treatment (MBT), Thermal Treatment (Waste to Energy), Combination of MBT and Thermal. Biological Treatment is the use of controlled atmosphere conditions to hasten the rate of organic waste decomposition. Hence, it stabilizes organic material for the use of composting or alternative landfill operations (GCC 2003, p.38). For Thermal technologies, it relies on heating waste to produce energy directly and indirectly (GCC 2003, p.38).

### ***1. Bioreactor Landfill & Bedminster System***

Bedminster system, gasification, waste separation, anaerobic digestion and neutralysis are the waste technologies that have been explored in both of the Gosford and Willoughby Council strategies. Only the bioreactor landfill option has been discussed in Gosford's strategy and the function is to enhance the microbial decomposition in landfills through the recirculation of leachate (Gosford City Council 2003, p.38). This is a life cycle approach because it accelerates the waste degradation and improves the landfill gas production through the use of power industrial generators. It is operated by returning electricity to the grid which is a direct way of reusing resources. Accordingly, bedminster system is the composting of solid waste and biosolids in a revolving drum which helps to reduce the waste in bulk (Psaila 2004, p.28). Although contamination by plastic, metal and glass will lead to low composting rate, it provides a strong organic content from the streamered organic waste (i.e. food waste) and mixed residual wastes.

### ***2. Gasification, Anaerobic Digestion & Neutralysis***

Gasification is a system where steel, plastic and other recyclables are removed first and the solid residual is mixed and heated in an autoclave. The carbon rich pulp is then heated to a high temperature with the resultant gas used in power generation (GCC 2003, p.45). The disadvantage of this system is the high premium price and the potential air toxicity issues. Neutralysis is a process where solid waste is made into lightweight ceramic material with potential for use as an aggregate in building construction (Psaila 2004, p.28). Anaerobic digestion is another effective option where the organic wastes are treated in a digester to produce methane for energy and soil conditioner as the end product (Psaila 2004, p.28). The positive aspect of this technology is the scopes to produce both electricity and compost but some of the risk factors include the potential effluent treatment and discharge risks. Another crucial issue that we have to consider is the suitability of products for public consumption because not all the material or resource can be produced potentially due to the physical and chemical contamination (GCC 2003, p.43).

As a result, the bedminster system is the most effective recovery method that reduces the impact to the environment by incorporating the mechanical separation as a pretreatment activity. Meanwhile, the system has been developed to full commercial status over the last 30 years in North America and Europe (GCC 2003, p.41). Therefore, it is convenient to be implemented by the different councils because there are number of brands available in Australia. For example, “EWT Pty Ltd – Bedminster” is operating at Raymond Terrace for Port Stephens Council (GCC 2003, p.42).

### **Education & Communication**

Blue Mountains Council and Willoughby City Council strategies emphasise on the awareness of local residents, schools and colleges sector. But Manly Council accentuates on the business sector and the responsibility within the council itself. Obviously, the community education campaign plays a significant role in the success of waste collection service. The aim of the campaign is to increase participation rates in recycling by providing contaminate free system and raise the environmental awareness of waste management (Psaila 2004, p.16).

#### ***1. Information-Based Education***

Internet and household resource recovery guide are the two main effective information based techniques because the residents can access the information regardless of time and place. Thus, internet provides the latest information on waste management through the council website such as household chemical collections dates, clean up and other garbage services. Meanwhile, the household resource recovery guide furnishes the instructions about kerbside chipping and location of recycling drop offs which is a way to consult and interact with the community regarding the waste services. Additionally, it assures that the strategy can enhance and increase people’s knowledge and attitude towards household waste management through these education campaigns.

## ***2. Action-Based Education***

Other effective action-based education methods include hands-on workshops, tours and information sessions about waste avoidance and recycling and managing organics at home such as composting and worm farming. This is an interactive way of communication between the communities as different messages and information can be delivered to the different parties through the participation of the workshops. Hence, everyone can express their own feeling and opinion about the different campaigns directly.

On the other hand, Manly Council has concentrated on the Council's duties and business sector which have not been discussed in the other strategies. For example, Manly Council will take the legal opportunity to apply consent conditions to minimise the amount of waste generated in assessing the waste implication of Development Application (Manly Council 2005, p.18). Meanwhile, Manly Council is providing a grant funding for the establishment and development of a repair/reuse centre within the Manly LGA. But the funding might be subsidized from the domestic waste charge levies which might also have a financial impact on the residents by increasing the council management fees.

For the business sector, Manly Council has recommended businesses reduce and reuse office waste by providing information for recycling and promoting benefits (Manly Council 2005, p.26). This is vital to the business sector because it helps to promote the Council's Zero Waste Policy and enhances the quality of the environment through waste avoidance practices. Meanwhile, it is essential to assist schools and colleges to educate students in integrating waste minimisation and prevention. Therefore, Manly Council has suggested conducting waste audits and worm farming programs for students so that they understand the importance of waste treatment. This is the best way to work in conjunction with other local schools because through the recycling activities, it assists the students to realize the most efficient way to recycle and the benefits that bring to the environment.

Although this type of education is only mentioned in the Manly Council's strategy, it is a good idea and approach to be implemented in other councils. This is because students are our future leader of the society and it is crucial that they are aware of the current waste problems and understand the appropriate way to save the environment continuously. This also demonstrates that education program is another efficient method of waste minimisation because it does not consist of high operation cost and it can facilitate more people to participate the program through workshops persistently. .

### **Chapter Review**

This chapter explores the different strategies and plans of waste management that are currently implementing by local councils such as waste and recycling collection services in the local community. This is different from the previous chapter as it concentrates on regional issues, i.e. the Waste Reduction and Purchasing Policy. This section provides a better insight on various issues and elements that the community can participate in waste avoidance. For example, councils have posted the recycling calendar to every household to ensure that the appropriate recyclable items are placed in the bins correctly (See Appendix B- Recycling Calendar for further details).

Again, this section stresses the different services and schemes that are monitored by the local councils. As residents, we should try our best to implement the practices that are set by the local government because the success of effective waste management relies on the cooperation of all involved parties. This also demonstrates that landfill disposal is definitely our final solution of waste treatment because the development of user-pays system and waste technology can alleviate our demand for landfill sites accordingly.

The following chapter will concentrate on the different approaches that are implemented overseas by examining the feasibility and flexibility of the schemes. It is important to find out how other countries manage and tackle the waste management problems. On the other hand, it is a good opportunity for Australia to adopt other useful strategies to enhance the flexibility of waste treatment in NSW.



**CHAPTER 5**  
**GLOBAL ACTIONS**  
**TOWARD WASTE MINIMISATION**

## **GLOBAL ACTIONS TOWARD WASTE MINIMISATION**

This chapter concentrates on the different waste management strategies that are implemented globally. We will explore the effectiveness of each scheme thoroughly. The four countries that will be discussed are Australia (Tasmania & Western Australia), Hong Kong (HK), Japan, USA (Florida) and Europe. These countries have been selected because they are affluent and developed society and waste management is a top concern in their communities. Therefore, it is important to learn and perceive how other countries broach the polluter pays principle, producer responsibility schemes and landfill disposal bans.

### **Australia -Tasmania**

Tasmania and Western Australia have set up action plans to control waste in metropolitan areas. For Tasmania, the state government has developed a Six-Point Action Plan – Controlling Waste (DPIWE 2005) that recommends the implementation of the waste classification and measurement systems. The purpose is to provide a consistent waste generation data and performance-monitoring program to enhance the waste systems (DPIWE 2005, p.1). Meanwhile, Tasmanian Landfill Sustainability Guide will be established by categorizing the landfills, the design criteria, the operational parameters and performance standards to reduce the level of environmental risks to the earth (DPIWE 2005, p.4). This is a good indicator because it provides a benchmark for assessing proposals for new landfill sites or extensions of existing sites so it gives a basis for setting permit conditions and standards.

Simultaneously, an Enforcement Policy was released in May 2004 and it sets out the principles, criteria and measures for enforcing Tasmania's environmental legislation (DPIWE 2005, p.7). The Environment Division is developing an Environmental Procedures Manual and an Authorised Officer Training Program to improve skills in environmental regulation. Unlike other states, Tasmania has strengthened, formalized and centralized the environmental enforcement activities by emphasizing policy development and training to enhance the efficiency of different environmental measures.

Another strategic action that is implemented in Tasmania but has not yet been introduced in NSW is the “Environmental Management and Pollution Control (Contaminated Sites) Amendment Bill” (DPIWE 2005, p.7). It creates an active and efficient framework for site assessment, waste management and environmental regulation in Tasmania. This is a proactive approach because it provides assurance to the community that the contaminated sites are managed appropriately through the examining of landfills (DPIWE 2005, p.10). Hence, it gives greater directions to the planning authorities for site assessment because it allows the councils to prioritise their actions and improve the sustainable management of these sites by ranking the hazards level of each site.

### **Western Australia**

Waste tracking systems and internal waste handling were introduced in Western Australia. The purpose is to ensure all the excavated waste fill is accounted for and relocated to its appropriate location (MRA 2003, p.7) so that the excavation, transportation, stockpiling and spreading of waste material can be managed safely and efficiently. Comparing to the waste tracking system in NSW, WA emphasises the monitoring of waste fill in terms of the movement and placement. But for NSW, the POEO (Waste) Regulation (DEC 2005) concentrates more on the waste levy issues and waste storage which is quite different from the WA’s approach.

Meanwhile, WA’s strategy centralizes the internal waste handling procedure to ensure that the transportation and handling of all contaminated material within the area is undertaken safely. This includes rating the excavation and placement of waste based on the compliance to air quality, noise and vibration criteria ,which has not been discussed in the POEO (Waste) Regulation (DEC 2005). Overall, WA’s approach emphasises environmental management issues that correspond to the relocation of contaminated material and the installation of clean soil over residual waste fill. The NSW Government could consider adopting these aspects by concentrating on the management of waste fills so that it gives a broader picture and understanding of the waste tracking procedure from a different perspective.

## **Asia - Hong Kong**

In 2004, a total of 5.7 million tonnes of waste were generated, of which 2.3 million tonnes (i.e. 40 percent) were recovered and 3.4 million tonnes (i.e. 60 percent) were disposed at landfills in Hong Kong (HKEPD 2005, p.4). The government has established “A Policy Framework for the Management of Municipal Solid Waste (2005-2014)” (HKEPD 2005) to tackle the waste problem in HK that is mainly caused by the rapid increase of the population. According to the Census in 2005, about 7 million people live in HK (Wikipedia 2006). As a result, Producer Responsibility Schemes (PRSs) and Landfill Disposal Bans have been introduced to control the waste management in HK.

### ***1. Producer Responsibility Schemes (PRSs)***

Firstly, the PRS is similar to the “Extended Producer Responsibility” in Waste Avoidance and Resource Recovery Strategy (Resource NSW 2003) that was discussed in Chapter 3. The concept is to put the onus on the producers and users of products (i.e. community) to share the responsibility for all the economic, social and environmental impacts of a product throughout its lifecycle (HKEPD 2005, p.25). Thus, the HK government proposed to establish the PRSs framework for specific products that have significant impact to waste disposal. This includes the process by which the product is produced, packaged, consumed and the end of its life.

PRS is certainly a direct approach to solve the waste problem because it shares the responsibility of the economic, social and environmental impacts of a product throughout its lifecycle among the consumers, industries and distributors. We want the commercial and the industrial sectors to rethink the way they approach the products from design to disposal. Therefore, consumers must make wise decisions on purchasing, reuse and disposal of products (HKEPD 2005, p.27). Thus, it assists the government to develop and sustain the local recycling industry through the establishment of a stable and flexible Producer Responsibility Schemes.

## ***2. Waste Charging***

At present, HK citizens do not pay for the costs of collecting, handling and disposing of the waste they generate and the government pays nearly \$1.2 billion (AUD) for the MSW management annually (HKEPD 2005, p.26). Therefore, the Waste Charging System has been introduced and the cost of managing MSW will be placed on the people who generate the waste in the first place (HKEPD 2005, p.26). This is the “polluter-pays” principle and it acts similar to the variable charging system by Willoughby City Council which has already been discussed in Chapter 4.

Therefore, by imposing a direct charge on MSW, people are more conscious of and are more responsible for their waste because it forces them to rethink their way of consumption and disposal behaviour. At the same time, households are compelled to separate the recyclable waste because it reduces the MSW charge that they need to pay by producing less waste. As a result, it reduces the capacity of landfills and the waste treatment cost entirely. This is an adequate approach because it allows everyone to think twice when we purchase and dispose as a commitment or a form of responsibility to the society.

## ***3. Landfill Disposal Ban***

Landfill Disposal Ban is a ban on biodegradable waste (i.e. kitchen and restaurant waste). It allows landfills to last longer and makes them less of a long-term environmental burden (HKEPD 2005, p.28). This is an effective strategy that Australia can adopt by diverting MSW away from expensive landfill space and alleviates the pressure on landfill space through the recovery of valuable materials. Figure 5.1 shows the different waste management strategies and principles that will apply to HK in the coming years, i.e. bulk reduction and disposal.

## ***4. EcoPark***

A 20 hectare EcoPark will be built in Tuen Mun Area 38 with a marine frontage of over 450m. Phase 1 of the EcoPark will be completed by the end of 2006 (HKEPD 2005, p.44). It furnishes permanent land for both the recycling and the environmental industries to

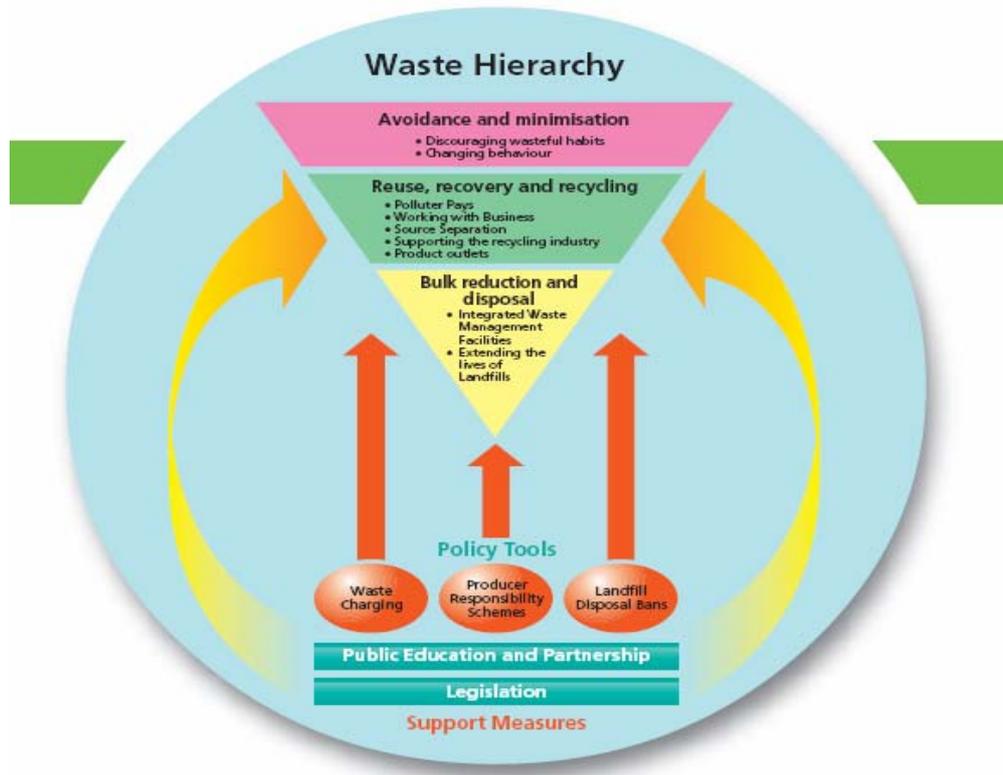
encourage investment in advanced and cost effective technologies. The government will fund the construction and an affordable rent will be offered to the waste and recycling industries. The EcoPark will give first priority to those industries which can help and accommodate the government to achieve the MSW's objectives. Meanwhile, a Green Procurement Policy is developed to encourage a regular review of the specifications for bulk purchase items which has incorporated the environmental friendly concept to facilitate the local corporation to apply this principle. Figure 5.2 illustrates the master planning layout of the EcoPark.

### ***5. Public Education***

HK government will provide an extensive outreach service through the Mobile Environmental Resource Centre and Green Desk to enhance the public awareness of waste minimisation. Simultaneously, environmental activities will be conducted continuously within the local community to encourage public participation in the MSW management and community programs (See Figure 5.3). These type of education approaches have been implemented in NSW by different local councils which have already been discussed in Chapter 4. Nevertheless, it is crucial to utilize this stream to facilitate the community to integrate the environmental elements in their daily routine (See Appendix C for the MSW Management Timeline).

### **Japan**

In 2000, a number of recycling laws were enacted in Japan, including the “Basic Law for Promoting the Creation of a Recycling-oriented Society” and the “Automobile Recycling Law in 2002” (Plastic Waste Management Institute 2004, p.1). Meanwhile, Japan has established other regulations to control dioxin emissions due to the impact of incineration in December 2002 (Plastic Waste Management Institute 2004, p.1). Japan produces approximately 400 million tons of industrial waste and 50 million tons of domestic waste per year (Plastic Waste Management Institute 2004, p.2) and this figure has remained largely unchanged for the past 10 years.



*Figure 5.1 Hong Kong's MSW Strategy (Source: Environment Protection Department, Hong Kong 2005, p.33, cited in Tackling the Problem – The Strategy)*



*Figure 5.2 Master Planning for EcoPark (Source: Environment Protection Department, Hong Kong 2005, p.44, cited in Supporting the Recycling Industry – the “Circular Economy”)*



*Figure 5.3 Public Education Program – Separation of Waste (Source: Environment Protection Department, Hong Kong 2005, p.29, cited in Public Education and Partnership)*

In Japan, domestic waste is disposed by incineration. It consists of waste from households and business waste from restaurants and other business establishments. The three industries that produced 60 percent of the waste are urban infrastructure industry (i.e. electricity, gas, heat service and water utilities), agricultural industry and construction industry (Plastic Waste Management Institute 2004, p.3).

### ***Recycling Technology***

The recycling methods that are implemented in Japan under the Container and Packaging Recycling Law (Plastic Waste Management Institute 2004, p. 16) are mechanical recycling, feedstock recycling (i.e. monomerization and liquefaction) and energy recovery (i.e. liquefaction, gasification and waste power generation). For mechanical recycling, it is implemented widely in manufacture, processing and distribution of plastic products which is a way of making new products out of unmodified plastic waste (Plastic Waste Management Institute 2004, p. 16).

NSW is also conducting this type of recycling method because recycled products are often durable, light and easy to process. Thus, it possesses good quality and this attracts different people to use them to replace other materials like steel, concrete and wood.

### ***Energy Recovery***

According to the “Basic Law for Promoting the Creation of a Recycling-oriented Society”, energy recovery is recognised as the second best solution of waste treatment in Japan (Plastic Waste Management Institute 2004, p.24). The different types of energy recovery are waste power generation, stocker ovens, gasification and melting furnaces. Out of all these types, gasification is recognised to be the most popular type of electricity production because of its small burden on environment (i.e. rendering waste harmless and reducing weight and volume) and the effectiveness in the utilization of energy (Plastic Waste Management Institute 2004, p.24).

This correlates with the different waste technologies that are currently being investigated for application in NSW. Meanwhile, it is vital to realize that unlike Australia, most Asian cities do not have enough land for waste disposal due to limited landfill sites. Therefore, it is essential to transform waste to a valuable and profitable energy resource (i.e. electricity) to accommodate the high density population. For example, about 12 million people live in Tokyo which is 10 percent of the Japan's population (Wikipedia 2006).

### ***Waste Power Generation***

There are many waste incineration facilities that are provided with a boiler to supply hot water for facilities such as local health spas, heating systems, bath houses and heated swimming pools. At the end of 2001, there are 210 waste incineration facilities in Japan (Plastic Waste Management Institute 2004, p.25). Accordingly, a new system is being investigated to further raise the efficiency of power generation through the combustion of gas that is produced by gasification and melting furnace.

As a result, the future development of waste management in Japan is to convert waste as a new energy through incineration by generating electricity in order to combat warming rather than simply burning. Additionally, the Japanese government is pursuing a policy to promote the use of renewable and sustainable energy resources as a waste power generation. It is recognised as an important resource like solar power, wind power and biomass power generation for Japan.

### USA

In Florida, 25 million tonnes of MSW was collected in 1999 and out of that, 55 percent of the MSW was generated from the commercial and 45 percent came from the residential sector (DEP Florida 2002, p.1). In 2000, about 15 percent of the MSW was combusted into energy and gases, 27 percent was recycled and 58 percent was disposed in landfills (DEP Florida 2002, p.1). According to recent data, Florida has 333 kerbside recycling programs that collect over 21 different types of material and 3.6 million homes have kerbside recycling available to them in 2000 (DEP Florida 2002, p.1). The kerbside recycling programs are available to 75 percent of all single family and 70 percent of all multi family units. Comparing to NSW, almost nine out of ten households (i.e. 89 percent) (Resource NSW 2003, p.23) have a kerbside recycling service which is 16.5 percent higher than Florida. This implies that kerbside recycling programs are more common and widely implemented in NSW than Florida.

MSW collected in Florida is either recycled, composted, combusted in a waste-to-energy (WTE) facility or disposed in a class I, II or III landfill. Today, Florida has 100 active Class I and Class III landfills. It is classified according to the amount and types of waste received (DEP Florida 2002, p.40). Class I and Class II landfills receive non-hazardous household, commercial, industrial and agricultural wastes. Class I landfills are those which receive an average of 20 tonnes or more of solid waste per day and Class II receive less than 20 tonnes of waste (DEP Florida 2002, p.40). Class III landfills contain waste other than household waste such as yard trash, construction and demolition debris and processed tires etc (DEP Florida 2002, p.40).

### ***Pollution Prevention (P2)***

Pollution Prevention (P2) is a key component of Florida's waste reduction program and it has assisted more than 450 Florida businesses in eliminating or reducing the generation of hazardous waste (DEP Florida 2002, p.2). P2 is a management tool that conserves and reuses materials that cause pollution. The program helps the business through the avoidance of the transfer of pollutants between air, land and water (DEP Florida 2002, p.25). P2 is broadly supported by businesses as it generates products and services without producing toxic emissions and the overall performance in Florida is outstanding.

This is a useful and effective approach that NSW can adopt because businesses are competitive to demonstrate their ability and efficiency in eliminating potential liabilities. Therefore, by applying technical assistance and facilities of this program, it supersedes the toxic or other harmful substances with raw material, water, energy and other natural resources. As a result, it reduces the harm to the environment and the cost of hazardous waste management. Hence, it has highly reduced the workers' exposure to toxins and this demonstrates that P2 is beneficial to both of the employer and employee directly.

### ***Waste to Energy (WTE)***

Florida has the largest capacity to burn MSW of any other state in USA and there are 13 Waste to Energy (WTE) facilities that generate over 500 megawatts of electricity daily (DEP Florida 2002, p.2). In 2001, the Florida WTE facilities incinerated 5.6 million tonnes of MSW which generated approximately 1.6 million tonnes of ash (DEP Florida 2002, p.48). Additionally, State Legislation created a legal and tax condition for the construction of WTE facilities in the late 1970s which has largely promoted and encouraged the WTE facilities extensively. Therefore, new technologies will be developed to tackle the different waste management issues such as advanced air pollution controls and efficient boilers.

Furthermore, the future WTE facilities that burn MSW could acquire renewable energy credits for the electricity they generate. These credits could sell to retail electricity suppliers to meet the requirement for annual percentages of electricity generation using renewable energy sources (DEP Florida 2002, p.35). This approach is to ensure that WTEs facilities retain importance status as a renewable energy resource which will definitely benefit waste management in Florida. Correspondingly, other innovative new concepts will be applied in Florida. It also comprises WTE/industry parks and “waste to water” which uses the electricity generated at the WTE to desalinate brackish ground water (DEP Florida 2002, p.34).

### **Europe**

In some European countries, landfilling is a significant problem because of the emissions of greenhouse gases into the air and landfill capacities are decreasing rapidly. Therefore, it is planning to introduce a landfilling ban for the biodegradable municipal waste (BMW). The aim is to reduce landfill and this coordinates with the Landfill Disposal Bans that will be implemented in HK by diverting waste away from the expensive landfill space. Figure 5.4 shows that Belgium (Flanders), Denmark, Italy, Norway and Netherlands have already introduced this ban and other European countries have also introduced in 2005.

Country	Ban on landfilling of biodegradable municipal waste
Austria	To be introduced 2004
Belgium (Flanders)	Yes
Denmark	Yes
Finland	To be introduced 2005
France	To be introduced 2002
Germany	To be introduced 2005
Italy	Yes (1)
Norway	Yes
Sweden	To be introduced 2005
The Netherlands	Yes

(1) Only non-recoverable waste and inert waste are allowed to be landfilled.

***Figure 5.4 Ban on Landfilling of BMW (Source: European Environment Agency 2002, p.16, cited in Landfilling)***

### ***Taxes and Fees on Waste Generation***

Taxes on products and waste are one of the most effective ways to minimise waste as it motivates the waste producers to recycle waste accordingly. Ten countries have already introduced a tax on landfilling. This includes Denmark and Austria. Denmark also has a weight-related fee on mixed household waste. However, the three Scandinavian countries and Netherlands have the highest taxes on waste (i.e. EUR 20 to 50 per tonne), while other countries are only EUR 5 to 20 per tonne (European Environment Agency 2002, p.16).

Additionally, Denmark, Norway and the Netherlands have taxes on the incineration of waste. At present, Australia does not have a specific ban or tax for landfilling but it is a good scheme to adopt because it improves the competitiveness of alternative treatment technologies such as recycling, incineration and composting. It has been implemented successfully in Austria as a landfill tax (i.e. EUR 7.3 to 43.6 per tonnes) and this has reduced the landfill rate in households from 63 to 32 percent (European Environment Agency 2002, p.23). Meanwhile, the recycling rate has also increased proportionally. On the other hand, it is vital to develop an efficient and flexible public control of waste stream because the imbalance of waste collection and treatment by waste operators may lead to the increase of illegal littering or dumping.

### ***Producer Responsibility***

This principle corresponds with HK's "Producer Responsibility Schemes" (PRSs) and Australia's "Extended Producer Responsibility" (EPR) by delegating the responsibility of waste collection and treatment to the producers. Practically, the public authorities will lose some influence and power in waste management under the producer responsibility strategies. But it furnishes a prevention target that cannot be gained in public waste management without extensive public investments (European Environment Agency 2002, p.17). In Germany and Sweden, it has been indicated clearly that producer responsibility have led to waste minimisation because the generation of packaging waste has decreased and the recycling of generated packaging has increased at the same time.

For Germany, the packaging consumption has decreased from 6.9 to 6.0 million tonnes between 1991 and 1997. In 1999, about 14.6 million tonnes of packaging waste was collected and within that 80 percent was recycled (European Environment Agency 2002, p.37). For Sweden, it has a positive development in recycling of packaging waste because the recycling rate in 1999 was about 73 percent which is a high recovery rate (European Environment Agency 2002, p.46). The advantage of the producer responsibility scheme is that the responsibility of the collection scheme is transferred to the producers instead of the associated authorities.

Therefore, the scheme gives us a clearer picture between the distinction of the part to establish the environmental targets (i.e. the competent authorities) and the part to fulfill the targets (i.e. the producers) (European Environment Agency 2002, p.20). Conversely, the disadvantage is the lack of clarification of responsibility between the producers and municipalities (i.e. mixed household waste) in terms of the collection schemes. Thus, it may experience some problems in defining the responsible duties among the two parties which is a negative consequence that we need to be aware of.

### ***Voluntary Agreement***

Voluntary Agreement is an agreement between the waste authorities and the specific industry about the fulfillment of specific targets in relation to a distinct waste type that is to stimulate waste prevention and minimisation practices (European Environment Agency 2002, p.20). This corresponds with the Australia's National Packaging Covenant (National Packaging Covenant Council 2005) because it is also a voluntary agreement for managing the environmental impacts of consumer packaging. Therefore, the Europe's voluntary agreement acts similar to the National Packaging Covenant as it implements the principles of shared responsibility through product stewardship between the key stakeholders in the packaging supply chain and other sectors (National Packaging Covenant Council 2005, p.1).

Substantively, one of the biggest advantages of this scheme is that the different industry can participate in fulfilling of the waste minimisation targets. This is a crucial component because the industry can utilize this good opportunity to learn and understand more about waste minimisation by conducting practices. This gives them a clear direction and goal to achieve within the production and manufacture process. Therefore, it facilitates the team spirit in the workplace and enhances the productivity and efficiency of the overall industry.

### ***Information Programs***

Waste avoidance information programs are widely conducted in Europe and this includes the “Cleaner Production Demonstration Program” in Ireland and the “Envirowise” in UK (European Environment Agency 2002, p.22). The Irish program is a subsidy scheme that promotes waste prevention activities in a limited number of companies. Conversely, the UK program is not a subsidy scheme but it is a marketing program that possesses strong technical information to overcome the different barriers and problems in undertaking the waste minimisation activities. Within this program, about 100 self-sustaining waste minimisation clubs have been established and the aim is to engage business in making environmental improvements (European Environment Agency 2002, p.22). These initiatives are effective and successful because they have reduced material use of over 240,000 tonnes per year and reduced waste disposal by more than 1 million tonnes per year in UK (European Environment Agency 2002, p.22).

As a result, the UK government intends to spend EUR 96 million on promotion of resource efficiency and cleaner production activities in the next 15 years (European Environment Agency 2002, p.22). The information programs are effective and feasible for waste reduction by establishing a flexible network between the companies. Meanwhile, it encourages more companies and organizations to achieve waste reduction radically through the implementation of information programs.

## **Chapter Review**

There are different actions and strategies that have been undertaken around the world to tackle the waste problem such as landfill disposal ban, producer responsibility scheme, waste charging and waste power generation. Australia's waste management technologies are somewhat behind those of Europe and Asia. This is because Australia does not have as high a population as those countries. Although the amount of waste we create is not as large as them, Australia has already investigated effective waste minimisation options to control the waste generation. For example, Willoughby City Council is currently conducting the variable charging systems in residential units and it intends to expand the service to multi occupancy units in the near future. Extended producer responsibility and product stewardship are the key components that have been incorporated in NSW's waste treatment sector as discussed in Chapter 3 previously. Hence, we can see that there are different strategies and actions that have been developed and applied in NSW to improve and conserve the natural environment in a long term sustainable manner. This also reveals that landfill disposal is definitely not our only choice of waste treatment.

As a result, after synthesising the different schemes from overseas, the main core message is that we have to be responsible for the waste we create and dispose of waste appropriately through the separation of waste. Together with the government, we can develop a clear vision to achieve sustainable waste management by resolving the imminent waste problem. Thus, it ensures a vibrant and prosperous city planning development through the success of waste treatment by enhancing the natural beauty of our environment.

In the following chapter, we will concentrate on the analysis and evaluation of the questionnaire about household waste management among the people who live in the different metropolitan areas and house types in Sydney. It outlines the performance, attitudes and knowledge of people toward waste management. Thus, it gives us an insight into people's behaviour in waste treatment which provides us with a better understanding about their concerns in recycling and their viewpoints to the various waste management issues.



## CHAPTER 6 RESEARCH DESIGN

## **RESEARCH DESIGN**

It is important to understand the different ways people recycle and compost since it influences the amount of waste we collect and send to landfill. The purpose of this section is to investigate the different house types that we live in and those house types affect our household waste management. A set of questionnaires were conducted in a face-to-face mode by the twelve participants who came from different house types and geographical locations in Sydney (i.e. Northern, Western and Southern Sydney). It gives us sufficient data and information to analyse the overall metropolitan area in Sydney. As discussed previously in Chapter 4 under Waste Disposal, this is a crucial point to be considered because the house types that we reside in (i.e. house, apartment, townhouse and duplex) have a significant impact in the way we dispose of our waste. For example, the composting rate of the apartment residents is lower than the house residents because there is no yard for them to compost food waste.

As a result, most of the food waste goes to the garbage directly. Although these are minimal issues the consequences cannot be neglected as it affects our landfill capacity and waste treatment process drastically. The different issues to be addressed and discussed are the performance of household waste management, the knowledge and skills of waste disposal and the attitude and behaviour towards recycling. These are the key components to be reinforced because one of the most effective waste management tools is that everyone has a sensible attitude and action toward reuse, recycle and reduction. The reason is that there is no other better option than public participation in the process.

### **Survey**

Firstly, based on the studies from previous chapters, open-ended and informal questions were developed to be responded to by the twelve participants. They have been selected due to their geographic location and the house type that they live in. The different metropolitan areas that have been investigated are the North-West (Castle Hill, Glenhaven, Bella Vista); North Shore (Killara, Chatswood, North Sydney); South-East (Coogee); Northern Sydney (Epping); Eastern Sydney (Rosebery); Southern Sydney (Bexley) and Western Sydney (Parramatta).

For house types, houses are investigated in the North-West and Northern Sydney area; apartments for the North Shore and Western Sydney; duplexes for the South-East and Eastern Sydney and townhouses are also examined in the Southern Sydney. By examining the survey results, a better understanding about the recycling habits and household recycling performance in Sydney is achieved. Twelve respondents have agreed to participate in the questionnaire by signing the 'Project Information Statement Form' from the HREA Panel. Additionally, they will be referred to numbers for identification so that no one will be identified directly, i.e. Participant No. 1/ No.2 (See Appendix D for the Summary of Questionnaire Responses).

### **Questionnaire**

Secondly, the questionnaire assists the participants to raise their concern and perception toward waste management as it covers the three major areas by emphasizing on the performance, knowledge and attitude of domestic waste treatment. The order of the questions help to gain an insight of the household's recycling habits and their willingness to participate in waste reduction activities. The first six questions relate to the participants' domestic waste generation, their performance in household recycling and the different problems arise in waste treatment. The purpose of this part is to gain an understanding of the most common form of waste in households and how often do the participants recycle, reuse and compost their waste. Thus, it furnishes us an insight of the household waste management activities and we can use this information to determine the best solution to solve the domestic waste problem.

Accordingly, the second part of the questionnaire (i.e.Q7 – Q9) emphasises on the participants' knowledge in recycling and it allows us to know more about their fundamental knowledge toward recycling. Hence, Q7 requires the participants to rate their knowledge of the material that can and cannot be recycled because one of the most common problems is that the non-recyclable items often place to the recycle bins constantly.

Meanwhile, Q8 & Q9 aim to discover whether the participant would take the initiative to find out more information about recycling through the local councils or the internet if they are unsure whether the material can be recycled or not. This is vital because it helps the councils to identify the key areas that have been overlooked. Thus, the council can put more work and effort in that particular part by conducting more promotion and campaign to address the issue. For example, if there is not enough waste management information delivers to the public, the local councils might have to consider other more informative streams so they can pass the message to their local residents effectively. These include composting workshops, recycle guides and waste management seminars that are recommended to be held on weekend. The reason is that it can attract more people to participate the seminar as a family activity, which would also facilitate and harmonize the communication between the different community groups within the local area.

Correspondingly, the third part of the questionnaire (i.e.Q10 - Q13) concentrates on the attitude and behaviour toward waste management. The aim of this section is to understand the participants' perspective and perception on recycling and littering. As stated earlier, public participation is a powerful tool and if everyone takes part in recycling and shares the same vision, sustainable waste management can be easily achieved. Thus, this guarantees our success in resolving the waste problem and maintains the quality of life and environment for our future generation. Therefore, Q12 and Q13 reflect the participants' behaviour and deportment regarding waste disposal and reusable items which help us to know more about their attitude and opinion toward waste management.

This section also encourages us to find more ways and methods to make the waste management scheme more user-friendly and convenient for people to implement. For example, place more recycling bins on streets, shopping centres, offices and schools can inspire more people to recycle. Additionally, we can encourage more people to use reusable shopping bags by largely promoting the advantages and convenience in councils and shopping centres.

## **General Findings**

The three themes that have concentrated and surrounded the questionnaire are:

1. Performance of Household Waste Management
2. Knowledge and Skills
3. Attitude & Behaviour toward Recycling

### ***1. Performance of Household Waste Management***

The majority of the participants stated that the most common form of waste in the household were kitchen waste (i.e. glad wrap, plastic packaging); food waste (i.e. fruit peels, vegetable offcuts, meat); chemical waste (i.e. detergent washing powder); newspaper; magazine; cans; bottles; plastic bags; and tissue paper. Meanwhile, more than half of the participants replied that almost 60 percent of their waste can be recycled (i.e. newspaper, plastic containers, glass bottles and jars) and 20 percent reused items such as plastic bags and yoghurt boxes. Thus, the remaining 20 percent were mainly food waste for compost. On the contrary, the North Shore residents recognised that only 30 percent – 45 percent of their waste can be recycled which is 15 percent less than other areas. Meanwhile, they do not conduct any composting activities.

As mentioned previously, this is a phenomenon that we should take notice of because the participants from the North Shore area live in apartments and there is no yard for them to compost. As a result, their participation rate in composting is relatively less than the residents who live houses in the Northern, North-West and Southern Sydney. This demonstrates that by living in the different type of residential dwellings, it will have a significant influence and impact to our household waste management which adds pressure to our landfill capacity proportionally. A majority of the participants' response that mother is the most active person in the household to make sure that rubbish gets sorted out and recycled appropriately.

On the other hand, participant No.3 and No.9 answered that “No one really takes the responsibility for recycling because just can’t be bothered”. This reveals that public education is important to draw people’s attention and awareness to recycling by informing them the consequence and the negative impacts that will bring to the environment. Meanwhile, all of the participants used the bins provided by the councils for recycling and participant No.4 from the Northern Sydney commented that “There are three bins in my household which are used for garbage, recycling and garden waste. But the recycling bin is bigger than the garbage bin which doesn’t really help us to do more recycling. Since not all of the waste can be recycled and by reducing the size of the garbage bin doesn’t really reduce the waste we produce”.

This is a critical point because at the moment, we do not pay for the waste we produced except the waste management fee to the council for providing the kerbside recycling services. Therefore, by referring to the implementation of the user-pays system which has been discussed in Chapter 4, it would definitely reduce the volume of waste we produce. Unlike other areas in Sydney, the apartment sector in the North Shore appears to have three individual bins for recycling which are classified as glass, plastic and aluminum bins. Thus, the North Shore participants believed that it is an effective system because there are six or more households live in each floor of the apartment and by dividing the waste separately; it saves time and energy for the waste collectors to collect.

Question 6 requires participants to consider their difficulties in recycling and few of them stated that they are unsure about recyclable and non-recyclable products. Other believe that packaging with plastic lamination and plastic bags cannot be recycled is a crucial issue. But there are reused plastic bags collection bins at supermarkets which is another effective way of recycling plastic bags. Participant No.5 and No.11 suggested that cleanup service should be conducted every three months instead of the present six months. This would assist the people to dispose the bulk, white goods and metal items which allow the green waste to be recycled efficiently.

## ***2. Knowledge and Skills***

Generally, most of the respondents believed that they have the fundamental knowledge about recycling and if they are unsure whether the product can be recycled, it goes to the garbage directly. Participant No.11 explained that “I would put it into the garbage bins because if they are not recyclable then I am concern if the Council will empty my recycling bin if they see other non-recyclable items are in it.” Meanwhile, only participant No. 7 answered that she would check with her local council about recyclable items. Again, almost all respondents believe that there is enough waste management information to the public. Some of the participants recommended that pamphlets and catalogues are useful to pass the recycling message around. Conversely, participant No.7 advised that this approach comprises of paper, production, publication and transportation which consume a lot of energy and it is not environmental at all. Thus, internet is an effective way to deliver the information to the public since it is environmental and convenient for people to access regardless of time and place.

## ***3. Attitude & Behaviour toward Recycling***

The items that people would like to recycle are plastic bags and packaging, styrofoam, furniture, wardrobe and CD-R but it needs to rely on the future waste management technologies to expand the number of recyclable items. The biggest influence that encourages the people to recycle is to reduce landfill and pollution in the long term perspective. Hence, it is essential to minimise the damage to the environment and raise the public awareness about the different problems that we might envisage if no action is taken. Satisfactorily, all the participants would dispose the waste to recyclable and non recyclable bins if they are available at streets and shopping centre. There are five participants who do not use reusable shopping bags and participant No.5 replied that “I need plastic bags for the garbage and there are collection bins available for the reuse of plastic bags so that’s recycle as well!” Notwithstanding, this is a form of recycling but it does not reduce the raw material in the production process so reusable bag is still the first priority for waste minimisation.

## **Chapter Review**

The findings of the survey demonstrated that the majority of the participants are aware of the operation of the overall household waste management by taking an initiative to recycle. Simultaneously, composting workshops and programs can be conducted frequently to encourage the people to compost since the composting rate is still low. This also indicates that the type of dwelling we reside in has a significant impact to our waste management domestically.

Apartment residents have a limited area to compost and the only way they can recycle is through worm farming or the recycling bins provided by the councils. Hence, councils should promote the importance of recycling bins and worm farming at apartments to encourage the people to recycle appropriately. Since the outcome of the questionnaire indicates that no one uses worm farm for composting and it is vital to introduce this method to the public so they have a better understanding of it. Due to the rapid growth of technology, the internet is a convenient and accessible way for people to find out more about recycling, reuse and other waste related information. This has enhanced our knowledge and understanding about domestic waste treatment.

Individual attitudes and behaviour are the most crucial components of the success of waste minimisation because the power of public participation is vigorous and forceful. After examining the responses gathered from the questionnaire, it has shown that everyone is concerned about the environmental issues and pollution problems that have caused been by landfill disposal. Therefore, it is important to promote the advantage and benefit of reusable items so the people are confident to purchase the products and hence, the consumption of the raw material and energy would be reduced gradually.

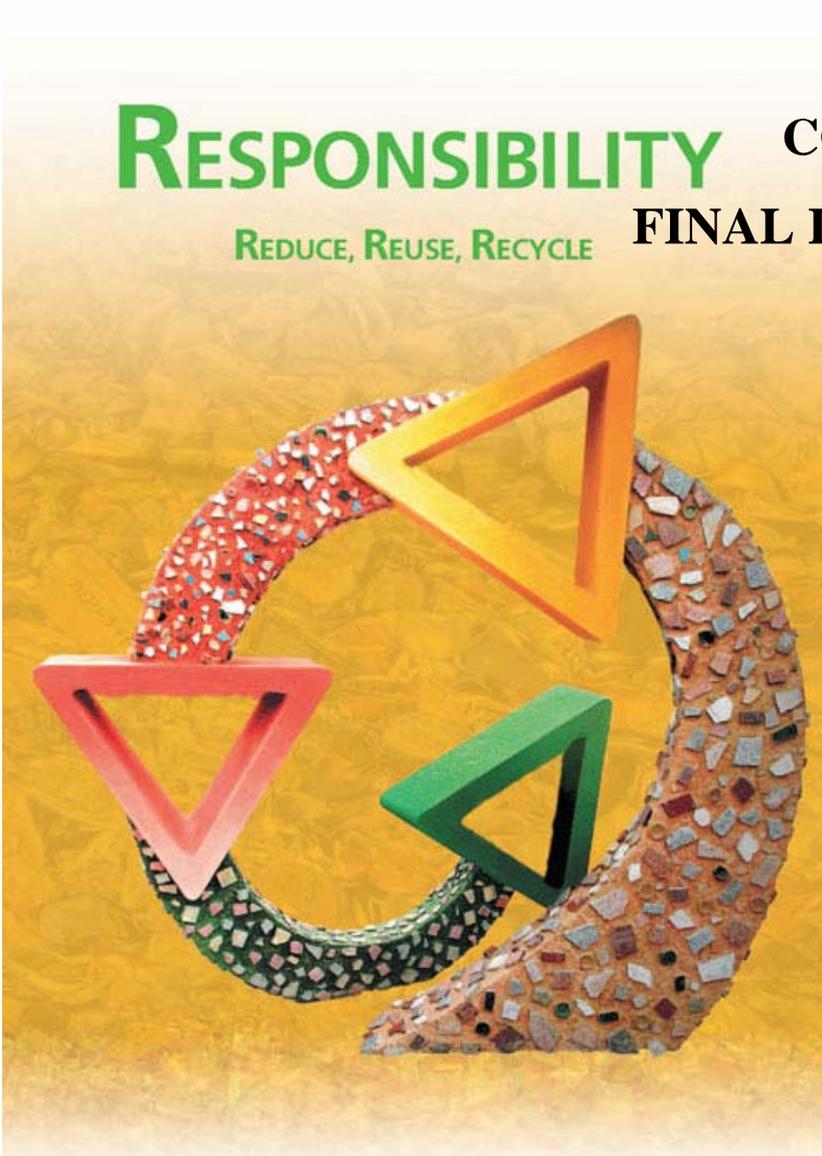
**CHAPTER 7**

**RESPONSIBILITY**

REDUCE, REUSE, RECYCLE

**CONCLUSION:**

**FINAL REFLECTION**



## **CONCLUSION: FINAL REFLECTION**

By reviewing the different waste management policies and examples that are being implemented in Australia, effective options are identified that can be introduced to reduce waste. Hence, landfill is definitely the only final repository of waste treatment. There are different methods that can be applied in households and workplaces through practices since these are the two main sectors where the wastes come from. For example, wastes can be minimised by encouraging the use of products and materials that can be reused with minimal processing such as durable packaging, product reuse and materials reuse. Obviously, the most important component is to encourage everyone to participate in the different ways of waste minimisation and to enhance the awareness of waste management.

Correspondingly, there were a number of elements discovered and learnt from the literature review of the newspaper articles, council standards, government publications and websites. It gives us a good understanding of the different implementation schemes that can be conducted to tackle the waste problem. Overall, NSW's waste management strategy is underpinned by variable charging system, kerbside recycling, extended producer responsibility and the national packaging covenant. This demonstrates that different viable solutions have been set for waste management, which is recognised as one of the highest agendas of the government and the community as a whole. Virtually, this is understandable because in an affluent and developed country like Australia, waste treatment issues are practically the most crucial element in the first priority. Thus, as town planners, it is essential to maintain and sustain the natural beauty of the environment and reduce the health risk to the community directly.

After conducting the survey, it appears that apartment residents have limited availability for recycling except using the bins provided by the councils and worm farming. As a result, it is important that everyone is aware of the worm farming method to ameliorate the overall composting rate in apartments. It also proves that the type of dwelling we reside in has a significant impact on our waste management. Accordingly, the examples of waste treatment overseas give us a good indicator and performance in the different strategies and schemes. In present, Australia focuses mainly on practices and policies

whereas Japan and USA rely heavily on waste technology such as incineration, energy recovery, waste power generation and waste to energy. Although Chapter 4 has explored the different waste technologies that will be implemented in Gosford but due to the high operation and maintenance cost, it will take an extensive time to become popular like Japan and USA.

This thesis discusses the statement, “The rapid increase of waste is creating pressure to our landfill capacity and this influences people’s attitude and behaviour toward waste disposal. Therefore, we should use our landfill as a final repository only for the unavoidable waste after waste treatment”. In fact, the research found that other than landfill, there are waste disposal methods which are environmentally sustainable such as recycling, composting, waste charging schemes and extended producer responsibility. These approaches are effective and long lasting because they do not cause risk and damage to the environment. Meanwhile, it reduces the energy in the production and transportation of resources through the reuse of raw materials.

Other waste technologies have also been discussed in the thesis such as gasification, waste power generation and incineration, although, a lot of investigation and research has to be carried out and tested for the performance of the different technologies. But at least, we are fully prepared and confident to face the different problems toward waste treatment in the years ahead. It is certain that different sectors must work together to solve the waste problem so that our future generation will not be burdened with cleaning up the mess we leave behind (HKEPD 2005, p.1). Secondly, the questionnaire reveals that people’s attitude and behaviour are crucial to the success of waste minimisation. Thus, if everyone has the same vision and puts an effort into recycling, it makes an enormous difference in achieving sustainable waste management in a long term perspective. But the core message here is to enhance the participation of every individual to be responsible for the products we consume and dispose. As planners, we must work together to control the waste problem as a perpetual investment for the future environment and community.

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## **APPENDICES**

Appendix A: Invitation to Participate - Composting

Appendix B: Recycling Calendar 2006

Appendix C: MSW Management Timeline (Hong Kong)

Appendix D: Ethics Advisory Panel Approval

Appendix E: Questionnaire

Appendix F: Summary of Questionnaire Responses

## Further Information

Call the Education Co-ordinator  
on 02 9724 3889

## To Register

Call the Education Co-ordinator  
on 02 9724 3889

OR

Complete the form below and either:

Fax to 02 9724 3715

OR

Post details to

39/46 Governor Macquarie Drive  
CHIPPING NORTON NSW 2170



I would like to attend the following  
**FREE composting workshop:**

Please Tick

Council Administration Building

- Seminar Room

Cnr Showground and Carrington  
Roads, Castle Hill (car park entry  
from Carrington Road)

9:30am - 10:30am

Saturday 27th May 2006

I am unable to attend but would  
be interested in other Composting  
Workshops in the future

Name \_\_\_\_\_

No. Attending (max.2) \_\_\_\_\_

Address \_\_\_\_\_

73

Contact No. \_\_\_\_\_



## What are the benefits of composting?

- Composting is a great way to recycle organic waste and reduce the amount of waste going to landfill
- Composting can help to reduce emissions of the greenhouse gas methane that is produced from rotting organic waste in landfill sites
- The compost produced helps to return nutrients to your soil and improves plant growth
- Composting helps to save water by improving the soil's capacity to hold water

*The Garden Shire*  
Composting  
Community

*The Garden Shire*  
Composting  
Community

# Invitation to Participate

• FREE composting workshops

• FREE compost bin for each household that participates

BAULKHAM HILLS SHIRE COUNCIL

APPENDIX A: INVITATION TO PARTICIPATE – COMPOSTING  
(Source: Baulkham Hills Shire Council 2006)

## What is a Composting Community?

It is a group of neighbours sharing their home composting experiences in order to lower the amount of food and garden waste going to landfill.

Households from selected streets in Baulkham Hills have been invited to participate in the Composting Community Program. It is anticipated that other Baulkham Hills Shire communities will have the opportunity to participate in the future.

*The Garden Shire*  
Composting  
Community



## How do I take part?

1. Register to participate in the program. Registrations can be made over the phone, by fax or mail (please see *Instructions overleaf*)
2. Fill in a survey before the workshop relating to your beliefs about composting
3. Attend a FREE one hour workshop about composting at:

Council Administration Building  
- Seminar Room  
Cnr Snowground and Carrington Roads,  
Castle Hill (car park entry from Carrington Rd)  
9:30am - 10:30am  
Saturday 27th May 2006

3. At the workshop receive a FREE compost bin (one per household)
4. Start composting your garden and food waste at home
5. Record the number of containers of food waste or garden waste put into your compost
6. Have access to the Compost Help-Line where you can gain solutions to any issues or problems that you have with your composting

## Why should I take part?

Participants of the Composting Community program will receive:

- ✓ A FREE compost bin (one bin per household)
- ✓ A FREE workshop provided by an Environmental Educator to inform you of the basic principles of composting (maximum of 2 people can attend per household)
- ✓ A FREE information booklet about composting and worm farming
- ✓ Access to a FREE Help-Line to assist your composting efforts
- ✓ Publicity of your street's composting efforts and the opportunity to get to know your neighbours

*The Garden Shire*  
Composting  
Community





## Baulkham Hills Shire Council Recycling Calendar 2006-2007

JJ Richards & SONS PTY LTD

### Recycling Collection (Area 1)

October 2006							November 2006							December 2006							January 2007							February 2007							March 2007																																																											
M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S																																																					
30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
April 2007							May 2007							June 2007							July 2007							August 2007							September 2007																																																											
M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S	S																																																					
30	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	

**Plastic containers (no lids)**  
△△△ only



**Package board**



**Steel and aluminium cans and empty aerosols**



**Glass bottles and jars (no lids)**



**Milk and juice cartons**



**Plastic bags**

**Nappies**

**Food scraps**

**Syringes**

**Green waste**

**Plastic containers**




**Waste and Recycling Hotline 1300 134 897**

Baulkham Hills Shire Council **9843 0555**

# A Policy Framework for the Management of Municipal Solid Waste (2005-2014)



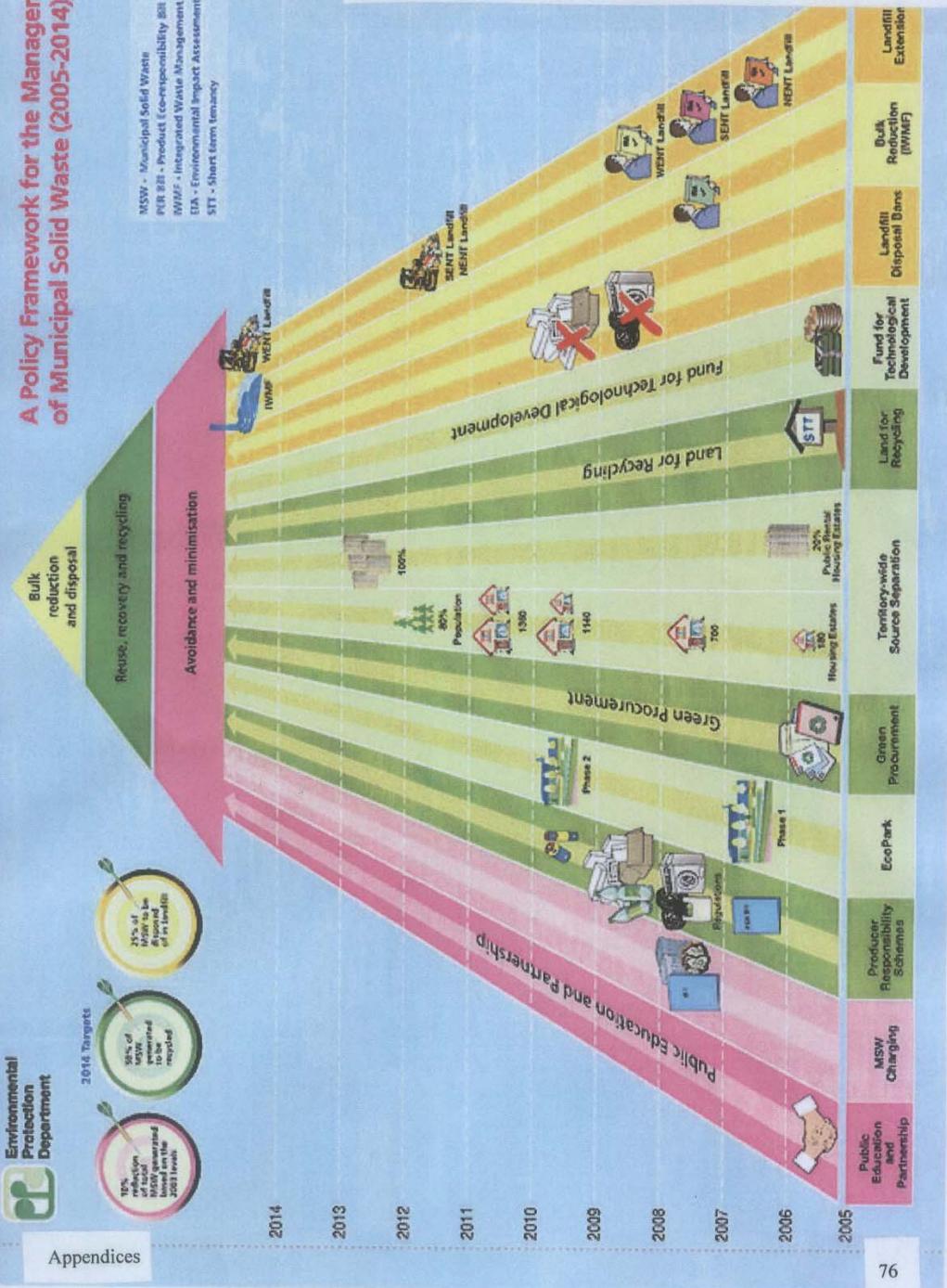
2014 Targets



MSW - Municipal Solid Waste  
 PWR 88 - Product Co-responsibility Bill  
 IWMPF - Integrated Waste Management Facilities  
 EIA - Environmental Impact Assessment  
 STT - Short term tenancy

2014  
2013  
2012  
2011  
2010  
2009  
2008  
2007  
2006  
2005

APPENDIX C: MSW MANAGEMENT TIMELINE (HONG KONG)  
 (Source: HK Environmental Protection Department 2005)



Appendices



18 August 2006

Application No: 065043  
Project Title: Personal and Domestic Waste Management in NSW

Attention: Shirley Yu  
Student No: 3064673

Dear Shirley,

Thank you for your application requesting approval to conduct research involving humans. The Panel has evaluated your application and upon their recommendation, has attached the decision below.

Please be aware that approval is for a period of twelve months from the date of this letter, unless otherwise stated below.

**Decision**

Approved with conditions                      Your application is approved; however, there are certain things you must do, before you may conduct your research. Please see below for details, and your responses will assist us in completing your file.

<b>Items that must be completed before research can commence:</b>	1	Your application does not include details about the timings of your research interviews or questionnaires. We cannot approve your application retrospectively. If your work has not been completed, please provide your detailed timing schedule, showing when you intend to conduct your research interviews or questionnaires, to the HREA Panel.
<b>Advisory comments:</b>	1	We do not recommend that you use your own personal address or telephone number on any documents issued to participants. If possible, you should supply an office or University contact details.
	2	You do not need a Consent Form for participants completing a Questionnaire; however, Consent Forms are needed whenever participating in a Focus Group or In-depth Interview, or whenever an interview is recorded.
	3	Please be aware that the HREA Panel cannot approve interviews or surveys of participants under the age of 18. Please see your Supervisor for further direction.

Any approval to conduct research given to the applicant Researcher is done so on the condition that the applicant Researcher is at the date of approval: (a) a Student undertaking an approved course of study in the FBE; or (b) a member of Academic Staff in the FBE. If, at any time subsequent to the date of approval and prior to completion of the research project the applicant

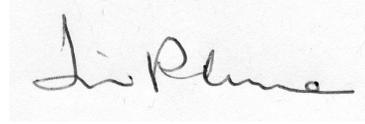
Researcher ceases to be either of (a) and (b) above, then any prior approval given to the applicant Researcher to conduct will be deemed to be revoked forthwith. The applicant Researcher must inform the FBE HREA Panel immediately upon any change, or possible change, to the applicant's status that may affect any prior approval given by the Panel to the applicant Researcher to conduct research.

Evaluation Authority:



Graham Fletcher (Convener)  
FBE HREA Panel

Approving Authority:



Jim Plume  
Head of School  
Faculty of the Built Environment

Copy to: S Thompson..., Supervisor



**Thesis Project Questionnaire:** Personal & Domestic Waste Management in NSW

**Student:** Shirley Yu (Ph: 0404 453 635, E-mail: yuenman123@hotmail.com)

**University Contact Details:** If you have any additional questions, you can contact Susan Thompson, the Associate Professor and Program Head of Planning & Urban Development (Ph: 9385 5295, E-mail: s.thompson@unsw.edu.au)

**Part 1 - Performance of Household Waste Management**

Q1) Which suburb do you live in Sydney and which Council does it manage by?

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Q2) What are the most common form of waste in your household?

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Q3) How much of your domestic waste can be recycled, reused or composted?  
Please explain.

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Q4) Who in your household is most active in making sure that rubbish gets sorted and recycled?

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Q5) Why do you concern about recycling? As a householder, what did you do to recycle waste material? (e.g. use the council bins, take material to central collection point at the local lump)

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Q6) What are the difficulties that your household is facing towards recycling?

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**Part 2 - Knowledge of Waste Management**

Q7) How would you rate your knowledge of what can and can't recycle?

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Q8) If you are unsure whether something can be recycled through your council's collection service, do you usually put it in for recycling anyway, put it your garbage/bin, or check with councils where it should go?

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Q9) Do you think is there enough waste management information such as recycle, reuse and reduce to the public? If not, where will you go to look for more information?

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**Part 3 - Attitude & Behaviour toward Waste Management**

Q10) Are there any items that you would like to recycle that you current can't?

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Q11) What has the biggest influence/function on encouraging you to recycle?

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Q12) If recycling bins were available like rubbish bins at streets, shopping centre. Would you separate your waste to recyclables and non- recyclable and litter to the appropriate bins?

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Q13) Do you use reusable shopping bags instead of plastic bags? If no, will you intend to use it in the future?

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## **APPENDIX F: SUMMARY OF QUESTIONNAIRE RESPONSES**

### **Part 1 - Performance of Household Waste Management**

#### **Q1) Which suburb do you live in Sydney and which Council does it manage by?**

##### ***North West***

1. Castle Hill (Baulkham Hills Shire Council) House
2. Glenhaven (Baulkham Hills Shire Council) House
3. Bella Vista (Baulkham Hills Shire Council) House

##### ***Northern Sydney***

4. Epping (Hornsby Shire Council) House

##### ***North Shore***

5. Killara (Ku-ring-gai Council) House
6. Chatswood (Willoughby City Council) Apartment
7. Chatswood (Willoughby City Council) Apartment
8. North Sydney (North Sydney Council) Apartment

##### ***South East***

9. Coogee (Randwick City Council) Duplex

##### ***Eastern Sydney***

10. Rosebery (City of Sydney) Duplex

##### ***Southern Sydney***

11. Bexley (Rockdale City Council) Townhouse

##### ***Western Sydney***

12. Parramatta (Parramatta City Council) Apartment

#### **Q2) What are the most common form of waste in your household?**

All Participants:

- a) Kitchen Waste [glad wrap, plastic packaging, tissues]
- b) Food Waste [fruit peels, vegetable offcuts, meat]
- c) Garden Waste [leaves, branches, grass]
- d) Chemical Waste [detergent, washing powder]
- e) Newspapers & Magazines

**Q3) How much of your domestic waste can be recycled, reused or composted?**

**Please explain.**

1. About 60 percent or more for items such as newspaper can be recycled, plastic bags and yoghurt boxes can be reused, food waste can be composted.
2. 65 percent can be recycled (i.e. magazines, aluminium cans, bottles and jars) and the food waste would be composted.
3. 50 percent can be recycled and the remaining waste goes to garbage.
4. 50 percent can be recycled and plastic bags will be reused for rubbish and we do not compost so the food waste goes to garbage directly.
5. 30 to 40 percent can be recycled and we do not compost.
6. 40 percent can be recycled such as plastic containers and packaging board. Since we live in apartments so we cannot compost the food waste.
7. 45 percent can be recycled and we do not reuse and compost in the household.
8. 30 percent can be recycled such as glass bottles and cans. Plastic bags are reused for garbage purposes and since we live apartment so we do not compost.
9. 60 percent can be recycled and we do not compost since there is no time so the remaining waste goes to the garbage.
10. 65 percent of the waste can be recycled such as magazines and newspaper and the other goes to the bin.
11. 60 percent of the waste can be recycled, e.g. newspapers magazines, bottles and containers.
12. 60 percent can be recycled and since we live in apartment which limits our compost activities so the food waste goes to the bin directly.

**Q4) Who in your household is most active in making sure that rubbish gets sorted and recycled?**

- a) Everyone (1, 2, 5, 6, 8, 11, 12)
- b) No One (3, 9) Participant No.3 & No.9 responded that “No one really takes the responsibility for recycling because just can’t be bothered”.
- c) Mother (4, 7, 10)

**Q5) Why do you concern about recycling? As a householder, what did you do to recycle waste material? (e.g. use the council bins, take material to central collection point at the local lump)**

All Participants:

- a) Council Recycling Bins

Note: Participants No.6, 7, 8 & 12 replied that there are 3 individual recycling bins for apartments and they are glass, plastic and aluminium.

**Q6) What are the difficulties that your household is facing towards recycling?**

1. Packaging with plastic lamination and dirty boxes packaging (i.e. meat trays) cannot be recycled.
2. Plastic items cannot be recycled.
3. No.
4. Unsure of recyclable and non-recyclable products.
5. No.
6. No but it would be good if plastic bags can be recycled in the future.
7. Plastic bags cannot be recycled but if there are more than I need, then I will put in the plastic bags reuse bins which are located at the supermarkets.
8. No.
9. No.
10. I do not have the time to sort out the waste whether it is recyclable or not which is a major problem for me.
11. Packaging on certain products do not state if they can be recycled and it is hard to determine if a particular product can be recycled.
12. No.

**Part 2 - Knowledge of Waste Management**

**Q7) How would you rate your knowledge of what can and can't recycle?**

All Participants:

- a) Average

**Q8) If you are unsure whether something can be recycled through your council's collection service, do you usually put it in for recycling anyway, put it your garbage/bin, or check with councils where it should go?**

All Participants (Except Participant No 5):

- a) Garbage/Bin (Additionally, Participant No.11 stated that "I would put it into the garbage bins because if they are not recyclable then I am concern if Council will empty my recycling bin if they see other non-recyclable items in the bin.")
- b) Check with the council's guideline (Participant No 5)

**Q9) Do you think is there enough waste management information such as recycle, reuse and reduce to the public? If not, where will you go to look for more information?**

All Participants (Except Participant No.11):

- a) Yes but improvement can be made by largely promoting the recycling message to the public through the publication of catalogues and pamphlets. But Participant No. 7

suggested that the publication process also consumes a lot of energy and paper which is not environmental either.

- b) No (Participant No.11 answered that “I don’t think there is enough information on what items council accept for recycling other than those that are daily use and I’ll check with Council for more information.”

### **Part 3 - Attitude & Behavior toward Waste Management**

**Q10) Are there any items that you would like to recycle that you current can’t?**

- a) Plastic Packaging (1, 2)
- b) Plastic Bags (6, 7, 10)
- c) Styrofoam (1, 2)
- d) CD-R (2, 7, 12)
- e) Furniture & Wardrobe (11)
- f) No (3, 4, 5, 8, 9)

**Q11) What has the biggest influence/function on encouraging you to recycle?**

All Participants (Except Participant No.9):

- a) Global warming; environment awareness; reduce landfill, pollution and the damage to the environment.
- b) No (Participant No.9)

**Q12) If recycling bins were available like rubbish bins at streets, shopping centre. Would you separate your waste to recyclables and non- recyclable and litter to the appropriate bins?**

All Participants:

- a) Yes

**Q13) Do you use reusable shopping bags instead of plastic bags? If no, will you intend to use it in the future?**

- a) Yes (1, 2, 4, 7, 8, 10, 12)
- b) No (3, 5, 6, 9, 11)

Participant No.3, 6, 9 & 11 are not using the reusable shopping bags in the moment but they are intended to purchase one due to environmental factors. Meanwhile, participants No.5 replied that “I need plastic bags for the garbage and there is collection bins available for the reuse of plastic bags so that’s recycle as well. But still, I am considering to purchase it to reduce the amount of plastic bags I have at home.”