Consultation Paper: Extended Producer Responsibility Priority Statement

Extended Producer Responsibility Priority Statement: Consultation Paper was prepared by the Waste Management Section of the NSW Environment Protection Authority, Sydney.

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Context

The development of an extended producer responsibility priority statement is a statutory responsibility of the Environment Protection Authority (EPA) under the *Waste Avoidance and Resource Recovery Act 2001*.

The wastes or products identified in this consultation paper on a first priority statement for NSW are those that the EPA considers to be both of concern and suitable for management through an extended producer responsibility (EPR) scheme. This draft priority statement does not, and is not intended to, address all waste materials or all waste management and resource recovery issues.

Many other waste materials may have detrimental effects on the environment, but EPR is not an appropriate tool to manage them. They are generally controlled through regulatory mechanisms, such as licensing under the *Protection of the Environment Operations Act 1997*.

Once finalised, the first priority statement will put relevant industries on notice that they need to act to reduce the amount and/or impact of their products in the waste stream. This consultation paper, however, does not recommend the introduction of any specific mandatory EPR schemes.

The data and other advice which led to the selection of the wastes or products of concern in this paper were the best available to the EPA at the time of preparation. The EPA expects that if any of the data in this paper is out-of-date, inaccurate or incomplete, industry and others will provide more appropriate and relevant data during the consultation period. This information will be carefully reviewed before finalising the wastes of concern and those which will be a priority focus.

The wastes or products identified in this paper have not been endorsed by the NSW Government and do not represent Government policy. The purpose of this consultation paper is to seek feedback on the proposed priorities for EPR. This will be followed by a report on submissions received and finalisation of an EPR priority statement for NSW.

Executive Summary

The Environment Protection Authority (EPA) is required under part 4 of the *Waste Avoidance and Resource Recovery Act 2001* to advertise a priority statement each year on extended producer responsibility schemes it plans to recommend to the Minister for the Environment for implementation. The EPA has prepared this consultation paper as a first step in meeting these requirements.

What is EPR?

Extended producer responsibility (EPR) is where manufacturers bear substantial physical and/or financial responsibility for the environmental impacts of their products. This includes 'upstream' impacts arising from the choice of materials and the manufacturing process, through to 'downstream' impacts from the use and disposal of products.

EPR is generally applied to post-consumer wastes which place increasing physical and financial demands on municipal waste management. It aims to encourage producers to 'internalise' a substantial portion of the environmental costs arising from the final disposal of their products. It also helps to keep products and materials out of the waste stream.

EPR schemes have been implemented in many other countries and regions including Europe, the United Kingdom, the United States, Canada, Taiwan, Japan and Korea.

Applicability of EPR

EPR has most often been applied to post-consumer wastes such as packaging, beverage containers, batteries, whitegoods (such as washing machines, refrigerators and dryers), computers, televisions and mobile phones. It is most effective for products where:

- there is a clearly identifiable producer
- the producer has a reasonable capacity to take action
- there is a well-structured or organised industry sector
- there is capacity to influence the whole supply chain.

EPR instruments

EPR is usually implemented using one of the following instruments:

- **take-back schemes**, where specific products or waste streams are taken back by the producer or returned to them
- **deposit/refund schemes**, where a payment is made when the product is purchased which is fully or partially refunded when the product is returned to a dealer or specialised treatment facility
- **advance recovery/disposal fees**, where a fee (generally paid at the point of sale) is levied on certain products, based on the estimated costs of collection and recycling
- **levies on particular materials** which are considered to cause pollution or create a hazard
- **performance standards**, where targets are set, for example, for minimum amounts of recycled content per product.

The instrument used to implement an EPR scheme will vary among industry sectors, depending on the type of waste, its environmental effects, the nature of the industry, and the state of the resource recovery market.

The priority statement

The purpose of the priority statement is to:

- identify wastes or products of concern
- put industry on notice that it will need to act to reduce the amount and/or impact of these products in the waste stream.

This consultation paper on the priority statement does not identify any EPR schemes which the EPA proposes to recommend for implementation. Instead, the EPA is giving industry, environment groups and the broader community an opportunity to provide further information to help in identifying the appropriate wastes of concern.

Assessment criteria

The EPA used one or more of the following criteria to identify the proposed wastes or products of concern in this paper:

- the detrimental environmental and/or public health impacts resulting from the waste
- the total volume of the waste requiring disposal and/or the percentage of the waste stream it comprises
- the potential for beneficial resource recovery
- the likelihood of illegal disposal through dumping or littering
- the level of community concern about the waste
- the extent to which EPR is the appropriate tool for managing the waste.

Wastes of concern

The preliminary wastes of concern the EPA has identified are:

- used tyres
- computers
- televisions
- nickel cadmium (NiCad) batteries
- agricultural/veterinary chemicals
- agricultural/veterinary chemical containers
- mobile phones and batteries
- packaging waste, including glass, PET[1], HDPE[2], liquidpaperboard[3], aluminium, steel, etc.
- cigarette butts
- electrical products, including whitegoods (other than computers, televisions and mobile phones)
- end-of-life vehicle residuals

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[1] PET = polyethylene terephthalate: clear plastic or tinted soft drink bottles and food or sauce containers

[2] HDPE = high-density polyethylene containers such as opaque plastic milk bottles, cream and fruit juice containers and solid coloured plastic used for detergent and cleanser containers

[3] Used, for example, to make milk cartons

- household hazardous waste components, e.g. paints, domestic pesticide and automotive chemical wastes, pharmaceuticals, smoke alarms, batteries (other than NiCads) containing lead and other toxic materials
- office paper
- polyvinyl chloride (PVC)
- treated timber, especially with copper chrome arsenate (CCA) and creosote
- whitegood residuals.

The identification of these wastes of concern is of a preliminary nature only. The EPA obtained information on these materials for each of the listed criteria largely from a review of national and international literature. The EPA expects that, if any of the data in this paper is out-of-date, inaccurate or incomplete, industry and others will provide more appropriate and relevant data. This information will be carefully reviewed before finalising the wastes of concern and those which will be a priority focus. This information will also help the EPA decide whether to include a waste or product in subsequent priority statements.

Priority areas of focus for the EPA over the next 12 months

The EPA will focus over the next year on the wastes or products that best meet the assessment criteria and are therefore of the highest immediate priority. The following wastes or products will require early action by industry to reduce the amount and/or impact of these materials in the waste stream:

1. wastes currently without a post-consumer management scheme:
    - used tyres
    - computers
    - televisions
    - NiCad batteries (excluding mobile phone batteries)
2. wastes with a post-consumer management scheme which the EPA will monitor and evaluate:
    - agricultural/veterinary chemicals
    - agricultural/veterinary chemical containers
    - mobile phones and batteries
    - packaging waste.

Next steps

The EPA is interested in receiving feedback on any aspect of this consultation paper, but particularly welcomes comment on the assessment criteria, the data and information used, the identified wastes of concern, the priority areas of focus for the EPA and possible evaluation criteria for EPR schemes. The EPA will consider all comments received, publish a report on the submissions and finalise the wastes of concern and those which will be a priority focus. As part of their respective roles, both the EPA and Resource NSW will discuss options for EPR with those industry sectors whose wastes are nominated as the final priority areas of focus.

An expert reference group will be established to advise the EPA and the Minister on the development and implementation of EPR schemes. The EPA, in consultation with the reference group, will evaluate progress of the industry sectors in developing and/or implementing effective EPR schemes, and reducing the amount and/or impacts of their products in the waste stream. Depending on the outcome of this evaluation, the EPA may recommend in future years the implementation of mandatory EPR schemes to the Minister for the Environment.

Introduction

Many sectors in society are becoming increasingly aware that current patterns of production and consumption need to be changed if we are to achieve ecological, social and economic sustainability. In particular, there is a clear need to substantially reduce the generation of waste and use resources more efficiently. To this end, it is critical to ensure that everyone meets their responsibilities to either avoid waste or recover useable resources, and that necessary policies and other measures are in place to ensure this happens.

Waste generation can have adverse impacts on the environment and public health. These impacts include pollution of surface and ground water; air pollution; generation of greenhouse gases; contamination of land; and noise, odours and other impacts on local amenity. The transport of waste can also cause similar impacts. Community concerns over potential environmental impacts make the siting of new landfills problematic in developed areas, while the siting of landfills in remote locations increases transport costs and energy use. Waste disposal may be an inefficient use of resources and an indicator of unsustainable practices. Equally importantly, resource recovery and reuse is necessary to achieve sustainability.

Extended producer responsibility (EPR) is an emerging principle for a new generation of waste prevention policies which focus on whole-of-life-cycle systems rather than the end of the product chain or end-of-pipe emissions from individual production facilities. In its broadest sense, EPR is the principle that producers bear responsibility for the environmental impacts of their products. This includes ‘upstream’ impacts arising from the choice of materials and the manufacturing process, through to ‘downstream’ impacts from the use and disposal of products.

The major impetus for EPR came from northern European countries in the late 1980s and early 1990s, as they were facing severe landfill shortages. It was quickly recognised that the benefits from EPR far outweighed simply reducing the pressure on landfill space. EPR also encourages reduction of waste at source and recycling, leading to reduced consumption of energy and materials and products with lower toxicities. This in turn leads to decreased environmental impacts, such as air and water emissions. In short, EPR has emerged as an important strategy for sustainability.

EPR is not a static concept, and the ways in which it is most effectively implemented are still being explored. Nonetheless, it is generally considered to be a sophisticated and useful tool that is producing positive results.

Legislative framework

In NSW, the Environment Protection Authority (EPA) is required by the *Waste Avoidance and Resource Recovery Act 2001* to develop a priority statement for EPR. Specifically, under part 4 of the Act, the EPA must advertise each year a priority statement on EPR schemes that it intends to recommend that the Minister for the Environment implement. The EPA is required to seek community input on its proposed priority statement and publish a report on the submissions.

The Act also enables regulations to be made to implement EPR schemes, but only after the Minister for the Environment is satisfied that this is necessary and the requirements of the Act have been met. Before recommending the introduction of an EPR regulatory scheme, the Minister must consider:

- the volume of waste requiring ultimate disposal or the toxicity of the waste generated
- whether there is an existing national scheme which adequately addresses waste issues in NSW
- whether there is an effective voluntary scheme in place which is able to achieve the desired outcomes and is being actively implemented, monitored and reported on
- whether economic analysis supports introduction of the scheme
- whether there are any constitutional or other impediments to NSW acting unilaterally in implementing the scheme.

Implementing EPR

The purpose of the priority statement on EPR is to:

- identify wastes or products of concern
- put industry on notice that it will need to act to reduce the amount and/or impact of these products in the waste stream.

The intent of the EPR provisions under the Act is to give industry an opportunity to voluntarily reduce the amount or effect of their products in the waste stream. Only in cases where industry has failed to act effectively will the Government intervene through EPR regulatory action.

The EPA sees implementation of EPR generally as a four-step process:

- In the *first* step the EPA identifies wastes of concern and invites community (including industry) feedback on those selected. The EPA will give priority focus to specific wastes of concern in the ensuing 12 months and encourage the identified industries producing them to take action to reduce their volume and/or impacts.
- The *second* step, at the end of the 12 months, is an evaluation by the EPA of industry performance over that period.
- In the *third* step the EPA may recommend to the Minister for the Environment the introduction of appropriate mandatory EPR schemes. Alternatively, the EPA may advise the Minister that no regulatory schemes are necessary, where industry has voluntarily introduced effective measures.
- In the *fourth* step, if necessary, the Minister assesses the need for a regulatory scheme, taking into account the criteria specified in the Act, including the progress made by industry in implementing the voluntary scheme.

Priority statements will be produced annually by the EPA. Future statements will identify wastes of concern and, where appropriate, recommend specific EPR schemes.

Providing comments

This paper includes:

- general information about EPR
- guiding principles that the EPA is considering adopting as indicators of successful EPR schemes
- wastes that the EPA proposes to identify as being of concern
- specific wastes of concern that the EPA intends to focus on as a priority over the next 12 months
- an outline of the steps that the EPA will take after receiving comments on this paper.

During passage of the *Waste Avoidance and Resource Recovery Act 2001*, the NSW Government highlighted its commitment to a robust and consultative process before it would consider introducing any mandatory EPR schemes. In line with this commitment, the EPA is seeking feedback on the first proposed priority statement, its approaches to EPR schemes, and the preliminary wastes of concern. The EPA will take into account submissions received before finalising the wastes of concern and those which will be a priority focus.

The EPA is particularly seeking responses to the following questions:

- Are the wastes identified as being of concern appropriate? Are there other wastes that should also be considered?
- Are the wastes that the EPA intends to focus on as a priority appropriate? Are there other materials that you consider more appropriate?

- Is the method used by the EPA to identify possible wastes of concern suitable, as set out in the list of assessment criteria and the supporting fact sheets? Are there other important factors that the EPA should consider?
- Is there additional data that would help the EPA identify wastes as being of concern or which would indicate that the identified wastes are not a concern?
- Is EPR the most effective tool for addressing the wastes included in this statement?
- What criteria should the EPA use to evaluate whether future actions taken by industry to reduce the impacts or volume of waste are sufficient to preclude any regulatory intervention by government?

The closing date for comments is Wednesday **30 April 2003**. Please send comments to:

Director Waste Management
NSW Environment Protection Authority
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or by e-mail to: info@epa.nsw.gov.au

under the title 'EPR Priority Statement Consultation'.

Responses to the consultation paper: privacy information

The EPA must handle personal information according to the *Privacy and Personal Information Protection Act 1998*. Details such as name, private address or other information that can identify respondents personally is defined as 'personal information' in that Act.

Any personal information received as part of comments on the consultation paper may be used for the purpose of developing a final priority statement. Personal details may be made known in some circumstances but only for the purpose of finalising this or later statements. For example, this could include acknowledging the authors of some comments.

Extended Producer Responsibility

Introduction

Extended producer responsibility (EPR) aims to keep products and materials out of the waste stream by ensuring that manufacturers play a strong role in effective waste management throughout the product's life cycle. The Organisation for Economic Co-operation and Development (OECD) has defined extended producer responsibility as:

'*an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle.*'[4]

The principle of EPR is that:

'*Producers of products should bear a significant degree of responsibility (physical and/or financial) not only for the environmental impacts of their products downstream from the treatment and disposal of their product, but also for their upstream activities inherent in the selection of materials and in the design of products.*'[5]

Not all waste products or materials are suitable candidates for an EPR scheme. EPR is most effective for post-consumer wastes where:

- there is a clearly identifiable producer
- the producer has a reasonable capacity to take action
- there is a well structured/organised industry sector
- there is capacity to influence the whole supply chain.

For other waste materials which have detrimental effects on the environment, EPR is not the best management tool. For example, many industrial and hazardous wastes, and by-products from industrial processes, such as slags and fly ash, are more effectively controlled through regulatory mechanisms, such as licensing under the *Protection of the Environment Operations Act 1997*.

EPR one of a suite of tools

EPR is one of a suite of tools that all levels of government (local, state and Commonwealth) can use to reduce the amount and/or impacts of waste materials. Other tools which deliver improved waste management outcomes include education, cleaner production, and a range of policy, economic and regulatory instruments, as outlined below.

Education: The NSW Government's litter reduction campaign has included such themes as *Don't be a tosser*, *Litter: it's in your hands*, and waste avoidance education as part of the *Our Environment – It's a Living Thing* program. The EPA has also worked with Clean-up Australia, Keep Australia Beautiful, the Nature Conservation Council of NSW and local government to pursue education campaigns with local communities.

Cleaner production: The NSW Government's Profiting from Cleaner Production Industry Partnership Program offers matched funding to help individual businesses, clusters of businesses and industry sectors introduce cleaner production processes. The program has a budget of $5 million over three years. Examples of businesses that have been involved in the program to date include the Motor

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[4] Organisation for Economic Co-operation and Development 2001, *Extended Producer Responsibility: A Guidance Manual for Governments*, p. 9

[5] Organisation for Economic Co-operation and Development 2001, *Extended Producer Responsibility: A Guidance Manual for Governments*, pp. 21–22

Traders Association, Advanced Manufacturing Centre with the Office of Western Sydney, Australian Pork Ltd, Mid Coast Dairy Advancement Group Inc., Master Painters Association, the composites industry and the boating industry.

Policy and market development: These include the NSW Government's Waste Reduction and Purchasing Policy, which encourages agencies to purchase materials with a recycled content where they are competitive on cost and performance; planning instruments such as the Waste Not Development Control Plan; and the Green Specifications for recycling concrete, brick and tiles in local roads.

Economic instruments: These include the waste levy in the Sydney Metropolitan and Extended Regulatory Areas, which discourages disposal to landfill; grant schemes such as Resource NSW's $3-million Research and Development Scheme; tax deductions provided by the Commonwealth Government for the development of industry waste plans; and differential pricing imposed by some councils for different sized garbage bins.

Regulatory and legal instruments: Examples include waste clean up notices under the *Local Government Act 1993*; environment protection licensing for generating, storing, transporting, receiving, processing, recycling and disposing of waste under the *Protection of the Environment Operations Act 1997*; enforcement, such as for litter offences; banning the disposal of certain wastes to landfill (such as whole tyres in the Sydney Metropolitan Area); and international treaties and conventions.

EPR is generally applied to post-consumer wastes that place increasing physical and financial demands on municipal waste management. It aims to send appropriate signals to producers to internalise a substantial portion of the environmental costs arising from the final disposal of the product.

EPR in practice

Producer responsibility for the management of post-consumer waste has been part of a broad range of international initiatives over the last decade, from the EPR schemes developed in Europe to the product stewardship and EPR schemes in North America. Many of the latter schemes have focused more on shared responsibility, but all systems involve a number of stakeholders to varying degrees. These include governments, designers, producers, manufacturers, suppliers, transporters, retailers, consumers, waste managers and recyclers.

Getting producers to play a greater role in effective waste minimisation beyond the point of sale or warranty helps keep products and materials out of the waste stream. In many cases, producers are more able to take the necessary action to avoid waste or recover resources than are the users of products. However, it is recognised that a substantial part of the costs incurred by producers through delivering EPR are normally passed on to the users of products.

EPR schemes have been implemented in many other countries and regions, including Europe, the United Kingdom, the United States, Canada, Taiwan, Japan and Korea. In all cases, they focus on developing sustainable systems that eliminate or minimise environmental impacts across a product's entire life cycle.

EPR schemes may be voluntary or mandatory or a combination of both. Some examples of voluntary and/or mandatory schemes are described below.

Examples of **voluntary and/or mandatory EPR schemes** include:

Voluntary EPR schemes	Refrigerant Reclaim Australia (RRA) spreads the cost of reclaiming and safely destroying surplus ozone-depleting refrigerants across industries using new refrigerants. RRA is administered and funded by an industry-wide levy of $1 per kilogram of refrigerants produced or imported. The revenue is held in a trust fund that pays for collecting and reprocessing reclaimed ozone-depleting substances. It is obligatory for wholesalers to take back the material, either for reprocessing or safe destruction. RRA was formed by the producers concerned to share the cost across the whole refrigerant industry. A nationwide network of collection points has been established.
Voluntary EPR schemes supported by regulation	The National Packaging Covenant is a cooperative approach between industry and all spheres of government that aims to achieve a nationally consistent approach to the life cycle management of packaging and paper. The covenant is supported by a National Environment Protection Measure which requires non-signatories to the covenant to meet certain standards, unless they can show that they are producing outcomes equivalent to those companies implementing the covenant.
Mandatory EPR schemes	In 1998, the Japanese Parliament passed a law on the recycling of specified household appliances. This law sets up a system of payments at the time of disposal. When consumers buy a replacement for one of the products covered, they can ask the retailer to take back the used product at the time of delivery. A special recycling charge is payable by the consumer. The retailer must return the used products to the manufacturers and importers, who are required to recycle them.

EPR instruments and measures

There are three primary categories of instruments that can be used to implement EPR: take-back schemes, economic instruments and performance standards.[6]

Examples of **take-back schemes** include:

Electronic product take-back schemes	Sweden's ordinance on producer responsibility requires dealers and manufacturers of electrical and electronic equipment to take back, free of charge, a piece of old equipment when the customer buys a new equivalent product. Producers are expected to finance their part of the take-back system through a fee on new products. In Norway, a nationwide system for the recycling of wastes from electrical and electronic products, as well as decommissioned machines, is in operation. The scheme is financed through an environmental fee, which is added to electrical and electronic products at the point of sale. In the Netherlands, the Disposal of White and Brown Goods Decree places almost full responsibility for electronic take-back on manufacturers and importers of electronic products. The legislation allows industry to impose a surcharge on the price of new products to help fund take-back schemes. A collection and disposal system for waste electrical and electronic equipment has been set up by the electronics industry.
Waste Electric and Electronic Equipment (WEEE) directive	This proposed European Union directive aims to promote electrical products that are designed for repair, upgrade, reuse, dismantling and safer recycling. It also sets a target for electronic waste recovery per capita annually.

[6] Organisation for Economic Co-operation and Development 2001, *Extended Producer Responsibility: A Guidance Manual for Governments*

Producer Responsibility Organisation labelling system	German industry has developed a labelling scheme to meet recycling and refilling targets required by the government and to allow industry to impose fees on packaging materials. Under the system, consumer product manufacturers pay an industry-created body to place a green dot on their packages. This represents a 'recycling guarantee'. The licensing fees paid by companies are used to pay for the collection and recycling of packaging waste throughout Germany. Where industry fails to achieve the set targets, a government-prescribed program is put in place. Other countries including Austria, Belgium, the Czech Republic, France, Greece, Hungary, Ireland, Latvia, Luxembourg, Norway, Poland, Portugal, Spain and Sweden are also now using the green dot system.

Examples of **economic instruments** include:

Consumer batteries	Denmark, Switzerland and Sweden have required makers/suppliers of small consumer batteries to levy a refundable deposit.
Beverage containers	A deposit refund scheme for beverage containers has been operating in South Australia since 1975. A refund of 5 cents per eligible container is provided to consumers, primarily at collection depots. The scheme currently covers beer and soft drink containers.
Mobile phone batteries	In Australia, industry charges a fee of 42 cents on every new phone purchased to provide for the collection and appropriate disposal of the phone batteries at the end of their product life. In Switzerland, a fee of 16 cents is imposed on each mobile phone sold to cover the costs of recycling. Currently the Swiss cost is low because the number of phones sold greatly exceeds the number that enters the waste stream in a given year.
Televisions and computers	In Switzerland, the recycling fee for a television is US$20. In the United States, advance recovery/disposal fees have been proposed for televisions and computers in Nebraska and South Carolina.

Performance standards involve, for example, setting targets of minimum amounts of recycled content per product. Progressive standards create the opportunity for innovation and encourage the take-back of materials for recycling or reuse of the product. They are often used for paper products, glass containers and beverage containers.

Other mechanisms include *eco-labelling*, in which labels are placed on products and packaging to provide consumers with information about a product's environmental performance;[7] and *product service systems*, in which manufacturers retain ownership of a product through leasing products and servicing them, rather than selling them to consumers.

Benefits of EPR

The benefits of a properly designed and implemented EPR scheme include:

- being a driving force for waste reduction and associated pollution reduction throughout many sectors of the economy
- reducing the number and scale of landfills and waste treatment facilities and their accompanying environmental impacts

[7] Eco-labelling is a form of consumer claim and Australian laws exist that protect consumers from claims that are misleading or likely to be deceptive.

- reducing the cost to local governments/communities for the physical and/or financial requirements of waste management
- improving the ease and timeliness of disassembling products for recycling and reuse
- encouraging resource recovery
- decreasing or eliminating potentially hazardous components of products
- promoting cleaner production and products
- supporting the achievement of public recycling and materials management goals
- promoting more efficient use of natural resources and materials
- closing of material loops to promote sustainable development
- encouraging more efficient and competitive manufacturing
- promoting more integrated environmental management by emphasising the product's life cycle.

Industry may benefit additionally from: market advantage through environmental leadership; greater adaptability within the government policy/legislative frameworks; and direct returns, such as energy and resource savings, reduced cost of pollution control measures and better product design.

Developing and implementing EPR schemes

Effective EPR schemes vary among industry sectors and depend on the types of waste, their environmental effects, the nature of the industry, and the state of the resource recovery market.

Generally, however, any EPR scheme needs to focus on environmental outcomes and include milestones, targets or other performance indicators to measure progress towards achieving these outcomes against established benchmark information. The steps in Figure 1 could be used as a guide by industry in developing an extended producer responsibility scheme.

An effective EPR scheme is likely to:

- be transparent to the community
- contain focused and measurable outcomes
- achieve wide participation
- promote best practice and continuous improvement
- follow a clear and structured process that promotes effective implementation
- allow flexibility in the means of achieving outcomes
- successfully accommodate large and small players
- support ongoing performance monitoring and reporting
- integrate EPR into mainstream business processes
- link into markets for recovered material
- be cost-effective
- be compatible with national initiatives
- address relevant national and international competition issues.

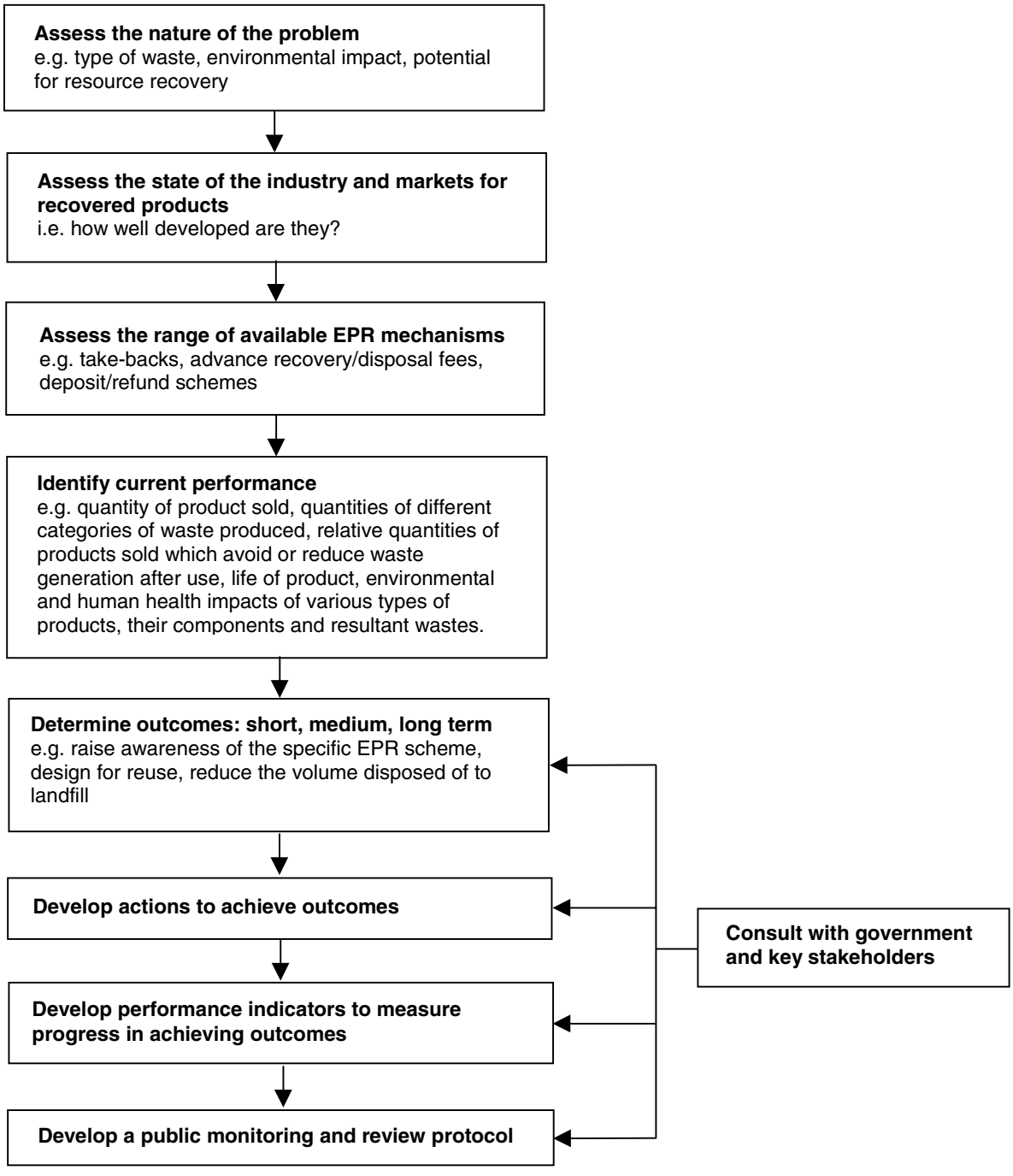

Figure 1: Steps in developing an EPR scheme

Key outcomes of the NSW Waste Avoidance and Resource Recovery Strategy

The *NSW Waste Avoidance and Resource Recovery Strategy*[8] was released in February 2003. The strategy identifies targets for achieving waste avoidance and resource recovery, and provides a framework for delivering these through the commitment of industry, government and other stakeholders to key programs and actions.

EPR schemes need to be closely linked and complement the strategy. For the wastes identified in this consultation paper, the four key outcome areas of the strategy are therefore the major initiatives which industry will be expected to focus on, namely:

- avoiding and preventing waste
- increased use of renewable and recovered resources
- reducing toxicity in products and materials
- reducing litter and illegal dumping.

These outcomes may be expanded into measures to gauge the success of an EPR program over a range of areas, such as:

Avoiding and preventing waste: Is less waste being generated? How many products have been redesigned to be more environmentally compatible? Have the products been redesigned to be less energy-intensive or to use less material or fewer materials? What changes to design have been made to enable the product to have a longer useful life? Can the product be reused for its original purpose (after re-conditioning) or for an alternative purpose?

Increased use of renewable and recovered resources: Is less waste being disposed of to landfill? Are materials that are easier and more economical to recycle being used in the manufacture of products? What is the input of raw materials per unit of product? What is the total energy used per unit of production? What proportion of the feedstock comes from sustainable sources? Is more waste being processed and more recyclate used in new products? What changes have been made to products to make them easier to recover or recycle?

Reducing toxicity in products and materials: Has the quantity of toxic materials contained in products been reduced? What is the quantity of toxic materials use per unit of product?

Reducing litter and illegal dumping: Is there a reduction in the quantity of the product being littered or illegally dumped? Is there an increase in the quantity of the product being recovered?

More information

The Environment Directorate of the Organisation for Economic Co-operation and Development (OECD) has produced a guidance manual for governments that contains useful information on EPR issues and benefits, and on the actions required to establish effective EPR programs. The manual, titled *Extended Producer Responsibility: A Guidance Manual for Governments*, is available on the OECD website at www.oecd.org

[8] A copy of the strategy is available on the Resource NSW website at www.resource.nsw.gov.au

Wastes of Concern

As an initial step in preparing its first EPR Priority Statement, the EPA has identified a number of wastes that are of concern according to one or more of the following criteria:

- the detrimental environmental and/or public health impacts resulting from the waste
- the total volume of the waste requiring disposal and/or the percentage of the waste stream it comprises
- the potential for beneficial resource recovery
- the likelihood of illegal disposal through dumping or littering
- the level of community concern about the waste
- the extent to which EPR is the appropriate tool for managing the waste.

The identification of these wastes of concern is of a preliminary nature only. The EPA obtained information on these materials for each of the listed criteria largely from a review of national and international literature. The EPA expects that, if any of the data in this paper is out-of-date, inaccurate or incomplete, industry and others will provide more appropriate and relevant data. This information will be carefully reviewed before finalising the wastes of concern and those which will be a priority focus. This information will also help the EPA decide whether to include a waste or product in subsequent priority statements.

The EPA has identified the following wastes of concern:

- used tyres
- computers
- televisions
- nickel cadmium (NiCad) batteries
- agricultural/veterinary chemicals
- agricultural/veterinary chemical containers
- mobile phones and batteries
- packaging waste, including glass, PET[9], HDPE[10], liquidpaperboard (e.g. milk cartons), aluminium, steel, etc.
- cigarette butts
- electrical products, including white goods (other than computers, televisions and mobile phones)
- end-of-life vehicle residuals
- household hazardous waste components, e.g. paints, domestic pesticide and automotive chemical wastes, pharmaceuticals, smoke alarms, batteries (other than NiCads) containing lead and other toxic materials
- office paper
- polyvinyl chloride (PVC)

[9] PET = polyethylene terephthalate: clear plastic or tinted soft drink bottles or food or sauce containers

[10] HDPE = high-density polyethylene containers include opaque plastic milk bottles, cream and fruit juice containers and solid coloured plastic used for detergent and cleanser containers

- treated timber, especially with copper chrome arsenate (CCA) and creosote
- whitegood residuals.

More detailed descriptions of each waste are included later in this section.

Priority areas of focus for the EPA

The EPA will focus on those wastes or products that best meet the above assessment criteria and are therefore of the highest immediate priority. The following wastes or products will require early action by industry to reduce the amount and/or impact of these materials in the waste stream:

- used tyres
- computers
- televisions
- nickel cadmium (NiCad) batteries, excluding mobile phone batteries.

The above wastes have been selected using the earlier criteria. They are also characterised by having no existing scheme for the effective post-consumer management of the waste. Schemes may be in the process of development, but do not currently have whole-of-industry agreement. The EPA will work to ensure that effective mechanisms are put in place by the relevant industries to reduce the quantities and/or impacts of these materials in the waste stream. For its part, industry will need to demonstrate progress against current performance data and in accordance with sound and publicly transparent performance evaluation criteria.

Another four wastes, which have post-consumer waste management schemes in place, will be closely monitored over the next 12 months:

- agricultural/veterinary chemicals
- agricultural/veterinary chemical containers
- mobile phones and batteries
- packaging waste.

These products have also been selected on the basis of the criteria above. The EPA's emphasis for these products will be to monitor and evaluate current waste management schemes to assess their effectiveness in reducing the quantities and/or impacts of these materials in the waste stream. Progress will need to be demonstrated by the industry sectors against current performance data.

Descriptions of each waste of concern

Used tyres

Of the 60,000 tonnes of discarded tyres generated each year in NSW, 54,000 tonnes (or 90%) are disposed of to landfill. An estimated 10% of waste tyres are illegally disposed of, or inappropriately stored before disposal.

Used tyres persist in the environment. Tyres, particularly in stockpiles, have potentially adverse environmental impacts and create threats to public health and safety. Because of their chemical makeup, burning tyres are extremely difficult to extinguish and cause severe atmospheric pollution. A recent fire in Sydney hospitalised people from surrounding areas due to respiratory concerns. Problems can also include water pollution from runoff from tyre fires, pollution of waters by chemicals leaching from dumped tyres, and solid waste management problems in landfills.

Computers and televisions

Significant quantities of electronic waste, including computers and televisions, are disposed of to landfill every year. For example, modelling of industry figures by Meinhardt Infrastructure and Environment Group[11] estimated that nationally by 2006 there would be 1.6 million computers disposed of to landfill, 1.8 million sent to storage (in addition to 5.3 million already in storage) and 0.5 million recycled.

Computer and television components such as lead, cadmium and flame retardants may impact adversely on human health and the environment or limit opportunities for material recycling. For example, lead in waste televisions and computers could contribute to heavy metal leakage from poorly managed landfills.

The rapid obsolescence of electronic equipment is inefficient, as is the use of non-renewable resources in manufacture which cannot be readily reused or recycled. There is some illegal dumping of obsolete equipment.

The presence of hazardous components (such as cathode ray tubes) in the waste stream may physically or financially create a barrier to recovery and recycling.

Nickel cadmium (NiCad) batteries, excluding mobile phone batteries

Rechargeable NiCad batteries are used extensively in both industrial and household applications to provide portable, long-life and low-cost power systems. NiCad batteries are used in small kitchen appliances, cordless phones, power tools and laptop computers. They are also used for communications equipment, emergency lighting and emergency power for medical equipment and hospitals. The most toxic component of NiCad batteries is the cadmium, which could cause environmental and health problems if disposed of inappropriately, e.g. if batteries are damaged or burnt. NiCad batteries also contain nickel, steel and graphite, which are potentially recoverable.

The levels of heavy metals, such as cadmium and nickel, may create a barrier to the recovery of other materials using biological or thermal waste processes.

Agricultural/veterinary chemicals

Unwanted stocks of agricultural/veterinary chemicals may pose serious risks to the environment, human health and international trade. For example, organochlorine pesticides bioaccumulate, others are highly mobile and can move or leach into surface and/or ground water, while others are persistent in soils and sediment. Pesticide contamination of primary produce can have a serious impact on trade. Misuse or accidental exposure to pesticides can affect health.

While no data is publicly available on agricultural/veterinary chemical use or waste generation, a recent report by the Australian Academy of Technological Sciences and Engineering estimated that 5000 tonnes of organophosphate insecticide were used in Australia every year.[12]

Agreed extended producer responsibility scheme

The industry association for agricultural and veterinary chemical manufacturers (Avcare) and the National Farmers' Federation have agreed to develop and implement a scheme called ChemClear to collect and safely dispose of unwanted chemicals. ChemClear will begin pilot collections in 2003, with the full roll-out to commence in 2004.[13] The Government-funded scheme to collect unwanted

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[11] *Computer and Peripherals Material Project*, consulting report prepared for Environment Australia by Meinhardt Infrastructure & Environment Group for Environment Australia, October 2001

[12] Australian Academy of Technological Sciences and Engineering 2002, *Pesticide Use in Australia*, p. vii

[13] 'New times, new responsibilities', *Avcare Annual Review 2001–02*

agricultural and veterinary chemical waste (ChemCollect) ceased collections in NSW in December 2002.

Industry firmly committed to the ChemClear scheme in November 1998. It was on the basis of industry's commitment to exercise its responsibilities through ChemClear that governments agreed to deliver the fully subsidised ChemCollect scheme. Industry now has the benefit of four years' experience from ChemCollect to help it prepare to commence the ChemClear scheme.

Agricultural/veterinary chemical containers

Agricultural/veterinary chemical containers that have not been properly rinsed have the potential to introduce pesticides into the environment if not disposed of appropriately. It is recommended practice, however, to triple-rinse or pressure-rinse emptied pesticide containers and pour the rinsate into the spray tank to ensure that very little, if any, pesticide remains in the container.

Current extended producer responsibility scheme

drumMUSTER is a national program for the collection and recycling of empty, cleaned, non-returnable crop production and on-farm animal health chemical containers. The National Farmers Federation, the National Association for Crop Production and Animal Health (Avcare), the Veterinary Manufacturers and Distributors Association, and the Australian Local Government Association together developed the initiative.

The drumMUSTER program provides for the collection, recycling or disposal of pesticide containers over 1 kilogram or litre in size manufactured by participants in the program. A levy of 4 cents per kilogram or litre is paid by consumers at the point of purchase for the collection and recycling or appropriate disposal of the containers. The program recently received Australian Competition and Consumer Commission approval to extend the coverage to non-hazardous product containers and containers with a capacity of less than one kilogram or litre. drumMUSTER currently operates in 82 out of the 86 rural council areas that the program identified as priorities in NSW. It operates in 115 out of all 172 NSW local government areas.

drumMUSTER data indicates that over 3 million waste agricultural/veterinary chemical containers (4800 tonnes) were collected by the program between 1 February 1999 and 30 November 2002.[14] The largest numbers of containers collected were 1.8 million 20-litre plastic containers (2200 tonnes) and 890,000 20-litre steel containers (1600 tonnes). Currently, between 25 and 30% of chemical containers sold annually are recycled through the drumMUSTER program.

Mobile phones and batteries

Heavy metals in mobile phones and batteries, such as nickel, copper and cadmium, may have an adverse impact on the environment if disposed of to landfills or energy-from-waste facilities, and during reprocessing. In Australia, 4–6 million mobile phone batteries are disposed of or recycled each year, according to the Australian Mobile Telecommunications Association (AMTA). Some components used in mobile phones or batteries are made from non-renewable resources. The rapid development of new models and technology has accelerated the number of obsolete mobile phones. AMTA estimates that Australia's 12 million mobile phone users replace their handset every 18–24 months.

Current extended producer responsibility scheme

In 1999, the mobile phone industry established a voluntary program that aims to recycle potentially toxic components in mobile phones, batteries and accessories. A levy of 42 cents on each new phone handset pays for the collection and appropriate disposal of unwanted phones and batteries. The

[14] drumMUSTER progress report, November–December 2002

industry scheme managed by AMTA has collected approximately 30 tonnes of phones, batteries and accessories to date (around 253,000 handsets).

Packaging waste

The total amount of packaging produced in Australia has not been quantified. However, over 88,000 tonnes of polyethylene terephthalate (PET) was consumed in 2000, 32,500 tonnes of liquidpaperboard packaging (e.g. milk cartons) was manufactured in 2000–01; and over 607,000 tonnes of primary beverage container packaging was produced in 2001.[15] Packaging waste, including glass and plastic bottles, paper and plastic bags, comprises around one-third of the litter stream.

Good resource recovery opportunities exist for some materials such as glass, high-density polyethylene (HDPE) and PET plastic, aluminium, paper and cardboard.

Current extended producer responsibility scheme

Packaging waste is being addressed through the National Packaging Covenant, which commenced in August 1999 and is in place until mid-2004. This is a joint industry and government initiative and is managed by a council with representatives from local and state governments and industry. It is underpinned by a regulatory National Environment Protection Measure (NEPM) for Used Packaging Materials, enforced by the States, which applies to businesses who do not join the covenant. An evaluation of the effectiveness of the covenant and NEPM is due in late 2003/early 2004.

Cigarette butts

Approximately 31 billion cigarette butts are generated every year in Australia. Cigarette butt litter comprised 58% of all items littered in public places around Australia[16] and butts have consistently made the top 10 of items picked up in Clean-up Australia Day rubbish since it started in 1990. Melbourne Water reports that cigarette butts make up about one-third of the more than one billion items of litter finding their way into Melbourne's waterways each year.

Cigarette butts can remain in the environment for at least five years. Preliminary hazard assessment indicates that butts pose a moderate hazard to aquatic organisms. Chemicals can leach from cigarette butts within an hour of contact with water and the toxicity of butt leachate persists for at least seven days. Cigarette butts have also been found in the stomachs of birds, turtles, whales and fish, affecting digestion and potentially leading to poisoning or starvation. Discarded cigarette butts have been identified as a cause of bushfires around the State.[17]

Electrical products—excluding computers, televisions and mobile phones

Significant numbers of electrical products are discarded each year (e.g. 2.5 million major whitegoods appliances in Australia[18]) and these numbers are increasing. This number of products translates directly into millions of tonnes of metals, plastics, glass, composites and various other materials.

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[15] Information sourced from action plans supplied under the National Packaging Covenant by the Plastics and Chemicals Industries Association, the Association of Liquidpaperboard Carton Manufacturers Inc. and the Beverage Industry Environment Council respectively. Action plans can be downloaded from the Packaging Council of Australia website at www.packcoun.com.au

[16] Beverage Industry Environment Council & Community Change 2001, *Littering Behaviour Study III: Measuring Environmentally Desirable Change in Australia*, BIEC

[17] The 1995 *NSW Fire Brigades Annual Report* estimated that cigarettes and matches directly caused over half of all fires in the built environment, with as many as 1200 grass and bushfires each year attributed to cigarettes.

[18] Environment Australia 2001, *Major Appliances Materials Project*, Table 1, Commonwealth of Australia, Canberra

Resource NSW has estimated that the amount of electrical waste in Australia from small appliances[19] is 31,400 tonnes.

The manufacture, use and disposal of electrical equipment emits approximately 48 million tonnes of greenhouse gases, a significant component of Australia's overall emissions.

In addition, most small and consumable electrical products, such as vacuum cleaners, power tools, kettles, toasters, hairdryers, lighting, etc., are made from non-renewable materials and low levels of recyclable or recycled content. The complex nature of these products makes material recovery difficult. The availability of these products for consumption and their ultimate disposal is likely to continue to increase because of low product prices and the increasing range of applications.

An issue is heavy metals and other toxic chemicals in electrical products, e.g. lead in light bulbs and their potential to contaminate the municipal waste stream. See Household Hazardous Waste below.

End-of-life vehicle residuals

The process of metal shredding follows the recovery and recycling of car parts of 'end-of-life' vehicles. These are vehicles that have reached the end of their operational life, estimated by the Australian Bureau of Statistics to be around 0.5 million vehicles annually and rising.[20]

A competitive market exists for recycled auto parts and the metal content of these vehicles (metals account for about 70% of vehicles by weight). The residual product from metal shredding includes rubber, glass, plastic, lead, other heavy metals, oils, automative fluids, etc. This is generally landfilled. Around 70,000 tonnes of shredder residuals are generated in NSW each year. Designing for disassembly at the design stage could reduce the metal recycling industry's disposal quantities and costs.

Household hazardous waste components

These include paints, domestic pesticide and automotive chemical wastes, pharmaceuticals, smoke alarms, and batteries (other than NiCads) containing lead and other heavy metals.

Disposal of these materials into the municipal waste stream or sewerage systems can adversely affect occupational and public health and safety, the operation of sewage treatment plants and/or biota downstream from sewage treatment plants. A particular concern is the ability of these wastes to cause problems for more innovative thermal and biological municipal waste treatment technologies. Household hazardous wastes may contaminate and limit recovery of resources from such processes, e.g. lead contaminating composts.

An estimated 8800 tonnes of household hazardous waste is generated in metropolitan Sydney each year. Around 50% of this waste is collected and diverted from the waste stream or sewer systems.[21]

A major challenge in strengthening appropriate producer responsibility for these wastes is the diversity of industries that they come from. Resource NSW is developing a program to help in the management of these wastes.

Office paper

The increasing use of computers in the workplace has accelerated office paper use. Consequently, office paper is a significant waste stream that continues to grow. A recent audit of nine office

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[19] Small appliances include television sets, radios, hi-fi equipment, vacuum cleaners, power tools, kettles, toasters, hairdryers, lighting, etc.

[20] Environment Australia 2002, *Environmental Impacts of End-of-Life Vehicles: An Information Paper*

[21] Information supplied by Resource NSW at www.resource.nsw.gov.au

buildings by Resource NSW indicated that 39 reams of copy paper are thrown out or recycled by every employee each year or 1.7 reams per square metre of office space per year.[22] Paper generally comprises about 55% of office waste. Office paper in this context includes printing and writing papers, writing pads and envelopes.

The levels of recycled content in office paper available in Australia could be increased. Although it is difficult to verify, the average recycled content of Australian office papers is believed to be low compared with paper available in other countries.

Polyvinyl chloride (PVC)

Over 200,000 tonnes of PVC is used in new products in Australia each year, with an estimated 10,000 tonnes disposed of to Sydney landfills each year. Unwanted PVC can be recycled into new products. There are three main problems associated with PVC during waste management:

- PVC can be a source of chlorine in energy-from-waste facilities which may release dioxins to the atmosphere if inappropriate technology is used.
- During mixed plastics recycling, the presence of PVC may cause the formation of hydrochloric acid, which may damage machinery and be an occupational health and safety risk for workers.
- Some plasticisers or additives in PVC may limit recycling or reuse options.

In November 2002, the Vinyl Council of Australia committed to a voluntary product stewardship scheme to promote improved environmental practices.

Treated timber

There are competing public interests for using timber treated with copper chrome arsenate (CCA) and creosote. The use of the chemicals extends the life of building materials used in houses and other timber structures with significant benefits to the community. However, inappropriate use of treated timber may adversely affect the environment and the health of workers or the public. Inappropriate disposal of treated timber can cause localised air emissions, leachate problems in unlined landfills or low-level contamination of land if applied as a mulch (or other materials such as wood ash).

Treated timber mixed with other wood waste limits the potential for the whole load to be recovered and reprocessed.

Whitegood residuals

Where metal recycling of such products occurs, the residuals from metal shredding include plastics and contaminants such as heavy metals and oils. Some residuals from whitegoods re-manufacturing and recycling may require special treatment because of the presence of ozone-depleting chemicals in the insulating foams and the refrigerants. In some European countries, the metal-shredding operation is undertaken in a vacuum so that the ozone-depleting chemicals can be recovered. Strategies to de-gas and disassemble the motors, other valuable parts and the plastic components could be developed by industry.

[22] Resource NSW 2002, *Waste Reduction and Recycling in Office Buildings Fact Sheet*

Next Steps

The EPA will consider all comments submitted on this consultation draft of the priority statement, including responses to the specific questions on which information is being sought and more general comments.

The EPA will reconsider the identification of wastes of concern in response to submissions received.

The EPA will prepare and publish a report on submissions received and inform the community about any revision of the identification of wastes of concern.

An expert reference group will be established to advise the EPA and the Minister on the development and implementation of EPR schemes.

As part of their respective roles, the EPA and Resource NSW will both seek to discuss options for EPR with the industry sectors whose wastes are finally identified as priority areas of focus. Discussions could focus on, for example, the sector's current waste generation and management practices, the Government's expectations, information and programs which may assist industry in its task to reduce the volume and/or impacts of its waste, and the best means of ongoing communication.

The EPA will consult with the reference group in evaluating the progress of the industry sectors that are finally identified as priority areas of focus. The EPA will assess industries' development and/or implementation of an effective EPR scheme and the level of progress in reducing the amount and/or impacts of their products in the waste stream. Depending on the outcome of this evaluation, the EPA may recommend in future years the implementation of a mandatory EPR scheme to the Minister for the Environment.

Appendix I:
Supporting Fact Sheets—Wastes for Priority Focus

These fact sheets have been developed for those wastes of concern that do not currently have a management scheme in place and are priority areas of focus for the EPA. They are intended to demonstrate why these wastes have been identified as a priority area of focus for the EPA and to inform the relevant industry sectors of the issues they should consider in developing an EPR scheme.

Used tyres

Computers

Televisions

Nickel cadmium (NiCad) batteries

Used Tyres

Of the 60,000 tonnes of discarded tyres generated each year in NSW, 54,000 tonnes (or 90%) are disposed of to landfill. An estimated 10% of waste tyres are illegally disposed of or inappropriately stored before disposal.

Used tyres persist in the environment. Tyres, particularly in stockpiles, have potentially adverse environmental impacts and pose threats to public health and safety. Problems can include atmospheric pollution from burning, potential water pollution from runoff from tyre fires, pollution of waters by chemicals leaching from dumped tyres, and solid waste management difficulties in landfills.

Why is the waste a problem?	
Quantity disposed of: absolute and percentage of waste stream	Current figures show that 170,000 tonnes of waste tyres are generated in Australia each year, the equivalent of 18 million car tyres. This figure is rising. 60,000 tonnes (around 6 million) tyres are generated in NSW and 90% of these are disposed of to landfill.
Environmental and/or health impacts	Used tyres persist in the environment. Tyres, particularly in stockpiles have potentially adverse environmental impacts and pose threats to public health and safety. Problems include atmospheric pollution from burning tyres; potential water pollution from runoff from tyre fires; the cost of fighting tyre fires; pollution of waters by chemicals leaching from dumped tyres; weed habitat and visual amenity impacts; solid waste management problems in landfills; and air emissions from tyres used as a fuel source. Water in dumped tyres can be a suitable environment for mosquitoes to breed, which can cause nuisance and mosquito-borne diseases. Used tyres that have been in water for 1.5 years continue to leach a variety of chemicals which adversely affect the organisms in the surrounding environment. After 10 years' environmental exposure, however, leachates from the tyres are no longer toxic. Health impacts from used tyre fires can be significant. A recent fire in Sydney hospitalised people from surrounding areas due to respiratory concerns.
Is it a significant component of illegally dumped materials?	Yes, in NSW an estimated 10% of waste tyres are illegally disposed of or inappropriately stored.
Is it a significant component of the litter stream?	Not usually regarded as litter.
Potential for resource recovery	Tyres are large, discrete objects which lend themselves to separate collection and transport systems. Used tyres are usually aggregated (e.g. at tyre dealerships, garages, etc.). Potential types of recovery include energy recovery, building materials, etc. The energy value of used tyres is comparable to coal. Another potential means of resource recovery is to convert tyres (via pyrolysis) to oil and other products.

Used Tyres

Does the presence of the substance in the waste stream create a barrier to recovery of other components or to innovation/uptake of new processes and/or technologies?	Whole tyres create problems in landfills as they consume large amounts of space and contain voids, which allow movement of gases and liquids. Buried whole tyres are reported to rise back to the surface. Their presence has been reported to destabilise compacted landfills. Tyres on vehicles affect recovery of residual waste and profitability of metal recovery in 'end-of-life' vehicles.
What infrastructure is available now?	
What systems are in place to collect the substance separately?	There are a large number of independent used tyre transporters in NSW, but their operations are not systematic. Collection is less of an issue than what happens to the collected tyres, which have little or no inherent value.
What reuse, recycling and/or disposal options are available?	Some reuse options exist: tyres can be recycled into other products such as rubber matting and other crumb rubber products, mixed into bitumen or used in civil engineering (e.g. retaining walls). However there are minimal markets for most products. Tyres have energy-from-waste potential in cement manufacturing and electricity generation. Most tyres are currently disposed of to landfill.
What actions have been taken to manage the waste?	
What actions have been taken by governments and/or industry overseas? How relevant are these in the Australian context?	• Bans to landfill in the USA. • Export to developing countries for reuse or recycling. • European Union Directive 1999/3 bans landfilling from 2006. • The United Kingdom is currently developing a statutory producer responsibility scheme and has a protocol for using tyres in cement kilns.
What have industry and government done in NSW and Australia?	An Industry Waste Reduction Plan in NSW between 1997 and 2001 was not supported by industry. Current measures: • Ban on landfill disposal of whole tyres in Sydney Metropolitan Area/Extended Regulated Area in NSW • Various regulatory controls including controls to prevent burning and illegal dumping, licensing of transport, storage and processing of large quantities of tyres. A national product stewardship scheme is under consideration through the Environment Protection and Heritage Council.
What are the barriers to better recovery/reduced generation?	
Structure of the generating sector and/or supply chain	There are two Australian tyre manufacturers with a turnover of $786 million in 2001 and approximately 90 importers of new tyres. There are an estimated 1700 used tyre industry operators in NSW involved in collection, retreading, transport, processing, etc. of used tyres.
Availability/maturity of systems and technologies to reduce, recover and/or reprocess	There is minimal potential for waste reduction. The technology is available for recovery and reprocessing, but the resulting products are not highly competitive in the marketplace.

Used Tyres

What markets exist for recovered products? Are there higher value uses?	Minimal markets exist currently. Retreading is a higher value reuse, although the car tyre retread market is in decline.
What barriers have been identified through current voluntary measures or pilot programs?	The waste tyre industry is fragmented. Barriers to entry to some segments of the industry are low and margins are low.
What opportunities exist for substitution with lower impact products or materials?	None foreseen
What can government do to support industry action?	
Identify areas and forms of assistance	• Assist in market development for recycled materials • Support energy-from-waste
Identify alternatives/other drivers to EPR	• Advance recovery/disposal fee • Limits on disposal
Identify whether systems are needed for existing stocks	An EPR scheme may need to account for any large existing stockpiles and dumps.
Participate in/support community education initiatives by industry	Education initiatives on tyre maintenance have had minimal effect. Tyres do not accumulate in households, so community education would need to focus on supporting markets for recycled tyre products and encouraging dealers to manage used tyres responsibly.

Computers

It has been estimated that by 2006 in Australia, 1.6 million computers will be disposed of to landfill each year, 1.8 million sent to storage (in addition to 5.3 million already in storage) and 0.5 million recycled. Computer components such as lead, cadmium and flame retardants may adversely affect human health and the environment on disposal or during material recycling. The rapid obsolescence of equipment is inefficient as is the use in manufacture of non-renewable resources which cannot be readily reused or recycled. Computers have a high potential for resource recovery.

There is minor illegal dumping of obsolete equipment. The presence of hazardous components (such as cathode ray tubes) in the waste stream may physically or financially create a barrier to recovery and recycling.

Why is the waste a problem?	
Quantity disposed of: absolute and percentage of waste stream	An estimated 2000–5000 tonnes of computers are disposed of to landfill in NSW per year. A recent Australian report[23] suggests that around 70% of obsolete computers are stored and only 1.5% disposed of to landfill.
Environmental and/or health impacts	Circuit boards, batteries and the glass in cathode ray tubes (CRTs) contain hazardous materials such as lead, mercury and hexavalent chromium. CRT monitors can contain about 2 kg of lead on average, with the exact amount depending on size and make. If disposed of, computers must be sent to landfills which are designed and managed to minimise adverse environmental impacts such as the escape of lead and other materials. Electronics equipment has been cited as a leading source of mercury in municipal waste. In addition, brominated flame retardants are commonly added to the plastics used in electronics. All of these substances are either human or environmental toxicants. They can be released into the environment through incinerator ash or landfill leachate, if improperly handled.[24]
Is it a significant component of illegally dumped materials?	No
Is it a significant component of the litter stream?	No

[23] *Computer and Peripherals Material Project*, prepared by Meinhardt Infrastructure & Environment Group for Environment Australia, October 2001

[24] US EPA Fact Sheet 2001, available at www.epa.gov

Computers

Potential for resource recovery	High potential for resource recovery. Computers are currently being produced which are designed for disassembly and have lower quantities of problematic materials such as lead, cadmium and flame retardants. Removing the problematic materials during design and production of a computer lowers the material management costs for recyclers. Markets for second-hand computers and parts have grown significantly in the last five years as the advantages from upgrading computer technology have declined. Second-hand computers are substantially cheaper than new models and can perform word processing or terminal functions for mainframe systems adequately. Major retailers are selling second-hand computers with warranties. Obsolete computers are being disassembled for material reprocessing. Additional efforts are needed to lower the costs of reprocessing plastics and glass from cathode ray tubes. The software on an end-of-life computer may be valuable and increase the potential for the equipment to be recycled. However, there are issues with software copyright and information security.
Does the presence of the substance in the waste stream create a barrier to recovery of other components or to innovation/uptake of new processes and/or technologies?	The heavy metals and flame retardants in computers would increase the costs for establishing and operating energy-from-waste facilities. Additional gas-scrubbing equipment and ash treatment may be required, depending on the design and operation of the energy-from-waste facility or feedstock quality. Improved collection systems may be required to divert materials such as cathode ray tubes and plastics.
What infrastructure is available now?	
What systems are in place to collect the substance separately?	The market for second-hand computers supports a free collection system for computers from business and large organisations that are less than five years old. Small business computers or computers used domestically can be dropped off for reuse, recycling or disassembly for materials at scrap metal merchants or second-hand computer refurbishers. Depending on the type, age and condition of the computer, a fee may be charged or the computer purchased. Computer screens typically incur a charge. Domestic computers placed on the kerbside for council hard waste collections are often scavenged before collection because of the potential value of the materials once disassembled. Computer screens are generally not scavenged.
What reuse, recycling and/or disposal options are available?	A range of options exists, from auctioning or selling unwanted computers for reuse and recycling to disassembly for material recovery. Some computers or parts of computers are deliberately destroyed due to concerns over data security and some have been designed to minimise the opportunity for espionage.

What actions have been taken to manage the waste?	
What actions have been taken by governments and/or industry overseas? How relevant are these in the Australian context?	Governments have implemented a range of strategies to improve the recovery of computers from the waste stream. Some governments have banned the use of materials that would be problematic during recycling and disposal in the design and manufacture of new computers. Another initiative under active consideration internationally has been the mandatory take-back of computers by manufacturers from consumers. Other governments have restricted the disposal of computers to certain types of landfills or energy-from-waste facilities. Some of the problematic materials that are concentrated during disassembly are regulated for transport and processing. International treaties cover computer scrap materials containing hazardous materials. Some governments have regulatory systems for the management of problematic wastes from generation to disposal. These requirements are in addition to any voluntary or mandatory extended producer responsibility or product stewardship schemes. In some countries, such as the United States, waste regulatory systems are being simplified to encourage the recovery and recycling of computers. Industry has developed new technologies and designs to minimise the levels of hazardous components in computer equipment. This includes finding alternatives to lead solder and introducing flat screen monitors to replace cathode ray tubes. Other design initiatives include strategies to improve the disassembly of computers and label plastics for recycling. Software manufacturers have addressed the need to transfer the licence with the hardware. The voluntary development of systems such as labels indicating the ownership of software attached to hardware like hard disks will encourage refurbishment, reuse and recycling of computers.

Computers

What have industry and government done in NSW and Australia?	In 1998, the NSW Government held a roundtable with industry to discuss end-of-life options for computers. Following this, in 1999, industry approached the former Australian and New Zealand Environment and Conservation Council (ANZECC) with an undertaking to develop a voluntary national product stewardship scheme for electrical equipment, including computers. To support the industry scheme, the Commonwealth Government commissioned Meinhardt Infrastructure & Environment Group to prepare a report on computers and peripherals.[25] A detailed discussion paper was also released. In NSW, a number of State Government agencies have adopted approaches supporting a voluntary product stewardship scheme: • The Department of Public Works and Services included environmental criteria in major government computer tenders and contracts in 2001 • Resource NSW and the Australian Information Industry Association are implementing a computer collection pilot program in western Sydney, in conjunction with local government and the Office of Western Sydney from November 2002 to March 2003.
What are the barriers to better recovery/reduced generation?	
Structure of the generating sector and/or supply chain	End-of-life computers are generated in three sectors: • *Large organisations* which generally sell excess computers to auctioneers or second-hand dealers • *Small- to medium-sized enterprises* which store them or offset the cost of data removal with free removal by computer refurbishers • *Households* where they typically stored, donated to relatives or friends, charities, community groups and scrap metal merchants, or disposed of to landfills. Auctions and trading of second-hand computers are common, with major retailers offering them with a warranty. Some integration of second-hand computer services has developed, such as data and hardware removal, refurbishment, parts recycling and disassembly.
Availability/maturity of systems and technologies to reduce, recover and/or reprocess	The supply chain for recovering and recycling computers has matured significantly over the last five years. Computers can be reused within networked systems as terminals. The speed, memory and software programs of computers manufactured since 1997 are adequate for many small- to medium-sized enterprises or domestic use. The disassembly of computer equipment for materials is commercially driven by the value of the metals. Several Sydney scrap metal merchants advertise for computer scrap. However, the glass from monitors and plastics from disassembled computers cost recyclers to dispose of, so this limits effective recovery of large volumes.

[25] *Computer and Peripherals Material Project*, prepared by Meinhardt Infrastructure & Environment Group for Environment Australia, October 2001

Computers

What markets exist for recovered products? Are there higher value uses?	Computers are complex mixtures of materials. Non-functioning or obsolete computers which cannot be reused or recycled for parts are scrapped. Metals such as copper, nickel, lead, aluminium and iron are recovered for recycling. Computers have special engineering plastics, which may contain additives to minimise fires, making recycling of them possibly problematic. The glass from cathode ray tubes can be used as a flux for lead and copper smelting, but the economic and environmental benefits need further evaluation.
What barriers have been identified through current voluntary measures or pilot programs?	Industry participants involved in voluntary measures (such as the existing markets for refurbishing computers and recycling materials and parts) have identified the following barriers: • The costs of disposing of the glass from cathode ray tubes • Poor markets or uncertainty in recycling plastics • Hazardous/industrial waste regulations for transport and storage • Software licences.
What opportunities exist for substitution with lower impact products or materials?	Computer manufacturers have begun to adopt practices to lower the impact of their products by substituting less toxic materials, e.g. liquid crystal screens instead of lead glass-screened cathode ray tubes. Large organisations can minimise the need to purchase new computers by establishing networked systems that link existing desktop systems as terminals.
What can government do to support industry action?	
Identify areas and forms of assistance	Government could encourage cathode ray tube glass as an alternative to the virgin sand materials used as fluxes at lead and copper smelters. This would be consistent with the shared responsibility product stewardship model proposed by the computer industry. Government could work with industry to develop a computer reuse and recycling guide for large organisations. This would assist in recovering computers for recycling before they are stored due to perceived concerns about data security and residual values. Government could consider strategies for recovering and recycling domestic computers.
Identify alternatives/other drivers to EPR	The Meinhardt report indicates that around 1.5% of computers are disposed of to landfills. This low rate may be due to uncertainty about how to dispose of computers and the consequent storage by owners, or high recovery and recycling rates. Limits on the disposal of computers to landfills could be considered in areas where a computer collection system is in place and working effectively for domestic computers.
Identify whether systems are needed for existing stocks	Around 70% of the computers stored are held by companies and individuals at home. Any collection and recycling strategy would need to accelerate the recovery of computers at a rate that does not swamp computer refurbishers and recyclers.
Participate in/support community education initiatives by industry	Government could help promote industry-funded education campaigns for computer collection and recycling.

Televisions

Significant quantities of electronic waste, including televisions, are disposed of to landfill every year. Components such as lead, cadmium and flame retardants may adversely affect human health and the environment on disposal or during material recycling. The rapid obsolescence of equipment is inefficient as is the use in manufacture of non-renewable resources which cannot readily be reused or recycled.

There is some illegal dumping of obsolete equipment. The presence of hazardous components (such as cathode ray tubes) in the waste stream may physically or financially create a barrier to recovery and recycling.

Why is the waste a problem?	
Quantity disposed of: absolute and percentage of waste stream	The quantities of televisions and entertainment equipment disposed of to landfills are difficult to determine accurately, although for NSW they are estimated to range between 5000 and 15,000 tonnes per annum.
Environmental and/or health impacts	The components used in the manufacture of televisions and entertainment equipment have an adverse impact on the environment if released. Problematic materials include lead from the solder and within the glass of cathode ray tubes (CRTs), flame retardants used within plastics and on printed circuit boards, and small quantities of heavy metals in standby batteries. CRT monitors can contain about 2 kg of lead, with the exact amount depending on size and make. Mercury from electronics has been cited as a leading source of mercury in municipal waste. In addition, brominated flame retardants are commonly added to the plastics used in electronics.[26] All of these substances are either human or environmental toxicants. They can be released into the environment through incinerator ash or landfill leachate, if improperly handled.
Is it a significant component of illegally dumped materials?	Some illegal dumping of obsolete equipment does occur. These materials are often collected during council hard waste collections, but some dumping occurs when residents move premises.
Is it a significant component of the litter stream?	No
Potential for resource recovery	The components used to manufacture televisions and entertainment equipment are generally made from non-renewable resources. Improved recovery and recycling will minimise the need to consume these resources. The move to digital televisions planned from 2008 will result in the disposal of more analogue televisions. Overseas studies suggest that the metals and plastic components in televisions do not have sufficient value to offset the costs of disassembly and recycling cathode ray tubes. This could be improved by lowering the cost of cathode ray tube recycling, designing for disassembly and establishing disassembly facilities. Additionally there may be efficiencies by collecting electrical equipment together, i.e. televisions with the more profitable whitegoods and computers.

[26] US EPA Fact Sheet 2001, available at www.epa.gov

Televisions

Does the presence of the substance in the waste stream create a barrier to recovery of other components or to innovation/uptake of new processes and/or technologies?	The presence of cathode ray tubes from televisions in the waste stream may physically or financially create a barrier to recovery and recycling of other waste.
What infrastructure is available now?	
What systems are in place to collect the substance separately?	There are currently no systems in place to collect televisions and entertainment equipment separately in NSW.
What reuse, recycling and/or disposal options are available?	There is some reuse of televisions and entertainment equipment within households. Some second-hand televisions and entertainment equipment are available commercially at opportunity shops operated by charities. A recent trend has been the use by councils of 'second-hand Saturdays' to minimise the quantities collected by hard waste collections. These events encourage the reuse of televisions and entertainment equipment across the community, although their electrical safety needs to be checked. Most obsolete televisions or entertainment equipment are disposed of by council-operated hard waste collections or delivery to transfer stations or landfills.

Televisions

What actions have been taken to manage the waste?	
What actions have been taken by governments and/or industry overseas? How relevant are these in the Australian context?	Governments have implemented a range of strategies to improve the recovery of televisions and entertainment equipment from the waste stream. Some governments have banned the use of materials that would be problematic during recycling and disposal in the design and manufacture of new equipment. Another initiative under active consideration internationally has been the mandatory take-back of televisions and electrical equipment by manufacturers from consumers. Other governments have restricted the disposal of televisions and entertainment equipment to certain types of landfills or energy-from-waste facilities. Some of the problematic materials that are concentrated during disassembly are regulated for transport and processing. International treaties cover electrical scrap materials containing hazardous materials. Governments have regulatory systems for the management of problematic wastes from generation to disposal. These requirements are in addition to any voluntary or mandatory extended producer responsibility or product stewardship schemes. In some countries, such as the United States, waste regulatory systems are being simplified to encourage the recovery and recycling of electrical equipment. Industry has developed new technologies and designs to minimise the levels of hazardous components in televisions. This includes finding alternatives to lead solder and introducing flat screen monitors to replace cathode ray tubes. Other design initiatives include strategies to improve the disassembly of televisions and label plastics for recycling. Pilot studies in the US state of Minnesota indicate that, for television re-collection and recycling, the cost of disassembly and management of the problematic components is higher than the value recovered from other parts.
What have industry and government done in NSW and Australia?	A television collection and recycling pilot was conducted in Melbourne in 2001[27] to support the development of a voluntary national industry product stewardship scheme. The pilot was funded by television and entertainment equipment suppliers such as Hitachi, LG Electronics, Mitsubishi Electric, NEC Australia, Panasonic, Philips, Samsung Electronics, Sanyo, Sharp and Sony; the Consumer Electronics Suppliers Association; Australian Electrical Equipment Manufacturers Association; EcoRecycle; and the Centre for Design at the Royal Melbourne Institute of Technology. The pilot will help evaluate the effectiveness of various collection strategies and develop an understanding of the costs involved in disassembling televisions and recycling materials. The findings of the pilot could be used by industry to justify the establishment of a scheme to encourage the recycling of televisions and entertainment equipment.

[27] Details from the Centre for Design, RMIT University at www.cfd.rmit.edu.au/dfe/takebackpilot

Televisions

What are the barriers to better recovery/reduced generation?	
Structure of the generating sector and/or supply chain	The majority of televisions and entertainment equipment are used domestically, although schools, other educational institutions and some companies also use them.
Availability/maturity of systems and technologies to reduce, recover and/or reprocess	Systems and technologies to recover, disassemble and recycle televisions or entertainment equipment are limited in NSW. Systems are in place for the recovery of materials such as metals, printed circuit boards, cables and electronic components such as transformers. Improved processing technologies are being developed and used internationally. These technologies separate components using a range of operations including magnetism, eddy currents and static electricity. They improve efficiency and reduce labour costs.
What markets exist for recovered products? Are there higher value uses?	Televisions and entertainment equipment are complex mixtures of materials. Non-functioning or obsolete equipment which cannot be reused is disposed of to landfills. The plastics used in televisions may contain additives to minimise fires, which may make their recycling problematic. The glass from cathode ray tubes can be used as a flux for lead and copper smelting, although the economic and environmental benefits need further evaluation.
What barriers have been identified through current voluntary measures or pilot programs?	The Melbourne pilot collection project (see above) has not published any outcomes as yet.
What opportunities exist for substitution with lower impact products or materials?	Over the next 10 years, as the price of flat screen televisions falls, sales of models with cathode ray tubes is likely to gradually decline. Although flat screens are more complex to manufacture, there are associated advantages such as lower energy use in operation, less packaging, reduced environmental impacts from distribution and transport because of their lighter weight and, most importantly, the absence of lead in the glass. Careful consideration of the component chemistry of liquid crystal screens is needed. Many manufacturers of entertainment equipment are replacing standby batteries containing problematic materials with batteries with lower environmental impacts. Lead solder is being replaced by tin-based solders with a major television manufacturing facility in western Sydney making the change-over recently. Careful consideration of the chemistry of alternatives is needed. Opportunities exist to replace the problematic flame retardants used on circuit boards and the plastic components with more benign materials. There are consumer protection laws in NSW that require electrical equipment to achieve set safety standards and it is possible that these could be revised to include EPR requirements. Other environmental initiatives already use the consumer safety approval scheme, such as the energy performance standards for some types of electrical equipment.

Televisions

What can government do to support industry action?	
Identify areas and forms of assistance	Government could encourage cathode ray tube glass as an alternative to the virgin sand materials used as fluxes at lead and copper smelters. This would be consistent with the shared responsibility product stewardship model proposed by equipment manufacturers. Government could consider strategies for recovering and recycling electrical equipment and supporting charity groups, councils or other organisations to divert materials from landfills.
Identify alternatives/other drivers to EPR	Government could consider limiting the disposal of televisions and entertainment equipment to landfills in areas where a collection system is in place and working effectively.
Identify whether systems are needed for existing stocks	Televisions and entertainment equipment are less likely to be stored than computers. It is not considered likely that there will be a backlog of televisions.
Participate in/support community education initiatives by industry	Industry could fund education campaigns for the collection of televisions and their recycling.

Nickel Cadmium Batteries

Rechargeable nickel cadmium (NiCad) batteries are used extensively in both industrial and household applications to provide portable, long-life and low-cost power systems. The most toxic component of the batteries is the cadmium, which could cause environmental and health problems if disposed of inappropriately. NiCad batteries also contain nickel, steel and graphite which are potentially recoverable.

The levels of heavy metals such as cadmium and nickel may create a barrier to the recovery of other materials using biological or thermal waste processes.

Why is the waste a problem?	
Quantity disposed of: absolute and percentage of waste stream	NiCad batteries are used to power electrical equipment or supply back-up power to equipment such as uninterruptible power supplies (UPS) for computer facilities and telephone exchanges. The number of NiCad batteries disposed of to NSW landfills is difficult to estimate but is thought to be less than 500 tonnes a year, or 0.01% of the total waste stream. It consists primarily of non-recyclable parts from battery disassembly, such as plastic separators.
Environmental and/or health impacts	NiCad batteries are composed primarily of nickel, cadmium and their compounds. Future battery-operated appliances may require the use of new materials with less impact on the environment or human health during their recycling or disposal.
Is it a significant component of illegally dumped materials?	No
Is it a significant component of the litter stream?	No
Potential for resource recovery	The larger batteries and those that are able to be separated from industrial equipment are nearly fully recovered because of the value of the materials. Smaller batteries and batteries built into equipment to provide power to an internal clock are not always recovered. These batteries may be a waste by-product when equipment is disassembled for material recycling. However the more likely disposal route is via a NSW landfill, either directly from equipment disposal or from the residuals of ferrous metal recovery at a shredding facility. Apart from batteries in mobile phones, most batteries in consumer equipment are not recovered at the end of life of the equipment. The metals within NiCad batteries have value if recovered.
Does the presence of the substance in the waste stream create a barrier to recovery of other components or to innovation/uptake of new processes and/or technologies?	The levels of heavy metals such as cadmium and nickel may be a barrier to the recovery of materials using composting or energy-from-waste processes. NiCad batteries may be inadvertently processed by shredding, crushing or grinding to release high levels of cadmium or nickel compounds into materials which are intended to be composted or processed into waste-derived fuels.

Nickel Cadmium Batteries

What infrastructure is available now?	
What systems are in place to collect the substance separately?	Large batteries are generally sold by specialist suppliers or large electrical equipment contractors. Batteries are usually exchanged, with the old battery removed by the supplier. Smaller electrical batteries are sold to manufacturers for inclusion in many types of electrical equipment. There are some systems in place to collect small batteries from emergency lighting, but these appear to be company-specific and far from universally available.
What reuse, recycling and/or disposal options are available?	Reuse options for NiCad batteries depend on the use, age and design of the battery. Some batteries that have not been properly charged or cycled (the sequence of charging and discharging a battery) may be reused after treatment. Some recycling of battery components can be undertaken. Difficulties may, however, arise because of occupational health and safety, consumer warranty or product quality requirements set by customer specifications or Australian Standards. Disposal options need to comply with the NSW waste regulatory requirements, including licensing and any additional restrictions placed on receiving waste from landfill operators.
What actions have been taken to manage the waste?	
What actions have been taken by governments and/or industry overseas? How relevant are these in the Australian context?	Most European and North American countries have comprehensive waste regulatory schemes for batteries involving generator and transporter tracking, advanced deposits or disposal fees. To encourage recovery of batteries some countries such as the USA have implemented specific legislation requiring battery recycling and labelling. This legislation includes the requirement to design equipment so that electrical power batteries can be removed during disassembly. The disposal of NiCad batteries in municipal waste has been banned in some countries (e.g. Switzerland) where there is advanced municipal waste disposal processing by either biological methods or energy-from-waste.
What have industry and government done in NSW and Australia?	NSW has environmental regulatory requirements for storing, transporting and reprocessing batteries. Some battery recovery and reprocessing is undertaken in NSW because of the value of waste materials.

What are the barriers to better recovery/reduced generation?	
Structure of the generating sector and/or supply chain	There are four main NiCad battery waste generators: • *standby power and solar power applications*, which are usually owned by commercial organisations or remote communities • *smaller appliances* which contain NiCad batteries connected to the power grid in both commercial and residential premises, such as emergency lighting and alarm systems • *small sealed NiCad batteries* which are assembled within electrical appliances, such as whitegoods, televisions, entertainment equipment, etc. • *small sealed NiCad batteries* which can be used as an alternative to non-rechargeable batteries in consumer electronic equipment.
Availability/maturity of systems and technologies to reduce, recover and/or reprocess	Generally the metals used in NiCad batteries have a positive value and many are recycled. The only specialised cadmium recovery facilities are based overseas. There are specialised waste management companies which recover commercially sourced batteries and export them under the Environment Australia's permit system for hazardous wastes. Further work may be required to improve the recovery of some plastic components such as separators between the cathode and anode. The glass fibres used as both a separator and a reservoir for electrolyte are currently disposed of to landfill.
What markets exist for recovered products? Are there higher value uses?	There are well-established markets for the metals and metal compounds recovered from used batteries. Less established are markets for products made from plastics recycled from battery casings. These products must not come into contact with food because of concerns about cadmium or other heavy metals contaminating the plastics.
What barriers have been identified through current voluntary measures or pilot programs?	The cost of disassembling small batteries from appliances is a barrier to recovery. Improved designs should enable batteries and other recoverable materials to be disassembled quickly with minimal equipment. Equipment manufacturers may need to develop disassembly guides for material recyclers to enable small batteries to be identified and recovered.
What opportunities exist for substitution with lower impact products or materials?	Nickel and cadmium are heavy metals which may adversely affect the environment during recycling and disposal. New chemistries based on lithium have been developed which have lower impacts on the environment during recycling or disposal to landfills.

Nickel Cadmium Batteries

What can government do to support industry action?	
Identify areas and forms of assistance	Industry could be supported to develop standardised recycling labels for NiCad batteries. Large commercial users, such as telephone exchanges, could be encouraged to voluntarily report on recovery and recycling rates. Mechanisms could be considered by government to ensure that all of the industry is covered by any scheme that is introduced. Possible areas are take-back, deposit and levy/benefit schemes.
Identify alternatives/other drivers to EPR	Limiting disposal of large NiCad batteries to all landfills could be considered because of the high potential for recycling. Free disposal of batteries would encourage separation at landfills or waste transfer centres for collection and recycling. Existing electrical product safety laws and regulations could be considered for labelling electrical equipment containing NiCad batteries.
Identify whether systems are needed for existing stocks	It is unlikely that there are any stockpiles of used batteries in the retail or local metal recycler sectors. Some commercial quantities are likely to be stockpiled with larger metal recyclers because components from NiCad batteries can be reused. Some battery manufacturers may also have stockpiles of used batteries. These stockpiles are the result of the high recycling rates and would be regarded as assets because of the value of the components. Small batteries that have been disassembled and stockpiled for recycling either locally or overseas need to comply with existing waste regulations. No additional systems are required for existing stocks.
Participate in/support community education initiatives by industry	Government could promote advertising by industry about recycling. Technical trade training for automotive, demolition and electrical industries could address battery recycling, disposal and maintenance.

Appendix II:
Supporting Fact Sheets—Wastes for Priority Focus with Post-Consumer Waste Management Schemes

Facts sheets have been included for the following wastes which are the subject of current post-consumer waste management schemes.

Agricultural/veterinary chemicals

Agricultural/veterinary chemical containers

Mobile phones and batteries

Packaging waste

Agricultural/Veterinary Chemicals

Unwanted stocks of agricultural/veterinary chemicals may pose serious risks to the environment, human health and international trade. For example, organochlorine pesticides bioaccumulate, others are highly mobile and can move or leach into surface and/or ground water, while others are persistent in soils and sediment. Pesticide contamination of primary produce can have a serious impact on trade. Misuse or accidental exposure to pesticides can affect health.

Why is the waste a problem?	
Quantity disposed of: absolute and percentage of waste stream	By 15 October 2002, over 600 tonnes of unwanted agricultural/veterinary chemicals had been collected through the ChemCollect program in NSW.
Environmental and/or health impacts	Unwanted stocks of agricultural/veterinary chemicals or pesticides may pose serious risks to the environment, human health and international trade. Organochlorine pesticides can persist for long periods in the environment and bioaccumulate. While the risk of any remaining stocks of persistent (and no longer registered) organochlorine pesticides entering the food chain should be reduced following ChemCollect, there is a risk that contamination could still occur from inappropriate disposal of these stocks. Some pesticides are highly mobile and can move or leach into surface and/or ground water, while others persist in soils and sediment. Where these pesticides or their breakdown products are bioavailable, there may be harm to biota. Pesticide contamination of farm products, such as endosulfan and chlorfluazuron (Helix) residues in beef, can have a serious impact on trade. Misuse or accidental exposure to pesticides can affect health. If these chemicals are disposed of correctly, the risk of any impacts should be small. If they are disposed of inappropriately, there is a high risk of impacts.
Is it a significant component of illegally dumped materials?	No
Is it a significant component of the litter stream?	Not usually regarded as litter
Potential for resource recovery	Agricultural/veterinary chemicals which are not date-limited and still have an approved label on the container could be reused or returned to the manufacturer. However, the majority would be disposed of as waste.
Does the presence of the substance in the waste stream create a barrier to recovery of other components or to innovation/uptake of new processes and/or technologies?	Contamination of waste by agricultural/veterinary chemicals may create a barrier to the recovery of materials using composting or energy-from-waste processes, but this depends on the nature of the particular chemicals.

Agricultural/Veterinary Chemicals

What infrastructure is available now?	
What systems are in place to collect the substance separately?	The State and Commonwealth governments funded ChemCollect, a one-off national collection, storage and destruction scheme for hazardous, unwanted and unregistered farm chemicals. ChemCollect began in NSW in November 2000 and collections ceased in December 2002. Industry has agreed to establish ChemClear, a program to collect and manage future unwanted farm chemicals. Pilot collections are scheduled to begin in 2003, with the full program roll-out to commence in 2004. Some agricultural/veterinary wastes have no clear disposal pathway, such as pet-wash wastes, animal, fruit and vegetable dip waste, rinsate from water or solvent rinsing of used containers, and unwanted prepared baits.
What reuse, recycling and/or disposal options are available?	Agricultural/veterinary chemicals which are not date-limited and still have an approved label attached to the container could potentially be reused. Current disposal options include treatment at a licensed waste facility, limited treatment via an evaporation pond, burial on farm (not desirable), and disposal to the domestic garbage stream.
What actions have been taken to manage the waste?	
What actions have been taken by governments and/or industry overseas? How relevant are these to Australian context?	*USA:* The Product Stewardship Institute (a non-government organisation allied to the University of Massachusetts) proposes a nationwide collection program, to be funded by industry.[28] However, the Action Plan shows no evidence of being embraced by the US EPA, agriculture agencies or industry bodies. *UK:* In 2001 the UK Environment Agency announced plans to develop a policy to manage a range of non-natural farm wastes, including agricultural/veterinary chemicals, with the focus on animal health products.[29] Development to date has been limited. *European Union:* Following a major review of its chemicals management framework, the EU released a White Paper on Chemicals Policy in 2001. This proposes the Registration, Evaluation and Authorisation of Chemicals (REACH) system, where a uniform system will be used to grade chemicals by category and volume. The planned changes propose a ban on chemicals that industry cannot show are safe to be used. So far REACH has proposed that all chemical manufacturers provide detailed information about potential chemical hazards on the labels of their products. However at this stage, it is not clear what impact the introduction of the REACH system will have on the use of agricultural/veterinary chemicals in EU member states.[30]

[28] Details at www.productstewardshipinstitute.org

[29] Details at www.environment-agency.gov.uk/subject/waste/306772/241420/?version=1&lang=_e

[30] Details at www.europa.eu.int/comm/environment/chemicals/0188_en.pdf

Agricultural/Veterinary Chemicals

What have industry and government done in NSW and Australia?	The State and Commonwealth governments funded ChemCollect, a one-off national collection, storage and destruction scheme for hazardous, unwanted and unregistered agricultural/veterinary chemicals. ChemCollect began in NSW in November 2000 and collections ceased in December 2002. ChemCollect was dependent on industry agreeing to manage its future chemical wastes. In 1999 three key industry groups—the National Association for Crop Production and Animal Health (Avcare), the Veterinary Manufacturers and Distributors Association and the National Farmers' Federation—signed the ChemClear Agreement to prevent, collect and manage future farm chemical wastes. The program, to be run and funded by the industry, is to begin operations after ChemCollect is wound up in each region. ChemClear will pilot collections in some areas of NSW in 2003 and commence full-scale operations in 2004. However, industry has not yet provided details about how it will implement the scheme.
What are the barriers to better recovery/reduced generation?	
Structure of the generating sector and/or supply chain	Agricultural/veterinary chemicals are manufactured and supplied by both large multinational and small companies. These chemicals are regulated up to and including the point of sale by the National Registration Authority.
Availability/maturity of systems and technologies to reduce, recover and/or reprocess	The national policy is to work towards reducing the risks to the environment and human health by encouraging the use of less toxic agricultural/veterinary chemicals and developing and implementing systems such as Integrated Pest Management.
What markets exist for recovered products? Are there higher value uses?	There are no markets for recovered products and no higher value uses.
What barriers have been identified through current voluntary measures or pilot programs?	Better recovery/reduced generation would require changes to product technology and user behaviour, linked with accessible and regular collections. ChemCollect information indicates that there may be problems in identifying agricultural/veterinary chemical wastes, e.g. wastes that are collected in unlabelled or incompletely labelled containers.
What opportunities exist for substitution with lower impact products or materials?	Older more problematic chemicals are being reviewed by the National Registration Authority and restrictions placed on their use or complete removal from the system. Less is needed to be applied of most newer chemical products to control pests or diseases and they may also present lower risks. Market-driven quality assurance programs and increased uptake of Integrated Pest Management and organic farming practices may reduce the use of agricultural/veterinary chemicals.
What can government do to support industry action?	
Identify areas and forms of assistance	To assist industry, government could have a role in guiding the transition from ChemCollect to ChemClear. The EPA is represented on the national ChemClear Steering Committee and Avcare is represented on the NSW ChemCollect Stakeholder Liaison Committee.

Agricultural/Veterinary Chemicals

Identify alternatives/other drivers to EPR	The appropriate disposal of pesticides is hampered by the generic disposal directions on most pesticide labels, which commonly refer to burial of pesticide containers and contents in a signposted disposal pit as the recommended approach. The need for changes to label directions is recognised, but as there are many thousands of products, progress on changing labels has been slow.
Identify whether systems are needed for existing stocks	Systems have already been provided for existing stocks through ChemCollect. While the ChemCollect program has successfully provided farmers with a fully subsidised destruction route for stocks of old chemicals, there may still be residual stocks of de-registered farm chemicals. Old wastes, e.g. organochlorine wastes, could possibly be disposed of through ChemClear, but at cost to farmers.
Participate in/support community education initiatives by industry	Government could further assist the farming sector through information and education on the availability of ChemClear.

Agricultural/Veterinary Chemical Containers

Agricultural/veterinary chemical containers that have not been properly rinsed have the potential to introduce pesticides into the environment if not disposed of appropriately. It is recommended practice, however, to triple-rinse emptied pesticide containers and pour the rinsate into the spray tank to ensure that very little, if any, pesticide remains in the container.

Current extended producer responsibility scheme

The drumMUSTER program provides for the collection, recycling or disposal of pesticide containers over 1 kilogram or litre in size manufactured by participants in the program. Recently the Australian Competition and Consumer Commission approved an expansion of the scope of the program to include non-hazardous product containers and containers with a capacity of less than 1 kilogram or litre.

Why is the waste a problem?	
Quantity disposed of: absolute and percentage of waste stream	No quantifiable data is available on total containers produced. However, the current program to collect this waste—drumMUSTER—reports that over 3 million waste agricultural/veterinary chemical containers (4800 tonnes) were collected by drumMUSTER between 1 February 1999 and 30 November 2002. The largest number of containers collected are for 20-litre plastic containers (1.8 million or 2200 tonnes) and 20-litre steel containers (890,000 or 1600 tonnes). It is not known what overall proportion of total container waste drumMUSTER is capturing.
Environmental and/or health impacts	Pesticide containers which have not been properly rinsed and disposed of properly have the potential to introduce pesticides into the environment. Since pesticides are designed to control pests, often by killing them, they are likely to have a significant capacity to affect the environment or human health on contact. It is recommended practice, however, to triple-rinse or pressure-rinse pesticide containers to ensure that very little, if any, pesticide remains in the container. If the containers have been properly rinsed, there should be little risk of harm to the environment or health.
Is it a significant component of illegally dumped materials?	The volume of pesticide container waste that has been illegally dumped has not been quantified. However, the environmental/health hazards associated with illegal dumping of non-rinsed pesticide containers has long been recognised as an issue of concern, particularly in those rural areas where pesticides are used intensively.
Is it a significant component of the litter stream?	No
Potential for resource recovery	The technology to recycle appropriately cleaned (i.e. triple- or pressure-rinsed) steel pesticide containers is available.

Does the presence of the substance in the waste stream create a barrier to recovery of other components or to innovation/uptake of new processes and/or technologies?	There is some concern that a focus on the recycling of pesticide containers may hamper the development of new approaches to pesticide packaging. Volumes of pesticide container waste could be reduced by the introduction of water-soluble packaging; concentrated liquid pesticide formulations; concentrated dry pesticide formulations in compostable paper packaging; and bulk pesticide delivery systems.
What infrastructure is available now?	
What systems are in place to collect the substance separately?	A voluntary national industry waste reduction scheme (which gave rise to the drumMUSTER program[31]) was entered into by key stakeholders to collect and manage pesticide containers. Program participants must collect, recycle or dispose of pesticide containers over 1 kilogram or litre in size. Participants have the following roles: *Manufacturers participating in drumMUSTER* • Identify non-returnable containers by applying drumMUSTER sticker • Pay a 4 cents a litre or kilogram levy to drumMUSTER and invoice the distributor/reseller *Resellers* • Explain the drumMUSTER levy to farmers • Invoice the 4 cents a litre or kilogram levy to farmers/farm chemical users *Farmers* • Flush, pressure-rinse or triple-rinse non-returnable containers in a range of sizes and formats, including 20- and 200-litre high-density polyethylene plastic and steel drums; 10-, 15- and 20-litre pails; and 5- and 10-litre tins and bottles • Transport containers with drumMUSTER stickers to collection centres on designated days *Councils participating in drumMUSTER* • Establish collection centres and inform farmers of collection duration • Inspect containers and accept cleaned containers • Employ materials recovery contractors to process empty containers [Funds generated via the levy are available for reimbursement to participating councils for all agreed costs incurred in running the drumMUSTER collection.] *Processors* • Process empty containers and send material back into the recycling stream

[31] Details at www.drummuster.com.au

What reuse, recycling and/or disposal options are available?	The industry waste reduction scheme that gave rise to drumMUSTER identified a set of goals for the reuse, recycling and disposal of pesticide containers: • reduce the number of containers entering the distribution stream through the establishment of industry targets aimed at encouraging manufacturers to adopt alternative packaging containers, technology and/or formulations • ensure non-returnable crop protection and animal health chemical containers have a defined route for disposal that is socially, economically and environmentally acceptable. Recyclers involved in drumMUSTER are asked to guarantee that they can provide ongoing markets for the recycling of the materials processed as a result of their participation. Approved processors are also asked to provide an auditable tracking system to ensure proper financial tracking and reporting. drumMUSTER requires the processing and recycling of both plastic and steel containers, and states a preference for processors that can provide a complete package.
What actions have been taken to manage the waste?	
What actions have been taken by governments and/or industry overseas? How relevant are these to Australian context?	*Canada:* The Canadian Crop Protection Institute has embraced the principle of extended producer responsibility and initiated a pesticide container recycling scheme in 1989.[32] The scheme reportedly collected and recycled nearly 4.7 million pesticide containers in 2000 and claims to have achieved a recovery rate of 67%. The scheme provides over 1000 collection sites in Canada, based in pesticide dealerships or local government depots. The program reputedly recycled 100% of the plastic containers collected in 1999 and 2000. *USA:* The USA has adopted safe pesticide container disposal information initiatives. In conjunction with industry, the US EPA has negotiated a new standard that requires all pesticides to be labelled with instructions about safe disposal techniques. *UK:* In 2001 the UK Environment Agency announced plans to manage a range of inorganic farm wastes, including the packaging that comes with farm products. Preliminary policies canvass the possibility of introducing: • Schemes to combine local authority waste collection services with large-scale services • Schemes for plastics recovery and direct recovery of wastes by suppliers.

[32] Details at www.cps-scp.ca/cropprotection.htm

Agricultural/Veterinary Chemical Containers

What have industry and government done in NSW and Australia?	The industry waste reduction scheme which gave rise to drumMUSTER came into effect with the condition that a mandatory industry waste plan might need to be introduced if the voluntary scheme proved inadequate. The industry waste reduction scheme was signed by key stakeholders: the National Farmers Federation, Avcare, the Veterinary Manufacturers and Distributors Association and the Australian Local Government Association. The drumMUSTER program is administered by Agsafe and managed by a council with representatives of those parties to the scheme, as well as Agsafe. drumMUSTER has operated since 1999, with reviews in July 2000 and July 2002. The findings of the latest review were expected to be released in early 2003.
What are the barriers to better recovery/reduced generation?	
Structure of the generating sector and/or supply chain	Pesticide containers are manufactured and supplied by both large multinational and smaller companies.
Availability/maturity of systems and technologies to reduce, recover and/or reprocess	Technology to recycle steel pesticides containers is available in Australia. drumMUSTER also specifies the following hierarchy of reuse/recycling/disposal options for plastic pesticide containers: 1. Plastic 20-litre containers originally intended for single use are to be forwarded to designated reprocessing contractors. 2. Where this is not possible, plastic containers can be granulated to a size of approximately 1–2 cm to facilitate their use in recycling or material recovery. 3. Where this is not possible, plastic containers can be shredded. However, plastics recyclers have also argued that there are a number of factors which diminish the attractiveness of recycling plastic pesticides products including: • Potential occupational health and safety issues associated with the emissions produced during the recycling of plastics • Consumer resistance to using products recovered from former pesticide containers.
What markets exist for recovered products? Are there higher value uses?	A market for recycled steel exists in Australia. Potential plastics recyclers have consistently argued that the small size of the Australian market means that there is little demand for recycled product.

Agricultural/Veterinary Chemical Containers

What barriers have been identified through current voluntary measures or pilot programs?	A number of barriers to the success of the current voluntary program have been identified: • collection coverage: not all local councils are party to the drumMUSTER program (especially in urban and remote areas) and not all containers in circulation are produced by manufacturers party to the program • until it was recently lowered, the threshold for eligibility left many smaller containers out of the system • issues with the adequacy of rinsing: containers which appear to have not been adequately rinsed (i.e. not triple-or pressure-rinsed) are excluded from drumMUSTER collections • practical difficulties with effective rinsing of containers with non-water-soluble chemicals. There are questions about the capacity of drumMUSTER to ensure that its waste hierarchy objectives are achieved because of the performance monitoring and auditing processes it uses. The 1999 review of drumMUSTER noted that the program's monitoring procedures had given rise to significant data gaps in key areas. Notably, the program had not established any data about the number of collected containers that were being successfully recycled.
What opportunities exist for substitution with lower impact products or materials?	In addition to the hierarchy of options adopted by drumMUSTER for the recycling of plastic and steel containers, there are a number of opportunities for waste reduction measures which could apply to pesticide containers that have not been targeted by the program. Pesticide container waste reduction strategies could include: • the use of dry (rather than liquid) formulations of pesticides in compostable cardboard containers • the use of concentrated liquid formulations of pesticides • the use of reusable containers (a limited number of pesticides are already provided in containers of this kind) • the use of water-soluble packaging • the introduction of bulk pesticide delivery systems.
What can government do to support industry action?	
Identify areas and forms of assistance	Government could advise industry on the operation of drumMUSTER and promote its availability.
Identify alternatives/other drivers to EPR	None applicable
Identify whether systems are needed for existing stocks	In the event that the existing drumMUSTER program has successfully adopted the recommendations of the previous review, it will potentially provide an adequate framework for the management of pesticide containers that are eligible for inclusion in the program. However, there is a concern that containers continue to be disposed of illegally or to landfill because they are not eligible for inclusion in drumMUSTER or the scheme does not operate in all council areas.

Agricultural/Veterinary Chemical Containers

Participate in/support community education initiatives by industry	The NSW Government has assisted in disseminating information about the drumMUSTER program since its inception. Government can continue to fulfil this kind of role when providing information about environmentally responsible waste management.

Mobile Phones and Batteries

Heavy metals in both mobile phones and batteries can have an adverse impact on the environment if disposed of to landfills or energy-from-waste facilities, or during reprocessing. Some components used in mobile phones or batteries are made from non-renewable resources. Development of new models and technology has increased the number of obsolete mobile phones. The Australian Mobile Telecommunications Association estimates that Australia's 12 million mobile phone users replace their handsets every 18–24 months and that 4–6 million mobile phone batteries are disposed of or recycled each year.

Current extended producer responsibility scheme

The mobile phone industry has established a voluntary program that aims to recycle potentially toxic components in mobile phones, batteries and accessories.

Why is the waste a problem?	
Quantity disposed of: absolute and percentage of waste stream	The quantity disposed of to landfills is low, estimated under 500 tonnes per year in NSW and less than 0.01% of the total waste stream.
Environmental and/or health impacts	The heavy metals in both mobile phones and batteries can have an adverse impact on the environment if disposed of inappropriately. Some components pose a potential environmental hazard if they are allowed to enter the waste stream in an uncontrolled manner.
Is it a significant component of illegally dumped materials?	No
Is it a significant component of the litter stream?	No
Potential for resource recovery	Some components used in mobile phones or batteries are made from non-renewable resources. Development of new models and technology has increased the number of obsolete mobile phones. The small quantities of materials used in the mobile phones and the complex nature of their manufacture may be a barrier to resource recovery.
Does the presence of the substance in the waste stream create a barrier to recovery of other components or to innovation/uptake of new processes and/or technologies?	The trend in mobile phone technology has been towards smaller and lighter handsets. When first available 10 years ago, handsets were large and heavy because of the use of sealed lead acid batteries. Although some phones can use non-rechargeable (primary) batteries, the vast majority depend on rechargeable (secondary) batteries, of which the main types include nickel cadmium, nickel metal hydride, lithium ion and lead acid batteries.

Mobile Phones and Batteries

What infrastructure is available now?	
What systems are in place to collect the substance separately?	The mobile phone industry's voluntary recycling program[33] aims to recycle potentially toxic components in mobile phones, their batteries and accessories. The recycling procedure provides a complete breakdown of chemical components to produce marketable commodities such as nickel (used in the production of stainless steel); cadmium (used for new batteries); and plastics (used in furniture). Recycling also prevents the re-formation of environmentally damaging compounds such as dioxins and furans in the exhaust gas stream. Since 1999, approximately 253,000 or 30 tonnes (enough to fill a small suburban house) of mobile phones, batteries and accessories have been collected for recycling in Australia. Australian Mobile Telecommunications Association (AMTA) and Planet Ark recently launched a national campaign to recover 1 million mobile phones.
What reuse, recycling and/or disposal options are available?	See above
What actions have been taken to manage the waste?	
What actions have been taken by governments and/or industry overseas? How relevant are these to Australian context?	To encourage the recovery of batteries, some countries such as the USA[34] have implemented specific legislation requiring battery recycling and labelling. Other countries, such as Switzerland, restrict the disposal of batteries in municipal waste. These countries have advanced municipal waste processing by either biological methods or by energy-from-waste.
What have industry and government done in NSW and Australia?	On behalf of its members, AMTA implemented the Mobile Phone Industry Recycling Program (see above) following an initial NSW trial of battery recycling in early 1999. The program recently joined with Planet Ark to launch a national mobile phone recycling program that allows the return of mobile phone batteries, handsets and accessories to participating dealerships. There they are collected and disposed of in a way that is safe to the environment.
What are the barriers to better recovery/reduced generation?	
Structure of the generating sector and/or supply chain	• Mobile phone shops • Retail stores
Availability/maturity of systems and technologies to reduce, recover and/or reprocess	There are currently over 1800 retail stores participating in the national Mobile Phone Industry Recycling Program.

[33] Mobile Phone Industry Recycling Program at www.amta.org.au/recycle/intro_what.htm

[34] Details at www.rbrc.com/BatteryAlert.pdf

Mobile Phones and Batteries

What markets exist for recovered products? Are there higher value uses?	Recovered products are reused in various applications: • Nickel in the production of stainless steel • Cadmium as a component in new batteries • Plastics in furniture • small amounts of gold and copper.
What barriers have been identified through current voluntary measures or pilot programs?	There are limited barriers. The AMTA battery and phone take-back scheme could voluntarily increase the amounts collected and recycled. Most mobile phone suppliers and network providers financially support the scheme. AMTA may need to consider whether non-members can participate in the scheme.
What opportunities exist for substitution with lower impact products or materials?	The shift to lithium-based batteries may phase out the use of nickel cadmium batteries in the next few years. Lithium appears to have a lower environmental impact than nickel cadmium or nickel hydride batteries.
What can government do to support industry action?	
Identify areas and forms of assistance	Importers and retailers could contribute to funding or participate in the AMTA scheme.
Identify alternatives/other drivers to EPR	Limiting disposal of mobile phones and batteries to landfills or energy-from-waste facilities has been implemented in other countries such as the USA, Switzerland, Germany, Japan, Korea and Taiwan.
Are systems needed for existing stocks?	Some stocks may be held domestically because of the uncertainty in municipal disposal practices. The AMTA collection scheme should be used to recycle the batteries and handsets.
Participation in/support for community education initiatives by industry	Government could promote greater awareness of the industry program.

Packaging Waste

Packaging is used to protect, contain, handle or market a broad range of materials or products. The level of packaging of consumer products has increased over the last 50 years, associated with the adoption and use by the community of domestic refrigerators, prepared foods and other consumable items. Other lifestyle changes such as the use of motor vehicles have changed the shopping patterns of the community. The levels of post-consumer domestic packaging are likely to continue to increase in the future as, for example, in the pre-packaging of individual serves of food.

Packaging can have both positive and negative impacts on the environment. A positive impact is the reduction in food spoilage and putrescible waste from prepared packaged foods. Adverse environmental impacts include litter from beverage containers, plastic bags and other packaging waste, the consumption of non-renewable resources and limited post-consumer recycling which results in the disposal of resources to landfill.

Current extended producer responsibility scheme

Packaging is broadly defined in the voluntary National Packaging Covenant agreed to by industry and governments in 1999. The entire packaging chain is covered by the covenant from raw material suppliers, importers, packaging manufacturers, packaging users/fillers and retailers. The NSW Government has passed regulations to support the industry signatories to the covenant and ensure they share a level playing field with non-signatory competitors.

Why is the waste a problem?	
Quantity disposed of: absolute and percentage of waste stream	Packaging waste ranges from unwanted shipping containers used to import consumable materials into Australia to individual sugar packets used in restaurants. Packaging can be made from plastic, glass, paper, cardboard, aluminium, steel, wood or mixtures such as liquidpaperboard (e.g. milk cartons) or plastic containers with an aluminium foil layer used for chips. The quantities of packaging waste disposed of to NSW landfills is difficult to quantify but could be as high as 10% of the Commercial and Industrial (C&I) and Municipal Waste streams. An estimated 365,000 tonnes of packaging material was collected at kerbside in NSW in 2000–01. This included: • 1500 tonnes aluminium • 79,000 tonnes glass • 400 tonnes liquidpaperboard • 190,000 tonnes paper and cardboard • 4000 tonnes HDPE plastic • 8000 tonnes PET plastic • 5500 tonnes steel cans • 3000 tonnes of other materials • 72,000 tonnes of commingled material.

Packaging Waste

Environmental and/or health impacts	The wide variety of uses and composition of packaging restricts the identification of specific environmental and health impacts. The major environmental impact is the substantial use of non-renewable resources. The other significant impact is litter. Packaging from fast food, beverage containers and plastic bags are common litter items. Litter can have a serious impact on wildlife and reduce the visual amenity of urban and rural environments.
Is it a significant component of illegally dumped materials?	Some household waste containing packaging is illegally dumped. This includes excess domestic waste disposed of in the streets or dumped in recreation and bushland areas and along roadsides.
Is it a significant component of the litter stream?	Yes. For example, around 13% of the litter stream is beverage containers.
Potential for resource recovery	There are resource recovery opportunities for all commonly used packaging materials currently recovered through kerbside recycling systems, drop-off centres, commercial operations collecting from businesses and other points, public place recycling and take-back schemes.
Does the presence of the substance in the waste stream create a barrier to recovery of other components or to innovation/uptake of new processes and/or technologies?	In general, no. However cross-contamination between packaging materials may cause problems, depending on the collection/technical system used to separate/recover/recycle materials.
What infrastructure is available now?	
What systems are in place to collect the substance separately?	• Kerbside recycling systems • Drop-off centres • Commercial collection from offices, restaurants, etc. • Public place recycling • Take-back schemes
What reuse, recycling and/or disposal options are available?	Many commercial operations collect, take away for a fee, or buy used packaging materials. These operations generally take a range of different materials for recycling.

Packaging Waste

What actions have been taken to manage the waste?	
What actions have been taken by governments and/or industry overseas? How relevant are these to the Australian context?	*European Union:* The EU has implemented a Packaging Waste Directive which requires member countries to recycle or incinerate for energy recovery 50% of packaging waste. Some European nations have implemented packaging legislation, e.g. Germany and Sweden. The Packaging Ordinance in Germany requires manufacturers and distributors to take-back packaging and arrange for its reuse or recycling. Some European countries have banned the use of particular packaging materials because of the adverse environmental impacts along the manufacturing chain, e.g. in Denmark it is illegal to sell beer, soft drinks or other beverages in aluminium cans. *Canada:* Canada and some states of the US have adopted a deposit return system for beverage containers. The Manitoba Product Stewardship Corporation facilitates the recovery of packaging and other products from the province's waste stream.[35] A 2-cent beverage container tax provides funding for recycling collection and education programs.
What have industry and government done in NSW and Australia?	Industry and government have negotiated and support the National Packaging Covenant[36] to encourage environmental responsibility/recycling in packaging (including beverage containers and plastic bags). The covenant is in place until mid-2004. The NSW Government became a signatory to the National Packaging Covenant in August 1999. The covenant is underpinned by a National Environment Protection Measure which applies to businesses who do not join the covenant. South Australia operates a container deposit legislation system. The NSW Government commissioned an independent review of the applicability of container deposit legislation in the State, which was released in 2001 (Stuart White, Institute for Sustainable Futures, University of Technology, Sydney). The matter is now being considered nationally through the Environment Protection and Heritage Council.
What are the barriers to better recovery/reduced generation?	
Structure of the generating sector and/or supply chain	Packaging materials are produced from a wide range of raw materials, such as wood from plantation forests through to complex component materials such as long-life milk containers that contain paper, plastic and aluminium. Some packaging material is made in Australia and exported, while other products are imported into Australia. Large numbers of industries are dependent on packaging: retailers and wholesalers, food manufacturers, the beverage industry, manufacturers, service sector. The packaging sector is fairly diverse. Raw material producers and processors often have limited knowledge of the final packaging uses of their products.

[35] Details at www.mpsc.com/

[36] Details at www.ea.gov.au/industry/waste/covenant/index.html

Packaging Waste

Availability/maturity of systems and technologies to reduce, recover and/or reprocess	Systems and technologies to reduce, recover and/or reprocess some packaging is well established. For example, estimated weight of kerbside materials sold and/or sent to secondary uses (including energy recovery) in 2000–01 include: • 1500 tonnes aluminium • 75,000 tonnes glass • 400 tonnes liquidpaperboard • 189,000 tonnes paper and cardboard • 4000 tonnes HDPE plastic • 7000 tonnes PET plastic • 5500 tonnes steel cans • 3000 tonnes other materials • 51,000 tonnes commingled materials. Materials recycled and sold for secondary use in NSW in 2000–01 totalled about 337,000 tonnes or 204 kg per household per year. This represents 92% of the 365,000 tonnes collected at kerbside in NSW so that almost all material collected is sent to recovery facilities. Actual recycling rates after delivery to recovery facilities are currently unknown. There has been widespread beverage container collection for recycling in NSW for the last 10 years through kerbside recycling. Numerous commercial systems and processes are available for recovering common packaging materials and many opportunities to reuse materials once collected. Government and industry have both invested in research and development on the impact of packaging materials and the use of alternative materials as part of the National Packaging Covenant.
What markets exist for recovered products? Are there higher value uses?	Markets for common packaging materials are well-established both in Australia and internationally. These markets are material-dependent, but are relatively robust. Commercial operations generally pursue the highest value use for collected materials. Highest value reuse is being encouraged/investigated as part of industry and government commitments to the National Packaging Covenant.
Barriers identified through current voluntary measures or pilot programs	The National Packaging Covenant identified a lack of consistency in the types of materials collected by councils through kerbside recycling schemes as a potential barrier to the recycling of ‘marginal’ packaging materials. Lack of consistency has also led to community uncertainty about which packaging can be recycled. There are generally low levels of cross-contamination of packaging collected for recycling, although this depends on the collection/sorting system. Investigations have identified the need for more public place recycling facilities to increase beverage container recycling.

Packaging Waste

Opportunities for substitution with lower impact products or materials	Due to the commercial nature of the packaging production industry, innovation is often used to lower costs, frequently resulting in environmental gains e.g. the use of lighter materials for packaging, standardised packaging, etc.
What can government do to support industry action?	
Possible areas and forms of assistance	• Participate in the detailed evaluation of the effectiveness of the National Packaging Covenant in delivering desired environmental outcomes from late 2003 onwards. • Work with industry to encourage environmentally responsible packaging, including beverage containers and shopping bags • Help develop/support emerging markets for post-consumer packaging materials, e.g. NSW Government Waste Reduction and Purchasing Policy • Assist with research and development and support of alternate recycling/reuse options
Identify alternatives/other drivers to EPR	Alternatives to Extended Producer Responsibility include: • limits on the use or disposal of packaging materials • setting recovery targets • setting recycled content targets for packaging materials.
Identify whether systems are needed for existing stocks	Systems are in place for reprocessing the majority of common packaging materials.
Participate in/support community education initiatives by industry	• Continue support for National Packaging Covenant educational activities • Support other industry programs where appropriate