Environment Protection and Heritage Council

Consultation Regulatory Impact Statement: Televisions and Computers

July 2009

Hyder Consulting

PRICEWATERHOUSECOOPERS

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Contents

Acronyms

ABARE	Australian Bureau of Agriculture and Resource Economics
ACS	Australian Customs Service
ACT	Australian Capital Territory
AIIA	Australian Information Industry Association
ARF	Advanced Recycling Fee
BCR	benefit cost ratio
CBA	cost benefit analysis
COAG	Council of Australian Governments
CPU	central processing unit
CRT	cathode ray tube
DECC	Department of Environment and Climate Change
DEWHA	Department of the Environment, Water, Heritage and the Arts
DFAT	Department of Foreign Affairs and Trade
EPHC	Environment Protection and Heritage Council
EPR	extended producer responsibility
ESD	ecologically sustainable development
LCD	liquid crystal display
MFD	multi function device
NEPM	National Environment Protection Measure
NPV	net present value
NSW	New South Wales
NT	Northern Territory
OBPR	Office of Best Practice Regulation
OECD	Organisation for Economic Co-operation and Development
OLED	organic light emitting diode
PC	personal computer
PRO	Producer Responsibility Organisation
PSA	Product Stewardship Australia
PV	present value
PwC	PricewaterhouseCoopers
QLD	Queensland
RIS	Regulatory Impact Statement
SA	South Australia
SED	Surface-conduction Electron-emitter Display
TAS	Tasmania
TV	television
VDU	visual display unit
VIC	Victoria
WA	Western Australia
WEEE	Waste Electrical and Electronic Equipment
WMAA	Waste Management Association of Australia
WTP	willingness to pay

Executive summary

This document is a consultation regulatory impact statement for end of life televisions and computers put out by the Environment Protection and Heritage Council.

Introduction

Electrical and electronic products, in particular televisions and computers, constitute a significant element of Australia's material consumption, domestic environmental impact and waste to landfill. In 2007/08, 31.7 million new televisions, computers and computer products[1] were sold in Australia, which is equivalent to 1.5 new units per person every year. In the same year 16.8 million units reached their end of life, which is close to one unit per Australian. Of these units, it is estimated that 88% were sent to landfill, with only 9% being recycled.[2] Over the next 20 years, a significant volume of televisions, computers and computer products for disposal/recycling is expected to be generated, with expectations that the end of life volume will more than double. Waste volumes are increasing with shorter life spans of product and increasing ownership of electrical products, with the number of televisions, computers and computer products reaching their end of life expected to grow to 44.0 million by 2027/28.

Internationally, programs are being developed or implemented to reduce the environmental impact of electrical and electronic products. The European Union and Japan have already implemented legislation requiring the recovery and recycling of televisions and computers whilst other Organisation for Economic Co-operation and Development (OECD) countries are in the process of introducing a range of mechanisms to address this issue.

Australia’s consideration of an approach for managing e-waste has been ongoing since the 1990s when national electrical and electronic waste management was put forward as an emerging priority by industry to the Australian and New Zealand Environment and Conservation Council (ANZECC), the precursor to the current Environment Protection and Heritage Council (EPHC).

In 2002 Environment Ministers agreed that national action was required in relation to waste electrical and electronic equipment. On behalf of the EPHC, a multi-jurisdictional working group, known as the Electrical Equipment Product Stewardship Sub-Group, examined the issue of waste electrical and electronic equipment and identified televisions and computers as first priorities for action as a result of their higher levels of hazardous

[1] In this document computer and computer products are defined as including: computer displays, computer desktops and similar, computer mobile units (e.g. laptops), computer peripherals (e.g. keyboards, mouse, hard drives, scanners, speakers, web cams, power cords, internal power supplies, external power supplies, fans, miscellaneous/other parts), personal or desktop laser and inkjet printers, and multi function devices.

[2] The remaining 3% were exported.

components relative to other types of electrical products, and the lost opportunities for conserving non-renewable resources due to products being sent to landfill. In 2008 EPHC committed to the development of a national solution to the problem of end of life televisions and computers.

In parallel with government consideration of the issues both the television and key players in the computer industries are keen to engage in large scale national action, with national regulatory support to ensure a level playing field in the market.

While each jurisdiction has its own regulation setting out waste minimisation policies (refer to Appendix D), currently only the Australian Capital Territory (ACT) Government has a ban on disposing television screens and computers monitors in its landfill. Other jurisdictions are considering bans and a number of take-back schemes have been trialled. In addition, a number of local governments across Australia have implemented or are considering bans or charges for disposing of e-waste in landfill. The number of responses to addressing television and computer waste, and more broadly e-waste, in Australia, demonstrates the significance of the issue to the community and the drive to take action

This document is a consultation regulatory impact statement. Its purpose is to examine the impacts of implementing consistent national arrangements for end-of-life televisions and computers. The regulatory impact statement assesses proposed options to address identified problems with end-of-life televisions and computers. This consultation regulatory impact statement does not propose to address the whole issue of end of life electrical and electronic products, but rather it is part of a proposed incremental approach. Other types of e-waste may also be considered by the EPHC; however they would be examined once a decision on the appropriate management for end of life televisions and computers is reached.

In considering the current regulation and the problems facing television and computer waste, this regulatory impact statement is a consultation document that aims to consider the following questions:

- What is the problem with waste televisions, computers and computer products?
- Does the problem justify consideration of government intervention?
- If a case for government intervention has been established, what should the objectives of this intervention be?
- What are feasible options for intervention that could wholly or partly achieve these objectives?
- How effective would the feasible options be to meet the identified objectives and provide the greatest net benefit for community?
- What is the feedback from public consultation on the points above?

The television and computer waste problem

Currently in Australia, each jurisdiction has its own waste minimisation legislation or policies. The broad powers provided to each jurisdiction by waste minimisation legislation means that there is a tangible risk that each jurisdiction will implement a different approach to the television and computer waste problem in the absence of a national approach. Due to this,

each jurisdiction has been working through the EPHC towards seeking a national solution. Specific television and computer waste responses have already begun to vary in different jurisdictions. For example the ACT has banned the disposal of computer monitors and television screens in landfill, and Victoria is trialling Byteback, a government-run computer collection and recycling scheme.

In addition, some private sector schemes have arisen to deal with the increasing volumes of waste television and computer products (e.g. Dell offers free recycling of any Dell branded equipment, and Apple offers free recycling for purchases from particular stores). However, these schemes are brand-specific so are not whole-of-waste solutions, and in addition it is not clear how easy it is for households to participate. While some television and computer waste is currently recycled, the financial value of the recycled material resources (metals, glass, plastic, etc.) is not high enough to fund an expansion of recycling beyond its current levels. In other words, recycling of these products is financially unviable without government support.

Despite some government and private sector intervention, the recycling rate remains low at 9% of units reaching end of life (excluding export of used items), or 10% based on tonnage - with the remainder being landfilled and a minor proportion that are exported.

Considering whether there is a case for government intervention to improve recycling or reduce landfill of television and computers in Australia, it is important to identify the possible problems with the current situation. The following problems have been identified for stakeholder consideration:

- Conservation of non-renewable resources. Televisions, computers and computer products contain embedded resources that are non-renewable, but that are lost under current disposal methods. A number of materials such as glass, plastics and lead are able to be recycled either in Australia or overseas. As volumes of televisions and computers increase, the volume of non-renewable resources being lost increases. There are measures of the value placed on these non-renewable resources:
  - *market value* – consultation with current recyclers indicates that the financial value that the market places on recycled television and computer items is on average $300-400 per tonne of recycled product. Considering this value, if the existing situation does not change, this could result in a loss of $240-380 million of financial value placed on the non-renewable resources from 2008/09 to 2030/31 (present value, 2009 dollars). However, it should be noted that it costs about $970 per tonne to collect and reprocess the waste resulting in a financial loss from recycling of about $620 per tonne; and
  - *society's intrinsic value of recovering non-renewable resources* – a choice modelling survey of more than 2,000 Australians conducted by URS has indicated that respondents were willing to pay to increase the current recycling rate and capture non-renewable resources ($0.50 per unit sold for each percentage increase in the recycling rate, which equates to $21.14 per unit sold or $963 per tonne sold to reach 50% recycling). While these values cover more than just resource recovery, it was society's intrinsic value that was considered the most significant issue by the survey respondents. The survey indicated that

there is significant intrinsic value placed on increasing recycling of resources, totalling $1.6 billion (present value over the period 2008/09 to 2030/31, 2009 dollars) if 70% recycling could be achieved within five to nine years.

- Community expectations are not being met. The choice modelling study discussed in the above point found that community expectations are not being met under current disposal methods. Using a choice modelling technique to value the community's willingness to pay for increasing the level of recycling of television and computer products, the study found that respondents were willing to pay between $18 and $27 per item for an increase in the recycling rate to 50% (from a current level of 9%), increasing to $33 to $50 per item for an increase to 90%. As the private cost of recycling does not take into account the willingness to pay, the current level of recycling does not meet community expectations.
- Free-rider problem. There have been some trials of television and computer recycling schemes in Australia, however, these have been successful only because of financial and program support from the government (e.g. the Victorian Byteback scheme), or in the cases when households/businesses/local government pay a fee to drop off waste products to a recycler. While key players in both the computer and television industry have expressed interest in setting up recycling schemes, they are unprepared to implement a scheme without full industry participation. There has been difficulty in gaining the support of all (and some smaller) industry players without being able to enforce participation, in short, a free rider problem. From the choice modelling work it is also reasonable to conclude that a further free-rider problem exists in relation to the community wanting all consumers to be involved in any recycling scheme as evidenced by the fact that only a small proportion of consumers have been willing to pay a fee to drop off waste television and computer products to a recycler. A key effect of the free-rider problem is the inability for the current situation to be improved much beyond current recycling levels of 9% of units sold each year.
- Landfill externality costs. There may also be a problem with landfilling of computers and televisions because of the toxicity of some of the materials contained in them. Materials such as lead, bromine, mercury and zinc can be dangerous to humans and the environment. While it is difficult to estimate the risk and cost involved with the landfilling of televisions and computers as volumes increase over time, it is likely that if the *status quo* continues the cost will increase. Based on the Productivity Commission's estimate of landfill externalities generally for all waste types, if the current landfill trends continue then landfill externality costs of $40.8 million will be incurred by Australians over the next 23 years (present value, 2009 dollars).

  The externality costs estimated by the Productivity Commission include costs from: greenhouse gas emissions, other gas emissions, leachate and loss of amenity. Given the specific nature of computer and television waste (i.e. almost all is non-organic), the amount of greenhouse gas is likely to be small and therefore leachate and loss of amenity is expected to be more relevant for television and computers waste. Drawing on the Productivity Commission's estimates for leachate and amenity externalities, if the current disposal pathways are not varied over the coming 23 years the landfill externality costs incurred are $3.4 million over this time (present

value, 2009 dollars) and if only leachate is considered then this cost would reduce further down to $1.7 million (present value, 2009 dollars).

- Landfill direct costs and opportunity cost of land. In addition to externality costs of landfilling televisions and computers, there are direct costs associated with operating landfills including the opportunity cost of land, and other ongoing operating costs that vary with landfill volumes. While television and computer waste is estimated to comprise less than 0.4% of landfill volumes generated each year, these volumes are projected to more than double if the current situation does not change, indicating that the landfill space required will also increase over coming years. Such an increase of waste televisions, computers and computer products in landfills is contradictory to Australian jurisdiction policies that seek to minimise landfill disposal. Given the current landfill disposal trends, direct landfill costs are estimated to total $42.5 million over the next 23 years (present value, 2009 dollars).

In addition to the problems with the current disposal methods, there are a number of policy factors that add to pressure for Australian governments to address these problems. These policy pressures include:

- Australia is a signatory to the Basel Convention on the Control of the Transboundary Movements of Hazardous Waste and Their Disposal (the Basel Convention) and the Stockholm Convention on Persistent Organic Pollutants (the Stockholm Convention). In particular, Australia is required as a signatory to the Basel Convention to ensure that the generation of hazardous and other wastes (including household wastes), within Australia is reduced to a minimum, taking into account social, technological and economic aspects; ensure adequate disposal facilities are available within Australia; control and reduce international movements of hazardous waste; and ensure that wastes are disposed of in an environmentally sound manner, which protects human health and the environment against any adverse effects of such wastes. The Basel Convention defines waste computers and televisions as ‘hazardous’. Some computers and televisions contain some of the persistent organic pollutants recently listed in the Stockholm Convention. Both Conventions impose requirements on the way these wastes are managed both domestically and internationally; and
- international pressure from countries that have already implemented television and computer recycling schemes.

Policy objectives

The objectives of a regulatory impact statement when considering government intervention should include broad-ranging concepts that can be applied to a range of problems. More specifically relating to end of life televisions and computers should be to address the conservation of non-renewable resources; meet community expectations regarding resource recovery and recycling; address market and regulatory failures; and avoid, where possible, any negative environmental impacts associated with waste going to landfill, while being consistent with broader government policy.

Consistent with the Council of Australian Governments’ *Best Practice Regulation A Guide for Ministerial Councils and National Standard Setting*

Bodies (2007) (the COAG guidelines) the following specific objectives have been agreed.

1 Broader objective – in line with the 1992 COAG endorsed National Strategy for Ecologically Sustainable Development (ESD) strategy, the broader objectives of any government intervention would be to:

   – improve the efficiency with which resources are used;

   – reduce the impact on the environment of waste disposal;

   – enhance community well-being; and

   – provide for equity between generations.

2 In the context of end of life televisions and computers, the objectives then become:

   – to bring the recovery of television and computer waste in line with community expectations regarding resource recovery and recycling;

   – to improve the efficiency with which resources contained in end of life TV and computer products are used;

   – to ensure fair and equitable geographical, industry and product coverage, which addresses the issue of free-riders; and

   – to ensure that any intervention should be complementary to other relevant domestic policies and international obligations, including the Basel Convention which obliges Australia to minimise the domestic production of hazardous and other wastes, taking into consideration social, technological and economic aspects, and to ensure wastes are managed in an environmentally sound manner.

Acknowledging that the above objectives will require implementation, administration and other costs, whilst generating a range of social and environmental benefits, an overriding objective in line with the COAG guidelines, will be to obtain a net benefit (benefits minus costs) for the community. This will be considered when alternative approaches to intervention are considered in a cost benefit analysis framework.

Policy options

Considering the problems identified and objectives established, a set of policy options have been identified that seek to address television and computer waste problems and wholly or partly achieve the stated objectives.

In order to identify the most feasible options, the following process was undertaken:

- identification of policy options – a range of possible policy options from doing nothing to improving recycling of televisions and computers were identified. In this process 18 options were identified;
- identification of funding approaches – a range of ten possible funding approaches to fund a policy/scheme for end of life televisions, computers and computer products were identified;

- assessment of policy and funding combinations – a range of policy and funding combinations (180 given there were 19 policy options and ten funding approaches) were identified; and
- most feasible options selected – considering the set of combinations identified, the most feasible set of policy/funding combinations (approximately 65 out of the total 180) were assessed against the following criteria:
  - resource recovery is maximised relative to other options;
  - costs are minimised relative to other options;
  - coverage is maximised relative to other options; and
  - administration is simple relative to other options.

  Based on assessment against the above criteria, nine options for a change in government intervention were identified that are considered most likely to achieve objectives and address problems. These options are those identified for detailed cost benefit analysis.

Considering findings of the qualitative analysis of each policy option, the nine options for a change in government intervention and the base case that are considered worthy of further cost benefit analysis are:

- Base Case: business as usual – under this scenario the current situation does not change. Some jurisdictions implement regulation or schemes but there is no national coordination of government policy. In the private sector, industry participants implement brand-specific schemes that do not cover all consumers or all waste televisions and computers;
- Options 1 & 2: Co-regulatory state-based Extended Producer Responsibility (EPR) scheme – implemented as a National Environmental Protection Measure (NEPM) with an exemption if the importer belongs to an industry scheme. This scheme is assumed to be administered by an industry-run Producer Responsibility Organisation (PRO), and makes use of a regulatory safety net to encourage participation that is administered by state and territory government. Two options for industry involvement were also considered:
  - *Option 1:* television and computer industries are jointly responsible for the collection of all products under a common PRO (including historic and orphan products).
  - *Option 2:* television industry responsible for the collection of all products (including historic and generic). Major computer brand owners responsible for historic waste from their own brand and importers of generic computer parts and equipment are responsible for all non-branded and historic products. There are two PROs.
- Options 3 & 4: Co-regulatory Commonwealth-based EPR – with an exemption if the importer belongs to an industry scheme. This scheme is assumed to be administered by a PRO, and makes use of a regulatory safety net to encourage participation that is administered by the Australian Government. Two options for industry involvement were also considered:

  - *Option 3:* television and computer industries are jointly responsible for the collection of all products under a common PRO (including historic and orphan products).
  - *Option 4*: television industry responsible for the collection of all products (including historic and generic). Major computer brand owners responsible for historic waste from their own brand and importers of generic computer parts and equipment are responsible for all non-branded and historic products. There are two PROs.

- Options 5 & 6: Co-regulatory Commonwealth excise (levy) – with an exemption if the importer belongs to an industry scheme. This scheme is assumed to be administered by a PRO, and makes use of a regulatory safety net to encourage participation that is administered by the Commonwealth Government. Two options for industry involvement were also considered:
  - *Option 5:* television and computer industries are jointly responsible for the collection of all products under a common PRO (including historic and orphan products).
  - *Option 6:* television industry responsible for collection of all products (including historic and generic). Major computer brand owners responsible for historic waste from their own brand and importers of generic computer parts/ equipment are responsible for all non-branded and historic products. There are two PROs.
- Option 7: Mandatory Commonwealth levy with a government-run subsidy scheme for collection/recycling – a Commonwealth administered scheme whereby regulations impose a fee to be paid on all imports, and subsidies are paid to recyclers for collection/recycling of televisions and computers;
- Option 8: Mandatory import license requirement – producers must hold a license to import televisions and computers, which involves membership of an industry scheme to collect and recycle waste items (involving an industry PRO administering the scheme on behalf of importers); and
- Option 9: Mandatory state-based EPR (NEPM) – involves an industry-run PRO administering a collection/recycling scheme on behalf of importers (who are required by regulation to take part in the scheme). Administration of required regulation could be undertaken by the Australian or state or territory governments.

Cost benefit analysis of options

Analysing the costs and benefits of the identified policy options using economic Cost Benefit Analysis (CBA), indicates that the nine television and computer recycling schemes assessed in this regulatory impact statement will result in net economic benefits to society. As the CBA is based on a range of estimates and assumptions, the appraisal results provide a general view about the likely expected economic outcomes that are subject to these assumptions. Despite this, the appraisal results in an overall conclusion that the options have positive economic outcomes, with relativities between options not expected to change with amendments to key assumptions.

In addition to establishing positive net economic benefits from implementing a scheme, the cost benefit analysis also compared nine possible policy options against the *status quo*.

The CBA and analysis of broader considerations indicates that:

- all nine recycling policy options assessed result in net benefits, with net present values (NPVs) ranging from $517-742 billion;
- there is little differentiation between the schemes in terms of the present value of costs and benefits; and
- any differentiation has been found to be due to differing ramp up of recycling rates, and varying administration costs.

Given the closeness of the options it is preferred that the community be given the opportunity to comment freely on which option might be the preferred, hence approach in the consultation regulatory impact statement is that no individual options are recommended and all will be considered through the consultation process.

1 Introduction

More than 16 million televisions, computers and computer products reach the end of their useful life each year, with the majority being landfilled and a small proportion recycled.[3] This is predicted to grow to 44 million by 2027/28. This report examines whether problems exist for end of life televisions and computers that may require government intervention. The report also considers policy options to address those problems.

1.1 Purpose of the regulatory impact statement

This document is a consultation regulatory impact statement. Its purpose is to examine the impacts of implementing consistent national arrangements for end-of-life televisions and computers and to consult the community and other stakeholders on these impacts.

Televisions and computers are increasingly popular in households and businesses around Australia. In 2007/08 there were 31.7 million televisions, computers and computer products sold into Australia,[4] which is equivalent to 1.5 new units per person every year.[5] In the same period, it is estimated that 16.8 million televisions, computers and computer products reached the end of their useful life.[6] This suggests that each Australian disposes of nearly one unit each year.

The number of computers and televisions being sold in Australia and the speed at which they reach obsolescence has been increasing in recent years, driven by industrial processes, rising incomes and wealth, demographic and lifestyle factors, rapidly improving technologies, the move to digital television and declining real costs due to falling prices of minerals and other raw material inputs.[7] As a result the volume of television and computer products reaching end of life each year is expected to increase at

[3] Note that computers that are reused or placed in storage are not defined as having reached end of life.

[4] Television and computer sales consisted of: 3.1 million televisions, 4.5 million assembled desktops and laptops, 1.6 million separate computer monitors and 22.6 million other computer products such as keyboards, mice, power cords or printers (known in the industry as 'peripherals').

[5] Sales data was estimated using DFAT data on imports. Population sourced from: ABS 2008, *3222.0 Population Projections, Australia*, Table 9 (Jun-2006 to Jun-2101 estimates).

[6] Television and computer products reaching end of life consisted of 1.2 million televisions, 2.1 million fully assembled computers and laptops, 700,000 computer monitors, and 12.9 million other computer components. It was assumed that televisions had an average lifespan of 8 years (constant over the appraisal period). Computers were assumed to have an initial lifespan of 3 years, a reuse lifespan of 3 years and a storage lifespan of 2 years. Computer disposal behaviour was based on the model in Meihardt 2001, 'Computer and Peripherals Material Project', prepared for the Department of Environment and Heritage (now the Department of the Environment, Water, Heritage and the Arts).

[7] R&Z Consulting (2008), Estimating Consumers' Willingness to Pay for End of life Televisions and Computers in Australia, prepared by Dr John Rolfe for the NSW Environmental Protection Agency, August 2008, page 3.

a much higher rate than sales (with sales projected to increase at a rate of 1% per annum compared to year-on-year growth in end of life arisings of 5% per annum).[8] This means that unless current practices are changed, a significant volume will be disposed in Australian landfills, given that recycling rates are currently low, at around 9% of computers and computer products sold each year, and less than 1% of televisions.[9] Over the next 20 years, it is estimated that if the existing situation is not changed, 652 million units will be accumulated in Australian landfills, compared to only 71 million (or 10% of end of life units) being recycled and recovered over this timeframe.

As indicated by these 20 year projections, if televisions and computers are not recycled when they reach their end of life, they are generally disposed in landfill. The disposal of televisions and computers in landfill has traditionally been seen as problematic for a number of reasons including hazardous impacts from landfill or inappropriate disposal, and the loss of non-renewable and potentially recoverable resources such as lead and aluminium.[10] In addition, it has been recently identified that the value of recycling includes not only the financial value that the market places on recycled materials, but also non-market values that represent the more 'intrinsic' values society places on increased recycling (e.g. a sense of personal/community duty or wanting to live in a less wasteful society). With increased landfill of televisions and computers, these values are lost.

These matters, along with their relative magnitude are primary considerations in this document, along with assessment of the potential role for government in addressing and helping realise the market and non-market values.

1.2 What is the process to prepare a regulatory impact statement?

The development of regulations at a national level involves a two-step process. Firstly, a consultation regulatory impact statement is prepared. Then, this statement is made publicly available for the purposes of encouraging feedback on the analysis of options, data, efficacy and suggestions on the information provided in the document. Submissions received in the consultation stage will be used to inform the development of stage 2, a decision regulatory impact statement, which will examine preferred options and other less preferred options.

In preparing the consultation regulatory impact statement the Council of Australian Governments' *Best Practice Regulation:* A Guide *for Ministerial Councils and National Standard Setting Bodies (2007)* (the COAG

[8] Sales for televisions and computers were estimated using Department of Foreign Affairs and Trade (DFAT) data on imports. End of life modelling was based on estimated sales, lifespan, weight and disposal pathways.

[9] The amount (tonnes) of televisions recycled was estimated based on surveys of 13 e-waste recyclers. This was converted to number of units based on estimated sales data.

[10] Nixon, H. and Saphores, J-D. M. (2007), *Financing Electronic Waste Recycling – Californian Households' Willingness to Pay Advanced Recycling Fees*, Journal of Environmental Management, 84(4): pages 547-559

Guidelines) have been followed.[11] The COAG guidelines provide step by step directions on the method required in order to provide clear justification as to why regulations should be introduced, remade or adjusted.

In order to assess whether government intervention is justified, it is necessary to demonstrate the existence of either a regulatory failure or a problem that the market is not likely to resolve on its own in a satisfactory manner. Within this context, this regulatory impact statement:

- provides a background to the television and computer industries;
- discusses pressures that may be impacting on end of life television and computer policies;
- assesses the dimensions of problems related to television and computer waste;
- sets out the possible objectives of a proposed scheme to regulate recycling of computer and television waste; and
- provides an estimate of the likely impacts of a range of alternatives to address the problem using cost benefit analysis.

The focus of this consultation regulatory impact statement is on television and computer waste and more specifically, televisions and computers, defined as follows:

- *television*: a visual display device, such as a cathode ray tube (CRT), liquid crystal display (LCD), surface-conduction electron-emitter display (SED), organic light emitting diode (OLED) or plasma unit, with an internal or external broadcast tuner; and
- *computer*: personal and laptop computers and peripherals.[12]

This document is a consultation regulatory impact statement. As such, the Environment Protection and Heritage Council seeks your feedback on the data, information and recommendations within this document.

1.3 Basis of data used

PwC has prepared this consultation regulatory impact statement in association with Hyder Consulting (Hyder). Hyder has provided technical input in relation to the computer and television industries by preparing the following data for use in this consultation regulatory impact statement:

[11] Council of Australian Governments (2007), *Best Practice Regulation: A Guide For Ministerial Councils and National Standard Setting Bodies*, October

[12] In this document computer and computer products are defined as including: computer displays, computer desktops and similar, computer mobile units (e.g. laptops), computer peripherals (e.g. keyboards, mouse, hard drives, scanners, speakers, web cams, power cords, internal power supplies, external power supplies, fans, miscellaneous/other parts), personal or desktop laser and inkjet printers, and multi function devices.

- information on current sales, reuse, storage, recycling and landfill of televisions, computers and visual display units, measured both in units and tonnes. The reports also provide an overview of apparent trends and preliminary forecasts in these categories assuming no new government policies are introduced ('business as usual') between the years 2007/08 and 2030/31;[13]
- a high level assessment of proposed policy options with regards to the likely recycling outcomes under each option and the cost of associated infrastructure required for collection and reprocessing;
- an average collection cost and reprocessing cost per kilogram and per tonne; and import threshold analysis; and
- an overview of the projected diversion rates for each of the four product groupings – televisions, computers, visual display units and all television and computer products – under each option.

In addition, the regulatory impact statement also draws on work commissioned by the Environment Protection and Heritage Council (EPHC) at the end of 2008 and completed early in 2009. This work was undertaken by URS, in combination with economists and statistics analysts from ERE Consulting and market research specialists from NWC Research, and involved surveying and modelling households' willingness to pay for increased television and computer recycling.[14]

1.4 Stakeholders consulted

In addition to the data discussed above, and the public and other documents presented in the reference list (Appendix A), the following organisations have contributed in some way to this publication:

- 1300EWASTE;
- Australian Customs Service (ACS);
- Australian Information Industry Association (AIIA) and members of the organisation;
- CLAW Environmental;
- Close the Loop;
- Department of Foreign Affairs and Trade (DFAT)
- E-Cycle Recovery;
- HMR Group Adelaide;
- MRI;

[13] A 20 year appraisal period commencing in the first year of the proposed schemes (2010/11) is based on recommendations in the COAG Best Practice Regulation Guidelines. See Commonwealth Government Office of Best Practice Regulation (2007), 'Best Practice Regulation Handbook', August, p 117

[14] URS (2009), *Willingness to Pay for E-Waste Recycling*, report prepared for the Environment Protection and Heritage Council, February. More information on choice modelling can be found in Appendix C.

- PGM Refiners;
- Product Stewardship Australia (PSA) and members of the organisation[15];
- Electrical Equipment Product Stewardship Sub-Group (also referred to as the project Steering Committee in this document);
- SIMS;
- Sustainability Victoria;
- TES-AMM;
- That Guys Recycling;
- The Eaglehawk Recycle Shop;
- Theiss Environmental;
- TIC Group; and
- Vantage Incorporated.

1.5 Structure of this regulatory impact statement

The analysis in the regulatory impact statement:

- presents a background to the television and computer industry (Chapter 2);
- discusses policy pressures and international policy relating to the television and computer industry (Chapter 3);
- identifies the problems related to waste televisions and computers (Chapter 4);
- outlines the objectives of any potential government intervention (Chapter 5); and
- outlines alternative policy options to be considered to wholly or party meet objectives (Chapter 6);
- assesses the costs and benefits of policy options considered most feasible (Chapter 7);
- discusses other considerations relevant to the policy options, including trade and market issues, economic efficiency and equity, as well as implementation aspects (Chapter 8); and
- provides a summary of key findings (Chapter 9).

The regulatory impact statement is also supported by a number of appendices:

[15] The multi-jurisdictional working group, known as the Electrical Equipment Product Stewardship Sub-Group, is represented by officials from the Australian Government, NSW and Victoria, and also includes a representative from the National Environment Protection Council Service Corporation

- Appendix A References;
- Appendix B Customs tariff data and definitions;
- Appendix C Choice modelling;
- Appendix D Australian jurisdictions policies;
- Appendix E Analysis of options;
- Appendix F Threshold analysis;
- Appendix G CBA assumptions;
- Appendix H Costs for each option;
- Appendix I Benefits for each option;
- Appendix J Summary of CBA results; and
- Appendix K Sensitivity analysis.

2 The television and computer industries and associated waste

To provide context for the discussion on television and computer waste problems and regulatory options, this chapter presents an overview of the television and computer industries. While noting that the television and computer industries are separate industries, this regulatory impact statement has analysed them jointly as a number of problems (discussed in chapter 4) are shared across the industries.

2.1 What are televisions and computers?

As indicated in chapter 1, this document uses the following definitions for televisions and computers:

- *television:* a visual display device, such as a cathode ray tube (CRT), liquid crystal display (LCD) or plasma unit, with an internal or external broadcast tuner; and
- *computer:* personal and laptop computers and peripherals.

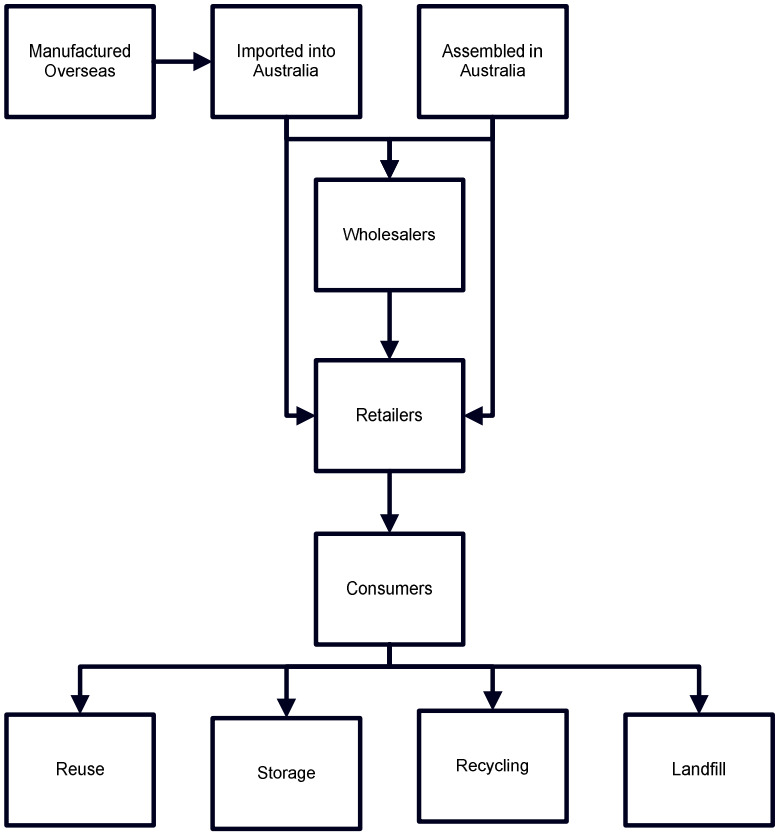
An implication of these definitions is that import, sales and recycling volumes tend to be presented on a unit basis. However, an understanding of issues such as landfill space, and also to understand some of the costs related to collection and recycling have required a conversion of units into tonnes to allow comparison and analysis of different products like computers, televisions, monitors, mice, keyboards, speakers and power cords. As a result, this chapter presents a profile of televisions and computers in either tonnes or units.

For the purposes of this consultation regulatory impact statement we have drawn on the tariff data and definitions used by the Australian Customs Service (ACS) to code televisions and computers. These codes are set out in Appendix B.

2.2 Television and computer industry participants

There are a number of participants in the television and computer industry supply chain, which is depicted in Figure 1.

Figure 1 Television and computer industry supply chain



Note: 'end of life' as defined in this document, relates to televisions and computers and computer products that are either 'recycled' or 'landfilled'. Items that are stored or reused are not considered to have reached their end of life yet.

Some of the key points relating to the supply chain are:

- all television, computer and computer products are manufactured overseas (although some units are sold in Australia prior to sale); and
- there are only two disposal destinations for televisions and computers that have reached their end of life; they are either recycled or landfilled.

The key elements of the supply chain are described further below.

Description of production

The components for microcomputers (used as personal computers and as servers for other computers and peripherals) are mostly manufactured and assembled overseas. In addition, a significant (12%)[16] but decreasing proportion of desktop personal computers are manufactured overseas but assembled to specifications in Australia ('white box' computers). However, all portable computers are assembled overseas.

IBM, Acer, Lenovo, Hewlett Packard, Dell and Toshiba are major suppliers of computers in Australia.[17] However, there are a large number of small to medium sellers, with the top four companies in the industry only accounting for around 10% of revenue of the computer and associated manufacturing industry.[18]

The Australian Information Industry Association (AIIA), which is the peak national body representing the technology sector,[19] estimates there are hundreds of companies that import components into Australia and assemble them into computers here. These unbranded products are known as 'white box' computers and currently account for around 12% of domestic retail sales.[20] It is expected that there will continue to be consolidation in the computer industry.

Employment, revenue and exports associated with computers manufactured and assembled in Australia have declined in recent years as import competition becomes stronger and manufacturing has moved overseas. More broadly, manufacturing of electronic products has progressively moved to countries with lower wages and material suppliers in close proximity. From a global perspective, however, this industry is in a growth phase. IBISWorld notes that there is a rapid introduction of new products due to a rapid rate of technological change, which will produce shorter life products cycles. Customer demand for, and acceptance of, new products is also rapidly growing.[21]

Similar to computers, Australia does not manufacture any televisions domestically. The last Australian manufacturing plant closed in 2006.[22]

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[16] Australian Information Industry Association (2009), *pers. comm,* 14 April

17 Note that major computer manufacturers located in advanced countries, such as the United States, are relocating, or contracting out, production to countries such as China which are offering low manufacturing costs. For example, in early 2005, IBM sold off its PC business to China's Lenovo group. China alone now accounts almost half of the value of all imports of computers into Australia. See IBISWorld Pty Ltd (2009), Computer and Related Manufacturing in Australia, 20 January

[18] IBISWorld Pty Ltd (2009), *Computer and Related Manufacturing in Australia,* 20 January

[19] Australian Information Industry Association (2009), 'About AIIA', available at < http://www.aiia.com.au/pages/aboutaiia.aspx>, accessed 21 April 2009

[20] Australian Information Industry Association (2009), *pers. comm,* 14 April

[21] IBISWorld Pty Ltd (2009), *Computer and Related Manufacturing in Australia,* 20 January

[22] Australian Broadcasting Association, (2006), *The World Today – Australia's last television plant closes*, accessed 9 April 2009, available at <http://www.abc.net.au/worldtoday/content/2006/s1554891.htm>

Unlike computers, however, Australia does not assemble any televisions locally, with all television sets imported from overseas. There is no assembly of imported components in Australia to produce 'white box' products.[23] The major suppliers of television sets within Australia are Sony, Samsung, LG, Panasonic and Sharp. They comprise around 74% of sales by value in Australia,[24] making the television industry more concentrated than the computer industry.

Television production has changed over the years in response to technology, the proposed shift from analogue to digital technologies, and the introduction of high definition televisions, which has allowed clearer pictures to be provided on larger formats.[25] It is estimated that 54% of Australian households are watching digital television,[26] and that high definition receivers account for 36% of all digital receivers.[27] This has resulted in a transition from CRT televisions to larger flat screen LCD, plasma and rear projection televisions.

Description of imports

Televisions and computers are all imported into Australia (noting that 'white box' computer components are all imported but are then assembled as desktop personal computers (PCs) in Australia). Given all items/components are imported, import data provides a useful measure of volumes and values sold each year in Australia for the two industries, and hence is used as the basis of information provided in this document. In comparison, data on retail sales is not publicly available as it is largely the industry itself that prepares and collates this data for internal industry use. Import data has, however, been used to estimate sales levels.

In 2007/08 in Australia there were approximately 3.1 million television set sales and 28.6 million computer and computer product sales, all from imported sources unless they are units assembled in Australia (that are assembled from imported components).

While televisions are imported as 'sets', only 8% of computer imports were fully assembled PCs or laptops. The majority of computer units imported were components such as printers, keyboards and mice, known in the industry as 'peripherals' (Figure 2).

[23] IBISWorld Pty Ltd (2009), *Electronic Component Manufacturing in Australia,* March

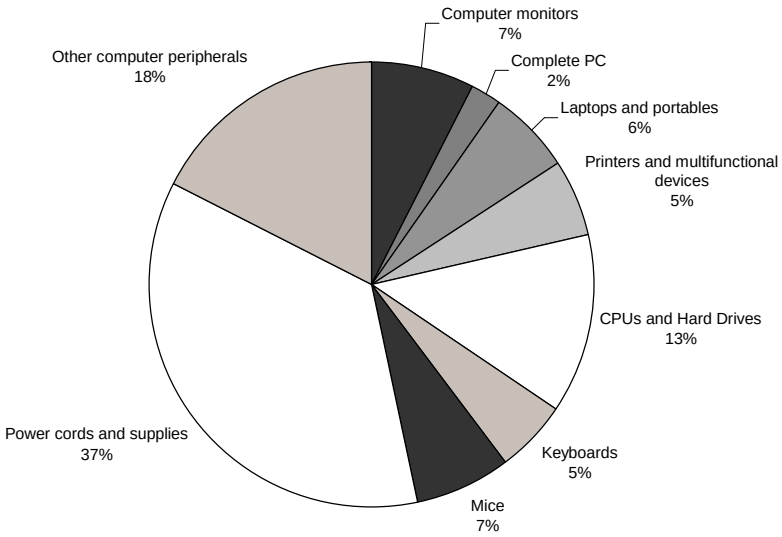
[24] Product Stewardship Australia (2009), *Pers. Comm.*, 13 March

[25] IBISWorld Pty Ltd (2009), *Electronic Component Manufacturing in Australia,* March

[26] Australian Communications and Media Authority 2008, 'Majority of households still turn to digital free-to-air television', available at http://www.acma.gov.au/WEB/STANDARD..PC/pc=PC_311091, accessed 20 April 2009

[27] IBISWorld Pty Ltd (2008), *Household Appliance Wholesaling in Australia*, 10 November, page 6

Figure 2 Computer imports 2007/08 (units)



Source: DFAT data on imports by quantity. Tariff code inclusions are provided in Appendix B.

The import destination and products are shown in Table 1, which illustrate that imports for all products predominantly occur in NSW, to a lesser degree in Victoria and Queensland, and to an even smaller degree in other jurisdictions.

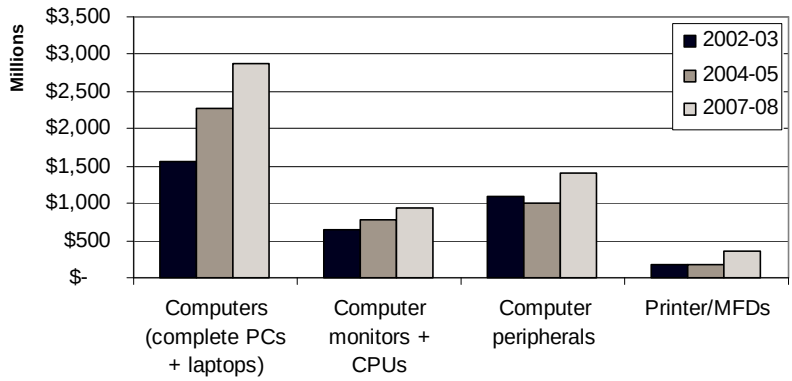
Table 1 Television and computer imports 2007/08 (units)

State	Televisions	Computers (complete PCs and laptops only)	Other computers products
NSW	44.20%	64.78%	63.77%
VIC	28.80%	22.82%	23.50%
QLD	17.15%	6.01%	5.99%
SA	2.27%	0.35%	0.37%
WA	7.51%	6.00%	6.32%
TAS	<0.01%	0.03%	0.04%
NT	0.06%	0.01%	0.01%
ACT	<0.01%	<0.01%	<0.01%

Source: DFAT data on imports by quantity and port of entry. Tariff code inclusions are provided in Appendix B

While there has been a reduction in the average value of computer items imported, the total value of imports has continued to increase. (See Figure 3)

Figure 3 Television and computer imports



Source: DFAT data on imports by quantity and value. Tariff code inclusions are provided in Appendix B

With the shift towards larger flat screen LCD, plasma and rear projection televisions, the value of imports is expected to increase in coming years, coinciding with the phasing out of analogue technology in favour of digital by 2013. In terms of computers, Australian consumers spent $2.8 billion on 1.2 million high-definition flat-panel televisions during 2007, which indicates the value of this industry.[28]

Description of sales

As outlined previously, sales (by unit) of computers and computer products are not directly equal to imports due to the assembly of 'white box' computers in Australia from imported components. Table 2 presents Australian sales estimates for 2007/08 based on the collation of import data into:

- televisions only;
- computers and computer products;
- visual display units only (i.e. televisions and computer monitors); and
- all televisions and computers and products.

Table 2 Television and computer sales 2007/08 (million units)

Product grouping	Sales volume
Televisions	3.1
Computers and computer products	28.6
Visual display units	6.7
All television and computers and computer products	**31.7**

Source: Sales data was estimated using DFAT data on imports. Tariff code inclusions are provided in Appendix B

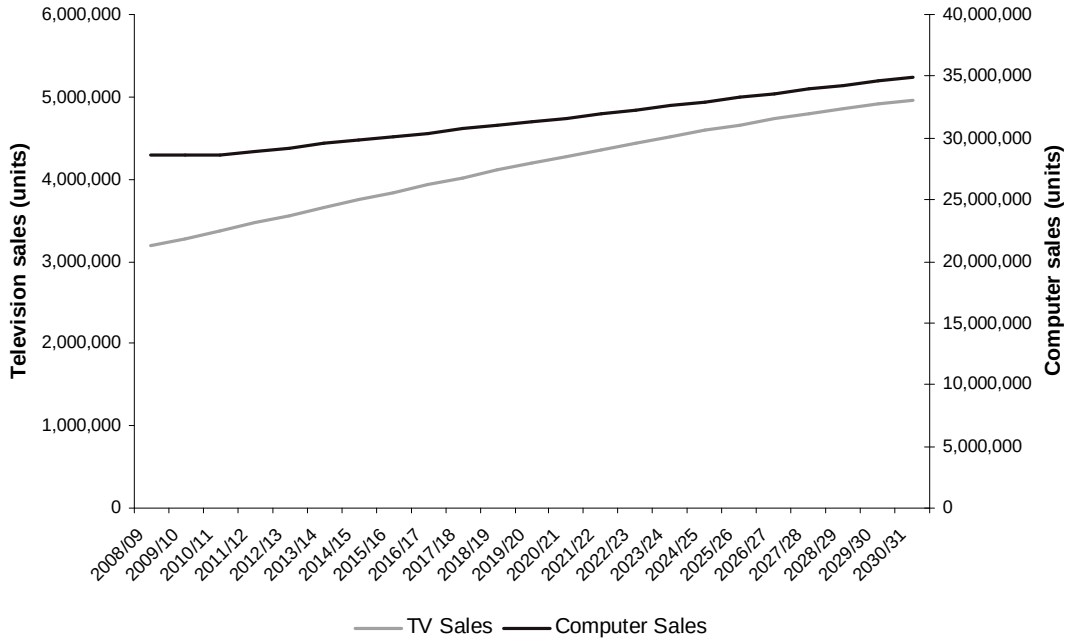
[28] The Australian Financial Review (2008), (60) 10 June

Sales projections

Sales volumes were projected under a 'business as usual case' (i.e. assuming no government or policy intervention over and above current measures) based on import data, historical trends and reports, and advice from industry association representatives.[29]

It is estimated that both television and computer sales volumes will increase over the next 20 years, as shown in Figure 4.

Figure 4 Television and Computer Sales 2007/08 – 2030/31



Source: Sales projections were made based on current DFAT import data with input from AIIA and PSA on anticipated sales growth.

Sales of computers and computer products are estimated to increase from 28.6 million units in 2007/08 to 33.9 million in 2027/28, while sales of televisions are estimated to increase from 3.1 million to 4.8 million units over the same period.[30]

[29] URS study found the following: each household has 2.87 televisions, 1.58 central processing units, 1.55 monitors and 0.96 laptops. [URS (2009), *Willingness To Pay for E-Waste Recycling*, Unpublished report prepared for the Environment Protection and Heritage Council, February 2009

30 Historic sales for televisions and computers were estimated using DFAT data on imports. Television sales were assumed to grow at a compound annual growth rate (CAGR) of 3% per annum growth in sales (units) in 2008/09 declining to 1% by 2030/31. This was assumed based on the anticipated initial continuation of sales growth over this period as households replace analogue units with digital, followed by a level of saturation in the number of new televisions required being reached. Computers and peripherals were projected to grow at AIIA has indicated that they expect negative or flat growth for 2008/09 and 2009/10, increasing slightly after that period. The assumed growth rates are: 0% 2008/09 and 2009/10, then a steady 1% growth rate from 2010/11 onwards.

Description of end of life

At their end of life, televisions, computers and computer products are either landfilled or recycled.

Some of the key factors impacting on the volume of end of life televisions and computers, which is expected to increase year-on-year if the current situation continues, are described below.

1. Sales volumes are expected to increase over the next 20 years. This is due to a number of factors including changes in technology, moves to digital television and consumer preferences (with television sales increasing from 3.1 million to 4.8 million, and computer and computer product sales volumes increasing from 28.6 million to 33.9 million over the next 20 years);[31]

2. End of life volumes are expected to increase faster than sales due to shorter lifecycles. Increased sales are expected to result in an increase in the volume of end of life televisions and computers as well, and in fact, these volumes are expected to increase more significantly than new sales, in particular as a result of the television and computer industries experiencing rapid technological change which is expected to produce shorter product lifecycles; and

Analysis of computer lifespan for this regulatory impact statement, has assumed that the average lifespan for commercial computers that are returned to the leasing company at the end of lease/life is 3 years until 2007/08, reducing to 1.5 years by 2027/28 and then remaining steady. For computers that are bought outright by the commercial operator or are owned by the company at the end of the lease period, it is assumed that the average lifespan is 4.5 years for computers until 2006/07, reducing to 1.5 years by 2027/28 and then remaining steady. For household computers it is assumed that the average lifespan is 10 years for computers until 2007/08 reducing to 5 years by 2027/28 and then remaining steady. The total lifespan for household computers that enter following a period of use within the commercial sector is assumed to be equal to the lifespan of a computer entering the household sector as a new computer.

Table 3 Computer and peripherals lifespan model factors used (2007/08 & 2027/28)

Type of Computer	Lifespan (years)
Leased commercial computers	3 (until 2007/08) reducing to 1.5 (by 2027/28) then remaining steady
Bought commercial computers	4.5 (until 2006/07) reducing to 1.5 (by 2027/28) then remaining steady
Household computers	10 (until 2007/08) reducing to 5 (by 2027/28) then remaining steady

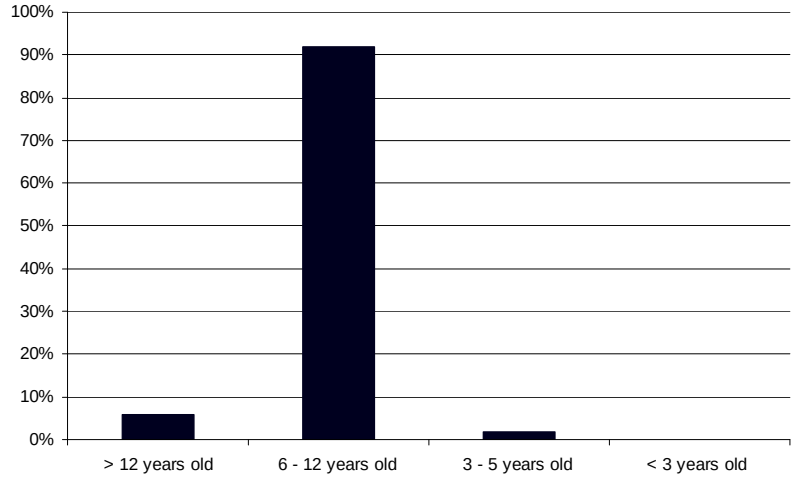
Source: Assumptions based on information provided by government and industry representatives

The estimated lifespan of computers is reinforced by data from Byteback (take-back computer scheme) run in Victoria by AIIA since 2005. Byteback

[31] Historic sales for televisions and computers were estimated using DFAT data on imports.

data (see Figure 5) indicates that 80% of items received were greater than seven years old, 19% were four to six years old and 1% were one to three years old.

Figure 5 Analysis of computer units received by Byteback scheme, 2005 -2008[32]



Source: Byteback (2009)

For televisions, industry advice has been used to estimate that the average lifespan has declined from 10 years for a unit purchased in 1995 and will be 7 years for a unit purchased in 2013, declining further to 3 years for a unit purchased in 2028/29. The reduction in lifespan is assumed to be linear over this period.

Table 4 Television disposal model factors used (2008/09)

Year of sale	Lifespan (years)
1995/96	10
2013/14	8
2028/29	3

Source: Industry advice

Significant volumes of redundant CRT televisions are projected. The shift to digital television is not only expected to influence purchases of televisions, but the phasing out of analogue televisions between 2010 and 2013 is likely to generate a significant volume of redundant CRT televisions for disposal/recycling;[33]

Changing product mix is likely to reduce the weight each unit comprises in landfills. Another factor at play is that in the computer industry, the product mix is changing with a shift away from desktops towards portable

[32] Australian Information Industry Association (2009), *Byteback*, Presentation given to PwC and Hyder Consulting, 10 March

[33] The shift from analogue to digital technology, particularly the trends towards digital set-top boxes, high definition, digital video disks (DVD) and Blu-ray technology, is allowing clearer pictures to be shown on larger formats, resulting in a shift away from CRT televisions towards flat screen LCD, plasma and rear projection televisions with much larger screen sizes.

laptop computers. The proportion of laptops has increased from 14% in 1998/99 to 54% in 2007/08. Laptops are lighter, with a laptop sold in 2007/08 weighting an estimated 2.5 kg compared with a desktop computer (with flat screen monitor) weighing an estimated 14 kg. In addition, there has been a shift from CRT to LCD screens, technological improvements resulting in lighter LCD screens and a trend towards lighter desktop boxes. As a result of these changes, the average weight of computers has declined from an estimated 25.3 kg in 2000/01 to 7.9 kg in 2007/08 and this trend is expected to continue. [34]

Based on consideration of the factors above, unless current practices change, the current trend of around 88% of end of life units being landfilled is not expected to change over the next 20 years. Table 5 estimates how many products are expected to reach end of life in 2007/08, under the current situation.

Table 5 Television, computer and visual display units' end of life 2007/08 (million units)

Product grouping	Sales volume	End of life volume
Televisions	3.1	1.2
Computers and computer products	28.6	15.7
Visual display units	6.7	3.4
All television and computers and computer products	31.7	16.8

Source: End of life modelling of television and computer products was based on estimated sales, lifespan, product weight and disposal pathways. Sales data was estimated using Department of Foreign Affairs and Trade (DFAT) data on imports. Input to the development of assumptions for lifespan, weight and disposal pathways was provided by AIIA, PSA and the project Steering Committee

Description of recycling

Recycling of televisions and computers is defined as 'the reprocessing of materials and products so they can be manufactured into new products'. This definition distinguishes between recycling and reuse, which is defined as 'when existing products and components are used for the same purpose, perhaps after being repaired'.[35]

In previous studies a number of barriers have been identified that mean comprehensive recycling systems have not yet been established, and that in part explains the low level of recycling currently in Australia. Barriers influencing the commercial viability of recycling televisions and computers have included:

- the separation of electronic components;
- low re-sale value of recovered resources;

[34] Ibid.

[35] URS (2009), *Willingness To Pay for E-Waste Recycling*, Unpublished report prepared for the Environment Protection and Heritage Council, February, Appendix A, question 6

- commodity price fluctuations; and
- establishing a broad-scale collection network.

The costs and uncertainties involved in the recycling of computers and televisions mean that unless the costs can be recovered by consumers, or the wider community, recycling is unlikely to occur.[36]

Levels of recycling were based on surveys of 13 e-waste recyclers and one e-waste collector who were asked to provide 2007/08 recycling of e-waste split by product type. Table 6 shows estimates of destinations of televisions and computers once they reach end of life.

Table 6 Television, computer and visual display units end of life destinations 2007/08 (million units)

Product grouping	Sales volume	End of life volume (total)	End of life split by disposal outcome			Diversion rate (Local recycling + overseas / total end of life)	Recycling rate [Local recycling / (local landfill + local recycling)]	Recycling rate as % of sales (local recycling/ sales)
			Exported for reuse[37]	Recycling	Landfill			
Televisions	3.1	1.2	0.0	0.01	1.1	1%	1%	0.4%
Computers and computer products	28.6	15.7	0.5	1.5	13.7	13%	10%	5%
Visual display units	6.7	3.4	0.3	0.3	2.8	17%	10%	4%
All television and computers and computer products	31.7	16.8	0.5	1.5	14.9	12%	9%	5%

Source: End of life modelling of television and computer products was based on estimated sales, lifespan, product weight and disposal pathways. Sales data was estimated using DFAT data on imports. Input to the development of assumptions for lifespan, weight and disposal pathways was provided by AIIA, PSA and the project Steering Committee

Estimated sales, end of life and disposal outcome data was converted into tonnes using estimated weights of television, computer and computer product unit weights. Table 7 shows the end of life destination based on tonnes of computers and televisions. The significant difference in diversion and recycling rates for computer and computer product 'units' (in Table 6) compared to computer and computer product 'tonnes' (Table 7) is because this group of items comprises a number of diverse products with vastly different weights. For example, end of life desktops were estimated to weigh 21 kg, compared to 8 kg for computer monitors, 3 kg for laptops, and 2.6 kg for peripherals.[38]

[36] URS (2009), *Willingness To Pay for E-Waste Recycling*, Unpublished report prepared for the Environment Protection and Heritage Council, February

[37] Note that reuse is the level of computers sent overseas for use.

[38] Estimates based on manufacturer's data and direct weight measurements.

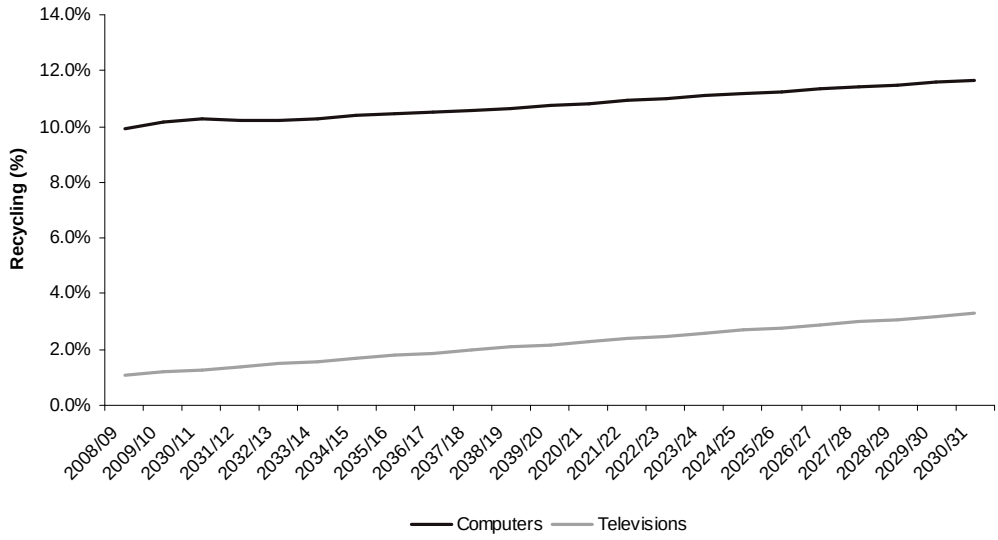
Table 7 Television, computer and visual display units end of life destinations 2007/08 (thousand tonnes)

Product grouping	Sales volume	End of life volume (total)	End of life split by disposal outcome			Diversion rate (Local recycling + overseas / total end of life)	Recycling rate [Local recycling / (local landfill + local recycling)]	Recycling rate as % of sales (local recycling/ sales)
			Exported for reuse[39]	Recycling	Landfill			
Televisions	68.2	27.7	0.0	0.3	27.5	1%	1%	0.4%
Computers and computer products	69.6	78.3	7.4	9.6	61.3	22%	14%	14%
Visual display units	88.5	52.8	2.9	3.6	46.3	12%	7%	4%
All television and computers and computer products	137.8	106.1	7.4	9.9	88.8	16%	10%	7%

Source: End of life modelling of television and computer products was based on estimated sales, lifespan, product weight and disposal pathways. Sales data was estimated using DFAT data on imports. Input to the development of assumptions for lifespan, weight and disposal pathways was provided by AIIA, PSA and the project Steering Committee

Figure 6 shows the estimated recycling rate over the next 20 years if the current trends continue (i.e. the 'business as usual' case), but taking into account the phasing out of analogue televisions by 2013 and assuming the effects of the current global economic slowdown are cursory in nature.[40]

Figure 6 Recycling rate (units recycled as a proportion of units reaching end of life) 2008/09 – 2030/31



Source: End of life modelling of television and computer products was based on estimated sales, lifespan, product weight and disposal pathways. Sales data was estimated using DFAT data on imports. Input to the development of assumptions for lifespan, weight and disposal pathways was provided by AIIA, PSA and the project Steering Committee

[39] Note that reuse is the level of computers sent overseas for use.

[40] Treasury forecasts that Australia will experience negative 0.5% GDP growth in 2009/10, but also forecasts that this will rise to positive 2.25% growth by 2010-11. See Australian Government 2009, 'Budget 2009-10: Budget Overview', Appendix H

Table 8 presents disposal methods of televisions and computers as a percentage of the total number of products reaching end of life.

Table 8 Disposal methods of televisions and computers as a percentage of end of life (by units)

Product	Landfill	Recycling	Export for reuse
Televisions	99.0%	1.0%	N/A
Computers and computer products	87.5%	9.5%	3.0%

Source: End of life modelling of television and computer products was based on estimated sales, lifespan, product weight and disposal pathways. Sales data was estimated using DFAT data on imports. Input to the development of assumptions for lifespan, weight and disposal pathways was provided by AIIA, PSA and the project Steering Committee

2.3 Summary

Televisions, computers and computer products are all imported into Australia (noting that 'white box' computer components are all imported but are then assembled as desktop PCs in Australia), and the trend of offshore manufacturing does not appear likely to change in the future. Unbranded 'white box' computers comprise a small and decreasing proportion of the market.

There appears to be consolidation in the sector brought about by a range of factors and perhaps accelerated by recent financial conditions. This has implications for policies that seek to match recycling programs with incumbent businesses when the actual waste was created by businesses that have been merged, entered the Australian market or ceased operation.

The amount of television and computer waste is growing due in part to changes in technology, moves to digital television, and consumer preferences. There is a lag of three to ten years, on average, between purchases of new televisions and computers and these products entering the waste stream.

Some waste is recycled and this is expected to increase. While it is true that this level of recycling is being undertaken without a comprehensive coordinated government mandate to recycle, much of the current recycling effort is supported in some way by the government, such as the subsidies in Victoria for the Byteback program.

Table 9 provides a summary of the television and computer industry.

Table 9 A summary of the television and computer industry (2007/08)

	Computers and computer products	Televisions
Location of Production	Overseas except for some assembly of desktop PCs	Overseas
Concentration of production	Low although likely to increase as the number of smaller 'white box' assemblers declines	High, no 'white box' assemblers
Number of imports	39.1 million in 2007/08, increasing due to rapidly changing technology decreasing life cycles	3.1 million in 2007/08, increasing due to more televisions per household and shift to digital

	Computers and computer products	Televisions
Type of product imported	Only 8% assembled PCs or laptops in 2007/08, mostly peripherals	All completed television sets
Value of imports	$5.6 billion increasing even with falling computer prices and decreased concentration in the market	$2.1 billion increasing due to demand for larger flat screen televisions
Sales	28.6 million in 2007/08	3.1 million in 2007/08
End of life	15.7 million units in 2007/08	1.2 million units in 2007/08
Recycling (% of end of life) (% of sales)	1.5 million units (10%) (less than 1%)	11,000 units in 2007/08 (1%) (5%)

3 Policy context and related pressures

There are a number of policy matters that have important implications for end of life televisions and computers. These policy pressures provide important context before proceeding to a discussion of the problems relating to television and computer waste, and also provide context for considering government intervention of current television and computer disposal and recycling practices.

3.1 Australian context

Australia is party to a number of international conventions and agreements which are particularly relevant to the management of computer and television waste both within Australia and internationally, including the Basel Convention on the Control of the Transboundary Movements of Hazardous Waste and Their Disposal (the Basel Convention) and the Stockholm Convention on Persistent Organic Pollutants (the Stockholm Convention).

The Basel Convention, which was opened for signature 22 May 1989, came into force 5 May 1992 and was ratified by 151 countries as at December 2002. Under the Basel Convention the Commonwealth has obligations to:

- minimise generation of hazardous waste within Australia;
- ensure adequate disposal facilities are available within Australia;
- control and reduce international movements of hazardous waste;
- ensure environmentally sound management of wastes; and
- prevent and punish illegal traffic.[41]

In addition to the import and export of waste computers and televisions, the Basel Convention has implications for the way end of life computers and televisions, which are classified as hazardous under the Basel Convention, are managed domestically.

The Australian Government has implemented the Hazardous Waste (Regulation of Exports and Imports) Act 1989 (Cth) (the Act) to meet part of Australia's obligations in this area. The main purpose of this Act is to regulate the import and export of hazardous waste to ensure that hazardous waste is disposed of safely so that human beings and the environment, both within and outside Australia, are protected from the harmful effects of the

[41] Department of the Environment, Water, Heritage and the Arts (2009), 'International hazardous waste conventions', site: http://www.environment.gov.au/settlements/chemicals/hazardous-waste/conventions.html cited: 5 May 2009

waste. The Act sets out the requirement for a permit before hazardous waste is imported or exported into Australia. The import, export and transit of hazardous waste is permitted by the Act under certain conditions, including the environmentally sound management of the waste to protect both the environment and human health. The Act identifies conditions under which e-waste, such as computers and televisions, might be considered hazardous waste and prohibits the export of such waste unless certain conditions are met, which include whether there is the capacity to deal appropriately with such wastes within Australia and whether the proposed export will ensure that the wastes are dealt with in an environmentally sound manner.[42]

In addition to the Basel Convention, domestic management of end of life computer and televisions is also affected by Australia's obligations as a signatory to the Stockholm Convention. Scientific understanding of the impacts of substances on the environment and human health continues to change. The listing of nine new persistent organic pollutants (POPs) under the Stockholm Convention which include materials, such as some brominated flame retardants used in many computers and televisions, may change the way relevant end of life computer and televisions are managed.

There are some seeming inconsistencies in the way hazardous waste is managed in Australia. Consumer products, such as televisions and computers, that contain hazardous substances and are defined as hazardous wastes under the Basel Convention, and require an export permit, may not be defined in domestic regulation as hazardous. The current approach to dealing with waste products that contain hazardous materials has been to deal with them on a product-by-product basis, rather than with their combined impact on the environment. There are limits to current understanding of the interaction and long-term impact of some materials being landfilled. There has been little research on what happens over a long period when a diverse mix of materials interacts in a landfill.

Each jurisdiction has its own waste minimisation legislation or policies as set out in Appendix D. The broad powers provided to each jurisdiction by waste minimisation legislation – for example the NSW Government's *Waste Avoidance and Resource Recovery Act 2001* – means that there is a tangible risk that each jurisdiction will implement a different approach to the television and computer waste problem in the absence of a national approach (discussed further in Chapter 4). Specific television and computer waste, and broader e-waste responses have already begun to vary in different jurisdictions:

- ACT has banned the disposal of computer monitors and television screens in landfill;
- SA has implemented an e-waste policy and has recently issued a discussion paper to ban e-waste from landfill. The EPA is currently

[42] Electrical Equipment Product Stewardship Sub-Group (2009), *Pers. Comm.* 9 July 2009

preparing a response to submissions made regarding the waste policy;[43]

- Victoria is trialling Byteback, a free computer collection and recycling trial, and trials have occurred in a number of jurisdictions including New South Wales (see Table 14);
- several recycling organisations accept used televisions and computers, but they may impose fees or charges;[44] and
- a number of local governments have implemented or are considering bans or charges for disposing of e-waste in landfill.[45]

In addition, there have been recent decisions at EPHC to develop a National Waste Policy that could bring together the varied approaches to particular wastes at a national level. This is explored in the Consultation Paper *A National Waste Policy; Managing Waste to 2020*.

3.2 Review of taxation

The Henry Tax Review may impact the way that funding is obtained to address the problems associated with television and computer waste

On 13 May 2008 the Australian Government announced the review of Australia's tax system known as the Henry Tax Review. The review will look at the current tax system and make recommendations to position Australia to deal with the demographic, social, economic and environmental challenges of the 21st century.

It is quite possible that the tax review may impact the way that funding is obtained to address the problems identified in the previous chapter. For instance, the Australian Treasury, in its architecture paper to support the Government's review, indicates that it supports in principle a move away from specific levies to greater reliance on broad based taxes and direct funding for government programs.[46]

This has implications for the likely success, cost and appetite for funding options specific to address television and computer waste concerns.

[43] Environment Protection Authority (2008), *Draft Environment Protection (Waste to Resource) Policy and Explanatory Report,* November, Adelaide

[44] CRT Recycling (http://www.crtrecycling.com.au/) based in Adelaide has an environmentally sound treatment facility for end of life CRTs

[45] For example, the Councils of Mosman, Manly, Pittwater and Warringah intend to put forward a Notice of Motion for a ban on disposal of e-waste landfill commencing 1 January 2010 at the 2009 National General Assemble of Local Government in Canberra on 21 to 24 June 2009. See Pittwater Council website, 'Pittwater supports regional e-waste ban', available at < http://www.pittwater.nsw.gov.au/council/media/news/2009/may/pittwater_supports_e-waste_ban>, accessed 19 June 2009

[46] Australian Treasury (2008), 'Architecture of Australia's Tax and Transfer System', pages 283 and 285-6

3.3 International pressure

Television and computer waste is an important international issue and a number of countries have implemented television and computer recycling schemes

Globally the issue of television and computer waste recycling has become an important focus for the future. International expectations provide pressure to address the issues discussed in Chapter 4.

The Basel Convention requires Australia to take appropriate measures to ensure that the generation of hazardous and other wastes (including household wastes) is reduced to a minimum taking into account social, technological and economic aspects. Given its status as developed country, this raises the expectation in the international and domestic community that Australia's approach to managing potentially hazardous waste will be consistent with international standards.

The European Union in February 2003 introduced regulation to member states and two European directives, the EU Waste electrical and electronic equipment (WEEE) and the Restriction of Hazardous Substances (EU RoHS). The WEEE Directive covers both obligatory recycling schemes and waste reduction strategies. In order to encourage designs that facilitate repair, reuse and recycling, the WEEE Directive established the principle of 'Extended Producer Responsibility'. Producers are financially responsible for the collection, treatment, recovery and environmentally sound disposal of the end of life televisions and computers. This degree of product stewardship effectively closes the loop on the product life-cycle.[47] The RoHS Directive regulates the use of six hazardous substances (lead, mercury, cadmium, hexavalent chromium, PBBs or PBDEs) in electrical and electronic goods.[48]

A lack of landfill capacity (similar to Europe) and densely populated urban environment has influenced Japan's e-waste scheme. The Home Appliance Recycling Law went into effect in April 2001. The law requires manufacturers and importers to collect and recycle their own appliances (including televisions). It consists of an 'old for new' scheme similar to Europe, giving retailers the primary responsibility to provide collection services. The scheme relies on end of life fees paid by consumers to finance the collection, transport, and recycling of products. Computer recycling is covered by the law for Promotion of Effective Utilisation of Resources, implemented in April 2001. Manufacturers are responsible for recycling of the computers, financed through backend user fees on computers purchased prior to 2003. Computers made post-2003, have an advanced recycling fee that consumers pay upon purchase.

The Japanese schemes emphasise recycling goals rather than targets, set at 55% for televisions with cathode ray tubes and 20-55% for office-use computers. In 2004, expectations were exceeded when 81% of televisions were recycled.

[47] Hart, S. (2007), *Capitalism at the Crossroads: Aligning Business, Earth and Humanity*, Wharton School Publishing, Pennsylvania, page 71

[48] Europa (2009), *Summaries of legislation: Waste electrical and electronic equipment,* website: http://europa.eu/scadplus/leg/en/lvb/l21210.htm>, accessed 6 March 2009.

In the United States, eighteen states have passed laws establishing statewide e-waste recycling programs. All states (excluding California) follow a producer responsibility approach with varying differences in the structures per state. Washington's scheme is one of the more developed, focusing largely on product stewardship. California is the only state to implement an advanced recycling fee that consumers pay upon purchase.[49]

The US Environmental Protection Agency (EPA) recently set a challenge to electronics retailers and television manufacturers to increase the collection and responsible recycling of discarded televisions. It is part of EPA's 'Plug-In to eCycling program'. This innovative program encourages retailers and manufacturers to become actively involved in television recycling.[50]

Canada has varying schemes established in its different states. In January 2009, Atlantic Canada Electronics Stewardship (ACES) scheme in Nova Scotia became the most comprehensive in Canada, covering over 40 types of electronics. The ACES program has 33 drop-off centres where residents and businesses can return their electronic products for recycling free of charge.[51]

There is clearly an international trend towards implementing recycling schemes to address the market failures associated with e-waste. If Australia fails to act to address these problems, it risks lagging behind the rest of the world.

3.4 Summary

In addition to the problems discussed in Chapter 4, there are a number of policy matters that have important implications for television and computer waste including:

- Australia's obligations as a signatory to the Basel and Stockholm Conventions affect the international and domestic management of television and computer waste;
- Australia has international obligations and expectations which provide pressure to address the issues presented in Chapter 4;
- the Henry Tax Review may mean that funding options are limited; and
- a number of international jurisdictions already have schemes addressing waste televisions and computers more specifically, and e-waste more broadly.

[49] Silicon Valley Toxics Coalition (SVTC), (2009), *E-waste and Recycling Laws,* website: www.etoxics.org/site/PageServer?pagename=svtc_ewaste_and_recycling_policy, accessed 5 March 2009

[50] US Environmental Protection Agency (2009), *TV Recycling Challenge,* website: www.epa.gov/epawaste/conserve/materials/ecycling/tv-challenge.htm, accessed 9 March 2009

[51] Atlantic Canada Electronics Stewardship (ACES), 2009, 'Electronics Recycling in Nova Scotia', accessed at http://www.acestewardship.ca, last viewed on 9 March 2009

4 Television and computer waste is a problem

This chapter discusses the nature and extent of the issues related to television and computer waste, why the market is not able to address the waste and the cost to society if some form of intervention is not undertaken.

4.1 Introduction

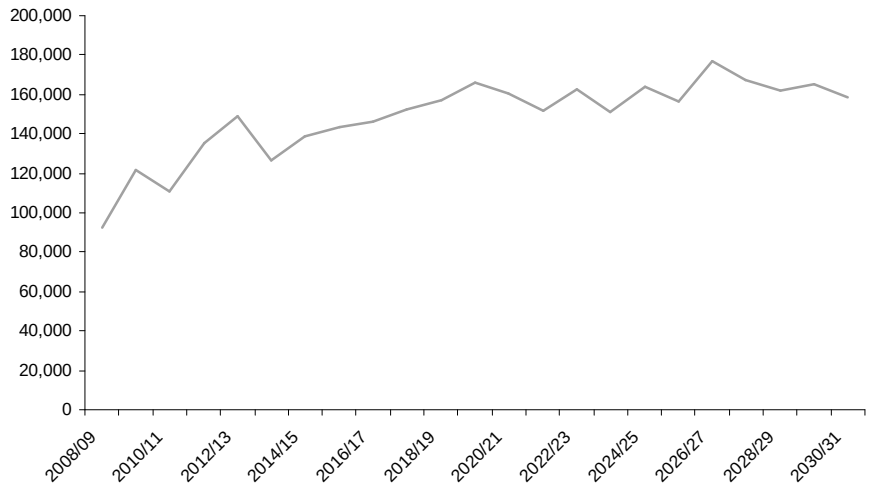
Televisions and computers were identified by EPHC in 2002/03 as a priority for action as a result of their higher levels of hazardous components relative to other types of electrical products, and the lost opportunities for conserving non-renewable resources due to products being sent to landfill. In 2008 EPHC committed to the development of a national solution to the problem of end of life televisions and computers.

In parallel with government consideration of the issues both the television and key players in the computer industries are keen to engage in large scale national action, with national regulatory support to ensure a level playing field in the market, providing compelling evidence of the significance of the issues.

Additionally, state-based initiatives, including landfill levies, have had limited impact on complex products like televisions and computers (refer to Appendix D for a discussion on state regulation). As a result, the volume of these products being disposed of in landfill are projected to increase significantly over the next 20 years addition, increasing at a rate of 5% year-on-year from current levels. And so, while television and computers comprise a small part of the waste stream (estimated to comprise less than 0.4% landfill volumes generated each year[52]), these products are expected to become an increasing part of the waste stream. Over the next 20 years, it is estimated that if the existing situation is not changed, 652 million units will be accumulated in Australian landfills, compared to only 71 million (or 10% of end of life units) being recycled and recovered over this timeframe. The landfill trend over the next 20 years if the current situation does not change is presented in the Figure 7.

[52] Waste Management Association of Australia (2005), *Submission to Waste and Resource Efficiency Inquiry*, 2005, website: www.pc.gov.au/__data/assets/file/0017/21905/sub028.rtf, accessed 9 March 2009

Figure 7 Landfill volumes projected under the business as usual case (units)



Source: end of life modelling was based on estimated sales, lifespan, product weight and disposal pathways, with input provided by AIIA, PSA and the project Steering Committee

While television and computer waste is relatively small in volume, it is predicted to grow to 168,000 tonnes by 2027/28. As landfill space is limited, and Australian governments aim to reduce waste going to landfill, this increase in volume creates policy conflict within Australian jurisdictions.

This consultation regulatory impact statement does not propose to address the whole issue of end of life electrical and electronic products, but rather it is part of a proposed incremental approach. Other types of e-waste may also be considered by the EPHC; however, they would be examined once a decision on the appropriate the management for end of life televisions and computers is reached.

The remaining sections of this chapter specify the problems and issues that have prompted consideration of government action. It provides information on the nature and extent of the problems related to waste televisions, computers and computer products, and also identifies the government and private sector actions that have been taken to address the problem in the past.

4.2 Problems of television and computer waste

1. Conservation of non-renewable resources

The community views the loss of non-renewable resources as the most significant problem associated with the landfill of televisions and computers

Televisions, computers and computer products contain embedded resources that are non-renewable, but that are lost under current disposal methods. A number of materials such as glass, plastics and lead are able to be recycled either in Australia or overseas. As volumes of televisions and computers increase, the volume of non-renewable resources being lost increases.

There are two elements that measure the value placed on these non-renewable resources and can assist to understand the extent of this problem:

- market value placed on recycled products; and

- society's intrinsic value placed on recovering non-renewable resources.

Profile of non-renewable resources in televisions and computers

Televisions and computers contain a number of embedded resources that are non-renewable because they are not replaceable naturally or by human activities, or are replaced so slowly by natural or artificial processes that for all practical purposes, once used they would not be available again within any reasonable time frame. Non-renewable resources must have a fixed stock or be in limited supply relative to the demand for them.[53] Although glass, plastics and metals are recyclable, they are produced from sand,[54] crude oil and metal ore respectively, which are non-renewable resources.

Table 10 presents the material composition of an average cathode ray tube and a flat panel display unit for televisions.

Table 10 Material composition of CRT and flat panel display (FPD) televisions

Material	CRT (grams)	%	FPD (grams)	%
Glass	17,802	67%	6,273	22%
Plastic	4,867	18%	8,594	30%
Copper	971	4%	834	3%
Iron	594	2%	4,127	15%
Aluminium	225	1%	1,776	6%
Steel / other metals	93	0%	5,923	21%
Other	2,118	8%	784	3%
Total	**26,670**	**100%**	**28,301**	**100%**

Source: United Nations University (2007), 2008 Review of Directive 2002/96 on Waste Electrical and Electronic Equipment (WEEE), Final report, United Nations University, Bonn, Germany, August 2007

Table 11 shows the material composition of an average desktop computer.

[53] Neha Khanna, 'On the Economics of Non-Renewable Resources', available at <http://www.eolss.net/ebooks/Sample%20Chapters/C13/E6-29-03-01.pdf>, accessed 6 July 2009.

[54] Although new sand is constantly being added to the environment due to the erosion of rocks, it is often considered to be non-renewable due to the length of time that this process takes. See Social Science Database, 'Is glass or sand renewable resources', available at <http://www.ssdata.org/Earth-Sciences-Geology/Is_glass_or_sand_renewable_resources__205024.html>, accessed 6 July 2009.

Table 11 Composition typical desktop computer (2006)

Material	% weight	Kg	Material	% weight	Kg
Plastics	22.99	6.21	Manganese	0.03	0.00
Lead	6.30	1.70	Silver	0.02	0.00
Aluminium	14.17	3.83	Cadmium	0.01	0.01
Iron	20.47	5.53	Mercury	0.00	0.00
Tin	1.01	0.27	Arsenic	0.00	0.00
Copper	6.93	1.87	Silica	24.88	6.72
Nickel	0.85	0.23	Gold	0.00	0.00
Zinc	2.20	0.60			

Source: University of Sydney, Environmental sustainability considerations for ICT areas – Consumption and Conservation of materials

The majority of these materials can be recovered if recycled. For example, computer equipment received through Byteback is broken down into the components listed in Table 12. Under this program, 99% of the metal from electronic equipment is recovered.

Table 12 Recyclable components of computers

Material	Recycling through Byteback
Plastics	Plastic represents over 30% of scrap generated from computer equipment. To ensure that the greatest possible amount is recovered and to eliminate environmental impacts, plastic scrap is separated and granulated to reduce it to a size that enables it to be converted into pellets ready for re-use.
Printed Circuit Boards	The recycling of printed circuit boards, connectors and integrated circuits is undertaken at Noranda Recycling in Canada because there is no disposal treatment facility in Australia that is capable of extracting the valuable metals they contain. The international transportation of printed circuit boards to Canada for smelting and refining raises no environmental concerns and is permitted under regulation.
Batteries	Nickel metal hydride, nickel cadmium and lithium batteries are sent to Societe Nouvelle D'Affinage Des Metaux in St. Quentin Fallavier in France for recycling. Lead batteries are recycled here in Australia. Export is allowed under the *Hazardous Waste (Regulation of Exports and Imports) Act 1989 (Cth)* once a permit has been issued.
Cathode Ray Tubes	A cathode ray tube contains approximately 2 to 3 kilograms of lead which is encapsulated in glass. After removal of all non-glass components, the vacuum is released and the CRT broken. The funnel and panel glass is then exported to Mirec Asset Management in the Netherlands under permit, where the leaded glass is recovered for new CRT manufacture by LG Electronics. CRT glass is packaged in a special container that prevents particles from being released into the atmosphere. Export is allowed under the *Hazardous Waste (Regulation of Exports and Imports) Act 1989 (Cth)* once a permit has been issued.
Liquid Crystal Displays	Liquid crystal displays are back-lit with gas discharge lamps which contain mercury. They are sent to a specialised mercury recovery facility.
Glass	All recovered glass from electronic equipment is sold to Pilkington Australia, a glass manufacturer.
Metal	Both ferrous and non-ferrous metals are easily separated from other components by hand and are sent away for smelting here in Australia. In excess of 99% of metal from electronic equipment is recovered, thereby ensuring the conservation of a non-renewable resource.
Insulated Wiring	Polyvinyl chloride (PVC) -covered wire, such as signal or power cables, are shredded and chopped to a small size and then granulated to separate the insulation from the copper wire. The remaining plastic is then recycled.

Material	Recycling through Byteback
Packaging Material	Re-usable packaging material is sold to Amtec, a recycling company in Thomastown, Victoria, and cardboard is sold to Bayside Cartons in Braeside, Victoria.
Power Supplies	Contain metal and plastic components and are sold to Sims Metal for recycling

Source: Byteback (2009), Frequently asked questions, website: http://www.bytebackaustralia.com.au/faq, accessed: 12 March 2009

As the inputs used to produce glass, plastics and metals[55] are non-renewable, landfilling waste televisions and computers results in the removal of non-renewable materials from the productive economy.

Financial market value placed on recycled products

When end of life televisions, computers and computer products are recycled, they are reprocessed into materials and products so they can be manufactured into new products. For example, recycled metal is separated from the waste televisions and computers to be sold on a secondary market to customers that will then use this metal in other production. These end market customers purchase the recycled materials based on a financial market value.

Consultation with current recyclers indicates that the financial value that the market places on recycled television and computer materials and products is on average $300-400 per tonne of recycled product.[56] The financial value of material that is recovered during the recycling varies greatly across the product types due to the material composition of the items. The revenue received for this material is also impacted by fluctuations in the market value of the materials that are extracted. Some computer products, such as desktop computer boxes, have a higher financial value due to the presence of precious metals. Other products, such as CRT and plasma visual display units and ink jet printers, have a much lower value. Fluctuations in the market value of materials have been seen in the past year with a dramatic drop in the price of some materials as a result of the global financial crisis. Future product changes such as size and material composition are also expected to have an impact on the financial value of material extracted through computers and television recycling.

Considering this value per tonne, if the existing situation does not change, this could result in a loss of $240-380 million of financial value placed on the non-renewable resources from 2008/09 to 2030/31 (present value, 2009 dollars). This indicates that the financial market alone values these non-renewable resources at a significant amount. However, it should be noted that it costs about $970 per tonne to collect and reprocess the waste resulting in a financial loss from recycling of about $620 per tonne.

[55] These non-renewable inputs are sand, crude oil and metal ore respectively

[56] Discussions with 2 e-waste recyclers (June 2009)

Society's intrinsic value placed on recovering non-renewable resources

One issue with the financial market value discussed above, is that it does not capture that the community also places 'intrinsic' economic values on recovering these non-renewable resources. And, while the market values of the resources are of interest, it is the non-use society values that are of particular importance in understanding the full extent of this problem.

As discussed above, the majority of materials used as inputs to produce the resources embedded in televisions and computers are non-renewable, including glass, crude oil and metal ore. A choice modelling survey undertaken in 2009 of more than 2,000 Australians has indicated that respondents were willing to pay to increase the current recycling rate, and the issue of recovering non-renewable resources was considered of highest importance for survey respondents. This indicates that society places a value on conserving materials for future generations, or as termed in the URS report: 'we run the risk of running out of resources while sending some valuable materials to landfill'.[57]

This choice modelling survey (described further in Box 1 below and in Appendix C), indicated that respondents were willing to pay to increase the current recycling rate, and they are willing to pay on average $0.50 per unit for each percentage increase in the recycling rate, which equates to $23 per tonne per percentage increase in recycling.[58] While these values cover more than just resource recovery, these were considered the most significant issues:

- the majority of respondents (52%) were of the opinion that society is generating too much waste, representing a drain on the resources available for future generations;
- the highest percentage (33%) of households ranked as the most important issue in dealing with household waste the 'risk of running out of resources while sending valuable materials to landfill'; and
- most respondents (60%) indicated that they recycle as much as they can and would like to see additional recycling systems put in place for the items that cannot be currently reused or recycled such as televisions and computers that have reached the end of their useful life. [59]

Comparing the *non-use value* placed by respondents with the volume of waste televisions and computers expected to be landfilled/lost if the current situation does not change, society is estimated to lose $1.6 billion in the

[57] URS (2009), *Willingness To Pay for E-Waste Recycling*, Unpublished report prepared for the Environment Protection and Heritage Council, February 2009, p 25

[58] URS (2009), *Willingness To Pay for E-Waste Recycling*, Unpublished report prepared for the Environment Protection and Heritage Council, February 2009, p 25

[59] URS (2009), *Willingness To Pay for E-Waste Recycling*, Unpublished report prepared for the Environment Protection and Heritage Council, February 2009

value they place on recycling over the next 23 years if 70% recycling can be achieved within 5-9 years (present value over the period 2008/09 to 2030/31, 2009 dollars). While it is not possible to isolate from this value, the value related specifically to recovering non-renewable resources, this was the issue of highest importance for survey respondents, indicating it impacted significantly on the total value placed on increasing recycling levels.

2. Community expectations are not being met

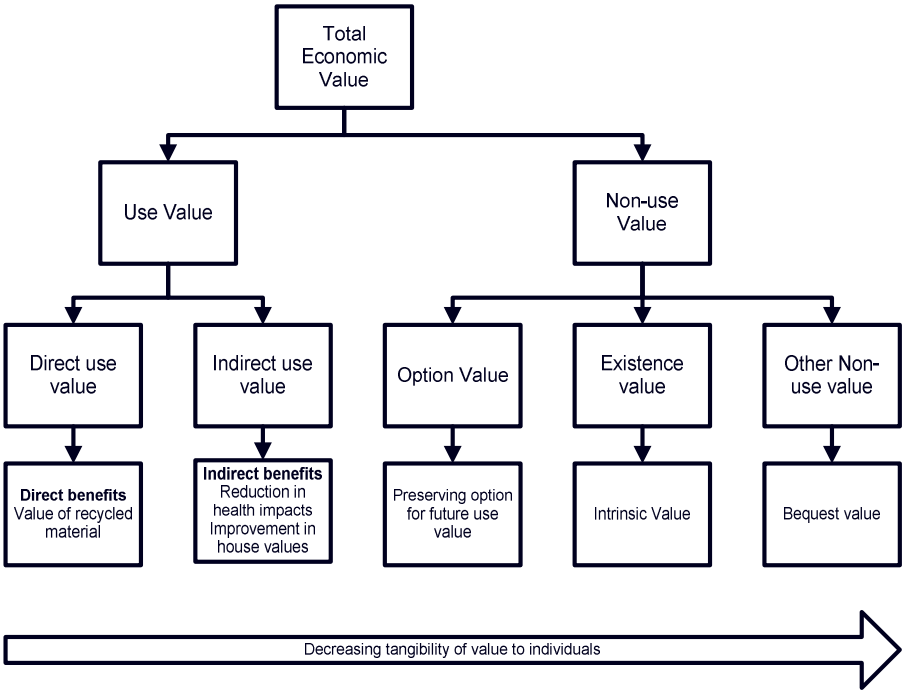
The financial costs of collection and recycling incurred by recyclers exceed the financial value of the recovered material resources. As a result the recycling of e-waste is not commercially profitable without a financial contribution beyond the sale of recovered material resources (see Figure 9 below). The true value of recycling to society includes not only household and business collection and transportation costs, but also the social benefits, which are not taken into account in private decision making by commercial entities. The community values recycling for a number of reasons including, but not limited to:

- the risk of running out of resources while sending some valuable materials to landfill (the problem discussed above);
- landfill sites are posing a threat to the natural environment;
- landfill space is running out;
- landfill sites are posing a threat to human health; and
- avoiding having landfill in their neighbourhood.[60]

In this regard, the economic benefit comprises use and non-use values. These are summarised in Figure 8.

[60] URS 2009, p 29, Chart 4-8

Figure 8 Categories of Value



Source: Adapted from Serageldin, I. (1999), Very Special Places: The Architecture and Economics of intervening in Historic Cities, The World Bank, Washington

The financial market values of the materials generated from recycling activities are *direct use values*. These benefits accrue directly to individuals.

The reduction in health impacts associated with the removal of hazardous substances from the environment and the positive effect on residential land prices from minimising hazardous waste in landfill operations are examples of *indirect use values*. These are the values that are gained indirectly from the natural resource.

There are also *non-use values*. These arise indirectly either through the knowledge of continued presence of resources in good health or through potential future uses. Non-use values can be divided into existence values (knowledge of their presence), option values (values for use in the future), quasi option values, and bequest values (arising from wanting to preserve the public good for future generations). The values include those listed on the previous page, relating to recovering non-renewable resources, and environmental and health impacts of landfilling.

Stated preference techniques help to quantify non-use values. One way to gain society's preference for non-use values is through choice modelling. A choice modelling study was undertaken in 2009 in order to gain an understanding of these values. A summary of this study is presented in Box 1, with some other higher-level discussion on choice modelling as an approach more broadly and some elements on the URS methodology are presented in Appendix C.

Box 1 Willingness to pay study for television and computer recycling

In 2008, the EPHC tasked a multi-skilled specialist team to conduct a willingness to pay study for television and computer waste. The study was undertaken jointly by ERE Consulting, NWC Research and URS.

The study's objective was to: verify whether people's concern that recycling levels are too low and too much is disposed to landfill, translates into their being willing to pay an amount to achieve a higher level or recycling over and above that provided by current commercial incentives.

In summary, the study involved:

- *modelling technique* – the stated preference technique of choice modelling was used. This involves surveying a sample of the wider community using a questionnaire that includes a set of choices involving trade-offs between various attributes (i.e. in this case respondents were asked to consider the trade-off between: the percentage of waste avoided and material recovered, and an additional cost they would be required to pay on each new television/computer purchased;
- *sample characteristics and size* – a sample size of 2,105 respondents was achieved from Sydney, Melbourne, Perth, Brisbane and Adelaide. Quotas were set based on age, gender and income level to ensure an adequate representation from across the different strata of society;
- *method of survey* – an online panel of respondents was surveyed. This panel was pre-selected as being representative of the Australian population;
- *nature of questions asked* – the questionnaire was developed following an iterative process, with pre-testing through focus groups and a pilot survey, allowing for development of the main survey. Questions were asked in the following categories:
    - demographic;
    - attitudes to waste;
    - television and computer ownership;
    - choice modelling;
    - follow-up questions.
- *advantages of the survey*:
    - integrated comments from the Office of Best Practice Regulation (OBPR) and the Australian Bureau of Agriculture and Resource Economics (ABARE) were incorporated in the survey to ensure the results could be incorporated in this regulatory impact statement;
    - the study is specific to televisions and computers, so is directly relevant for this regulatory impact statement;
    - the main survey was undertaken in January 2009, so incorporates impacts of the current global financial crisis;
- *shortcomings of the survey*:
    - incorporated household but not commercial values;
    - not all states/jurisdictions were incorporated, and only metropolitan areas were considered;
    - the questionnaire did not discuss peripherals and computer components.

Source: URS (2009), Willingness To Pay for E-Waste Recycling, Unpublished report prepared for the Environment Protection and Heritage Council

The URS research found that respondents were willing to pay between $0.43 and $0.53 per item for an increase in recycling of 1% above current levels.

Table 13 shows the range of willingness to pay (WTP) for three recycling recovery rates under the assumption that items will be dropped off by households for recycling.[61]

Table 13 Willingness to Pay (WTP) estimates

Recovery level / premium for kerbside	WTP for each % increase in waste recovery ($ over 5 years)	WTP per item ($)
50% recovery	32.03 – 48.34	18.18 – 27.44
70% recovery	45.10 – 68.07	25.60 – 38.64
90% recovery	58.17 – 87.79	33.02 – 49.84
Kerbside premium (all recovery levels)[62]		3.55

Source: URS (2009), Willingness To Pay for E-Waste Recycling, Unpublished report prepared for the Environment Protection and Heritage Council

This indicates there are substantial social benefits to recycling of computers and televisions which are not captured under the current situation. As the community values recycling more than the market, if there is no government intervention, then society will not receive benefits which they are estimated to value at between $18 and $27 per item for an increase in the recycling rate to 50% (from a current level of 7%), increasing to $33 to $50 per item for an increase to 90%. As the private cost of recycling does not take into account the willingness to pay, the current level of recycling does not meet community expectations. As indicated above, the value community places on recycling is expected to total $1.6 billion over the next 23 years for an average scheme able to achieve 70% recycling or more (present value, 2009 dollars).

3. The free-rider problem

There are two aspects to the free-rider problem facing end of life televisions and computers:

- the community wants to ensure that their recycling activities make a difference and hence consumers' willingness to pay is predicated on the assumption that there is complete coverage; and
- industry bodies in the television industry (Product Stewardship Australia) and the computer industry (Australian Information Industry Association) have both proposed industry recycling schemes,[63] however, they have found it difficult to gain full coverage of

[61] Note that the study only tested the willingness to pay for 50%, 70% and 90% recycling rates, meaning that the estimated willingness to pay should not be applied to recycling rates bellow 50%.

[62] Consumers were willing to pay $3.55 per item for a kerbside collection service instead of having to drop off the units at collection facilities.

[63] Product Stewardship Australia (2006), *Product Stewardship Agreement for Televisions: An agreement between the Environment Protection and Heritage Council and the television industry;* AIIA and Planet Ark Consulting (2005), *AIIA – E-waste program development phase: Report for discussion and feedback*

businesses responsible for creating the waste. They have indicated that they will not implement the schemes in the absence of the government providing the schemes with a regulatory underpinning due to concerns about scheme participants facing a competitive disadvantage relative to non-participants.

Community free-riders

As indicated by the URS choice modelling study, the Australian community is willing to pay to $0.50 per item sold for each percentage increase in the recycling rate of televisions and computers. This equates to between $21-45 per unit sold, for recycling schemes delivering recycling rates of between 50-90%.[64] However, despite this significant willingness to pay per whole television or computer, the situation has not arisen that consumers are directly paying this to recyclers as a fee for recycling, resulting in the currently low recycling rates. In particular, organisations such as Dell promote and offer fee-based recycling for any branded computer products, however the computer and computer product recycling rate is currently only 10% of end of life. This indicates that a free-rider problem exists for consumers to participate in recycling. This is further supported by the respondents to the choice modelling study indicating they are willing to pay more per unit if the recycling rate is higher, as this indicates they are willing to pay more if there are less free-riders and coverage of recycling is significantly higher than currently.

Industry free-riders

A number of television and computer recycling schemes have already been trialled in Australia and overseas. Australian government supported schemes are described in Table 14, along with two private sector schemes.

[64] URS 2009, p 42, Table 4-13 (only for televisions and computers, does not account for consumers purchasing computer products and peripherals)

Table 14 Government and private sector television and computer recycling schemes

Name of Scheme	Organisations Involved	Description
Computer Asset Recover Service	Compaq NSW EPA	A pilot take-back and computer recycling scheme was conducted by Compaq and MRI through a grant received under the NSW EPA's Waste Challenge program. The scheme was conducted in the Sydney metropolitan area. It was estimated that 30% of equipment collected in the pilot program would eventually be reused, 40% would be recovered and the remaining 30% would be used in other electronic equipment.[65]
Byteback	Sustainability Victoria Australian Information Industry Association (AIIA) and founding partners Apple, Canon, Dell, Epson, Fujitsu, Fuji-Xerox, HP, IBM, Lenovo, and Lexmark.	Byteback is a free take-back program to help people dispose of end of life computer equipment responsibly. The program is funded 56% by the Victorian Government and 44% by the Byteback partners. Individuals and small businesses deposit their unwanted computer equipment at one of the eight locations throughout Victoria.
Dell	Pick up of computer products (free and fee-based service)	Dell offers free pick-up of any Dell branded equipment (with collection charges over 22 kg). In addition, it also offers fee-based recycling of non-Dell computer equipment ranging from $8.50-15.50 per unit depending on the location or if it is dropped-off by the consumer.
Apple	Recycling of computer products	Apple currently offers free recycling for purchases from particular stores in Sydney, Chatswood or Chadstone, or for online purchases of Apple-branded produces.

Source: Apple website 2009: http://www.apple.com/au/environment/recycling/program/au/index.html; and Dell website 2009: http://supportapj.dell.com/support/topics/topic.aspx/ap/shared/support/r ecycle/en/home_small_business?c=au&l=en&s=gen

As indicated in the table above, the private sector schemes are brand-specific as a result of the free-rider issue. This means that they are not whole-of-waste solutions for end of life television and computers. In addition, it is not clear how easy it is for households to participate, nor if these results guarantee recycling as opposed to refurbishment or reuse.

Key industry players in both the computer and television industry have expressed interest in setting up recycling schemes.[66] However, particularly in the computer industry, there is a problem with unbranded or orphaned products. Unbranded products are those that do not belong to a major brand because the individual components were imported and assembled in Australia. Orphaned products are those that belong to a company that no longer participates in the industry or no longer exists because it has become insolvent. While major players are interested in setting up a scheme, there is

[65] Commonwealth of Australia (2001), *Developing a Product Stewardship Strategy for Electrical and Electronic Appliances in Australia,* March, Canberra, page 46

[66] Both the computer industry representative body (the Australian Information Industry Association) and the television representative body (Consumer Electronics Suppliers Association) have expressed interest and developed possible product stewardship schemes.

difficulty in obtaining a commitment from the minor players to pay for the scheme and subsequently enforcing that commitment.

Table 15 shows the brands of products collected through the Byteback scheme.

Table 15 Brands of computers collected through Byteback Scheme, 2005 -2008

Source of Computer	Percentage collected by Byteback
Byteback Partners (incl. IBM)	46%
Acer+Gateway, Toshiba & Asus	6%
Other Leading Brands	16%
Unbranded & Unknown	10%
All Other	22%
Total	**100%**

Source: Australian Information Industry Association (2009)

Apple, Brother, Canon, Dell, Epson, Fujitsu, Fuji-Xerox, HP, IBM, Lenovo, and Lexmark voluntarily participate in the Byteback scheme which is funded 56% by the Victorian Government and 46% by the partners. However, as can be shown in Table 15 the majority (54%) of computers collected through Byteback are not members of the scheme and therefore do not contribute financially.[67] This highlights a concern of the ongoing viability of voluntary schemes, particularly if the current government subsidies in support of programs like Byteback are removed or cease.

In the computer industry there has been a major shift in consumer purchasing preferences in recent years. For example, unbranded, unknown brands and orphaned desktop computers comprised 44% of the waste collected by the Byteback scheme in October to December 2008. However, only 18% of current desktop computers sold are from unbranded or unknown brands, indicating there has been a shift in the market, largely due to consumer shift towards branded laptops. This creates issues relating to equity between the current waste stream and future waste streams. While branded products comprise 82% of the current market sales, they only comprise of 56% of the current waste. The additional problem of determining who should be responsible for the waste and the large number of small players importing small quantities of products add to the free-rider problem.

Overall, the free-rider problem has been a significant issue contributing to a lack of industry responses to television and computer waste. In particular, industry bodies such as the AIIA and the PSA have indicated that they are unable to act due to the free-rider problem, and as a result suggest that government intervention recycling schemes will be short lived as industry participants will chose not to participate, and recycling levels will decline.

[67] Australian Information Industry Association (2009), *Byteback*, Presentation given to PwC and Hyder Consulting 10 March 2009

4. Toxicity and other environmental externalities associated with landfilling of waste

There is limited information available on the toxic and other environmental risks that landfilling of televisions and computers places on the Australian community. However, international research has resulted in television and computer waste being considered to be hazardous such as under the Basel Convention), and there are international standards and guidelines covering the appropriate management of such waste to manage the risk to the environment and human health.

Notwithstanding it is possible to draw on research relating to general environmental externalities generated by landfills.

Broader waste environmental externality costs

There are significant differences in the estimates of the private cost per tonne of waste to landfill in Australian studies undertaken to date. Some of these differences are due to the size of the landfill, whether a landfill is new or already operating, the value of land, and the management practices employed at the site.[68]

An example of a recent assessment of environmental and other external landfill costs (for all waste types, not specific to e-waste) was presented by the Productivity Commission in its 2006 inquiry into *Waste Management in Australia.*[69] The Productivity Commission concluded that there are a number of external costs of landfill management, including:

- greenhouse gas emissions – the methane and carbon dioxide emissions from the landfill contribute to the greenhouse gas effect. Based on US Environment Protection Authority and Australian Greenhouse Office estimates the Productivity Commission calculates the external costs of greenhouse gas emissions for waste at between $5 and $21 per tonne of waste disposed at a properly located, engineered and managed landfill;
- other gas emissions – other gas emissions produced by landfills, such as benzene and methyl chloroform emissions, can have an adverse effect on human health and the environment. The Productivity Commission estimates these emissions to have an external cost of less than $1. The Productivity Commission concludes that modern landfills have been set up to minimise the risk to human health and the environment and that when the gas is emitted into open air it is expected to be diluted to extremely low concentration;

[68] BDA Group 2009, DRAFT, *The full cost of landfill disposal in Australia*, prepared for DEWHA, 22 June 2009, p 17

[69] Productivity Commission (2006), *Waste Management*, Inquiry Report no. 38, 20 October, Canberra, Appendix B

- leachate – the liquid that is passed through a landfill that may have become contaminated with organic or inorganic compounds and metals can cause damage to human health or environment if it is not contained within the landfill. The Productivity Commission valued the cost of leachate at less than $1 per tonne of waste because the likelihood of exposure in Australian landfills is low. There are also direct costs to local governments from leachate prevention and management.;and[70]
- amenity costs – these costs include the loss in amenity of nearby households and businesses. The Productivity Commission estimates that these costs are less than $1 per tonne of waste.

A summary of these Productivity Commission externality values (for waste disposed of in a properly located, engineered and managed landfill) are outlined in Table 16.

Table 16 Externality costs of landfill disposal

External cost	$ per tonne
Greenhouse Gas Emissions	5 – 21
Other gas emissions	1
Leachate	1
Amenity	1
Total external cost from landfill	**8 – 24**

Source: Productivity Commission (2006), Waste Management, Inquiry Report no. 38*, 20 October, Canberra*

Based on the Productivity Commission's estimate of landfill externalities generally for all waste types, if the current landfill trends continue for television and computer waste, then landfill externality costs of $40.8 million will be incurred by Australians over the next 23 years (present value, 2009 dollars).

However, given the specific nature of computer and television waste (i.e. almost all is non-organic), the amount of greenhouse gas is likely to be small and therefore leachate and loss of amenity is expected to be more relevant for televisions and computers waste of the externality costs identified by the Productivity Commission. Drawing on the Productivity Commission's estimates for leachate and amenity costs, it is estimated that if the current disposal pathways are not varied over the coming 23 years then landfill externality costs totalling $3.4 million will be incurred over this time (present value, 2009 dollars). If only leachates were considered then this cost would reduce further down to $1.7 million (present value, 2009 dollars).

It is also important to note that these externality values are not supported equally by other studies undertaken on landfill externalities, and as such

[70] R&Z Consulting (2008), *Estimating consumers' willingness to pay for recycling end of life televisions and computers in Australia: A framework for economic analysis,* Unpublished report by Dr John Rolfe, Prepared for the NSW Environment Protection Agency; R&Z Consulting (2009), *Designing a Stated Preference Experiment*, Unpublished report by Dr John Rolfe, prepared for the NSW Environment Protection Agency

may not be an accurate measure of landfill costs. As discussed further below, more detailed understanding of landfill externalities for any waste stream may require a complex and lengthy scientific risk assessment.

Waste environmental externality costs specific to televisions and computers

There are a number of environmental risks often identified with the landfilling of televisions, computers and other electrical products, mainly due to the possibility of leaching and evaporation of hazardous substances.[71] These possible risks are discussed below, however it is important to note that there is limited evidence to understand the extent of environmental problems relating to these items.

While the risk is expected to be low, and hence this problem less significant than others presented in this chapter, it is important that we do not discount it given that there is no conclusive scientific evidence on this issue. There are no scientific studies measuring the environmental risks related specifically to emissions from television and computer waste in Australian landfills. There are scientific risk assessments of hazardous substance emissions from landfill sites overseas. However, these are of limited relevance for assessing the risks from television and computer waste in Australia because of the potential for significant differences in, for example, environmental conditions and management practices. Moreover, there appears to be a lack of consensus among these reports on the risks of contamination.

In terms of what is known about the potential environmental impacts of television and computer waste, Table 17 outlines the hazardous substances in television and computer CRT monitors for an average unit size. Hazardous materials contained in televisions and computers also include mercury, cadmium, Polybrominatediphenylethers (PBDEs) and copper. It has been noted that cadmium contained in plastics, bromine in brominated flame retardant plastics or lead contained in glass may leach into the soil and groundwater when placed into landfill. In addition, PBDEs may also evaporate and be transported through the atmosphere.[72]

[71] Commonwealth of Australia (2001), *Developing a Product Stewardship Strategy for electrical and electronic appliances in Australia: Discussion Paper*, Canberra, page 39

[72] Ibid

Table 17 Hazardous substances in televisions and computers (based on average unit size)

Substance	Cathode Ray Tube Television (grams)	Cathode Ray Tube Computer monitor (grams)
Lead	1,787.57	786.04
Bromine	20.40	3.97
Zinc	6.41	25.90
Antimony	5.75	3.02
Chlorine	3.78	n/a
Chromium	3.75	3.78

Source: United Nations University (2007), 2008 Review of Directive 2002/96 on Waste Electrical and Electronic Equipment (WEEE), Final report, United Nations University, Bonn, Germany, August 2007

Examples of the impact of these hazardous television and computer waste substances include:

- lead – is toxic to virtually every biological system. For humans, it is harmful by inhalation and if swallowed, and may impair fertility and may cause harm to unborn children. Lead also has high acute and chronic effects on plants, micro-organisms and animals as it accumulates in the environment;[73]
- mercury – affects humans and animals. Mercury, mercury alkalis and inorganic compounds of mercury are toxic by inhalation, skin contact and if swallowed. In humans, mercury can affect the nervous system causing problems with sight, coordination and balance. Mercury accumulates in animals and organisms and therefore animals who regularly use the food chain may be a higher risk for mercury poisoning;[74] and
- chromium VI – affects humans and animals. It may cause cancer by inhalation and cause sensation by skin contact. It is very toxic to aquatic organisms and may cause long-term adverse effects in the aquatic environment.

In summary, while noting their classification as containing hazardous materials under the Basel and Stockholm Conventions, it is difficult to know the risk of hazardous substances that are actually contained in televisions and computers when they are disposed of in landfill. However, if the current *status quo* continues, increasing volumes of substances such as nickel, copper, cadmium, chromium and mercury may generate some level of health or other risks over the longer term to the community.[75]

[73] Ibid, page 40

[74] Ibid, p.41

[75] R&Z Consulting (2008), *Estimating Consumers' Willingness to Pay for Recycling End of life Televisions and Computers in Australia: A framework for Economic Analysis,* Report provided to the New South Wastes Environmental Protection Agency, August, page 3

5. Landfill direct costs and opportunity cost of land

In addition to externality costs of landfilling televisions and computers, there are direct costs associated with operating landfills including the opportunity cost of land, and other ongoing operating costs that vary with landfill volumes.

While television and computer waste is estimated to comprise less than 0.4% of landfill volumes generated each year, these volumes are projected to more than double if the current situation does not change, indicating that the landfill space required will also increase over coming years. In addition, the increase of waste televisions, computers and computer products in landfills is contradictory to Australian jurisdiction policies that seek to minimise landfill disposal.

The Waste Management Association of Australia (WMAA) have estimated some of the direct costs of landfills, relating chiefly to the operating and capital costs required to operate a landfill. These are listed below (excluding levies, management costs, profit margin and GST):

- $2 per tonne for land purchase including airspace;
- $2 per tonne for approvals and site development;
- $6.50 per tonne for cell development;
- $10 per tonne for operation including monitoring and fees; and
- $2.50 per tonne for capping and rehabilitation;
- $2 per tonne for aftercare.[76]

Given the current landfill disposal trends, and considering the WMAA per tonne estimates, direct landfill costs are estimated to total $42.5 million over the next 23 years (present value, 2009 dollars).

Land opportunity costs is a fairly contentious cost linked with landfills, as Australia is a big country. However, despite this, access to well located, suitable land to build a landfill is difficult.[77] A case heard recently in the NSW Land and Environment Court demonstrates the difficultly involved in the construction of a new waste disposal facility[78]. Orange City Council had attempted to seek approval to construct a landfill and resource processing facility near Molong. The case overturned the approval of the development, with Chief Justice Preston finding that consent to develop should not be granted unless the consent authority is satisfied that the development will

[76] Waste Management Association of Australia (2005), *Submission to Waste and Resource Efficiency Inquiry*, 2005, website: www.pc.gov.au/__data/assets/file/0017/21905/sub028.rtf, accessed 9 March 2009

[77] R&Z Consulting (2008), *Estimating Consumers' Willingness to Pay for Recycling End of life Televisions and Computers in Australia: A framework for Economic Analysis,* Report provided to the New South Wastes Environmental Protection Agency, August, page 20

[78] *Hub Action Group Incorporated v Minister for Planning and Orange City Council* [2008] NSWLEC 116 (17 March 2008)

not have an adverse effect on the long term use for sustainable agricultural production. Referring to Section 68, Preston CJ stated: 'to approve a development which is likely to have .... adverse effects on the long term use, for standard agricultural production, of prime crop and pasture land would not be consistent with the principles of Ecological Sustainable Development'. This decision therefore finds that agricultural land has more value, under ecological sustainable development, than waste management (i.e. landfill).[79]

4.3 Current private and public sector intervention, and impacts if there is no change

As discussed in Chapter 3, each jurisdiction in Australia currently has its own waste minimisation legislation or policies. The broad powers provided to each jurisdiction by waste minimisation legislation means that there is a tangible risk that each jurisdiction will implement a different approach to the television and computer waste problem in the absence of a national approach. As a result of this however, each jurisdiction has been working through the EPHC towards seeking a national solution.

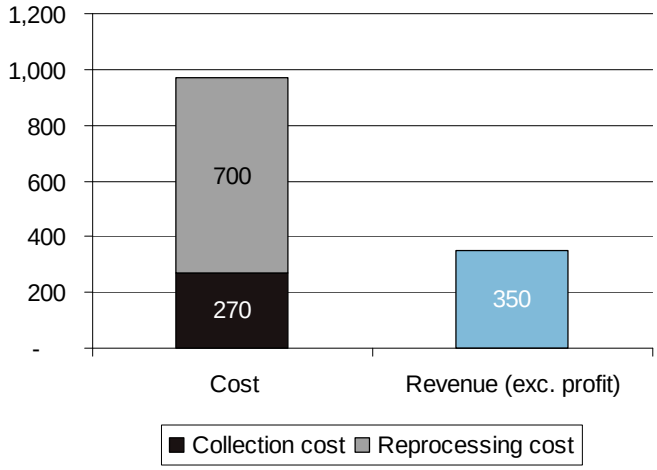
In addition, and as discussed briefly in Table 14, some private sector schemes have arisen to deal with the increasing volumes of television and computer waste; in particular by Dell and Apple. These schemes are brand-specific, so are not whole-of-waste solutions to the television and waste problems discussed further below. In addition, it is not clear how easy it is for households to participate, nor if these results guarantee recycling as opposed to refurbishment or reuse.

The margin between costs of collection and reprocessing and the revenue received from recovered resources are not sufficient to result in recycling levels that society wants, which is why it is probable that a privately run scheme will not occur in the absence of government intervention

A further potential reason that private sector intervention is not achieving significant change in recycling levels, is that while some television and computer waste is currently recycled, the financial costs of collection and recycling incurred by recyclers exceed the financial value of the recovered material resources. As a result the recycling of e-waste is not commercially profitable without a financial contribution beyond the sale of recovered material resources, or without government support. An indicative *financial* cost/revenue profile for recycling and collecting a tonne of waste, is presented in Figure 9 below.

[79] Department of Environment, Heritage Water and the Arts (2009), *Pers. Comm.* 12 May 2009; Environmental Defender's Officers (2008), *Case note: Hub Action Group Incorporated v Minister for Planning and Orange City Council [2008] NSWLEC 116,* website: http://www.edo.org.au/edonsw/site/pdf/casesum/hub_casenote080404.pdf, accessed 12 May 2009

Figure 9 Indicative financial market costs and revenues related to processing a tonne of television/computer waste ($ per tonne)



Source of financial costs: based on Hyder (2006) and discussions with e-waste recyclers (2009)
Source of financial revenue: based on discussions with two recyclers (2009)

Notwithstanding the ability to extract some value from recycling products, recyclers are private companies and therefore only take into account private costs and benefits in making their commercial decisions. They do not take into account negative externalities or community benefits. As such, they will only choose to recycle if the revenue that they receive from recycling is greater than the costs they incur in recycling.

While there is some recycling currently occurring (1% of end of life television tonnage excluding exports, and 10% for computers and computer products),[80] higher revenue from recovered resources will be required in order to increase this rate of recycling.

The current situation without coordinated government involvement is not resulting in television, computer and computer product recycling levels that society wants. This indicates that the financial value of the recycled material resources (metals, glass, plastic etc) is not high enough to fund an expansion of recycling beyond its current levels. While there are financially valuable material resources contained within televisions and computers which have reached their end of life, in terms of the environmental value of recovered material resources, it is difficult to reach a market solution to access these material resources. This is due to the following:

- it is often more financially costly to collect and recycle the material resources than the financial value of the sale of these material resources;
- entry to the market is difficult due to high fixed costs associated with establishing collection infrastructure and recycling facilities;

[80] Ibid

- there is information asymmetry in that recyclers do not know when consumers will dispose of these products and there is no coordinated collection system; and
- there are large transaction costs associated with coordinating the collection and recycling of these material resources.

In summary, despite some government and private sector intervention to date, the recycling rate remains low at 9% of end of life units or 10% based on end of life tonnes – with the remainder being landfilled but for a minor proportion that are exported. As a result, the problems related to television and computer waste described above are arising despite the government and private sector interventions above currently taking place.

4.4 Summary

The problems with television and computer waste, which justify consideration of government intervention include:

- Televisions and computers contain non-renewable resources such as plastics, glass and metals that are lost if television and computer waste is landfilled:
  - Over the next 20 years, it is estimated that if the existing situation is not changed, 652 million units will be accumulated in Australian landfills, compared to only 71 million (or 10% of end of life units) being recycled and recovered over this timeframe.
  - If this volume is landfilled, this could result in a loss of $240-$380 million of financial value placed on the non-renewable resources from 2008/09 to 2030/31. However, given that the recycleable material in television and computer waste is valued at around $300-$400 per tonne of recycled product and it costs about $970 per tonne to collect and reprocess the waste, there is a financial loss from recycling of about $620 per tonne.
  - Society's intrinsic value of recovering non-renewable resources is estimated to total $1.6 billion over the period 2008/09 to 2030/31, if 70% recycling can be achieved within five to nine years. This value captures more than just resource recovery, however the choice modelling survey that produced this result indicates recovery of non-renewable resources was considered the most significant issue by respondents.
- While some of the television and computer waste is currently recycled, without government support the current recycling activity is unlikely to be sustained. The private loss from recycling is not recovered from the value of the resource. As indicated above, the value community places on recycling totals $1.6 billion over the next 23 years (present value, 2009 dollars). This indicates that despite inefficient market incentives to recycle television and computer waste, society values waste reduction and recycling of television and computer waste more than financial markets. Without addressing this problem, society's value will be lost when end of life televisions and computers are landfilled.
- Even if the market price was sufficient to encourage recycling, industry and consumers are concerned about fairness of any recycling schemes. The extent of the free-rider issue is significant, as it is

preventing private sector involvement in recycling schemes to date that extends beyond brand-specific offers to customers. Also, the choice modelling survey indicates that consumers are willing to pay higher amounts per unit if higher rates of recycling coverage are achieved.

- Toxicity and landfill externality costs are also important and become increasingly so as the volume of television and computer waste increases. However, given the difficulty estimating environmental externality costs of landfill for general waste or specifically for television and computer waste, it is challenging to provide an accurate measure of landfill costs. Based on the Productivity Commission's estimate of landfill externalities generally for all waste types, if the current landfill trends continue for television and computer waste, then landfill externality costs of around $40.8 million will be incurred by Australians over the next 23 years. If only landfill externality costs related to leachate and loss of amenity are considered (likely more relevant for television and computer waste), then the landfill externality costs incurred by Australians is between $1.7-3.4 million over this same timeframe.
- Landfill direct costs and opportunity cost of land are also expected to increase with increasing end of life televisions and computers. Given the current landfill disposal trends, direct landfill costs are estimated to total $42.5 million over the next 23 years based on WMAA's landfill cost estimates for waste in general.

5 Objectives

Considering the television and computer waste problems identified in Chapter 4, there are a number of objectives for voluntary, co-regulatory or regulatory intervention.

5.1 Introduction

The objectives of any government intervention relating to end of life televisions and computers should be to address the conservation of non-renewable resources; meet community expectations regarding resource recovery and recycling; address market and regulatory failures; and avoid, where possible, any negative environmental impacts associated with waste going to landfill (as outlined in Chapter 4), while being consistent with broader government policy.

5.2 Policy objectives

The nature and extent of the problem suggests that objectives for Government intervention should be focused on maximising recovery of non-renewable resources in line with community expectations, ensuring any regulatory coverage is fair and equitable, and also aiming for any intervention to be an efficient and effective mechanism.

These objectives draw on the 1992 Council of Australian Governments (COAG) endorsed National Strategy for Ecologically Sustainable Development (ESD), which sets out 'the broad strategic and policy framework under which governments will cooperatively make decisions and take actions to pursue ESD [ecologically sustainable development] in Australia'. The strategy is still in effect with relevant core objectives being:

- to enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations; and
- to provide for equity within and between generations.

As part of the National Strategy for Ecologically Sustainable Development, a national approach to waste minimisation and management has been agreed. The challenge posed in the National Strategy was:

> *To improve the efficiency with which resources are used and reduce the impact on the environment of waste disposal, and to improve the management of hazardous wastes, avoid their generation and address clean-up issues.*

These objectives are also consistent with the obligations Australia has as a signatory to the Basel and Stockholm Conventions. In particular, Australia is required as a signatory to the Basel Convention to ensure that the generation of hazardous and other wastes (including household wastes), is reduced to a minimum; ensure adequate disposal facilities are domestically available; control and reduce international movements of hazardous waste; and ensure environmentally sound management of wastes.

Consistent with Australia's international obligations and the 1992 ESD strategy, the identified objectives in developing a solution to the effective management of end of life televisions and computers are outlined below in relation to a voluntary, co-regulatory or regulatory scheme.

5.3 Summary of objectives

The following objectives have been identified following consideration of the COAG guidelines that the objective should be clear and broad, but not too broad, in order to permit assessment of relevant alternatives.

1 Broader objective – in line with ESD strategy, the broader objectives of any government intervention would be to:

- improve the efficiency with which resources are used;
- reduce the impact on the environment of waste disposal;
- enhance community well-being; and
- provide for equity between generations.

2 In the context of end of life televisions and computers, the objectives then become:

- to bring the recovery of television and computer waste in line with community expectations regarding resource recovery and recycling;
- to improve the efficiency with which resources contained in end of life TV and computer products are used;
- to ensure fair and equitable geographical, industry and product coverage, which addresses the issue of free-riders; and
- to ensure that any intervention should be complementary to other relevant domestic policies and international obligations, including the Basel Convention which obliges Australia to minimise the domestic production of hazardous and other wastes, taking into consideration social, technological and economic aspects, and to ensure wastes are managed in an environmentally sound manner.

Acknowledging that the above objectives will require implementation, administration and other costs, whilst generating a range of social and environmental benefits, an overriding objective in line with the COAG guidelines, will be to obtain a net benefit (benefits minus costs) for the community. This will be considered in Chapter 7 when alternative approaches to intervention are considered in a cost benefit analysis framework.

We welcome stakeholder feedback on the objectives relevant for end of life televisions and computers.

6 Options

This chapter identifies a range of possible government interventions that are considered most likely to assist overcoming the television and computer waste problems defined in Chapter 4, and based on achieving objectives established in Chapter 5. The options identified in this chapter will be analysed in further detail using cost benefit analysis in Chapter 7.

6.1 Introduction

COAG Best Practice Regulation Guidelines: Principle 2: A range of feasible policy options must be considered, including self-regulatory, co-regulatory and non-regulatory approaches, and their benefits and costs considered.

This chapter draws on the objectives stated in Chapter 5 to identify regulatory and non-regulatory options that seek to address television and computer waste problems and wholly or partly achieve the stated objectives.[81]

The objective of this chapter within the consultation regulatory statement is to consider a range of policy options in order to identify those that are most feasible and should be subject to cost benefit analysis in Chapter 7. In order to identify the most feasible options, the following process was undertaken:

- identification of policy options – a range of possible policy options from doing nothing to improving recycling of televisions and computers were identified;
- identification of funding options – a range of possible funding options to fund a policy/scheme for end of life televisions, computers and computer products were identified;
- assessment of policy and funding combinations – a range of policy and funding combinations were identified; and
- most feasible options selected – considering the set of combinations identified, the most feasible set of combinations were assessed against a set of criteria. Based on this, nine options for a change in intervention were identified, which are considered most likely to achieve objectives and address problems. These options are those identified for detailed cost benefit analysis (as described in Chapter 7).

6.2 Identification of policy options

As a first step in the process of identifying options to address the television and computer waste problems identified in Chapter 4, the following 18 regulatory, co-regulatory and non-regulatory policy options (refer to Table 18) were identified as being capable of wholly or partly achieving the Chapter 5 objectives:

[81] Council of Australian Governments (2007), *Best Practice Regulation A Guide for Ministerial Councils and National Standard Setting Bodies*, October, p 10; Australian Government Office of Best Practice Regulation (2007), *Best Practice Regulation Handbook*, August, page 17

- business as usual – 1. the current situation does not change. Some jurisdictions implement regulation or schemes but there is no national coordination of government policy. In the private sector, industry participants implement brand-specific schemes that do not cover all consumers or all waste televisions and computers;
- non-regulatory options:
  - *2. public education scheme* – to educate the community about the problems relating to television and computer waste and the recycling opportunities available;
  - *collection scheme* – administered by government to increase collection of waste televisions and computers. Could be administered by:
    - 3. local government;
    - 4. state or territory government; or
    - 5. Commonwealth Government; and
  - *6. industry coordinated collection scheme* – to increase collection of waste televisions and computers (voluntary industry participation).
- co-regulatory options:
  - *scheme to incentivise collection and recycling* – that is administered by an industry-run Producer Responsibility Organisation (PRO) – see Box 2 for detail on PRO roles and responsibilities. It is also assumed that such a scheme would make use of a regulatory safety net to encourage participation, which is administered by state government or the Commonwealth Government, which could be:
    - 7. State-based extended producer responsibility (EPR) safety net imposed on importers/retailers that do not become members of the industry scheme;
    - 8. Commonwealth-based EPR safety net imposed on importers/retailers that do not become members of the industry scheme; or
    - 9. Commonwealth excise tax safety net imposed on importers/retailers that do not become members of the industry scheme.
- regulatory options:
  - *10. a mandatory import license requirement* – producers must hold a license to import televisions and computers, which involves membership of an industry scheme to collects and recycle waste televisions and computers.
  - *11. a subsidy for collection/recycling* – a Commonwealth administered scheme whereby regulations impose a fee to be paid on all imports, and subsidies are paid to recyclers for collection/recycling of televisions and computers;
  - *12. design standards* – sets standards for production of televisions, computers and computer products that could either:

(i) assist in ease of recycling/disassembly of waste products, or (ii) reduce hazardous substances to lower landfill externalities;

- *13. mandatory extended producer responsibility scheme* – with an industry-run PRO administering a collection/recycling scheme on behalf of importers (who are required by regulation to take part in the scheme). Administration of required regulation could be undertaken by state government or the Commonwealth Government;
- *14. mandatory extended retailer responsibility scheme* – with an industry-run PRO administering a collection/recycling scheme on behalf of retailers (who are required by regulation to take part in the scheme). Administration of required regulation could be undertaken by state governments or the Commonwealth Government;
- *15. mandatory responsibility on local government* – with local governments required by regulation to administer a collection/recycling scheme for waste televisions and computers;
- *16. deposit refund scheme* – legislation requires retailers to collect a deposit on each new product and provide a refund when the product is returned to a collection site for recycling;
- *17. tradable permits* – recyclers that meet specific requirements set out in regulations the power to generate 'permits' based on their recycling, with importers/recyclers imposed an obligation to purchase a specific number of permits per year based on the amount of equipment they supply; and
- *18. landfill bans* – state-based regulation would require owners and operators of landfill to refuse television and computer waste.

A more detailed description of the options is presented in Appendix E, Table E.1.

As a PRO is assumed in a number of the policy options examined in this document, Box 2 provides some detail of the possible roles and responsibilities of an industry PRO.

Box 2 Possible roles and responsibilities of an industry PRO

In consideration of possible television and computer waste schemes in this consultation document, a PRO is assumed to be a not for profit organisation that will play a key role administering and running a scheme.

The goal of a PRO could be to: establish and run an effective collection and recycling scheme for television and computer products on behalf of television and computer manufacturers and importers of these products in Australia.

The roles/responsibilities of PRO in a scheme could be to:

- represent the television and computer industries on producer responsibility issues;
- develop a collection and recycling scheme for televisions, computers and computer products;
- establish a network of permanent collection sites;
- achieve recycling targets and manage the recycling of end of life products through competitive tenders and contracts with e-waste recycling companies;
- ensure that all data relevant is captured relating to key performance indicators; and
- engage in education and awareness raising activities with a range of stakeholders to ensure collection and recycling targets are achieved.

Source: Adapted from 'Draft Product Stewardship Agreement for Televisions', September 2006

6.3 Identification of policy funding approaches

After identifying the 18 possible policy options listed above, the second step in the process of identifying feasible options to address the problems of television and computer waste was to identify a range of feasible approaches to fund the policy options identified above. The following ten funding approaches were identified for consideration against each of the policy options:

- Local governments:
  - 1. landfill charge; and
  - 2. rates.
- State/territory governments:
  - 3. fee for service (point of sale customer charge); and
  - 4. state and territory consolidated revenue.
- Commonwealth Government:
  - 5. Commonwealth consolidated revenue;
  - 6. point of sale excise;
  - 7. point of import excise; and
  - 8. import license fee.
- Industry:
  - 9. industry association fees; and
  - 10. industry association levy.

These funding approaches are described in more detail in Appendix E, Table E.2.

6.4 Combinations of policy and funding options

Given that each of the policy option could be funded by a range of methods, the next step in analysis of options was to consider how many feasible combinations there are, and to conduct further assessment of each.

As presented in Appendix E, Table E.3, 180 combinations of policy options and funding methods were identified (presented as each individual box in this table). This significant number of possible options is derived from having 18 possible policy options, and then ten possible funding approaches for each of the policy options.

Based on qualitative analysis of each of the 180 possible policy option/funding approach combinations, it was concluded that up to 65 of these combinations were practical (presented in Table E.3 as any box shaded in gray and without a cross). This was based on the following considerations:

- the level of government that administered the scheme would also be responsible for funding the majority of a scheme (e.g. a Commonwealth excise on imports would not feasibly fund a local government collection scheme);
- schemes involving an industry-run PRO would also require government funding if regulation is required (e.g. for government administration and regulatory set up costs);
- industry association fees (not supplemented with an industry levy) would only be sufficient to fund a public education scheme or voluntary industry scheme;
- an industry association levy could be used to fund the administration of co-regulatory schemes or the costs of Producer Responsibility Organisations (PROs) in mandatory schemes; and
- a deposit refund scheme could be funded by a Commonwealth point of sale excise or a State point of sale customer charge (fee for service).

6.5 Selection of most feasible options

From the 65 combinations of policy options and funding approaches (identified in the step above), a qualitative assessment was undertaken to further refine these combinations to those considered most feasible to address television and computer waste problems and wholly or partly achieve the stated objectives. In order to conduct this qualitative analysis, each of the 18 policy options were assessed against a set of criteria, and then an appropriate funding approach was also considered. The set of criteria used in this step includes:

- Resource recovery is maximised relative to other options – the amount of resources collected and recycled is maximised compared to other options. Considering the objectives in Chapter 5 and the problems in Chapter 4, this objective was considered the most important of these indicators;
- Costs are minimised relative to other options – the cost in which resources are recovered and costs required to implement the scheme

are minimised. This is a high level estimate for qualitative assessment, that will be explored further in a CBA framework for selected options;

- Coverage is maximised relative to other options – the option maximises geographical, industry and product coverage compared to other options considered, to ensure that it is fair and equitable; and
- Administration is simple relative to other options – the option is simple to understand, implement, administer, comply with and enforce, and it minimises the number of parties involved in this process. In addition the option is complementary to other policies, and requires minimal change to existing requirements.

Findings of the qualitative analysis of each policy, considering the criteria above, are presented in Table 18.

Table 18 Qualitative analysis of feasible policy options

Policy Option	Who runs	Impact on:				Feasible Funding Options	Decision
		Resource Recovery	Cost	Coverage	Administrative Simplicity		
1. Business as usual	**Current government & private sector involvement**	**Low**. Current low recycling rates are assumed to continue.	**Low.** Only some jurisdictions and some companies involved.	**Low**. Not all companies and consumers are captured/participate.	**Medium.** Industry and consumers must understand different regulation in different jurisdictions. No national regulation.	• Commonwealth or state consolidated revenue; and • Producers currently funding own schemes.	**Considered as 'base case' in CBA**
2. Public Education	**State /territory governments & industry**	**Low**. Not efficient as a standalone scheme and recovery opportunities are currently inadequate in coverage and scope.	**Low.** Only administration costs of the body administering the scheme.	**Low**. Increases the awareness of some consumers, but imposes no obligations on them.	**High.** Only requires administration of the public education campaign and involves no regulations.	• Commonwealth or state consolidated revenue; • Industry association fees; or • An industry association levy.	No further analysis
3. Local government collection scheme (no targets or policy regulation)	**Local government**	**Low.** Likely that not all councils will implement, local government has no jurisdiction over commercial waste management and there are no enforceable targets.	**Low.** Will be able to set up collection facilities at existing landfill sites.	**Medium.** Likely that not all councils will implement and local government has no jurisdiction over commercial waste management.	**High.** Only requires local government administration and involves no regulations.	• Landfill charge; or • Local council rates.	No further analysis
4. State government collection scheme (no targets or policy regulation)	**State /territory governments**	**Low.** Includes commercial waste and all council areas, but no enforceable targets	**Medium.** May be able to establish collection facilities at State owned waste transfer stations, but likely that additional infrastructure will be required. Involves higher administration costs than a local government collection scheme due to the increased scale and scope.	**Medium.** All products are covered, but likely that not all states will implement a scheme.	**High**. Only requires state/territory government administration and involves no regulations.	• Fee for service (point of sale customer charge); or • Commonwealth / State consolidated revenue.	No further analysis
5. Commonwealth government collection scheme (no targets or policy regulation)	**Common-wealth Government**	**Low.** There is a lower chance of implementation as waste management has long been the province of state/local government and there are no enforceable targets.	**High.** Compared to a state government collection scheme it is expected that capital costs will be higher due to a lack of existing Commonwealth infrastructure and administration costs will be higher due to the increased scale of the scheme.	**High.** Covers all products and all states.	**Medium.** Commonwealth administration is expected to be more complicated than state/territory administration due to the increased coverage of the scheme and lack of historic involvement in waste management.	• Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; or • Point of import excise.	No further analysis
6. Industry coordinated collection scheme (voluntary with no policy regulation)	**Industry PRO**	**Low.** Industry has indicated that they will not participate broadly in a voluntary scheme without a regulatory safety net.	**Low.** Infrastructure costs and the costs of setting up administrative bodies are still incurred even if there is no participation.	**Low.** Industry has indicated that they will not participate broadly in a voluntary scheme without a regulatory safety net.	**High.** Industry has indicated that they will not participate broadly in a voluntary scheme without a regulatory safety net.	• Industry association fees; or • An industry association levy.	No further analysis

Policy Option	Who runs	Impact on:				Feasible Funding Options	Decision
		Resource Recovery	Cost	Coverage	Administrative Simplicity		
7. Co-regulatory Scheme (State administered EPR regulatory safety net, and with industry involvement)	**State /territory governments & industry PRO**	**High.** Involves enforceable targets and onerous regulatory safety net responsibilities encourage participation.	**High.** Higher administration costs compared to Commonwealth administered scheme. Will require PRO costs.	**High.** Covers all products and the onerous regulatory safety net ensures participation.	**Low.** More onerous administrative burden for industry association/PRO than an industry coordinated collection scheme, but lower ongoing state government administration requirements due to an onerous safety net.	• Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; • Point of import excise; or • Industry association levy.	**Identified for further analysis (Options #1 & #2)**
8. Co-regulatory Scheme (Commonwealth administered EPR regulatory safety net, and with industry involvement)	**Common-wealth Government & industry PRO**	**High.** Involves enforceable targets and onerous regulatory safety net responsibilities encourage participation.	**Med.** Lower administration costs compared to State administered scheme, but still likely to be higher than the business as usual cost. Will require PRO costs.	**High.** Covers all products and the onerous regulatory safety net ensures participation.	**Low.** More onerous administrative burden for industry association/PRO than an industry coordinated collection scheme, but lower ongoing state government administration requirements due to an onerous safety net.	• Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; • Point of import excise; or • Industry association levy.	**Identified for further analysis (Options #3 & #4)**
9. Co-regulatory Scheme (Commonwealth excise regulatory safety net, and with industry involvement)	**Common-wealth Government & industry PRO**	**High.** Involves enforceable targets and onerous regulatory safety net responsibilities encourage participation.	**High.** Higher infrastructure costs compared to the State/Territories due to the absence of existing ownership. Will require PRO costs.	**High.** Covers all products and the onerous regulatory safety net ensures participation.	**Medium:** More onerous administrative burden for industry association/PRO than an industry coordinated collection scheme, but excise regulations are already in place so administration will be simpler than a co-regulatory scheme with an individual EPR safety net.	• Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; • Point of import excise; or • Industry association levy.	**Identified for further analysis (Options #5 & #6)**
10. Mandatory Import Control Scheme (with industry involvement)	**Common-wealth government & industry PRO**	**High**. Enforceable targets and license requirements ensure participation. Investigation of the ozone substance model showed this may be viable enough to assess further in a CBA.	**High.** Higher infrastructure costs compared to the State/Territories due to the absence of existing ownership. Will require PRO costs.	**High.** Covers all products and the onerous regulatory safety net ensures participation. All products and onerous regulatory safety net ensures participation.	**Medium.** More onerous administrative burden for industry association/PRO than an industry coordinated collection scheme and, but the scheme is administration by a single body, so administration will be simpler than a co-regulatory scheme with an individual EPR safety net, which is administered by multiple states and territories.	• Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; • Point of import excise; • Import license fee; or • Industry association levy.	**Identified for further analysis (Option #8)**

Policy Option	Who runs	Impact on:				Feasible Funding Options	Decision
		Resource Recovery	Cost	Coverage	Administrative Simplicity		
11. Subsidy scheme for collection/ recycling	**Common-wealth Government**	**High.** Increased revenue from collection and recycling from the subsidy will incentivise increased levels of recycling and may make recycling financially viable for new entrants to the market.	**High.** Incumbent recyclers should be able to use existing infrastructure, but new entrants will incur large up front infrastructure costs. Requires administration of both the collection of the excise and the payment of the subsidy. However, excise regulations are already in place.	**High.** All collectors and recyclers are eligible for the subsidy and all products are covered.	**Medium.** Administration would be similar to the existing Product Stewardship for Oil (PSO) Scheme. A subsidy scheme requires regulations relating to the levels and criteria for the subsidy and imposes compliance costs on recyclers, who must report to the government how much they have recycled and be subjected to audits to determine the veracity of their reporting.	• Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; and • Point of import excise.	**Identified for further analysis (Option #7)**
12. Design Standards	**Common-wealth Government**	**Low.** Design standards may make recycling easier, but they do not necessarily result in increased levels of recycling.	**Medium.** Large regulatory design and enforcement costs due to the complexity of design standards. However, there will be no additional costs for collection/transport and a small reduction in reprocessing costs.	**Medium.** Only covers new products.	**Low.** The Australian Customs Service (ACS) will be required to determine whether products comply with the design standards, which requires a high level of expertise.	• Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; and • Point of import excise.	No further analysis
13. Mandatory Extended Producer Responsibility (with industry involvement)	**State/ territory governments & industry PRO**	**High.** Mandatory recycling targets are set out in regulations and are enforceable.	**High.** Costs are likely to be similar to co-regulatory schemes. However, administration costs are expected to be higher in a mandatory scheme due to increased enforcement costs. In the co-regulatory schemes it is assumed that the regulatory safety net is sufficient onerous to force all producers into the industry scheme, so no enforcement is required.	**High.** Covers all producers and all products.	**Medium.** Requires Commonwealth Government administration of regulations and recyclers are likely to require a Producer Responsibility Organisation (PRO) to help them meet their obligations.	• Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; • Point of import excise; and • Industry association levy.	**Identified for further analysis (Option #9)**
14. Mandatory Extended Retailer Responsibility (with industry involvement)	**Common-wealth Government & industry PRO**	**High.** Mandatory recycling targets are set out in regulations and are enforceable. However, recycling levels are expected to be lower than in a mandatory EPR scheme as enforcement	**High.** Costs are expected to be similar to a mandatory EPR scheme. However, enforcement costs are expected to be higher because there are substantially more retailers than there are producers.	**High.** Covers all retailers and all products.	**Low.** Commonwealth Government administration of the regulations will be more difficult than in a mandatory EPR scheme because of the larger number of retailers who	• Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; and	No further analysis

Policy Option	Who runs	Impact on:				Feasible Funding Options	Decision
		Resource Recovery	Cost	Coverage	Administrative Simplicity		
		of the targets is more difficult given the large number of retailers.			will face obligations under the scheme.	• Point of import excise.	
15. Mandatory Responsibility on Local Government	**State or Common-wealth government**	**Medium.** Mandatory recycling targets are set out in regulations and are enforceable. However, the lack of local govt responsibility for commercial waste may reduce the effectiveness of the scheme.	**High.** Enforcement costs are expected to be higher than in a mandatory EPR because there are substantially more local councils in Australia than there are producers.	**High:** Covers all Local Governments and all products.	**Low.** Commonwealth Government administration of the regulations will be more difficult than in a mandatory EPR scheme because of the larger number of local councils who will face obligations under the scheme.	• Landfill charge; • Rates; • Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of import excise; or • Point of sale excise.	No further analysis
16. Deposit Refund Scheme	**State or Common-wealth government**	**Low.** The scheme only applies to new products and encourages collection instead of recycling.	**Low.** Requires investment in collection facilities, but involves low administration and compliance costs.	**Low.** The deposit is only collected for new products and the refund only applies to products presented at designated collection sites.	**High.** There are likely to be low administration and compliance costs associated with collecting the deposit and paying the deposit. However, there is more variation in the products than in traditional deposit refund scheme such (e.g. bottles).	• Fee for service (point of sale customer charge); or • Point of sale excise.	No further analysis
17. Tradeable Permits Scheme	**State or Common-wealth government**	**Medium.** The scheme will encourage reprocessing if the requirements are met for the permits. However, the scheme may only be effective in easily accessible areas with established recycling.	**High.** There will be substantial administration, enforcement and compliance costs as the scheme will be highly complex.	**High.** Covers all producers and all products.	**High.** The scheme is highly complex and places obligations on both producers and recyclers.	• Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; and • Point of import excise.	No further analysis
18. Landfill ban	**State or Common-wealth government**	**Low.** While the scheme discourages disposal at landfill, it does not encourage recycling. In fact, it may encourage illegal dumping	**Low.** The scheme requires sites for storage of products disposed of at landfill and costs associated with cleaning up sites where there has been illegal dumping. However, administration of the scheme only requires monitoring at landfill sites and compliance costs are low.	**Low.** The scheme covers all products but it is easy to avoid the scheme (e.g. illegal dumping)	**High.** Administration of the scheme only requires monitoring at landfill sites	• Landfill charge; • Rates; • Fee for service (point of sale customer charge); • Commonwealth / State consolidated revenue; • Point of sale excise; and • Point of import excise.	No further analysis

As indicated in this table, of the set of 65 feasible combinations identified in the previous step, nine options for a change in government intervention have been identified as being most likely to address television and computer waste problems and wholly or partly achieve the stated objectives. These options are listed below, with more detail provided in Appendix E, Table E.4:

- Co-regulatory schemes:
  - State-based EPR implemented as a National Environmental Protection Measure (NEPM) with an exemption if the importer belongs to an industry scheme:
    - ***Option 1:*** television and computer industries responsible for the collection of all products (including historic and orphan products).
    - ***Option 2:*** television industry responsible for the collection of all products (including historic and generic), major computer brand owners responsible for historic waste from their own brand and importers of generic computer parts and equipment are responsible for all non-branded and historic products.
  - Commonwealth-based EPR with an exemption if the importer belongs to an industry scheme:
    - ***Option 3:*** television and computer industries responsible for the collection of all products (including historic and orphan products).
    - ***Option 4:*** television industry responsible for the collection of all products (including historic and generic), major computer brand owners responsible for historic waste from their own brand and importers of generic computer parts and equipment are responsible for all non-branded and historic products.
  - Commonwealth excise (levy) with an exemption if the importer belongs to an industry scheme.
    - ***Option 5***: television and computer industries responsible for the collection of all products (including historic and orphan products).
    - ***Option 6***: television industry responsible for the collection of all products (including historic and generic), major computer brand owners responsible for historic waste from their own brand and importers of generic computer parts and equipment are responsible for all non-branded and historic products.
- Regulatory schemes:
  - ***Option 7:*** mandatory Commonwealth levy with a government-run subsidy scheme for collection/recycling.
  - ***Option 8:*** mandatory import license requirement.
  - ***Option 9:*** mandatory state-based EPR (NEPM).

It should be noted that each option contains four sub-options relating to four product groups included in the analysis:

- televisions only;
- computers and computer products;
- visual display units (VDUs) only; and
- all televisions, computers and computer products.

Each of these options will be compared against the ‘do nothing’ option, whereby the status quo is maintained. This is referred to as the business as usual case.

These nine policy change options (and the four product group sub-options) are analysed and compared through a cost benefit analysis in the following chapter.

7 Costs and benefits

COAG Best Practice Regulation Guidelines Cost Benefit Analysis: *There should be an outline of the costs and benefits of the proposal(s) being considered. This should include direct and indirect economic and social costs and benefits. There should also be analysis of distinct alternatives (including 'do nothing') to the proposed regulation.*

This section presents the results of a rigorous cost benefit analysis, which compares the economic costs and benefits of each policy option identified in Chapter 6. The options are assessed against the *status quo* where there is no government intervention, in order to determine whether they deliver a net benefit to society.

Some of these additional factors are considered in Chapter 8.

7.1 Introduction

In Chapter 4 a number of problems were identified relating to television and computer waste. As government intervention should generally occur only when it can be demonstrated that the benefits of intervention outweigh the costs, this chapter presents a cost benefit analysis of a set of possible policy options for government.

This appraisal has been undertaken consistently with the COAG guidelines for analysis of regulations. In order to analyse the impacts of proposed government intervention to address the television and computer waste problem, a cost benefit analysis (CBA) has been undertaken to compare the benefits and costs of the policy options relative to a 'business as usual' scenario, discounted to convert them to their present value (2008/09) for comparative purposes.

This CBA uses Net Present Value (NPV) economic measure of performance which is the difference between the present value (PV) of total incremental costs and the PV of total incremental benefits. Benefit Cost Ratio (BCR) is an additional economic measure presented in this chapter.[82] If the NPV is positive or the BCR is greater than 1, this indicates that the benefits exceed the costs and the policy provides society with a net benefit. However, if the BCR is less than 1 or the NPV is negative, then the costs of the scheme exceed the benefits and the scheme imposes a net cost on society.

Generally, the scheme with the highest BCR or NPV is the preferred option. The COAG guidelines favour the highest NPV as the appropriate standard for choosing a preferred option, in line with adoption of the option that generates the greatest net benefit for the community.

However, there may be alternative decision criteria used to reach a final conclusion including:

- stakeholder commitments and support;

[82] The BCR is the ratio of the PV of economic benefits to the present value of economic costs over the life of the project.

- government willingness and preference; and
- ease of implementation and ongoing support.

Some of these additional factors are considered in Chapter 8.

7.2 Which options were analysed?

As detailed in Chapter 6, nine options for policy change were selected to be subjected to a CBA. These options for change, and the base case for the appraisal, are:

- Base Case (business as usual): the current situation does not change. Some jurisdictions implement regulation or schemes but there is no national coordination of government policy. In the private sector, industry participants implement brand-specific schemes that do not cover all consumers or all waste televisions and computers;
- Co-regulatory schemes:
- State-based Extended Producer Responsibility (EPR) implemented as a National Environmental Protection Measure (NEPM) with an exemption if the importer belongs to an industry scheme:
  - ***Option 1:*** joint television and computer recycling scheme.
  - ***Option 2:*** separate television and computer recycling schemes.
- Commonwealth-based EPR with an exemption if the importer belongs to an industry scheme:
  - ***Option 2:*** joint television and computer recycling scheme.
  - ***Option 3:*** separate television and computer recycling schemes.
- Commonwealth excise (levy) with an exemption if the importer belongs to an industry scheme.
  - ***Option 2:*** joint television and computer recycling scheme.
  - ***Option 3:*** separate television and computer recycling schemes.
- Regulatory schemes:
  - ***Option 7:*** Mandatory Commonwealth levy with a government-run subsidy scheme for collection/recycling.
  - ***Option 8:*** Mandatory import license requirement.
  - ***Option 9:*** Mandatory state-based EPR (NEPM).

For each of the nine policy change options, separate product analysis was undertaken to isolate the costs and benefits for each option if it was to apply to:

- televisions only;
- computers and computer products;
- visual display units (VDUs) only; and

- all televisions, computers and computer products.[83]

The appraisal results presented in this chapter assume that a government scheme will require household/business 'drop off' of end of life products.[84] Kerbside schemes are analysed in a sensitivity analysis in Appendix K, Table K.7.

In addition, threshold analysis was undertaken to assess the economic outcomes if importers of small quantities of televisions or computers are excluded from any policy intervention. Three thresholds based on the number of units imported were identified and assessed within the CBA framework (see Appendix F for further details on the threshold analysis undertaken). These thresholds significantly decreased the number of importers facing obligations under the schemes, while maintaining significant coverage. For example, when assessing 'all' television and computer waste products, the number of companies captured by the proposed schemes decreased from 10,190 with no threshold to 460 with a threshold of 5,000 units. However, these 460 companies accounted for 95.3% of total units sold in 2008.

Table 19 Selected threshold levels and associated percentage coverage and number of companies – all products (2008 import data)

Indicator	No threshold	Threshold 1	Threshold 2	Threshold 3
Threshold level (no. units per importer required for inclusion in scheme)	0	200	1,000	5,000
Coverage (% of units included in scheme, 2008)	100%	99.6%	98.4%	95.3%
Companies (number included in scheme, 2008)	10,190	1,990	1,020	460

Source: ACS data on import activity, provided by DEWHA

The CBA results for each option, product and threshold are presented in Appendices I to K. However, due to the complexity of the model, the results examined within this chapter relate to the 'all products' category and a threshold of 5,000 units (threshold 3) as this combination produced the most favourable NPV and BCR results.

As the CBA is based on a range of estimates and assumptions, the appraisal results provide a general view about the likely expected economic outcomes that are subject to these assumptions. Despite this, the appraisal results in an overall conclusion that the options have positive economic outcomes,

[83] Note that projections in the 'all products' category are equal to the sum of projections in the 'televisions' and 'computers' categories. However, the category 'visual display units' is a subset of the 'televisions' and 'computers' categories.

[84] This collection method is known as 'drop-off'. An alternative method of collection is 'kerbside pick-up' where consumers and businesses leave e-waste outside their homes/businesses and it is collected on designated days in a similar fashion to existing local council waste collection services.

with relativities between options not expected to change with amendments to key assumptions.

7.3 General assumptions

General assumptions relating to all options are outlined in Appendix G, Table G.1 and relate to:

- the time period of analysis;
- the discount rate; and
- underlying recycling projections.

The base year of the appraisal is the current year: 2008/09. The Steering Committee advised that it would take two years to design and implement the schemes, which are consequently assumed to commence in 2010/11. In order to analyse each scheme's operation over 20 years (in accordance with the COAG guidelines), the analysis commences in 2008/09, and continues for 20 years after the first year of operation of the scheme (2010/11), until 2030/31. Therefore, the appraisal period spans from 2008/09 to 2030/31.[85]

As suggested by the COAG guidelines, the benefits and costs were discounted to present value terms (2008/09 and 2009 dollars) using a discount rate of 7%. Sensitivity analysis was conducted using discount rates of 3% and 11%86 (see Appendix K, Tables K.1 and K.2).

7.4 Sales and recycling projections

Underlying sales and recycling projections are key inputs to the CBA, as they assist in quantifying the varying impact each policy option is likely to have. The majority of costs and benefits incorporated in the CBA are linked in some way to sales and/or recycling levels. For example, collection costs are linked to recycling volumes and consumer surplus from increased recycling is linked to the recycling rate.

Key assumptions used to project sales, products reaching end of life,[87] recycling levels, landfill volumes and export volumes and importer numbers over the period of analysis include:[88]

- a comprehensive network of conveniently located drop-off points to be established under each scheme.[89] These will form part of scheme collection costs;

[85] Commonwealth Government Office of Best Practice Regulation (2007), 'Best Practice Regulation Handbook', August, p 117

[86] Ibid, p 120

[87] A product reaches end of life when it is no longer able to be reused.

[88] These projections were reported both on a unit and tonnage basis.

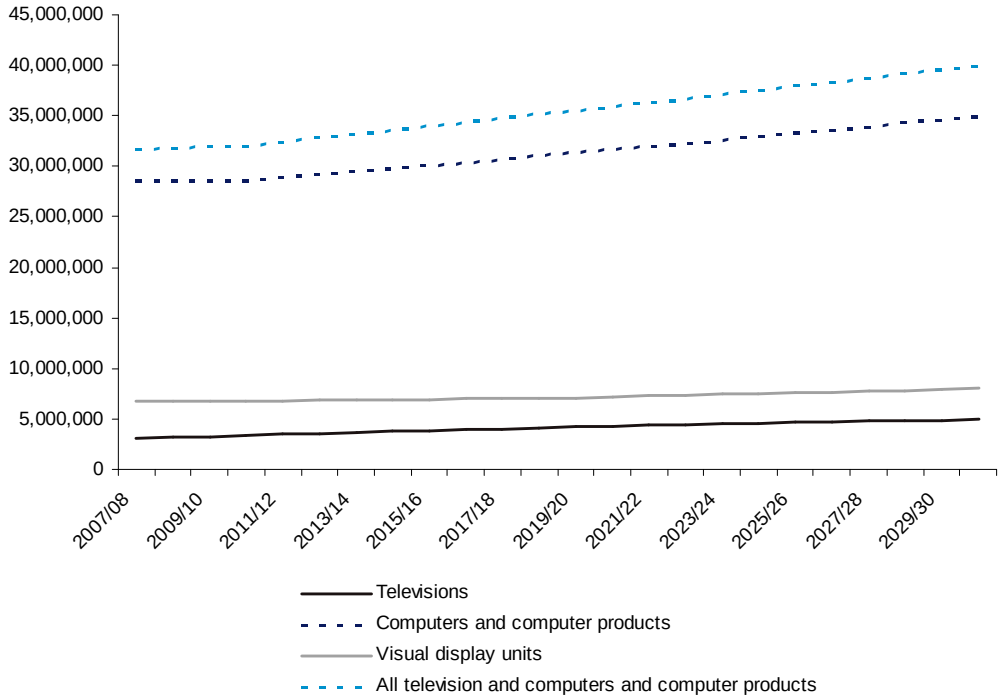
- this will be accompanied by significant efforts in education and promotions, aimed at both household and commercial equipment owners, to ensure that collection and recycling targets are achieved by 2015/16. For example, options 5, 7 and 8 are projected to reach a 70% recycling rate in 2015/16 (year 5);
- sales, lifespan and resulting end of life waste levels are equal across all options, as individual policy options are not expected to influence these. The growth in products reaching end of life is projected to outstrip growth in sales as product lifespans decrease in line with rapid technological change;
- recycling and landfill diversion rates are not assumed to vary if different thresholds are applied on importer coverage;[90]
- the amount of material exported for reuse under the options assessed will not vary from the business as usual scenario;
- the volume of computers and televisions recovered and recycled increases over the period of analysis;
- the proposed thresholds for those who are covered under the scheme will not impact the diversion rates achieved under each option;
- diversion rates are expected to be higher if a kerbside collection service was established and / or if a landfill ban was put in place;
- the ramp up of recycling rates is assumed to vary between policy options (see beneath Table 20 for further details); and
- projected recycling levels are equivalent for the following groups of similar options (see beneath Table 20 for further details).

Projected sales trends. Figures 10 and 11 present the projected sales trends assumed in the CBA. As indicated in these figure, sales of new televisions, computers and computer products are not expected to vary between the policy options analysed. It is assumed that none of the options will impact the sales or lifespan of products. As such, total sales, as well as end-of-life levels for each option are expected to be equal to the business as usual scenario.

[89] For example, at existing Local Government landfill sites and state and territory government waste transfer stations.

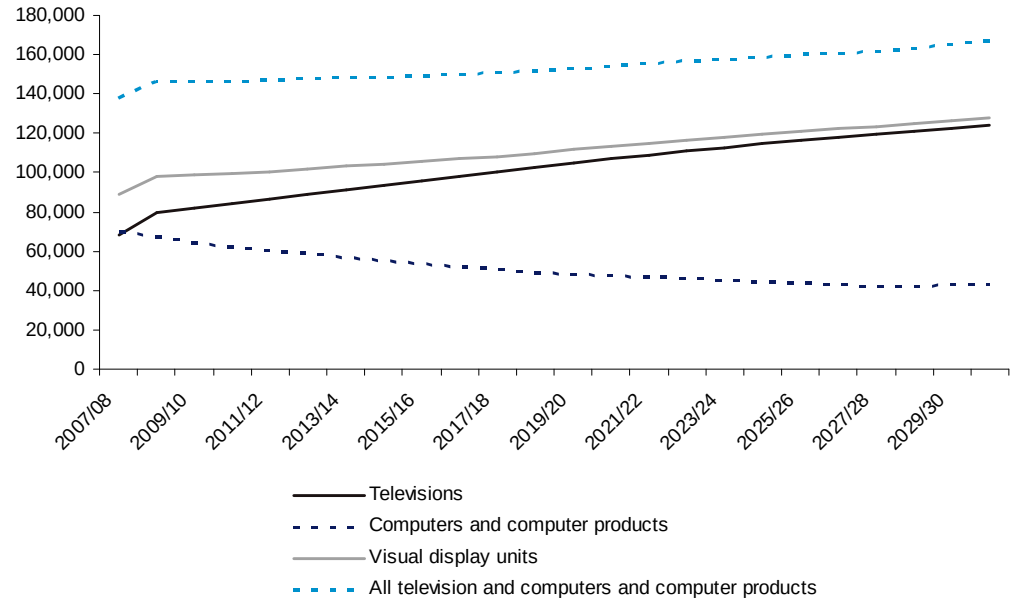
[90] The diversion rate is the sum of the recycling and export volumes divided by the total end of life volumes.

Figure 10 Sales volumes for the base case and policy options (units sold) 2007/08 – 2030/31



Source: DFAT data on imports

Figure 11 Sales volumes for the base case and policy options (tonnes sold) 2007/08 – 2030/31



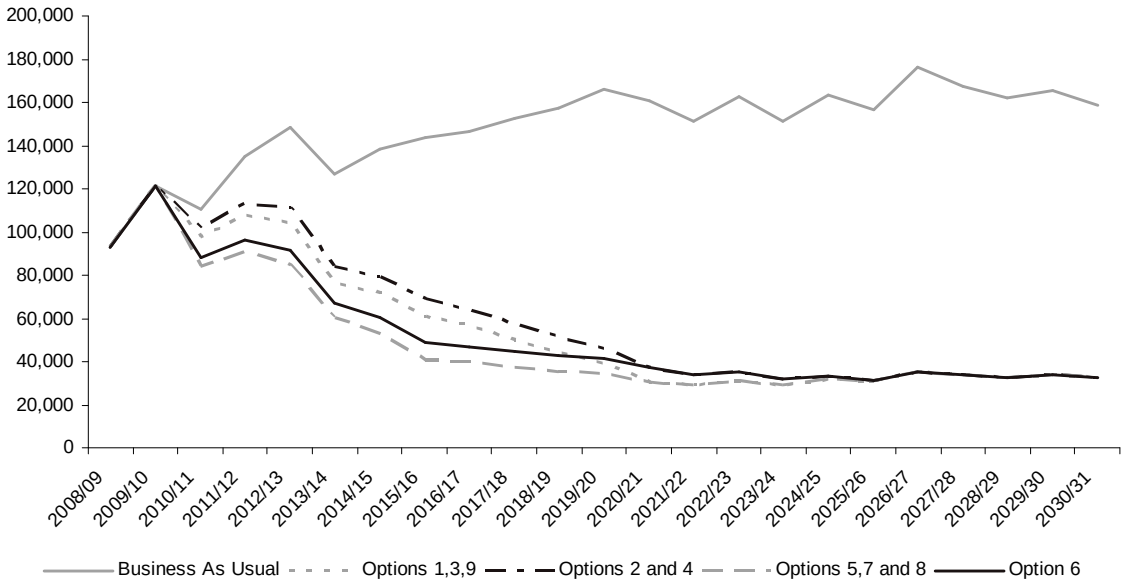
Source: DFAT data on imports

As indicated in the figures above, while computers and computer products comprise the most significant proportion of total television and computer units, on a tonnage basis they contribute a lower proportion. In addition, this proportion is set to decrease over the next 20 years as a result of the reducing weight for these products resulting from technological

developments, at a much more significant rate than televisions or visual display units.

Projected landfill trends. Figure 12 shows the estimated landfill levels over the next 23 years under each of the options analysed, and in comparison with the business as usual case.

Figure 12 Landfill volumes under the base case and policy options (tonnes) - 2007/08 – 2030/31



Source: End of life modelling of television and computer products was based on estimated sales, lifespan, product weight and disposal pathways. Sales data was estimated using DFAT data on imports. Input to the development of assumptions for lifespan, weight and disposal pathways was provided by AIIA, PSA and the project Steering Committee

70% recycling target. As presented in Figure 12 and also in Table 20 below, although recycling under each option examined in the CBA is projected to reach the same rate by 2030/31, the speed at which the recycling rate increases differs between the options. Options 5, 7 and 8 are the quickest to reach 70% recycling, while options 2 and 4 are the slowest. A 70% recovery rate has been used to allow for comparison of the options, as costing all options against the same recovery rate allows a more meaningful comparison. Instead variations between the options' recycling rates relate to the amount of time and cost to achieve this level. A rate of 70% of end of life tonnes generated each year is considered to be an upper limit of a drop off scheme. In comparison with other recycling schemes:

- National Packaging Covenant – recovery is around 58% and increasing, with a target of 65% to be achieved next year, with potential to continue increasing after that;
- DrumMuster – was previously achieving approximately 66% recovery. However as a result of drought impacts, has been difficult to measure against sales in recent years due to significant reduction in sales; and

- Product Stewardship for Oil scheme – in 2007/08, 50% of petroleum based oil sales were recycled under the PSO scheme. This represents a close to 20% increase on 2001/02 levels in the scheme's first full year of operation (42% of sales in that year).[91]

Table 20 Recycling outcomes - all products, threshold 3

Option	Landfill rate 2015/16 (%)	Recycling rate 2015/16 (%)	Years to reach 70% recycling rate	Total recycled 2008/09 to 2030/31 (million tonnes)
Business as usual case	90%	7%	N/A	0.2
1	39%	59%	8	2.3
2	44%	54%	9	2.2
3	39%	59%	8	2.3
4	44%	54%	9	2.2
5	26%	73%	5	2.5
6	31%	67%	7	2.4
7	26%	73%	5	2.5
8	26%	73%	5	2.5
9	39%	59%	8	2.3

Note: these rates as a proportion of end of life tonnes

A key assumption of the recycling rates above is that all options will have sufficient effort made by the body running the scheme through education, marketing and other promotional activities (such as engagement with community or charity groups to undertake collection drives) to reach diversion rates outlined in the television industry scheme proposal. Stakeholder comment on these recycling rates, and the 70% objective would be appreciated as part of the consultation period, and whether the rates are realistic.

The ramp up of recycling rates is assumed to vary between policy options based on the following:

- recycling rates for the schemes will be delayed where options require legislation to be implemented at the state/ territory level (e.g. options 1, 2 and 9), in line with experience with the National Packaging Covenant of three years or more delay before all states/ territories have legislation in place; and
- where a separate scheme is applied to computer products (options 2, 4 and 6) there is expected to be lower diversion rates in the first ten years as it is assumed there is limited responsibility under these schemes for unbranded and orphan items to be captured and

[91] Packaging Covenant and DrumMuster recycling rates provided by the Steering Committee. Product Stewardship for Oil recycling rates sourced from PwC 2009, *Second Independent Review of the Product Stewardship (Oil) Act 2000 - Final Report*, February 2009

recycled. Although importers of generic parts and equipment are required to pay an advanced recycling fee to the PRO, this is not expected to be sufficient to fund recycling of a substantial volume of unbranded and orphan products.[92]

Projected recycling levels are equivalent for the following groups of similar options:

- options 1, 3 and 9 – extended producer responsibility schemes with NEPM regulation;
- options 5, 7 and 8 – mandatory Commonwealth Schemes and/or Commonwealth imposed levy. Option 7 is expected to have little difference when compared with a television industry scheme except that it would be run by a government body. As such this option has been assumed to be in line with the diversion rates achieved in the options where the television industry scheme is implemented with no delay to start-up of the program (options 5 and 8); and
- options 2 and 4 – separate schemes for televisions and computers based on EPR frameworks.

To ensure comparability, weight projections per unit have been applied to sales, recycling landfill and end of life projections to take into account the fact that:

- televisions, computers, and computer components are all different so units of these products cannot be directly compared;
- the product mix of computers is expected to change in the future, with a substitution away from desktops towards laptops, which are relatively smaller and lighter; and
- over time the materials used in manufacturing are changing, with lighter, less expensive material expected to be used to manufacture televisions and computers in the future.

7.5 Impact identification

As a result of a change to the business as usual case whereby a national scheme is implemented to increase recycling of end of life televisions, computers and computer products, the following impacts are expected. These are all relative to the business as usual case.

Negative impacts included in the CBA (costs):

- consumer collection costs in relation to road transportation of waste are not expected to vary significantly from the business as usual case, though will decrease in terms of less landfill fees being paid;

[92] Option 6 is projected to achieve 70% recycling in 2016-17 (year 6); options 1, 3 and 9 are projected to achieve 70% recycling in 2018/19 (year 8); and options 2 and 4 are projected to achieve 70% recycling in 2019/20 (year 9).

- industry collection costs are estimated to increase;
- reprocessing costs are estimated to increase;
- externality costs associated with transport and production are expected to remain similar to current levels given transport also occurs in the base case (just to landfills), and production of new products will be required in the base case if recycled products are not available in the market;
- regulatory design and implementation costs are expected to increase, but with some efficiency created from a national approach;
- industry PRO administration costs are expected to increase;
- government administration costs are expected to increase;
- importer compliance costs are estimated to increase;
- compliance costs for recyclers are expected to increase;
- scheme communication costs are expected to increase;

Positive impacts included in the CBA (benefits):

- society's intrinsic value of recovering non-renewable resources and other non-market benefits from increasing recycling levels is estimated to increase (consumer surplus);
- recovery of the financial market value placed on recovered television and computer components will increase;
- landfill externality costs are expected to decrease; and
- landfill direct costs and opportunity cost of land are also expected to decrease.

These are discussed in turn below.

7.6 Costs

The costs considered and estimated as part of the CBA are discussed below. Further detail on assumptions relating to estimated costs are provided in Appendix G.

Consumer collection costs. These are costs incurred by consumers and businesses dropping off television and computer waste at designated collection facilities at locations such as landfills, waste transfer stations and local businesses. This largely captures costs to transport waste by car/truck/other method to a collection site, and is also assumed to include a change in landfill fees now avoided. This cost was taken into account as part of the URS Willingness to Pay Survey (i.e. the 'consumer surplus' benefit discussed below is the net of all costs consumers would expect to incur if a scheme is implemented) and so household/business transportation costs were not separately estimated.

Industry collection costs are expected to be incurred by the industry to collect end of life televisions and computers and transport them to reprocessing locations. This may include road transport costs from a collection point to a recycling facility, as well as capital and operating costs

for collection sites. These costs are estimated to be $273 per tonne in 2009 dollars, or an average of $1 per unit.[93]

While it is likely that collection cost savings may be expected from achieving economies of scale as a result of increased recycling volumes in the industry (with estimates that savings of 20% could be achieved when collection reaches 70%), the costs incorporated into the CBA are conservative and so do not assume any long term cost saving. Contributing to the conservative nature of this assumption is the trend to lighter televisions and computers. This will mean lower handling cost as the number of units per tonne increases; however this has not been incorporated into the appraisal.[94] Sensitivity analysis was undertaken In Appendix K, Table K.10 to see the effects of economies of scale from increased recycling volumes by assuming that collection cost savings of 20% are achieved when recycling reaches 70%.

Table 21 presents a summary of collection and reprocessing costs by product type.

Table 21 Estimated collection and recycling costs (2009 dollars, weighted averages, rounded)

Product group	Collection costs ($/unit)	Reprocessing costs ($/unit)	Total ($/unit)
Televisions	$6	$18	$24
Computers and computer products	$1	$3	$1
Visual display units	$4	$11	$15
All televisions, computers and computer products	$1	$4	$5
Product group	**Collection costs ($/tonne)**	**Reprocessing costs ($/tonne)**	**Total ($/tonne)**
Televisions	$273	$700	$973
Computers and computer products	$273	$700	$973
Visual display units	$273	$700	$973
All televisions, computers and computer products	$273	$700	$973

Source: Estimates based on Hyder (2006), 'Television EPR Scheme Producer Responsibility Organisation Cost Analysis', prepared for NSW DECC and discussions with e-waste recyclers and estimated product weights based on information from AIIA and PSA.
Note: exclude profit, GST and revenue received for on-selling of materials. Have been rounded.

[93] Estimates based on Hyder (2006), 'Television EPR Scheme Producer Responsibility Organisation Cost Analysis', prepared for NSW DECC.

[94] The URS Willingness to Pay Survey stated that 'alternative schemes are described in terms of…[w]hat it would cost you, compared to the current situation' and respondents were told to 'remember how much money you have to spend and your other financial commitments.' See URS 2009, Appendix A

Reprocessing costs relate to costs incurred by the recycling industry to recycle either one tonne or one unit of waste televisions and computers. In this appraisal, reprocessing costs are estimated to be $700 per tonne of television and computer waste or an average of $4 per unit.[95] Given the labour intensive nature of the recycling industry, the majority of these costs (50-70%) are estimated to be labour costs. Reprocessing costs are presented above in Table 21, alongside collection costs.

While two e-waste recyclers have indicated that there may be some scope for these costs to decrease over time as recycling levels increase and economies of scale are reached, this has not been applied in this appraisal to result in more conservative NPV and BCR results. Based on industry discussions, recycling cost savings over the long term could be 9% saving once recycling reaches 20% and 20% saving (on initial reprocessing costs) once recycling reaches 50%. Sensitivity analysis was undertaken in Appendix K, Table K.11 to see the effects of reprocessing cost savings when recycling increases due to economies of scale. These costs are assumed to exclude profit margin based on discussions with e-waste recyclers. This has been excluded as it could be considered a transfer between parties (consumers of recycled products to reprocessors).

Externality costs associated with transport and production. These costs relate to externality costs incurred by third parties as a result of transport and production costs generated in the base case and as a result of the policy options assessed. For example, externalities involved with transport and production may include increased carbon emissions from reprocessing or noise from metropolitan road transport. Externalities involved with transport and production have been assumed to essentially net out from the 'business as usual' base case, as television and computer waste is currently transported anyway (in the base case the majority will be transported to a landfill, and with a policy change it is expected they will be transported to a collection/recycling point). In addition processing of metal, plastic, glass, and other components also currently occurs (however in the base case this is expected to be for new products, whereas under a policy change this will be for recycled products). A more detailed assessment of the lifecycle including electricity used during processing, and a change in kilometres driven under the base case, would be required in order to estimate this cost more accurately, which would be difficult given the national scale of this analysis.

Regulatory design and implementation costs. These include government-incurred costs to design the regulation, make regulatory amendments, and then implement any varied legislation/regulation. It is expected to largely incorporate labour time and cost. Regulatory design and implementation is expected to take two years (2008/09 to 2009/10), with costs ranging from $350,000 per year for Commonwealth options 3,4,5,6 and 8 (due to efficiency from having a single jurisdiction) to $500,000 per year for option 7

[95] Per tonne estimates are based on Hyder (2006), 'Television EPR Scheme Producer Responsibility Organisation Cost Analysis', prepared for NSW DECC and discussions with e-waste recyclers. Per unit estimates were made using the estimated average per unit weight across currently disposed items.

(as two sets of regulations will be required under this option). These cost estimates are fairly high level, however are based on consideration of other recycling schemes and discussions with the Steering Committee that has experience implementing such schemes. For example the Australian Tyre Industry Council (ATIC) estimate costs to develop the proposed tyres product stewardship agreement and related NEPM development costs of $400,000 (or approximately $350,000 excluding labour costs).[96]

Industry scheme administration costs. This cost item relates to administrative costs of an industry-run PRO, that will administer the collection and recycling in all schemes but option 7. Co-regulatory schemes (options 1 to 6) and mandatory schemes (options 8 and 9) are assumed to be administered by an industry-coordinated PRO with government administering the regulation, however, option 7 is assumed to be administered solely by Government. PRO administration costs are estimated to range from $1.25 million per annum for a joint industry scheme to $2.1 million per annum when separate schemes are assumed to be run concurrently for televisions and computers. These are based on estimates for PRO administration costs contained in the Hyder 2006 *Television EPR Scheme Producer Responsibility Organisation – Cost Analysis*. These costs are lower than estimated in the ATIC business plan, which estimate average costs to per annum of $4.4 million.

Direct government administration costs relate to costs for government to administer the scheme and regulation on an ongoing basis, and also include costs related to chasing industry participants to join the co-regulatory schemes. This has been found to generate significant costs for the National Packaging Covenant, and as a result six hours of labour per new importer has been assumed as contributing to the administration costs, which was applied to estimates for importer numbers each year. Total administration costs are estimated to range from $0.6 million (options 3 and 4) to $3.5 million per annum (options 1, 2 and 9), with state-administered schemes being more expensive than Commonwealth-administered schemes due to the duplication of effort of the multiple jurisdictions.

Importer compliance costs are estimated to be $600 per importer for option 7 based on the recently proposed tyres NEPM scheme,[97] which involves an advanced recycling fee and subsidies for recycling. This includes education, notification, permission, procedural, publication and documentation, purchase and record keeping costs. Other options are assumed to cost $1,000 per importer, as they involve a greater requirement to report against targets. Option 8 is assumed to involve an additional 5% increase in compliance costs due to the licensing requirement of this scheme.

Compliance costs for recyclers are estimated at $20,000 per annum per recycler for option 7, based on the existing Product Stewardship for Oil

[96] ATIC Business Plan cost item provided by the Steering Committee.

[97] MMA 2007, 'Tyres National Environmental Protection Measure: Threshold Study', prepared for the National Environment Protection Council, November 2007, p 18

(PSO) Scheme.[98] For recyclers under option 7, these costs are likely to involve reporting, monitoring and other scheme compliance costs in order to be eligible to receive Government recycling/collection subsidies. There are no recycler compliance costs assumed for other options, as recyclers only face contractual obligations with the PRO.

Communication costs. It is estimated that the cost of a national communications campaign is $8.8 million in the first year of the scheme (2010/11)[99] and the cost of reinforcing the initial scheme in subsequent years will be $500,000 until the end of the appraisal period. These are based on estimates for PRO administration costs contained in the Hyder 2006 *Television EPR Scheme Producer Responsibility Organisation – Cost Analysis*, and are not assumed to vary between the options.

Key drivers of costs

- Collection and reprocessing costs have most significant impact on total costs – as outlined in Table 22, total discounted net costs over the 23 year period range from $837 million (option 4) to $995 million (option 8). The main cost drivers for each policy option are reprocessing and collection costs, which account for between 91% and 96% of the total incremental costs under all options (discounted to 2009 dollars). These costs are assumed to increase proportionally in line with increased recycling levels. Other reasons for some schemes having higher or lower costs on a present value basis relates to the ramp up of recycling rates, some schemes taking 5 years to reach a 70% recycling rate resulting in higher reprocessing and collection costs, and some taking 9 years resulting in lower costs when comparing options over the analysis period.
- Differentiation between schemes also occurs due to varying administration costs – while having less of an impact on scheme differentiation than collection and reprocessing costs, there is differentiation in estimation of the administration costs for industry and government run schemes. These cost estimates are unique for each option and not linked to the level of recycling. These administration costs, comprising policy design and implementation, PRO administration, government administration, and communications costs, account for from 3-6% of total costs. As this indicates, these costs have a minor impact on differences in total costs relative to reprocessing and recycling costs.

Funding of cost items. Considering the costs presented in Table 22, there is a range of potential funding scenarios for each. These are discussed in Chapter 8, Section 8.3.

[98] PwC 2009, 'Second Independent Review of the Product Stewardship (Oil) Act 2000', February, prepared for the Department of the Environment, Water, heritage and the Arts

[99] This includes websites, printed collateral material, TV advertisements, radio advertisements, print ads, outdoor media, in store retail advertising, event management and a school education program. See Hyder 2006, pp 16-17

Table 22 Incremental costs, annual and present values over the analysis period ($ millions, all products, threshold 3)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Collection	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$3.2	$2.3	$3.2	$2.3	$6.4	$5.5	$6.4	$6.4	$3.2
	2015/16	$21.3	$19.4	$21.3	$19.4	$26.7	$24.8	$26.7	$26.7	$21.3
	Total (PV)	$234.2	$221.8	$234.2	$221.8	$260.0	$247.5	$260.0	$260.0	$234.2
Reprocessing	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$8.2	$5.9	$8.2	$5.9	$32.4	$14.1	$32.4	$32.4	$8.2
	2015/16	$54.7	$49.7	$54.7	$49.7	$68.5	$63.5	$68.5	$68.5	$54.7
	Total (PV)	$600.6	$560.6	$600.6	$568.8	$680.6	$634.9	$680.6	$680.6	$600.6
Policy design and implementation	2008/09	$0.5	$0.5	$0.4	$0.4	$0.4	$0.4	$0.5	$0.5	$0.5
	2010/11	-	-	-	-	-	-	-	-	-
	2015/16	-	-	-	-	-	-	-	-	-
	Total (PV)	$0.9	$0.9	$0.7	$0.7	$0.7	$0.7	$1.0	$1.0	$0.9
PRO administration	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$1.3	$2.1	$1.3	$2.1	$1.3	$2.1	-	$1.3	$1.3
	2015/16	$1.3	$2.1	$1.3	$2.1	$1.3	$2.1	-	$1.3	$1.3
	Total (PV)	$12.7	$21.1	$12.7	$21.1	$12.7	$21.1	-	$12.7	$12.7
Government administration	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$3.6	$3.6	$0.7	$0.7	$2.2	$2.2	$2.2	$2.3	$3.6
	2015/16	$3.6	$3.6	$0.7	$0.7	$2.2	$2.2	$2.2	$2.3	$3.6
	Total (PV)	$36.3	$36.3	$7.1	$7.1	$22.4	$22.4	$22.6	$23.4	$36.4
Importer compliance	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.3	$0.5	$0.5
	2015/16	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.3	$0.5	$0.5
	Total (PV)	$5.2	$5.2	$5.2	$5.2	$5.2	$5.2	$3.1	$5.5	$5.2
Recyler compliance	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	-	-	-	-	-	-	$0.3	-	-
	2015/16	-	-	-	-	-	-	$0.3	-	-
	Total (PV)	-	-	-	-	-	-	$3.3	-	-
Communications	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$8.8	$8.8	$8.8	$8.8	$8.8	$8.8	$8.8	$8.8	$8.8
	2015/16	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5
	Total (PV)	$12.3	$12.3	$12.3	$12.3	$12.3	$12.3	$12.3	$12.3	$12.3
Total	2008/09	$0.5	$0.5	$0.4	$0.4	$0.4	$0.4	$0.5	$0.5	$0.5
	2010/11	$25.4	$23.1	$22.6	$20.2	$51.5	$33.2	$50.4	$51.6	$25.4
	2015/16	$81.9	$75.7	$79.0	$72.9	$99.7	$93.5	$98.6	$99.8	$81.9
	Total (PV)	$902.2	$858.1	$872.8	$837.0	$993.9	$944.1	$983.0	$995.4	$902.3

Note: 2008/09, 2010/11 and 2015/16 values are undiscounted, annual values at a point in time. 2008/09 is the first year of the appraisal period, 2010/11 is the first year of operation of the schemes and 2015/16 is the first year that one of the schemes reaches 70% recycling. These are not readily comparable with each other as they are not discounted to 2009 dollars. The present value lines represented discounted costs for each option.

Note: Table H.3 in Appendix H presents percentage comparisons of each cost item.

Table 23 separates total costs into the parties that directly incur each cost item. It is important to note that this does not have any implications regarding scheme funding (discussed further above Table 22). For example, reprocessing costs are considered to be recycler costs despite some schemes potentially funding some or all of these. Instead, the table below enables government insight into which costs items it could potentially subsidise as part of the scheme definition. This table indicates that, due to the magnitude of collection and reprocessing costs, recyclers are responsible for between $782 million to $944 million (91% to 96%) of the PV of costs depending on the policy option. In contrast, the state governments are responsible for up to $46 million (5%) and the Australian government is responsible for up to $37 million (4%) depending on the scheme.

Table 23 Split of total incremental costs by party responsible ($ millions, all products, threshold 3)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Recyclers (collection, reprocessing, compliance costs)	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$11.3	$8.2	$11.3	$8.2	$38.8	$19.7	$39.0	$38.8	$11.3
	2015/16	$76.1	$69.1	$76.1	$69.1	$95.2	$88.2	$95.5	$95.2	$76.1
	PV	$834.8	$782.3	$834.8	$790.5	$940.6	$882.4	$944.0	$940.6	$834.8
Importers (compliance costs)	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.3	$0.5	$0.5
	2015/16	$0.5	$0.5	$0.5	$0.5	$0.5	$0.5	$0.3	$0.5	$0.5
	PV	$5.2	$5.2	$5.2	$5.2	$5.2	$5.2	$3.1	$5.5	$5.2
PRO (administration costs)	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$1.3	$2.1	$1.3	$2.1	$1.3	$2.1	-	$1.3	$1.3
	2015/16	$1.3	$2.1	$1.3	$2.1	$1.3	$2.1	-	$1.3	$1.3
	PV	$12.7	$21.1	$12.7	$21.1	$12.7	$21.1	-	$12.7	$12.7
State Government (administration, regulatory and communication costs)	2008/09	$0.5	$0.5	-	-	-	-	-	-	$0.5
	2010/11	$12.4	$12.4	-	-	-	-	-	-	$12.4
	2015/16	$4.1	$4.1	-	-	-	-	-	-	$4.1
	PV	$45.6	$45.6	-	-	-	-	-	-	$45.6
Cth Government (administration, regulatory and communications costs)	2008/09	-	-	$0.4	$0.4	$0.4	$0.4	$0.5	$0.5	-
	2010/11	-	-	$9.5	$9.5	$11.0	$11.0	$11.0	$11.1	-
	2015/16	-	-	$1.2	$1.2	$2.7	$2.7	$2.7	$2.8	-
	PV	$3.9	$3.9	$20.1	$20.1	$35.4	$35.4	$35.9	$36.7	$3.9
Total	2008/09	$0.5	$0.5	$0.4	$0.4	$0.4	$0.4	$0.5	$0.5	$0.5
	2010/11	$25.4	$23.1	$22.6	$20.2	$51.5	$33.2	$50.4	$51.6	$25.4
	2015/16	$81.9	$75.7	$79.0	$72.9	$99.7	$93.5	$98.6	$99.8	$81.9
	PV	$902.2	$858.1	$872.8	$837.0	$993.9	$944.1	$983.0	$995.4	$902.3

Note: 2008/09, 2010/11 and 2015/16 values are undiscounted, annual values at a point in time. These are not readily comparable with each other as they are not discounted to 2009 dollars. The present value lines represented discounted costs for each option. See Appendix H, Table H.4 for percentages

7.7 Benefits

The benefits that have been identified to occur as a result of a government backed scheme to increase recycling of televisions and computers are the:

- society's intrinsic value of recovering non-renewable resources and other non-market benefits from increasing recycling levels is estimated to increase (consumer surplus from increased recycling);
- recovery of the financial market value placed on recovered television and computer components will increase;
- avoided landfill externality costs; and
- avoided landfill direct costs and opportunity cost of land.

Positive (or negative) impacts on employment creation have not been incorporated into the CBA. These types of impacts are not readily captured in a CBA framework, given that it is difficult to attribute employment impacts on a particular party. In addition, employment affects are challenging to assess in a 'net' sense, for example workers may simply switch from other sectors of the economy to the recycling industry as a result of these policy options. These affects would be more accurately captured in a computable general equilibrium model of economic impacts.

Key assumptions

Avoiding double counting of benefits. As part of the URS 2009 Willingness to Pay Study, it was identified that the net value of recycling includes the following values identified by the 2,000+ survey respondents:

- risk of running out of resources while sending some valuable materials to landfill;
- landfill sites are posing a threat to the natural environment;
- landfill space is running out;
- landfill sites are posing a threat to human health; and
- avoiding having landfill the neighbourhood.[100]

However, despite the respondents indicating that the above benefits are important issues for them relating to improving recycling of televisions and computers, the benefits the respondents place on increased recycling is not necessarily limited to this list. In contrast, the choice modelling undertaken by URS and its sub-consultants, aimed to capture the value based on any number of range of benefits the respondent chose to value. In addition, the willingness to pay value estimated from this survey process was estimated as a 'lump sum' value per unit for each percentage increase in recycling – which means it is not possible to isolate any further specific values for the point raised above.

[100] URS (2009), *Willingness to Pay for E-Waste Recycling*, 28 February, p 25

In order to avoid double counting, and considering that the willingness to pay value derived in the 2009 survey is a 'lump sum' value, we have assumed a conservative approach that respondents had considered each of the following impacts in estimating their willingness to pay:

- recovery of the financial market value placed on recovered television and computer components will increase;
- avoided landfill externality costs;
- avoided landfill direct costs and opportunity cost of land;[101] and
- change in consumer collection costs.

As a result, these benefit items have not been separately incorporated into the CBA, rather the willingness to pay value (assumed to capture all of these) has been used as the only measure of benefits). In particular this is relevant as it captures not only the 'measurable' benefits such as recovery of resource value, but also 'non-measurable' benefits associated with the intrinsic value placed by respondents on aspects such as the 'feel good factor' of increasing recycling.

The benefits in the table below are presented to indicate the benefits that are traditionally measurable or non-measurable. Care must be taken in assessing this table however, given the parameters used to measure landfill externalities and landfill direct costs are not necessarily accurate measures as they are not specific to television and computer waste and also the approach used to quantify these components vary thus making direct comparison a difficult and potentially spurious exercise. In addition, these cannot necessarily all be incorporated into the CBA given there may be double counting (see discussion below Table 24). Nevertheless, for completeness sake the table is presented.

Even the financial market value for resources is heavily dependent on a range of market and economic factors so is not necessarily an accurate measure over a 20 year time period. In contrast, the willingness to pay survey is a technique to measure all of the benefits as a collective. The choice modelling survey integrates comments from the Office of Best Practice Regulation (OBPR) and Australian Bureau of Agriculture and Resource Economics (ABARE) to ensure the results could be incorporated in this regulatory impact statement.

[101] Landfill externality and direct costs are considered to be already taken into account in the URS Willingness to Pay Study, as respondents indicated the opportunity cost of land as being an issue, and also because respondents were asked to consider all costs in estimating a willingness to pay value (which is assumed to include landfill fees, which would be used to fund the direct costs of landfill).

Table 24 Incremental benefits ($ millions, all products, threshold 3, discounted 2009 dollars)

	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Total avoided landfill externalities [1]	*$21.2*	*$20.0*	*$21.2*	*$20.0*	*$23.7*	*$22.4*	*$23.7*	*$23.7*	*$21.2*
Greenhouse gas emissions	$18.6	$17.5	$18.6	$17.5	$20.7	$19.6	$20.7	$20.7	$18.6
Other gas emissions	$0.9	$0.8	$0.9	$0.8	$1.0	$0.9	$1.0	$1.0	$0.9
Leachate	$0.9	$0.8	$0.9	$0.8	$1.0	$0.9	$1.0	$1.0	$0.9
Amenity	$0.9	$0.8	$0.9	$0.8	$1.0	$0.9	$1.0	$1.0	$0.9
Total avoided direct landfill costs	*$22.1*	*$20.8*	*$22.1*	*$20.8*	*$24.6*	*$23.4*	*$24.6*	*$24.6*	*$22.1*
Land purchase including airspace	$1.8	$1.7	$1.8	$1.7	$2.0	$1.9	$2.0	$2.0	$1.8
Approvals and site development	$1.8	$1.7	$1.8	$1.7	$2.0	$1.9	$2.0	$2.0	$1.8
Cell development	$5.7	$5.4	$5.7	$5.4	$6.4	$6.1	$6.4	$6.4	$5.7
Operation including monitoring and fees	$8.8	$8.3	$8.8	$8.3	$9.9	$9.3	$9.9	$9.9	$8.8
Capping and rehabilitation	$2.2	$2.1	$2.2	$2.1	$2.5	$2.3	$2.5	$2.5	$2.2
Aftercare	$1.8	$1.7	$1.8	$1.7	$2.0	$1.9	$2.0	$2.0	$1.8
Financial/market resource value recovered (mid-level externalities [2]	*$300.3*	*$284.4*	*$300.3*	*$300.3*	*$284.4*	*$333.4*	*$317.4*	*$333.4*	*$333.4*
Willingness to pay	*$1,521.8*	*$1,374.7*	*$1,521.8*	*$1,374.7*	*$1,724.7*	*$1,553.3*	*$1,724.7*	*$1,724.7*	*$1,521.8*

Source: recycling and landfill volumes that form the basis of this table are based on estimated stales, lifespan, weight and disposal pathways. Parameter values are sourced from: (i) Productivity Commission (2006 (landfill externalities); (ii) WMAA 2005 (landfill direct costs); (iii) discussions with 2 e-waste recyclers in June 2009 (financial resource value); and (iv) URS 2009 (remaining consumer surplus]

[1] Note: Given the specific nature of computer and television waste (i.e. almost all is non-organic), the amount of greenhouse gas is likely to be small and therefore 'leachate' and 'amenity' landfill externality costs are expected to be more relevant for television and computer waste

[2] Note: Consultation with current recyclers indicates that it costs around $970 per tonne to collect and reprocess the waste resulting in a financial loss from recycling of about $620 per tonne.

Willingness to pay value of benefits from increased recycling. To avoid double counting, the willingness to pay value of benefits accruing to society from increased recycling have been the only benefit measure incorporated in the CBA analysis of the nine new policy options. This ensures that all market and non-market benefits are included and not simply estimates of market or 'traded' values.

The willingness to pay study of community expectations and preferences for recycling televisions and computers estimated that households are willing to pay $0.50 per unit recycled for every 1% increase in recycling above current levels, based on survey responses received.

In order to interpret and adapt the results of the URS study into this CBA of policy options, a number of adjustments were required. Two key areas of adjustment that PwC has made (which are described in more detail in Table 25) are:

1 *URS per unit estimates were converted to a per tonne estimate* to ensure a comparable analysis given:

– URS did not include components and peripherals, and including these on a 'per unit' basis would not reflect that they are

significantly smaller and lighter than whole televisions and computers (which were the basis of the URS estimate); and

- Product weights are expected to change over time, with manufacturing projected to employ cheaper and lighter inputs. This can be captured in 'tonnage' projections more readily than 'unit projections'.

2 *Revised sales projections were applied to the URS parameter values* – the URS report provided five year projected willingness to pay amounts for inclusion in the CBA based on household numbers, and sales per household information provided in the survey. However:

- the five year projections are based on static household numbers, despite ABS projecting a 1.3% average annual growth in household numbers from 2007/08 to 2025/26, and even higher at 1.6% per annum over the next five years;[102]
- the five year projections are based on static sales projections of 1.76 items per household over this timeframe, and in addition do not incorporate purchase of computer products and peripherals; and
- as a result, PwC has incorporated sales projections estimated by Hyder as part of this regulatory impact statement, and based on a detailed analysis of current 2007/08 sales and imports for televisions, computers and computer products.

In addition there were two key elements to the PwC application of choice modelling outputs, that have resulted in the values used being relatively conservative, namely:

1 *The choice modelling values were only applied to sales volumes when the schemes reached 50% recycling levels* – the URS study presented respondents with scenarios of above 50% recycling. As a result, URS suggests that 'results should not be extrapolated for levels of recycling outside the boundaries used in this study.'[103] It is considered reasonable to extrapolate the willingness to pay values at lower rates, but only where a scheme will result in levels of recycling above 50%. However, to ensure the CBA is conservative, PwC has not applied benefits in the years prior to 50% recycling levels being achieved, in line with the URS recommendation; and

2 *A conservative willingness to pay per item sold was used that incorporates a drop-out rate* – URS provided two measures of willingness to pay per item sold, based on the average willingness to pay of $0.50 per item per percentage increase:

- estimate considering only responses received and not considering the drop-out rate – this results in an estimated

[102] ABS 2004, Catalogue Number 3236.0 2001-2026 household projections

[103] URS 2009, 'Willingness to pay for E-Waste Recycling', prepared for the Environment Protection and Heritage Council, February 2009, p 38

household willingness to pay per item of $24.50 at a 50% recycling level; and

- more conservative estimate considering drop-out rate – as 14% of respondents did not complete the survey, URS provided a conservative estimate based on an assumption that respondents that did not complete the survey have a $0 willingness to pay. Considering this produces a weighted value of $21.14 per item sold (for a 50% recycling level).[104]

The above four assumptions, along with other considerations relevant to incorporation of the willingness to pay value in the CBA, are discussed further in Table 25.

Table 25 Adaptations made to choice modelling results

Reasons to adapt willingness to pay results for CBA	Approach to address within CBA
The URS study analysed whole televisions, desktops and laptops. ***Policy options explored in this regulatory impact statement aim to address 'whole' and 'units' including components and peripherals***[105]	Whole units and components/peripherals do not provide equivalent resource recovery outcomes as components/peripherals are relatively smaller and lighter. While the URS survey did not explicitly include components and peripherals, it is likely that survey respondents considered components and peripherals as part of a complete computer system. Components and peripherals comprise 80% of end of life television and computer units. However, they only contribute 30% of the weight.[106] Therefore, while we could capture 'whole' computers reaching end of life, there are a large number of peripherals that we would assume consumers would be willing to pay for, but which are not sold as part of a complete system. By converting the willingness to pay to a per tonne basis, we have assumed that consumers' willingness to pay for a component or peripheral is equal to its weight relative to the complete system. A shortfall of this approach is that as computers and televisions have different unit weights, it is possible that combining them will distort the estimated benefits. However, the willingness to pay for televisions and computers was combined in the URS study, so it was not possible to separate them when converting them to a per tonne basis. Instead, a weighted average was used. An alternative method to estimate a relative willingness to pay for peripherals and other computer products is according to 'relative value' as opposed to 'weight'. However, given the significant range in value for different television computer and television items (for example a television could be valued anywhere from $100-$5,000), it is considered too difficult to estimate an average value across each

[104] Ibid

[105] However, this consultation regulatory impact statement separately analyses televisions, visual display units and computers and its definition of computer also includes components/peripherals such as keyboards, mice, hard drives, scanners, speakers, web cams, power cords, power supplies, fans, printers and multi function devices (MFDs).

[106] Television weights were calculated from data in Tables 23 and 24 (pages 49 and 50) of United Nations (2008) 'Review of Directive 2002/96 on Waste Electrical and Electronic Equipment'. The average weight of laptops, desktops with CRT monitors and desktops with LCD monitors was estimated based on manufacturer's data and actual weight measurements. The proportion of laptops and desktops with each type of monitor was estimated based on DFAT import data on laptops and computer displays.

Reasons to adapt willingness to pay results for CBA	Approach to address within CBA
	product group that would accurately capture possible variation in willingness to pay values. In addition, as the value placed on resource recovery is likely to be in consideration of weight that may be recovered or removed from landfill, tonnes are considered a relevant conversion factor for this analysis.
Incorporating choice modelling outputs into a CBA requires results to be in a uniform 'unit' or 'value'	To incorporate the URS study results, the estimate of **$21.14 per unit sold (for 50% recycling)** was converted to **a per tonne per percentage estimate of $963 per tonne sold** based on assumptions relating to 'whole', 'unit', component and peripheral tonnage in 2008/09 (see Figure 9), and a weighted average weight of 'whole' televisions, desktops and laptops (22 kg/unit).[107] The resulting value per tonne was then applied to annual sales projections to estimated year-by-year change. It is acknowledged that this 'per tonne' approach is different to the 'per unit' and '5-year total' approach taken by URS. However it was considered the only way to enable comparable analysis given the inclusion of peripherals in the Consultation regulatory impact statement and expected changes in product weight over time. In fact, the weight of 22 kg/unit used to covert the value to a 'per tonne' basis is conservative as: • it represents televisions and computers currently reaching end of life; • new units sold in 2008/09 are estimated to weigh 14.8 kg/unit; • unit weights are expected to decrease further. If this lower weight (14.8 kg/unit) was used the willingness to pay value increases to **$1,430/tonne sold**, or close to a 50% increase in the willingness to pay value used by PwC of $963 per tonne. The figure of $1,430 per tonne applied as a sensitivity analysis. Additionally, as the more conservative value incorporating the 14% drop-out rate was incorporated, this adds a further conservative element. Sensitivity analysis of the effect of applying the less conservative willingness to pay of $24.50 per item sold (i.e. not considering the drop-out rate) is presented in Appendix K, Table K.12.
It is important to understand if all costs and benefits are incorporated in the CBA when the choice modelling inputs are incorporated.	As part of the URS study, survey respondents were asked to consider what it would cost them 'compared to the current situation', and told to 'remember how much money you have to spend and your other financial commitments' when estimating their stated preference. For this reason consumer collection costs were not considered separately in the appraisal to avoid double counting of cost savings.[108]

[107] Calculated using the formula: = (41.7%*25.96kg)+(58.3%*19.11kg)

[108] The URS Willingness to Pay Survey stated that 'alternative schemes are described in terms of…[w]hat it would cost you, compared to the current situation' and respondents were told to 'remember how much money you have to spend and your other financial commitments.' See URS 2009, 'Draft Report: Willingness to pay for E-Waste Recycling', prepared for the Environment Protection and Heritage Council, February, Appendix A

Reasons to adapt willingness to pay results for CBA	Approach to address within CBA
Point of sale fee was implicated as the payment method during the URS survey.[109]	Given a range of schemes and funding options are being considered in this regulatory impact statement, this analysis required the use of the willingness to pay results regardless of the scheme funding method to enable comparison. As a number of the schemes are likely to require a passing of costs (e.g. an import fee) onto consumers, it was considered that the point of sale mechanism is relevant for the majority of schemes. Of note, the URS focus groups used to define the survey indicated that a number of respondents supported the government funding of schemes,[110] which encompasses options 1,2 and 9.
The URS survey was only conducted on a metropolitan basis, and did not include Tasmania, ACT or the NT	This analysis assumed that the willingness to pay results are representative across all states/territories and regions in Australia.
The willingness to pay values are applicable for schemes delivering more than 50% recycling as scenarios below this percentage were not presented in the survey[111]	PwC considers it would be reasonable to assume the willingness to pay results are representative across all recycling rates above the current levels (i.e. as all of the nine policy change options target recycling rates of above 50% and reach this level of recycling within 3 to 5 years, the WTP could reasonably be applied from the first year of the scheme). However, in order to present conservative estimates, PwC has only applied choice modelling values to sales volumes when the schemes reached 50% recycling levels, in line with URS recommendations. Sensitivity analysis has been undertaken of the results if the benefits are applied from the first year of the scheme (see Appendix K, Table K.12).
URS assumed a straight-line relationship between willingness to pay and recycling	It is expected that the willingness to pay would be less at the margins. However, URS's scope of work did not allow for such analysis. Therefore, there was assumed to be a straight line relationship between the WTP and the units of waste recovered.[112]
URS results indicated that it was only Sydney and Perth with a significant	As the approach used by URS to determine the willingness to pay values involved weighted averages, these values were also assumed in the CBA.

[109] Respondents were instructed to 'remember that if you choose a new recycling scheme, you will have to pay an additional cost for each new computer and TV that you purchase. Your payment will help fund the new recycling scheme (URS 2009, 'Draft Report: Willingness to pay for E-Waste Recycling', prepared for the Environment Protection and Heritage Council, February, Appendix A). The consensus from focus groups was that 'user pay' was a good principle and that the practicalities of payment collection made the product levy at point of sale quite attractive (URS 2009, *pers. comm.*, 24 March 2009)

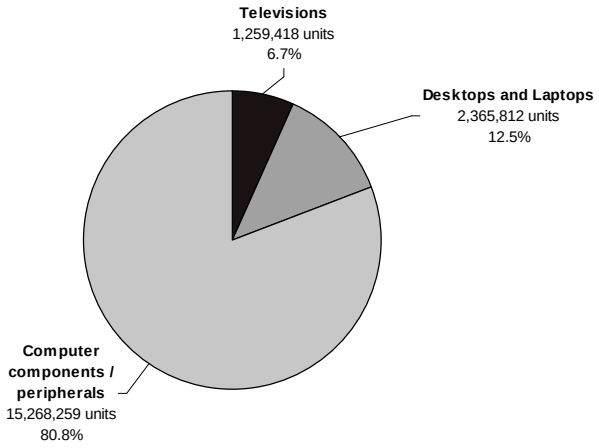
[110] Of the 15% of respondents who always chose the *status quo* in the URS Willingness to Pay study, 27% indicated that they thought the government should pay and 39% objected to paying, including 12% who chose both (URS 2009, *pers. comm.*, 24 March 2009)

[111] URS (2009), *Willingness to Pay for E-waste Recycling*, 28 February 2009, p16

[112] URS 2009, *pers. comm.,* 24 March 2009

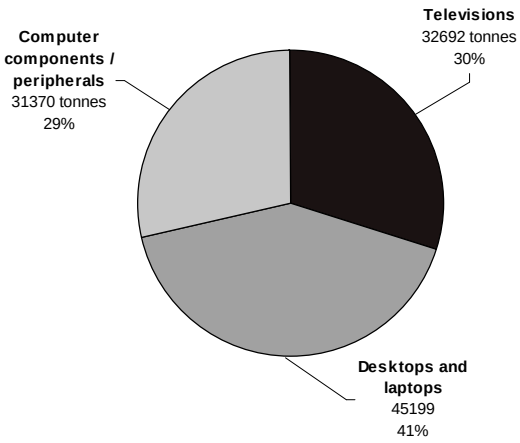
Reasons to adapt willingness to pay results for CBA	Approach to address within CBA
kerbside premium, however, a weighted kerbside value was used from willingness to pay results, which increased the average value	

Figure 13 Estimated products reaching end of life in 2008/09 (units)



Source: End of life modelling of television and computer products was based on estimated sales, lifespan, product weight and disposal pathways. Sales data was estimated using DFAT data on imports. Input to the development of assumptions for lifespan, weight and disposal pathways was provided by AIIA, PSA and the project Steering Committee

Figure 14 Estimated products reaching end of life in 2008/09 (tonnes)



Source: as per figure above (Figure 13)

Key drivers

As illustrated in Table 26, the total net present value of benefits for the 'all products' category with a minimum threshold of 5,000 units ranges from $1.4 billion (options 2 and 4) to 1.7 billion (options 5,7 and 8).

This result is driven principally by the recycling rate assumed for a particular year, as URS provided varying values per unit purchased dependent on how high the recycling rate is. In addition, it is driven by sales projections as this formed the basis to apply the willingness to pay parameter to. A summary of benefits for each option is presented below.

Table 26 Incremental benefits - all products, threshold 3 ($ millions)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Benefits from increased recycling ($ millions)	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2015/16	170.1	155.4	170.1	155.4	209.1	194.2	209.1	209.1	170.1
	Total (NPV)	1,521.8	1,374.7	1,521.8	1,374.7	1,724.7	1,553.3	1,724.7	1,724.7	1,521.8

Note: 2008/09, 2010/11 and 2015/16 values are undiscounted, annual values at a point in time. These are not readily comparable with each other as they are not discounted to 2009 dollars. The present value lines represented discounted costs for each option.

7.8 Results

As noted above, the COAG guidelines favour highest NPV, as this assists in selection of the option that generates the greatest net benefit for the community. BCR is usually useful when there are budget constraints and the most 'effective' spend for each dollar spent.

Given the closeness of the options it is preferred that the community be given the opportunity to comment freely on which option might be the preferred, hence the current approach in the consultation regulatory impact statement is that *no individual options are recommended and all will be considered through the consultation process*.

The CBA results suggest all options will deliver a net benefit to society, with the NPVs ranging from $517 million (option 2) to $742 billion (option 7) and the BCRs ranging from 1.6 (options 2, 4 and 6) to 1.8 (option 7).

Table 27 Summary of results - all products, threshold 3 (incremental to base case, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Costs	$ millions	$902	$858	$873	$837	$994	$944	$983	$995	$902
Benefits	$ millions	$1,522	$1,375	$1,522	$1,375	$1,725	$1,553	$1,725	$1,725	$1,522
NPV	$ millions	$620	$517	$649	$538	$731	$609	$742	$729	$620
BCR	Number	1.7	1.6	1.7	1.6	1.7	1.6	1.8	1.7	1.7

Note: results are presented on an incremental basis to the 'business as usual' base case.

In order to enable further comparison of the options given there is not significant variation in results, Table 28 presents incremental scheme costs and benefits based on the number of units sold. (Note these do not relate to cost parameters used in the CBA such as reprocessing costs, rather these are outputs of the modelling that are presented based on the number of new televisions and computers sold.) This table indicates that a VDU scheme with a minimum threshold of 2,000 units (threshold 3) would result in:

- incremental scheme costs (incremental to the business as usual case) of between $3.80 to $4.40 per new VDU sold – this table also reflects that unit 'scheme costs' are expected to increase over time as recycling increases relative to sales growth; and
- incremental scheme benefits of between $6.10 and $7.50 per unit sold on average over the period of analysis.[113]

The scheme costs per unit sold have been presented as it could be indicative of a charge per unit sold that would be required to cover all incremental scheme and recycling costs. In practice, a charge to cover scheme costs could also be based on the 'value of units' (i.e. a percentage of sales value) in order to differentiate between higher value televisions and computers and lower value units (e.g. peripherals). This is likely to be explored further in a decision regulatory impact statement, along with further analysis of 'total' as opposed to 'incremental' costs and benefits as presented in this analysis.

Table 28 Incremental costs and benefits ($ millions, VDUs, threshold 3)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Incremental costs ($ millions)	2008/09	$0.47	$0.47	$0.35	$0.35	$0.35	$0.35	$0.50	$0.50	$0.47
	2010/11	$22.23	$21.97	$19.35	$19.08	$45.38	$27.94	$44.45	$45.47	$22.23
	2015/16	$56.93	$55.99	$54.04	$53.10	$69.49	$68.55	$68.59	$69.59	$56.93
	2030/31	$101.64	$102.47	$98.75	$99.59	$100.26	$101.09	$99.46	$100.35	$101.64
	PV	$668.01	$660.13	$638.57	$635.87	$733.38	$715.68	$724.68	$734.62	$668.03
Incremental benefits ($ millions)	2008/09	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2010/11	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2015/16	$114.90	$110.93	$114.90	$110.93	$144.29	$140.24	$144.29	$144.29	$114.90
	2030/31	$197.50	$197.50	$197.50	$197.50	$197.50	$197.50	$197.50	$197.50	$197.50
	PV	$1,032.21	$1,021.01	$1,032.21	$1,021.01	$1,241.35	$1,223.74	$1,241.35	$1,241.35	$1,032.21
Sales (million units)	2008/09	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75
	2010/11	6.76	6.76	6.76	6.76	6.76	6.76	6.76	6.76	6.76
	2015/16	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94
	2030/31	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00
	Total	166.19	166.19	166.19	166.19	166.19	166.19	166.19	166.19	166.19
Unit Costs ($/unit)	2008/09	$0.07	$0.07	$0.05	$0.05	$0.05	$0.05	$0.07	$0.07	$0.07
	2010/11	$3.29	$3.25	$2.86	$2.82	$6.71	$4.13	$6.57	$6.73	$3.29
	2015/16	$8.21	$8.07	$7.79	$7.66	$10.02	$9.88	$9.89	$10.03	$8.21
	2030/31	$12.71	$12.82	$12.35	$12.45	$12.54	$12.64	$12.44	$12.55	$12.71
	PV	$4.02	$3.97	$3.84	$3.83	$4.41	$4.31	$4.36	$4.42	$4.02
Unit Benefits ($/unit)	2008/09	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2010/11	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2015/16	$16.57	$15.99	$16.57	$15.99	$20.80	$20.22	$20.80	$20.80	$16.57
	2030/31	$24.70	$24.70	$24.70	$24.70	$24.70	$24.70	$24.70	$24.70	$24.70
	PV	$6.21	$6.14	$6.21	$6.14	$7.47	$7.36	$7.47	$7.47	$6.21

Note: VDUs were used instead of all products because the unit costs for all products were diluted by the large number of component and peripheral sales, which were estimated to constitute 80% of total sales by units in 2008/09.
Note: these do not relate to cost parameters used in the CBA such as reprocessing costs, rather these are outputs of the modelling that are presented based on the number of new televisions and computers sold.

[113] This per unit analysis draws on per tonne estimates derived from the CBA, which have been converted to a 'per unit sold' basis for comparative purposes. In addition, the per unit costs and benefits are currently based on 2007/08 unit weights and will require further analysis in the decision regulatory impact statement to achieve greater accuracy based on projected weights.

7.9 Sensitivity analysis

Sensitivity analysis was undertaken to test how responsive and sensitive the CBA results are to changes in key assumptions. Sensitivity analysis was undertaken with respect to changes in:

- discount rate;
- willingness to pay values;
- PRO cost savings from administering a joint scheme for all products;
- the proportion of kerbside pickup;
- the scheme ramp up period; and
- weight assumptions used to convert the willingness to pay estimate to a per tonne basis.

Results of the sensitivity analysis undertaken are presented in Appendix K. They illustrate that even if there are changes in key assumptions:

- the NPV is expected to be positive for all options; and
- the relativities between the options do not change significantly.

Discount rate. The OBPR recommended using rates of 3% and 11% to test the sensitivity of the results to the 7% discount rate. Using the lower sensitivity of 3% increases the range of the NPV from $517 million (option 2) - $742 million (option 7) in the core analysis to $1,363 million (option 4)-$1,565 million (option 8) in the sensitivity analysis, while using the upper sensitivity of 11% decreases the NPV range to $283-$453 million. This is due to the fact that the options involve high up front costs, with benefits occurring later in the appraisal period. The higher the discount rate, the less weight is given to future streams of costs and benefits and the more weight is given to immediate costs and benefits (and vice versa).

PRO admininistration costs. In the core appraisal, it is assumed that a single PRO will benefit from a 40% cost saving from administering a joint scheme instead of two PROs administering separate schemes (options 1, 3, 5, 7, 8 and 9). Changing this 40% assumption to either 30% or 50% has almost no effect on the BCR as the vast majority of costs captured in the CBA are related to collection and reprocessing.

Kerbside versus drop-off. If the options employed a kerbside pick up service instead of requiring households to drop off television and computer waste at collection facilities, the range of the NPVs stayed roughly the same, changing to $414-598 million. Consumers collection costs are expected to decrease (as captured by their higher willingness to pay), and

communications costs are estimated to be $5.9 million in the first year.[114] Industry collection costs are estimated to be $188 per tonne.[115]

Willingness to pay values. The URS Willingness to Pay Study contained lower confidence interval, average and upper confidence interval estimates of WTP. It also assumed that the 13.7% of respondents that dropped out of the survey (i.e. did not finish) had $0 WTP. The average willingness to pay was estimated to be $24.50 for 50% recycling.[116] Taking into account the 13.7% of respondents that dropped out reduces the WTP estimate to $21.14 and this more conservative estimate was used in the core analysis. The lower confidence interval estimate of $18.18/unit sold ($828/tonne sold) results in the NPV decreasing to a range of $324-$500 million. However, the upper value of $23.68/unit sold ($1,078/tonne sold) increases the NPV range to $682 to $949 million.

Weight assumption to estimate consumer surplus. In converting the URS per unit WTP estimates to a per tonne basis, the core appraisal assumed that in 2008/09 an end of life television weighs 26 kg and an end of life computer (desktops and laptops only) weighs 19 kg. However, in 2008/09 the weight of new televisions and computers was 25 kg and 7.5 kg respectively. Adjusting the CBA with the lower weight of 'new products' instead of 'end of life products,' the willingness to pay increases to $1,430 per tonne sold and the range of the NPVs increases to $1,184-$1,579 million.

7.10 Summary

It is considered that the difference between each of the options in terms of net economic benefits is marginal and options are broadly on par. This outcome reflects that, while there is some differentiation between options in terms of ramp up of recycling (which affects all benefits and the largest cost item: collection and reprocessing costs), as the schemes all target the maximum expected level midway through the analysis period, there is not a significant deviation in final total net benefits.

Some of the key option-specific findings based on the objectives outlined in Chapter 5 include:

[114] Hyder 2006, 'Television EPR Scheme Producer Responsibility Organisation – Cost Analysis', prepared for the NSW Department of Environment and Conservation and Product Stewardship Australia.

[115] Estimates were based on Hyder (2006), 'Television EPR Scheme Producer Responsibility Organisation Cost Analysis', prepared for the NSW Department of Environment and Climate Change (NSW DECC), ABS Census data, data from the Byteback program and surveys of thirteen e-waste recyclers and one e-waste collector

[116] URS (2009), *Willingness to Pay for E-Waste Recycling*, 28 February , p 36

- *Net economic benefits*: option 7 results in the highest NPV and BCR as a result of lower administrative costs from a centralised Commonwealth approach, combined with no requirement for a PRO.
- *Costs are minimised* – incremental costs are lowest for option 4 and highest for option 8.
- *Administration is simple* - Commonwealth-administered options (options 3-8) result in lower total costs to all levels of government. Commonwealth costs are lowest for options 3 and 4 and highest for option 8.

Other factors outside the cost benefit analysis that may influence the decision between each of the options are discussed in Chapter 8.

Other considerations

This section identifies a range of other factors that may be relevant to comparing television and computer waste policy options, but which could not be incorporated into the cost benefit analysis because they cannot be monetised or included in an economic appraisal.

8.1 Introduction

In addition to cost benefit analysis, the COAG guidelines recommend conducting qualitative analysis of costs and benefits where quantification is not possible.[117]

In line with the COAG guidelines, this chapter analyses a range of trade, industry, administration and consumer aspects in an attempt to further understand the potential impact of the nine policy change options examined in this report.

The factors considered include:

- Trade and market issues:
  - potential impacts on trade of televisions and computers;
  - potential impacts on the television and computer recycling industries; and
  - potential impacts on international competitiveness;
  - potential impact of international regimes;
- Economic efficiency, equity and flexibility:
  - impact on television and computer consumers;
  - potential impact on (small) business;
  - potential impacts on regional, rural and remote areas;
  - equity between government jurisdictions administering schemes; and
  - potential impacts on the environment;
- Implementation aspects, compliance strategies and enforcement procedures:
  - scheme implementation;
  - administrative simplicity;

[117] Commonwealth Government Office of Best Practice Regulation 2007, 'Best Practice Regulation Handbook', August, pp 68, 78

- implications from scheme funding methods; and
- potential impacts on existing administrative and legislative frameworks.

8.2 Trade and market issues

Potential impacts on trade of televisions and computers

All televisions, computers and components/peripherals are imported into Australia, and so trade impacts are likely to be captured uniformly in each of the nine new policy options being implemented. It is not considered that there will be any significant trade and market issues relating to televisions and computers as a result of any of the policy options being implemented.

If no regulatory threshold is applied, all importers are equally incentivised to either become part of an industry-coordinated scheme, or will be equally subject to a mandatory government scheme. However, if a threshold is introduced, importers falling below the threshold would be advantaged relative to other scheme participants that incur compliance costs and/or payment of a fee to assist in scheme funding. Even so, the relatively low market share of these importers means that this is likely to have an insignificant effect on the entire market. For example, with a minimum threshold of 5,000 units, 9,734 out of 10,194 importers would not face obligations under a scheme. However, these companies only account for 4.7% of total unit sales in the market, as of 2008. A further point is that this impact occurs regardless of which of the options is adopted, as it is linked to a policy decision on a regulatory threshold as opposed to a decision about a specific scheme.

An additional trade and market consideration that does differentiate between the possible new policy options relates to options 2, 4 and 6, which treat branded computer importers differently to importers of generic parts and equipment. Broadly speaking, these schemes have been modelled on an industry proposal that major computer brand owners take responsibility for historic and new waste from their own brand, paying the PRO after their products have physically been recycled. In contrast, it is proposed that importers of generic parts and equipment are responsible for all non-branded and orphan equipment and must pay an advanced recycling fee to the PRO as soon as their product is imported (with no responsibility for historical, unbranded waste to be captured). This approach could create inequities within the market as the generic and branded companies are subject to different mechanisms, and there may be compliance and other cost differences as a result,

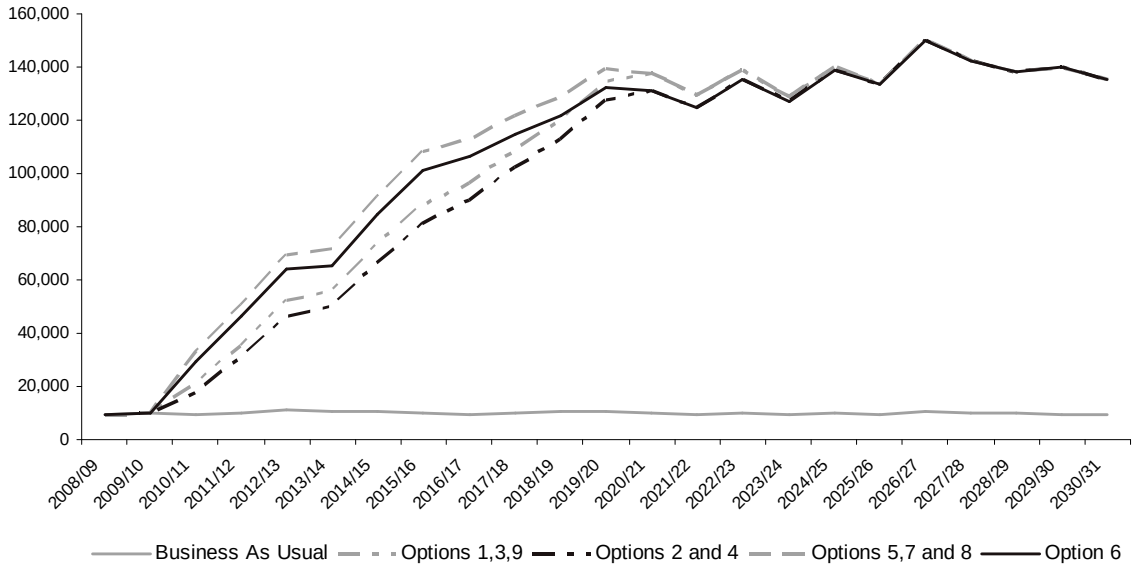
Potential impacts on the television and computer recycling industries

Over the analysis period from 2008/09 to 2030/31, recycling of televisions and computers is expected to grow from 9,700 to 135,000 tonnes per annum (representing a 12% year-on-year growth) under the nine recycling policy options. This indicates cumulative recycling volumes averaging 2.4 million tonnes over the time period from 2008/09 to 2030/31.

Despite recycling reaching the same levels in the final year under each scheme, it has been considered that the options will differ in terms of recycling rate ramp up. The recycling outcomes broadly support mandatory Commonwealth schemes (options 7 and 8) and co-regulation with a Commonwealth excise regulatory safety net (option 5), which reach a rate of 70% recycling within 5 years of commencement. Recycling outcomes are inferior where there are separate schemes for televisions and computers (options 2, 4, 6). For example, compared to option 5, option 6 results in an additional 70,408 tonnes of television and computer waste being disposed of in landfill between 2008/09 and 2030/31. This is due to the fact that a separate computer industry scheme is assumed to incorporate limited responsibility for unbranded and orphan (see Appendix G for scheme assumptions). These products are currently estimated to account for 20% of computer products reaching end of life.

Table 20 in Chapter 7, and Figure 15 below illustrate that although recycling under each option examined in the CBA is projected to reach the same rate by 2030/31, the speed at which the recycling rate increases differs between the options. Options 5, 7 and 8 are the quickest to reach 70% recycling, while options 2 and 4 are the slowest.

Figure 15 Projected recycling levels - tonnes, all products, threshold 3



In terms of broader impacts on the television and computer recycling industry as a result of implementing a policy option discussed in this consultation regulatory impact statement, it is likely that increased recycling volumes are likely to induce market entry, with increased levels of competition providing a number of advantages including decreased prices. In addition, as recycling is largely a labour intensive disassembly process, there is expected to be a correlation between increased recycling levels and job growth. However this job growth is expected to result in substitution from other industries. The net employment impact for the economy as a whole has not been estimated in this consultation regulatory impact statement.

Even broader are potential impacts on the general recycling industry, and in particular recycling of other waste for the recovery of similar products as for television and computer waste (e.g. steel, aluminium and plastic). As options

7, 8 and 9 may provide subsidies to recyclers, and as other options may receive government funding potentially allowing scheme administrators to pay higher recycling rates to television and computer reprocessors, this could potentially create issues for other recycling industries that compete in the same recycled product markets.

Potential impacts on international competitiveness

All new televisions and computers are imported to Australia, and it is understood that an insignificant volume of new products are re-exported for sale overseas. In addition, exports of end of life televisions and computers comprise a relatively small proportion of total end of life arisings (6% for 2007/08). As a result, it is expected that any policy for television and computer waste will not have a significant impact on Australia's international competitiveness in the television and computer industries.

Potential impact of international regimes

Australia faces treaty obligations under the World Trade Organisation General Agreement on Tariffs and Trade. Under article 1 (General Most-Favoured Nation Treatment), Australia must offer the same 'advantage, favour, privilege or immunity' granted in relation to a product to all member countries. In addition, a series of agreements have reduced tariff barriers, quantitative restrictions and subsidies. If the excise is construed as a tariff, options 5 to 7 may be inconsistent with this treaty.

Australia is also a party to the Basel Convention on the Control of the Transboundary Movements of Hazardous Waste and their disposal. The Act identifies e-waste as a hazardous waste and prohibits the export of e-waste to countries where adequate hazardous waste laws either do not exist or are not enforced. As exports for reuse under the options are projected to be the same as the business as usual scenario, the schemes are not expected to impact on Australia's obligations to regulate the export of hazardous waste.

8.3 Economic efficiency, equity and flexibility

Potential impacts on television and computer consumers

Potential impacts on consumers from implementation of a television and computer waste scheme could include higher prices for televisions and computers resulting from importers passing on recycling fees or increased compliance costs in their prices.

The choice modelling undertaken by URS in 2009 asked respondents to indicate how much they would be willing to pay in terms of an 'additional cost on each new TV / computer purchased' for recycling schemes where the 'percentage of waste avoided and material recovered' ranged between 50% to 90%.[118] As survey respondents provided their willingness to pay on this

[118] URS (2009), *Willingness to Pay for E-Waste Recycling*, 28 February, Appendix A

basis, the consumer preferences determined in this study indicate that consumers are willing to pay higher prices for their television and computers if it will result in increased recycling of television and computer waste, and as such by definition consumers will still receive a net benefit as a result of a television and computer waste scheme if the cost of that scheme is less than the willingness to pay.

Funding of cost items. Considering the cost items presented in Table 22 (Chapter 7), there is a range of potential funding scenarios for each:

- *collection and recycling costs* – currently incurred by the recycling industry. There is potential the scheme could wholly or party fund these costs, e.g. under option 7, these costs could be funded from an import excise payable on imports to the Commonwealth Government. For all other options, which incorporate an industry PRO that will manage the recycling of end of life products through competitive tenders and contracts with e-waste recycling companies, it may be industry levies payable to the PRO by importers of new television and computer products, that could wholly or party fund these costs. Under this scenario, these costs may be passed onto consumers of new televisions and computers either through a visible/invisible fee at point of sale 'advanced recycling fee';
- *PRO administration* – option 7 does not incur this cost as there is no PRO administering the scheme. For the other options, funding of these costs is likely to be similar to collection and reprocessing costs (i.e. it may be industry levies payable to the PRO by importers that could wholly or party fund these costs). Similarly, these costs may be passed onto consumers of new televisions and computers either through a visible/invisible fee at point of sale;
- *scheme communication costs* – if the PRO manages scheme communication and public education, it is likely these costs will be funded in the same manner as PRO administration costs. However, if the Government manages public education then it is likely this cost will be funded from consolidated revenue;
- *policy design and implementation, and other government administration costs* – it is likely that these costs will be funded from consolidated revenue from either the State or Commonwealth Government dependent on which level of government is administering the scheme. For option 7, there is a possibility scheme administration could be funded from the excise fee payable on imports, however if the scheme is similar to the Product Stewardship for Oil (PSO) scheme, then the scheme is not operated on a cost recovery basis – rather the levy is captured in consolidated revenue and costs are also sourced from consolidated revenue regardless if there is a shortfall or surplus in funds; and
- *importer and recycler compliance* – these costs would be expected to be incurred by either the importers or recyclers participating in the scheme. If these costs are passed on to either consumers of new products or consumers of recycled materials, it is likely that this will be in an invisible manner via pricing of products.

Funding and other more specific implementation matters (e.g. the possible size of a fee on new items purchased) will form part of the decision regulatory impact statement.

Potential impact on (small) business

The businesses that are potentially impacted by the proposed schemes are importers and recyclers. As illustrated in the CBA, importer compliance costs are estimated to range from $600 per importer (option 7) to $1,050 per importer (option 8). With no threshold, total compliance costs for involved businesses range from $69 million to $121 million dependent on the option (in present value terms over the period of analysis from 2008/09 to 2030/31). However, with a minimum threshold of 5,000 units, the number of companies captured by the scheme falls from 10,194 to 460 (95.5% reduction) and compliance costs fall by 95.5%, to between $3 million and $5 million (in present value terms over the analysis period), representing a reduction of $66-116 million.

This finding indicates that by implementation of a regulatory threshold, the impact of the scheme, in particular on small businesses can be reduced significantly. In contrast, the absence of a threshold is likely to impose a burden on small businesses as the 9,734 companies exempted from the scheme under threshold 3 are only responsible for 4.7% of imports, but are responsible for 95.5% of compliance costs, when the schemes are analysed on a 'no threshold' basis.

Table 29 Importer compliance costs at varying threshold levels (all products)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Importer compliance (no threshold)	2008/09	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2010/11	$10.51	$10.51	$10.51	$10.51	$10.51	$10.51	$6.31	$11.04	$10.51
	2015/16	$11.07	$11.07	$11.07	$11.07	$11.07	$11.07	$6.64	$11.62	$11.07
	NPV	$115.34	$115.34	$115.34	$115.34	$115.34	$115.34	$69.20	$121.11	$115.34
Importer compliance (threshold 3)	2008/09	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2010/11	$0.47	$0.47	$0.47	$0.47	$0.47	$0.47	$0.28	$0.50	$0.47
	2015/16	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.30	$0.52	$0.50
	NPV	$5.20	$5.20	$5.20	$5.20	$5.20	$5.20	$3.12	$5.46	$5.20
Total	**2008/09**	**$0.47**	**$0.47**	**$0.35**	**$0.35**	**$0.35**	**$0.35**	**$0.50**	**$0.50**	**$0.47**
	2010/11	**$25.44**	**$23.09**	**$22.56**	**$20.21**	**$51.50**	**$33.23**	**$50.37**	**$51.63**	**$25.45**
	2015/16	**$81.89**	**$75.75**	**$79.01**	**$72.87**	**$99.67**	**$93.52**	**$98.56**	**$99.79**	**$81.90**
	NPV	**$902.18**	**$858.14**	**$872.81**	**$836.97**	**$993.85**	**$944.10**	**$982.97**	**$995.42**	**$902.30**

Note: 2008/09, 2010/11 and 2015/16 values are undiscounted, annual values at a point in time. These are not readily comparable with each other as they are not discounted to 2009 dollars. The present value lines represented discounted costs for each option

Table 30 Importer compliance costs as a proportion of total costs and at varying threshold levels (all products)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Importer compliance as a proportion of total costs (no threshold) (%)	2008/09	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2010/11	41%	46%	47%	52%	20%	32%	13%	21%	41%
	2015/16	14%	15%	14%	15%	11%	12%	7%	12%	14%
	NPV	13%	13%	13%	14%	12%	12%	7%	12%	13%
Importer compliance as a proportion of total costs (threshold 3) (%)	2008/09	0%	0%	0%	0%	0%	0%	0%	0%	0%
	2010/11	2%	2%	2%	2%	1%	1%	1%	1%	2%
	2015/16	1%	1%	1%	1%	1%	1%	0%	1%	1%
	NPV	1%	1%	1%	1%	1%	1%	0%	1%	1%

Note: 2008/09, 2010/11 and 2015/16 values are undiscounted, annual values at a point in time. These are not readily comparable with each other as they are not discounted to 2009 dollars. The present value lines represented discounted costs for each option

In terms of other businesses involved in the scheme, recycler compliance costs are only expected under option 7, which will impose obligations such as reporting requirements in order to receive subsidies. While these costs amount to $20,000 per recycler per annum, they only account for 0.5% of total reprocessing costs.

Table 31 Recycler compliance costs - all products ($ millions)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Recyler compliance	2008/09	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2010/11	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.28	$0.00	$0.00
	2015/16	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.32	$0.00	$0.00
	NPV	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$3.35	$0.00	$0.00
Reprocessing	2008/09	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2010/11	$8.15	$5.87	$8.15	$5.87	$32.36	$14.15	$32.36	$32.36	$8.15
	2015/16	$54.72	$49.70	$54.72	$49.70	$68.50	$63.48	$68.50	$68.50	$54.72
	NPV	$600.62	$560.55	$600.62	$568.76	$680.64	$634.87	$680.64	$680.64	$600.62

Note: 2008/09, 2010/11 and 2015/16 values are undiscounted, annual values at a point in time. These are not readily comparable with each other as they are not discounted to 2009 dollars. The present value lines represented discounted costs for each option

Potential impacts on regional, rural and remote areas

Regional, rural and remote areas are likely to face higher costs to transport and collect end of life televisions and computers to collection points and to recyclers, as a result of greater distances to collection and reprocessing facilities relative to metropolitan locations. However, this issue is expected to be the same for all options, so does not differentiate between policy options. In the decision regulatory impact statement, or when a television and computer waste policy option is further refined, this issue could be further assessed. For example, increased subsidies or grants could be provided to these areas to assist with higher costs.

Equity between government jurisdictions

For government administration of a television and computer waste policy, state-administered schemes (options 1, 3 and 9) may result in inequitable costs being incurred between the states and territories. This is because the vast majority of imports occur in NSW and to a lesser extent in Victoria, Queensland and Western Australia. This is not reflective of the final destination of television and computer sales in Australia, which are expected to be more in line with the population distribution. This has implications if scheme costs are shared on the basis of import volumes, as the proportion of imports and end of life arising is not aligned.

Table 32 Television and computer imports 2007/08 (units)

State/territory	Television imports	Computer imports (complete PCs & laptops only)	Other computers product imports
NSW	44.20%	64.78%	63.77%
VIC	28.80%	22.82%	23.50%
QLD	17.15%	6.01%	5.99%
SA	2.27%	0.35%	0.37%
WA	7.51%	6.00%	6.32%
TAS	<0.01%	0.03%	0.04%
NT	0.06%	0.01%	0.01%
ACT	<0.01%	<0.01%	<0.01%

Source: DFAT, ACS and NSW DECC

Potential impacts on the environment

Environmental impacts on the nine recycling policy options have been considered in the cost benefit analysis undertaken in Chapter 7. These include:

- externality costs associated with transport and production;
- landfill externality costs; and
- landfill direct costs and opportunity cost of land.

8.4 Implementation aspects, compliance strategies and enforcement procedures

Scheme implementation

In considering the differences between each of the nine new policy options, the CBA results and assumptions indicate:

- There is not a significant difference in regulation design and implementation costs between the nine policy change options examined. These costs range from $680,000 to $970,000 (present value) over the first two years of the appraisal across each of the schemes.
- PRO administration costs are lower under a joint scheme for all products due to a reduction in the duplication of effort, resulting in options 2, 4 and 6 having higher PRO costs relative to options 1, 3,5,7,8 and 9.
- On a per importer and per recycler basis, compliance costs are not expected to vary between the options with the exception of option 7. While this option has lower importer compliance costs due to the absence of recycling targets, total compliance costs are higher as it is the only option that places reporting obligations on recyclers to receive recycling subsidies.

Table 33 Implementation, compliance and enforcement costs (all products, threshold 3, $ millions)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Policy design and implementation	2008/09	$0.47	$0.47	$0.35	$0.35	$0.35	$0.35	$0.50	$0.50	$0.47
	2010/11	-	-	-	-	-	-	-	-	-
	2015/16	-	-	-	-	-	-	-	-	-
	NPV	$0.90	$0.90	$0.68	$0.68	$0.68	$0.68	$0.97	$0.97	$0.90
PRO administration	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$1.25	$2.08	$1.25	$2.08	$1.25	$2.08	-	$1.25	$1.25
	2015/16	$1.25	$2.08	$1.25	$2.08	$1.25	$2.08	-	$1.25	$1.25
	NPV	$12.66	$21.10	$12.66	$21.10	$12.66	$21.10	-	$12.66	$12.66
Government administration	2008/09	-	-	-	-	-	-	-	-	-
	2010/11	$3.58	$3.58	$0.70	$0.70	$2.21	$2.21	$2.23	$2.31	$3.59
	2015/16	$3.58	$3.58	$0.70	$0.70	$2.21	$2.21	$2.23	$2.31	$3.59
	NPV	$36.30	$36.30	$7.15	$7.15	$22.39	$22.39	$22.61	$23.41	$36.42
Compliance costs	2008/09	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2010/11	$0.47	$0.47	$0.47	$0.47	$0.47	$0.47	$0.56	$0.50	$0.47
	2015/16	$0.50	$0.50	$0.50	$0.50	$0.50	$0.50	$0.62	$0.52	$0.50
	NPV	$5.20	$5.20	$5.20	$5.20	$5.20	$5.20	$6.47	$5.46	$5.20

Administrative simplicity

In terms of PRO administration, the options assuming separate television and computer industry schemes and hence two separate PRO bodies (options 2, 4 and 6), are expected to have higher PRO administration costs than those with single-bodies (options 1, 3, 5, 8 and 9). Option 7 does not involve any PRO costs as it is assumed to only be administered by the government, with no industry scheme administration.

In relation to Government administration costs, the results of the CBA illustrate that the Commonwealth-administrated schemes (options 3 to 8) are administratively more cost effective than State-administered schemes. This is due to the fact that these schemes are administered by a single entity, resulting in efficiencies from reduced reporting requirements and duplication of effort.

The total administrative costs of both government and a PRO body are presented for comparative purposes in Table 34.

Table 34 Administration costs ($ millions, all products, threshold 3)

Administrator		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
		States	States	Cth	Cth	Cth	Cth	Cth	Cth	States
PRO Administration	2010/11	$1.25	$2.08	$1.25	$2.08	$1.25	$2.08	$0.00	$1.25	$1.25
	2015/16	$1.25	$2.08	$1.25	$2.08	$1.25	$2.08	$0.00	$1.25	$1.25
	NPV	$12.66	$21.10	$12.66	$21.10	$12.66	$21.10	$0.00	$12.66	$12.66
Government Administration	2010/11	$3.58	$3.58	$0.70	$0.70	$2.21	$2.21	$2.23	$2.31	$3.59
	2015/16	$3.58	$3.58	$0.70	$0.70	$2.21	$2.21	$2.23	$2.31	$3.59
	NPV	$36.30	$36.30	$7.15	$7.15	$22.39	$22.39	$22.61	$23.41	$36.42
Total	2010/11	$4.83	$5.66	$1.95	$2.78	$3.46	$4.29	$2.23	$3.56	$4.84
	2015/16	$4.83	$5.67	$1.95	$2.79	$3.46	$4.29	$2.23	$3.56	$4.84
	NPV	$48.96	$57.40	$19.81	$28.25	$35.06	$43.50	$22.61	$36.07	$49.08

Potential impacts on existing administrative and legislative frameworks

All of the policy options examined in this paper will involve drafting of new legislation or regulations, or potentially amendment to current laws such as the Excise Act for options 5-7. However, the policies appear to be consistent with the fact that:

- a number of jurisdictions have regulations setting out waste minimisation policies;
- the ACT Government has specifically banned cathode ray tube televisions from landfill; and
- SA has recently issued a discussion paper to ban e-waste from landfill.[119]

[119] All states and territories have waste minimisation policies. The ACT has banned the disposal of computer monitors and television screens in landfill and SA has recently issued a discussion paper to ban e-waste from landfill.

Conclusions

This chapter summarises the key findings and conclusions of the consultation regulatory impact statement.

There are a number of market failures relating to television and computer waste that possibly justify government intervention. In consideration of policy objectives that could assist in overcoming the problems of television and computer waste, a number of policy options have been examined within this consultation regulatory impact statement to determine if they are likely to:

- meet policy objectives;
- result in a net economic benefit to society; and
- compliment domestic policies and international obligations.

A government-backed policy to increase resource recovery and its efficiency through recycling schemes for televisions and computers is expected to generate a range of costs including industry compliance, government and industry administration, and also increased collection and recycling costs. However a non-market valuation undertaken to quantify the consumer surplus resulting from increased resource recovery levels, combined with avoided costs of landfill indicates that there are also significant benefits likely to be generated from a scheme to increase recycling levels. Analysing these benefits against the costs identified, using economic cost benefit analysis, indicates that a television and computer recycling scheme will result in net economic benefits to society. It is acknowledged that the CBA results are based on a series of assumptions which may be subject to change, but sensitivity analysis reveals that all options still deliver a net benefit to society following changes to key assumptions.

In addition to establishing positive net economic benefits from implementing a scheme, the cost benefit analysis also compared nine possible recycling policy options against the *status quo*.

This analysis indicated there is little differentiation between the schemes regardless of whether they are mandatory or co-regulatory, state/territory government administered or Australian Government administered.

Given the closeness of the options it is preferred that the community be given the opportunity to comment freely on which option might be the preferred, hence the current approach in the consultation regulatory impact statement is that no individual options are recommended and all will be considered through the consultation process. To assist this, findings for each option are summarised in Table 35.

Table 35 Summary of option impact analysis

	CBA results				Other key features and impacts
Policy option	**Total costs ($ millions, PV)**	**Total benefits ($ millions, PV)**	**Net present value ($ millions, NPV)**	**Benefit cost ratio**	
Option 1	$ 902 million	$1,522 million	$ 620 million	1.7	• State administered so higher costs for Government; • Recycling rates delayed because it requires legislation to at the state/territory level; and • State Government costs are highest (along with options 2 and 9)
Option 2	$ 858 million	$ 1,375 million	$ 517 million	1.6	• Lowest incremental costs of all options; • Separate computer schemes do not cover historic or orphan products; • Higher PRO administration costs because separate television and computer schemes; • Slowest option to reach 70% recycling (along with option 4); • State Government costs are highest (along with options 1 and 9); and • Recycling costs are lowest.
Option 3	$ 873 million	$1,522 million	$ 649 million	1.7	• Commonwealth administered so lower costs for Government; • Commonwealth costs are lowest for options 3 and 4; and • Recycling rates delayed because it requires legislation to at the state/territory level.
Option 4	$ 837 million	$ 1,375 million	$ 538 million	1.6	• Commonwealth administered so lower costs for Government; • Commonwealth costs are lowest for options 3 and 4; • Separate computer schemes do not cover historic or orphan products; • Slowest option to reach 70% recycling (along with option 2); • Higher PRO costs due to separate television and computer industry schemes; and • Lowest collection and reprocessing costs.
Option 5	$ 994 million	$ 1,725 million	$ 731 million	1.7	• Commonwealth administered so lower costs for Government; and • Quickest to reach 70% recycling (along with options 7 and 8).
Option 6	$ 944 million	$ 1,553 million	$ 609 million	1.6	• Commonwealth administered so lower costs for Government; • Separate computer schemes do not cover historic or orphan products. • Higher PRO costs due to separate television and computer industry schemes
Option 7	$ 983 million	$ 1,725 million	$ 742 million Highest NPV of all options	1.8 Highest BCR of all options	• highest NPV and BCR as a result of lower administrative costs from a centralised Commonwealth approach, combined with no requirement for a PRO; • Only option that imposes compliance costs on recyclers; • Quickest option to reach 70% recycling (along with options 5 and 8); • Recyclers costs are highest; • Importer compliance costs are lowest; and • Lower industry involvement in scheme administration.
Option 8	$ 995 million	$ 1,725 million	$ 729 million	1.7	• Highest incremental costs of all options; • Commonwealth administered so lower costs for Government; • Commonwealth costs are highest for option 8; • Quickest option to reach 70% recycling (along with options 5 and 7); • Highest collection and reprocessing costs; and • Importer compliance costs are highest.
Option 9	$ 902 million	$1,522 million	$ 620 million	1.7	• Recycling rates delayed because it requires legislation to at the state/territory level; and • State Government costs are highest (along with options 1 and 2)

Note: costs, benefits and net benefits are presented on a present value (discounted) basis, and are presented on an incremental basis to the business as usual base case

Appendices

Appendix A References

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Appendix B Customs tariff data and definitions

The import tariff codes and their relationship with the presentation of results in the four categories throughout this report – televisions, computers, visual display units and televisions and computers are set out in the following table.

Table B.1 Television and Computer Imports Codes

Import tariff code (10-digit)	Description		Televisions	Computers	Visual display units	Televisions and computers
8528.72.00/ various	Televisions		✓		✓	✓
8528.73.00.35			✓		✓	✓
8528.51.00.32	Computer displays	Flat panel		✓	✓	✓
8528.41.00.10		CRT type		✓	✓	✓
8471.50.00.69	Computer desktops and similar	CPU		✓		✓
8471.41.00.27						
8471.49.00.67		Complete PC		✓	✓	✓
8471.30.00.20	Computer mobile units	Laptops and portable		✓		✓
8471.60.00.55	Computer peripherals	Keyboards		✓		✓
8471.60.00.92		Mouse		✓		✓
8471.70.00.74		Hard drives		✓		✓
8471.60.00.95		Scanners		✓		✓
8518.29.90.23		Speakers		✓		✓
8525.80.10.15		Web cams		✓		✓
8544.42.19.02		Power cords		✓		✓
8504.40.30.59		Internal power supplies		✓		✓
8504.40.90.80		External power supplies		✓		✓
8414.59.90.52		Fans		✓		✓
8473.30.00.62		Miscellaneous/ other parts		✓		✓
8443.32.00.71	Personal or desktop laser and inkjet printers	Ink-jet		✓		✓
8443.32.00.72		Dot matrix		✓		✓
8443.32.00.74		Laser		✓		✓
8443.31.00.61	Multi function device (MFD)	Ink-jet		✓		✓
8443.31.00.62		Dot matrix		✓		✓
8443.31.00.64		Laser		✓		✓

Appendix C Choice modelling

Overview of choice modelling

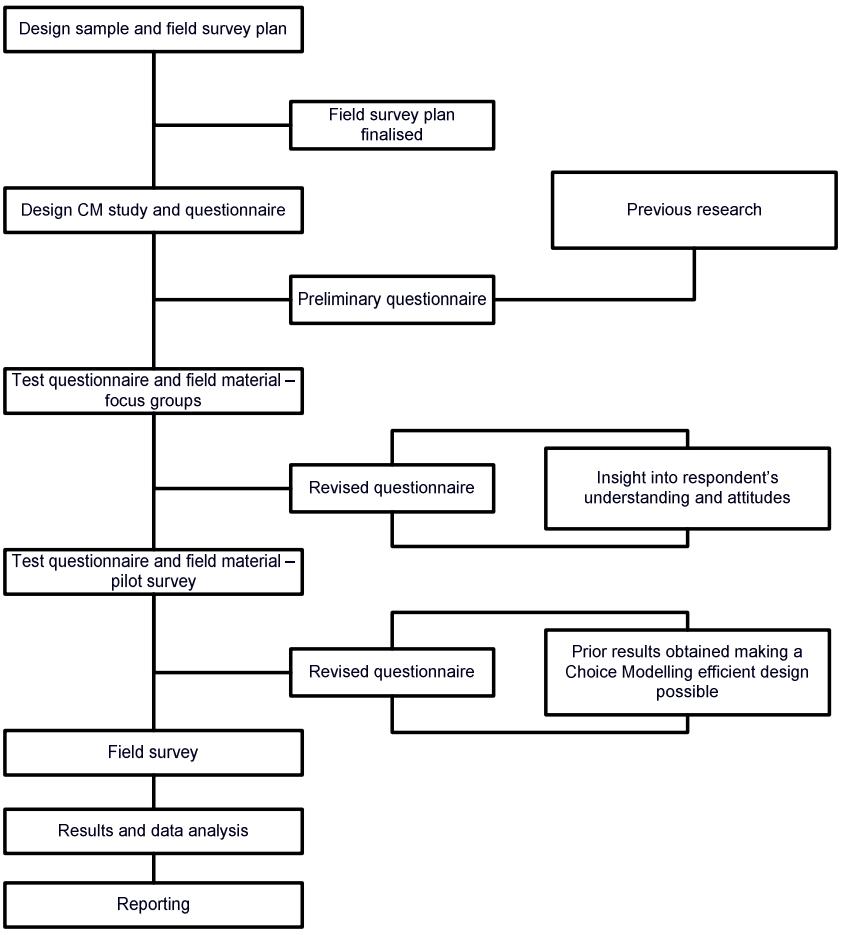
Choice modelling is used by economists to obtain people's stated preference for different options in a hypothetical setting. It involves an experiment that aims to replicate a market setting, where people are confronted with the choice of various products that are characterised by specific attributes and an acquisition price.

As it uses a hypothetical situation and asks for respondents to state their preference given a particular situation it is able to be used to value products (or outcomes) that do not currently exist in the market place.

Television and computer waste choice modelling

Choice modelling was used by URS to estimate consumers' willingness to pay for the non-market values associated with recycling end of life televisions and computers. A number of steps were undertaken to design and refine a questionnaire so that a survey of 2,105 people could be conducted. These steps are outlined in the figure below.

Figure C.1 Choice Modelling Methodology



Further detail on the methodology and results can be found in the full URS report, or in Box 1 within this document.[120]

[120] URS (2009), *Willingness to Pay for E-Waste Recycling*, 28 February 2009

Appendix D Policies in Australian jurisdictions

Australian jurisdictions each have legislation and / or policies related to waste reduction and efficiency of use and this provides an additional policy argument as to why recycling of televisions and computers should be regulated. Policies include:

- NSW – the waste regulatory framework is administered under two principal pieces of legislation:
  - *Protection of the Environment Operations Act 1997* – aims to promote pollution prevention, the elimination of harmful wastes, the reduction in the use of materials and the re-use, recovery and recycling of materials. The main feature of the legislation is that it establishes the waste and environment levy and enables the Government to set out explicit protection of the Environment policies (PEPs), which establish environmental standards, goals, protocols and guidelines. They are also the means of adopting Australia-wide environment protection measures set by the National Environment Protection Council.[121]
  - *Waste Avoidance and Resource Recovery Act 2001* – used to establish programs to help reduce waste generation and recover resources. It develops a waste hierarchy that ensures that resource management options are considered against the priorities of:
    - Avoidance – to reduce the amount of waste generated;
    - Resource recovery – reuse, recycling, reprocessing and energy recovery; and
    - Disposal – management of all disposal options in the most environmentally responsible manner.[122]
- Victoria: *Environment Protection Act 1970* – includes functions to protect the environment from the impact of wastes and sets out the waste hierarchy. The State Environment Protection Policy (Waste Minimisation) establishes a framework that promotes the adoption by the industry of processes, practices and technologies that minimise the generation of industrial waste

[121] NSW Government Department of Environment and Climate Change (2008), 'About POEO legislation', available at http://www.environment.nsw.gov.au/legislation/aboutpoeo.htm#major, accessed 16 April 2009

[122] NSW Government Department of Environment and Climate Change (2009), 'Waste avoidance and resource recovery in NSW', available at http://www.environment.nsw.gov.au/warr/index.htm/ , accessed 16 April 2009; NSW Government Department of Environment and Climate Change (2009), 'The waste management and resource recovery framework', < http://www.environment.nsw.gov.au/waste/> , accessed 16 April 2009

- Queensland: *Environmental Protection Act 1994* aims to protect Queensland's environment while allowing for development that improves quality of life. The Environment Protection (Waste Management) Policy 2000 aims to:
  - promote efficiency in the use of resources
  - promote the maximum use of wastes as a resource
  - helps achieve continuous improvement in the standard of waste management activities
  - provides for the preparation of industry waste reduction programs that incorporate the waste management hierarchy, the 'polluter pays' principle, the 'user pays' principle, and the product stewardship principal
- Western Australia: *Environmental Protection Act 1986*, provides a basis for the Environment Protection Authority to prepare environmental protection policies, to undertake environmental impact assessment of proposals and to recommend the making of regulations which can address the management of wastes and the protection of the environmental impacts of those wastes. In addition the passage of the *Waste Avoidance and Resource Recovery Act 2007* established the Waste Authority, which is required to develop a State-wide, long term waste strategy for waste avoidance and resource recovery including the setting of targets for waste reduction and resource recovery and the diversion of waste from landfill.[123]
- South Australia: *Environment Protection Act 1993*, incorporates the principles of ecologically sustainable development requiring the economic and environmental considerations be integral to address issues such as pollution, waste, contamination and environmental harm generally. South Australia's Strategic Plan 2007 aims to encourage sustainability and includes a target of reducing waste to landfill by 25% by 2014. South Australia's Waste Strategy 2005-2010 aims to:
  - Foster sustainable behaviour
  - Redirect waste away from landfill
  - Establish effective recycling systems and reprocessing infrastructure
  - Enact policies to encourage avoidance, reduction, re-use and recycling of televisions and computers
  - Encourage cooperation.[124]

[123] WA Department of Environment and Conservation website, 'Waste Management', available at http://www.dec.wa.gov.au/pollution-prevention/waste-management/index.html, accessed 16 April 2009

[124] Environment Protection Authority,(2009), *'Zero Waste SA, 'Waste and Resource Recovery'*, available at http://www.epa.sa.gov.au/waste.html, accessed 16 April 2009; Zero Waste SA website, 'Waste Strategy', available at < http://www.zerowaste.sa.gov.au/About.mvc/Wastestrategy, accessed 16 April 2009

The South Australian government has implemented an e-waste policy and has recently issues a discussion paper to ban e-waste from landfill.

- Tasmania: *Environmental Management and Pollution Control Act 1994*– sets out the objectives of the resource management and planning system of Tasmania, which include to prevent environmental degradation and adverse risks to human and ecosystem health by promoting pollution prevention, clean production technology, reuse and recycling of materials and waste minimization programmes.[125]
  - Best practice standards for landfill are contained in the Landfill Sustainability Guide 2004
- Northern Territory: *Waste Management and Pollution Control Act 1998* – has a strategy for waste management and pollution control which aims to encourage industry to develop waste management plans and conduct voluntary waste audits.
- Australian Capital Territory: have an Electrical and Electronic Waste Product Stewardship Framework consistent with a "No Waste by 2010" strategy. The aim of the strategy is to eliminate waste going to landfill by 2010 by encouraging producer responsibility, encourage consumers to make sound purchasing decision, promoting cost effective methods for recovering resources and facilitating the conversion of waste into commercially viable products.

[125] Government of Tasmania (1994), *Environmental Management and Pollution Control Act* 1994 (Tas), Schedule 2

Appendix E Analysis of options

This appendix presents detail about each of the options analysed in this regulatory impact statement to assist in determining the options assessed within the detailed CBA. It discusses each of the broad steps undertaken in the analysis of options.

Step 1: Identify possible policy options for end of life televisions and computers

The initial list of possible policy options identified as part of the regulatory impact statement is presented in table below. One of these does not represent a change in the current situation (the business as usual case), whereas the others are all possible policy options for a change in government intervention.

Table E.1 Initial list of policy options identified

Regulation	Option		Description
Current	1	Business as usual	The current situation does not change. Some jurisdictions implement regulation or schemes but there is no national coordination of government policy. In the private sector, industry participants implement brand-specific schemes.
Non-regulatory	2	Public Education	Government or industry runs public information campaigns to educate the public about how to access existing recycling opportunities.
	3	Local Government Collection Scheme	Recycling scheme organised at the Local Government level. Local Government provides collection infrastructure, but there are no targets or policy regulations.
	4	State Government Collection Scheme	Recycling scheme organised at the Local Government level. State government provides collection infrastructure and may use existing Local Government infrastructure, but there are no targets or policy regulations.
	5	Cth Government Collection Scheme	Recycling scheme organised at the Commonwealth Government level. Commonwealth Government provides collection infrastructure and may use existing State and Local Government infrastructure, but there are no targets or policy regulations.
	6	Voluntary Industry Scheme	Voluntary schemes administered by the computer and television industries. There are collection and recycling targets, but inclusion in the scheme is voluntary and there are no regulations to enforce the targets.
Co-regulatory	7	Co-regulatory Industry Scheme with a State-based Individual Producer Responsibility Safety Net	State/Territory Regulations would impose mandatory requirements on importers to have an Action Plan and demonstrate that they had achieved performance targets for collection, recycling and reporting with an exemption if the company joins an approved voluntary industry schemes.
	8	Co-regulatory Industry Scheme with a Commonwealth-based Individual Producer Responsibility Safety Net	Commonwealth regulations would impose mandatory requirements on importers to have an Action Plan and demonstrate that they had achieved performance targets for collection, recycling and reporting with an exemption if the company joins an approved voluntary industry scheme. The aim would be to make the regulation onerous to encourage all companies to join the industry scheme
	9	Co-regulatory Industry Scheme with a Commonwealth Excise safety net.	This option would place a Commonwealth Excise Tax on each product supplied to the market with an exemption for products supplied by companies that participate in an approved voluntary industry scheme. The aim would be to drive companies into the industry scheme by setting the excise tax at a higher amount than the cost of participating in the scheme. This is not intended to create an alternative funding source for recycling or to compete with the industry scheme.
Regulatory Options	10	Mandatory Import License Requirement	Producers must hold a license to import televisions and computers. To be licensed, a producer must pay a license fee and an on-going administration fee for each unit imported to the Commonwealth, report the amount imported to the Commonwealth and belong to an approved industry scheme (i.e. option 5)
	11	Design Standards	Regulatory design standards make recycling easier and more efficient per item,
	12	Mandatory extended producer responsibility	Producers would be financially and physically responsible for ensuring that current end of life product is collected and recycled, regardless or brand, age or condition. The amount they would need to collect and recycle would be based on their market share. To determine market share and compliance, each regulated producer would need to report the amount of product they supplied to the market and the amount they collected and recycled. Targets would be consulted with

Regulation	Option		Description
			relevant industries, but not negotiated as under the Industry Agreements above (policy options 5 to 8)
	13	Mandatory extended retailer responsibility	Same as above (policy option 10) except that the responsibility would fall on retailers based on their market share.
	14	Mandatory Responsibility on Local Governments	A mandatory physical and financial responsibility for collection and recycling is placed on local government
	15	Deposit Refund Scheme	Legislation requiring retailers to collect a deposit on each new product and provide a refund when the product is returned to a collection site for recycling.
	16	Tradeable Permits Scheme	This option would involve giving recyclers that meet specific requirements set out in regulations the power to generate "permits" based on the number of pieces of equipment they recycle. Regulations would also impose an obligation on producers to purchase a specific number of permits per year based on the amount of equipment they supply to the market.
	17	Landfill ban	State-based regulation would require owners and operators of landfill to refuse to accept televisions and computers.
	18	Subsidy for collection recycling	Regulations set out the criteria and levels of subsidies paid to recyclers for collection and recycling of televisions and computers.

Step 2: Identify possible funding options for a television and computer waste scheme

The initial list of possible funding options identified is presented in table below.

Table E.2 Initial list of funding options identified

	Funding Option		Description
Local Government	1	Landfill charge	Consumers and businesses are charged per unit/tonne of television and computer waste that is disposed of at Local Government landfills
	2	Rates	Charged by Councils on an annual basis to cover the cost of providing services and facilities to residents and businesses in the Local Government area.
State / Territory Government	3	Fee for service (point of sale customer charge)	Under s 90 of the Constitution, only the Commonwealth can impose an excise/tax. States can impose a 'disposal fee' if it is collected at point of sale, is related to the cost of recycling the particular piece of equipment and is used to recycle that particular piece of equipment. A fee for service cannot be used to provide general funding for recycling.
	4	State consolidated revenue	All revenues raised or received by the Executive Government of a State/Territory
Commonwealth Government	5	Commonwealth consolidated revenue	All revenues raised or received by the Executive Government of the Commonwealth, which can be appropriated for the purposes of the Commonwealth subject to the Constitution.[126]
	6	Point of sale excise	A Commonwealth Excise (tax) imposed at point of sale. Unlike a fee for service, this doesn't have to relate to the cost of recycling a particular piece of equipment and can be used to provide general funding for recycling.
	7	Point of import excise	A Commonwealth Excise (tax) imposed at point of import. Unlike a fee for service, this doesn't have to relate to the cost of recycling a particular piece of equipment and can be used to provide general funding for recycling.
	8	Import license fees	Importers are required to pay a fee to obtain a license permitting them to import goods into Australia.
Industry	9	Industry association fees	An annual subscription fee payable by members of the industry association. Industry association fees can be used to fund any activity of the industry association.
	10	Industry association levy	An industry association levy is raised for a special purpose and may not be used to fund other activities of the industry association.

[126] *Commonwealth of Australia Constitution Act*, s 81

Step 3: Identify range of policy and funding combinations, then determine most feasible set of combinations

The table below presents the combination of policy and funding options in the above two tables, and the combinations that were identified.

Table E.3 Combinations of policy and funding options identified

				FUNDING OPTIONS								
			Who funds	Local Government		State/Territory Govt	Commonwealth Government				Industry	
		Policy Description	**Who runs**	**Funding Description**	Landfill charge	Rates	Fee for service (Point of Sale customer charge)	Cth/(state) consolidated revenue	Point of sale excise	Point of import excise	License fee	Industry Association fees	Industry Association levy
POLICY OPTIONS		Business as usual	Current situation										
	Non-regulatory	Public education	State Gvt, Cth Gvt or industry										
		Local govt collection scheme (no targets or policy regulation)	Local Gvt										
		State govt collection scheme (no targets or policy regulation)	State/Territory Gvt										
		Cth govt collection scheme (no targets or policy regulation)	Cth Gvt										
		Industry coordinated collection scheme (voluntary with no policy regulation)	Industry										
	Co-reg	Coregulatory Industry Scheme (Individual EPR)	Cth or State Gvt										
		Coregulatory Industry Scheme (Cth excise)	Cth Gvt										
	Mandatory	Mandatory Scheme (Import Control)	Cth Gvt										
		Subsidy scheme for collection/ recycling	Cth or State Gvt										
		Design Standards	Cth Gvt										
		Mandatory Extended Producer Responsibility	Cth or State Gvt										
		Mandatory Extended Retailer Responsibility	Cth or State Gvt										
		Mandatory Responsibility on Local Government	Cth or State Gvt										
		Deposit Refund Scheme	Cth or State Gvt										
		Tradeable Permits	Cth or State Gvt										
		Landfill ban	Cth or State Gvt										

Note: coloured cells indicate 'feasible' set of funding and policy options. Cells filled with an 'x' indicate policy and funding options not considered further due to feasibility.

Step 4: Identify options considered most likely to achieve objectives and address problems

The next step was to consider which options will achieve objectives and address problems. In order to do this, each policy option above was assessed in order to identify those for detailed CBA analysis. A table presenting this process and its outcomes is provided in Chapter 6. The table below presents the options identified for detailed CBA analysis.

Table.4 Options that will be subjected to Cost Benefit Analysis

No.	Policy & funding option	Option (affects scheme objectives)	Description	Product group
	Business as usual	N/A	Future if continue on current basis - i.e. some voluntary local/state Govt efforts but not coordinated (e.g. Byteback)	i) TVs only ii) Computers only iii) Visual display units from TVs & computers iv) All TVs and computers
1& 2	Co-reg: state-based EPR (NEPM) with exemption if belong to an industry scheme	Option 1: Joint scheme applying to all products	- Voluntary Industry Scheme, with industry responsible for collection of all products (including historic and orphan) and targets. [Collection targets - Year 1: No target, Year 2: 40%, Year 3: 55%, Year 4: 70%, Year 5: 80%, Following years: 80%] [Recycling targets - Year 1: at least 60% of the average weight of a TV recovered for recycling, Year 2: 60%, Year 3: 70%, Year 4: 80%, Following years: 85%] - NEPM measure with consistent state regulations that requires producers who refuse to join the voluntary industry scheme to have an approved action plan and demonstrate that they achieve performance targets - Policy Administration by State Government - Scheme administration by the industry PRO - Industry levy paid to PRO to fund scheme (likely passed on to consumers...but at discretion of industry). Policy development, monitoring and enforcement of regulations and reporting of enforcement actions funded from State consolidated revenue	i) TVs only ii) Computers only iii) Visual display units from TVs & computers iv) All TVs and computers
		Option 2: Separate scheme applying to computers	- Computer Industry same as Option 1....except that industry is not responsible for collection of all products. Instead is a voluntary Industry Scheme with split responsibility: (i) Major brand owners take responsibility for historic waste from their own brand (pay PRO after their brand is recycled) (ii) Importers of generic parts and equipment are responsible for all non-branded and orphan equipment (pay advanced recycling fee to PRO on import) – an estimated 20% of end of life units pa is not likely to be collected/recycled as historical unbranded units are not captured - analysis should indicate costs for branded verses non-branded producers. - Targets assumed as per Option 1	i) Computers only ii) Visual display units from computers
3 & 4	Co-reg: Cmwth-based EPR with exemption if belong to an industry scheme	Option 3: Joint scheme applying to all products	- Voluntary Industry Scheme, with industry responsible for collection of all products (including historic and orphan) and collection targets [Collection targets - Year 1: No target, Year 2: 40%, Year 3: 55%, Year 4: 70%, Year 5: 80%, Following years: 80%] [Recycling targets - Year 1: at least 60% of the average weight of a TV recovered for recycling, Year 2: 60%, Year 3: 70%, Year 4: 80%, Following years: 85%] - Similar approach as NEPM option above, but with Cth regulations that require producers who refuse to join the voluntary industry scheme to have an approved action plan and demonstrate that	i) TVs only ii) Computers only iii) Visual display units from TVs & computers iv) All TVs and computers

No.	Policy & funding option	Option (affects scheme objectives)	Description	Product group
			they achieve performance targets - Policy Administration by Cth Government - Scheme administration by the industry PRO - Industry levy paid to PRO to fund scheme. Policy development and regulations funded from Cth consolidated revenue	
		Option 4: Separate scheme applying to computers	- Computer Industry same as Option 3....except that industry is not responsible for collection of all products. Instead is a voluntary Industry Scheme with split responsibility: (i) Major brand owners take responsibility for historic waste from their own brand (pay PRO after their brand is recycled) (ii) Importers of generic parts and equipment are responsible for all non-branded and orphan equipment (pay advanced recycling fee to PRO on import) – an estimated 20% of end of life units pa is not likely to be collected/recycled as historical unbranded units are not captured - Targets assumed as per Option 3	i) Computers only ii) Visual display units from computers
5 & 6	Co-reg: Cmwth levy with exemption if belong to an industry scheme	Option 5: Joint scheme applying to all products	- Voluntary Industry Scheme, with industry responsible for collection of all products (including historic and orphan) and collection targets. [Collection targets - Year 1: No target, Year 2: 40%, Year 3: 55%, Year 4: 70%, Year 5: 80%, Following years: 80%] [Recycling targets - Year 1: at least 60% of the average weight of a TV recovered for recycling, Year 2: 60%, Year 3: 70%, Year 4: 80%, Following years: 85%] - Cth Excise Regulatory Safety Net requires producers who refuse to join the voluntary industry scheme to pay an excise - Policy Administration by Cth Government - Scheme administration by the industry PRO - Industry levy paid to PRO to fund scheme. Policy development and regulations funded from Cth consolidated revenue offset by any funds generated from the levy. - Note: this is not a revenue generation exercise. The intention is to drive all producers into the scheme and collect no funds via the levy.	i) TVs only ii) Computers only iii) Visual display units from TVs & computers iv) All TVs and computers
		Option 6: Separate scheme applying to computers	- Computer Industry same as Option 5....except that industry is not responsible for collection of all products. Instead is a voluntary Industry Scheme with split responsibility: (i) Major brand owners take responsibility for historic waste from their own brand (pay PRO after their brand is recycled) (ii) Importers of generic parts and equipment are responsible for all non-branded and orphan equipment (pay advanced recycling fee to PRO on import) – lower diversion rate for first 10 years is expected as historical unbranded units are not captured - Targets assumed as per Option 5	i) Computers only ii) Visual display units from computers iii) Visual display units from TVs & computers iv) All TVs and computers
7	Mandatory: Cmwth levy with government-run scheme (Oil scheme approach)	Option 7: Mandatory so all involved	- scheme involves paying a subsidy per item collected/recycled - Policy Administration by Cth Government, including regulation regarding the levels/criteria for the subsidy - Scheme Administration by Cth Government - Funding from Cth Excise at point where product first enters the market (i.e. point of import) - Funds would cover all government administration costs, as well as subsidy for recycling. - Levy would be set on a single item, such as the visual display unit (including laptops, etc.), but the funds generated would be used to recycle all equipment and peripherals, not just the visual display unit.	i) TVs only ii) Computers only iii) Visual display units from TVs & computers iv) All TVs and computers
8	Mandatory: Import license requirement (all companies required to have license, pay fee,	Option 8: Mandatory so all involved	- Cth advice that an import control safety net would require licensing (i.e. effectively results in mandatory industry involvement) - Mandatory Industry Scheme, with industry responsible for collection of all products (including historic and orphan) and collection targets[Collection targets - Year 1: No target, Year 2: 40%, Year	i) TVs only ii) Computers only iii) Visual display units from TVs & computers

No.	Policy & funding option	Option (affects scheme objectives)	Description	Product group
	report info, belong to a scheme).		3: 55%, Year 4: 70%, Year 5: 80%, Following years: 80%] [Recycling targets - Year 1: at least 60% of the average weight of a TV recovered for recycling, Year 2: 60%, Year 3: 70%, Year 4: 80%, Following years: 85%] - Producers must hold a license to import product. To be licensed, a producer must pay a license fee and an on-going administration fee for each unit imported to the Cmwlth, report the amount imported to the Cmwlth and belong to an approved scheme. Membership in the scheme would involve paying a levy for each item imported (over and above the amount paid to the Cmwlth) and report the amount imported to the scheme. - Policy Administration – Commonwealth Government (funded from license fee and ongoing fee per unit, i.e. no impost on consolidated revenue) - Enforcement - Australian Customs Service (ACS) - Scheme administration by the industry PRO (funded by the industry levy paid to the PRO)	iv) All TVs and computers
9	Mandatory: state-based EPR (NEPM) (all companies required to report info and join a scheme. Schemes regulated and required to report)	Option 9: Mandatory so all involved	- Mandatory Industry Scheme, with industry responsible for collection of all products (including historic and orphan) and collection targets[Collection targets - Year 1: No target, Year 2: 40%, Year 3: 55%, Year 4: 70%, Year 5: 80%, Following years: 80%] [Recycling targets - Year 1: at least 60% of the average weight of a TV recovered for recycling, Year 2: 60%, Year 3: 70%, Year 4: 80%, Following years: 85%] - NEPM measure with consistent state regulations that regulates and enforces penalty for not achieving requirements - Policy Administration by State Government - Scheme administration by industry PRO (i.e. industry levy paid to PRO to fund scheme administration) - Policy development and regulations funded from State consolidated revenue	i) TVs only ii) Computers only iii) Visual display units from TVs & computers iv) All TVs and computers

Appendix F Threshold analysis

Table F.1 shows the threshold level (number of units) and resulting percentage coverage (% of units imported by companies) and number of companies included in the scheme) at the three different threshold levels selected for analysis. The coverage and number of companies is based on application of the thresholds to 2008 Customs data.[127]

Table F.1 Selected threshold levels and associated percentage coverage and number of companies

	No threshold	Threshold 1 (units)			Threshold 2 (units)			Threshold 3 (units)		
	Companies (number, 2008)	Threshold level (units)	Coverage (% of units, 2008)	Companies (number, 2008)	Threshold level (units)	Coverage (% of units, 2008)	Companies (number, 2008)	Threshold level (units)	Coverage (% of units, 2008)	Companies (number, 2008)
Televisions	458	400	99.6%	79	2,000	98.5%	45	5,000	97.5%	37
Computers	9,999	200	99.5%	1,945	1,000	98.3%	997	4,000	95.7%	503
VDUs	1,874	100	99.6%	493	500	98.6%	202	2,000	96.9%	94
All products	10,194	200	99.6%	1,985	1,000	98.4%	1,023	5,000	95.3%	460

Source: ACS

Based on the threshold levels given in Table G.1 and 2007 Customs data, the number of companies who would have dropped out of the scheme between 2007 and 2008 and the number of companies who would have entered the scheme in 2008 (e.g. who weren't included in the scheme in 2007) are presented in Table G.2.

Table F.2 Impact of the chosen threshold level on companies included, drop out of companies and new companies included, by number of companies

	Drop out of importing companies (imported in 2007 but not in 2008)				Entrance of new importers into the market (imported in 2008, but not in 2007)			
	No Threshold	Threshold 1	Threshold 2	Threshold 3	No threshold	Threshold 1	Threshold 2	Threshold 3
Television	379	46	19	11	329	26	13	11
Computers	4,648	834	485	230	5,054	852	391	182
VDUs	1,102	106	56	33	1,287	347	107	33
All products	4,810	855	494	208	5,175	862	393	152

Source: ACS

[127] Customs data was provided for 'companies' and for 'individuals'. Customs were not able to provide data for these individuals to enable the threshold analysis at the product group level. However, across all import codes individuals imported on average 4-5% of total units. The remaining import threshold analysis therefore excluded any units imported by individuals.

Appendix G CBA assumptions

The tables in this appendix show the assumptions and parameters that have formed the basis for the CBA presented in this RIS.

Table G.1 CBA assumptions and parameters – General assumptions

Assumption	Unit	Value	Source
Discount Rate	%	7% (sensitivities at 3%, 11%)	The COAG guidelines
Timeframe	Years	• Base year is 2008/09 • Scheme assumed to start in 2010/11 after 2 years of design and implementation	Steering Committee
Time period of analysis	Years	Scheme analysed over 20 years from the first year of operation of the scheme i.e. 2010/11 to 2030/31	The COAG guidelines
Sensitivity	%	To be conducted on key parameters including: • Discount rates of 3% and 10% (currently 7%) • PRO cost savings of 30% and 50% from administering both schemes • Willingness to pay of $18.18/unit sold and $23.68/unit sold (currently $21.14/unit sold) representing the upper and lower confidence intervals respectively • 100% kerbside pickup (currently 100% drop off collection) • Television and computer (desktops and laptops only) weights of 25kg and 7.5kg respectively for 'new products' (currently 25.96 and 19.11 kg respectively for 'end of life products'	• The COAG guidelines • Steering Committee • URS Willingness to Pay Study • URS Willingness to Pay Study • Manufacturer's data and direct weight measurements of new televisions and computers
Import/end of life/collection/recycling volumes	Units/tonnes/no. importers	This data is the key input in the CBA and varies for each year, product and option.	• Australian Customs Service data on importers of television and computers over two years from 2007 to 2008 • Steering Committee • Australian e-waste recyclers • Television and computer industry representatives • Import data sourced from Department of Foreign Affairs and Trade on television imports from 1998/99 to 2007/08 and on computer imports for the period 1999/00 to 2007/08 • Tables 23 and 24 (pages 49 and 50) of United Nations University (2007) Review of Directive 2002/96 on Waste Electrical and Electronic Equipment • Previous Hyder research on televisions and computers

Table G.2 CBA assumptions and parameters –Collection Cost Assumptions

Cost Assumptions	Unit	Value	Source	Note
1) Proportion of Collection by Method				
Drop-off	%	100%	• Product Stewardship Australia 2006, 'Draft Product Stewardship Agreement for Televisions: An Agreement between the Environment Protection Heritage Council and the Television Industry' • AIIA and Planet Ark Consulting 2005, 'AIIA – E-waste Program Development Phase: Report for Discussion and Feedback'	• Sensitivity analysis was conducted assuming 100% kerbside collection, • To understand the difference between the options it is feasible to use either of these collection method assumptions in the core appraisal as the relativities between the options should not change
Kerbside	%	0%		
2) Household collection costs (including transport from household to waste transfer station/drop-off point)				
Drop-off	$/unit	N/A	URS Willingness to Pay Study	• Household collection costs are already taken into account in the URS Willingness to Pay Study. The survey stated that 'alternative schemes are described in terms of…[w]hat it would cost you, compared to the current situation' and respondents were told to 'remember how much money you have to spend and your other financial commitments.' (Appendix A). In the absence of one of the proposed schemes, households would have to transport television and computer waste to landfill, so their willingness to pay is incremental to the cost of transportation to collection facilities. • It is implied that commercial entities would have the same willingness to pay as households.
Kerbside	$/unit	N/A	URS Willingness to Pay Study	
3) Industry collection costs (including capital costs, operating costs and transport from collection point to recycling facility)				
Possible cost savings from economies of scale (not incorporated in appraisal)	%	20%	Advice the Steering Committee	Cost savings due to economies of scale are assumed to be achieved when recycling reaches 70% Not incorporated in core appraisal, but applied as a sensitivity analysis
Television • Drop-off • Kerbside	• $/unit • $/tonne • $/unit • $/tonne	• $6.14 (weighted average) • $272.94 • N/A • $461.30	Estimates were based on Hyder (2006), 'Television EPR Scheme Producer Responsibility Organisation Cost Analysis', prepared for the NSW Department of Environment and Climate Change (NSW DECC),	• It was not possible to split operating costs and one-off capital costs and therefore included them together.[128] • Average unit weights are weighted averages based on the number of units sold into the Australian market in 2007/08 and the weights of each type of unit • Collection cost parameters exclude GST

Cost Assumptions	Unit	Value	Source	Note
Computers • Drop-off • Kerbside	• $/unit • S/tonne • $/unit • $/tonne	• $0.68 ($2.02 for complete desktops/laptops, $1.53 for monitors and $0.32 for peripherals) • $272.94 • N/A • $461.30	ABS Census data, data from the Byteback program and surveys of thirteen e-waste recyclers and one e-waste collector	• Estimates on a $/tonne basis will account for changes in unit weights of televisions/computers over time and the shift from desktops to laptops. Therefore, it was unnecessary for them to provide $/unit estimates for kerbside collection
VDUs • Drop-off • • Kerbside	• $/unit • $/tonne • $/unit • $/tonne	• $3.64 • $272.94 • N/A • $461.30		
All • Drop-off • Kerbside	• $/unit • $/tonne • $/unit • $/tonne	• $1.21 (weighted average) • $272.94 • N/A • $461.30		
4) Government Infrastructure Costs				
Drop-off	• $/unit • $/tonne	N/A	N/A	It is assumed that new sites will not be developed just for television and computer waste. It is assumed that hook lift bins will be rented at existing landfill sites and waste transfer stations.
Kerbside	• $/unit • $/tonne			

[128] Collection costs for 'drop-off' are comprised of equipment rental (22.5 cubic metre hook lift bins) at waste facilities such as local government landfill sites and state government waste transfer stations; a cartage and fuel surcharge per load (with a heavier weighting for rural transport); staff salary at the site and facility rental for a covered area/site. The fact that it is not possible to separate capital expenditure and operating costs for collection is not expected to have an impact on the NPV as the policy options will utilise existing infrastructure meaning that no capital investment will be required. However, there will be some lumpiness with 'kerbside collection' capital expenditure as it is assumed that a new vehicle will be required every 7 years. Currently, the kerbside collection vehicle costs have been annualised. It is acknowledged that this will affect the discounted value of costs and will therefore affect the NPV estimates. The impact of this assumption can be explored further in the Decision RIS.

Cost Assumptions	Unit	Value	Source	Note
5) Government Collection Costs				
Drop-off	• $/unit • $/tonne	• $0 • $0	PwC	As consumers will drop off television and computer waste at collection facilities and importers will transport television and computer waste from collection facilities to reprocessing facilities, so there are no Government transport costs
Kerbside	• $/unit • $/tonne	• N/A • $461.30	Estimates were based on Hyder (2006), 'Television EPR Scheme Producer Responsibility Organisation Cost Analysis', prepared for the NSW Department of Environment and Climate Change (NSW DECC), ABS Census data, data from the Byteback program and surveys of thirteen e-waste recyclers and one e-waste collector	• This will capture the cost impact of a policy including kerbside collection • It is assumed that government kerbside collection costs will be the same as those estimated for industry, as the industry estimate does not include a site rental component

Table G.3 CBA assumptions and parameters – Recycling Cost Assumptions

Cost Assumptions	Unit	Value	Source	Note
1) Reprocessing costs (including capital and operating costs of recycling operations)[129]				
Possible cost savings from economies of scale (not captured in appraisal)	%	8.5% saving when recycling reaches 20% 20% saving when recycling reaches 50%		Cost savings due to economies of scale are assumed to be achieved as throughput increases. Not incorporated in appraisal, but applied as a sensitivity analysis
Television	• $/unit • $/tonne	• $18.17 • $700	Estimates were based on Hyder (2006), 'Television EPR Scheme Producer Responsibility Organisation Cost Analysis', prepared for the NSW Department of Environment and Climate Change (NSW DECC) and confirmed in consultation with recyclers.	Per tonne reprocessing cost estimate excludes profit, GST and collection costs. An estimated cost per unit is provided here for reference only as these have not been used within the CBA model. The estimated cost per unit for each product category is based on the $700/tonne reprocessing cost and the estimated average weight of a unit disposed of in 2008/09 for each product category (TV – 26.0kg; Computers – 4.3kg; Visual display units – 16.0kg; All products – 5.8kg).
Computer	• $/unit • $/tonne	• $3.04 • $700		
VDUs	• $/unit • $/tonne	• $11.18 • $700		
All	• $/unit • $/tonne	• $4.05 • $700		

[129] In contrast to the collection cost estimates, a 'bottom up' approach was not employed. Instead the three largest e-waste recyclers were contacted and asked for their feedback on a cost estimate that include both capital and operating expenditure but excluded profit, GST and collection cost. It is acknowledged that there may be some 'lumpiness' in capital expenditure due to the requirement of new entrants to purchase plant and equipment and for existing players to expand capacity, however there is significant existing infrastructure that will be used in initial years meaning that capital expenditure is expected to be gradual over time. In addition, any new investment in plant/equipment is expected to involve periodic loan repayments which will smooth the lumpy capital expenditure. One reprocessor noted that capital expenditure would be offset with a reduction in labour cost and the overall cost would therefore remain steady. This assumption can be explored further in the Decision RIS.

Table G.4 CBA assumptions and parameters – Regulation Design/Implementation Cost Assumptions

Cost Assumptions	Unit	Value	Source	Note
Years to design and implement	Years	2	Steering Committee	Schemes commence 2010/11
Options 1 and 2 - Co-reg: State-based EPR (NEPM) • Direct Costs (Cth) • Staff Costs (Jurisdictions) • Efficiencies from designing and implementing uniform state regulations • Total	• $/2 years • $/2 years • % • $/year	• $350,000 • $145,000 • 50% • $465,000	• Tyres NEPM • Steering Committee • =($350,000 + (8*$145,000/2))/ 2	• A NEPM is already in place, but each jurisdiction will incur costs to design and implement policy-specific regulations and industry agreements • Direct costs include line items such as project team travel costs, consultation roadshow costs, consultancy fees for regulatory impact statement development and teleconferences, but do not account for the time spent on the project by jurisdictional officers • Tyres NEPM data was supplied by the Steering Committee
Options 3 and 4 - Co-reg: Cth-based EPR • Direct Costs (Cth) • Staff Costs (Cth) • Total	• $/2 years • $/2 years • $/year	• $400,000 • $300,000 • $350,000	• Tyres NEPM • Steering Committee • =($400,000+$300,000)/2	• Compared to State-based NEPM, there is only one jurisdiction, creating efficiencies. However, these options would require the drafting of a NEPM-style Cth regulation • Direct costs include line items such as project team travel costs, consultation roadshow costs, consultancy fees for regulatory impact statement development and teleconferences, but do not account for the time spent on the project by Cth officers • Tyres NEPM data was supplied by the Steering Committee
Options 5 and 6: Co-reg with Cth Levy	$/year	$350,000	It is assumed that the costs are the same as the Cth-based EPR	The Cth would need to amend the excise legislation, setting the criteria and amount of the levy
Option 7: Cth levy and subsidy • Direct Costs (Cth) • Staff Costs (Cth) • Total	• $/2years • $/2 years • $/year	• $400,000 • $300,000 • $500,000	• Tyres NEPM • Steering Committee • =($400,000+(2*$300,000))/2	• In addition to the costs above, this option also needs regulations for the subsidy (i.e. amount, criteria). • It is assumed that the Cth would incur twice the staff costs because there are two sets of regulations • Tyres NEPM data was supplied by the Steering Committee
Option 8: Mandatory Import License	$/year	• $350,000	It is assumed that the costs are the same as the Cth-based EPR and Cth Excise options	• Cth legislation will need to be drafted.
Option 9: Mandatory State-based EPR (NEPM)	$/year	• $465,000	It is assumed that there are the same design/implementation costs for the co-regulatory and mandatory schemes	

Table G.5 CBA assumptions and parameters – Administration Cost Assumptions

Cost Assumptions	Unit	Value	Source	Note
1) PRO administration costs				
Separate scheme for televisions	$/year	$1,042,000	Hyder 2006, 'Television EPR Scheme Producer Responsibility Organisation – Cost Analysis', prepared for the NSW Department of Environment and Conservation and Product Stewardship Australia.	• There is no PRO for option 7 (Mandatory Cth levy and subsidy) as it involves Government subsidies not recycling targets
Separate scheme for computers	$/year	$1,042,000	It is assumed that Computer PRO costs are the same as TV PRO costs.	
Savings from administering both	$	40%	Steering Committee	
Joint scheme for all products	$/year	$1,250,400	=(1,042,000+1,042,000)*(1-40%)	Options 1,3,5,8,9
2) Government administration of regulations				
a) Coregulation				
Options 1 and 2: State-based EPR (NEPM) • Scheme administration • Hours to chase to join industry scheme • Salary per year (gross) • Salary per hour (gross) • Salary per hour (net) • Cost per importer	 • $/year • Hours/new importer • $/year • $/hour • $/hour • $/importer	 • $3,528,198 • 6 • $155,000 • $78.58 • $55.01 • $330.05	 • Steering Committee • Steering Committee • Steering Committee	• It is assumed that there are 52.25 weeks per year and 37.75 hours per week • It is assumed that the taxation rate is 30%
Options 3 and 4: Cth-Based EPR • Scheme administration • Hours to chase to join industry scheme • Salary per year (gross) • Salary per hour (gross) • Salary per hour (net) • Cost per importer	• $/year • Hours/new importer • $/year • $/hour • $/hour • $/importer	• $640,698 • 6 • $180,000 • $91.26 • $63.88 • $383.28	• Steering Committee • Steering Committee • Steering Committee	A gross salary of $129,000 was estimated by DEWHA and on-costs were calculated using the 2009-10 NPP Standard Departmental Staff Costing Template
Options 5 and 6: Cth Levy • Scheme administration • Hours to chase to join industry scheme • Salary per year (gross)	• $/year • Hours/new importer	• $2,1462,18 • 6 • $180,000	• Steering Committee • Steering Committee • Steering Committee	A gross salary of $129,000 was estimated by DEWHA and on-costs were calculated using the 2009-10 NPP Standard Departmental Staff Costing Template

Cost Assumptions	Unit	Value	Source	Note
• Salary per hour (gross) • Salary per hour (net) • Cost per importer	• $/year • $/hour • $/hour • $/importer	• $91.26 • $63.88 • $383.28		
b) Mandatory				
Option 7: Cth Levy with Subsidy (PSO)	$/year	• $2,232,818	Steering Committee	• There is no PRO as the scheme involves Government subsidies not recycling targets • The Cth Government does not need to chase importers to enforce the scheme as it is a subsidy scheme
Option 8: Import Control • Scheme administration • Proportion of importers that require enforcement action • Hours to chase to enforce • Salary per year (gross) • Salary per hour (gross) • Salary per hour (net) • Cost per importer	• $/year • % • Hours/new importer • $/year • $/hour • $/hour • $/importer	• $1,610,948 • 40% • 6 • $180,000 • $91.26 • $63.88 • $383.28	• Steering Committee	A gross salary of $129,000 was estimated by DEWHA and on-costs were calculated using the 2009-10 NPP Standard Departmental Staff Costing Template
Option 9: Mandatory State-based EPR: • Scheme administration • Proportion of total importers that require enforcement action • Hours to chase to join industry scheme • Salary per year (gross) • Salary per hour (gross) • Salary per hour (net) • Cost per importer	• $/year • % • Hours/ importer • $/hour • $/hour • $/hour • $/importer	• $3,528,198 • 40% • 6 • $155,000 • $78.58 • $55.01 • $330.05	• Steering Committee	Scheme administration costs are assumed to be the same as for the co-regulatory scheme (options 1 and 2)
3) Communications Costs				
All Options	$/year	• $8,801,310 (2008/09) • $500,000.00 2009/10 onwards) • $5,905,333 (kerb side pick up)	• Hyder 2006, 'Television EPR Scheme Producer Responsibility Organisation – Cost Analysis', prepared for the NSW Department of Environment and Conservation and Product Stewardship Australia.	It is assumed that following a significant national education and promotions campaign in year 1, communications costs will reduce to $500,000 thereafter to reinforce the initial campaign.

Table G.6 CBA assumptions and parameters – Compliance Cost Assumptions

Cost Assumptions	Unit	Value	Source	Note
1) Importer Compliance Costs				
a) Co-regulation				
Options 1 & 2 - State-based EPR (NEPM)	$/importer	• $1,000	• MMA 2007, 'Tyres National Environmental Protection Measure: Threshold Study', p 18 • Preliminary estimate	It is assumed that importer compliance costs are higher than in Option 7 as importers also need to report against recycling targets
Options 3 & 4 - Cth-based EPR	$/importer	• $1,000	• MMA 2007, 'Tyres National Environmental Protection Measure: Threshold Study', p 18 • Preliminary estimate	It is assumed that importer compliance costs are higher than in Option 7 as importers also need to report against recycling targets
Options 5 & 6 - Cth Excise	$/importer	• $1,000	• MMA 2007, 'Tyres National Environmental Protection Measure: Threshold Study', p 18 • Preliminary estimate	It is assumed that importer compliance costs are higher than in Option 7 as importers also need to report against recycling targets
b) Mandatory				
Option 7 - Commonwealth Levy with Government-run Scheme	$/importer	$600	MMA 2007, 'Tyres National Environmental Protection Measure: Threshold Study', p 18	The Tyres threshold analysis is most applicable to Option 7, as the Tyres NEPM involves an Advanced Recycling Fee (ARF), which is a similar mechanism to a Cth levy.
Option 8 - Import Control • Scheme Compliance • License Requirement	$/importer	• $1,000 • 5% increase to scheme compliance	• MMA 2007, 'Tyres National Environmental Protection Measure: Threshold Study', p 18 – Preliminary estimate	In addition to the compliance costs incurred in the Cth co-regulatory schemes (options 3 to 6) there is also a cost associated with complying with the license requirement.
Option 9 - Mandatory State-based EPR	$/importer	$1000	Tyres Threshold study (p. 18…no. tyres method)	It is assumption that importer compliance costs are the same as in the Cth co-regulatory scheme (options 3 to 6)
2) Recycler Compliance Costs				
a) Co-regulation				
Options 1 & 2 - State-based EPR (NEPM)	$/recycler	• $0	It is assumed that recyclers do not have any compliance costs as they only have a contractual obligation.	
Options 3 & 4 - Cth-based EPR	$/recycler	• $0	It is assumed that recyclers do not have any compliance costs as they only have a contractual obligation.	
Options 5 & 6 - Cth Excise	$/recycler	• $0	It is assumed that recyclers do not have any compliance costs as they only have a contractual obligation.	

Cost Assumptions	Unit	Value	Source	Note
b) Mandatory				
Option 7 - Commonwealth Levy with Government-run Scheme • Recycler compliance • No. of recyclers • Time between new entrant	• $/recycler • Recyclers • years	• $20,000 • 13 • 3	• PSO (2nd Independent Review) – PwC survey 2008 • Survey of 13 e-waste recyclers	• The PSO Review survey is most applicable to Option 7, as it relates chiefly to applying for subsidies monitored by the Cth • If there is a new entrant every 3 years, there will be 20 recyclers by 2030/31
Option 8 - Import Control	$/recycler	• $0	It is assumed that recyclers do not have any compliance costs as they only have a contractual obligation.	
Option 9 - Mandatory State-based EPR	$/recycler	• $0	It is assumed that recyclers do not have any compliance costs as they only have a contractual obligation.	

Table G.7 CBA assumptions and parameters – Benefit Assumptions

Benefit Assumptions	Unit	Value	Source	Note
1) Consumer surplus from increased recycling				
WTP for a 1% increase in recycling • WTP for 50% recycling excluding respondents that dropped out • Proportion of respondents that dropped out • WTP of drop outs • WTP including drop outs • Television sales • Computer sales (desktops and laptops only) • Average weight of televisions • Average weight of computers (desktops and laptops only) • Weighted average weight of televisions and computers (desktops and laptops only)	• $ per unit per 1% increase in recycling above current levels • $/unit • % • $ per unit per 1% increase in recycling above current levels • $/unit sold • $/tonne sold % of units % of units kgs/unit kgs/unit kgs/unit	• $0.50 • $24.50 • 13.7% • $0 • $21.14 • $962.55 o 41.70% o 58.30% o 25.96 kg/unit o 19.11 kg/unit o 21.96 kg/unit	• URS Willingness to Pay Study • URS Willingness to Pay Study • URS Willingness to Pay Study • URS Willingness to Pay Study • URS Willingness to Pay Study • =(21.14/21.96)*1000 o DFAT, ACS o United Nations University (2007), manufacturer's data and actual weight measurements o =(41.70%*25.96)+(58.30%*19.11)	• This WTP value captures the following benefits: ▪ Risk of running out of resources while sending some valuable materials to landfill ▪ Landfill sites pose a threat to the natural environment ▪ Threat to human health from landfill ▪ Landfill space is running out ▪ Avoid having landfill in my neighbourhood • The results are only true if recycling levels increase to between 50-90% as this was the range examined in the study. Sensitivity analysis was undertaken on using a linear extrapolation of the WTP for recycling levels below 50%. • Sensitivity analysis was undertaken to exclude the 13.7% of respondents that dropped out of the survey (i.e. did not complete). This increased the average WTP to $24.50 per unit sold, which was converted to an estimate of 1,116/tonne sold. o The estimate of willingness to pay per tonne is based on average estimated weights of 2008-09 end-of-life computers and televisions. This will take into account the reduced unit weights over time and consequent decrease in recoverable resources. Sensitivity analysis was undertaken on using the 2008/09 estimated average weights of new televisions and computers.
Kerbside premium	• $/unit • $/tonne • $/5 years • $/year	• $3.55 • $165.22 • $2,320,000 • $4,640,000	• =(3.55/21.49)*1000 • URS Willingness to Pay Study • =2,320,000/5	• Households are WTP for kerbside collection regardless of the recycling levels • Sensitivity analysis was undertaken to increase kerbside collection from 0% to 100%.
2) Avoided cost of landfill				
Baseline cost e.g. land	$/tonne	$25	Waste Management Association of Australia submission to the 2006 Productivity Commission Waste and Resource Efficiency Inquiry	The direct landfill costs estimated were land purchase including airspace, approvals and site development, cell development, operation including monitoring and fees, capping and rehabilitation, and aftercare. Landfill fees, which are used to fund the direct costs of landfill, were taken into account by the respondents to the URS study who were asked to consider all their costs in determining their incremental WTP.

Benefit Assumptions	Unit	Value	Source	Note
				In addition, one of the benefits explicitly mentioned in the URS study is that landfill costs are running out. Therefore, including an estimate of the baseline costs of landfill would involve double counting of estimates. As such, this benefit is excluded.
Externality cost	$/tonne	N/A	Productivity Commission	The Productivity Commission estimated the externality costs of landfill to be $24/tonne.[130] However, this estimate should not be included as it would involve double counting. It is assumed that respondents to the URS WTP study had full knowledge of the types and values of externalities associated with landfill and that they took these externality costs into account in determining their incremental willingness to pay for increased recycling of televisions and computers.

[130] Productivity Commission 2006, 'Waste Management', Productivity Commission Inquiry Report No. 38, 20 October 2006

Appendix H Costs for each option

Table H.1 Present value of total costs per option ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$614	$610	$585	$585	$654	$654	$644	$654	$614
	Threshold 1	$608	$604	$579	$579	$647	$647	$641	$649	$608
	Threshold 2	$608	$604	$578	$578	$647	$647	$641	$648	$608
	Threshold 3	$608	$604	$578	$578	$656	$656	$640	$648	$608
Computers	No threshold	$477	$428	$451	$406	$517	$460	$444	$519	$473
	Threshold 1	$372	$323	$343	$298	$409	$352	$390	$411	$371
	Threshold 2	$359	$311	$330	$286	$396	$340	$384	$398	$359
	Threshold 3	$353	$304	$324	$279	$390	$333	$381	$391	$353
VDUs	No threshold	$692	$684	$663	$661	$753	$735	$736	$758	$690
	Threshold 1	$674	$666	$644	$642	$739	$721	$727	$740	$673
	Threshold 2	$669	$662	$640	$637	$735	$717	$725	$736	$669
	Threshold 3	$668	$660	$639	$636	$733	$716	$725	$735	$668
All	No threshold	$1,031	$987	$1,005	$969	$1,126	$1,076	$1,049	$1,128	$1,027
	Threshold 1	$922	$878	$893	$857	$1,014	$964	$993	$1,016	$922
	Threshold 2	$909	$865	$880	$844	$1,001	$952	$987	$1,003	$910
	Threshold 3	$902	$858	$873	$837	$994	$944	$983	$995	$902

Table H.2 Ranking of total costs per option

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	56	54	43	43	74	74	65	76	55
	Threshold 1	52	47	41	41	69	69	63	73	53
	Threshold 2	50	46	39	39	67	67	62	72	51
	Threshold 3	48	45	37	37	77	77	61	71	49
Computers	No threshold	34	29	31	26	35	32	30	36	33
	Threshold 1	18	6	11	*3*	27	12	22	28	17
	Threshold 2	15	5	8	2	24	10	20	25	16
	Threshold 3	13	4	7	1	21	9	19	23	14
VDUs	No threshold	92	90	82	80	107	102	104	108	91
	Threshold 1	89	83	66	64	105	95	98	106	88
	Threshold 2	87	81	60	58	101	94	97	103	86
	Threshold 3	84	79	59	57	99	93	96	100	85
All	No threshold	140	130	136	127	143	142	141	144	139
	Threshold 1	123	115	117	111	137	126	131	138	122
	Threshold 2	120	113	116	110	134	125	129	135	121
	Threshold 3	118	112	114	109	132	124	128	133	119

Table H.3 Percentage split of total costs per option

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Collection	2008/09	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2010/11	12.5%	9.9%	14.1%	11.3%	12.4%	16.6%	12.7%	12.4%	12.5%
	2015/16	26.1%	25.6%	27.0%	26.6%	26.8%	26.5%	27.1%	26.8%	26.1%
	Total (PV)	26.0%	25.8%	26.8%	26.5%	26.2%	26.2%	26.4%	26.1%	26.0%
Reprocessing	2008/09	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2010/11	32.0%	25.4%	36.1%	29.0%	62.8%	42.6%	64.3%	62.7%	32.0%
	2015/16	66.8%	65.6%	69.3%	68.2%	68.7%	67.9%	69.5%	68.6%	66.8%
	Total (PV)	66.6%	65.3%	68.8%	68.0%	68.5%	67.2%	69.2%	68.4%	66.6%
Policy design and implementation	2008/09	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	2010/11	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2015/16	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total (PV)	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
PRO administration	2008/09	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2010/11	4.9%	9.0%	5.5%	10.3%	2.4%	6.3%	0.0%	2.4%	4.9%
	2015/16	1.5%	2.8%	1.6%	2.9%	1.3%	2.2%	0.0%	1.3%	1.5%
	Total (PV)	1.4%	2.5%	1.5%	2.5%	1.3%	2.2%	0.0%	1.3%	1.4%
Government administration	2008/09	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2010/11	14.1%	15.5%	3.1%	3.5%	4.3%	6.6%	4.4%	4.5%	14.1%
	2015/16	4.4%	4.7%	0.9%	1.0%	2.2%	2.4%	2.3%	2.3%	4.4%
	Total (PV)	4.0%	4.2%	0.8%	0.9%	2.3%	2.4%	2.3%	2.4%	4.0%
Importer compliance	2008/09	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2010/11	1.9%	2.1%	2.1%	2.3%	0.9%	1.4%	0.6%	1.0%	1.9%
	2015/16	0.6%	0.7%	0.6%	0.7%	0.5%	0.5%	0.3%	0.5%	0.6%
	Total (PV)	0.6%	0.6%	0.6%	0.6%	0.5%	0.6%	0.3%	0.5%	0.6%
Recycler compliance	2008/09	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2010/11	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%
	2015/16	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%
	Total (PV)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%
Communications	2008/09	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	2010/11	34.6%	38.1%	39.0%	43.5%	17.1%	26.5%	17.5%	17.0%	34.6%
	2015/16	0.6%	0.7%	0.6%	0.7%	0.5%	0.5%	0.5%	0.5%	0.6%
	Total (PV)	1.4%	1.4%	1.4%	1.5%	1.2%	1.3%	1.3%	1.2%	1.4%

Table H.4 Responsibility for cost, annual and present values over analysis period (%, all products, threshold 3)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Recyclers (collection, reprocessing, compliance)	2008/09	44.5%	35.3%	50.2%	40.3%	75.3%	59.2%	77.5%	75.1%	44.5%
	2010/11	92.9%	91.2%	96.3%	94.8%	95.5%	94.3%	96.9%	95.4%	92.9%
	2015/16	92.5%	91.2%	95.6%	94.5%	94.6%	93.5%	96.0%	94.5%	92.5%
	PV	-	-	-	-	-	-	-	-	-
Importers (compliance)	2008/09	1.9%	2.1%	2.1%	2.3%	0.9%	1.4%	0.6%	1.0%	1.9%
	2010/11	0.6%	0.7%	0.6%	0.7%	0.5%	0.5%	0.3%	0.5%	0.6%
	2015/16	0.6%	0.6%	0.6%	0.6%	0.5%	0.6%	0.3%	0.5%	0.6%
	PV	-	-	-	-	-	-	-	-	-
PRO (admin)	2008/09	4.9%	9.0%	5.5%	10.3%	2.4%	6.3%	-	-	-
	2010/11	1.5%	2.8%	1.6%	2.9%	1.3%	2.2%	-	-	-
	2015/16	1.4%	2.5%	1.5%	2.5%	1.3%	2.2%	-	-	-
	PV	100.0%	100.0%	-	-	-	-	-	-	100.0%
State Government (regulations, administration and communications)	2008/09	48.7%	53.6%	-	-	-	-	-	-	48.7%
	2010/11	5.0%	5.4%	-	-	-	-	-	-	5.0%
	2015/16	5.1%	5.3%	-	-	-	-	-	-	5.1%
	PV	-	-	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	-
Cth Government (regulations, administration and communications)	2008/09	-	-	42.1%	47.0%	21.4%	33.1%	21.9%	21.5%	-
	2010/11	-	-	1.5%	1.7%	2.7%	2.9%	2.8%	2.8%	-
	2015/16	0.4%	0.5%	2.3%	2.4%	3.6%	3.7%	3.7%	3.7%	0.4%
	PV	44.5%	35.3%	50.2%	40.3%	75.3%	59.2%	77.5%	75.1%	44.5%

Appendix I Benefits for each option

Table I.1 Present value of total benefits per option ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$971	$971	$971	$971	$1,158	$1,158	$1,158	$1,158	$971
	Threshold 1	$971	$971	$971	$971	$1,158	$1,158	$1,158	$1,158	$971
	Threshold 2	$971	$971	$971	$971	$1,158	$1,158	$1,158	$1,158	$971
	Threshold 3	$971	$971	$971	$971	$1,158	$1,158	$1,158	$1,158	$971
Computers	No threshold	$488	$406	$488	$406	$560	$465	$560	$560	$488
	Threshold 1	$488	$406	$488	$406	$560	$465	$560	$560	$488
	Threshold 2	$488	$406	$488	$406	$560	$465	$560	$560	$488
	Threshold 3	$488	$406	$488	$406	$560	$465	$560	$560	$488
VDUs	No threshold	$1,032	$1,021	$1,032	$1,021	$1,241	$1,224	$1,241	$1,241	$1,032
	Threshold 1	$1,032	$1,021	$1,032	$1,021	$1,241	$1,224	$1,241	$1,241	$1,032
	Threshold 2	$1,032	$1,021	$1,032	$1,021	$1,241	$1,224	$1,241	$1,241	$1,032
	Threshold 3	$1,032	$1,021	$1,032	$1,021	$1,241	$1,224	$1,241	$1,241	$1,032
All	No threshold	$1,522	$1,375	$1,522	$1,375	$1,725	$1,553	$1,725	$1,725	$1,522
	Threshold 1	$1,522	$1,375	$1,522	$1,375	$1,725	$1,553	$1,725	$1,725	$1,522
	Threshold 2	$1,522	$1,375	$1,522	$1,375	$1,725	$1,553	$1,725	$1,725	$1,522
	Threshold 3	$1,522	$1,375	$1,522	$1,375	$1,725	$1,553	$1,725	$1,725	$1,522

Table I.2 Ranking of total benefits per option

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	89	89	89	89	53	53	53	53	89
	Threshold 1	89	89	89	89	53	53	53	53	89
	Threshold 2	89	89	89	89	53	53	53	53	89
	Threshold 3	89	89	89	89	53	53	53	53	89
Computers	No threshold	121	137	121	137	109	133	109	109	121
	Threshold 1	121	137	121	137	109	133	109	109	121
	Threshold 2	121	137	121	137	109	133	109	109	121
	Threshold 3	121	137	121	137	109	133	109	109	121
VDUs	No threshold	69	81	69	81	37	49	37	37	69
	Threshold 1	69	81	69	81	37	49	37	37	69
	Threshold 2	69	81	69	81	37	49	37	37	69
	Threshold 3	69	81	69	81	37	49	37	37	69
All	No threshold	17	29	17	29	1	13	1	1	17
	Threshold 1	17	29	17	29	1	13	1	1	17
	Threshold 2	17	29	17	29	1	13	1	1	17
	Threshold 3	17	29	17	29	1	13	1	1	17

Appendix J Summary of CBA results

TableJ.1 Net present value per option - benefits net of costs ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$357	$360	$386	$386	$504	$504	$514	$504	$357
	Threshold 1	$363	$366	$392	$392	$511	$511	$517	$509	$363
	Threshold 2	$363	$367	$392	$392	$511	$511	$518	$510	$363
	Threshold 3	$363	$367	$393	$393	$502	$502	$518	$510	$363
Computers	No threshold	$11	-$22	$37	$0	$43	$5	$116	$41	$14
	Threshold 1	$116	$83	$145	$108	$151	$113	$169	$149	$116
	Threshold 2	$128	$95	$157	$120	$164	$125	$176	$162	$128
	Threshold 3	$134	$102	$164	$127	$170	$132	$179	$169	$134
VDUs	No threshold	$340	$337	$369	$360	$489	$489	$505	$483	$342
	Threshold 1	$359	$355	$388	$379	$502	$502	$514	$501	$359
	Threshold 2	$363	$359	$392	$384	$506	$507	$516	$505	$363
	Threshold 3	$364	$361	$394	$385	$508	$508	$517	$507	$364
All	No threshold	$491	$388	$517	$406	$599	$477	$676	$597	$495
	Threshold 1	$600	$497	$629	$517	$710	$589	$731	$708	$600
	Threshold 2	$612	$509	$642	$530	$723	$602	$738	$722	$612
	Threshold 3	$620	$517	$649	$538	$731	$609	$742	$729	$620

Table J.2 Ranking of NPVs (benefits net of costs)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	104	98	78	78	52	52	35	54	103
	Threshold 1	95	86	74	74	39	39	30	43	96
	Threshold 2	91	85	71	71	37	37	28	42	92
	Threshold 3	89	84	69	69	57	57	27	41	90
Computers	No threshold	141	144	139	143	137	142	131	138	140
	Threshold 1	130	136	120	133	118	132	112	119	129
	Threshold 2	124	135	117	128	115	127	110	116	125
	Threshold 3	121	134	114	126	111	123	109	113	122
VDUs	No threshold	107	108	83	99	64	63	51	65	106
	Threshold 1	102	105	76	82	56	55	36	59	101
	Threshold 2	94	100	73	81	49	48	34	50	93
	Threshold 3	87	97	68	80	46	45	32	47	88
All	No threshold	62	77	31	67	22	66	10	23	61
	Threshold 1	21	60	13	29	8	24	3	9	20
	Threshold 2	16	44	12	26	6	19	2	7	17
	Threshold 3	14	33	11	25	4	18	1	5	15

Table J.3 Summary of BCRs

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	1.58	1.59	1.66	1.66	1.77	1.77	1.80	1.77	1.58
	Threshold 1	1.60	1.61	1.68	1.68	1.79	1.79	1.81	1.79	1.60
	Threshold 2	1.60	1.61	1.68	1.68	1.79	1.79	1.81	1.79	1.60
	Threshold 3	1.60	1.61	1.68	1.68	1.76	1.76	1.81	1.79	1.60
Computers	No threshold	1.02	0.95	1.08	1.00	1.08	1.01	1.26	1.08	1.03
	Threshold 1	1.31	1.26	1.42	1.36	1.37	1.32	1.43	1.36	1.31
	Threshold 2	1.36	1.31	1.48	1.42	1.41	1.37	1.46	1.41	1.36
	Threshold 3	1.38	1.33	1.51	1.45	1.44	1.40	1.47	1.43	1.38
VDUs	No threshold	1.49	1.49	1.56	1.55	1.65	1.66	1.69	1.64	1.50
	Threshold 1	1.53	1.53	1.60	1.59	1.68	1.70	1.71	1.68	1.53
	Threshold 2	1.54	1.54	1.61	1.60	1.69	1.71	1.71	1.69	1.54
	Threshold 3	1.55	1.55	1.62	1.61	1.69	1.71	1.71	1.69	1.55
All	No threshold	1.48	1.39	1.51	1.42	1.53	1.44	1.64	1.53	1.48
	Threshold 1	1.65	1.57	1.70	1.60	1.70	1.61	1.74	1.70	1.65
	Threshold 2	1.67	1.59	1.73	1.63	1.72	1.63	1.75	1.72	1.67
	Threshold 3	1.69	1.60	1.74	1.64	1.74	1.65	1.75	1.73	1.69

Table J.4 Ranking of BCRs

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	85	82	53	53	12	12	4	14	84
	Threshold 1	79	69	48	48	7	7	3	11	80
	Threshold 2	77	68	45	45	5	5	2	10	78
	Threshold 3	75	67	43	43	15	15	1	9	76
Computers	No threshold	141	144	138	143	137	142	135	139	140
	Threshold 1	133	136	115	127	124	131	113	126	132
	Threshold 2	128	134	106	116	118	125	109	119	129
	Threshold 3	122	130	101	110	112	120	108	114	123
VDUs	No threshold	104	103	87	89	57	52	41	61	102
	Threshold 1	97	95	72	81	42	34	29	47	96
	Threshold 2	94	92	65	74	37	30	27	40	93
	Threshold 3	90	88	64	70	35	28	26	36	91
All	No threshold	107	121	100	117	98	111	59	99	105
	Threshold 1	56	86	31	71	32	66	20	33	55
	Threshold 2	50	83	23	63	24	62	18	25	51
	Threshold 3	38	73	19	60	21	58	17	22	39

Table J.5 Incremental costs and benefits ($ millions, VDUs, threshold 3)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Total costs ($ millions)	2008/09	$0.47	$0.47	$0.35	$0.35	$0.35	$0.35	$0.50	$0.50	$0.47
	2010/11	$22.23	$21.97	$19.35	$19.08	$45.38	$27.94	$44.45	$45.47	$22.23
	2015/16	$56.93	$55.99	$54.04	$53.10	$69.49	$68.55	$68.59	$69.59	$56.93
	2030/31	$101.64	$102.47	$98.75	$99.59	$100.26	$101.09	$99.46	$100.35	$101.64
	Total (PV)	$668.01	$660.13	$638.57	$635.87	$733.38	$715.68	$724.68	$734.62	$668.03
incremental benefits ($ millions)	2008/09	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2010/11	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2015/16	$114.90	$110.93	$114.90	$110.93	$144.29	$140.24	$144.29	$144.29	$114.90
	2030/31	$197.50	$197.50	$197.50	$197.50	$197.50	$197.50	$197.50	$197.50	$197.50
	Total (PV)	$1,032.21	$1,021.01	$1,032.21	$1,021.01	$1,241.35	$1,223.74	$1,241.35	$1,241.35	$1,032.21
Sales (million units)	2008/09	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75
	2010/11	6.76	6.76	6.76	6.76	6.76	6.76	6.76	6.76	6.76
	2015/16	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94	6.94
	2030/31	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00	$8.00
	Total (PV)	166.19	166.19	166.19	166.19	166.19	166.19	166.19	166.19	166.19
Unit Costs ($/unit)	2008/09	$0.07	$0.07	$0.05	$0.05	$0.05	$0.05	$0.07	$0.07	$0.07
	2010/11	$3.29	$3.25	$2.86	$2.82	$6.71	$4.13	$6.57	$6.73	$3.29
	2015/16	$8.21	$8.07	$7.79	$7.66	$10.02	$9.88	$9.89	$10.03	$8.21
	2030/31	$12.71	$12.82	$12.35	$12.45	$12.54	$12.64	$12.44	$12.55	$12.71
	Total (PV)	$4.02	$3.97	$3.84	$3.83	$4.41	$4.31	$4.36	$4.42	$4.02
Unit Benefits ($/unit)	2008/09	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2010/11	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
	2015/16	$16.57	$15.99	$16.57	$15.99	$20.80	$20.22	$20.80	$20.80	$16.57
	2030/31	$24.70	$24.70	$24.70	$24.70	$24.70	$24.70	$24.70	$24.70	$24.70
	Total (PV)	$6.21	$6.14	$6.21	$6.14	$7.47	$7.36	$7.47	$7.47	$6.21

Appendix K Sensitivity analysis

Table K.1 NPVs assuming a discount rate of 3% ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$668	$673	$711	$711	$859	$859	$874	$858	$669
	Threshold 1	$677	$682	$721	$721	$869	$869	$879	$867	$677
	Threshold 2	$678	$682	$721	$721	$870	$870	$879	$868	$678
	Threshold 3	$678	$683	$722	$722	$855	$855	$879	$868	$678
Computers	No threshold	$68	$22	$107	$55	$115	$62	$223	$112	$74
	Threshold 1	$226	$179	$269	$217	$277	$223	$304	$274	$226
	Threshold 2	$244	$198	$287	$235	$295	$242	$314	$293	$244
	Threshold 3	$254	$207	$297	$245	$305	$251	$319	$303	$254
VDUs	No threshold	$652	$644	$694	$680	$848	$842	$873	$840	$655
	Threshold 1	$680	$672	$723	$709	$869	$863	$886	$868	$681
	Threshold 2	$686	$678	$729	$715	$875	$869	$889	$873	$686
	Threshold 3	$688	$680	$732	$717	$877	$871	$890	$876	$688
All	No threshold	$903	$764	$942	$793	$1,047	$889	$1,162	$1,044	$909
	Threshold 1	$1,066	$927	$1,109	$961	$1,215	$1,056	$1,246	$1,212	$1,067
	Threshold 2	$1,085	$946	$1,128	$980	$1,234	$1,075	$1,255	$1,231	$1,085
	Threshold 3	$1,096	$957	$1,140	$991	$1,245	$1,086	$1,261	$1,243	$1,096

Table K.2 NPVs assuming a discount rate of 11% ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$192	$195	$213	$213	$308	$308	$315	$307	$192
	Threshold 1	$196	$199	$217	$217	$312	$312	$317	$311	$196
	Threshold 2	$196	$200	$218	$218	$313	$313	$317	$312	$196
	Threshold 3	$196	$200	$218	$218	$306	$306	$317	$312	$196
Computers	No threshold	-$18	-$41	$1	-$26	$5	-$23	$56	$3	-$15
	Threshold 1	$57	$34	$78	$51	$82	$54	$95	$80	$57
	Threshold 2	$66	$43	$87	$60	$91	$63	$99	$89	$66
	Threshold 3	$70	$47	$91	$64	$95	$68	$102	$94	$70
VDUs	No threshold	$176	$175	$197	$192	$290	$294	$302	$286	$177
	Threshold 1	$189	$189	$210	$205	$300	$303	$308	$299	$190
	Threshold 2	$192	$192	$213	$208	$303	$306	$310	$302	$192
	Threshold 3	$193	$193	$214	$209	$304	$307	$310	$303	$193
All	No threshold	$269	$192	$288	$203	$351	$257	$406	$350	$272
	Threshold 1	$347	$269	$368	$283	$430	$336	$445	$429	$347
	Threshold 2	$356	$278	$377	$292	$440	$345	$450	$438	$356
	Threshold 3	$361	$283	$382	$297	$445	$350	$453	$444	$361

Table K.3 NPVs assuming PRO costs savings of 30% from administering both schemes ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$357	$360	$386	$386	$504	$504	$514	$504	$357
	Threshold 1	$363	$366	$392	$392	$511	$511	$517	$509	$363
	Threshold 2	$363	$367	$392	$392	$511	$511	$518	$510	$363
	Threshold 3	$363	$367	$393	$393	$502	$502	$518	$510	$363
Computers	No threshold	$11	-$22	$37	$0	$43	$5	$116	$41	$14
	Threshold 1	$116	$83	$145	$108	$151	$113	$169	$149	$116
	Threshold 2	$128	$95	$157	$120	$164	$125	$176	$162	$128
	Threshold 3	$134	$102	$164	$127	$170	$132	$179	$169	$134
VDUs	No threshold	$338	$337	$367	$360	$486	$489	$505	$481	$340
	Threshold 1	$357	$355	$386	$379	$500	$502	$514	$499	$357
	Threshold 2	$361	$359	$390	$384	$504	$507	$516	$503	$361
	Threshold 3	$362	$361	$392	$385	$506	$508	$517	$505	$362
All	No threshold	$489	$388	$515	$406	$597	$477	$676	$595	$493
	Threshold 1	$598	$497	$627	$517	$708	$589	$731	$706	$598
	Threshold 2	$610	$509	$639	$530	$721	$602	$738	$719	$610
	Threshold 3	$618	$517	$647	$538	$729	$609	$742	$727	$617

Table K.4 NPVs assuming PRO cost savings of 50% from administering both schemes ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$357	$360	$386	$386	$504	$504	$514	$504	$357
	Threshold 1	$363	$366	$392	$392	$511	$511	$517	$509	$363
	Threshold 2	$363	$367	$392	$392	$511	$511	$518	$510	$363
	Threshold 3	$363	$367	$393	$393	$502	$502	$518	$510	$363
Computers	No threshold	$11	-$22	$37	$0	$43	$5	$116	$41	$14
	Threshold 1	$116	$83	$145	$108	$151	$113	$169	$149	$116
	Threshold 2	$128	$95	$157	$120	$164	$125	$176	$162	$128
	Threshold 3	$134	$102	$164	$127	$170	$132	$179	$169	$134
VDUs	No threshold	$342	$337	$371	$360	$491	$489	$505	$485	$344
	Threshold 1	$361	$355	$390	$379	$504	$502	$514	$504	$361
	Threshold 2	$365	$359	$394	$384	$509	$507	$516	$507	$365
	Threshold 3	$366	$361	$396	$385	$510	$508	$517	$509	$366
All	No threshold	$493	$388	$519	$406	$601	$477	$676	$599	$497
	Threshold 1	$602	$497	$631	$517	$713	$589	$731	$711	$602
	Threshold 2	$614	$509	$644	$530	$726	$602	$738	$724	$614
	Threshold 3	$622	$517	$651	$538	$733	$609	$742	$731	$622

Table K.5 NPVs assuming a willingness to pay of $18.18/unit ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$221	$224	$250	$250	$342	$342	$352	$342	$221
	Threshold 1	$227	$230	$256	$256	$349	$349	$355	$347	$227
	Threshold 2	$227	$231	$257	$257	$349	$349	$355	$348	$227
	Threshold 3	$227	$231	$257	$257	$340	$340	$355	$348	$227
Computers	No threshold	-$58	-$79	-$31	-$57	-$35	-$60	$37	-$37	-$54
	Threshold 1	$48	$26	$77	$51	$73	$48	$91	$71	$48
	Threshold 2	$60	$39	$89	$63	$85	$60	$97	$84	$60
	Threshold 3	$66	$45	$96	$70	$92	$67	$101	$90	$66
VDUs	No threshold	$196	$194	$224	$217	$315	$317	$331	$309	$197
	Threshold 1	$214	$212	$243	$236	$328	$331	$340	$328	$215
	Threshold 2	$218	$216	$248	$241	$333	$335	$342	$331	$218
	Threshold 3	$220	$218	$249	$242	$334	$337	$343	$333	$220
All	No threshold	$278	$195	$304	$213	$357	$260	$434	$355	$282
	Threshold 1	$387	$304	$416	$325	$469	$371	$490	$467	$387
	Threshold 2	$399	$317	$429	$338	$482	$384	$496	$480	$399
	Threshold 3	$407	$324	$436	$345	$489	$392	$500	$488	$406

Table K.6 NPVs assuming a willingness to pay of $23.68/unit/% ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$473	$477	$502	$502	$644	$644	$654	$643	$474
	Threshold 1	$479	$483	$509	$509	$650	$650	$656	$649	$479
	Threshold 2	$480	$483	$509	$509	$650	$650	$657	$649	$480
	Threshold 3	$480	$484	$509	$509	$641	$641	$657	$649	$480
Computers	No threshold	$69	$27	$96	$49	$111	$61	$183	$108	$73
	Threshold 1	$174	$132	$203	$156	$218	$169	$237	$216	$175
	Threshold 2	$187	$144	$216	$169	$231	$181	$243	$229	$187
	Threshold 3	$193	$150	$222	$175	$237	$188	$246	$236	$193
VDUs	No threshold	$464	$459	$493	$483	$638	$636	$654	$632	$466
	Threshold 1	$483	$478	$512	$502	$651	$649	$663	$651	$483
	Threshold 2	$487	$482	$516	$506	$656	$654	$665	$654	$487
	Threshold 3	$488	$484	$518	$508	$657	$655	$666	$656	$488
All	No threshold	$674	$553	$700	$571	$806	$664	$883	$804	$678
	Threshold 1	$783	$662	$812	$683	$918	$776	$939	$916	$783
	Threshold 2	$795	$674	$824	$696	$931	$788	$945	$929	$795
	Threshold 3	$802	$682	$832	$703	$938	$796	$949	$936	$802

Table K.7 NPVs assuming 100% kerbside pickup ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$284	$303	$313	$313	$428	$428	$438	$427	$285
	Threshold 1	$290	$309	$320	$320	$434	$434	$441	$433	$290
	Threshold 2	$291	$310	$320	$320	$435	$435	$441	$434	$291
	Threshold 3	$291	$310	$320	$320	$425	$425	$441	$434	$291
Computers	No threshold	-$13	-$31	$14	-$18	$16	-$17	$88	$14	-$9
	Threshold 1	$93	$74	$122	$90	$124	$91	$142	$122	$93
	Threshold 2	$105	$87	$134	$102	$136	$103	$148	$134	$105
	Threshold 3	$111	$93	$140	$109	$143	$110	$152	$141	$111
VDUs	No threshold	$252	$268	$281	$274	$394	$397	$411	$389	$254
	Threshold 1	$271	$287	$300	$294	$408	$410	$420	$407	$271
	Threshold 2	$275	$291	$304	$298	$412	$415	$422	$411	$275
	Threshold 3	$276	$292	$306	$299	$414	$416	$423	$413	$276
All	No threshold	$361	$288	$388	$282	$455	$339	$532	$453	$366
	Threshold 1	$470	$397	$499	$394	$567	$450	$588	$565	$471
	Threshold 2	$483	$410	$512	$406	$580	$463	$594	$578	$483
	Threshold 3	$490	$417	$520	$414	$587	$471	$598	$585	$490

Table K.8 NPVs assuming that televisions weigh 25.00 kg and computers (desktops and laptops only) weigh 7.47 kg ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$828	$832	$857	$857	$1,067	$1,067	$1,077	$1,066	$829
	Threshold 1	$834	$838	$864	$864	$1,073	$1,073	$1,080	$1,072	$834
	Threshold 2	$835	$838	$864	$864	$1,074	$1,074	$1,080	$1,073	$835
	Threshold 3	$835	$839	$864	$864	$1,064	$1,064	$1,080	$1,073	$835
Computers	No threshold	$247	$175	$274	$197	$315	$231	$387	$313	$251
	Threshold 1	$353	$280	$382	$305	$423	$339	$441	$421	$353
	Threshold 2	$365	$293	$394	$318	$436	$351	$448	$434	$365
	Threshold 3	$371	$299	$401	$324	$442	$358	$451	$440	$371
VDUs	No threshold	$842	$833	$870	$856	$1,092	$1,083	$1,108	$1,086	$843
	Threshold 1	$860	$851	$889	$875	$1,105	$1,097	$1,117	$1,105	$861
	Threshold 2	$864	$855	$894	$880	$1,110	$1,101	$1,119	$1,108	$864
	Threshold 3	$866	$857	$895	$881	$1,111	$1,103	$1,120	$1,110	$866
All	No threshold	$1,230	$1,056	$1,256	$1,074	$1,437	$1,232	$1,513	$1,435	$1,234
	Threshold 1	$1,339	$1,165	$1,368	$1,185	$1,548	$1,343	$1,569	$1,546	$1,339
	Threshold 2	$1,352	$1,177	$1,381	$1,198	$1,561	$1,356	$1,576	$1,559	$1,352
	Threshold 3	$1,359	$1,184	$1,388	$1,206	$1,569	$1,364	$1,580	$1,567	$1,359

Table K.9: NPVs assuming linear willingness to pay before recycling reaches 50% ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$555	$559	$584	$584	$642	$642	$652	$642	$556
	Threshold 1	$561	$565	$591	$591	$649	$649	$655	$647	$561
	Threshold 2	$562	$565	$591	$591	$649	$649	$655	$648	$562
	Threshold 3	$562	$565	$591	$591	$640	$640	$656	$648	$562
Computers	No threshold	$122	$96	$149	$118	$151	$131	$224	$149	$126
	Threshold 1	$228	$201	$257	$226	$259	$239	$277	$257	$228
	Threshold 2	$240	$214	$269	$238	$272	$251	$284	$270	$240
	Threshold 3	$246	$220	$276	$245	$278	$258	$287	$277	$246
VDUs	No threshold	$575	$558	$603	$581	$653	$645	$669	$648	$576
	Threshold 1	$593	$576	$622	$600	$667	$659	$679	$666	$594
	Threshold 2	$597	$580	$627	$604	$671	$663	$680	$670	$597
	Threshold 3	$599	$582	$628	$606	$672	$665	$681	$671	$599
All	No threshold	$750	$702	$776	$720	$848	$804	$925	$846	$754
	Threshold 1	$859	$811	$887	$831	$959	$915	$980	$957	$859
	Threshold 2	$871	$823	$900	$844	$972	$928	$987	$971	$871
	Threshold 3	$878	$830	$908	$852	$980	$936	$991	$978	$878

Table K.10 NPVs assuming collection cost savings of 20% when recycling reaches 70% due to economies of scale ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$384	$387	$413	$412	$536	$532	$546	$535	$385
	Threshold 1	$390	$393	$420	$419	$542	$538	$549	$541	$390
	Threshold 2	$391	$394	$420	$419	$543	$539	$549	$542	$391
	Threshold 3	$391	$394	$420	$419	$533	$529	$549	$542	$391
Computers	No threshold	$26	-$8	$53	$14	$62	$19	$135	$60	$30
	Threshold 1	$132	$97	$161	$121	$170	$127	$189	$168	$132
	Threshold 2	$144	$109	$173	$134	$183	$140	$195	$181	$144
	Threshold 3	$150	$115	$180	$140	$189	$146	$198	$188	$150
VDUs	No threshold	$371	$366	$399	$389	$524	$519	$540	$519	$372
	Threshold 1	$389	$385	$418	$409	$538	$533	$549	$537	$390
	Threshold 2	$393	$389	$423	$413	$542	$537	$551	$541	$393
	Threshold 3	$395	$390	$424	$414	$543	$538	$552	$542	$395
All	No threshold	$534	$428	$561	$446	$650	$519	$726	$647	$538
	Threshold 1	$643	$537	$672	$558	$761	$631	$782	$759	$643
	Threshold 2	$656	$550	$685	$571	$774	$644	$789	$772	$656
	Threshold 3	$663	$557	$692	$578	$782	$651	$792	$780	$663

Table K.11 NPVs assuming reprocessing cost savings due to economies of scale ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$435	$436	$464	$463	$591	$590	$601	$590	$435
	Threshold 1	$441	$442	$470	$469	$597	$596	$604	$596	$441
	Threshold 2	$441	$443	$471	$470	$598	$597	$604	$596	$441
	Threshold 3	$441	$443	$471	$470	$588	$587	$604	$597	$441
Computers	No threshold	$59	$19	$86	$42	$100	$53	$172	$97	$63
	Threshold 1	$165	$124	$194	$150	$207	$161	$226	$205	$165
	Threshold 2	$177	$137	$206	$163	$220	$174	$232	$218	$177
	Threshold 3	$183	$143	$213	$169	$226	$180	$235	$225	$183
VDUs	No threshold	$428	$420	$457	$446	$588	$584	$604	$583	$430
	Threshold 1	$447	$439	$476	$465	$602	$598	$613	$601	$447
	Threshold 2	$451	$443	$480	$469	$606	$602	$615	$605	$451
	Threshold 3	$452	$445	$482	$471	$607	$604	$616	$606	$452
All	No threshold	$618	$505	$644	$526	$742	$612	$819	$740	$622
	Threshold 1	$727	$614	$756	$637	$853	$723	$874	$851	$727
	Threshold 2	$739	$626	$769	$650	$866	$736	$881	$865	$739
	Threshold 3	$747	$634	$776	$658	$874	$744	$885	$872	$747

Note: Reprocessing costs are estimated to be $700/tonne, comprised of $500/tonne for labour and $200 for overheads. When reprocessing reaches 20%, overheads are assumed to reduce to $140/tonne (total reprocessing costs of $640/tonne) and when reprocessing reaches 70%, overheads are assumed to reduce to $60/tonne (total reprocessing costs of $560/tonne).

Table K.12.NPVs excluding survey drop outs - WTP of $24.50 per unit sold ($ millions, discounted, 2009 dollars)

		Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
TVs	No threshold	$511	$515	$540	$540	$689	$689	$698	$688	$511
	Threshold 1	$517	$521	$546	$546	$695	$695	$701	$694	$517
	Threshold 2	$517	$521	$547	$547	$695	$695	$702	$694	$517
	Threshold 3	$517	$521	$547	$547	$686	$686	$702	$694	$517
Computers	No threshold	$88	$42	$114	$64	$132	$79	$205	$130	$92
	Threshold 1	$193	$148	$222	$172	$240	$187	$258	$238	$194
	Threshold 2	$206	$160	$235	$185	$253	$199	$265	$251	$206
	Threshold 3	$212	$166	$241	$191	$259	$206	$268	$258	$212
VDUs	No threshold	$504	$499	$533	$523	$686	$683	$702	$680	$506
	Threshold 1	$523	$518	$552	$542	$700	$697	$711	$699	$523
	Threshold 2	$527	$522	$556	$546	$704	$701	$713	$703	$527
	Threshold 3	$528	$523	$558	$547	$705	$703	$714	$704	$528
All	No threshold	$733	$606	$759	$624	$873	$724	$950	$871	$737
	Threshold 1	$842	$715	$871	$736	$985	$836	$1,005	$983	$842
	Threshold 2	$854	$728	$883	$749	$998	$849	$1,012	$996	$854
	Threshold 3	$862	$735	$891	$756	$1,005	$856	$1,016	$1,003	$861

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