Economic Aspects of the Zero Waste SA Strategy Review

A report to

Zero Waste SA

Prepared by

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In association with

RWA resources and waste advisory group

and

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ABBREVIATIONS

ABS	Australian Bureau of Statistics
BCR	Benefit Cost Ratio
CBA	Cost Benefit Analysis
C&D	Construction and Demolition
DC	District Council
NPV	Net Present Value

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EXECUTIVE SUMMARY

Zero Waste SA (ZWSA) is undertaking a review of *South Australia's Waste Strategy 2011 – 2015* (the Strategy 2011-2015) and has commissioned consultants to assist with this task. The review focuses on understanding and analysing South Australia's waste strategy and programs, reviewing international best practice, identifying critical needs for the next strategy period, and assessing institutional delivery options to meet these needs. The consultants' work will culminate in the production of a specific review report for ZWSA. An important component of reviewing the South Australian waste strategy is to provide an understanding of the economic dimension of the strategy which will, in turn, help articulate and clarify the case for allocation of public funds to the sector.

This paper presents the method and results of the required economic tasks as stated in the project's revised *Statement of Requirements* for the project, set by Zero Waste SA. The detailed economic analysis provided in this report has been incorporated in a summarised form in the review report, *Review of South Australia's Waste Strategy 2011-2015*. Specifically the economic analysis required by ZWSA was to:

a. Evaluate the economic results of a minimum of seven programs (or equivalent) in the current and previous ZWSA Business Plans, and identify the direct and indirect contribution from these activities to the waste management and resource recovery industry sectors using data / multipliers for different recycled material types

b. Quantify and interpret the direct and indirect (flow-on effects) economic contribution of the waste management[1] and the resource recovery[2] industry sectors in South Australia which includes:

   - capital, revenue, expenses and employment
   - direct and indirect contribution to Gross State Product (including multipliers)
   - direct and indirect impacts on exports and imports (state boundaries)

   and derive performance indicators from these data allowing comparison with other jurisdictions (nationally or internationally, where available) as a measure of the effectiveness of the South Australian Waste Strategy.

With respect to Task a, cost benefit analyses (CBAs) were undertaken of the following ZWSA projects and programs:

- Three funded projects from the Regional Infrastructure Investment Program
  - Wattle Range Council Resource Recovery Facilities
  - District Council of Cleve Waste Transfer and Recycling Facility

[1] ANZSIC Classification 29-Waste Collection, Treatment and Disposal Services.

[2] ANZSIC Classification 2922-Waste Remediation and Materials Recovery Services.

    - Regional construction and demolition (C&D) resource recovery facility
- Resource efficiency assessment component of the Industry Program
- Facilitation of kerbside recycling incorporating the Kerbside Performance Incentives Program, Kerbside Performance Incentives Plus Program and the *Recycle Right* program.

The Regional Infrastructure Investment Program projects' cost benefit analyses (three case studies out of 109 projects funded) showed a range of results, as can be expected from the diversity of projects funded; a Net Present Value of $0 in the Wattle Range Council case study, a modest NPV (approximately $19,000) for the District Council of Cleve case study and a substantial NPV ($3.4 million) for the regional construction and demolition resource recovery facility case study. All projects contributed towards landfill waste diversion, and the Cleve facility supported proposed rationalisation of waste collection services in the region. This contributes to a number of potential environmental, social and economic benefits.

The results of the Industry Program CBA indicate that ZWSA's investment in resource efficiency assessments (i.e. capacity building) in 24 manufacturing and service companies would generate significant net benefits to the South Australian community of approximately $7.8 million. Expressed in terms of annual net benefits, this equates to around $560,000 per year. For every dollar invested $6.70 is returned in operational cost savings.

The results of the CBA for this project are conservative as they do not take into account potential benefits (e.g. cost savings) accruing to users of recycled materials; from the survey it was estimated that an additional 680 tonnes of waste was diverted from landfill annually for reuse. Furthermore, there are unpriced environmental benefits from resource use efficiency and avoided emissions. For example, from the survey sample of 24 companies, 6,906MWh of electricity (16% reduction), 1652GJ of natural gas (2% reduction) and 341ML of fuel (reduction of 14%) were saved annually as a result of implementing the audits' recommendations.

The results of ZWSA's facilitation of kerbside recycling in metropolitan councils (Kerbside Performance Incentives Program, Kerbside Performance Incentives Plus Program and the *Recycle Right* program) indicate that this investment would generate significant net benefits to the South Australian community of approximately $22.1 million. Expressed in terms of annual net benefits, this equates to around $1.6 million per year. For every dollar invested $2.60 is returned in kerbside collection cost savings. This analysis used conservative assumptions, and there are potentially significant future benefits that have not been included, through more widespread placing of food waste in the organics stream (initiated through the Kerbside Waste Incentives Plus Program) and through potential cost savings through reduced contract prices for dry recyclables collection.

The waste management industry overall is shown to be an important contributor to the South Australian economy. Results of a macro-economic analysis of the industry reveal:

- Gross industry turnover of an estimated $1,020 million[3]
- Value added by the industry in 2011-12 was $280 million, or $504 million once multiplier effects are taken into account (equivalent to 0.58% of Gross State Product)
- Waste management services are provided directly by private sector firms and local government authorities operating within the waste management sector and also by industrial sectors that provide their own services
- Contributions by these sectors to GSP are 0.38%, 0.07% and 0.13% respectively, indicating that local government is responsible for only 12% of economic activity in this area
- Employment is estimated to be 2,900 jobs, or 3,100 when measured as full-time equivalents (FTE) and with multiplier effects an estimated 4,700 jobs in total or 4,800 FTE, of which less than 20% is generated through local government.

The figures reveal the relatively modest economic significance of the local government component of waste management activity. However, the complexity of the local government component, reflected in a highly diffuse material source and wide variety of material types that have relatively low monetary value, gives rise to the relatively high level of effort and resources that are put into managing the municipal waste flow.

Table ES1 (overleaf) places the significance of the waste management and resource recovery industry into perspective. For example, the waste and resources recovery industry has a direct contribution to Gross State Product similar to that of the air transport industry and substantially greater than the fishing and aquaculture and renewable electricity generation industries. In terms of employment, the waste and resources recovery industry is on a par with the water industry and is significantly larger than air transport, fishing and aquaculture, and the combined (fossil fuel and renewable) electricity generation sectors.

[3] This figure includes some elements of double counting and in this sense may overstate the size of the industry. For example, rate income to local government to pay for waste management services is included as local government revenue and payments by local government to waste management companies is included as private sector income.

Table ES1 Relative scale of the waste management and resources recovery industry compared to other sectors of the economy, 2011/12

Sector	Direct contribution to GSP ($ million)	Direct employment (FTE)
Waste and resources recovery [a]	280	3,100
Water	550	3,100
Air transport	290	1,700
Accommodation	600	6,000
Fishing and aquaculture	210	1,800
Fossil fuel electricity generation	330	850
Other electricity generation [b]	100	250

[a] Includes waste management services provided directly by private sector firms and local government authorities operating within the waste management sector and also by industrial sectors that provide their own waste management services. The latter component was estimated using ABS (2013a) experimental estimates adjusted at the state level. This adjustment process may mean that the estimates do not include all production activities involving the use of recovered materials.

[b] Includes biomass, geothermal, solar, tidal and wind.

Based on ABS employment data, the resource recovery part of the sector was estimated to generate around 1,440 FTE jobs and 2,200 when multiplier effects are included. This represents approximately 45% of the waste and resources recovery sector's total employment. In terms of Gross State Product, around $125 million directly, and almost $230 million in total, are generated by the resource recovery sector. It should be noted that these estimates do not include all activities involving the use of recovered and recycled materials and therefore almost certainly understate the size and significance of the sector to the South Australian economy.

The analysis of economic contribution of the waste industry to the state economy has relied heavily on the Australian Bureau of Statistics (ABS) publication *Waste Account, Australia, Experimental Estimates* (ABS 2013a). This publication provides a series of experimental tables showing information on the generation and disposal of waste to landfills or to recycling facilities, the supply of recycled materials in the economy and related financial flows. The methodologies and data used in this publication will be reviewed and assessed by the ABS over time to improve the quality and usefulness of information provided in future waste accounts. It is a recommendation of this report that ZWSA engage with the ABS in this review process so that the data will provide a clear and transparent indication of waste industry activity across *all* sectors of the economy at the state level, particularly in the value of recoverable and recyclable materials.

1. INTRODUCTION

Zero Waste SA (ZWSA) is undertaking a review of *South Australia's Waste Strategy 2011 – 2015*[4] and has commissioned consultants to assist with this task. The review focuses on understanding and analysing South Australia's waste strategy and programs, reviewing international best practice, identifying critical needs for the next strategy period, and assessing institutional delivery options to meet these needs. The consultants' work will culminate in the production of a specific report to ZWSA. An important component of reviewing the South Australian waste strategy is to provide an understanding of the economic dimension of the strategy which will, in turn, help articulate and clarify the case for allocation of public funds to the sector. The Cost Benefit Analysis (CBA) carried out for the last strategy period[5] showed a modest net incremental benefit.

This paper presents the method and results for completing the required economic tasks as stated in the project's revised *Statement of Requirements* set by ZWSA for the review project. The detailed economic analysis provided in this report has been incorporated in a summarised form in the *Review of South Australia's Waste Strategy 2011-2015*. Specifically the economic analysis required by ZWSA was to:

a. Evaluate the economic results of a minimum of seven programs (or equivalent) in the current and previous ZWSA Business Plans[6], and identify the direct and indirect contribution from these activities to the waste management and resource recovery industry sectors using data / multipliers for different recycled material types

b. Quantify and interpret the direct and indirect (flow-on effects) economic contribution of the waste management[7] and the resource recovery[8] industry sectors in South Australia which includes:

   - capital, revenue, expenses and employment
   - direct and indirect contribution to Gross State Product (GSP)including multipliers
   - direct and indirect impacts on exports and imports (state boundaries)

   and derive performance indicators from this data allowing comparison with other jurisdictions (nationally or internationally, where available) as a measure of the effectiveness of the South Australian Waste Strategy.

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[4] http://www.zerowaste.sa.gov.au/resource-centre/publications/waste-strategy

[5] South Australia's Waste Strategy 2005-2010 Benefit Cost Assessment Volume 1: Summary Report. MMA and BDA Group, for ZSWA. 2007. Note: EconSearch were also involved in the preparation of this report.

[6] http://www.zerowaste.sa.gov.au/About-Us/business-plan.

[7] ANZSIC Classification 29-Waste Collection, Treatment and Disposal Services.

[8] ANZSIC Classification 2922-Waste Remediation and Materials Recovery Services.

Section 2 provides an overview of the Cost Benefit Analysis (Section 2.1) and the Economic Impact Analysis (Section 2.2).

Detailed CBAs are provided for the Regional Infrastructure Investment Program (Section 3), the Industry Program (Section 4) and ZWSA's Facilitation of Kerbside Performance Incentives programs (Section 5).

Section 6 discusses the estimated contribution of the waste management and the resource recovery industry sectors to the South Australian economy.

2. METHOD OF ANALYSIS

2.1 Economic Evaluation of ZWSA Programs

This task aims to understand the economic contribution that ZWSA programs have made to the waste and recycling sector, and in turn, to the South Australian economy. Essentially, the outcome of the task was to demonstrate the return on investment that programs have achieved.

2.1.1 Data

As set out in its annual business plans, ZWSA undertakes a diverse range of programs and activities and, due to budget limitations, it was not possible to analyse all of these. Therefore, an important step in the evaluation was deciding with ZWSA on which programs to analyse. An initial meeting was held with ZWSA to identify the programs to be assessed and:

- Identify reference material that contains relevant data and information about the projects
- Obtain contact details of program leaders and industry representatives who would be in a position to assist with data and assumptions for the analysis, and
- Discuss the need for additional information.

For each program, information and data gaps were identified in relation to:

- Time profile of expenditure / funding related to each program and associated information products
- Capital and operating costs associated with industry adoption (where relevant)
- Existing capital, operating, maintenance and other relevant costs in the production systems that are the target of the research projects
- Production returns and net margins in the same target production systems
- Current resource conditions, and
- Potential environmental and social impacts from changes to resource conditions arising from each program.

Where data gaps were identified they were addressed, where possible, by consulting with the program leaders and industry representatives who have knowledge of the program and / or technology and key industry organisations. Rawtec (a resource efficiency assessment service provider) and other team members assisted EconSearch in this process.

2.1.2 Method

The CBAs conducted for this assignment were undertaken according to the principles and method outlined in:

- The Commonwealth Government's *Introduction to Cost-Benefit Analysis and Alternative Evaluation Methodologie*s (Department of Finance and Administration 2006a)
- The Commonwealth Government's *Handbook of Cost-Benefit Analysis* (Department of Finance and Administration 2006b).

The key characteristics of the CBA method employed in this study include the following.

- The CBA includes a base case or counterfactual scenario, that is, the benchmark against which the 'with ZWSA investment' scenario was compared. The base case was defined as what would have occurred without ZWSA investment.
- The CBA was conducted over a 30 year time period and results were expressed in terms of net benefits, that is, the incremental benefits and costs of the 'with ZWSA investment' scenario relative to those generated by the base case scenario[9].
- Costs and benefits were specified in real terms (i.e. constant 2013 dollars). Past and future values were converted to present values by applying a discount rate of 6.0%.
- In order to account for uncertainty, sensitivity analysis was undertaken using a range of values for key variables.
- The evaluation criteria employed in the analysis is Net Present Value (NPV)[10] and Benefit-Cost Ratio (BCR)[11].
- For the CBA, costs and benefits for both the 'with ZWSA investment ' and 'without ZWSA investment' scenarios have been listed in tabular form and include those that can be readily identified and valued in monetary terms as well as those which cannot be easily valued in monetary terms because of the absence of market signals. The tables provide an indication of the likely distribution of the costs and benefits between stakeholder groups and the source of the information.

[9] Where incremental benefits = ('with ZWSA' benefits – 'without ZWSA' benefits) and incremental costs = ('with ZWSA' costs – 'without ZWSA' costs).

[10] NPV was defined as discounted net benefits, where net benefits = (incremental benefits – incremental costs).

[11] BCR was defined as: discounted incremental operational savings/discounted incremental net investment.

2.2 Contribution of Waste Sector to South Australian Economy

2.2.1 Data

In 2013 EconSearch prepared a set of updated South Australian input-output tables (RISE models) for the Department of Premier and Cabinet which was used to estimate the contribution of the waste sector to the South Australian economy. The industry specification in the RISE model includes, as a separate sector, Subdivision 29 (*Waste Collection, Treatment and Disposal Services*) as defined in the Australian and New Zealand Standard Industrial Classification (ANZSIC) 2006[12] (see Appendix 1).

The input-output database was compiled for 2011-12, the latest year for which data required for the database were available (e.g. State Accounts, which form part of the ABS National Accounts). This database, already compiled, collated and held in-house by EconSearch, allowed for ready quantification of the waste management industry's contribution to the South Australian economy.

The current RISE model database enables estimation for Subdivision 29 in 2011-12 of:

- Gross output (revenue)
- Expenses - materials and services incurred in South Australia by industry sector
- Direct contribution to Gross State Product derived from the aggregation of three separate measures for Subdivision 29 in the RISE database, namely
    - Compensation of employees (household income)
    - Gross operating surplus and gross mixed income and
    - Indirect taxes less subsidies
- Expenditure on materials and services imported into South Australia (imports), and
- Revenue generated from the sales of goods and services to end-users outside South Australia (exports).

In addition to Subdivision 29 (private companies involved in the provision of waste management services), the Australian Bureau of Statistics (2011, 2013a) has described how some waste management services are provided by local government administration (ANZSIC Class 7530 in Subdivision 75 - Public Administration) and some by non-waste management businesses, mostly by the construction industry but also by transport, wholesale, manufacturing, mining, retail and other industries.

It is important to note that some key businesses that process / manufacture waste material into a product or feedstock material suitable for other business inputs (composting, plastics

12 http://www.abs.gov.au/AUSSTATS/abs@.nsf/bb8db737e2af84b8ca2571780015701e/3A307F67B0D461DDCA25697E0018FC9D?opendocument

recycling, and scrap steel processing) are not represented in Subdivision 29. These businesses are represented in a range of other ANSIC sectors (e.g. manufacturing) and, as described below, their contribution to the industry was estimated using ABS (2013a) experimental estimates adjusted at the state level. This adjustment process may mean that the estimates do not include all production activities involving the use of recovered materials. Their inclusion would almost certainly augment the size and significance of the sector to the South Australian economy.

2.2.2 Method

The extended definition of the waste sector (beyond Subdivision 29) means that the process of generating industry multipliers and estimating the economic contribution of the industry to the state economy is not a straightforward one. The following steps outline the broad approach to the task.

- ABS (2011, 2013a) provided financial data for Subdivision 29 and waste management activities for the general government sector for 2009-10. These data, available at the state level, included number of establishments, revenue by source, expenses by category and employment.
- Income for waste management services generated by non-waste management businesses was provided in ABS (2013a) on an industry basis but only for Australia as a whole. The South Australian share of national activity was estimated for each industry on the basis of the South Australian industry's share of the national industry's total value added (ABS 2012).
- Based on data provided in Rawtec (2013)[13], no changes were made to resource recovery activity levels between 2009-10 and 2011-12, although dollar values for 2009-10 were inflated to 2011-12 dollars using relevant price indices. The value of economic activity by industrial sectors that provide their own waste management services was estimated and apportioned across industries outside of Subdivision 29 using ABS (2013a) experimental estimates adjusted at the state level. The attribution and adjustment process means that the final estimates of economic contribution by the waste management sector may not include all production activities involving the use of recovered materials, particularly the value of recoverable and recyclable materials outside of Subdivision 29 and waste management activities of local government[14].
- The disaggregation of ANZSIC Subdivision 29 into (i) Class 2922 (Waste Remediation

[13] Unpublished report.

[14] ABS (2013a) provides a series of experimental tables showing information on the generation and disposal of waste to landfills or to recycling facilities, the supply of recycled materials in the economy and related financial flows. The methodologies and data used in this publication will be reviewed and assessed by the ABS over time to improve the quality and usefulness of information provided in future waste accounts. It is a recommendation of this report that ZWSA engage with the ABS in this review process so that the data provide a clear and transparent indication of waste industry activity across *all* sectors of the economy at the state level, particularly in the value of recoverable and recyclable materials.

and Materials Recovery Services) and (ii) Group 291 + Class 2921 (Waste Collection, Treatment and Disposal Services) was made on the basis of employment ratios.

- Using the disaggregated data, the application of the RISE model enabled calculation of specific sector multipliers relating to the different program / material / service types and quantification of the waste management industry's contribution to the South Australian economy. These impacts were measured in terms of
    - Employment (total jobs and full-time equivalents)
    - Gross State Product
    - Household income.

3. REGIONAL INFRASTRUCTURE INVESTMENT PROGRAM COST BENEFIT ANALYSIS

3.1 Background

ZWSA's regional infrastructure activities aim to help regions to implement waste reforms in a pro-active manner. Through this program, ZWSA provides financial support for infrastructure investment to enhance resource recovery of materials from country areas. ZWSA has funded regional waste management plans that are used to guide improvements on a regional basis.

The program was reviewed in 2009-10, is subject to continuous improvement in response to reviews, and is strongly supported by regional councils. To date the program has allocated over $7.45 million to 109 regional infrastructure improvements. More recently it has contributed seed funding to support regional waste coordinators.

Infrastructure requires considerable time to obtain development and other approvals. Despite recent developments in local government to work within strategic documents such as long term financial plans and asset management plans, most applicants from this sector still seek funding from ZWSA before consolidating their own council budgets and proceeding with their projects. Hence the grants act as a catalyst to progressing infrastructure improvements.

The regional program supports a wide array of projects, including proposals for new or upgraded transfer stations, the installation of balers, the expansion or creation of recycling facilities, and even mobile balers for use across multiple facilities. The program has broad appeal to local government, not-for-profit community groups and industry.

In total, 109 individual regional investment projects have been supported since 2005. Three such projects were selected for economic analysis. These were selected from groupings that took geographical spread and facility type into consideration, while remaining uninfluenced by other factors. The three projects were:

- Wattle Range Council Resource Recovery Facilities
- District Council of Cleve Waste Transfer and Recycling Facility
- regional construction and demolition resource recovery facility.

3.2 Wattle Range Council Project Description

In 2006 Wattle Range Council planned for resource recovery facilities on Council land in Millicent, Penola and Beachport. The Council encountered some obstacles with gaining planning approval and as a result the planned Beachport facility did not go ahead. The actual

project cost of the Millicent and Penola facilities was $2.76m. These sites, commissioned in July 2011, receive hard refuse, organic waste, scrap metal and bulky items from the public[15]. Materials received are placed into large receptacles and then transported to Mount Gambier for resource recovery.

The key impetus behind this project was that the local landfill was due to close in 2010. At the time Council operated a number of smaller resource recovery facilities including two composting depots (Glencoe, South End) and five transfer stations (Mount Burr, Tantanoola, Kalangadoo, Furner and Beachport). Waste and / or recyclables from these sites were transported to Mount Gambier for resource recovery and / or landfill disposal using 3.0m^3 bins. The costs associated with collecting these relatively small bins on a regular basis from across the district would have been high.

Through this project Council was able to rationalise to two resource recovery sites (down from seven). Waste and recyclables received at these two sites are aggregated and placed into larger bins (40m^3) for transport to Mount Gambier resulting in lower collection and transport costs. The Council was also able to increase resource recovery from 300 tonnes to 894 tonnes in the first year (based on a performance report submitted to ZWSA).

ZWSA provided $150,000 (excl. GST) in funding toward the project through its Regional Infrastructure Investment Program.

3.3 Base Case

As the closure of the local landfill site was a clear driver for improved waste transfer facilities, it was expected that these facilities would have gone ahead without ZWSA financial support. It was expected that it was likely that the project would have been delayed and may have been designed differently and may not have achieved the same levels of resource recovery. Discussions with Frank Brennan[16] (CEO of Wattle Range Council during planning and implementation of the project) indicated that the project would have gone ahead as planned without any delay if ZWSA funding had not been secured.

3.4 Results of Analysis of Wattle Range Project

As the 'with ZWSA investment' is the same as the 'without ZWSA investment' scenario, the incremental costs and benefits are zero and hence the NPV for this project is also zero.

[15] Kerbside recycling collection is also provided to residents by Council for dry comingled recyclables, and these items do not come through the waste transfer station

[16] November 2013

3.5 District Council of Cleve Project Description

In 2006 the District Council (DC) of Cleve planned a transfer station and recycling facility at Cleve. The total project cost was approximately $525,000. This site was commissioned in 2010-11 and receives recyclables from the public[17], as well as commercial and industrial (C&I) and construction and demolition (C&D) waste from businesses in the region. Local residents and businesses can drop off their recyclables at this facility free of charge. These materials are then baled before being transported to other regional centres or Adelaide for resource recovery.

This new facility replaced existing transfer stations at Cleve, Darke Peak, Arno Bay and Rusdall which collected, processed and stored materials for transport to a landfill elsewhere. It also replaced the use of the Council depot for recycling, which was not suitable for baled products and had very limited undercover sorting. This project provided a facility that allowed expanded recycling of waste by the community.

Through establishing this facility Council resource recovery increased from 70 tonnes to 169 tonnes in the first year (based upon performance report submitted to ZWSA). Centralisation and greater aggregation of waste, and sorting and baling of recyclables onsite has reduced transport costs and also presents the material in a form suitable for delivery direct to market (achieving greater value).

ZWSA provided $150,000 (excl. GST) in funding toward the project through its Regional Infrastructure Investment Program.

3.6 Scope of Costs and Benefits of Cleve District Council Project

Table 3-1 and Table 3-2 list, in qualitative terms, the benefits and costs associated with the 'with ZWSA investment' scenario and the base case ('without ZWSA investment') scenario.

[17] Kerbside recycling collection is currently provided to residents in the townships of Cleve and Arno Bay only.

Table 3-1 Benefits of the DC Cleve project

Scenario	Benefit	Beneficiary	Valued in Monetary Terms	Source of Information
Base case (without ZWSA investment) scenario	Identical to the 'with ZWSA investment' scenario but with a time lag of 1 year	See below	See below	See below
With ZWSA investment scenario	Council income from gate fees and sale of recyclables	DC Cleve	Yes	DC Cleve, Rawtec
	Avoided gate fees	Ratepayers	Yes	DC Cleve
	Residual value of project capital	DC Cleve	Yes	DC Cleve

Table 3-2 Costs of the DC Cleve project

Scenario	Cost	Bearer of the Cost	Valued in Monetary Terms	Source of Information
Base case (without ZWSA investment) scenario	Identical to the 'with ZWSA investment' scenario but with a time lag of 1 year	See below	See below	See below
With ZWSA investment scenario	Capital costs	DC Cleve, ZWSA	Yes	DC Cleve, ZWSA
	Transfer station operating costs	DC Cleve	Yes	Rawtec
	Waste and recyclables transport costs	DC Cleve	Yes	Rawtec
	General waste disposal fees	DC Cleve	Yes	Rawtec

3.7 Data and Assumptions Used for Quantifying Costs and Benefits

3.7.1 Costs

Capital costs

The total capital cost of the project, excluding land, was reported by DC Cleve to be $523,619[18]. The purchase of land was included at an estimated cost of $100,000.

[18] As reported in DC Cleve's financial summary report, dated 10/5/2011.

Transfer station operating costs

Transfer station operating costs of $210,000 per year for the four transfer stations prior to the commissioning of the Cleve transfer station, and $190,000 per year once the Cleve transfer station was operational were assumed. These estimated costs were provided by Rawtec.

Waste and recyclables transport costs

General waste transport costs of $45 per tonne prior to the commissioning of the Cleve transfer station, and $40 per tonne once the Cleve transfer station was operational were assumed. Likewise, recyclables transport costs prior to commissioning the Cleve transfer station of $60 per tonne and $40 per tonne once the Cleve transfer station was operational were assumed (Rawtec).

General waste disposal fees

General waste disposal costs (i.e. landfill gate fees) of $120 per tonne prior to the commissioning of the Cleve transfer station, and $90 per tonne once the Cleve transfer station was operational were assumed (Rawtec).

3.7.2 Benefits

Income from the sale of recyclables

DC Cleve receives income from the sale of recyclables collected from their transfer station. Income of $40 per tonne was assumed (Rawtec).

Income from gate fees

Gate fees are charged by DC Cleve to persons disposing of waste at the transfer station(s), with the exception of recyclables for which the gate fee is waived (DC Cleve). A gate fee of $160 per tonne was assumed (Rawtec).

Avoided gate fees

The Cleve transfer station has enabled more recycling to occur, from 70 tonnes per year prior to the commissioning of the station to an estimated 250 tonnes per year after commissioning. Enabling more recycling to take place has reduced the amount of general waste being disposed by the public at the waste transfer station and hence the cost of disposal.

Residual value of project capital

The project capital employed at the end of the period of analysis (30 years) may have a residual value, based on the depreciable life of an asset. The purchased land asset was assumed to have maintained its value. The residual value of project capital in the 'with ZWSA investment' scenario was estimated to be approximately $412,000 (undiscounted) and $415,000 in the base case.

3.7.3 Base Case

Because closure of the local landfill site was a clear driver for building improved waste transfer facilities, it was expected that these facilities would have gone ahead without the ZWSA financial support. However it was expected that it was likely that the project would have been

delayed and may have been designed differently and may not have achieved the same levels of resource recovery.

Discussions with DC Cleve[19] indicated that the project would have gone ahead as planned with a one year delay if ZWSA funding had not been secured. The analysis is based on these assumptions.

3.8 Results of Analysis of DC Cleve Project

3.8.1 Key Indicators

The results of the economic analysis have been expressed in terms of two evaluation criteria, the net present value (NPV) and the benefit cost ratio (BCR).

The results of the CBA expressed in terms of the NPV are provided in Table 3-3. These results are based on the expected values for key variables, as outlined in Section 3.7.

Table 3-3 Net Present Value of the DC Cleve project

	$ [a]
Gate Fees	-28,066
Avoided gate fees (ratepayers)	28,066
Sale of recyclables	7,017
Residual value of project capital	-4,316
Capital expenditure	-39,651
Site operating costs	20,000
Transport costs - general waste disposal	9,667
General waste disposal fees	31,687
Transport costs - recyclables to Adelaide	-5,617
Net Present Value	**18,787**

[a] In 2013 dollars.

Source: EconSearch analysis.

Relative to the base case, it is apparent that this investment would generate modest net benefits to the regional community of approximately $19,000. Expressed in terms of annual net benefits, this would equate to almost $1,400 per year. Note that these net benefits represent a return to the combined investment by ZWSA and local government.

The results are reported as present values on an item by item basis in Table 3-3. There are two dimensions to each value: (i) it is a *present value* so it represents the current worth of a future stream of cash flows over a 30 year period that have been discounted at a given rate; and (ii) the value in each of the 30 years has been calculated as the difference between the base case value and the 'with project' value.

[19] November 2013.

The first item in Table 3-3 is gate fees (-$28,000) which represents a loss in income to the operator (DC Cleve) compared to the fees that would have been collected without the project. The second item is avoided gate fees ($28,000) which represents the reduction in gate fees that rate payers will have to pay compared to the fees that would have been paid without the project. As can be seen, this second item neatly offsets the first.

The third item, sale of recyclables ($7,017), represents the increase in income to DC Cleve from the sale of recyclables compared to the income that would have been generated without the project. Because the base case is essentially a one year lag of the ZWSA investment scenario, this item represents the present value of the increase in the sale of recyclables in the first year.

The fourth item, residual value of project capital (-$4,316), indicates that the value of project capital at Year 30 would be less than the value of the project capital under the base case scenario. This result arises because the ZWSA investment scenario, while the same as the base case investment, takes place one year earlier, so that by Year 30 the project capital would depreciate by slightly more (and therefore have a lower value) than it would under the base case.

The fifth item, capital expenditure ($-39,651), indicates the value of the project capital for the ZWSA investment scenario less the value of the project capital under the base case. This difference arises simply in the timing of the investments; Year 1 in the case of the ZWSA investment scenario and Year 2 under the base case.

The sixth item, site operating costs, is a positive value which indicates the operating costs of the project are less than current operating costs and so the investment one year earlier than the base case generates a cost saving of $20,000 for the ZWSA investment scenario.

The seventh item, transport costs - general waste disposal ($9,667), indicates the reduction in transport of general waste in Year 1 under the ZWSA investment scenario generates a positive outcome for that scenario, compared to the base case.

Similarly the eighth item, general waste disposal fees ($31,687), indicates the reduction in disposal of general waste in Year 1 under the ZWSA investment scenario generates a positive outcome, compared to the base case.

While the transport costs for general waste disposal are reduced, the transport cost of recyclables (the ninth item) is higher under the ZWSA investment scenario (-$5,617), this being the cost of transporting recyclables in Year 1.

The BCR for this project, based on expected values for key variables is estimated to be 1.4. In other words, for every dollar invested $1.40 is returned in operational cost savings.

3.8.2 Sensitivity Analysis

The results of the analysis were re-estimated using values for key variables that reflect the uncertainty of those variables. Sensitivity analyses were undertaken for different values for:

- Discount rate

- General waste disposal fees
- Site operating costs
- Steady state recycling volume.

Discount rate

A key variable is the discount rate. In the analysis a discount rate of 6.0% was used and sensitivity analysis on discount rates was undertaken using discount rates of 4.0% and 8.0%. The results are presented in Table 3-4.

Table 3-4 Results of sensitivity analysis on the discount rate

Discount rate	NPV ($ [a])	BCR
4%	27,598	1.8
6% [b]	18,787	1.4
8%	9,454	1.2

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show some variation in the NPV and BCR, but even at a higher discount rate (8%) the result is still positive.

General waste disposal fees

In the analysis the general waste disposal cost was a significant component of costs. The analysis used a rate of $120 per tonne and a sensitivity analysis was undertaken using rates 25% lower and 25% higher than the expected value. The results are presented in Table 3-5.

Table 3-5 Results of the sensitivity analysis on general waste disposal fee rate

General waste disposal fees ($/t)	NPV ($ [a])	BCR
90	10,865	1.2
120 [b]	18,787	1.4
150	26,709	1.6

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show some variation in the NPV and BCR, but even with a lower general waste disposal cost ($90/t) the result is still positive.

Site operating costs

In the analysis the site operating costs were a significant component of costs. The analysis used an annual cost of $210,000 and a sensitivity analysis was undertaken using rates 25% lower and 25% higher than the expected value. The results are presented in Table 3-6.

Table 3-6 Results of the sensitivity analysis on site operating costs

Site operating costs ($)	NPV ($ [a])	BCR
157,500	13,787	1.3
210,000 [b]	18,787	1.4
262,500	23,787	1.5

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show some variation in the NPV and BCR, but with lower site operating costs ($157,500) the result is still positive.

Steady state recycling volume

In the analysis the steady state recycling volume figure (i.e. the expected annual recycling tonnage over the long term) has a significant effect on the costs of managing the waste that comes through the waste transfer station. The analysis used an annual recycling figure of 250 tonnes and a sensitivity analysis was undertaken using rates 25% lower and 25% higher than the expected value. The results are presented in Table 3-7.

Table 3-7 Results of the sensitivity analysis on the steady state recycling volume value

Steady state recycling volume (t)	NPV ($ [a])	BCR
187.5	9,353	1.2
250 [b]	18,787	1.4
312.5	28,221	1.6

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show some variation in the NPV and BCR, but even at a lower steady state recycling volume (187.5t) the result is still positive.

3.9 Regional Construction and Demolition Resource Recovery Facility Project Description

In 2008 a regional construction and demolition (C&D) resource recovery facility project was put forward for ZWSA support. The total project cost was estimated at $662,000. This site was commissioned in January 2013 and receives construction and demolition materials from builders and regional councils. These materials are recovered through mechanical and manual sorting procedures.

This project focuses on a waste stream that is commercially challenging for councils. This is because of high capital costs, high operating costs and the difficulty of identifying and establishing markets for the recovered materials. These issues are integral to C&D waste processing.

C&D waste was already received and reprocessed at the site. Establishment of the resource recovery facility resulted in significant improvements in sorting efficiency and product quality, leading to greater quantities and higher value of recovered materials.

ZWSA provided $150,000 (exclusive of GST) in funding toward the project through its Regional Infrastructure Investment Program.

3.10 Scope of Costs and Benefits of the Regional Construction and Demolition Resource Recovery Facility Project

Table 3-8 and Table 3-9 list, in qualitative terms, the benefits and costs associated with the 'with ZWSA investment' scenario and the base case ('without ZWSA investment') scenario.

Table 3-8 Benefits of the regional construction and demolition resource recovery facility project

Scenario	Benefit	Beneficiary	Valued in Monetary Terms	Source of Information
Base case (without ZWSA investment) scenario	Identical to the 'with ZWSA investment' scenario but with a time lag of 5 years	See below	See below	See below
With ZWSA investment scenario	Income from gate fees and sale of recyclables	Project Proponent	Yes	Rawtec
	Income from sale of reprocessed materials	Project Proponent	Yes	Rawtec
	Residual value of project capital	Project Proponent	Yes	Rawtec

Table 3-9 Costs of the regional construction and demolition resource recovery facility project

Scenario	Cost	Bearer of the Cost	Valued in Monetary Terms	Source of Information
Base case (without ZWSA investment) scenario	Identical to the 'with ZWSA investment' scenario but with a time lag of 5 years	See below	See below	See below
With ZWSA investment scenario	Capital costs	Project Proponent	Yes	Project Proponent
	Reprocessing waste operating costs	Project Proponent	Yes	Rawtec
	Residual waste disposal fees	Project Proponent	Yes	Rawtec

3.11 Data and Assumptions Used for Quantifying Costs and Benefits

3.11.1 Costs

Capital costs

The total capital cost of the project was reported by the project proponent to be $661,800[20].

Resource recovery facility operating costs

Resource recovery facility operating cost assumptions (labour, power and plant maintenance) are provided in Table 3-10. These cost estimates were provided by Rawtec.

Table 3-10 Resource recovery facility operating cost assumptions used in the analysis

C&D waste type	Operating costs for reprocessing waste ($/t)		
	Pre-investment	With ZWSA investment	Base case
Clean	12	12	12
Mixed	5	45	50

Source: Rawtec

Before the investment was made it was assumed that material recovery was achieved from the clean C&D waste only, which required minimal reprocessing. It was assumed that the mixed C&D waste was not reprocessed and the $5/tonne cost was the handling cost of waste received. With the commissioning of the sorting / reprocessing plant (assumed in both the 'with ZWSA investment' scenario and the base case[21]) it was assumed that it was possible to process the mixed C&D waste stream. Due to a smaller investment in plant in the base case, it was assumed that processing costs for the mixed C&D waste were 11% higher.

An initial waste volume of 6,000 tonnes of clean C&D waste and 14,000 tonnes of mixed C&D waste was received by the facility. It was assumed that the quantity of material received increased by 5% per year (Rawtec).

See Table 3-11 for the assumptions concerning the materials composition of the C&D waste streams.

[20] As reported in Project Proponent's application (dated 1/9/2008).

[21] See Section 3.11.3 for more details.

Table 3-11 Materials composition of the C&D waste streams

C&D waste type	Materials composition (%)						
	Bricks	Concrete	Other inerts	Timber	Metal	Residual	Total
Clean	5%	80%	5%	0%	5%	5%	100%
Mixed	5%	25%	15%	25%	5%	25%	100%

Source: Rawtec

Residual waste disposal costs

Costs of $80 per tonne were assumed for the disposal of the residual C&D waste (Rawtec).

3.11.2 Benefits

Income from the sale of recovered material

The proponent receives income from the sale of recovered and reprocessed material from their facility. Resource recovery facility operating cost assumptions (includes labour, power and plant maintenance) are provided in Table 3-12.

Table 3-12 Income received from recovered materials

Recovered material type	Income received ($/t)
Bricks	10
Concrete	10
Other inerts	10
Timber	5
Metal	100

Source: Rawtec

Income from gate fees

The proponent charges gate fees for disposing of construction and demolition waste at the resource recovery facility. A gate fee of $9 per tonne for clean C&D waste and $85 per tonne for mixed C&D waste was assumed (Rawtec).

Residual value of project capital

The project capital employed at the end of the period of analysis (30 years) may have a residual value, based on the depreciable life of an asset. The residual value of project capital in the 'with ZWSA investment' scenario was estimated to be $120,000 and approximately $518,740 (undiscounted) in the base case.

3.11.3 Base Case

Discussions with the proponent indicated that the project would have gone ahead with a five-year anticipated delay and with a 10% smaller capital investment if ZWSA funding had not been secured. As a result of the smaller investment in plant it was anticipated that mixed C&D waste reprocessing costs would be higher by approximately 11%.

3.12 Results of Analysis of the Regional Construction and Demolition Resource Recovery Facility Project

3.12.1 Key Indicators

The results of the economic analysis have been expressed in terms of two evaluation criteria, the Net Present Value (NPV) and the Benefit Cost Ratio (BCR).

The results of the CBA expressed in terms of the NPV are provided in Table 3-13. These results are based on the expected values for key variables, as outlined in Section 3.11.

Table 3-13 Net Present Value of the regional construction and demolition resource recovery facility project

	$ [a]
Gate Fees	0
Sale of reprocessed material	775,357
Residual value of project capital	-73,590
Capital expenditure	-322,453
Site operating costs	-1,333,038
Residual waste disposal costs	4,327,574
Net Present Value	**3,373,850**

[a] In 2013 dollars.

Source: EconSearch analysis.

Relative to the base case, it is apparent that this investment would generate significant net benefits to the regional community of approximately $3.4 million. Expressed in terms of annual net benefits, this would equate to $245,107 per year. Note that these net benefits represent a return to the combined investment by ZWSA and industry.

As noted for the previous case study (Section 3.7), the results in Table 3-13 are reported as present values on an item by item basis. There are two dimensions to each value: (i) it is a *present value* so it represents the current worth of a future stream of cash flows over a 30 year period that have been discounted at a given rate; and (ii) the value in each of the 30 years has been calculated as the difference between the base case value and the 'with project' value.

The first item in Table 3-1 is gate fees ($0). The zero value indicates that the gate fees for the facility are the same under the base case and with ZWSA investment. This is because the quantity and price of clean C&D and the quantity and price of mixed C&D are assumed to be the same under both scenarios.

The second item, sale of reprocessed material ($775,357), reflects the fact that the investment occurs five years earlier with ZWSA investment. This means that for five years, under this scenario, the facility will be reprocessing and selling material that would not have occurred under the base case.

The third item, residual value of project capital (-$73,590), indicates that the value of project capital at year 30 would be less than the value of the project capital under the base case

scenario. This result arises because the ZWSA investment scenario, while the same as the base case investment, takes place five years earlier, so that by year 30 the project capital would depreciate by more (and therefore have a lower value) than it would under the base case.

The fourth item, capital expenditure (-$322,453), indicates the value of the project capital for the ZWSA investment scenario less the value of the project capital under the base case. This difference arises simply in the timing of the investments; Year 1 with ZWSA investment and Year 6 under the base case.

The fifth item, site operating costs (-$1,333,038), is a negative value which indicates the operating costs of the project are greater than current operating costs (because processing more mixed C&D) and so the investment five years earlier than the base case generates additional costs for the 'with ZWSA investment' scenario. However, as shown in Table 3-10, the reprocessing costs for mixed C&D with ZWSA investment are assumed to be $5/tonne lower than under the base case scenario. This reduces the operating cost differential between the two scenarios but does not completely offset the difference.

The sixth item, residual waste disposal costs ($4,327,574), indicates that the reduction in disposal of residual waste in Years 1–5 under the ZWSA investment scenario generates a positive outcome, compared to the base case. Clearly this is the most significant item contributing to the overall positive result.

The BCR for this project, based on expected values for key variables is estimated to be 11.5. In other words, for every dollar invested $11.50 is returned in operational cost savings.

3.12.2 Sensitivity Analysis

The results of the analysis were re-estimated using values for key variables that reflect the uncertainty of those variables. Sensitivity analyses were undertaken for different values for:

- Discount rate
- Operating costs for reprocessing mixed C&D waste
- Disposal costs for residual waste to landfill.

Discount rate

A key variable is the discount rate. In the analysis a discount rate of 6.0% was used and sensitivity analysis on discount rates was undertaken using discount rates of 4.0% and 8.0%. The results are presented in Table 3-14.

Table 3-14 Results of sensitivity analysis on the discount rate

Discount rate	NPV ($ [a])	BCR
4%	4,050,367	15.9
6% [b]	3,373,850	11.5
8%	2,888,093	9.1

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show variation in the NPV and BCR, but even with a higher discount (8%) the result is still positive.

Operating costs for reprocessing mixed C&D waste

In the analysis the operating costs for reprocessing mixed C&D waste were a significant component of the costs. The analysis used a rate of $45 per tonne and a sensitivity analysis was undertaken using rates 25% lower and 25% higher than the expected value. The results are presented in Table 3-15.

Table 3-15 Results of sensitivity analysis on the operating costs for reprocessing mixed C&D waste

Operating costs for reprocessing mixed C&D waste ($/t)	NPV ($ [a])	BCR
33.75	3,797,268	12.8
45.00 [b]	3,373,850	11.5
56.25	2,950,433	10.1

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show variation in the NPV and BCR, but even with a higher reprocessing cost ($56.25/t) the result is still positive.

Disposal costs for residual waste

The proponent has to dispose of the residual waste. In the analysis the disposal cost was a significant component of the costs. The analysis used a rate of $20 per tonne and a sensitivity analysis was undertaken using rates 25% lower and 25% higher than the expected value. The results are presented in Table 3-16.

Table 3-16 Results of the sensitivity analysis on the disposal costs for residual waste

Disposal costs for residual waste to landfill ($/t)	NPV ($ [a])	BCR
60	2,291,957	8.1
80 [b]	3,373,850	11.5
100	4,455,744	14.8

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show variation in the NPV and BCR, but even with lower disposal costs for residual waste ($60/t) the result is still positive.

3.13 Discussion

ZWSA's financial contribution for the Wattle Range Council's Waste Transfer Facilities was small, being about 5% of total investment funding. Since the funding is effectively a transfer of public funds from SA waste levy payers to Wattle Range rate payers, the incremental costs and benefits are zero and hence the NPV for this project is also zero. It should be noted, however, that the need to rationalise regional facilities was identified in the regional strategies co-funded by ZWSA. The regulatory pressure to close poor performing landfills, as articulated in the first state waste strategy, was also a precursor for this investment.

ZWSA's investment in the DC Cleve Waste Transfer and Recycling Facility was estimated to result in a modest net benefit to the SA community. The sensitivity analysis undertaken for the CBA for this project indicates that the result is robust, that we can say with confidence that the broader community is better off for ZWSA investing in this project than not investing in this project. Since the commissioning of the facility, DC Cleve, DC Kimba and DC Franklin Harbour are proposing a shared waste collection service. The Cleve Waste Transfer and Recycling Facility is an essential component of this proposal. It is expected that the shared waste collection service will enable regular kerbside collection of dry recyclables from all residential properties in the council areas, bringing a number of social, environmental and economic benefits:

- Improved amenity and ease of use over the current systems of collection
- Improved occupational health and safety for waste / recyclables collectors
- Improved rates of waste separation leading to more material recovery, and
- An expected $100,000 annual savings to the councils' waste operations (DC Cleve, pers. comm.[22]) due to reduced labour for waste collection, improved operating efficiencies and economies of scale in recyclable material handling.

[22] November 2013

ZWSA's investment in the facility has brought forward investment in this project by five years and enabled better material recovery facilities to be built resulting in a substantial net benefit to the SA community. The results of the CBA for this project are conservative as they do not take into account potential benefit (e.g. cost savings) accruing to users of the recycled material. Furthermore, there are unpriced environmental benefits from this project from diverting waste from landfill and avoiding the use of virgin material for construction purposes.

4. INDUSTRY PROGRAM COST BENEFIT ANALYSIS

4.1 Industry Program Analysis Description

The Industry Program (formerly known as the Resource Efficiency Assistance Program) has operated since 2007. The program assists clients to accelerate the uptake of sustainable business practices with a focus on resource management. It primarily targets South Australian based small and medium sized enterprises and key industry associations.

Under the program a number of activities have been undertaken, and these include:

- Facilitating and funding resource efficiency assessments (materials, energy and water) for client organisations
- Providing advice that assists clients better manage their waste contracts, and advice on recycling systems
- Funding training and information sessions with industry regarding waste management and resource efficiency
- Assisting clients to submit applications to the Energy Efficiency Information Grants and Cleantech Technology Investment Programs
- Developing 37 case studies showcasing clients' achievements
- Facilitating industry networking and events
- Establishing a wide range of partnerships and sponsorships to help drive behavioural change with industrial and economic development associations
- Piloting a supply chain sustainability program with SA Power Networks and rolling this out to metropolitan Adelaide and key regions.

This analysis focuses on the facilitating and funding resource efficiency assessments for client organisations component of the program. In 2012 and 2013 ZWSA surveyed participating clients to assess action on resource efficiency improvements since receiving their resource efficiency assessments. This analysis is based on the results of the 2013 survey.

To date the initiative has had 229 clients. Eighty one clients are currently active. ZWSA sent the survey to 51 clients. Responses were received from 27 clients, of which 24 responses that contained robust data were used for analysis.

4.2 Scope of Costs and Benefits of the Industry Program

Table 4-1 and Table 4-2 list, in qualitative terms, the benefits and costs associated with the 'with ZWSA investment' scenario and the base case ('without ZWSA investment') scenario.

Table 4-1 Benefits of the Industry Program

Scenario	Benefit	Beneficiary	Valued in Monetary Terms	Source of Information
Base case (without ZWSA investment) scenario	Identical to the 'with ZWSA investment' scenario but: 65% of clients would have done nothing (i.e. not made the investment or achieved any benefit) 7% of clients would have made the investment anyway and achieved similar benefits 28% of clients would have made the investment and achieved similar benefits but with a time lag of 10 years	See below	See below	See below
With ZWSA investment scenario	Avoided costs of inefficient resource use	Industry	Yes	ZWSA survey, Rawtec
	Increased diversion of materials from landfill	Industry	Yes	ZWSA survey, Rawtec

Table 4-2 Costs of the Industry Program

Scenario	Cost	Bearer of the Cost	Valued in Monetary Terms	Source of Information
Base case (without ZWSA investment) scenario	Identical to the 'with ZWSA investment' scenario but 65% of clients would have done nothing (i.e. not made the investment) 7% of clients would have made the investment anyway 28% of clients would have made the investment with a time lag of 10 years	See below	See below	See below
With ZWSA investment scenario	ZWSA, other Government and Industry investment	ZWSA, other Government, Industry	Yes	ZWSA survey

4.3 Data and Assumptions Used for Quantifying Costs and Benefits

4.3.1 Costs

Investment costs

Through the survey, ZWSA provided information on the investment by the participants sourced from private capital, other state and the Australian government grant funding. ZWSA also provided information about the funding provided to participants (i.e. funding resource efficiency assessments) and an estimate of staff time input. The total amount invested was estimated to be $1.8 million. A breakdown of the investment costs is provided in Table 4-3.

Table 4-3 Investment costs for the Industry Program resource efficiency assessments

Investment costs	$ [a]
ZWSA - grants	224,647
ZWSA - staff time	53,216
Company investment	1,043,411
Private investment	10,000
Other SA Government investment	25,000
Federal Government investment	416,323
Total	**1,772,597**

[a] In 2013 dollars.

Source: ZWSA.

4.3.2 Benefits

Avoided cost of inefficient resource use

Through the survey, participants provided estimates of their 'before' the intervention[23] and 'after' the intervention resource use for:

- Electricity
- Gas
- Fuel
- Water.

The resource use was normalised to company turnover to account for changes in resource use due to changes in productivity. It was conservatively assumed that no further improvements in resource efficiency would be achieved beyond that achieved in the reporting period.

[23] i.e. resource efficiency assessment and implemented resource efficiency actions.

Analysis of the survey data provided the following price estimates. These were used to calculate the average unit price for the resources described above:

- Electricity - 17c/kWh
- Gas - $160.30/GJ
- Fuel - $1.28/L
- Water - $2.46/KL.

For the electricity price projections it was assumed that the real price increase per year from 2013–2016 would be 7.93% and from 2017 onwards would be 1.38% (SKM MMA 2011a). A natural gas real price increase per year of 0.9% was assumed (SKM MMA 2011b). A real price increase of 3% for water[24] and a 0.5% for fuel[25] was assumed.

Diversion of materials from landfill

Through the survey, participants provided estimates of their 'before' the intervention[26] and 'after' the intervention waste generation for the following resources:

- Waste to landfill
- Waste to recycling / reuse.

Analysis of the survey data provided the following price estimates. These were used to calculate the average unit price for the resources described above:

- Waste to landfill - $254/t
- Recycling - $40/t.

A real price increase of 1% per year was factored in for future general waste contract prices. No real price increase was factored in for recycling contract prices.

4.3.3 Base Case

Discussions were held with ZWSA and Rawtec to analyse the likely 'without ZWSA investment' scenario. Generally, it was felt that clients fell into three categories:

- Those that would not have pursued resource efficiency assessments without ZWSA support and would not have tackled resource inefficiencies in their organisations
- Those that were planning to undertake resource efficiency assessments and tackle resource inefficiencies in their organisations anyway
- Those that intended to tackle resource inefficiencies in their organisations sometime in the future but had a limited understanding of how to progress these initiatives.

[24] EconSearch assumption.

[25] Based on analysis of historical fuel prices for Adelaide.

[26] Intervention means resource efficiency assessment and implemented resource efficiency actions.

Based on the results of the survey, the following assumptions were made about the base case:

- 65% of clients would have done nothing (i.e. not made the investment or achieved any benefit)
- 7% of clients would have made the investment anyway and achieved the same benefits, and
- 28% of clients would have made the investment and achieved the same benefits but with a time lag of 10 years.

4.4 Results of Analysis of Industry Program

4.4.1 Key Indicators

The results of the economic analysis have been expressed in terms of two evaluation criteria, the net present value (NPV) and the benefit cost ratio (BCR).

The results of the CBA expressed in terms of the NPV are provided in Table 4-4. These results are based on the expected values for key variables, as outlined in Section 4.3.

Table 4-4 Net Present Value of the Industry Program resource efficiency assessments

	$ [a]
Avoided costs - waste to landfill	1,193,131
Avoided costs - landfill diversion	-592,682
Avoided costs - electricity	3,416,306
Avoided costs - gas	4,760,869
Avoided costs - fuel	1,740,461
Avoided costs - water	-1,386,035
Resource efficiency investment costs	-1,360,915
Net Present Value	**7,771,134**

[a] In 2013 dollars.

Source: EconSearch analysis.

Relative to the base case, it is apparent that this investment would generate significant net benefits to industry program clients of approximately $7.8 million. Expressed in terms of annual net benefits, this would equate to $560,000 per year. Note that these net benefits represent a return to the combined investment by ZWSA and industry.

The results in Table 4-4 are reported as present values on an item by item basis. There are two dimensions to each value: (i) it is a *present value* so it represents the current worth of a future stream of cash flows over a 30 year period that have been discounted at a given rate (6.0% per annum); and (ii) the value in each of the 30 years has been calculated as the difference between the base case value and the 'with-project' value.

The first item in Table 4-4 is avoided cost – waste to landfill ($1,193,131). This indicates the reduction in disposal of waste to landfill under the ZWSA investment generates a positive outcome for that scenario, compared to the base case.

The second item, avoided cost – landfill diversion (-$592,682). This indicates that the increased landfill diversion under the ZWSA investment generates an increased cost for that scenario, compared to the base case.

Items 3 to 5, avoided cost of electricity, gas and fuel ($3,416,306, $4,760,869 and $1,740,461 respectively) indicates that the reduction in the use, and therefore the cost, of these under the ZWSA investment scenario generates significant positive outcomes compared to the base case.

The sixth item, avoided cost – water ($-1,386,035), is a negative value which indicates that there is a higher level of use and therefore cost of water under the ZWSA investment which generates a negative outcome for that scenario, compared to the base case.

The seventh item, resource efficiency investment costs (-$1,360,915), indicates the value of the project capital for the ZWSA investment scenario less the value of the project capital under the base case. This difference arises because there is more investment and it occurs earlier under the ZWSA investment scenario, compared to the base case.

The BCR for this project, based on expected values for key variables is estimated to be 6.7. In other words, for every dollar invested $6.70 is returned in operational cost savings.

4.4.2 Sensitivity Analysis

The results of the analysis were re-estimated using values for key variables that reflect the uncertainty of those variables. Sensitivity analyses were undertaken for different values for:

- Discount rate
- Waste to landfill annual contract price increase
- Recycling collection annual contract price increase
- Time lag for base case.

Discount rate

A key variable is the discount rate. In the analysis a discount rate of 6.0% was used and sensitivity analysis on discount rates was undertaken using discount rates of 4.0% and 8.0%. The results are presented in Table 4-5.

Table 4-5 Results of sensitivity analysis on the discount rate

Discount rate	NPV ($ [a])	BCR
4%	10,246,973	8.8
6% [b]	7,771,134	6.7
8%	5,976,463	5.3

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show variation in the NPV and BCR, but even with a higher discount rate (8%) the result is still positive.

Waste to landfill annual contract price increase

The analysis factored in possible price changes for resource use and waste handling costs. It is difficult to predict long-term changes in these prices. Sensitivity analyses were undertaken on all cost price changes. The waste to landfill annual contract price change is presented Table 4-6. The analysis used a rate of 1% increase per year and a sensitivity analysis was undertaken using rates of 0% and 5%.

Table 4-6 Results of sensitivity analysis on the waste to landfill annual contract price increase

Waste to landfill annual price increase	NPV ($ [a])	BCR
0%	7,651,994	6.6
1% [b]	7,771,134	6.7
5%	8,485,050	7.2

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show variation in the NPV and BCR, but even without an annual landfill price increase the result is still positive.

Recycling collection annual contract price increase

As discussed previously, it is difficult to predict long-term changes in resource use and waste handling costs. The analysis assumed no change in the recycling collection contract price. A sensitivity analysis was undertaken using an annual price decrease of 5% and price increase of 5%. The results are presented in Table 4-7.

Table 4-7 Results of the sensitivity analysis on the recycling collection annual contract price increase

Landfill diversion annual price increase	NPV ($ [a])	BCR
-5%	7,955,076	6.8
0% [b]	7,771,134	6.7
5%	7,388,167	6.4

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show variation in the NPV and BCR, but even with an annual landfill diversion price increase of 5% the result is still positive.

Sensitivity analysis on other cost price changes showed smaller variation in the results and are not presented.

Time lag, base case

In the base case it was assumed that some of the clients would have achieved similar resource use savings without ZWSA investment, but that there would have been a significant delay to

implementing resource audits and consequent measures to reduce resource use. There is uncertainty about the length of time delay. The analysis used a delay of 10 years and a sensitivity analysis was undertaken using figures 50% lower and 50% higher than the expected value. The results are presented in Table 4-8.

Table 4-8 Results of the sensitivity analysis on the time lag used in the base case

Base case, timelag	NPV ($ [a])	BCR
5	7,138,846	6.7
10 [b]	7,771,134	6.7
15	8,264,972	6.8

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show variation in the NPV and BCR, but even with a shorter time lag under the base case (5 years) the result is still positive.

4.5 Discussion

The Industry Program's investment in audits, to improve industry knowledge about resource use efficiency, has resulted in a substantial net benefit to the South Australian community. Sensitivity analysis of key variables in this analysis indicates that the result is robust. The results of the CBA for this project are conservative as they do not take into account potential benefits (e.g. cost savings) accruing to users of recycled materials. From the survey it was estimated that an additional 680 tonnes of waste was diverted from landfill annually for reuse.

Furthermore, there are unpriced environmental benefits from resource use efficiency and avoided emissions. For example, from the survey sample of 24 companies 6,906MWh of electricity (16% reduction), 1652GJ of natural gas (2% reduction) and 341ML of fuel (reduction of 14%) were saved annually as a result of implementing the audits' recommendations. It should also be noted that there were substantial resource use efficiencies evident from the survey that were not included in the analysis, because they could not be directly attributed to the audits funded by ZWSA. However, it is reasonable to assume that at least in some instances the knowledge gained from the ZWSA funded audits was used to identify other resource use efficiency opportunities.

5. KERBSIDE PERFORMANCE INCENTIVES COST BENEFIT ANALYSIS

5.1 Kerbside Performance Incentives Description

ZWSA has been working with metropolitan and regional councils to develop a consistent, 3-bin kerbside waste collection system (i.e. residual waste, comingled dry recyclables and organic waste). Prior to 2005, many metropolitan councils individually had, or were experimenting with various kerbside collection systems to divert waste from landfill.

ZWSA's Kerbside Performance Incentives Program facilitated metropolitan councils rationalising their systems to a common, high performing 3-bin system.

In order to reach the stretch target levels of kerbside waste diversion, food waste will need to be collected with other organic waste. ZWSA has assisted councils to pilot appropriate household food waste collection systems through its Kerbside Performance Incentives Plus Program, and continues support to implement food waste collection.

ZWSA has also implemented the *Recycle Right* program, which provides accurate and consistent information on how to separate household waste appropriately to reduce contamination in bins and increase recycling activity. The campaign uses media advertising, social media, fact sheets, a template collection calendar design, a 1300 recycling 'hot line', an education resource for non-English speaking members of the community, education materials for schools, banners, flyers, other education materials such as bin tags. ZWSA supports KESAB *environmental solutions*' workshops and site visits for council staff and elected members as part of this program and continues to work with councils to encourage the take up of the *Recycle Right* brand and suite of educational resources.

This analysis focuses on these three ZWSA programs and their effect on household waste diversion from landfill in metropolitan councils.

5.2 Scope of Costs and Benefits of Kerbside Performance Incentives

Table 5-1 and Table 5-2 list, in qualitative terms, the benefits and costs associated with the 'with ZWSA investment' scenario and the base case ('without ZWSA investment') scenario.

Table 5-1 Benefits of ZWSA facilitation of kerbside recycling

Scenario	Benefit	Beneficiary	Valued in Monetary Terms	Source of Information
Base case (without ZWSA investment) scenario	From 2005-2011, the rate of kerbside waste diversion improvement is half of that of the 'with ZWSA investment' scenario with regard to dry recyclables and organic waste, and a 1% improvement per year thereafter Achieves equivalent waste diversion tonnages to the 'with ZWSA investment' by 2021	See below	See below	See below
With ZWSA investment scenario	Kerbside collection cost savings	Local government	Yes	Rawtec
	Increased diversion of materials from landfill	Community	Partially, financial benefit included in kerbside collection cost savings estimation	Rawtec

Table 5-2 Costs of ZWSA facilitation of kerbside recycling

Scenario	Cost	Bearer of the Cost	Valued in Monetary Terms	Source of Information
Base case (without ZWSA investment) scenario	No ZWSA investment	See below	See below	See below
	No local government co-investment in scheme beyond 'business-as-usual' investment	See below	See below	See below
With ZWSA investment scenario	ZWSA investment	ZWSA	Yes	ZWSA
	Local government co-investment in scheme beyond 'business-as-usual' investment	Local government	Yes	ZWSA

5.3 Data and Assumptions Used for Quantifying Costs and Benefits

5.3.1 Costs

ZWSA investment

ZWSA provided the budgets for the two kerbside incentive programs and the *Recycle Right* program and an estimate of staff time (including on-costs) to manage the programs. The total investment from 2005–2015 is estimated to be approximately $7 million.

Local government investment

Council applicants to the kerbside incentive programs provided details of their co-investment. This amount was assumed to be their total additional investment in the scheme beyond their existing investment in kerbside collection systems. The total amount reported (used in the analysis) is $4.89 million.

It was assumed that local government made no additional investment in education in household waste separation as a result of the scheme.

5.3.2 Benefits

Kerbside collection cost savings

Data on actual kerbside waste separation for 2004–2011 was provided by Rawtec. It was conservatively assumed that no further improvement in waste separation would occur beyond 2011.

Population projections for 2012 onwards were based on the ABS (2013b) *Population Series B for Greater Adelaide*[27], which shows consistent 1% increases per year. This annual increase is consistent with 2004–2011 population trends.

Kerbside collection costs for residual waste, dry co-mingled recyclables, organic waste and hard waste were provided by Rawtec. The following rates were used:

- Residual waste - $160/tonne
- Dry co-mingled recyclables - $110/tonne
- Organic waste - $90/tonne, and
- Hard waste - $300/tonne.

[27] http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/3222.0main+features102012%20(base)%20to%202101.

5.3.3 Base Case

The base case was developed by analysing the waste diversion levels in the base year (2004) before the ZWSA schemes were initiated, against the succeeding years (2005–2011) waste diversion levels.

From 2005–2011, the base case assumed a rate of kerbside waste diversion improvement (dry recyclables and organic waste) that was half that occurring under the 'with ZWSA investment' scenario. From 2012 onwards a 1% improvement per year was assumed until equivalent waste diversion tonnages of the 'with ZWSA investment' is achieved (in 2021).

5.4 Results of Analysis of Kerbside Incentives

5.4.1 Key Indicators

The results of the economic analysis have been expressed in terms of two evaluation criteria, the Net Present Value (NPV) and the Benefit Cost Ratio (BCR).

The results of the CBA expressed in terms of the NPV are provided in Table 5-3. These results are based on the expected values for key variables, as outlined in Section 5.3.

Table 5-3 Net Present Value of the kerbside recycling intervention

	$ [a]
Avoided kerbside collection costs	36,127,865
ZWSA investment costs	-8,074,445
Local Government additional investment costs	-5,926,851
Net Present Value	**22,126,569**

[a] In 2013 dollars.

Source: EconSearch analysis.

Relative to the base case, it is apparent that this investment would generate significant net benefits to the South Australian community of approximately $22.1 million. Expressed in terms of annual net benefits, this equates to $1.6 million per year. Note that these net benefits represent a return to the combined investment by ZWSA and local government.

As noted for the previously reported case studies (Sections 3 and 4), the results in Table 5-3 are reported as present values on an item by item basis. There are two dimensions to each value: (i) it is a *present value* so it represents the current worth of a future stream of cash flows over a 30 year period that have been discounted at a given rate; and (ii) the value in each of the 30 years has been calculated as the difference between the base case value and the 'with project' value.

The first item in Table 5-3 is avoided kerbside collection costs ($36,127,865). This represents the reduction in kerbside collection costs to local government under the ZWSA investment scenario, compared to the costs that would be incurred under the base case. The estimation is driven by the base case assumption that the rate of kerbside waste diversion improvement

would be half that occurring under the 'with ZWSA investment' scenario with regard to dry recyclables and organic waste.

The second and third items, ZWSA investment costs and local government additional investment costs (-$8,074,445 and -$5,926,851), indicate the project investment value that is additional to investment under the base case.

The BCR for this project, based on expected values for key variables is estimated to be 2.6. In other words, for every dollar invested $2.60 is returned in kerbside collection cost savings.

5.4.2 Sensitivity Analysis

The results of the analysis were re-estimated using values for key variables that reflect the uncertainty of those variables. Sensitivity analyses were undertaken for different values for:

- Discount rate
- Base case kerbside separation efficiency assumptions
- Local government investment in the scheme.

Discount rate

A key variable is the discount rate. In the analysis a discount rate of 6% was used and sensitivity analysis on discount rates was undertaken using discount rates of 4 and 8%. The results are presented in Table 5-4.

Table 5-4 Results of sensitivity analysis on the discount rate

Discount rate	NPV ($ [a])	BCR
4%	21,396,984	2.6
6% [b]	22,126,569	2.6
8%	22,973,973	2.5

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show very little variation in the NPV and BCR, and it can be concluded that the discount rate has little impact on the results.

Base case kerbside separation efficiency assumptions

In the analysis the kerbside collection cost was a significant component of the costs of this project. Kerbside collection costs are sensitive to the waste separation assumptions. From 2005–2011, the base case assumed that kerbside separation efficiency (dry recyclables and organic waste) is 50% of the 'with ZWSA investment' scenario. A sensitivity analysis was undertaken using rates 25% lower and 25% higher than the expected value. The results are presented in Table 5-5.

Table 5-5 Results of the sensitivity analysis on the base case kerbside separation efficiency assumptions

Base case kerbside separation efficiency assumptions (recyclables and organic waste)	NPV ($ [a])	BCR
38%	35,691,934	3.5
50% [b]	22,126,569	2.6
63%	8,561,204	1.6

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show significant variation in the NPV and BCR, but the result is still positive over a 50% range in this variable. At a base case kerbside waste separation efficiency of 70% the NPV is $3,000 and the BCR is 1.0.

Local government investment in the scheme

Council applicants to the kerbside incentive programs provided details of their co-investment. This amount was assumed to be their total additional investment in the scheme beyond their existing investment in kerbside collection systems. The total amount reported (used in the analysis) is $4.89 million ($444,802 per year). It was assumed that local government made no additional investment in education in household waste separation as a result of the scheme. Because there is uncertainty about councils' co-investment, a sensitivity analysis was undertaken using rates 25% lower and 25% higher than the expected value. The results are presented in Table 5-6.

Table 5-6 Results of the sensitivity analysis on the local government investment in the scheme

LGA investment in the scheme ($/year)	NPV ($ [a])	BCR
333,601	23,608,282	2.9
444,802 [b]	22,126,569	2.6
556,002	20,644,856	2.3

[a] In 2013 dollars.

[b] Expected value.

Source: EconSearch analysis.

The results of the sensitivity analysis show some variation in the NPV and BCR, but the result is still positive over a 50% range in this variable.

5.5 Discussion

There is potential for even greater net benefits in the future, particularly in relation to food waste. Prior to 2011 there were food waste trials, which were expanded after 2011. The trials

showed that waste diversion rates of 70% could be achieved (ZWSA, pers. comm.[28]). Since 2011, 30% of councils have moved to placing food waste in the organics stream. While there are some costs associated with caddies and bags, food waste equates to approximately 40% of the residual waste bin (ZWSA, pers. comm.[29]), so there are significant benefits to be generated as more councils adopt this and as more residents participate so that this behaviour becomes the social norm.

While this analysis has been limited to the metropolitan area, it is also worth noting that the recycling rate in non-metropolitan councils has increased from 12% in 2003-04 to 38% in 2010-11 (more than trebled) before the impact of any moves to place food waste in the organics stream.

Finally it is worth noting that the costs associated with dry recycling are likely to decrease significantly in the future with the introduction of the sale of commodities in future contracts. This is already the case in relation to one large metropolitan council (ZWSA, pers. comm.[30]).

[28] November 2013.

[29] November 2013.

[30] November 2013.

6. CONTRIBUTION OF THE WASTE INDUSTRY TO THE SA ECONOMY

6.1 Data and Assumptions

Input-output analysis is the analytical method this study used to measure the economic impacts of the waste industry. Input-output analysis provides a standard approach for the estimation of economic and social impacts of a particular activity. The model calculates industry multipliers that can then be applied to various development, growth or change scenarios. While this method has limitations, it is widely used in economic impact analysis and is a practical method for measuring economic impacts at the regional or state level.

The model used for the analysis of the South Australian economy was originally developed for the Department of Premier and Cabinet (EconSearch 2013). The model development process entailed using the national input-output table prepared by the Australian Bureau of Statistics. Given a set of base data (prepared by EconSearch), the national model was used to prepare an initial estimate of input-output tables, trade matrices and behavioural equations for each region and the state. Local data were then used to adjust the initial estimates to develop a set of state and regional models consistent across industries and in regional aggregation.

The waste industry is divided into three broad sub-sectors (Section 2):

- Waste management services - private business (ANZSIC Subdivision 29)
- Waste management services - local government authorities (ANZSIC Class 7530 (part)), and
- Waste management services - other industries (non–waste management businesses, ANZSIC various).

It is important to note that some key businesses that process / manufacture waste material into a product or into a feedstock material suitable for other business inputs (composting, plastics recycling, and scrap steel processing) are not represented in Subdivision 29 (Section 2.2.2). These businesses are represented in a range of other ANZSIC sectors (e.g. manufacturing) and, their contribution to the waste industry was estimated using ABS (2013a) experimental estimates adjusted at the state level. This adjustment process may mean that the estimates do not include all production activities involving the use of recovered materials. Inclusion of these would almost certainly augment the size and significance of the sector to the South Australian economy.

Estimates of direct employment, income and expenses in the South Australian waste industry in 2011-12 are provided in Table 6-1 (overleaf). Key points to note include:

- Total income across all industries is around $1.02 billion
- Total employment across all sub-sectors is estimated at just over 2,900 jobs
- Associated with this employment are wages and salaries of $160 million
- The total income figure is inflated by double counting along the value chain

- The vast majority (90%) of 'other income' for LGAs is in the form of local government rates, and
- Income from the sale of recyclable or recoverable material is estimated to total $313 million (consistent with the Rawtec (2013) estimate).

Although the issue of double counting along the value chain is difficult to quantify precisely, the expense items detailed in Table 6-1 do give some clue to its magnitude. For example, the items 'contract and subcontract expenses for waste management expenses' and 'fees for the treatment / processing and / or disposal of waste' together account for more than $180 million for waste management businesses and LGAs. These expenses must be paid for out of income or revenue generated by the businesses and LGAs purchasing the services. At the same time these expenses will be income for other businesses and so, in effect, this income is counted twice.

While gross income or turnover is an easy concept to understand, value added (otherwise known as contribution to Gross State Product) is a better measure in the context of an industry's contribution to the state economy. Value added for an industry is comprised of wages and salaries, gross operating surplus of business operating in the industry and indirect taxes (e.g. payroll tax).

From the data presented in Table 6-1, the direct value added attributable to the South Australian waste industry was estimated. The direct wages and salaries across all sectors of the waste industry were estimated to be $160 million. Across all sectors the difference between aggregate income ($1,020 million) and aggregate expenses ($996 million) was calculated to be $26 million. However this estimate fails to capture the gross operating surplus earned by businesses that are included under the expense items. For example, the fees paid to firms under the item 'Contract and subcontract expenses for waste management services' are a cost to the organisations paying for the service fees but for the companies receiving the fees part of the payment will be an operating surplus.

Using the data in Table 6-1 and with the aid of the RISE model, the total gross operating surplus plus indirect taxes across all waste sectors was estimated to be $120 million. This, together with wages and salaries of $160 million, gives direct value added attributable to the South Australian waste industry of $280 million.

Table 6-1 Estimated direct employment, income and expenses in the South Australian waste industry, 2011-12[a]

		Waste Management Services, SA			Waste Management Services Other Industries, SA									Total all Industries
		2011/12			2011/12									
		Private	LGAs	Total	Agriculture	Mining	Manufacturing	Construction	Wholesale	Retail	Transport, Postal & Warehousing	All other service industries	Total	
Businesses at end June (2009/10)	no.	182	68	250										
Employment at end June (2009/10)	no.	1,917	339	2,256	0	21	78	264	72	5	106	124	671	**2,927**
Income														
Income from waste services	$m	388.8	12.7	401.4	0	4	14	47	13	1	19	22	119	**521**
Income from sales of recyclable or recoverable material	$m	227.7	2.5	230.2	3	3	30	4	20	21	0	2	83	**313**
Other sources of income & income from energy generated from waste	$m	54.9	131.6	186.5	-	-	-	-	-	-	-	-	-	**186**
Total income	*$m*	*671.4*	*146.7*	*818.1*	*3*	*7*	*44*	*51*	*33*	*22*	*19*	*24*	*202*	***1,020***
Expenses														
Wages and salaries	$m	108.2	15.5	123.6	0	1	4	14	4	0	6	7	37	**160**
Contract and subcontract expenses for waste management services	$m	50.1	76.8	126.9	-	-	-	-	-	-	-	-	-	**127**
Fees for the treatment/processing and/or disposal of waste	$m	37.0	22.1	59.1	-	-	-	-	-	-	-	-	-	**59**
Other expenses	$m	429.8	26.4	456.2	0	6	22	75	21	1	30	35	191	**647**
Total expenses	*$m*	*625.1*	*140.8*	*765.8*	*0*	*7*	*26*	*90*	*25*	*2*	*36*	*42*	*228*	***994***

[a] Based on data provided in Rawtec (2013), no changes were made to resource recovery activity levels between 2009-10 and 2011-12, although dollar values for 2009-10 were inflated to 2011-12 dollars using relevant price indices. Accordingly, there was no credible basis to update the number of businesses or employment values provided in ABS (2013a) and were therefore left unchanged.

Source: ABS (2011, 2013a), Rawtec (2013), EconSearch analysis.

As noted in the source to Table 6-1, data were drawn from Rawtec (2013) to help estimate the direct economic contribution of the waste and resource recovery sector in South Australia. In particular the Rawtec data were useful in indicating the value of recyclable and recoverable material, estimated to be worth $313 million in 2011/12 as reported in Table 6-1. The disaggregation of this value by material type is provided in Table 6-2.

Table 6-2 Estimated resource value for recovered materials in South Australia from the 2011-12 Recycling Activity Survey

Material category	Resource recovery (tonnes)	Estimated on-sale price [a] ($/tonne)	Estimated Resource Value ($ millions)	Price data source [a]:
Masonry	976,600	$15	$14.6	WME (2011)
Metals	452,300	$400	$180.9	WME (2011)
Organics	901,600	$35	$31.6	WME (2011)
Cardboard & Paper	249,400	$225	$56.1	WME (2011)
Plastics	19,620	$250	$4.9	WME (2011)
Glass	68,000	$90	$6.1	Authors' estimate
Other Materials	82,800	$10	$0.8	Authors' estimate
Separately Reported Materials	1,230,000	$15	$18.5	Authors' estimate
TOTAL ALL Materials	3,980,320	$79	$313.5	

[a] Refer to Survey Methodology in Appendix 1 of Rawtec (2013) for additional information on resource recovery value assumptions and methodology.

Source: Rawtec (2013)

6.2 Results of Analysis

The direct contribution of the waste industry to the South Australian economy is detailed in Table 6-3. Direct value added (contribution to GSP) was estimated to $280 million in 2011-12 which comprised 0.32% of gross state product. The sector's share of state household income and employment is slightly higher at around 0.40%, reflecting the relatively labour intensive nature of the industry.

As noted in the previous section, the total jobs across all sub-sectors of the waste management services industry were estimated to be more than 2,900 jobs. According to the ABS Census of Housing and Population, people working in this sector, on average, work more than a full working week (37.5 hours). This means the full time equivalent (FTE) employment is actually higher than the total number of jobs, estimated to be more than 3,100 in 2011-12.

The same set of indicators are provided in Table 6-3 for the water, sewerage and drainage; fishing and aquaculture; accommodation; electricity generation (fossil fuel) and electricity generation (renewable) sectors.

In terms of direct value added, the water and accommodation industries are approximately double the size of the waste management industry while the electricity generation by fossil fuel industry is 20% larger. The fishing and aquaculture industry is about 25% smaller than the waste management industry and the electricity generation by renewable energy industry is less than half the size.

Table 6-3 Direct contribution of the waste industry and other select industries to the SA economy, 2011-12

	Waste Management		Water, Sewage, Drainage		Fishing & Aquaculture		Accommodation		Electricity Generation - Fossil Fuel [a]		Electricity Generation - Renewable [b]	
	Direct Contribution	SA Share (%)	Direct Contribution	SA Share (%)	Direct Contribution	SA Share (%)	Direct Contribution	SA Share (%)	Direct Contribution	SA Share (%)	Direct Contribution	SA Share (%)
Value added ($m)	280	0.32%	530	0.58%	210	0.23%	607	0.66%	336	0.37%	101	0.11%
Household income ($m)	201	0.40%	192	0.38%	190	0.38%	296	0.59%	74	0.15%	22	0.04%
Employment (fte)	3,164	0.45%	3084	0.44%	1,754	0.25%	5,976	0.86%	842	0.12%	253	0.04%
Employment (total)	2,927	0.40%	2734	0.38%	1,763	0.24%	6,577	0.91%	721	0.10%	217	0.03%

[a] ANZSIC code 2611.

[b] ANZSIC code 2619.

Source: EconSearch (2013), EconSearch analysis.

Given the labour intensive nature of the industry, when viewed in terms of employment the waste management industry is generally of greater significance. For example, the number of direct jobs in the waste management industry is similar to the water industry (almost 3,100 FTE) and much greater than the electricity generation (fossil fuels) industry (more than 800 FTE).

Direct income, employment and detailed expenditure data for the waste industry were applied to the SA RISE model to provide estimates of the contribution of the waste industry to the South Australian economy (Table 6-4).

Estimates of economic impact were calculated for the waste industry's three sub-sectors.

The bulk of the impact occurs in the private waste management services sector (66%) followed by other industries (22%) and local government services (12%). Note that estimates for local government exclude the waste management services outsourced from the private sector. These impacts are included under private waste management services.

Table 6-4 Direct and indirect contribution of the waste management industry to the SA economy, 2011-12

	Direct Contribution	Share of SA (%)	Production Induced	Consumption Induced	Total Contribution	Share of SA (%)
Private Waste Management Services						
Value added ($m)	183	0.21%	25	123	330	0.38%
Household income ($m)	132	0.26%	14	61	207	0.41%
Employment (fte)	2,074	0.30%	188	880	3,142	0.45%
Employment (total)	1,918	0.26%	197	972	3,086	0.43%
Local Government Services						
Value added ($m)	34	0.04%	5	23	61	0.07%
Household income ($m)	24	0.05%	3	11	38	0.08%
Employment (fte)	385	0.06%	35	164	584	0.08%
Employment (total)	356	0.05%	37	181	574	0.08%
Other Industries						
Value added ($m)	62	0.07%	8	42	112	0.13%
Household income ($m)	45	0.09%	5	21	70	0.14%
Employment (fte)	705	0.10%	64	299	1,069	0.15%
Employment (total)	652	0.09%	67	330	1,050	0.14%
Total Waste Management						
Value added ($m)	280	0.32%	38	187	504	0.58%
Household income ($m)	201	0.40%	22	93	316	0.63%
Employment (fte)	3,164	0.45%	288	1,342	4,794	0.69%
Employment (total)	2,927	0.40%	300	1,483	4,710	0.65%

Source: EconSearch analysis.

The flow-on or indirect effects (i.e. the multiplier effects) have been estimated in two parts: production-induced and consumption-induced effects. The production-induced effects arise from expenditure by waste management business / organisations on goods and services supplied by other firms in South Australia. The consumption-induced effects arise from expenditure of industry workers' income on goods and services supplied by South Australia businesses.

Based on employment shares from the 2011 census, the impact of the waste remediation and materials recovery sector has been estimated and is provided in Table 6-5.

Table 6-5 Direct and indirect contribution of the waste remediation and materials recovery sector to the SA economy, 2011-12

	Direct Contribution	Indirect Contribution	Total Contribution	SA Share (%)
Value added ($m)	127	102	229	0.27%
Household income ($m)	91	52	144	0.29%
Employment (fte)	1,440	742	2,181	0.31%
Employment (total)	1,331	811	2,143	0.30%

Source: EconSearch analysis.

Based on ABS employment data, the resource recovery part of the sector was estimated to generate 1,440 direct FTE jobs and almost 2,200 when multiplier effects are included. This represents approximately 45% of the waste and resources recovery sector's total employment of 4,800 FTE. In terms of GSP, around $125 million directly and almost $230 million in total is generated by the resource recovery part of the sector. It should be noted that these estimates do not include all activities involving the use of recovered and recycled materials and therefore almost certainly understate the size and significance of the sector to the South Australian economy.

6.3 Discussion

The waste management industry is an important contributor to the South Australian economy. Results of a macro-economic analysis of the industry reveal the following.

- Value added by the industry in 2011-12 was $280 million, or $504 million once multiplier effects are taken into account. This is equivalent to 0.58% of Gross State Product.
- Waste management services are provided directly by private sector firms and local government authorities operating within the waste management sector and also by industrial sectors that provide their own services.
- Contributions by these sectors to GSP are 0.38%, 0.07% and 0.13% respectively, indicating that local government is responsible for only 12% of economic activity in this area.
- Employment is estimated to be 2,900 jobs, or 3,100 when measured as full-time equivalents (FTE). With multiplier effects included there are an estimated 4,700 jobs in total (4,800 FTE). Employment generated through local government activity is less than 20% of the total.

The figures reveal the relatively modest economic significance of the local government component of waste management activity. However, the complexity of the local government component, reflected in a highly diffuse material source and wide variety of material types that have relatively low monetary value, gives rise to the relatively high level of effort and resources that are put into managing the municipal waste flow.

Table 6-6 places the significance of the waste management and resource recovery industry into perspective.

Table 6-6 Relative scale of the waste management and resources recovery industry compared to other sectors of the economy, 2011-12

Sector	Direct contribution to GSP ($ million)	Direct employment (FTE)
Waste and resources recovery [a]	280	3,100
Water	550	3,100
Air transport	290	1,700
Accommodation	600	6,000
Fishing and aquaculture	210	1,800
Fossil fuel electricity generation	330	850
Other electricity generation [b]	100	250

[a] Includes waste management services provided directly by private sector firms and local government authorities operating within the waste management sector and also by industrial sectors that provide their own waste management services. The latter component was estimated using ABS (2013a) experimental estimates adjusted at the state level. This adjustment process may mean that the estimates do not include all production activities involving the use of recovered and recycled materials.

[b] Includes biomass, geothermal, solar, tidal and wind.

The analysis of economic contribution of the waste industry to the state economy has relied heavily on the Australian Bureau of Statistics (ABS) publication *Waste Account, Australia, Experimental Estimates* (ABS 2013a). This publication provides a series of experimental tables showing information on the generation and disposal of waste to landfills or to recycling facilities, the supply of recycled materials in the economy and related financial flows. The methodologies and data used in this publication will be reviewed and assessed by the ABS over time to improve the quality and usefulness of information provided in future waste accounts. It is a recommendation of this report that ZWSA engage with the ABS in this review process so that the data provide a clear and transparent indication of waste industry activity across *all* sectors of the economy at the state level, particularly in the value and downstream utilisation of recoverable and recyclable materials.

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APPENDIX 1 WASTE INDUSTRY DEFINITION

For the purpose of this analysis the waste industry has been defined as the activity undertaken in the four industry classes defined under ANZSIC Subdivision 29 - Waste Collection, Treatment and Disposal Services[31].

Subdivision 29 has two groups:

- *Group 291 - Waste Collection Services, and*
- *Group 292 - Waste Treatment, Disposal and Remediation Services.*

Group 291 (Waste Collection Services) is comprised of two classes as defined below.

Class 2911 - *Solid Waste Collection Services*

This class consists of units mainly engaged in the collection and haulage (except long distance) of domestic, commercial or industrial solid waste (except through sewerage systems). This class also includes units who provide portable toilets, bins and other receptacles for hire to clients as part of a waste collection service.

Primary activities:

- Bin hiring and waste collection service
- Garbage collection service
- Hazardous waste, solid, collection service
- Industrial waste, solid, collection service
- Metal barrel / skip hiring and waste collection service
- Night soil collection service
- Portable toilet hiring and waste collection service
- Rubbish collection service
- Solid waste collection service
- Solid waste haulage service (local), and
- Waste, solid, collection service.

Class 2919 - Other Waste Collection Services

This class consists of units mainly engaged in the collection and haulage (except long

[31] This section draws on definitions provided in ABS (2008).

distance) of domestic, commercial or industrial liquid waste and other waste types (except through sewerage systems).

Primary activities:

- Hazardous waste (except solid) collection service
- Industrial waste (except solid) collection service
- Liquid waste collection service
- Liquid waste haulage service (local)
- Oil collection service
- Septic tank waste collection service (except repairs and maintenance), and
- Waste collection service n.e.c.

Group 292 (Waste Treatment, Disposal and Remediation Services) is also comprised of two classes as defined below.

Class 2921 - Waste Treatment and Disposal Services

This class consists of units mainly engaged in the treatment or disposal of solid, liquid and other waste types (including hazardous). Also, included are units mainly engaged in operating landfills, combustors, incinerators, compost dumps and other treatment facilities (except sewage treatment facilities), including waste transfer stations.

Primary activities:

- Garbage disposal service
- Hazardous waste treatment or disposal service
- Operating landfills
- Operating other waste treatment facilities
- Rubbish dump or tip operation
- Sanitary disposal service, and
- Septic tank pumping or cleaning service (except repairs and maintenance).

Class 2922 - Waste Remediation and Materials Recovery Services

This class consists of units mainly engaged in the remediation and clean-up of contaminated buildings and mine sites, mine reclamation activities, removal of hazardous material such as asbestos and lead paint and other toxic material abatement. This class also includes units mainly engaged in providing materials recovery and sorting services.

Primary activities:

- Asbestos removal service
- Hazardous material removal
- Lead paint abatement service
- Materials recovery station operation
- Materials separating and sorting operation
- Mine reclamation
- Remediation service, environmental
- Toxic material abatement, and
- Waste remediation.