



Government of South Australia  
Zero Waste SA



# Zero Waste South Australia

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## South Australian Recycling Industry Investment Review

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### Priority Investment Opportunities

September 2009

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# Executive Summary

Zero Waste SA (ZWSA) has sought an analysis of the capacity and capability of existing resource recovery infrastructure to accommodate current and future demand in the sector. Two earlier reports from this study have documented collated views on the subject from industry, plus analytical results of likely supply and demand scenarios. Now, this third report, with a focus on infrastructure in the metropolitan Adelaide region, sets out the findings of the study team on the priority investment program areas that ZWSA might consider supporting to boost resource recovery in South Australia.

A key finding from this study is that South Australia is well positioned in respect of the availability of current, and near-term anticipated, resource recovery infrastructure to manage the supply of materials presenting for recycling, through to 2019-20.

The resource recovery sector in South Australia, with considerable support from ZWSA, has managed exceptionally well to anticipate supply and demand for infrastructure. This has resulted in South Australia becoming one of the leading jurisdictions in the country when it comes to resource recovery and diversion of waste from landfill.

There are however, opportunities where further investment offers potential to build on this impressive positioning and maintain South Australia in this leading position. Four key program areas for investment consideration have been identified:

- support to improve the efficiency of primary sorting facilities,
- facilities for sorting mixed residual waste prior to despatch to landfill,
- support to achieve sustainable markets, and
- support to improve the quality and quantity of material presenting for beneficiation.

In each suggested program area, the investment opportunities lie primarily in refinement of practices, systems and technologies, rather than in large fixed items of infrastructure or facilities. These opportunities arise through a combination of circumstances, including:

- changing regulatory conditions,
- receiving market demands on product quality,
- sector interest in productivity improvements, and
- recognised benefits that arise with improved flexibility and innovation.

This third stage report presents the case for a suite of potential investment program areas and sets out a comparative analysis of the areas so that the relative benefit of each might be compared against the other (potentially) competing opportunities.

The report concludes by outlining an approach for moving forward with the sector to identify the specific opportunities in the program areas through a competitive proposal process and grant scheme. This includes indicating the expected cost range of investments that may need to be made by Zero Waste SA on a per project basis, which can be used to determine the total investment expenditure required depending on how many projects it wishes to fund in each of the program areas.

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# 1 Background

The assignment to date has consulted with industry, studied available data and established a likely picture for the supply and demand for resource recycling infrastructure in South Australia from the current time through to 2019-20.

Two reports have been prepared to this stage in the assignment, namely:

- Stage 1 – a discussion paper setting the scene for industry consultations and providing a briefing paper for industry participants; and
- Stage 2 – a report identifying the supply and demand pictures.

Now this Stage 3 report presents a set of recommendations on investment options that Zero Waste SA might consider to support the on-going drive for removing more recyclable materials from the waste stream before residual wastes are despatched to landfill.

This Stage 3 report is structured as follows:

- a snap shot of the infrastructure issues identified through the assignment to date;
- a consideration on investment intervention in secondary processing;
- a comment on infrastructure areas where intervention may not be beneficial;
- a summary of infrastructure areas where intervention may be beneficial on a program basis, with accompanying discussion;
- prioritised program areas for investment, with commentary on relative costs and benefits, metrics for measuring success rates, and some policy options that might be considered to support the sector in general and the specific investment opportunities identified in particular, and
- concludes with a brief outline of a competitive process for identifying specific investment opportunities within each of the program areas.

## 2 Snap Shot of Infrastructure Issues Identified

South Australia is well positioned in respect of the availability of current, and near-term anticipated, resource recovery infrastructure to manage the supply of materials presenting for recycling, through to 2019-20.

For the major commodity streams, traditionally considered for resource recovery, there is no evidence:

- that collectors of materials destined for recycling are pushing-back to waste generators to slow down source separation and supply efforts,
- that materials presenting for resource recovery are being turned away by reason of inadequate infrastructure capacity or availability,
- that beneficiated materials are being stockpiled or disposed of due to unsatisfactory market conditions,
- that materials recovered from the feed streams cannot find markets, or
- that these conditions are likely to change materially in the period to 2019-20 as a result of industry failing to invest in new infrastructure or capacity.

Specific areas identified where supply of materials presenting for recovery may not be adequately accommodated by current or future infrastructure include:

- regional areas where opportunities for increased resource recovery from residual waste might be hampered by the availability of suitable infrastructure or the economics of transporting to suitable infrastructure,
- metropolitan facilities for receipt and sorting of mixed residual waste streams prior to despatch to landfill, that might be required as a result of the Waste to Resources EPP, and
- tyre recycling facilities that might be required if a national producer responsibility scheme is introduced.

In respect of the latter issue where a national producer responsibility scheme might arise, a similar situation might exist, but was not explored in this assignment, in the areas of paints and e-waste.

Notwithstanding this apparent adequacy of current and proposed infrastructure capacity to meet demand for the traditional recyclables material streams, participants in the sector clearly identified areas where system improvements might be achieved, to deliver wider benefits to the sector. In particular these included:

- support to achieve sustainable and discerning markets for products,
- support to improve the quality of material streams presenting for beneficiation,
- support to improve specific aspects of materials handling and sorting to improve recovery rates.

Accordingly, the recommended key priority investment program areas for ZWSA in recycling infrastructure and market development lie principally in the latter and system improvements to the former (instead of necessarily building new infrastructure).

The following sections develop and discuss these program areas, including likely costs, type of grants and proposed success-evaluation metrics.

## 3 Interventions to Boost Secondary Processing

### 3.1 Key issues & guiding principles

Contributors to this study from both Government and industry sides raised the question of ZWSA intervening in markets to boost local participation in secondary resource beneficiation. Whilst there appears to be nascent interest from industry to invest, if and when conditions are suitable, there remains a nagging question for many about the role of Government in crystallising these investments and building local market resilience.

However, in many instances the desire to invest in these circumstances boils down to a desire to achieve an aspirational objective that might not be fulfilled by natural market forces alone. It is therefore essential to identify whether the failure being pursued is indeed a true market failure, or a failure of the markets to deliver on non-market aspirations and objectives.

A decision by Government to intervene in a market through investment of resources is generally only considered where there is a reasonable supposition that a market failure exists and natural market dynamics are not effectively in play to moderate or correct the failure. In this situation:

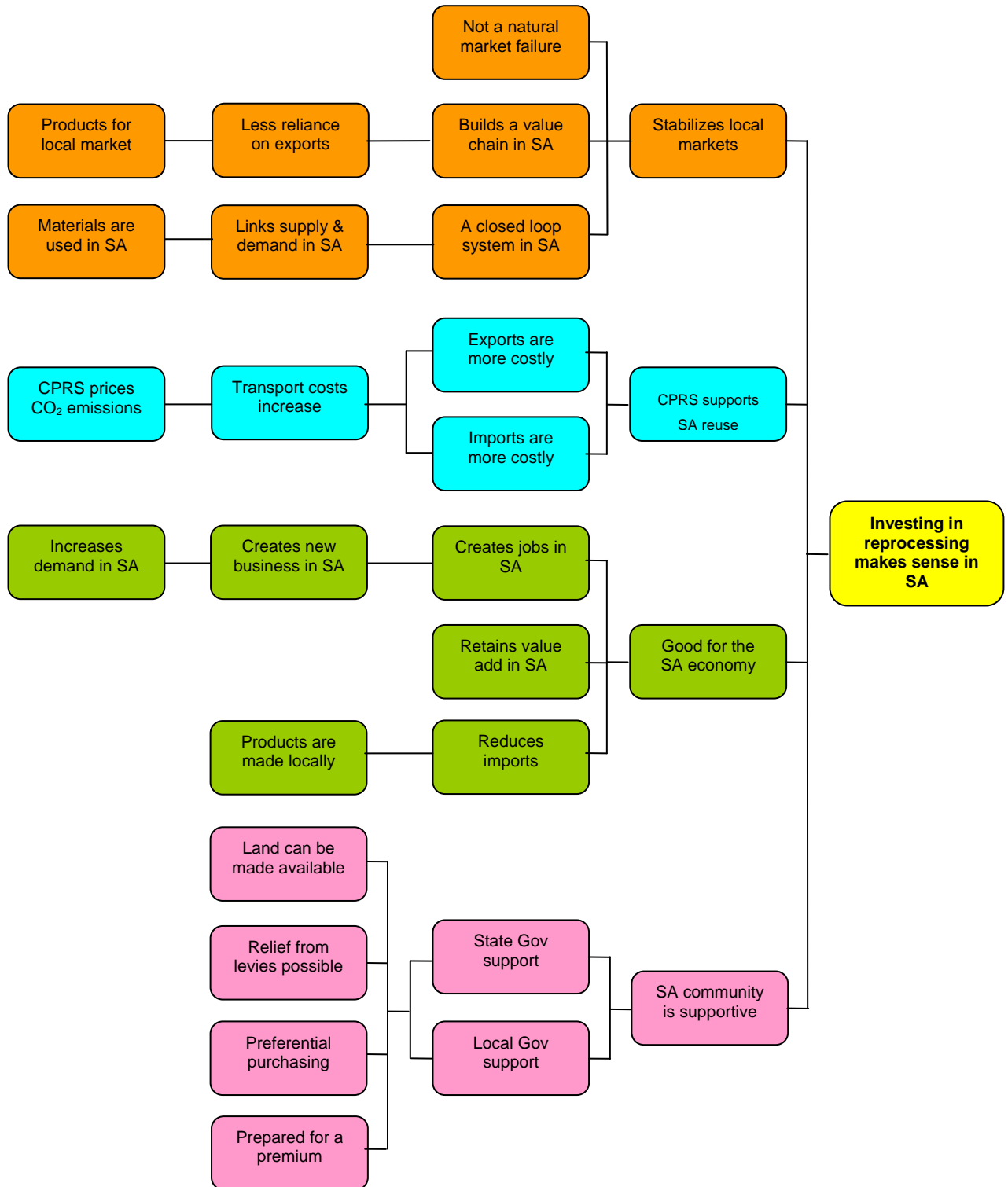
- the intervention should be closely examined, a clear case developed for intervention in a system where natural market forces should become effective, the intervention should emulate natural market circumstances and be applied at or near the point of failure.

Exceptions to this general principle will arise in circumstances where outcomes are desired that may not necessarily be delivered by natural market dynamics alone – for example where improvements in resource conservation outcomes might be sought, but natural markets do not respond in the desired way. In this situation:

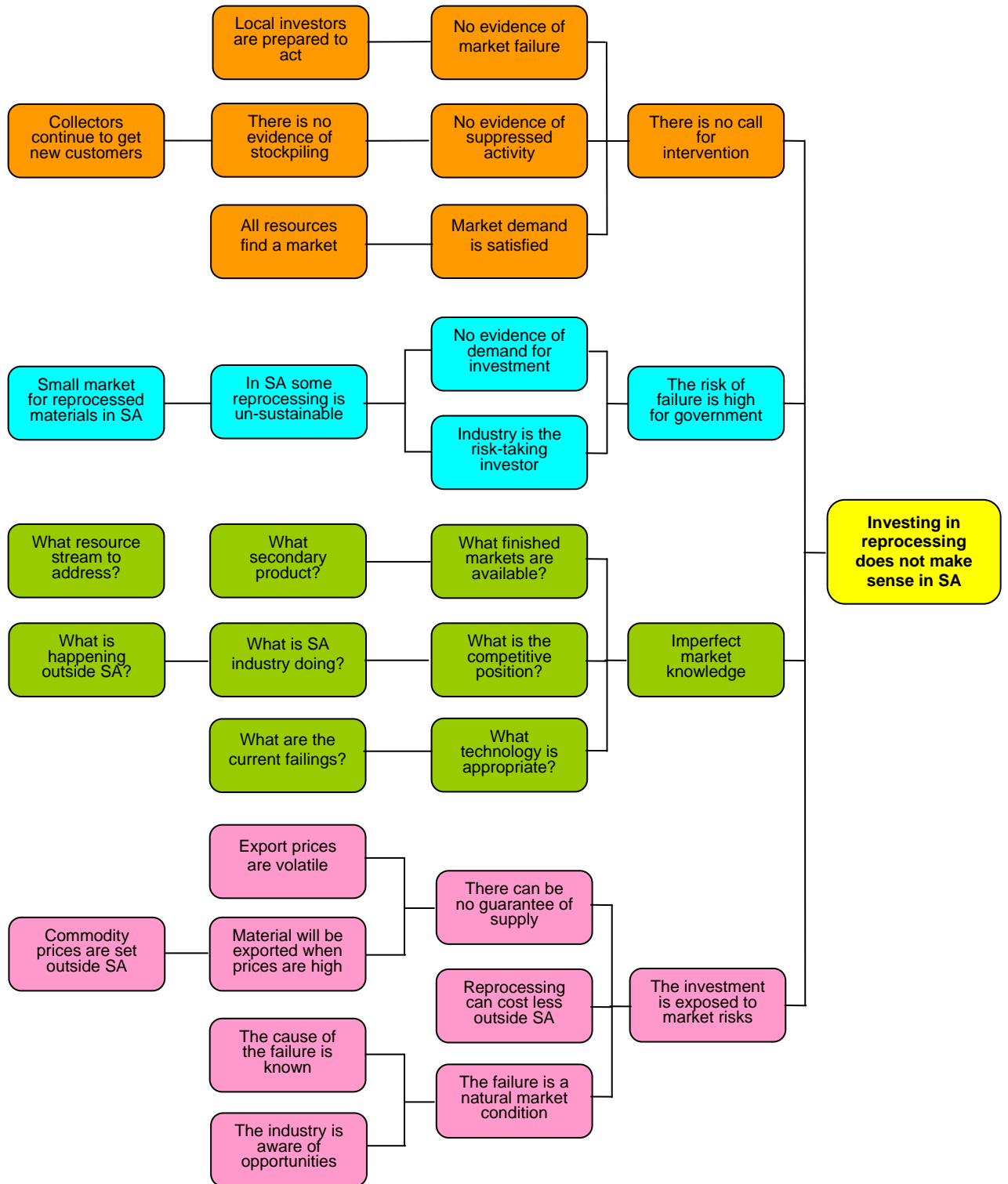
- the extent of intervention should be related to the importance of the failure and the cost that one is prepared to invest in addressing the failure outside of natural market forces.

To help shed some light on the issues and establish a process of consideration that might be followed when pondering this question of intervention, the factors that arise can be presented in an argument map format, where the prose of each argument is translated into a graphic form. In each of the two argument cases presented below, the proposition being tested is “*whether investing in reprocessing makes sense in South Australia*”. Each side is presented as a sequence of positions or statements underpinned by supporting arguments, which in turn may be further supported by a second and a third level of underpinning arguments. Figures 1 and 2 present basic argument maps *for* and *against* the proposition respectively.

**Figure 1: Argument Map supporting Investment Intervention**



**Figure 2: Argument Map against Investment Intervention**



## 3.2 Areas Where Intervention May Not Be Beneficial

At Stage 2 of the assignment a view was formed, and re-stated earlier in this report, that:

*“South Australia is well positioned in respect of the availability of resource recovery infrastructure to accommodate the supply of materials presenting for recycling, both today and in the period up to 2019-20”,*

On the basis that this view is reasonably representative of general market conditions, there would appear to be little justification for investment intervention in infrastructure for the traditional material streams associated with resource recovery and recycling.

The exception to the general case arises in circumstances where specific failures have been identified, and natural market developments are unlikely to rectify the failure. Some examples of such instances are discussed below.

## 3.3 Areas Where Intervention May Be Beneficial

Specific areas where intervention investment may be warranted include:

- support to improve the effectiveness of primary sorting facilities;
- facilities for sorting mixed residual waste prior to despatch to landfill;
- support to achieve sustainable markets;
- support to improve the quality and quantity of material presenting for beneficiation;
- support in regional areas where opportunities for increased resource recovery from residual waste might be hampered by the availability of suitable infrastructure; and
- targeted education and awareness raising linked to primary intervention initiatives..

Within each of these potential program areas there will be multiple ideas and specific opportunities for process and productivity improvement, depending on the particular circumstances and operating challenges at each individual resource recovery facility. In the following sections, the proposed program areas are discussed to highlight the broad potential and set the scene for a competitive system of grants with industry, where industry is called upon to identify and justify specific investment opportunities within the program areas.

### 3.3.1 Improving Effectiveness of Primary Sorting Facilities

Where waste streams are separated at source – dry recyclables, garden organics, food organics, bricks and concrete, etc. – the streams are presented to primary sorting facilities where the aim is to remove contaminants and aggregate like materials for further processing or despatch to secondary process facilities.

There appears to be opportunities where improvements in the efficiency and effectiveness of existing primary sorting facilities may be supported, thereby:

- improving the quality of the recovered resources,
- reducing the amount of sub-standard or contaminated resources that are despatched to low-value markets or landfill,
- recovering further resources from the residual before consigning to landfill

The opportunities for support typically lie in the areas of contaminant removal and material sorting and might include innovations and improvements in equipment, technologies and practices.

Initiatives that might improve the efficiency and effectiveness of resource recovery from streamed wastes could include the following:

- Upgrading of key processing bottlenecks that are ineffective or inefficient at separating resources from non resources. This would be applicable across most recycling sorting/processing infrastructure including MRF operations, C&D/C&I processing operations, organics processing and plastics beneficiation
- Supporting developing technologies and processes around de-packaging including those that can extract food products from non-rigid packages that have been discarded due to a package exceeding its use-by date, or a package being damaged in handling;
- developing material handling systems in the front-end sorting that facilitate recovery of contaminants and any bulky wastes;

Of these types of initiative, it is not unreasonable for Government to consider involvement, in one form or another. A specific grants program could be developed to target measurable improvements in recycling infrastructure effectiveness.

### 3.3.2 Sorting Mixed Wastes

There is a clear expectation in the consultation draft of the Waste to Resources EPP that there will be a requirement for all waste streams to be intercepted prior to disposal at facilities where sorting and resource recovery might be put into effect. As yet, the extent of resource recovery expected and the veracity of compliance checking have not been set out, so it is currently not possible to be definitive on the infrastructure investments that might be required.

In consultations with industry, the lack of clarity for the final form of the EPP and the requirements it may contain mean that industry participants have not made firm decisions on infrastructure investment. Most prefer to await clear directions, with some clearly expecting that they might get by with existing infrastructure – as is the case at some transfer stations.

If it emerges that there will be reasonable expectations of resource recovery, and that this will be accompanied by rigorous compliance testing and possibly mandatory reporting, then it is clear that the existing infrastructure currently used to despatch waste streams to landfill will not be adequate for the task.

There will therefore be a demand for introduction of new purpose-built receival facilities, especially for C&I wastes, where sorting of incoming waste streams can be conducted in safety, followed by despatch of residuals to the landfills via traditional transfer facilities. Logically, where space and circumstances permit, the new receival facilities could be co-located and operate as a “front-end” to the existing transfer facilities.

Initiatives that might improve the recovery of materials from mixed waste streams could include the following:

- improving the “sortability” of incoming waste streams through a reduction in the level of contaminating substances at source removing contaminants such as food organics, paints, chemicals and other liquids, that would leave residual wastes cleaner, more easily sorted, presenting less occupational health and safety risks and generally improving the value of the recovered materials;
- permitting multiple activities at transfer sites to allow sorting, primary processing (e.g. shredding), stockpiling and separate despatch;
- permitting utilisation of “low-grade” fuels in energy from waste facilities;
- developing “rough sorting” systems that might undertake a coarse sort of incoming materials from situations such as events, petrol stations, public places, etc., where significant quantities of recoverable materials may be masked or degraded by contaminating wastes that are co-disposed; and
- developing material handling systems in the front-end sorting that facilitate recovery of bulky recoverable materials and contaminants.

Of these types of initiatives, it is not unreasonable for Government to consider involvement, in one form or another, in all five possibilities.

### 3.3.3 Sustainable Markets

The resource recovery sector relies entirely on markets that are prepared to accept the products generated from the sector. Sustainable markets provide sustainable support for the supply side of industry.

But the drive for sustainable markets must have at least two basic elements – flexible and responsive suppliers, and aware and discerning buyers.

In natural market systems there will be a continual churn in the demand for products and it is unrealistic to expect that single product lines can always find sustainable markets. There needs to be flexibility on the part of suppliers to modify and adapt products to meet changing market demands.

On the demand side, awareness of the availability and benefits of products manufactured from recycled and recovered resources is a continuing challenge, made ever-more challenging when the marketing budgets for new products, using virgin resources, are compared with the marketing often

associated with products from recycled goods. In meeting these challenges, suppliers need flexibility and innovation in marketing, and on-going awareness programs.

The organics market segment is one of particular note, due to the forecast of excess of 100,000 tonnes per annum additional recovered organics being recovered within the next 5 years. Whilst the processing capability appears to be in place, this is a significant increase in volume (+25%) for the market to adsorb over a relatively short period.

Typical initiatives that might help to develop and maintain sustainable markets could include:

- market knowledge and intelligence to understand the drivers of change in market demand;
- buyer awareness to comprehend product qualities and benefits;
- business practices, systems and arrangements that support internal flexibility to adapt to new products;
- support to industry to boost innovation capacity;
- product development that taps into market demands and preferences;
- technologies and processes to transition products into higher grade markets; and
- technologies within the business to allow adaptation to changing product demand.

Of these types of initiative, the first four might be suitable for Government involvement, the fifth to a lesser extent, and industry could be left to primarily manage and introduce the last two classes of initiative involving technological improvements.

### 3.3.4 Quality and Quantity of Supply Materials

The efficiency of recovering materials from discard streams and the value of the recovered materials will both be highly dependent on the quality of the incoming streams. Equally, the cost of recovery will be impacted by both the quality and the quantity of the materials presenting. This is especially important in source separated streams of recoverables such as organics and dry recyclables, where contamination and low supply volumes adversely impact on resource recovery economics.

The Recycling at Work initiative of ZWSA aims to address part of this issue – that of supply quantities – by providing incentives to collection contractors to build sustainable collection runs that can deliver higher quantities of recoverable materials into the market. Here, ZWSA is leveraging off the self-interest of the collection contractors to find new customers by in-fill selling and score sustainability runs – in the process delivering increased quantities for resource recovery.

Similar self-interest leverage opportunities might well be an effective way to boost both quantity and quality of source separated materials. Facilities managers or building managers might represent one such opportunity. In this instance the facility or building manager might be incentivised to roll-out source separation disposal systems across their buildings, requiring multiple tenants to sort waste before discard and cleaning contractors to maintain stream separation through to collection.

This is another example of the *one-to-many* approach of Recycling at Work, where one party is incentivised and many parties are encouraged to participate – significantly multiplying the impact of a relatively small intervention in a way that is likely to lock-in change in behaviour at source.

The one-to-many model could be further examined in various contexts in the C&I sector to identify opportunities for interventions that improve both stream quality and quantity. Possible areas for consideration might be:

- the building manager example presented above;
- retail chains and franchises where standard criteria can be set at a high level for individual retail outlets to follow – fast food, petroleum products, clothing, shopping centres, etc.;
- government purchasing where suppliers are required to comply with set criteria;
- government purchasing where users of procured services within government are required to comply with set criteria.

In the last area, specific targets might be considered such as the health sector, the education sector, etc.

This type of intervention is very much suited to government leadership and incentive, and supports both this area identified for improvement opportunity as well as the earlier mentioned area of cleaning up mixed waste streams to improve sortability.

### 3.3.5 Regional Infrastructure

In the not too distant future, the quantity of waste discarded to landfill in non-metropolitan areas of South Australia will exceed the tonnes of waste disposed to landfill in metropolitan Adelaide – even though the population ratio and waste generation ratio clearly is biased towards the metropolitan area. In addition, with the lower level of resource recovery in the non-metropolitan areas, the quantities of potentially recoverable resources going to landfill would appear to represent an attractive target for further recovery effort.

This issue was not specifically addressed on this assignment under the defined scope of work, but it was briefly touched upon, when considering the potential impact of transferring resources recovered in the regional areas to metropolitan facilities for beneficiation.

It would appear that the issue of regional resource recovery through increased source separation is one of market failure and one where strategic intervention through investment of resources might prove beneficial.

Given that ZWSA is currently in the process of reviewing the non-metropolitan programs within the Waste Strategy, and given the lack of detailed investigation on this assignment, it is considered inappropriate to proffer specific recommendations in this report.

### 3.3.6 Targeted Education and Awareness

This aspect of change would appear to warrant inclusion in this section dealing with areas for consideration of intervention. This is primarily because education and awareness-raising are fundamental tools that can enhance all of the foregoing opportunities.

In looking at education and awareness opportunities, it may be productive to consider the prime intervention and objective, and then to consider education and awareness as one of the specific tools that might be harnessed to enhance the intervention. This targeting of the education and awareness interventions allows material to be packaged and delivered on the one-to-many basis mentioned above, where third parties do the delivery on behalf of ZWSA.

## 4 Program Areas for Investment

### 4.1 Analysis

At Attachment A an analysis is presented of the various options discussed in Section 3 above, with the objective of establishing some relative leverage between the program areas where specific investment implementation.

### 4.2 Benefits from Investment

In the analysis at Attachment A, benefits and leverage that might be achieved through investment in the various opportunities were highlighted. Here those benefits are summarised under a series of headings where benefits can accrue and where indicators of performance can be identified when monitoring the outcomes from specific investments.

The leverage obtained from intervention investment would include the following:

- *investment by others* – in each of the program areas ZWSA investments should be seen as a demonstration of opportunity or potential. Once the demonstration is completed and openly reported from the demonstration site, the remaining industry participants will be motivated to invest in similar improvements or opportunities;
- *tonnes diverted* – each of the program areas is intended to facilitate interception of waste and improvement of recovery of resources at existing facilities. On this basis, tonnes diverted from disposal, additional tonnes recovered and the quality of the recovered tonnes represent benefits and indicators of performance;
- *employment* – intercepting waste streams for resource recovery prior to disposal represents new activity that would require new employment; while enhancements to existing systems and infrastructure would lead to improved productivity of existing employees, rather than additional employment;
- *local economic benefit* – in the interception of waste streams and resource recovery there will be a requirement for new equipment and new employment, both of which can be supplied from the local markets; while upgrading existing systems and technologies will have beneficial impact in the technology supply business volume, but perhaps little change in employment
- *stabilisation of markets* – this will depend on the material recovered and the immediate market to which it is despatched for secondary processing;
- *carbon impacts* – in respect of the solid inorganic materials recovered, the principle carbon benefits relate to the recycling and reuse of those materials in-lieu of using virgin resources. Any biodegradable materials recovered from landfill would yield an associated emissions

benefit at the landfill and possible further benefits depending on the secondary process used for final beneficiation;

- *behaviour change* – the thrust of ZWSA is to establish behaviour change at source or point of discard, with maximum focus on source separation to yield cleaner streams for better resource recovery levels and higher material quality. Three of the four program areas are internal to the resource recovery sector and are unlikely to have upstream influence on the behaviour of waste generators. However, the fourth program area is targeting quality of streams presenting – both to primary sorting and secondary beneficiation activities. To the extent that initiatives supported under this program area target waste stream quality upstream of primary sorting, there will be follow-on benefits in behaviour change;
- *sustainability* – a key objective of an investment grant will be to establish viable approaches to improving the recovery of resources from incoming waste streams. Once demonstrated as beneficial, it is highly likely that the wider industry will seek to replicate the improvements and thus build sustainability into the sector.

### 4.3 Outlining the Programs

In the tabulation below the four proposed program areas are discussed from the perspective of need, examples of where investment might be beneficial, a range of benefits that might accrue and the likely cost range of individual investments that might be proposed by industry through a competitive grants arrangement. The cost range for individual investments is given on per project basis. This will enable to Zero Waste SA to consider how many projects it wishes to fund in each program areas depending on the total expenditure it intends to allocate.

**Table 4.1 - Recommended Priority Investment Program Areas**

Investment Program Area for ZWSA	Need	Examples	Benefits	Estimated Cost Range per Project
<p><b>1. Support effectiveness improvements of primary processing/sorting facilities (See 3.3.1)</b></p>	<p>Most current resource recovery facilities have parts of the process that are less than ideally efficient. This may manifest itself as poor separation of recyclables from each other or genuine waste components or as a bottleneck that restricts processing. This result is residual waste streams to landfill still containing recoverable resources and the quality of the recovered resources being downgraded</p>	<p>Opportunities can be found in existing recycling MRFs, C&amp;D recycling operations and facilities targeting recovery of recyclables from the C&amp;I stream including paper/cardboard, plastic and organics.</p>	<p>Increased recovery of resources and resource efficiency.  Less resources to landfill in the residual from the recycling facility.  Increase the quality of the resources recovered. This will increase value and potential application of recovered resource.</p>	<p>\$10,000 - \$1,000,000</p>
<p><b>2. Support installation or upgrade of facilities for sorting mixed residual waste prior to despatch to landfill (See 3.3.2)</b></p>	<p>The proposed Waste to Resources EPP will encourage increased sorting/recycling infrastructure for the mixed waste stream, particularly from the C&amp;I sector.</p>	<p>Existing metropolitan transfer stations and recycling facilities are considering infrastructure upgrades or new installations</p>	<p>Increased recovery of resources and resource efficiency.  Less resources to landfill in the residual from the recycling facility</p>	<p>\$100,000 - \$2,000,000+</p>

<b>3. Support to achieve sustainable markets for recycled products (See 3.3.3)</b>	Ongoing market & product development is required to provide demand for the recycled products against an increasing volume of recycled products	Organics areas volume increase needs to be matched with increased product usage.  Beneficiation of paper, cardboard and plastic	Value added products  Increased volumes of recycled product sales  Increased product acceptance  Increased market sustainability	\$10,000 - \$500,000
<b>4. Support to improve the quality and quantity of recyclables presenting (See 3.3.4)</b>	Ongoing support for increasing sources separated recycling systems through Recycling at Work program and expansion to a new program for facilities/cleaning management companies		Increased recovery and quality of recyclables  Less recyclables to landfill  Increased efficiency for collection companies logistic operations through additional services	\$10,000- \$50,000 pa

## 5 Moving Forward

In the foregoing sections, the broad areas of investment that might be proposed by industry might be grouped into three general classes:

- **Information** - development and dissemination of information to improve knowledge and practices,
- **Incentives** - providing financial incentives to motivate parties to change practices, and
- **Funding** - investment in process technology and practice to demonstrate outcomes that can be achieved.

ZWSA has successful business models in place for all three of these forms of intervention, and there is good sense in maintaining current approaches for the first two of these, developing programs, and partners and soliciting proposals from relevant parties to move forward with the investment ideas.

In respect of funding investment in process technology and practice, this intervention borders on the investment area where, in fully efficient markets, industry would logically be motivated to invest without external stimulus. However, in some instances this is not happening and government stimulus in the market with strategic interventions can establish and expedite a path for progress.

This assignment was not intended as a detailed analysis of the operating performance of the recycling sector. Rather it was aimed at looking at the adequacy, today and in the near future, of the infrastructure in the sector. In the process of the study, and in particular through the industry consultations, some broad improvement areas have been identified – the suggested program areas – and some specific ideas raised.

In moving forward from this study it is proposed that a competitive grants scheme be established in each of the four program areas identified in Table 4.1, where industry participants are invited to identify specific ideas or opportunities for stimulus investment by ZWSA in the form of an Expression of Interest.

Proponents would be required to base their investment proposal on business plans developed by the proponents with support from ZWSA as appropriate. A possible model for this approach might be as follows.

- Call a round of expressions of interest for grants from the market for proposals that involve joint funding by the respondent and ZWSA in investment ideas from within the four program areas.
- Assess the EOIs and invite a short list of respondents to prepare preliminary business cases – with ZWSA contributing a fixed amount to the cost of the business case from each invitee.
- Assess the preliminary business cases and select a limited number of attractive submissions to proceed to full business case, funding models and marketing proposals on a maximum 50:50 cost-share basis with ZWSA.

Enter into funding agreements with one or more of the parties to move forward with the initiative with performance requirements (based on the business case). There are two options ZWSA may like to consider funding. The first option is to fund up to a maximum 50:50 cost share basis as per previous grant programs, based on achieving project performance requirements. The second option ZWSA may like to consider is to fund selected projects with performance requirements and shared rewards (both based on the business case) for ZWSA to re-coup some of the seed funding. This option could consider funding to be greater than 50% up front by ZWSA with a “dividend” recouping the upfront investment following the period after commissioning. In both cases the business case funding would be a sunk cost and would not be recovered. The objectives behind the second option are:

1. the investments by ZWSA are directly aimed at productivity increases in both plant through-put and resource recovery,
2. thus there will be improved financial outcomes on the part of the operator of the facility,
3. the level of funding from ZWSA would exceed the normal 50:50 cost share basis,
4. the additional funding is designed to act as a trigger to stimulate the private investment and get the initiative operational,
5. in recognition of the additional stimulus, the proponent would repay the ZWSA investment in excess of the 50:50 share level from proceeds generated.

# Attachment A Prioritising Opportunities

## A.1 Analysis

In this attachment, an analysis is presented of the various intervention options discussed in the broad program areas in Section 3 of the report, with the objective of establishing some relativity between the opportunities in respect of a likely priority for implementation, and thus establishing some broad parameters within which ZWSA can go to industry for specific opportunities for investment.

The analysis is completed via three sets of tables:

- Set A – Discussing the Initiatives,
- Set B – Implementing the Initiatives, and
- Set C – Assessing the Leverage.

Within Table Sets A and B, there are four sub-tabulations to group the initiatives into the four classes used in Section 3 of the report:

- 1 – Improving the Effectiveness of Primary Sorting Facilities,
- 2 – Sorting Mixed Wastes,
- 3 – Sustainable Markets, and
- 4 – Quality and Quantity of Supply.

For Table Set C, the four program areas are grouped onto one table summarising the prioritising analysis.

In the first table set (Tables A-1 to A-4) the discussion on each opportunity is expanded using four common headings for comment and discussion, allowing relative comparisons to be made between the various opportunities. The selected headings for comparison are:

- a brief description of the technology or practice that is the object of the intervention,
- the role of education and awareness raising in supporting the intervention,
- metrics that might be used to measure success, and
- policy initiatives that might be considered to support the intervention.

In the second table set (Tables B-1 to B-4) the discussion is expanded into ideas for the form and nature of the intervention, possible funding mechanisms that might be considered and the influence or impact that the intervention might achieve in terms of improving resource recovery.

In the third table (Table C), relative assessments are made between the opportunities under three assessment headings, and a fourth heading that combines the assessments to establish a relative ranking or prioritisation. The selected assessment headings and the ranking heading are:

- relative cost to implement the initiative – a score of 1 to 10 with 1 representing a cost of less than \$100,000 and 10 representing a cost in excess of \$1,000,000 total investment,
- relative effectiveness or attractiveness of the initiative in terms of the scale of uptake by parties impacted or targeted – a score of 1 to 5 with 1 representing a very low effectiveness and 5 representing a very high level of effectiveness, and
- relative benefit of the initiative in terms of additional material recovered – a score of 1 to 5 with 1 representing a very low benefit and 5 representing a very high level of benefit, followed by
- the relative leverage that the initiative might deliver – calculated as the product of the relative effectiveness and the relative benefit divided by the relative cost giving an indicative relative leverage in the range 0.1 to 25.0

**Table A-1: Discussing the Initiatives – Improving Effectiveness of Primary Sorting Facilities**

INTERVENTION AREA/INITIATIVE	TECHNOLOGY/PRACTICE	EDUCATION & AWARENESS	METRICS FOR SUCCESS	SUPPORTING POLICY OPTIONS
- <b>upgrade recycling processing equipment</b>	Upgrade or replacement of existing recycling processing equipment to enable improved separation of resources from non resources.	NA	Increase recovery % from incoming stream, less waste to landfill	Landfill levy supports further recovery
- <b>technology to extract food from non-rigid packs</b>	A means to extract the packaged product from the incoming waste stream – possibly via a manual picking station targeting contaminants as well.  A means to extract the food contents from the pack via shredding, crushing, squeezing etc.	<i>For waste generators –</i> information on including non-rigid packaged foods in the organic waste stream where the packaging is damaged, the food product tainted or the use by date is exceeded.	Tonnes of packaged foods discarded to the organics stream.	Guidelines regarding the discard of spoiled, out of date food products for farm animal consumption.
- <b>front-end sorting of bulky contaminants</b>	A means to mechanically extract obvious and bulky contaminants from the incoming waste stream – possibly involving a wide flat conveyor and mechanical picking tool.	<i>For plant operators –</i> operating practices to more effectively extract contaminants.	Tonnes of contaminants removed from the incoming stream.	None.

**Table A-2: Discussing the Initiatives – Sorting Mixed Wastes**

INTERVENTION AREA/INITIATIVE	TECHNOLOGY/PRACTICE	EDUCATION & AWARENESS	METRICS FOR SUCCESS	SUPPORTING POLICY OPTIONS
– <b>improve sortability of incoming waste</b>	Increase the extent of source separation of contaminating wastes such as organics, liquids, and hazardous wastes.	<i>For waste generators</i> – information on the impacts of contaminating wastes combined with options for separate discard and collection of those materials.	Extent of generator take-up of special collections.  Extent of clean-up of mixed waste stream received.	Strong position in WtR EPP for resource recovery, coupled with mandatory reporting.
– <b>permit multiple activities on sites</b>	Flexible licence conditions at existing waste receival facilities, such as transfer stations to determine the extent of flexibility to undertake waste sorting and storage activities.	<i>For regulators</i> – information on the extent to which the WtR EPP can be served with flexible licensing.  <i>For plant operators</i> – regulatory and reporting obligations for waste sorting and storage.	Tonnes of materials recovered from existing transfer facilities.	Strong position in WtR EPP for resource recovery, coupled with mandatory reporting, flexible licensing conditions, on proviso of adherence to strict protocols.
– <b>permit use of low-grade material in EfW</b>	Flexibility in composition limits for high-calorific mixed waste fraction acceptable for manufacture into a RDF.	<i>For regulators</i> – information on the performance of RDF manufactured from mixed waste.  <i>For plant operators</i> – guidelines on practical composition limits for	Tonnes of low-grade mixed waste converted to RDF.	Flexibility in fuel mix composition guidelines for RDF.

INTERVENTION AREA/INITIATIVE	TECHNOLOGY/PRACTICE	EDUCATION & AWARENESS	METRICS FOR SUCCESS	SUPPORTING POLICY OPTIONS
		efficient handling and combustion without adverse emissions.		
– <b>pre-sort technology for targeted streams</b>	Technology to “rough sort” waste streams from activities such as outdoor events; hospitality functions, public places etc. as a pre-cursor to sorting the materials in a conventional MRF.	<p><i>For event managers</i> – guidelines on improving disposal management practices at functions, event and public places.</p> <p><i>For waste generators</i> – targeted messages on source separation.</p>	Tonnes of material recovered from waste streams from targeted event.	Local Government permit requirements for implementation of appropriate containers and disposal management at events and public places.
– <b>front-end sorting of bulky waste</b>	A means to mechanically extract obvious and bulky contaminants from the incoming waste stream – possibly involving a wide flat conveyor and mechanical picking tool.	<i>For plant operators</i> – operating practices to more effectively extract contaminants.	Tonnes of contaminants removed from the incoming stream.	None.

**Table A-3: Discussing the Initiatives – Sustainable Markets**

INTERVENTION AREA/INITIATIVE	TECHNOLOGY/PRACTICE	EDUCATION & AWARENESS	METRICS FOR SUCCESS	SUPPORTING POLICY OPTIONS
– <b>assemble market intelligence</b>	Improved market intelligence and knowledge to better understand market trends and changing demand for product.	<i>For recyclers</i> – information on market trends and drivers.	Diversity of products derived from generic streams – paper, plastics etc.	None.
– <b>foster buyer awareness</b>	Improved consumer/user knowledge on the performance and benefits of products and materials derived from recovered resources to boost demand.	<i>For the consumer/user</i> – information on performance and benefits.	Growth in consumer/user demand.	Stronger support from Government purchasing schemes for goods manufactured from recovered resources.
– <b>practices for business flexibility</b>	Business management practices within recycling companies that foster flexibility and ability to rapidly respond to changing market demands.	<i>For recyclers</i> – the benefits of establishing flexible work practices and systems to facilitate rapid changes in design and production of goods to suit changing market demands.	Demonstrated up-take of flexibility support initiatives.	None.
– <b>boost industry innovation</b>	Business management practices within recycling companies that	<i>For recyclers</i> – the benefits of adopting innovation in practices and	Demonstrated up-take of innovation support	None.

INTERVENTION AREA/INITIATIVE	TECHNOLOGY/PRACTICE	EDUCATION & AWARENESS	METRICS FOR SUCCESS	SUPPORTING POLICY OPTIONS
	foster innovation.	systems to achieve competitive positioning.	initiatives.	
– <b>support market-focused product development</b>	Not applicable for government intervention.	N.A.	N.A.	None.
– <b>technology for transitioning to higher value products</b>	Not applicable for government intervention.	N.A.	N.A.	None.
– <b>technology for business adaptability</b>	Not applicable for government intervention.	N.A.	N.A.	None.

**Table A-4: Discussing the Initiatives – Quality & Quantity of Supply**

INTERVENTION AREA/INITIATIVE	TECHNOLOGY/PRACTICE	EDUCATION & AWARENESS	METRICS FOR SUCCESS	SUPPORTING POLICY OPTIONS
– <b>building manager</b>	Engage building managers in converting all tenants to source separation.	<p><i>For managers</i> – benefits of improved waste collection and management, plus enhanced reputation.</p> <p><i>For waste generators</i> – the benefits of source separation in terms of cost and environment.</p>	Number of buildings converted	None.
– <b>retail chains</b>	Engage retail chain and franchise managers in converting all outlets to source separation.	<p><i>For managers</i> – benefits of improved waste collection and management, plus enhanced reputation.</p> <p><i>For waste generators</i> – the benefits of source separation in terms of cost and environment.</p>	Number of retail chains and franchises converted.	None.
– <b>government suppliers</b>	Engage government purchasing managers to require suppliers to adopt source separation.	<p><i>For managers</i> – the importance of government agencies taking note of government sustainability initiatives and targets.</p> <p><i>For waste generators</i> – the benefits</p>	Government purchasing managers prepared to participate.	None.

INTERVENTION AREA/INITIATIVE	TECHNOLOGY/PRACTICE	EDUCATION & AWARENESS	METRICS FOR SUCCESS	SUPPORTING POLICY OPTIONS
– <b>government purchasers</b>	Engage government purchasing managers to require users of government purchases to adopt source separation.	<p>of source separation in terms of cost and environment.</p> <p><i>For managers</i> – the importance of government agencies taking note of government sustainability initiatives and targets.</p> <p><i>For waste generators</i> – the benefits of source separation in terms of cost and environment.</p>	Government purchasing managers prepared to participate.	None.

**Table B-1: Implementation Options – Improving Effectiveness of Primary Sorting Facilities**

INTERVENTION AREA/INITIATIVE	FORMS OF INTERVENTION	FUNDING MECHANISMS	BENEFICIAL IMPACTS
<ul style="list-style-type: none"> <li>– <b><i>upgrading of recycling processing equipment to make resource recover more effective</i></b></li> </ul>	<p>Support in implementation of equipment replacements or upgrades within existing facilities</p>	<p>Identify and part-fund replacement or upgrade equipment</p>	<ul style="list-style-type: none"> <li>– Higher recover of resources</li> <li>– Reduced volumes to landfill</li> <li>– Increase recovered resource quality and value</li> </ul>
<ul style="list-style-type: none"> <li>– <b><i>technology to extract food from non-rigid packs</i></b></li> </ul>	<p>A review of technologies to be publicly released for wide industry dissemination. Support in development of prototypes.</p>	<p>Fund review of technology and dissemination seminar. Identify and part-fund prototype development.</p>	<ul style="list-style-type: none"> <li>– Waste generators can recycle damaged and aged packaged foods, that currently are disposed to landfill.</li> <li>– Organics processing facilities can beneficially extract the foods from packages and use in generating organic products.</li> </ul>
<ul style="list-style-type: none"> <li>– <b><i>front-end sorting of bulky contaminants</i></b></li> </ul>	<p>A review of technologies to be publicly released for wide industry dissemination. Support in development of prototypes.</p>	<p>Fund review of technology and dissemination seminar. Identify and part-fund prototype development.</p>	<ul style="list-style-type: none"> <li>– Contaminants removed prior to processing to yield superior products that command higher prices.</li> <li>– Less product discarded or sold into low-value markets.</li> </ul>

**Table B-2: Implementation Options – Sorting Mixed Wastes**

INTERVENTION AREA/INITIATIVE	FORMS OF INTERVENTION	FUNDING MECHANISMS	BENEFICIAL IMPACTS
<ul style="list-style-type: none"> <li>– <b>improve sortability of incoming waste</b></li> </ul>	<p>Education and awareness material at point of generation.</p> <p>Support for special collections of contaminating wastes.</p> <p>One-to-many leverage through collection, cleaning, building management contractors.</p>	<p>Fund preparation and dissemination of material, including information seminars.</p> <p>Financial incentives for leverage agents.</p>	<ul style="list-style-type: none"> <li>– Incoming mixed wastes more safely sorted.</li> <li>– Higher resource recovery.</li> <li>– Less waste to landfill.</li> <li>– Contaminating and hazardous wastes collected and managed in dedicated services.</li> </ul>
<ul style="list-style-type: none"> <li>– <b>permit multiple activities on sites</b></li> </ul>	<p>Analysis of operating licences for existing facilities.</p> <p>Review of flexibility options.</p> <p>Development of operating protocols to maintain governance.</p>	<p>Fund analyses, options development and drafting of protocols.</p>	<ul style="list-style-type: none"> <li>– Maximise utilisation of existing infrastructure.</li> <li>– Greater opportunity to recover resources.</li> <li>– Less waste to landfill.</li> </ul>
<ul style="list-style-type: none"> <li>– <b>permit use of low-grade material in EfW</b></li> </ul>	<p>Development of guidelines for acceptable compositions of mixed waste streams for manufacture of RDF.</p> <p>Scale test combustion of fuel mixes to validate emissions estimates.</p>	<p>Fund guideline development.</p> <p>Part fund scale test combustions trials.</p>	<ul style="list-style-type: none"> <li>– Reduced waste to landfill.</li> </ul>
<ul style="list-style-type: none"> <li>– <b>pre-sort technology for targeted streams</b></li> </ul>	<p>Develop and demonstrate “rough sorting” systems for targeted streams.</p>	<p>Financially support development of “rough sort” methodology and subsidise demonstration trials.</p>	<ul style="list-style-type: none"> <li>– Improve quality of streams presenting to MRFs.</li> <li>– Reduced waste to landfill.</li> </ul>

INTERVENTION AREA/INITIATIVE	FORMS OF INTERVENTION	FUNDING MECHANISMS	BENEFICIAL IMPACTS
<ul style="list-style-type: none"> <li>- <b>front-end sorting of bulky waste</b></li> </ul>	A review of technologies to be publicly released for wide industry dissemination. Support in development of prototypes.	Fund review of technology and dissemination seminar. Identify and part-fund prototype development.	<ul style="list-style-type: none"> <li>- Contaminants removed prior to sorting to improve resource recovery from mixed waste streams..</li> </ul>

**Table B-3: Implementation Options – Sustainable Markets**

INTERVENTION AREA/INITIATIVE	FORMS OF INTERVENTION	FUNDING MECHANISMS	BENEFICIAL IMPACTS
– <b><i>assemble market intelligence</i></b>	A market analysis of trends in consumer demand, the forces shaping those demands and possible future directions.	Fund review and analysis and disseminate widely across the industry.	<ul style="list-style-type: none"> <li>– Improved awareness within the recycling sector of trends and likely future demands for new and/or different products.</li> <li>– Improved information to improve flexibility.</li> </ul>
– <b><i>foster buyer awareness</i></b>	Educative campaigns targeting consumers/users and particular material streams to boost awareness to materials and the benefits.	Fund campaign and support advertising.	<ul style="list-style-type: none"> <li>– More discerning buyers.</li> <li>– Stronger market pull for recovered resources.</li> </ul>
– <b><i>practices for business flexibility</i></b>	Develop and demonstrate guidelines on business practices that engender flexibility and capacity to respond to changing market demands.	Fund development of guidelines. Part fund demonstrations.	<ul style="list-style-type: none"> <li>– More flexibility within recycling companies to adapt quickly the changing consumer demands.</li> <li>– Builds resilience in industry to better withstand price and demand fluctuations.</li> <li>– Helps to support steady demand for material streams.</li> </ul>
– <b><i>boost industry</i></b>	Develop guidelines on business	Fund development of guidelines.	<ul style="list-style-type: none"> <li>– More flexibility within recycling</li> </ul>

INTERVENTION AREA/INITIATIVE	FORMS OF INTERVENTION	FUNDING MECHANISMS	BENEFICIAL IMPACTS
<b><i>innovation</i></b>	practices that engender innovation within the sector.	Fund dissemination seminars.	<p>companies to adapt quickly the changing consumer demands.</p> <ul style="list-style-type: none"> <li>– Builds resilience in industry to better withstand price and demand fluctuations.</li> <li>– Helps to support steady demand for material streams.</li> </ul>
– <b><i>support market-focused product development</i></b>	Not appropriate for government intervention.	None	<ul style="list-style-type: none"> <li>– More flexibility within recycling companies to adapt quickly the changing consumer demands.</li> <li>– Builds resilience in industry to better withstand price and demand fluctuations.</li> <li>– Helps to support steady demand for material streams.</li> </ul>
– <b><i>technology for transitioning to higher value products</i></b>	Not appropriate for government intervention.	None	<ul style="list-style-type: none"> <li>– More flexibility within recycling companies to adapt quickly the changing consumer demands.</li> <li>– Builds resilience in industry to better withstand price and demand fluctuations.</li> <li>– Helps to support steady demand</li> </ul>

INTERVENTION AREA/INITIATIVE	FORMS OF INTERVENTION	FUNDING MECHANISMS	BENEFICIAL IMPACTS
<ul style="list-style-type: none"> <li>- <b>technology for business adaptability</b></li> </ul>	Not appropriate for government intervention.	None	<ul style="list-style-type: none"> <li>for material streams.</li> <li>- More flexibility within recycling companies to adapt quickly the changing consumer demands.</li> <li>- Builds resilience in industry to better withstand price and demand fluctuations.</li> <li>- Helps to support steady demand for material streams.</li> </ul>

**Table B-4: Implementation Options – Quality & Quantity of Supply**

INTERVENTION AREA/INITIATIVE	FORMS OF INTERVENTION	FUNDING MECHANISMS	BENEFICIAL IMPACTS
– <b>building manager</b>	Educative material and incentive.	Fund incentive scheme modelled on Recycling at Work.	<ul style="list-style-type: none"> <li>– Roll-out of source separation in high rise buildings.</li> <li>– Locked-in practices once commenced.</li> <li>– Reduced waste to landfill.</li> <li>– Greater resource recovery.</li> </ul>
– <b>retail chains</b>	Educative material and incentive.	Fund incentive scheme modelled on Recycling at Work.	<ul style="list-style-type: none"> <li>– Roll-out of source separation in high rise buildings.</li> <li>– Locked-in practices once commenced.</li> <li>– Reduced waste to landfill.</li> <li>– Greater resource recovery.</li> </ul>
– <b>government suppliers</b>	Educative material and appeal to government sustainability targets.	None.	<ul style="list-style-type: none"> <li>– Supply companies converting to source separation.</li> </ul>
– <b>government purchasers</b>	Educative material and appeal to government sustainability targets.	None.	<ul style="list-style-type: none"> <li>– Users of government supplies (schools, hospitals, offices etc.) converting to source separation.</li> </ul>

**Table C: Assessing the Leverage**

INTERVENTION AREA/INITIATIVE	RELATIVE COST	RELATIVE EFFECTIVENESS	RELATIVE BENEFIT	RELATIVE LEVERAGE
<b>Improving Effectiveness of Primary Sorting Facilities</b>				
– <i>upgrade recycling processing equipment</i>	4.0	4	5	5.00
– <i>technology to extract food from non-rigid packs</i>	3.0	2	1	0.67
– <i>front-end sorting of bulky contaminants</i>	4.0	3	2	1.50
<b>Sorting Mixed Wastes</b>				
– <i>improve sortability of incoming waste</i>	5.0	5	5	5.00
– <i>permit multiple activities on sites</i>	2.0	3	2	3.00
– <i>permit use of low-grade material in EfW</i>	2.0	3	3	4.50
– <i>pre-sort technology for targeted streams</i>	1.0	2	2	4.00
– <i>front-end sorting of bulky waste</i>	4.0	2	1	0.50
<b>Sustainable Markets</b>				
– <i>assemble market intelligence</i>	1.0	1	2	2.00
– <i>foster buyer awareness</i>	2.0	1	1	0.50
– <i>practices for business flexibility</i>	2.0	2	2	2.00
– <i>boost industry innovation</i>	1.0	1	1	1.00
– <i>support market-focused product development</i>	2.0	3	2	3.00.
– <i>technology for transitioning to higher value products</i>	2.0	3	2	3.00.

INTERVENTION AREA/INITIATIVE	RELATIVE COST	RELATIVE EFFECTIVENESS	RELATIVE BENEFIT	RELATIVE LEVERAGE
– <i>technology for business adaptability</i>	2.0	3	2	3.00.
<b>Quality &amp; Quantity of Supply</b>				
– <i>building manager</i>	3.0	3	3	3.00
– <i>retail chains</i>	2.0	2	3	3.00
– <i>government suppliers</i>	1.0	1.0	1.0	1.00
– <i>government purchasers</i>	1.0	1.0	1.0	1.00