Final Report

National Packaging Covenant Gap Analysis

Prepared for the National Packaging Covenant Industry Association
February 2005

CONTENTS

Executive Summary

Martin Stewardship & Management Strategies Pty Ltd (MS2) and New Resource Solution Pty Ltd have been commissioned to identify and document the gaps and inconsistencies in the collection, storage and analysis of packaging materials flow data as required by the National Packaging Covenant in order to help inform discussions currently underway to develop packaging and litter targets for proposed revisions to the Covenant (Covenant MkII).

Fundamental changes are needed to provide reasonably accurate, independently verifiable data to determine progress against Covenant MkII targets and key performance indicators (KPIs). The use of current datasets and methodologies to determine compliance would clearly be open to considerable challenge for virtually every area examined.

Where data is collected at a local level, local governments and/or their contractors compile data based primarily on overall tonnages, with composition studies conducted perhaps every few years to estimate material composition within those overall tonnages. In the absence of reasonable data, local governments must estimate waste and recovery quantities. Material categories can vary significantly depending on need and funding limitations and data is rarely, if ever, verified at the source.

Where jurisdictions are required to report for the National Environment Protection Measure on used packaging, they usually rely on surveying local governments and compiling varying datasets developed using varying methodologies. Even New South Wales and Victoria, which are the most advanced in their data collection, recognise these inherent weaknesses and provide disclaimers with their datasets. Queensland's efforts are further hindered by a relatively low presence of weighbridges and data collection points, resulting in a complete absence of recycling sales and contamination data across all material types. Over 50% of South Australia's kerbside collections are classified as 'other', a material category no other state used. Reliable recovery statistics are limited or absent entirely for West Australia, and Tasmania, while Northern Territory data is heavily aggregated.

Industry recovery data is available for a range of material types, but still limited in scope and based primarily on surveys. Even within material types, definitions and data collection methodologies can vary significantly. Of primary concern on consumption data is the lack of data on packaging related to finished products imported to Australia. Such data is likely to have a significant impact on the validity of consumption data for material types such as plastic wrap, cardboard and consumer product packaging. Current frameworks have become concentrated in the hands of too few parties in the absence of independent data verification. Variations in kerbside/away from home consumption and recovery data, reporting periods and inventory levels provide further variation.

Using available industry and Government datasets, and estimating additional consumption of paper and glass provides the following summary of 2003 Australian recovery for packaging materials:

	Kerbside/Municipal Recovery		**Away from Home Recovery**		**Overall Recovery**	
Material	**Tonnes**	**%**	**Tonnes**	**%**	**Tonnes**	**%**
Paper/cardboard	333,300	42%	1,200,000	94%	1,533,300	74%
Glass	320,000	68%	30,000	4%	350,000	30%
Plastics	92,500	28%	42,400	13%	134,900	21%
Steel cans	46,200	44%	46,200	44%	92,400	44%
Aluminium cans	18,000	79%	11,000	48%	29,000	63%
Total	**810,000**	**47%**	**1,329,600**	**54%**	**2,139,600**	**51%**

Available industry and jurisdictional data frameworks have evolved over time to address different needs and have been given different resource and funding priorities. These frameworks have also evolved to address needs other than those for the purpose they are now being asked to address. 'Fault' for the inability of the current system to address current needs does not lie with any particular organisation. Jurisdictions and industries have to deal with existing weaknesses and modify the current system to meet identified needs that these data frameworks were never intended to address.

Report recommendations have been targeted at Covenant MkII KPIs. It is recommended that:

- A credible management system be put in place to monitor Covenant MkII without establishing an unwieldy and cost prohibitive data collection system;
- The Covenant MkII KPIs currently on the table be reconsidered in light of current data availability and impracticality of future measurement;
- A methodology for national or jurisdictional source based (bin) audits of waste and recycling streams be developed, agreed upon by all parties and costed;
- A methodology for verification of survey information supplied by industry and government be developed, agreed upon by all parties and costed;
- Where widespread audits are required an independent national team of auditors be established to monitor the data collection system, reduce costs and preserve the impartiality of the process;
- A composite indicator that combines indicators of environmental impact (during manufacture and distribution) with material flow be considered ;
- Target setting reflect the uncertainties on the current datasets and that baseline figures be re-examined and targets potentially adjusted to reflect corrected estimates;
- A timetable be set for the benchmarking process; and
- NPCIA contribute (with Government) to the funds required for establishing the new data collection regime.

1.0 Introduction

Martin Stewardship & Management Strategies Pty Ltd (MS2) has been commissioned to examine existing data collection, storage and analysis relating to the quantity of packaging materials by material type throughout the supply and end of life management chain (collectively referred to as the packaging lifecycle). New Resource Solutions Pty Ltd (NRS) has been engaged as a subcontractor to provide additional technical expertise on local government and jurisdictional data.

The primary objective is to identify and document the gaps and inconsistencies in the collection, storage and analysis of packaging materials flow data as required by Australia's National Packaging Covenant (Covenant). Secondary objectives include:

- Describe and depict the general lifecycle of packaging in Australia with particular attention to the pathways for resource recovery.
- Identify and document the points in the lifecycle where data needs to be collected based on key performance indicators (KPIs) contained in proposed revisions to the Covenant (Covenant MkII).
- Identify and document the contacts responsible for existing data management systems.
- Identify and document the gaps and inconsistencies in the data collected and the techniques/systems employed.
- Collect or describe (where available) existing data collection templates, material classification systems and IT systems.
- Identify and document materials auditing methodologies currently in use and comment on the quality of the resulting data.
- Recommend variations to Covenant KPIs based on practicality of data collection.
- Recommend requirements for a consultancy to develop a data collection methodology.

The governing body for the Covenant, the National Packaging Covenant Council (NPCC), has overseen thorough review of the Covenant and proposed the resulting Covenant MkII. Various reviews and submissions highlighted the need for greater accountability by Covenant signatories and Covenant MkII therefore contains a range of KPIs that encompass the packaging lifecycle (Table 1). Parties responsible for data collection and reporting for the KPIs, including industry (Ind), local governments (LG), state and territory governments (SG), the Commonwealth (Clth), recyclers (R), the NPCC and Covenant signatories (Sigs) are also shown in Table 1. Data collection points for these KPIs across the packaging lifecycle are shown in Figure 1.

Numbered KPIs from Covenant Mark II (Table 1) have been included in Figure 1 at points where necessary data collection is likely to occur. In this way Figure 1 illustrates not only where data might be collected but the distribution of performance indicators throughout the entire packaging lifecycle. It is clear that points such as manufacture and recyclables collection have a large concentration of KPIs.

Table 1: Covenant MkII Key Performance Indicators

	Key Performance Indicator	Responsible
1.1	Total weight of packaging (including distribution packaging) used p.a. (domestic & imported) and the total weight of products packaged	Ind
1.2	Resources used to produce the package: energy used, water used and production efficiency	Ind
1.3	Changes to protection, safety, hygiene and shelf-life considerations associated with the packaging	Ind
1.4	Changes in marketing and distribution of the product to minimise packaging	Ind
2.1	Proportion of recycled content used p.a. in packaging, by material type (including plastic bags)	Ind
3.1	Reduction in new and existing product packaging unable to be recovered and re-utilised using existing recovery schemes	Ind
3.2	Reduction in contamination rates for collection and material recovery systems	LG, SG, R
3.3	Total weight of packaging disposed to landfill and as a percentage of total waste and relative to other waste stream components	LG, SG
4.1	Total weight of packaging material re-utilised by type and end market	Ind
4.2	Diversion rates of recovery systems for material types eg domestic, public place, commercial and industrial	LG, SG, R
4.3	Total resource allocation for research and development to address agreed barriers	NPCC
4.4	Products purchased with recycled content (number of units purchased as a percentage of total units for the 3 highest quantity purchases	All Sigs
5.1	Quantity of packaging in the litter stream	SG
5.2	Total resource allocation for education and research and development to identify and address/reduce environmental impacts	NPCC, Ind, SG, LG
6.1	Number of signatories who have formally adopted the Environmental Code of Practice for Packaging (Code) and developed systems for implementation	Ind
7.1	Number of Councils operating according to good practice collection principles and state-based benchmarks	LG, SG
7.2	Number of signatories operating in-house collection and recovery systems and litter management consistent with available good practise guides	Ind, LG, SG
7.3	Percentage of signatories operating/promoting good practise collection and recovery systems and litter management within their direct sphere of influence (eg customers, clients, key stakeholders)	Ind, LG
8.1	Proportion of households covered by kerbside collection systems	LG
8.2	Proportion of households covered by other collection systems	LG, SG, R
8.3	Proportion of commercial and industrial premises covered by recycling collection systems	LG, SG, R
8.4	Weight of packaging to landfill and recycling from in-house operations	All Sigs
8.5	Proportion of Councils and government agencies providing public place infrastructure	LG, SG, Clth
8.6	Proportion of signatories providing in-house recycling facilities	All sigs
9.1	Participation rates in resource recovery systems (kerbside, workplace)	LG
9.2	Contamination rates in resource recovery systems (kerbside, events, venues, public places, workplaces)	LG, R
9.3	Improvements in knowledge about the functional attributes of packaging, including recyclability/ reuse	NPCC
9.4	Increase in consumer information to enable more informed behaviour	Ind, LG
9.5	Improvements in litter behaviour	LG, SG

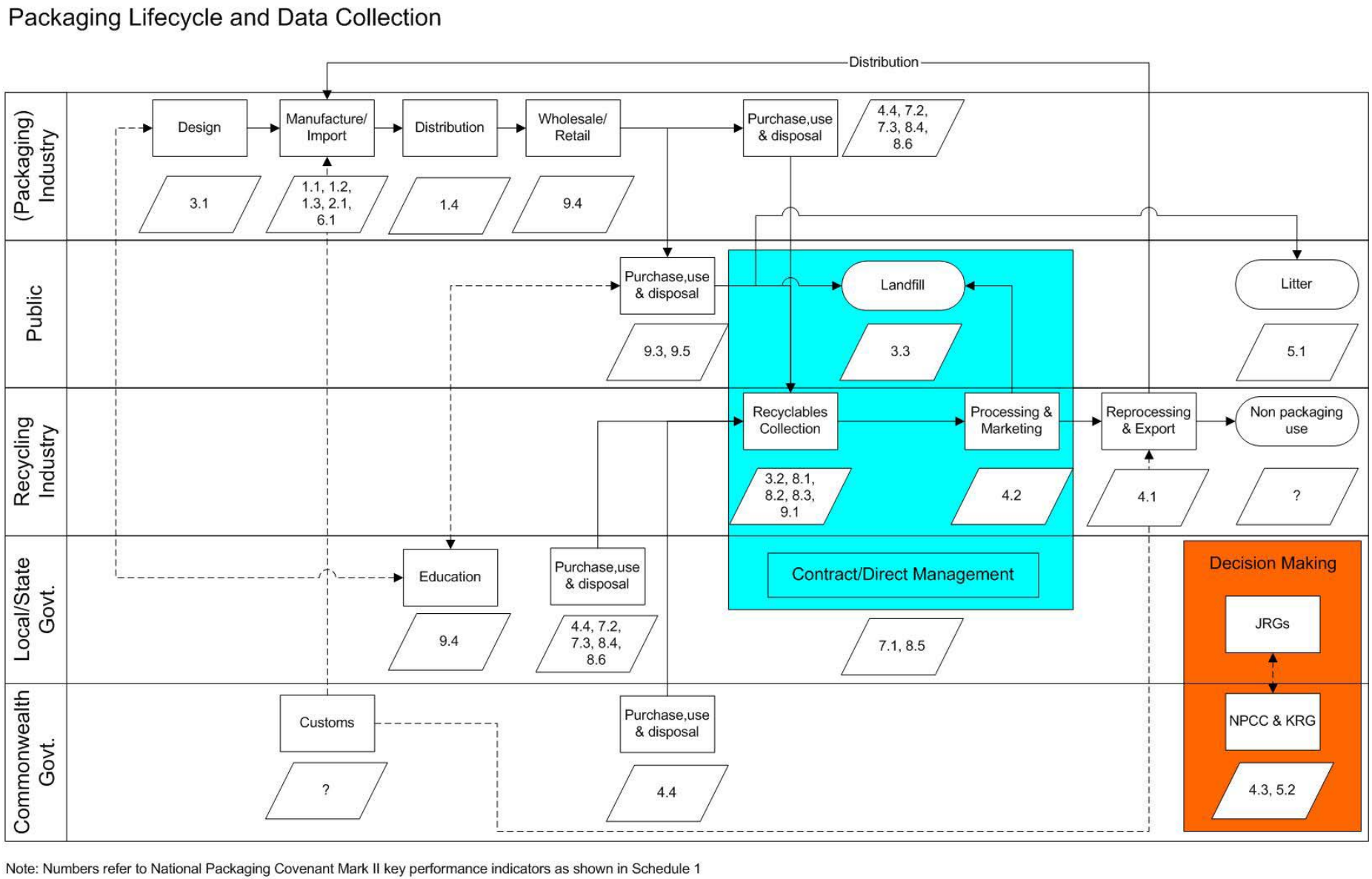


Figure 1: KPI data collection points across the packaging lifecycle

Figure 1 represents the flow of materials and information through the supply chain. The rectangles represent processes and the rhombuses contain reference to KPI and associated data collection activities. Solid lines with directional arrows indicate flow of materials while dashed lines indicate flow of information. Note that processes and KPI are grouped horizontally by stakeholder group to indicate which stakeholder is most likely to provide the relevant data. Where material leaves the system an oval (a terminator) is used.

In the particularly complex and multi-stakeholder area of recyclables collection and recovery a blue box has been used to show the close relationship between local government, recyclers and the public. Local government nearly always administers the recycling system but doesn't necessarily operate the collection and sorting infrastructure.

Although the area of 'Decision Making' is not part of the packaging lifecycle it is included in Figure 1 because two of the KPI refer to resource allocation through the jurisdictional and national decision making bodies.

1.1 Background

The Covenant commenced in July 1999 as the voluntary component of a co-regulatory arrangement to address lifecycle environmental impacts of consumer packaging in Australia. The National Environmental Protection (Used Packaging Materials) Measure (NEPM) provides the regulatory underpinning for the Covenant, acting as a safety net to minimise damage by free riders.

Environment Ministers, sitting as the Environment Protection and Heritage (EPHC) have endorsed Covenant MkII conditional on the development of overarching targets for packaging and litter. Establishing and monitoring progress against such targets requires an understanding of the strengths and weaknesses of the current approach and an exploration of possible solutions. Therefore, the National Packaging Covenant Industry Association (NPCIA), which represents six peak industry bodies and over 600 company signatories to the Covenant, has commissioned this study to help inform discussions currently underway to develop the packaging and litter targets required by the EPHC.

1.2 Methodology

This analysis has been conducted as a desktop study utilising publicly available publications and consultations with a wide variety of industry and government stakeholders whose assistance is greatly appreciated.

1.3 Limitations

MS2 and NRS intended to provide detailed data compilation and analysis of available datasets for this report. However, the authors determined that significant quantitative analysis using the available datasets would have implied greater credibility than warranted, and decided not to conduct such analysis.

This report was compiled over a short period of time during the January holiday period. While every effort was made to make this report as comprehensive as possible, some individuals the authors attempted to contact were not available to provide additional insight and verification.

1.4 Report Format

Sections 2.0 and 3.0 examine current government and industry data collection process, respectively. Section 4.0 evaluates key datasets and surveys. Conclusions and recommendations, including those targeted at specific KPIs, comprise Section 5.0.

2.0 Government Data Collection

While all levels of government have the ability to collect data on flows of waste and recyclables local government, in its service provision or contract management role, tends to be the most active in collecting data directly from the public and the collection/processing system. Each local government tends to perform a kerbside waste and recycling audit either when putting together a waste strategy or when going to tender for new services. Good collection, processing and marketing contracts set up between local governments and recycling contractors have provision for the contractor to periodically audit waste and recyclables, however this is not always the case.

State governments generally act to aggregate data from local governments so as to obtain a picture for the entire state. State government may also work with local or regional authorities to do large scale auditing of the waste and recycling stream where several local governments are audited at once. Where regional groups are operating, an audit may be performed prior to preparing a regional waste strategy or prior to tendering for Alternative Waste Technologies (AWT).

A significant portion of the proposed Covenant Mark II KPIs require government to collect data relating to resource recovery services and their internal operations. There are four basic ways in which this data can be obtained:

- Material auditing of bins or trucks either at the kerbside or at the point of recovery/disposal to understand composition and contamination levels;
- Collect information from local government (via a survey) possibly via state government agencies who aggregate the data (required under current NEPM);
- Collect data directly from recyclers and reprocessors via a survey (currently voluntary); and
- Litter auditing of public spaces and surveys of public behaviour relating to littering.

2.1 Kerbside Auditing

Kerbside or bin auditing is probably the only method accurate enough to provide quality data for Covenant KPIs 3.3, 4.2, 9.1 and 9.2. The alternative is for recyclers to set up advanced monitoring systems in their Materials Recovery Facilities (MRF).

Where auditing of the waste and recyclables stream is occurring it is rare that a common methodology or material categorisation system is used, even within the same jurisdiction (or city). The NEPM requires jurisdictions to carry out annual surveys (audits) of packaging items and their associated brand owners represented in the kerbside recycling system.[1] Early in the implementation of the NEPM an agreed survey methodology was developed and distributed through the Jurisdictional Recycling Groups (JRGs). This appears to be the only shared kerbside auditing methodology used by all jurisdictions. Unfortunately the methodology is designed only to count packaging items by brand owner, not to establish material composition by weight or volume as required by Covenant KPI 4.2.

The Australian Waste Database (AWD) provides a uniform national categorisation system for urban solid waste (and recycling) characterisation and has been endorsed by the Australian and New Zealand

[1] National Environmental Protection (Used Packaging Materials) Measure Methodology, Survey of Kerbside Materials to Determine Brand Owners, provided by Barbara Butt, Department of Environment Heritage.

Environment Conservation Council (ANZECC)[2] (now the EPHC). The classification system is flexible in that it is hierarchical, allowing the waste auditor to use broad inclusive categories at the top level (all plastics) or detailed sub-categories (just HDPE). This flexibility can also lead to problems when comparing data.

Different authorities have different goals for the audits they commission. A larger number of material categories requires larger sample sizes, which in turn increases the cost of the audit. For this reason audits tend to sort to the minimum of material categories required to answer the questions at hand. For example, when considering installation of a waste-to-energy facility an audit may only sort materials into high, medium and low calorific value categories. This data is of no use in measuring Covenant KPIs. Varying material categories from audit to audit also restricts the ability to aggregate or compare audit data, a process crucial to measuring the proposed Covenant KPIs.

Waste and recyclables auditing is an expensive process. Individual local governments spend between $20,000 and $100,000 on any one kerbside audit. The cost of an audit depends on the sample size required and the method used to collect the sample. In turn sample size depends on:

- The level of error deemed acceptable;
- The inherent variation within the population (for example contamination of recycling bins is highly variable); and
- The geographical level of detail at which conclusions need to be drawn from the data.

Samples should be collected randomly from the geographical area being audited to ensure they are representative of the entire population. Cheaper audits tend to assume that a convenient sample (collected from one or two streets) is representative. This simplifies the sample collection process and therefore reduces cost. Another way to reduce the cost of sampling is to collect samples randomly in a garbage or recycling truck and then sort the entire truck into the desired material categories. Unfortunately because the discrete samples (each bin) are mixed there is no way to calculate the statistical error using this methodology. Like the variation in material categories, variation in sample collection methodologies also restricts the ability to aggregate and compare audit data from different local governments and jurisdictions.

Jurisdictions tend not to perform comprehensive state or territory wide kerbside audits that include all waste and recycling streams. Where they do, audits can only be performed once every few years due to the logistics and cost involved. Notable exceptions include: the ACT where there are no separate local governments, the territory is of a manageable size and progressive No Waste strategy is in place; and in South Australia, where EPA commissioned a large scale kerbside audit in 2002 covering 25 of the 34 local government areas in the state. Other jurisdictions do not appear to have attempted kerbside auditing on this scale.

The NSW Department of Environment and Conservation (DEC) has been considering the potential for a state-wide kerbside or MRF audit over the last few years. More recently the DEC have been investigating methodologies and discussing auditing approaches with other jurisdictions[3]. It is thought that an audit of kerbside collected material in NSW with a robust methodology could not be undertaken for less than $1 million.

[2] http://www.deh.gov.au/industry/construction/wastewise/handbook/audit.html, The Australian Waste Database, accessed 26 January 2005. See also the CRC for Waste Management & Pollution Control.

[3] Personal communication with Graham Kohler, Sustainability Programs Division, Dept. of Environment and Conservation.

2.2 Local Government Surveys

Ten (10) of the Covenant KPIs would require information from local government either by directly auditing their activities or by requiring them to fill out a survey. Under the NEPM jurisdictions have agreed on a minimum standard form called 'Annual Report by Local Government Authorities' (LG1). The standard form is accompanied by guidelines for the local government officers who fill it out. Some jurisdictions ask additional questions as part of this survey or distribute a separate waste management survey.

Local governments are often surveyed both by state government and peak local government groups in their state. Local governments are asked to provide at least some of the following recycling information by state governments:

- Quantity of each material type in the recycling stream (tonnes);
- Contamination levels in the recycling they collect from kerbside (%);
- Participation rate in kerbside recycling systems (%);
- Cost of providing the recycling service to their residents;
- Number of households and/or population of their LGA;
- Type of containers used to collect waste and recycling;
- Their recycler(s) and contractual arrangements;
- Availability of other resource recovery systems (for example drop-off) and population serviced by those systems; and
- Number and type of recycling services provided to commercial and industrial properties.

While the standard local government survey is comprehensive regarding the characteristics of the kerbside recycling system and the material recovered, it does not provide information on the internal activities of local government. Covenant Mark II requires additional information on:

- Green purchasing activities;
- Resource allocation for eduction and R&D;
- Adoption of best practice in-house resource recovery systems;
- Quantity and type of resources recovered through in-house systems;
- Provision of public place infrastructure;
- Provision of information to residents/consumers on recycling systems.

Such information is likely to be available from local government but is generally not aggregated by the states and territories. The NSW DEC have undertaken an extensive local government waste and recycling survey in 2003 and 2004 including information on commercial services, contracts and even green purchasing. Unfortunately this survey still falls short of the data requirements for Covenant Mk II KPIs.

In many jurisdictions local governments are also required to report to state governments on waste collection and disposal services. Waste is collected through garbage bins (weekly or sometimes fortnightly) and through less frequent 'hardwaste' collections otherwise known as 'council cleanups' where larger items of waste are collected. While most packaging ends up in bins, larger sized cardboard packaging figures heavily in hardwaste collections and in illegally dumped material. Data on these waste streams is crucial to measuring KPI 3.3, however local government collects information only on

overall tonnages disposed and only rarely audits the waste stream composition (usually when considering changes to services or the adoption of waste treatment technologies).

While local governments are surveyed to obtain the information listed above they do not always have the necessary information to properly fill out the survey form provided. This can lead to application of estimates and old waste/recycling composition data to provide a break up of recyclables by material type. The compilers of these surveys, state government officers, do not record whether the data provided is based upon comprehensive local audits or simply best estimates. For example in NSW some local governments send in aggregated data to the DEC, who then apply standard compositions to estimate quantities by material type.[4]

While each local government must sign off on their survey responses, at least for NEPM data, resources are not available for verification of that data at the source. NSW and Victoria have indicated that they check the additions and look for anomalies when processing survey responses from local governments. Despite these verification processes both jurisdictions provide disclaimers relating to information from local government. Other jurisdictions have applied relatively few resources to verification.

> *[NSW] Investigations into data quality have revealed that in 2002-03 and in previous years not all councils maintain records of the quantity of kerbside material collected and information received from recycling/reprocessing contractors is not to the detail required for NEPM Used Packaging Report. In these cases, Councils supply estimates.*[5]
>
> *EcoRecycle [Victoria] has sought to verify information provided in data collection returns by local governments through rigorous follow-up with individual local governments by telephone, fax and email, to validate data entries. In addition, EcoRecycle circulated extracts containing individual local government returns to Regional Waste Management Group Executive Officers and Regional Education Officers to verify data. Through these steps and extensive data analysis, EcoRecycle has identified and corrected a significant number of anomalies. However, EcoRecycle is not in a position to validate underlying data in the report. Findings in this report are therefore subject to the accuracy of data provided by individual local governments.*[6]

The NEPC Annual Report 2002-2003 contains summary presentations of data provided by the Jurisdictions under the NEPM. Most jurisdictions report under a 'Table (1)', which presents amounts of materials: collected at the kerbside; sent for secondary reuse/energy recovery; and contamination disposed to landfill. As proposed under the NEPM, this information is sourced from the local government surveys discussed above rather than directly from private sector recyclers or through kerbside audits. It is likely that better quality data could be obtained from recyclers and/or reprocessors, however this information will certainly be considered commercially sensitive and would require careful handling and aggregation.

EcoRecycle has recently completed a report commissioned by the Kerbside Recycling Group (KRG) to evaluate all existing methodologies used by jurisdictions in the collection of waste stream and recycling data from local government.[7] Only six (6) surveys were received from the jurisdictions with the only

---

[4] Personal Communication with Jillian Gallagher, Environmental Protection and Regulation Division, Dept. Environment and Conservation, NSW.

[5] NEPC Annual Report 2002-2003 p207

[6] Local Government Data Collection 2002-2003, Waste Management Services – August 2004, EcoRecycle Victoria, p47.

[7] KRG Project No. 2001/01, Waste Stream and Recycling Data Collection Methodologies (Draft), Unpublished. Supplied in electronic form by Nick Chrisant, Project Manager Data Collection, EcoRecycle Victoria.

common link being the mandatory NEPM Survey already discussed in this report. EcoRecycle found that surveys had: very little consistency between one survey and another; no standardisation of definitions and terms; and very different methodologies.

The report provides a comprehensive analysis of each survey, the gaps in the data collected and the inconsistencies in methodology and terminology between surveys. While the report is critical of survey technique it appears that questioning the quality of the information provided by local government is outside the scope of the report. Despite this limit to the scope it is clear that the existing EcoRecycle survey is the most comprehensive and long-standing, NSW and Queensland have reasonable surveys in place and the remaining jurisdictions rely on the standard NEPM Survey. It is also clear that the jurisdictions lack both the data and the consistency of data collection to provide sufficient information for the KPIs proposed under Covenant Mark II.

The final section of ERV's report proposes a standardised survey based on the ERV model. The goal would be the 'production of uniform national statistics'[8] by collecting a limited set of data that all jurisdictions could source with the resources they currently have available. While this may address some consistency problems, this would mean national data would be limited to what the least active jurisdiction could provide. Given that data from the most active jurisdictions is not enough to feed into Covenant Mark II KPIs, this would not appear to address the immediate problem of setting benchmarks and targets for Covenant Mark II.

2.3 Recyclers and Reprocessors Surveys

KPI 4.1 is the only KPI associated with local government that would require data gathering from material recyclers and reprocessors. KPI 4.1 is intended as a measure of the total weight of packaging material re-utilised by type and end-market. NSW[9] and Victoria[10] have surveys that gather data directly from reprocessors. Queensland[11] and the ACT conduct surveys to gather information from recyclers. All data from the private sector is aggregated (for confidentiality) at the state level for annual reporting. At present there are no surveys of recyclers and/or reprocessors in SA, WA, Tasmania or the ACT.

The reports based on the NSW and Victorian surveys include breakdowns of the volume of materials, by type, according to source and end-market. However there are some variations in categorising the sources of materials. For example, the Victorian survey includes a category for 'collectors' where the identity of the source was uncertain, and the NSW report includes 'other processors' as a source.

While in Victoria some effort is made to verify the data received from individual reprocessors, neither auditing of the survey respondents, nor verification of the data supplied has been undertaken in NSW thus far. As such, the quality of the reported data in both jurisdictions is subject to the accuracy of the data provided by reprocessors. The problems inherent in the existing survey methodologies are best summarized in the following quote from the Victorian report for 2002/03:

> *No estimates were undertaken for non-responding companies due to the high disparity of tonnages collected and reprocessed by many of the industries surveyed from one year to the next. This makes it*

[8] Ibid. p25

[9] DEC, NSW Reprocessing Industries Survey

[10] EcoRecycle, Annual Survey of Victorian Recycling Industries

[11] Data collected from private waste and recycling contractors is reported in the annual *State of Waste & Recycling in Queensland*.

very difficult to make an assumption about the nature and trend of the reprocessing sector. The survey, therefore, can only measure and report on data from responding reprocessors without any estimates for non-responding companies.

Both jurisdictions are attempting to overcome these problems by aiming to maximise participation by the larger reprocessing operations in order to capture the highest proportion of material flows.

2.4 Litter Auditing

There are three proposed KPIs in the NPC MkII that make direct reference to the management of litter. One of these (KPI 7.3) is measured as part of broader commitments undertaken by signatories to the Covenant, while the others are intended to measure the quantity of packaging as a proportion of the litter stream (KPI 5.1) and changes in littering behavior generally (KPI 9.5). Assuming that data relevant to KPI 7.3 will be provided directly by the signatories through annual reporting to the (JRGs), this section will focus on the suitability of data and reporting systems currently available for KPIs 5.1 and 9.5 from local, regional and state governments.

At present only two jurisdictions (Victoria & NSW) have introduced protocols for monitoring trends in litter management. Both jurisdictions are employing the qualitative Cleaner Communities Assessment Tool (CCAT), developed by Community Change P/L. In NSW the CCAT has been combined with a purely quantitative Litter Characterisation Survey, developed by the DEC and intended to provide a snapshot of the quantity & type of litter deposited at selected public places (although it does not isolate packaging materials as a separate category). In both jurisdictions the aim is to compare data accumulated over consecutive surveys to indicate changes in, and monitor the impact of, programs designed to modify littering behaviour.

KPI 5.1 - Quantity of packaging in the litter stream

Due to limitations on cost and resources available quantitative data on litter is usually limited to manual 'litter counts' that demonstrate the proportions of different materials observed in field surveys. Examples of these include the audits conducted by non-government organisations such as Clean Up Australia Day 'Rubbish Report', the Keep South Australia Beautiful (KESAB) quarterly litter count and the Keep Australia Beautiful National Litter Index, developed by Ian McGregor[12]. The Litter Characterisation Survey used in NSW Littering Protocol differs from these in that it also characterises litter by weight and volume, and is specifically designed to compliment the CCAT[13] (by surveying the same sites chosen for assessment).

While these studies are useful in understanding and monitoring littering behaviour over time, the main limitation of the data being gathered from these litter counts is that it only provides the proportion of materials as components of the littering stream, as opposed to providing estimates of the total quantity by weight or volume. The main deficiency in the data currently being collected, with respect to KPI 5.1 is that it does not differentiate 'packaging material' as a category or enable aggregation to the appropriate standard.

[12] The KAB National Association is actively seeking funding to recommence its National Litter Audit that will gather data for the National Index. The Index is a database of audits conducted by the KAB organisation nationally.

[13] Although the CCAT methodology also includes a litter count it is not directly comparable with the Litter Characterisation Survey due to differences in scope, definition and categorisations of litter.

In an attempt to overcome these limitations and deficiencies Nestle and Nolan-ITU[14] have recently developed a methodology for better understanding the scope and impact of litter for a significant part of the packaging sector. These include the Direct Litter Indicator (DLI) which is intended as a measure of the visual impact and persistence of Fast Moving Consumer Goods litter in the environment, and the Cumulative Litter Indicator (CLI) which takes into account risk factors (environmental and corporate). Although these tools will provide data that is useful to brand owners they do not specifically address the KPIs and some of the assumptions made are the dependent on the quality of data gathered from existing litter counts.

KPI 9.5 – Improvements in litter behaviour

As mentioned above the CCAT methodology has been adopted in the NSW and Victoria Litter Monitoring Protocols. The CCAT is a technique for monitoring behavioural aspects of littering over a prescribed area at selected sites. Importantly, the range of 'site types' are standardised to enable comparison across jurisdictions.

In addition to being adopted in the litter monitoring protocols for NSW and Victoria, the CCAT has also been used for program evaluation by some larger LGAs (eg. Hobart, Brisbane, Townsville).

The Beverage Industry Environment Council (BIEC) has employed Community Change since 1997 to conduct a series of Littering Behaviour Studies (LBS). These are now part of BIEC's commitments under the NPC with the results presented in BIEC's annual National Benchmark reports. These reports use the Disposal Behaviour Index (DBI), a seven point scale which represents the amount of binning, littering and recycling in public places, to compare behaviour from place to place and city to city over time. According to Community Change the DBI provides a more thorough, albeit more costly study of littering behaviour[15] than the CCAT.

[14] Carrol, B. & Shmigel, P. (2004) Understanding Fast Moving Consumer Goods Litter, presentation to the Leading on Litter Conference, Melbourne, May 2004.

[15] Community Change, 2003, *Victorian Litter Monitoring Protocol, Pilot Test & Benchmarks using the CCAT.*

3.0 Industry Data Collection

This section examines material- or industry-specific data on packaging consumption and recovery. While national industry data is likely to be more reliable than jurisdictional data, it still has its weaknesses. Most industry data also relies to some extent on surveys and collection processes are not transparent nor independently verified. Industry data is generally compiled by associations that may not represent the full range of consumption and recovery sources. Definitions and data collection methodologies can also vary significantly. Of particular concern is that virtually all industry datasets fail to account for import or export of packaging on finished product.

The Regulatory Impact Statement (RIS) currently being undertaken for Covenant MkII will update available consumption and recovery figures, largely using the sources listed in this section. Summary data from the draft RIS was considered where possible in this report.

3.1 Plastics

The plastics industry conducts an annual survey to determine consumption and recycling by plastic resin type. Import data is gathered from Customs. Consumption data is gathered by surveying plastics reprocessors. PACIA (2004a) indicates that due to an improved methodology, additional consumption (mainly from imports) in the market was identified. Consumption and recycling figures for 2001 and 2002 were then revised accordingly to enable more accurate data and trend comparison. Summary statistics for the survey are shown in Table 2.

Table 2: Plastic Consumption and Recovery (in Tonnes) 2003 (PACIA 2004a, p14)

Polymer	Consumption	Domestic Reprocessing	Export for Reprocessing	Total Recycling	Recycling Rate
PET	134,011	17,014	25,232	42,246	31.5%
HDPE	268,070	38,417	23,471	61,888	23.1%
PVC	221,286	7,675	1,174	8,849	4.0%
L/LDPE	301,848	30,849	5,868	36,716	12.2%
PP	240,068	20,788	2,934	23,721	9.9%
PS	47,800	2,422	0	2,422	5.1%
EPS	34,641	2,432	0	2,432	7.0%
ABS/SAN	21,604	1,832	0	1,832	8.5%
Polyurethane	47,475	7,678	0	7,678	16.2%
Nylon	18,882	560	0	560	3.0%
Other	185,707	1,040	0	1,040	0.6%
Totals	**1,521,394**	**130,707**	**58,678**	**189,385**	**12.4%**

The plastic figures in Table 2 are for all plastics, not just those from kerbside collections. The survey does, however, provide estimated percentages of material by source for each state and an accompanying report (PACIA 2004b) provides greater detail on sector sources for each resin type. PACIA (2004a and 2004b) also differentiates between packaging and non-packaging use of plastics.

This is essential, as resins such as PET, HDPE and L/LDPE are more commonly used in packaging while other resins could be used in durable products not relevant to Covenant considerations.

Inventories and length of time before the resins enter recycling or disposal streams could have a significant impact on the accuracy of plastics data. PACIA (2004a, p8) notes:

> *'As plastics have gained market share for long-term applications the amount of plastic consumed is always greater than the amount requiring disposal and available for recycling. For long-term applications a recycling rate based on the quantity of plastics available for recycling is required. The establishment of the amount of plastics being disposed of from long-term applications in any 12 month period would require extensive work, including the auditing of landfills for the disposal of plastics and as such is not considered feasible at this time.'*

PACIA (2004a) reports a 20.5% packaging recycling rate and 6.3% non-packaging recycling rate for plastics in 2003 (up from 19.9% and 3.5%, respectively, in 2002). 2003 plastic consumption and recovery by resin type for packaging is shown in Table 3.

Under the PACIA report, the packaging category includes all primary, secondary and tertiary packaging, including business to business packaging. Customs data is for imports in the form of resin, pellets or flakes and does not include packaging or packaging of finished products.

Table 3: 2003 Plastics Consumption and Recovery by Resin Type (derived from PACIA 2004b)

Polymer	2003 Total Consumption (t)	% of Consumption That's Packaging	2003 Packaging Consumption (t)	2003 Total Recovery (t)	% of Recovery That's Packaging	2003 Kerbside/ Municipal Packaging Recovery (t) (1)	2003 C&I/ Away from Home Packaging Recovery (t) (2)	2003 Packaging Recovery (t)	2003 Packaging Recovery Rate (%)
PET (#1)	134,011	88%	117,930	42,246	99%	41,646	11	41,705	35.4%
HDPE (#2)	268,070	60%	160,842	61,888	84%	44,558	7,338	51,896	32.3%
PVC (#3)	221,286	6%	12,171	8,849	22%	1,428	529	1,957	16.1%
L/LDPE (#4)	301,848	70%	211,294	36,716	84%	607	30,271	30,841	14.6%
PP (#5)	240,068	45%	108,031	23,721	25%	4,292	1,753	6,045	5.6%
PS (#6)	47,800	67%	32,026	2,422	45%	0	1,089	1,089	3.4%
EPS (#6)	34,461	30%	10,338	2,432	35%	0	844	844	8.2%
ABS/SAN (#7)	21,604	30%	6,481	1,832	29%	0	539	539	8.3%
Polyurethane (#7)	47,475	0%	0	7,678	0%	0	0	0	16.2%
Nylon (#7)	18,882	not known	not known	560	0%	0	0	0	not known
Other	185,707	N/A	N/A	1,040	0%	N/A	N/A	N/A	not known
Total	**1,521,212**		**659,112**	**189,384**	**71%**	**92,531**	**42,374**	**134,917**	

Notes

(1) Consists of Post Consumer Domestic - Packaging.

(2) Consists of Pre Consumer Industrial - Packaging and Post Consumer Industrial - Packaging

Several references indicating 2002 were assumed to be 2003, given the survey period.

PACIA 2004b did not report recycling figures for Polycarbonate, Acetal and Acrylic in order to maintain confidentiality.

PACIA 2004b reports the packaging/non-packaging split, but not residential/away from home consumption split.

3.2 Paper and Paper Products

Paper and paper products statistics for FY02/03 obtained from the Australian Paper Industry Council (APIC n.d.) are provided in Table 4.

Table 4: Paper Consumption and Wastepaper Collections FY02/03 (tonnes) (APIC n.d.)

Product	Production	Exports	Imports	Consumption	Wastepaper Collections (1)	Recovery Rate(%) (2)
Newsprint	412,000	0	275,000	687,000	352,000	51.2
Printing & Writing	564,000	100,000	892,000	1,356,000	206,000	15.2
Tissue	194,000	1,000	67,000	260,000	N/A	N/A
Packaging & Industrial	1,892,000	416,000	233,000	1,709,000	1,097,000	64.2
Total	3,061,000	516,000	1,467,000	4,011,000	1,655,000	41.3

Note: (1) Net fibre - adjusted for imports, exports and sales to non-APIC companies.

(2) Derived from Collections and Recovery data in the table.

The source for APIC's import statistics is the Australian Bureau of Agricultural and Resource Economics (ABARE). Note that the APIC statistics do not differentiate between residential and away from home consumption. Paper industry experts the authors consulted indicated that up to 75% of paper and cardboard consumption is away from home and that about 420,000 tonnes are available for kerbside recovery[16]

APIC (n.d.) also report 1,084,000 tonnes of recovered Packaging & Industrial paper used to produce new products in FY02/03. Further categorisation of the total was not available.

Newsprint statistics compiled by the Publishers National Environment Bureau (PNEB) are commonly cited for the strength of their robustness. Table 5 summarises the PNEB statistics for 2003.

Table 5: Newsprint Consumption and Recycling 2003 (tonnes) (PNEB 2004)

	Standard and Improved Grade Newsprint Consumption	Total Newsprint Recycled	ONP Post-consumer Collection	ONP Post-Consumer Recovery Rate (%)	State Recycling Rate (%)
Queensland	116,175	79,375	65,434	63.5	68.3
New South Wales	248,253	191,051	161,261	73.2	77.0
ACT	18,280	13,644	11,000	66.3	74.6
Victoria	181,519	139,828	118,045	73.3	77.0
South Australia	48,321	31,398	24,932	58.2	65.0
Western Australia	92,511	65,305	54,204	66.1	70.6
Tasmania	11,415	7,392	6,420	63.4	64.8
Northern Territory	2,008	400	350	19.7	19.9
Total including inserts	**718,482**	**528,393**	**441,646**	**69.3**	**73.5**

[16] Personal communication with Kate Vinot, Visy Industries.

Figures for total newsprint recycled include publishers' waste and old newsprint (ONP). ONP tonnages from household collections normally vary from 50-100% of total paper collected.

The PNEB approach still has its weaknesses when looking at the potential applicability of the PNEB methodology to other material types. Data collection for newsprint is relatively straightforward, especially when compared to other material types[17]. Key factors include the small number of principal end users, detailed data collection methodology that has evolved over several years, and staff dedicated to ongoing data collection and refinement over time. Therefore, applying the PNEB approach to other material types would not prove as effective.

One issue that takes considerable effort in refining the PNEB data compilation is fluctuation in inventory data. Deliberately reducing inventory could result in decreased apparent consumption when actual consumption was increasing. This is likely to also be a significant issue for other material types.

3.3 Aluminium Cans

Total aluminium can recovery in 2002 has been reported by the Aluminium Can Group (ACG) as 28,500 tonnes, with an associated 63.1% recycling rate (ACG n.d.). Data that has not been publicly available to date is that 29,000 tonnes of aluminium were recovered in 2003, and the Aluminium Can Group has determined a recycling rate of 63.4%[18]. Working backwards from these numbers results in estimated aluminium can consumption in 2003 of 45,741 tonnes.

The ACG results are based on phone surveys, and the resulting recovery figures are subject to significant fluctuations in inventory levels based on London Metal Exchange market prices[19].

3.4 Beverage Containers

Beverage production data was obtained from Australian Beverages Council Ltd (ABC, previously the Australasian Soft Drink Association, or ASDA) and BIEC. Both the ABC and BIEC admit that there have been weaknesses in current beverage production estimates over the past several years.

Until the past few years, the Australian Bureau of Statistics (ABS) collected the data and reporting was compulsory. When the ABS decided to discontinue data collection in this area, the ASDA began a parallel data collection process. As reporting became voluntary instead of mandatory, data quality began to deteriorate[20]. ABC is currently attempting to develop a data collection process to make the data more robust.

Production statistics for aerated and carbonated waters reported by the ABC for the year ending 30 September 2004 are provided in Table 6.

---

[17] Personal communication with Tony Wilkins, News Limited.

[18] Personal communication with Malcolm Matthews, Aluminium Can Group.

[19] Personal communication with Malcolm Matthews, Aluminium Can Group.

[20] Personal communication with Tony Gentile, Australian Beverages Council Ltd, and Maree McCaskill, Beverage Industry Environment Council.

Table 6: ABC Production Statistics Year Ended 30 September 2004 ('000 Litres)

Canned	Glass	PET	Post-Mix[21]	Total
568,784	67,662	1,318,109	266,124	2,220,679

While the ABC statistics provide some indication of consumption, they do not provide the conversions into container material types necessary to calculate consumption values for packaging.

Production and packaging data from the BIEC (2004) 2003-04 Covenant Action Plan Report is provided in Table 7. The methodology used to develop the figures is not stated in the report, and is therefore not available for analysis in this report.

Table 7: BIEC 2003-04 Production and Packaging Data (BIEC 2004)

Primary Packaging (000's tonnes)						
	1996	**2000**	**2001**	**2002**	**2003**	**2004**
Al	37.4	36.5	37.6	37.8	38.3	38.9
Glass	582.4	575.6	516.7	509.1	505.2	513.3
PET	43.2	52.9	43.2	45.3	47.0	46.6
Total	**663.0**	**665.0**	**597.5**	**592.2**	**590.5**	**598.8**
Volume of beverage (megalitres)						
	1996	**2000**	**2001**	**2002**	**2003**	**2004**
Al	947.1	849.7	909.5	918.1	930.9	949.5
Glass	1023.5	1045.3	946.5	933.6	926.5	942.3
PET	1235.3	1264.7	1347.8	1423.6	1476.3	1,464.5
Total	**3205.9**	**3159.7**	**3203.8**	**3275.3**	**3333.7**	**3,356.3**
Grams packaging/litres of beverage						
	1996	**2000**	**2001**	**2002**	**2003**	**2004**
Al	39.5	43.0	41.3	41.2	41.1	41.0
Glass	569.0	550.7	545.9	545.3	545.3	544.7
PET	35.0	41.8	32.1	31.8	31.8	31.8
Total	**206.8**	**210.5**	**186.5**	**180.8**	**177.1**	**178.4**
Gross Secondary Packaging						
			2001	**2002**	**2003**	**2004**
	000's tonnes		79.9	79.1	79.8	81.4
	Grams/ litre		24.9	24.2	23.9	24.3
Net Transport Packaging						
			2001	**2002**	**2003**	**2004**
	000's tonnes		12.7	12.4	12.5	12.7
	Grams/ litre		3.9	3.8	3.7	3.8

The ABC and BIEC have different member companies, with some overlap. Datasets will therefore vary. The ABC data is based on aerated and carbonated waters, while the BIEC data is primarily beer and soft drink. The ABC data is developed on a quarterly basis, and can therefore be aggregated on either a fiscal year or calendar year basis, depending on need.

[21] Fountain drinks

3.5 Glass

In 2003, Australian glass consumption totalled around 850,000 tonnes. Visy, which tolls (processes) recovered glass for ACI Glass Packaging, the dominant industry player in glass, reports that in 2003-04, Visy recovered and recycled 300,000 tonnes of glass[22]. ACI Glass Packaging report that they purchased 247,669 tonnes of glass from Visy in 2003 and 225,372 tonnes in 2004[23]. The difference in the reported figures between Visy and ACI is that Visy's figures would include materials such as contaminants and off-specification material[24]. The 300,000 tonne figure does not include total contamination or recovered glass not destined for ACI.

3.6 Steel (cans, tins, etc)

In Australia, 1.7 billion steel cans are sold p.a. (SCRC n.d.). Using an average of 15,000 tins for one tonne of steel, or 67 grams per tin, 113,900 tonnes of steel cans are consumed p.a. The Steel Can Recycling Council (n.d.) reports a 44% recycling rate nationally, which would result in an estimated 50,116 tonnes recycled.

The steel data highlights the difficulties in comparing consumption and recovery data. While using SCRC (n.d.) figures results in a steel can consumption estimate of 113,900 tonnes, consultants Nolan-ITU, which conduct the SCRC survey, have used a steel can consumption figure of 210,000 tonnes in the draft RIS they are currently undertaking on Covenant MkII. Since the same consultants are responsible for both projects and since there is only one provider of tin-plated steel can sheet (Bluescope Steel), it is assumed that the draft RIS contains more recent and more accurate data than the publicly available SCRC figures. However, neither figure can be verified using publicly available data.

Using the RIS consumption figure (210,000 tonnes) and applying the SCRC recovery rate (44%) results in an estimated steel can recovery of 92,400 tonnes, or an increase of over 40,000 tonnes over the estimate derived from publicly available figures.

3.7 NSW JRG Market Intelligence Database

The NSW JRG commissioned the development of an online database on packaging and the processing markets for packaging materials (http://www.jrgnsw.com.au/select.php) based primarily on industry data. From the outset, the NSW JRG intended that the database would be national in scope and provide reliable data on market conditions over time[25]. However, the current database is significantly out of date. Most data is from 2001 or 2002 reports, so data may therefore be from even earlier periods.

The database is currently being updated, however the current version does not allow for reliable research, as the time periods covered, sources of the data by product type and data collection methodologies are not transparent. Data for the database is likely to continue to draw from available

[22] The Visy Report 2003/04 and Action Plan 2004/05

[23] Personal communication with Warwick Hassan, ACI Glass Packaging.

[24] Personal communication with Kate Vinot, Visy Industries.

[25] Personal communication with Bruce Powell, Beverage Industry Environment Council.

industry data and is therefore susceptible to the weaknesses highlighted for the individual industry datasets.

3.8 Summary of Relevant Data

A summary of consumption and recovery using available industry data, with all the limitations cited above, is provided in Table 8. Consumption figures for paper and glass are likely to be heavily impacted by limited data for packaging related to finished products. Obtaining reliable data in this area could have a significant impact on overall packaging recovery rates, the full extent of which cannot be determined at this time.

As an indication of the potential weakness in paper and glass consumption figures, the total glass packaging consumption figure of 850,000 tonnes for 2003 seems significantly understated when compared to the 505,200 tonnes for BIEC 2003-04 data (Table 7). BIEC members do not consist of all beverage manufacturers, and only around 40% of Australian wine manufacturers[26]. The 850,000 tonne figure is also not likely to account for the full range of glass jars imported with finished product, nor for glass containers for spirits, virtually all of which are imported[27]. Table 9 contains revised estimates of paper/cardboard and glass consumption and recovery to attempt to adjust for packaging on finished product. Additional paper/cardboard consumption was estimated at 372,750 tonnes, while additional glass consumption was estimated at 325,000 tonnes. These estimates bring consumption figures in line with a range of available sources on waste composition.

Kerbside newsprint recovery was subtracted from a total figure of around 775,000 total tonnes of paper/cardboard for kerbside collections (draft RIS) to revise the kerbside/municipal recovery estimate. As C&I/Away from Home paper/cardboard recovery figures were reasonably well developed, they were not revised. Revisions caused the kerbside/municipal paper/cardboard recovery rate to drop to 42% (from 53% in Table 8) and the overall paper/cardboard recovery rate to drop to 74% (from 83% in Table 8).

Total consumption and recovery figures for glass were adjusted to reflect revised consumption estimates provided by BIEC (40% kerbside/60% away from home) and an estimated 320,000 tonnes of glass recycled from kerbside collections in 2003 (draft RIS). Revisions resulted in adjusted glass recovery rates of 68% for kerbside/municipal (35% in Table 8), 4% C&I/Away from Home (35% in Table 8) and an overall glass packaging recovery rate of 30% (35% in Table 8).

Even substantial improvements in recovery for other material types would not likely have a dramatic effect on overall recovery rates given the dominance of paper/cardboard and glass. The influence of paper/cardboard and glass on consumption and recovery figures is compounded by significantly varied residence times in the economy.

[26] Personal communication with Bruce Powell, Beverage Industry Environment Council.

[27] All spirits sold in Australia are imported, with the exception of Bundaberg Rum.

Table 8: Summary of 2003 Industry Consumption and Recovery Data

Material Type	Total Consumption (t)	Kerbside/ Municipal Consumption (t)	Kerbside/ Municipal Recovery (t)	Kerbside/ Municipal Recovery Rate (%)	C&I/ Away from Home Consumption (t)	C&I/ Away from Home Recovery (t)	C&I/ Away from Home Recovery Rate (%)	Total Recovery (t)	Overall Recovery Rate (%)
Paper/Cardboard (1)	1,709,000	427,250	224,275 (7)	52.5%	1,281,750	1,200,000	93.6%	1,424,275	83.3%
Glass Packaging (2)	850,000	425,000	150,000	35.3%	425,000	150,000	35.3%	300,000	35.3%
Plastics Packaging (3)									
PET (#1)	117,930	58,965	41,646	70.6%	58,965	11	0.0%	41,705	35.4%
HDPE (#2)	160,842	N/A	44,558	N/A	N/A	7,338	N/A	51,896	32.3%
PVC (#3)	12,171	N/A	1,428	N/A	N/A	529	N/A	1,957	16.1%
L/LDPE (#4)	211,294	N/A	607	N/A	N/A	30,271	N/A	30,841	14.6%
PP (#5)	108,031	N/A	4,292	N/A	N/A	1,753	N/A	6,045	5.6%
PS (#6)	32,026	N/A	0	N/A	N/A	1,089	N/A	1,089	3.4%
EPS (#6)	10,338	N/A	0	N/A	N/A	844	N/A	844	8.2%
ABS/SAN (#7)	6,481	N/A	0	N/A	N/A	539	N/A	539	8.3%
Nylon (#7)	not known	N/A	0	N/A	N/A	0	N/A	0	not known
Other	not known	N/A	0	N/A	N/A	0	N/A	not known	not known
Plastics Subtotal	659,112	329,556	92,531	28.1%	329,556	42,374	12.9%	134,917	20.5%
Steel cans (4)	210,000	105,000	46,200	44.0%	105,000	46,200	44.0%	92,400	44.0%
Aluminium beverage cans (5)	45,741	22,871	18,000	78.7%	22,871	11,000	48.1%	29,000	63.4%
Subtotal	**3,473,853**	**1,309,677**	**531,006**	**40.5%**	**2,164,177**	**1,449,574**	**67.0%**	**1,980,592**	**57.0%**
Newsprint (6)	718,482	718,482	441,646	61.5%		86,747		528,393	73.5%
Total Kerbside Est.		**2,028,159**	**972,652**	**48.0%**					

Notes

(1) Includes paper, cardboard, liquid paperboard and wet strength board. Consumption allocated using a proportion of 25% Kerbside/Municipal and 75% C&I/Away from Home provided by Visy Industries. The draft RIS uses a consumption figure of 1,626,000 tonnes. Sources for the RIS estimate are not known. Kerbside/Municipal Recovery estimate from BA 2004. C&I/Away from Home recovery figure from Visy Recycling.

(2) Consumption and recovery figures provided by ACI Glass Packaging.

(3) From PACIA 2004a and PACIA 2004b. In the absence of more reliable consumption data, a 50:50 split in consumption has been assumed, consistent with recovery sources.

(4) Consumption data is from the draft RIS, while the recovery rate of 44% from SCRC n.d. has been applied to estimate recovery. Consumption allocation estimated by Visy Industries.

(5) Personal communication with Malcolm Matthews, Aluminium Can Group. Consumption and recovery allocations estimated by Visy Industries.

(6) From PNEB 2004. Newsprint total consumption and C&I/Away from Home recovery figures include publishers scrap.

(7) From BA 2004.

Focus is on packaging materials. Plastics figures are packaging-specific; glass figures are assumed to be packaging-specific.

Consumption data is not robust enough to determine recovery rates for Kerbside/ Municipal and C&I/Away from Home categories for some material types.

Table 9: Revised Summary Using Adjusted Paper/Cardboard and Glass Figures

Material Type	Total Consumption (t)	Kerbside/ Municipal Consumption (t)	Kerbside/ Municipal Recovery (t)	Kerbside/ Municipal Recovery Rate (%)	C&I/ Away from Home Consumption (t)	C&I/ Away from Home Recovery (t)	C&I/ Away from Home Recovery Rate (%)	Total Recovery (t)	Overall Recovery Rate (%)
Paper/Cardboard	2,081,750	800,000	333,354	41.7%	1,281,750	1,200,000	93.6%	1,533,354	73.7%
Glass Packaging	1,175,000	470,000	320,000	68.1%	705,000	30,000	4.3%	350,000	29.8%
Plastics Packaging									
PET (#1)	117,930	58,965	41,646	70.6%	58,965	11	0.0%	41,705	35.4%
HDPE (#2)	160,842	N/A	44,558	N/A	N/A	7,338	N/A	51,896	32.3%
PVC (#3)	12,171	N/A	1,428	N/A	N/A	529	N/A	1,957	16.1%
L/LDPE (#4)	211,294	N/A	607	N/A	N/A	30,271	N/A	30,841	14.6%
PP (#5)	108,031	N/A	4,292	N/A	N/A	1,753	N/A	6,045	5.6%
PS (#6)	32,026	N/A	0	N/A	N/A	1,089	N/A	1,089	3.4%
EPS (#6)	10,338	N/A	0	N/A	N/A	844	N/A	844	8.2%
ABS/SAN (#7)	6,481	N/A	0	N/A	N/A	539	N/A	539	8.3%
Nylon (#7)	not known	N/A	0	N/A	N/A	0	N/A	0	not known
Other	not known	N/A	0	N/A	N/A	0	N/A	not known	not known
Plastics Subtotal	659,112	329,556	92,531	28.1%	329,556	42,374	12.9%	134,917	20.5%
Steel cans	210,000	105,000	46,200	44.0%	105,000	46,200	44.0%	92,400	44.0%
Aluminium beverage cans	45,741	22,871	18,000	78.7%	22,871	11,000	48.1%	29,000	63.4%
Subtotal	**4,171,603**	**1,727,427**	**810,085**	**46.9%**	**2,444,177**	**1,329,574**	**54.4%**	**2,139,671**	**51.3%**
Newsprint	718,482	718,482	441,646	61.5%		86,747		528,393	73.5%
Total Kerbside Est.		**2,445,909**	**1,251,731**	**51.2%**					

Notes

Focus is on packaging materials. Plastics figures are packaging-specific; glass figures are assumed to be packaging-specific.
Consumption data is not robust enough to determine recovery rates for Kerbside/ Municipal and C&I/Away from Home categories for some material types.

4.0 Evaluation of Datasets and Studies

Attempting to analyse current datasets, given their limitations, involves synthesising different data with varying levels of certainty and data intended for different purposes. This section is intended to provide an overview of some of the current datasets, summarise relevant studies and assess their applicability to setting or enforcement of Covenant MkII targets.

4.1 NEPC Annual Report

The National Environment Protection Council (NEPC) Annual Report 2002-2003 (NEPCSC 2003) consists of jurisdiction-based surveys of local government waste and recycling activities using agreed codes for material types (see Section 2.2).

NEPCSC sales figures[28] were subtracted from NEPCSC data for kerbside recycling collections to determine disposal of contaminant to landfill for each material type listed. Where states aggregated two or more material categories or where the material classification was unclear, the analysis aggregated the material into the largest relevant material (eg, 'glass' or 'mixed plastic'). Summary results are shown in Table 10.

Where NEPM data was available to calculate amount disposed to landfill, jurisdictional data matched the calculations (SA contained some small variations) except for NSW. For NSW NEPM data, every reported figure was off from the calculated value, yet the total figures matched (Table 11). This variation is likely due to the application of composition data and lack of effective data validation.

Factors affecting data robustness for the NEPCSC 2003 data include:

- Breakouts by material type are overly reliant on waste or recycling composition studies.
- Little or no data validation is conducted.
- Emphasis on kerbside data due to the nature of the Covenant/NEPMs in place.
- The NEPM for WA was not yet in place, and therefore no data was included for WA.
- Reporting by material type is inconsistent, likely due to different collection processes by jurisdiction. For example, NSW data shows four classes of glass: white (commonly known as flint), green, brown and glass (assumed to be mixed). Victoria and SA listed three classes (white, green and brown). Queensland included green and brown glass in with white glass.
- SA has classified over half of their residential collection material type data as 'other', which distorts all other classifications for SA. When aggregated on a national basis, SA's classification of 'other' accounted for 2.9% of specified material categories.

[28] Residential Kerbside Recycling Sold or Sent for Secondary Use Including Energy Recovery (in tonnes)

- NSW has a much higher proportion of mixed glass than does Victoria, which is likely due to the presence of the Binder automated colour sorting system in Victoria. Given the variety of sorting systems and classifications, it may be necessary to aggregate all glass as one material type.

Table 10: NEPM Summary and Variations for 2002-03 NEPM Data (Derived from NEPCSC 2003)

Code	Material Types	Residential Kerbside Recycling Collected (in tonnes)	%	Residential Kerbside Recycling Sold or Sent for Secondary Use Including Energy Recovery (in tonnes)	Residential Kerbside Recycling Residual Fraction (contaminants) Disposed of to Landfill (in tonnes)	Calculated Contami-nation to Landfill(%)	NEPCSC 2003 Value for Landfill Disposal (in tonnes)	Difference in Landfill Disposal Data (in tonnes)	Difference in Landfill Disposal Data (% of Reported Value)
A081	Paper - white office	10,178	0.9%	9,672	506	5.0%	510	-4	-1%
A00	Paper mixed	426,973	36.9%	337,716	89,257	20.9%	31,533	57,724	183%
A01	Cardboard	264,713	22.9%	223,222	41,491	15.7%	9,776	31,715	324%
A06	Liquid Paper Board	3,752	0.3%	3,559	192	5.1%	220	-27	-12%
D0121	Glass White	56,570	4.9%	51,901	4,669	8.3%	4,683	-14	0%
D0122	Glass Green	38,575	3.3%	34,481	4,094	10.6%	4,066	28	1%
D0123	Glass Brown	53,543	4.6%	48,453	5,090	9.5%	5,045	45	1%
D01	Glass	154,884	13.4%	110,077	44,807	28.9%	7,335	37,472	511%
E01	PET	36,113	3.1%	30,120	5,993	16.6%	2,447	3,545	145%
E0221	HDPE (clear/opaque)	17,211	1.5%	13,274	3,936	22.9%	1,103	2,833	257%
E0222	HDPE (coloured)	4,229	0.4%	3,283	946	22.4%	240	706	294%
E02	HDPE	5,971	0.5%	5,630	341	5.7%	347	-6	-2%
E03	PVC	1,207	0.1%	1,110	96	8.0%	83	13	15%
E04	LDPE	23	0.0%	23	0	1.2%	0	0	-26%
E05	Polypropylene	262	0.0%	92	170	64.8%	24	146	614%
E07	Plastic (other)	4,148	0.4%	3,555	594	14.3%	140	454	324%
G01	Aluminium (cans)	10,500	0.9%	8,535	1,965	18.7%	461	1,503	326%
F01	Steel (cans, tin, etc)	34,051	2.9%	29,332	4,720	13.9%	1,338	3,381	253%
	Other	33,427	2.9%	32,791	636	1.9%	8,422	-7,786	-92%
	Total	**1,156,328**	**100.0%**	**946,825**	**209,503**	**18.1%**	**81,676**	**127,827**	**157%**

Table 11: Variation Between Calculated and Reported Values for NSW 2002-03 NEPM Data (derived from NEPCSC 2003)

Code	Material Types	Residential Kerbside Recycling Collected (in tonnes)	%	Residential Kerbside Recycling Sold or Sent for Secondary Use Including Energy Recovery (in tonnes)	Residential Kerbside Recycling Residual Fraction (contaminants) Disposed of to Landfill (in tonnes)	Calculated Contami-nation to Landfill(%)	NEPCSC 2003 Value for Landfill Disposal (in tonnes)	Difference in Landfill Disposal Data (in tonnes)	Difference in Landfill Disposal Data (% of Reported Value)
A081	Paper - white office	3,942.44	0.8%	3,736.50	205.94	5.2%	210.16	-4.22	-2.01%
A00	Paper mixed	178,487.36	34.4%	162,109.03	16,378.33	9.2%	15,979.51	398.82	2.50%
A01	Cardboard	151,137.79	29.1%	147,522.39	3,615.40	2.4%	4,135.23	-519.83	-12.57%
A06	Liquid Paper Board	926.57	0.2%	880.38	46.19	5.0%	47.37	-1.18	-2.49%
D0121	Glass White	15,659.51	3.0%	14,810.68	848.83	5.4%	863.03	-14.20	-1.65%
D0122	Glass Green	4,562.41	0.9%	3,933.95	628.46	13.8%	600.72	27.74	4.62%
D0123	Glass Brown	12,713.97	2.5%	11,349.48	1,364.49	10.7%	1,319.53	44.96	3.41%
D01	Glass	109,644.52	21.1%	102,290.75	7,353.77	6.7%	7,335.21	18.56	0.25%
E01	PET	14,925.12	2.9%	13,673.29	1,251.83	8.4%	1,228.33	23.50	1.91%
E0221	HDPE (clear/opaque)	2,740.88	0.5%	2,432.93	307.95	11.2%	297.10	10.85	3.65%
E0222	HDPE (coloured)	744.46	0.1%	701.75	42.71	5.7%	43.18	-0.47	-1.09%
E02	HDPE	5,750.91	1.1%	5,449.03	301.88	5.2%	307.92	-6.04	-1.96%
E03	PVC	362.90	0.1%	339.92	22.98	6.3%	23.03	-0.05	-0.22%
E04	LDPE	23.08	0.0%	22.80	0.28	1.2%	0.38	-0.10	-26.32%
E05	Polypropylene	117.34	0.0%	92.11	25.23	21.5%	23.76	1.47	6.19%
E07	Plastic (other)	412.79	0.1%	399.49	13.30	3.2%	14.43	-1.13	-7.83%
G01	Aluminium (cans)	2,635.18	0.5%	2,402.96	232.22	8.8%	227.13	5.09	2.24%
F01	Steel (cans, tin, etc)	14,005.13	2.7%	12,900.03	1,105.10	7.9%	1,088.86	16.24	1.49%
	Other	0.00	0.0%	0.00	0.00	N/A	0.00	0.00	N/A
	Total	**518,792.36**	**100.0%**	**485,047.47**	**33,744.89**	**6.5%**	**33,744.88**	**0.01**	**0.00%**

4.2 Boomerang Alliance Report

The Boomerang Alliance (BA 2004) report compiled data from the NEPCSC 2003 report for NSW, Vic, Qld, SA and NT. Data for WA, Tas, and the ACT were estimated using a method that is not transparent and BA did not respond to attempts to question the methodology. We are therefore unable to evaluate the robustness of these estimates at this time. The BA 2004 report contains all the data flaws of the NEPCSC 2003 data, plus others.

The BA (2004, p46) report compared kerbside recycling estimates with consumption estimates for a range of packaging types (Table 12).

Table 12: BA Estimated Kerbside Recycling Rates for Packaging 2002-03 (BA 2004)

		Kerbside Recycling	
Packaging Material Type	**Consumption (Tonnes)**	**Tonnes**	**Rate**
Paper/Cardboard	1,709,000	224,275	13%
Glass	850,000	329,989	39%
PET Plastic	117,930	37,483	32%
HDPE Plastic	160,842	28,862	18%
Other Plastic	368,224	7,366	2%
Aluminium (cans)	45,166	11,598	26%
Steel (cans, tins, etc)	113,900	38,051	33%
Totals:	**3,365,062**	**677,624**	**20.1%**
Plus Old Newsprint	718,482	528,393	74%

While the BA report indicates that the figures in Table 12 are for kerbside recycling, the footnotes accompanying the original table imply that the consumption figures may also include away from home consumption for a range of material types, and are therefore underestimating packaging recovery rates. The glass consumption and recovery figures also include both residential and away from home sources and do not therefore represent a kerbside recycling rate.

As shown in Table 12, the BA 2004 report shows 528,393 total tonnes of newsprint collected *through kerbside* and indicates that the figure was sourced from the PNEB 2004 report (see section 3.2). The PNEB 2004 report p.13 shows a total of 528,393 total tonnes of newsprint recycled for paperboard, Australian newsprint, other, export and alternative technology, and notes that the total newsprint recycled includes publishers waste and old newspapers. Therefore, the BA use of the PNEB dataset is inconsistent with the original source document.

According to paper industry experts, about 420,000 tonnes of paper and cardboard are available for kerbside recovery[29] (as opposed to the BA figure of 1,709,000 tonnes in Table 12, which is the total Packaging & Industrial consumption figure reported in APIC n.d.). Assuming the BA figure of 224,275 tonnes of kerbside recovery is correct, the kerbside recycling rate for paper and cardboard would then be 53%, rather than the 13% reported.

[29] Personal communication with Kate Vinot, Visy Industries.

The BA methodology for determining aluminium can recovery was not provided in their report. Primary documents referred to in the BA report indicated a total aluminium can recovery in 2002 of 28,500 tonnes and a 63.1% recovery rate (ACG n.d.), rather than the 26% reported in BA 2004.

As shown in Section 3.6, an estimated 210,000 tonnes of steel cans are consumed p.a. and with a 44% recycling rate nationally, 92,400 tonnes are recycled. The BA report used the methodology described in Section 3.6 to estimate consumption at 113,900 tonnes, but only reported a 33% recycling rate (38,051 tonnes). The reason for the discrepancy cannot be determined at this time, as the BA methodology for determining these figures was not made available.

5.0 Conclusions and Recommendations

As a matter of priority, it is imperative that Australia develop and implement a nationally consistent methodology and validation process to effectively measure industry progress against Covenant MkII KPIs. The use of current datasets and methodologies to determine compliance would clearly be open to considerable challenge for virtually every area examined.

Available industry and jurisdictional data frameworks have evolved over time to address different needs and have been given different resource and funding priorities. These frameworks have also evolved to address needs other than those for the purpose they are now being asked to address. 'Fault' for the inability of the current system to address current needs does not lie with any particular organisation. Jurisdictions and industries have to deal with existing weaknesses and modify the current system to meet identified needs that these data frameworks were never intended to address.

It is important to recognise that KPIs do not have to completely measure the whole system. Rather they must be accepted by all the parties as being representative of what is happening. For example figures for consumption of packaging materials will never match figures for disposal and recycling because some materials stay in the economy for long periods. It may be easier to ignore direct measurement of consumption and measure recovery and disposal as a proxy for consumption. This would also allow industry to focus on measurement of the environmental factors relating to manufacture and distribution.

There has been a tendency for state governments to avoid large scale waste and recyclables auditing at the source. Instead audits have been left to local governments and recyclers who use many and varied methodologies for measuring materials flows. The resulting information is scattered amongst stakeholders and difficult to reconcile. Industry data is similarly scattered amongst individual companies and associations. Only by collecting raw data directly from the kerbside, public place or workplace bin can the multitude of stakeholders and methodologies be circumvented.

It is recommended that:

- A credible management system be put in place to monitor Covenant MkII without establishing an unwieldy and cost prohibitive data collection system;
- The Covenant MkII KPIs currently on the table be reconsidered in light of current data availability and impracticality of future measurement;
- A methodology for national or jurisdictional source based (bin) audits of waste and recycling streams be developed, agreed upon by all parties and costed;
- A methodology for verification of survey information supplied by industry and government be developed, agreed upon by all parties and costed;
- Where widespread audits are required an independent national team of auditors be established to monitor the data collection system, reduce costs and preserve the impartiality of the process;
- A composite indicator that combines indicators of environmental impact (during manufacture and distribution) with material flow be considered ;
- Target setting reflect the uncertainties on the current datasets and that baseline figures be re-examined and targets potentially adjusted to reflect corrected estimates;
- A timetable be set for the benchmarking process; and
- NPCIA contribute (with Government) to the funds required for establishing the new data collection regime.

Given the need to link data methodologies to Covenant MkII KPIs, key findings relating to each KPI have been summarised in Table 13.

When considering auditing disposal and recovery systems at the source it is important to understand the potential pathways for packaging once it has reached the end of its useful life. Attachment 2 depicts the pathways as defined by public behaviour, available collection system and recovery/disposal option.

Table 13: Covenant MkII KPI Analysis and Recommendations

	Key Performance Indicator	Source	Gaps / Issues / Comments
1.1	Total weight of packaging (including distribution packaging) used p.a. (domestic & imported) and the total weight of products packaged	Industry	Fundamental for demonstrating overall progress against Covenant MkII targets currently under development. Packaging on finished products remains a serious gap and will need to be addressed.
1.2	Resources used to produce the package: energy used, water used and production efficiency	Industry	Links with the Environmental Code of Practice for Packaging (Code) currently being revised by the NPCIA.
1.3	Changes to protection, safety, hygiene and shelf-life considerations associated with the packaging	Industry	Links with the Code currently being revised by the NPCIA. Issues such as these are essential to understanding packaging in context and will have direct impact on progress against targets.
1.4	Changes in marketing and distribution of the product to minimise packaging	Industry	Links with the Code currently being revised by the NPCIA.
2.1	Proportion of recycled content used p.a. in packaging, by material type (including plastic bags)	Industry	Consistency in terms and methodologies will be necessary, especially in areas such as use of industrial scrap and use of post consumer materials.
3.1	Reduction in new and existing product packaging unable to be recovered and re-utilised using existing recovery schemes	Industry	Fundamental for demonstrating overall progress against Covenant MkII targets currently under development.
3.2	Reduction in contamination rates for collection and material recovery systems	Local Govt., Recyclers	This is not by material type so will be easily obtained from local government and recyclers who generally have to measure this under their supply contracts (payment is often based on threshold contamination rates). Recyclers could be asked to cooperate by providing this data directly.
3.3	Total weight of packaging disposed to landfill and as a percentage of total waste and relative to other waste stream components	Local Govt.	Must use kerbside audit of garbage bins or landfill audit to gather this data. Audits of the waste stream only occur every few years. A consistent audit methodology would be required. Local Govt. would not be likely fund more regular audits and may not comply with standard audit methodology.
4.1	Total weight of packaging material re-utilised by type and end market	Industry, Reprocessors, Exporters	The market intelligence database developed by the NSW JRG would be a logical place to store such data, provided that the database is revised to keep more current and provide greater transparency for data and methodologies.
4.2	Diversion rates of recovery systems for material types eg domestic, public place, commercial and industrial	Local Govt. & Recyclers	Overall diversion rates available but not by material type or by recovery system. Must use kerbside audit of recycling and garbage bins to gather this data. Audits only occur every few years and different authorities use different methodologies. MRF could supply data but not by source (recovery system). Recyclers may not provide information voluntarily.
4.3	Total resource allocation for research and development to address agreed barriers	NPCC	Ensuring development of consistent data collection methodologies and verification process should be a priority area for funding.
4.4	Products purchased with recycled content (number of units purchased as a percentage of total units for the 3 highest quantity purchases	Industry & Local Govt.	Many local governments have some sort of buy recycled program but in most cases don't measure their performance in this way. This data not sourced through any existing survey of local government by state government. See Local Govt. Buy Recycled Groups (where they exist) in each jurisdiction for best available information.
5.1	Quantity of packaging in the litter stream	State Govt.	See 9.5

	Key Performance Indicator	Source	Gaps / Issues / Comments
5.2	Total resource allocation for education and research and development to identify and address/reduce environmental impacts	All?	Probably available from governments but not collated and reported as such.
6.1	Number of signatories who have formally adopted the Environmental Code of Practice for Packaging (Code) and developed systems for implementation	Industry	The NPCIA is currently leading revisions to the Code. Given the diversity of packaging and the range of decision points for packaging decision making, determining the extent of adoption/implementation could prove difficult.
7.1	Number of councils operating according to good practice collection principles and state-based benchmarks	Local Govt.	In some cases JPGs have defined best practice and are providing incentives for their adoption. This is a slow process as changes can only be made as contracts are renewed. Relatively straight forward to obtain data through state govt. survey of local govt or through model contracts programs.
7.2	Number of signatories operating in-house collection and recovery systems and litter management consistent with available good practise guides	Industry, Local Govt.	Must standardise and define 'good practice'. State govt. surveys of local govt. do not ask this question at this time but could be asked in future. May need independent verification to be credible.
7.3	Percentage of signatories operating/promoting good practise collection and recovery systems and litter management within their direct sphere of influence (eg customers, clients, key stakeholders)	Industry, Local Govt.	See 7.2
8.1	Proportion of households covered by kerbside collection systems	Local Govt.	Not always asked by state govt. surveys of local govt. but should be easy to obtain and should only change occasionally as new services are implemented.
8.2	Proportion of households covered by other collection systems	Local Govt.	See 8.1
8.3	Proportion of commercial and industrial premises covered by recycling collection systems	Local Govt., Recyclers	Not something normally measured by local govt. and could be considered commercially sensitive by recyclers if they were asked directly. Some local governments have their own commercial recycling services but this doesn't provide a complete picture of commercial recycling.
8.4	Weight of packaging to landfill and recycling from in-house operations	Industry, Local Govt.	Majority of local governments do not collect this information. Likely to require regular auditing of in-house waste and recycling streams. Aggregation of data would require surveying those local governments participating in the Covenant.
8.5	Proportion of Councils and government agencies providing public place infrastructure	Local Govt.	Only local governments provide public place recycling infrastructure (other than the ACT). This indicator is not quantitative about how much infrastructure or its effectiveness. Many councils are only just trialling such services. Occasional state program may also be trialling public place services. Currently a very small proportion of the packaging recovered by weight.
8.6	Proportion of signatories providing in-house recycling facilities	Local Govt., Industry	Important to define a minimum standard for the existence of an 'in-house recycling facility'. State govt. surveys of local govt. do not ask this question at this time but could be asked in future. May need independent verification to be credible.
9.1	Participation rates in resource recovery systems (kerbside, workplace)	Local Govt.	Participation rates in kerbside established by infrequent kerbside audits. A standard methodology for calculating participation rates has been agreed under the NEPM but there is no guarantee that it was used by local govt.. Certainly no comprehensive measure of participation in workplace systems, particularly non council workplaces.

	Key Performance Indicator	Source	Gaps / Issues / Comments
9.2	Contamination rates in resource recovery systems (kerbside, events, venues, public places, workplaces)	Local Govt., Recyclers	Contamination rates in kerbside systems tend to be based on kerbside audits. Recyclers do not keep recyclables segregated by source when processing so that cannot distinguish between the contamination rates in various recycling systems. Many disparate sources of data required for this indicator probably need to be audited rather than constantly monitored.
9.3	Improvements in knowledge about the functional attributes of packaging, including recyclability/ reuse	NPCC	Requires a community survey in each jurisdiction. Some jurisdictions already have surveys (and many councils do surveys) but questions are different and no attempt has been made to aggregate disparate sources of information.
9.4	Increase in consumer information to enable more informed behaviour	Industry, Local Govt.	Very hard to benchmark and measure improvements. Endless increase in consumer information not necessarily desirable. Better to set standard and measure adoption. Local govt. can be surveyed to find out what information they provide but difficult to analyse the resulting information.
9.5	Improvements in litter behaviour	Local Govt., State Govt.	NSW, Victoria and SA furthest progressed with methodology. All using one consultant so methodologies similar by default. ACT using Clean-up Australia Day information primarily to record amount of litter not behaviour. May best be audited at jurisdictional/national level by NPCIA independent of government.

Colour Coding:

Red	Kerbside auditing of bins or trucks required to gather data – will need consistent methodology
Green	Collect data directly from recyclers through survey – should be confidential and aggregated to state level for presentation
Blue	Collect information from local government (survey) possibly via state government – will need independent verification
Yellow	Auditing of public spaces required to gather data – will need consistent methodology

6.0 References

ACG – see Aluminium Can Group

Aluminium Can Group (ACG n.d.), Figures – *Australian Aluminium Beverage Recycling Can Rates*, available at http://www.aluminium-cans.com.au/Facts2.html, accessed January 2005.

APIC – see Australian Paper Industry Council

Australian Paper Industry Council (APIC n.d.), *Statistics*, available at www.apic.asn.au/statistics/default.htm, accessed January 2005.

BA – see Boomerang Alliance

Beverage Industry Environment Council (2004), *National Packaging Covenant National Action Plan Year 4 Report 2003 – 2004*, Sydney.

BIEC – see Beverage Industry Environment Council

Boomerang Alliance (2004), *National Packaging Covenant - Say No to the Waste Club*, Sydney.

Carrol, B. & Smighel, P. (2004) *Understanding Fast Moving Consumer Goods Litter*, a presentation to the Leading on Litter Conference, Melbourne, May 2004.

Curnow, R., Sphehr, K. & Casey, D. (2003) *Victorian Litter Monitoring Protocol, Pilot Test & Benchmarks using the Clean Communities Assessment Tool*, report by Community Change Pty Ltd, submitted to EcoRecycle Victoria.

DEC (2004) NSW Reprocessing Industries Survey 2001-2002 & 2002-2003 - Combined Summary Report, NSW Department of Environment & Conservation.

Department of Environment Heritage, *National Environmental Protection (Used Packaging Materials) Measure Methodology, Survey of Kerbside Materials to Determine Brand Owners*, provided in electronic form by Barbara Butt.

Department of Environment and Heritage, *Australian Waste Database*, http://www.deh.gov.au/industry/construction/wastewise/handbook/audit.html, accessed 26 January 2005.

EcoRecycle Victoria (2004) *Annual Survey of Victorian Recycling Industries, 2002-2003*.

EcoRecycle Victoria (2004) *Local Government Data Collection 2002-2003, Waste Management Services – August 2004*.

EcoRecycle Victoria (2004) *KRG Project No. 2001/01, Waste Stream and Recycling Data Collection Methodologies (Draft)*, unpublished.

Keep Australia Beautiful National Association (KABNA) Programs: Litter Audit, www.keepaustraliabeautiful.org.au/nat/01_cms/details.asp?k_id=40 , accessed 27/01/05

Keep South Australia Beautiful (KESAB): KESAB - Litter Statistics – Latest Survey, www.kesab.asn.au/litterstats/index.htm , accessed 27/01/05.

National Environment Protection Council Service Corporation (NEPCSC [date]), *Annual Report 2002-2003 Reports from Jurisdictions on the Implementation of the Used Packaging Materials NEPM*, Canberra.

NEPCSC – see National Environment Protection Council Service Corporation

PACIA – see Plastics and Chemicals Industries Association

Plastics and Chemicals Industries Association (PACIA 2004a), *National Plastics Recycling Survey 2004*, prepared by Nolan-ITU, Melbourne.

Plastics and Chemicals Industries Association (PACIA 2004b), *National Plastics Recycling Survey 2004: Polymer Re-Use and Capability Report*, prepared by Nolan-ITU, Melbourne.

PNEB – see Publishers National Environment Bureau

Publishers National Environment Bureau (PNEB 2004), *Industry Waste Reduction Agreement Newsprint Industry 2001-2005 Mid–Term Review and Report on Year 3*, Sydney.

Queensland EPA (2004) *The State of Waste and Recycling in Queensland 2003*.

SCRC – see Steel Can Recycling Council

Steel Can Recycling Council (SCRC n.d.), The Steel Can Story, available at http://www.cansmart.org/steelcanstory_web.pdf, accessed January 2005.

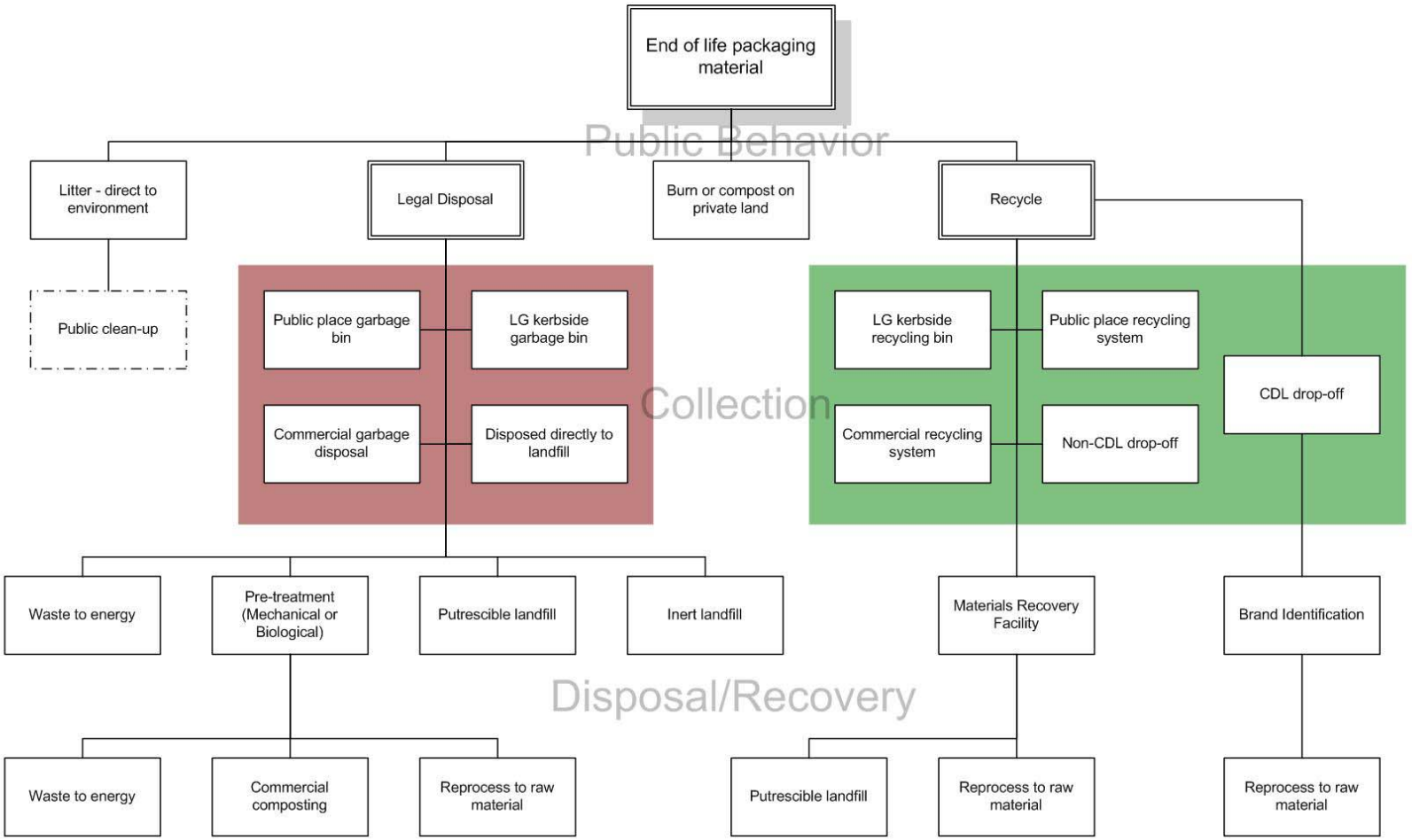
Attachment 1: Government Contacts

Name	Organisation/Role	Contact number
Barbara Butt	Assistant Director, Environmental Stewardship Team, Department of Environment and Heritage (Cmwlth)	(02) 62741679
Nick Chrisant	Project Manager Data Collection, EcoRecycle Victoria	(02) 96536936
Mark Cretney	Department of Primary Industries (Tasmania), Environment and Water, Environmental Division, Waste & Community Services Group	(03) 62336518
Rae Dilli	Project Officer (Recycling Industries), EcoRecycle Victoria	(03) 96393322
Jill Gallagher	Manager Waste Data, Environment Protection and Regulation Division, Department of Environment and Conservation (NSW)	(02) 99955772
Monina Gilbey	Environment Protection and Heritage Council (EPHC)	(08) 84191206
Sarah Gorman	Project Officer – Regional & Municipal, EcoRecycle Victoria	(03) 96393322
John Harley	Manager, Sustainability Programs Division, Department of Environment and Conservation (NSW)	(02) 88376018
Matt Kinch	Senior Environmental Policy Officer, Office of Environment and Heritage, Northern Territory	(08) 89244020
Graham Kohler	Senior Projects Officer, Sustainability Programs Unit, Department of Environment and Conservation (NSW)	(02) 42624311
Rob Middlin	Senior Project Officer (JPG member) South Australian Environmental Protection Authority	(08) 84633383
Margaret Nicholson	Senior Policy Officer – ACT No Waste	(02) 62075898
Tim Powe	Manager, Business Partnerships, Queensland Environmental Protection Agency	(07) 32276313
Margaret Turpin	Covenant Officer, Western Australian Department of Environment	(08) 92780935

Attachment 2:

Recovery and Disposal Pathways for Packaging Material

Prepared by New Resource Solutions Pty Ltd



Page 1