



Western Australian Local
Government Association
**Litter Management Options in Western
Australia**

September 2002

Ref: 4070-02

NOLAN-ITU Pty Ltd ACN 067 785 853 ABN 23 359 240 890

Suite 70, Level 7 / 104 Bathurst Street, SYDNEY NSW 2000
Telephone: (02) 9283 9361 Facsimile: (02) 9283 9362



NOLAN-ITU PTY LTD

ACN 067 785 853

ABN 23 359 240 890

Copyright © Nolan-ITU Pty Ltd 2002

“ This document is and shall remain the property of Nolan-ITU Pty Ltd. The document may only be used for the purpose for which it was commissioned and in accordance with the terms of engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited ©”.

REF: 4070-02

Document History and Status

Issue	Status	Date	Project Manager	Reviewer
1-1	1 st draft	July 2002	L. Whyte	P. Shmigel
1-2	2 nd draft	August 2002	L. Whyte	P. Shmigel
1-3	3 rd draft	15 August 2002	L. Whyte	B Schacher
1-4	Final draft	19 September 2002	L. Whyte	P. Shmigel
1-5	Final	24 September 2002	L. Whyte	P. Shmigel

Acknowledgments

This project was funded by the WA Waste Management and Recycling Fund and supported, through participation in the Project Steering Group by; the Beverage Industry Environment Council; the Conservation Council of WA; the Department of Environment, Water and Catchment Protection; the Keep Australia Beautiful Council; the Shire of Dardanup; and the Shire of Greenough.



TABLE OF CONTENTS

ACRONYMS.....	III
EXECUTIVE SUMMARY	V
1 INTRODUCTION.....	1
2 PROJECT CONTEXT	2
2.1 Project Steering Group Directions	2
2.2 What is Litter?.....	4
2.3 A Conceptual Model of the Litter Effect	5
3 THE LITTER EFFECT IN WA	11
3.1 Litter Costs in WA	11
3.2 Stakeholder Consultation	17
3.3 Desktop Data Review.....	21
3.4 Local Government Survey	37
3.5 Nolan-ITU Visual Assessment.....	40
3.6 Deficiencies in the Available Data.....	42
3.7 Recommendations to Address Data Deficiencies	48
3.8 How is Litter Currently Managed in WA?.....	50
3.9 WA Litter Effect Observations	52
4 IDENTIFICATION OF MECHANISMS.....	55
4.1 Identification of a Range of Generic Mechanisms.....	55
4.2 Education	57
4.3 Physical Intervention.....	58
4.4 Enforcement	58
4.5 Producer Responsibility	60
5 ASSESSMENT OF MECHANISMS.....	62
5.1 Introduction to Multi-Criteria Assessment.....	62
5.2 Step 1 – Selection of Sample Mechanisms for Review	63
5.3 Step 2 – Establish the Evaluation Criteria and Weightings	63
5.4 Step 3 – Ranking of Potential Mechanisms to Manage Litter	65
5.5 Step 4 – Running the MCA.....	65
5.6 Step 5 – Interpreting the Results	67



TABLE OF CONTENTS (cont.)

6	FINAL RECOMMENDATIONS.....	72
6.1	What has been determined about the litter effect in WA and managing it?	72
6.2	Where to from here?.....	73
6.3	WA Litter Abatement: Forward Path.....	75
7	REFERENCES.....	85
7.1	Reports & Journals.....	85
7.2	Internet Resources.....	87

APPENDIX I – Stakeholders contacted for project input

APPENDIX II – Mechanisms Overview

APPENDIX III – Litter Management Mechanisms Summary

APPENDIX IV – MCA Scoring Framework

APPENDIX V – Mechanisms Score Sheet

APPENDIX VI – KABC Programs Conducted in 2000/01

ACRONYMS

ATM	Automatic Teller Machine
ATS	Administrative Training Services
BAT	British American Tobacco
BIEC	Beverage Industry Environment Council
CALM	Department of Conservation and Land Management
CCC	Community Change Consultants
CUA	Clean Up Australia
CDL	Container Deposit Legislation
DBI	Disposal Behaviour Index
DEWCP	Department of Environment, Water and Catchment Protection
DRRG	Darling Range Rubbish Group
EPA	Environment Protection Authority
EPR	Extended Producer Responsibility
FMCG	Fast Moving Consumer Goods
GPT	Gross Pollutant Trap
IWRA	Industry Waste Reduction Agreement
IWRP	Industry Waste Reduction Plan
KABC	Keep Australia Beautiful Council
KABNA	Keep Australia Beautiful National Association
KABV	Keep Australia Beautiful Victoria
LBS	Littering Behavioural Study
LGA	Local Government Area
MCA	Multi Criteria Analysis
MWAC	Municipal Waste Advisory Council
MWC	Mobile Work Camp
MRWA	Main Roads Western Australia
NGO	Non-government Organisation
NPC	National Packaging Covenant
OA	Observational Approach
OECD	Organisation for Economic Co-operation and Development
RARE	Resource And Recovery Education
RID	Regional Illegal Dumping
SRT	Swan River Trust
The Association	Western Australian Local Government Association
VLAA	Victorian Litter Action Alliance



EXECUTIVE SUMMARY

In response to requests from member Councils, the Western Australian Local Government Association (the Association) through the Municipal Waste Advisory Council (MWAC) undertook an investigation to determine options to best manage litter in Western Australia (WA). Under the direction of a stakeholder-based representative Project Steering Group, Nolan-ITU, a sustainable resource management consultancy, was engaged to undertake the investigation.

Project Context

Comprising a number of key phases, the project sought to achieve the following objectives:

- Gather information about the litter issue in WA and litter management;
- Develop an assessment framework for evaluating litter management mechanisms; and
- Make recommendations to provide a basis for future litter abatement strategies in WA.

Tasks undertaken to achieve these project objectives included:

1. *Assessment of the litter stream in WA* – identification of both the real and perceived problems of litter;
2. *Data assessment* – identification of any deficiencies in available data on the WA litter stream and recommendations for addressing these deficiencies;
3. *Identification of litter management mechanisms* – within WA, nationally and internationally;
4. *Development of an assessment framework* – suitable for use during the project, as well as for more localised assessment of litter management mechanisms after project completion;
5. *Assessment of selected mechanisms* – in terms of ability to address litter problems in WA and potential to reach preferred outcomes; and
6. *Investigation of costs* – associated with the proposed mechanisms and the potential for the distribution of costs in the WA context.

While the project undertook evaluation of a robust sample of mechanisms, it did not seek to make final recommendations on a preferred mechanism or strategy for WA, as a range of research and policy tasks are still required prior to proceeding to that stage.

Defining the Litter Effect

The first course of action in undertaking the investigation was to define the problem at hand. Litter has a range of different meanings in various legislation and is often viewed in a different way by organisations charged with managing litter. However, for the most part and very importantly, the definitions do not directly encompass human behavioural aspects and activities but rather the material / physical aspects of litter.

As a result, a broader conceptual model was developed that embraces the totality of the problem in WA, including its anthropocentric aspects. This model combines the physical aspects of “litter” and the behavioural aspects of “littering” into a holistic ‘*litter effect*’. By accepting that the problem is the overall litter effect (which encompasses the environmental, social and financial costs associated with litter), the project was better placed to carry out a broader analysis of litter issues and to seek out more comprehensive improvement measures.

Fundamentally, the litter effect occurs through a complex relationship of factors that result in different litter and littering patterns in different circumstances and their incumbent environmental, social and financial impacts. The litter effect’s factors are described below:

- CAUSE – why litter occurs, what it is the result of;
- BEHAVIOUR – how items get littered, the method/technique of littering;
- ITEM – what commonly gets littered;
- STREAM – where litter typically accumulates (generally the combination of cause, behaviour and item that result in distinct litter impacts in given geographical areas and/or locations), and;
- MECHANISM – intervention measure used to address either the causes and/or their behavioural effects and/or particular or collective commonly littered items and/or litter streams.

Figure I provides a visual representation of the ‘Litter Effect Model’.

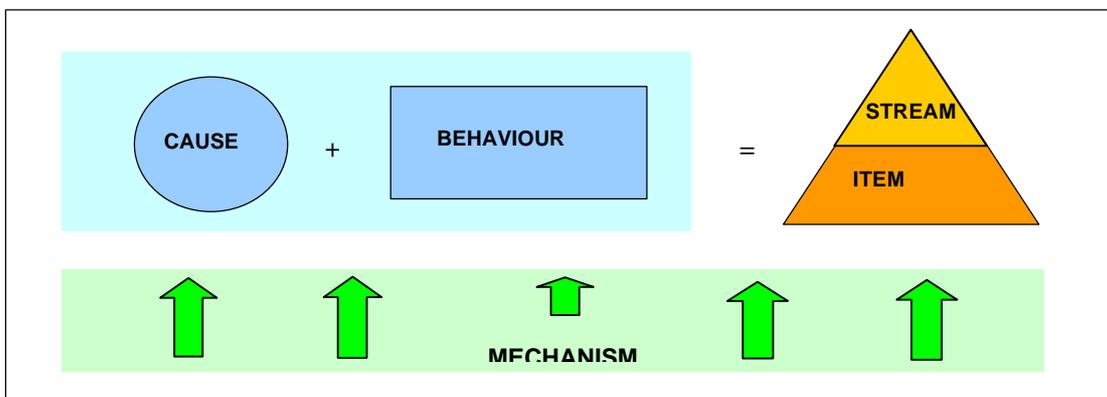


Figure I – The ‘Litter Effect Model’

Quantifying the Litter Effect in Western Australia

To quantify the litter effect in WA, a wide-ranging investigative process was applied incorporating extensive stakeholder consultation, desktop data review, a survey of WA Local Governments and a Nolan-ITU visual assessment.

Consideration of local stakeholder views combined with the best available factual information and primary research enabled the following overall observations about the litter effect in WA to be made:

- Albeit for different reasons and in different ways, litter is considered a genuine issue by the majority of stakeholders approached;
- However, and while further exploration is required, litter would appear to receive a lower priority than other issues with environmental impact, such as hazardous wastes or water pollution;
- Though it is articulated in various ways, many stakeholders would seem primarily concerned with the social (eg, aesthetics and amenity) and economic (eg. clean up costs) dimensions of litter rather than its environmental impact per se;
- Within the overall litter issue, and although there is limited statistical proof of an increase in the practice, illegal dumping is becoming an increasing priority among many stakeholders;
- A variety of programs currently exist to address the litter effect with most focussed on 'after the fact' aspects rather than the causes and behaviour that result in litter;
- Over \$16.5 million per year (as a very conservative estimate) is currently being spent in WA on anti-litter initiatives by local and State Government, industry and non-government organisations (NGOs);
- The majority of direct costs for litter management are currently borne by Local Government;
- There is a somewhat of a 'silo effect' occurring in terms of the conduct of anti-litter programs by agencies, eg, different programs are being run in parallel and with often the same overall objectives but in isolation of each other;
- The extent, rate, amount, disbursement, and type of litter cannot be absolutely quantified at this stage due to existing data gathering systems that are not comprehensive or comparable;
- The exact environmental, social and financial impacts of the litter effect cannot be absolutely quantified for the same reason; and
- The current data is not sufficiently quantitative to set clear benchmarks for improvement or to definitively evaluate the effectiveness of implementing litter abatement measures.

While it is difficult to definitively *measure* the litter effect in WA with the existing information, the litter effect model can be used to describe and highlight major aspects (based on stakeholder research and existing data assessment) that require consideration in the context of anti-littering mechanisms.

Priority issues that relate to causes, behaviours, items and streams in WA have been summarised in Table I.

Table I: Priority litter effect aspects in WA

1. Major CAUSES	
Insufficient and/or inappropriately designed disposal facilities in public place locations and on construction and demolition sites	
Increases in landfill charges	
Lack of guidelines and/or strict regulation for the storage and/or handling of waste materials	
Distance to waste disposal bin/facilities	
Negligence / habit	
Lack of education / awareness	
Weather conditions	
2. Common BEHAVIOURS	
Casual littering by individuals	
Avoidance of long distance waste haulage / and or landfill charges	
Lack of due care in the collection and transportation of wastes and recyclables	
Lack of due care in the transportation of loads (ie. uncovered loads)	
Throwing litter from motor vehicles and public transport	
Placing of advertising material in open spaces (ie. under vehicle windscreen wipers, property gates etc)	
Lack of due care during building construction and demolition activities	
Overfilling or inappropriate use of public place litter and recycling bins	
Inappropriate disposal of syringes and hazardous items	
Vandalism of public bins and property	
3. Common ITEMS	
Beverage containers	Milk cartons
Beverage related litter (straws, caps and tops)	Paper (general – inc. newspaper and packaging)
Confectionery wrappers	Plastics (general – inc. assorted bags and packaging)
Construction materials	Syringes
Cigarette butts	Takeaway food packaging
Domestic waste (general)	Vehicle tyres
Hazardous items (general – inc. containers of liquid waste)	Vehicle components (general – inc. whole cars)
Junk mail	Vending tickets (ATM, public transport tickets, docketts, invoices)
Large household items (inc. whitegoods, appliances)	

Table I (continued): Litter effect aspects in WA

4. Major litter STREAMS	
Roadsides	Unkempt property and derelict sites
Construction and industrial sites	Fast food outlets
Waterways and beaches	Special events (general)
Shopping centres	Remote areas (ie. nature reserves)
Bus stops, train stations and other public transport postings	

Identification of Mechanisms for Managing the Litter Effect

Detailed research was undertaken to identify a broad range of generic litter mechanisms used for the prevention and management of litter (national and international), including a number of generic Container Deposit Legislation (CDL) system types through:

- Internet and library research;
- An extensive literature review; and
- Personal communication with government, industry and community experts currently running litter abatement programs.

The range of mechanisms identified potentially suitable for the WA context were categorised under four key headings developed in consultation with the Project Steering Group:

1. *Education* – education mechanisms range from ‘blanket education’, which target general littering behaviour to ‘targeted education’, which specifically focus on a particular issue of concern. Mechanisms within this category generally target litter prevention;
2. *Enforcement* – enforcement measures are the ‘big stick approach’ to litter abatement aimed at preventing litter by providing a framework to discipline offenders and create disincentives to inappropriate behaviours;
3. *Physical Intervention* – physical intervention is the definition broadly used for mechanisms that feature the use of litter prevention infrastructure an/or involve the physical clean up or control of littered items; and
4. *Producer Responsibility* – incorporates mechanisms that seek to make the producer of a product responsible for the post-consumer management of that product.

Furthermore, the focus of different mechanisms generally falls in one of two areas:

1. *PREVENTION* – pro-active approaches which aim to reduce or stop the occurrence of litter; and
2. *CLEAN UP* – reactive approaches to remove litter from the physical environment once it has occurred. Until preventative pro-active approaches are 100% effective, there will continue to be a need for clean up or reactive measures.

The Project Steering Group selected a representative sample of mechanisms for further review from a broader list of options identified based on:

- *Potential capacity to address litter issues identified in WA* - defined as cause, behaviour, item and stream;
- *The availability of reasonable information so that the mechanism will fit into the architecture of a Multi Criteria Assessment (MCA) review* - ie. if a mechanism cannot be assessed against the evaluation criteria due to a lack of information, the resulting score will not be a realistic reflection of the mechanism's potential to reduce litter;
- *Representation of local, national and international programs*; and
- *Representation of mechanisms from the four key groups* - described above.

Mechanisms selected for further review through MCA were:

- Mass Media Public Awareness Campaign - NSW EPA "Don't be a Tosser" campaign;
- Guidebook and Tool Kit - US EPA Illegal Dumping Prevention Tool Kit;
- School Program - Gould League Victoria Waste Wise Schools Program;
- Community Program - Tidy Towns, Keep South Australia Beautiful (KESAB);
- Public Place Waste and Recycling Receptacles - Cottesloe Council, WA;
- Pocket Ashtrays - NSW EPA trial distribution of pocket ashtrays to smokers;
- Gross Pollutant Traps (GPTs) - CDS Technology, Randwick City Council, NSW;
- Community Clean Up Program - Clean Up Australia Day;
- State Government Clean Up Program - Administrative Training Services (ATS) / Main Roads WA Mobile Work Camps (MWCs);
- Regulatory Framework - NSW Protection of the Environment Operations Act, 1997;
- Illegal Dumping Program - Regional Illegal Dumping (RID) Squad, Western Sydney, NSW;
- National Packaging Covenant Action Plan - British American Tobacco (BAT);
- Container Deposit Legislation - South Australian model;
- Container Deposit Legislation - Alberta model; and
- Municipal street sweeping program – Woollahra Council, NSW.

Assessment of Mechanisms Using Multi-Criteria Analysis

MCA is a valuable tool to assist decision-makers to manage complex issues. It can be used to both improve the quality of a decision and also to justify why a particular action is taken. A significant advantage of using MCA is that it has the capacity to analyse both quantitative evaluation criteria as well as qualitative evaluation criteria (eg, yes/no, pluses and minuses, ordinal ranking).

To provide a basis for the assessment of mechanisms utilising the MCA model, the Project Steering Group and a stakeholder focus group meeting contributed to the development of evaluation criteria. Weightings were also developed to reflect WA stakeholder priorities. The list of evaluation criteria and their weightings is provided in Table II.

Table II: Evaluation criteria and allocated weightings

Evaluation Criteria	Weighting
<i>Financial Aspects</i>	
Financial cost to local government	6.5
Financial cost to state government	4.5
Financial cost to industry	4.4
Financial cost to community	5.5
Equity of financial cost distribution	5.5
Subtotal	26.4
<i>Behavioural Change</i>	
Effectiveness in achieving producer responsibility	8.0
Effectiveness in promoting consumer responsibility	8.6
Effectiveness in changing behaviours	12.1
Subtotal	28.7
<i>Environmental Aspects</i>	
Environmental benefit	8.9
Effectiveness in supporting visual amenity	3.9
Subtotal	12.8
<i>Scope</i>	
Applicability across a range of commonly littered items	6.4
Applicability across a range of litter behaviours	6.1
Applicability across a range of litter causes	4.6
Applicability across a range of litter streams based on prioritisation (environmental, needs basis, social priorities)	6.9
Subtotal	24
<i>Management Framework</i>	
Institutional complexity	4.4
Consistency with existing commitments under the NPC	3.7
Subtotal	8.1
TOTAL	100

The scope of the project imposed limitations on the number of mechanisms that could be suitably investigated to an appropriate level for incorporation into the assessment process. However, the nature of the MCA tool means that additional mechanisms and alternative weightings can be included at any future stage once the appropriate level of information is obtained.

Following the development and weighting of the evaluation criteria, each mechanism was “scored” based on how well it satisfied each of the nominated evaluation criteria. The scoring framework developed for the mechanisms was based on researched MCA practice as well as standards for impact assessment.

Interpreting the Results of the MCA

The selected mechanisms were evaluated using concordance analysis, which ranks the mechanisms based on how well they meet the stakeholder priorities outlined in the weighted evaluation criteria. Figure II displays the order of rank for each of the mechanisms assessed through the MCA framework.

Rank	Mechanism
1	Tidy Towns - KESAB
2	Clean Up Australia Day - WA
3	Waste Wise Schools Program - Gould
4	NSW Protection of the Env Ops Act, 1997
5	Illegal Dumping Squad - Western
6	CDL - South Australia
7	"Don't be a Tosser" Campaign - NSW EPA
8	CDL - British Columbia
9	Waste Wise Litter Kit - EcoRecycle
10	Cigarette Butt Receptacles - City of Sydney
11	Pocket Ashtrays - NSW EPA trial
12	Mobile Work Camps - WA Main Roads
13	Public Place Litter Bins - Cottesloe Council,
14	Gross Pollutant Traps - Randwick City
15	Street Sweeping - Woollahra
* denotes Mechanisms were ranked equally using concordance	

Figure II: Overview of concordance rankings of selected litter management mechanisms

The final ranking of mechanisms reflects how well the different mechanisms met the collective objectives of the range of stakeholders that have diverse interests in the litter effect. The mechanisms that tended to get a higher ranking generally:

- Have a broad focus covering a range of litter causes, behaviours, items and/or streams;
- Are well-established programs with documented evidence of performance in reducing litter; and/or
- Are of a more pro-active preventative nature and generally target behavioural change, which was a key stakeholder objective.

Recommendations for Progressing Understanding and Management in Western Australia

At present, there is no concrete rationale for concluding that WA does or does not need a radically different approach to litter management. Additionally, there is no substantive way to recommend a specific approach. However, this is not to suggest that further action is not required, as stakeholders clearly consider litter an important issue and it undoubtedly has real (but difficult to quantify) environmental, social and financial impacts.

For WA litter effect stakeholders to collectively decide on a final strategy for litter abatement and the appropriate blend of mechanisms (including potential new ones) to use, several outcomes need to be first achieved. At the same time that WA litter effect stakeholders are developing their final strategy for litter abatement, several initiatives can be undertaken in terms of continual improvement of current WA litter abatement efforts. In fact, the continual improvement of current efforts will compliment the process of deciding what is ultimately the best approach for WA.

The forward path presented here for the development of an overarching litter abatement strategy for WA considers several aspects identified during the project:

1. Stakeholder perspectives about the litter effect – what stakeholders know about and/or perceive about the litter effect and what they think is important to do.

According to their agencies' role, constituency and area of activity, different stakeholders interpret the litter effect in different ways. It will be important to work toward a more common and shared understanding of the problem at hand.

2. Availability of objective information about the litter effect – what is and is not factually established about the quantitative and qualitative aspects of litter, littering, and litter abatement mechanisms.

The project determined that there is a lack of objective and/or comprehensive data about the litter effect in WA. This is the case for a variety of both institutional and methodological reasons. It will be important to work toward a more robust way of consistently and reliably identifying the litter effect on a state-wide basis. Establishment and multi-stakeholder endorsement of an appropriate methodology would constitute significant national leadership on the litter effect.

3. Current WA litter abatement program capacity – what currently occurs.

A variety of agencies and players currently contribute to litter management in WA. The project has also identified gaps in coverage by current programs including a lack of emphasis on causes and behaviours as well as some litter streams, as well as an apparent lack of coordination. A realistic forward path needs to acknowledge the gaps and address coordination aspects in order to be successful.

4. Australian and international best practice – what occurs elsewhere and could occur in WA.

The overview of existing practices from other Australian and international settings has been undertaken and showed that proof of effectiveness is lacking.

In going forward, it is therefore important for WA litter effect stakeholders to show leadership and undertake their own actions to objectively determine:

- a) How much litter / littering behaviour is reduced / improved by a given initiative; and
- b) How much an initiative costs and how these costs can be distributed.

5. A repeatable assessment framework – a way of deciding on what is most suitable for WA.

The forward path needs to feature an accepted way of revisiting mechanisms, especially as more factual information about them is gathered. A MCA framework has been established by the project. However, once sufficiently researched, there are many more mechanisms that could be assessed using the MCA framework - each new piece of information will improve the assessment.

The MCA framework can also be modified to incorporate additional evaluation criteria and different weightings to reflect localised priorities in WA.

WA Litter Abatement Forward Path Summary

Fundamentally, the forward path needs to feature the following components:

- Structure – how the development a WA litter abatement strategy is to be managed;
- Information – on what basis should the WA litter abatement strategy be developed; and
- Programs – how the WA litter abatement strategy will be delivered;

In light of available resources, the forward path toward the overall end point of developing an overarching WA litter management strategy is presented over a three-year timeframe in Table III. However, this could well be expedited if that is the collective will of stakeholders.

Table III: WA litter abatement path forward summary

Timeframe	Target
YEAR 1	Establish appropriate multi-stakeholder forum for developing a WA Litter Abatement Strategy and overseeing all relevant development tasks (<i>Structure</i>)
	Seek optimal performance – through greater inter-agency coordination and innovation - of existing programs (<i>Programs</i>)
	Develop clear State-wide methodology to both measure current litter effect and provide benchmark information on relative effectiveness of litter abatement mechanisms (<i>Information</i>)
	Develop more refined problem definition among all stakeholders based on more comprehensive factual base (<i>Information</i>)
	Achieve stakeholder consensus about problem and outcomes that are sought (<i>Information</i>)
	Identify and prioritise small scale litter abatement trials (<i>Programs</i>)
	Explore synergies with other State-based programs that could have litter on their agenda (<i>Information</i>)
YEAR 2	Implement small scale trials of new litter abatement initiatives (<i>Programs</i>)
	Develop database for program information storage (<i>Information</i>)
	Develop guidelines to specifically assist Councils incorporating litter management strategies in waste management plans (<i>Programs</i>)
YEAR 3	Conduct evaluation of litter abatement trials using data from methodology and MCA framework (<i>Information</i>)
	Further evolve the ‘litter effect’ model and understand how it applies to different parts of the state. (<i>Information</i>)
	Develop resources and guidelines on best practice litter abatement options for different circumstances (<i>Programs</i>)
	Finalise WA Litter Abatement Strategy including overall litter reduction goal and associated environmental, social, policy and institutional objectives (<i>Information</i>)
	Consider review of legislative framework (<i>Structure</i>)

1 INTRODUCTION

The Western Australian Local Government Association (the Association) through the Municipal Waste Advisory Council (MWAC) appointed Nolan-ITU, a sustainable resource management consultancy, to identify, assess and report on mechanisms for the management of litter in Western Australia (WA).

The Association is the peak organisation of Local Government in WA, representing the 142 Councils in WA plus Christmas Island and Cocos (Keeling) Islands.

The project objective was to identify options for the management of litter in WA. Several key tasks were required to achieve the project objective:

1. *Assessment of the Litter Stream in WA* – identification of both the real and perceived problems of litter;
2. *Data Assessment* – identification of any deficiencies in available data on the WA litter stream and recommendations for addressing these deficiencies;
3. *Identification of Litter Management Mechanisms*;
4. *Development of an Assessment Framework* – suitable for more localised assessment of litter management mechanisms after project completion;
5. *Assessment of Selected Mechanisms* – in terms of ability to address litter problems in WA and potential to reach preferable outcomes; and
6. *Investigation of the Costs* – associated with the proposed mechanisms and the potential for the distribution of costs in the WA context.

Fundamentally, the project sought to gather information about litter and litter management, develop an assessment framework for litter management mechanisms and make recommendations to provide a basis for future litter abatement strategies in WA. While the project undertook evaluation of a robust sample of mechanisms, it does not seek to make final recommendations on a preferred mechanism or strategy for WA, as a range of research and policy tasks are still required prior to proceeding to that stage.

To ensure objectivity and rigour in the investigation, a Project Steering Group consisting of several stakeholders oversaw the project. A range of organisations that are relevant to litter management in WA participated:

- Beverage Industry Environment Council (BIEC);
- Conservation Council of WA;
- Department of Environment, Water and Catchment Protection (DEWCP);
- Keep Australia Beautiful Council (KABC);
- Municipal Waste Advisory Council (MWAC);
- Shire of Dardanup;
- Shire of Greenough; and
- Western Australian Local Government Association.

2 PROJECT CONTEXT

2.1 Project Steering Group Directions

In reviewing litter management mechanisms for Western Australia (WA), it is important to consider key issues and challenges that have the potential to influence outcomes. At the project’s inception meeting, the Project Steering Group identified the following barriers to and drivers for improved litter management in WA:

Barriers	Drivers
<ul style="list-style-type: none"> • Poor problem definition – there is a lot of anecdotal information about litter but limited data. • Policy / legislative support – there is no strategic framework for litter management in WA at present. • Lack of resources – major issue for agencies and Councils. • Lack of identified best options for litter management – no guidelines for how to most effectively spend money, especially when working within a limited budget. • Lack of emphasis on Producer Responsibility • Litter has generally been considered a lower priority issue compared to other waste management issues. • Lack of awareness about litter, including at senior management level. 	<ul style="list-style-type: none"> • Community environmental concerns. • State Government’s broader sustainability agenda and waste education strategy. • Policy/legislative support – the current review of relevant waste management legislation may be an opportunity. • Local Government concerns about the cost of current litter management. • Local Government interest in potential alternative litter management options, including Container Deposit Legislation (CDL). • Stakeholder feedback would indicate that the litter issue is getting worse and requires greater attention. • Creation of Waste Management Board – independent and providing direct advice to the Minister for the Environment.

The Project Steering Group further established that current issues and challenges relating to litter in WA can be grouped into four key focus areas:

1. *Policy and Strategic Direction* - there is generally a lack of policy or gaps in policy creating challenges for optimal coordination of current litter projects and activities.
2. *Data (collection, management, measurement, monitoring)* - there is a lack of reliable and/or comparable information and data on litter in both WA and nationally causing challenges for problem definition.
3. *Education and Communication* - there is a lack of awareness and understanding in the community regarding the impacts of litter, littering and litter management options, compounded by fragmented educational and communication messages, which creates challenges for future behavioural change programs.
4. *Social Attitudes and Perceptions* - litter is also a social and community issue and the challenge is to develop solutions that address this aspect as well.

It is also significant to note that the Project Steering Group - reflecting stakeholder priorities - included the examination of illegal dumping within the overall ambit of the project. Traditionally, most attempts to address litter as a problem have focused on “casual littering”, eg, incidents where individuals inappropriately dispose of generally smaller items, such as fast moving consumer goods (FMCGs).

The Project Steering Group developed the following contextual scan (Table 2-1) of the litter issue in WA, which served as the starting point for further research and analysis. The scan tried to describe the current situation with litter in WA; the elements of a ‘best case’ scenario; the elements of a ‘worst case’ scenario, and; drivers for and barriers to the ‘best case’ scenario.

Table 2-1: Project Steering Group ‘contextual scan’ of the litter issue in WA

Worst case scenario	Barriers to progress	Current situation	Drivers for progress	Best case scenario
Continued increase in littered and illegally dumped items	Geography - size relative to population base, geographic isolation of sites	Casual littering remains constant and incidents of illegal dumping are increasing	Corporate social /environmental responsibility	Year-on-year, reduction in littered items
Increased littering in sensitive areas	Consumer attitudes and behaviours	Government scrutiny increasing	Some stakeholder engagement	Improved consumer behaviour
Poor disposal behaviour by consumers	Fragmentation of resources and infrastructure	Some people litter habitually, deliberately or because of a lack of bins	Community environmental concerns	Stakeholder collaboration
Restrictions placed on access to public space	Funding allocation to litter issues when other environmental issues are more of a priority	Belief that there is no problem or that the problem is managed	Council concerns about the cost of current litter management	Accurate data collection methodology and measurement techniques
Allocation of resources on ineffective programs	Organisations operating in isolation	Infrastructure patchy	State government waste education strategy	Greater resources or more efficient use of existing resources
Limited NPC support or EPR involvement	Capacity to agree to a framework.	Minimal industry support from some sectors	Sustainability agenda	Consistency in the message delivered
Current funding allocations diverted to more topical environmental issues	Limited policy / legislative support	Enforcement of litter incidents is minimal	Interest in potential alternative litter management options, i.e. CDL	Broader industry responsibility and support for initiatives
	Lack of identified best options and litter management mechanisms	Lack of strategic framework to outline what works in different circumstances	EPR debate	An educated public that accepts responsibility for their own litter
		State government is an NPC signatory	Waste Management Board	Clear policy and strategic direction
		Illegal dumping of items is reported to be increasing	Stakeholder feedback that the litter issue is getting worse	

2.2 What is Litter?

Any project aimed at improved environmental or social outcomes needs to first understand what it is that needs to be improved. In considering litter management options, it is important to first attempt to define the problem at hand.

There is a range of different definitions for what actually constitutes “litter” as a physical entity. Broadly speaking, “litter” can mean pollution, chicken or pet bedding waste, garden scrap and/or rubbish that has been incorrectly disposed of. The Keep Australia Beautiful National Association (KABNA) refers to litter as “man-made solid waste that is not in containers where it belongs” (KABNA 1992).

For the purpose of this report, the working definition of litter has been taken from the WA Litter Act 1979, which states that litter includes:

- *All kinds of rubbish, refuse, junk, garbage or scrap; and*
- *Any articles or material abandoned or unwanted by the owner or the person in possession thereof, but does not include dust, smoke or other like products emitted or produced during the normal operations of any mining, extractive, primary or manufacturing industry.*

For the purposes of the Act, litter is deposited on land or on or in waters if:

- *It is placed, put, left, dropped or thrown there; or*
- *It is allowed to fall there or be carried there by the action of wind or water, or both.*

The definition in the Act is considered a sufficient starting point in that it covers the predetermined scope of the project, which covers all littered and illegally dumped materials. It is also locally relevant.

However, and very importantly, the definition does not directly encompass human behavioural aspects and activities rather than material / physical aspects. As a result, it is important to develop a broader conceptual model that embraces the totality of the problem in WA, including its anthropocentric aspects.

There are clearly two fundamental and highly inter-related aspects to consider. On the one hand is the physical entity called “litter”, eg, what we actually see *in situ* as defined in the Act. On the other hand are the human behaviours called “littering”, eg, the sum total of attitudes and behaviours resulting in litter.

It is important to proceed from this holistic standpoint. If the problem is defined solely as “litter”, potential solutions could be overly targeted at direct remediation measures, such as clean ups of littered materials. If the problem is defined solely as “littering”, potential solutions could be overly directed at changing people’s behaviours, such as educational initiatives. Therefore, Nolan-ITU believes that the two linked aspects need to be taken together: litter and littering are holistically referred to as *the litter effect*.

Additionally, the litter effect better encompasses aspects associated with illegal dumping. A definition of the problem as solely “litter” would put an inadvertent emphasis on FMCGs rather than the bulky items that tend to be found in the typical composition of illegally dumped materials.

By accepting that the problem is the overall litter effect, and the environmental, social and financial costs associated with the litter effect, the project is better placed to carry out a broader analysis and seek out more comprehensive improvement measures.

2.3 A Conceptual Model of the Litter Effect

The litter effect is an ongoing issue that occurs to different degrees across the globe amongst different cultures and by people from different educational, ethno-linguistic, religious and socio-economic backgrounds. Among the challenges in managing the litter effect is that it occurs in a range of areas, is the result of a number of different attitudinal and behavioural aspects, and features a vast and varied number of littered items that can accumulate in a broad range of geographical areas and physical places.

Fundamentally, the litter effect occurs through a complex relationship of factors that result in different litter and littering patterns in different circumstances and their incumbent environmental, social and financial impacts. The litter effect’s factors are described below, as is the terminology used in this report:

- **CAUSE** – why litter occurs, what it is the result of;
- **BEHAVIOUR** – how items get littered, the method/technique of littering;
- **ITEM** – what commonly gets littered; and
- **STREAM** – where litter typically accumulates (generally the combination of cause, behaviour and item that result in distinct litter impacts in given geographical areas and/or locations).
- **MECHANISM** – intervention measure used to address either the causes and/or their behavioural effects and/or particular or collective commonly littered items and/or litter streams.

Understanding that the litter effect is multi-faceted provides a basis for better addressing the overall issue and better identifying comprehensive litter management mechanisms.

2.3.1 Cause

The “cause” is that which drives the litter effect. Examples of “why” litter occurs include:

- Infrastructure and design – inappropriately designed, insufficient or infrequently cleared disposal facilities and/or no disposal facilities;
- People’s attitudes – don’t care, think someone else will clean it up, don’t understand the impact; lack of awareness;
- Regulation – lack of frameworks for the handling of waste and recyclable materials;

- Economics – increased landfill charges, cost of transporting wastes to appropriate disposal facilities; and
- Weather conditions – material can be carried by wind and/or water.

Litter management mechanisms could be targeted at the causes of the litter effect.

2.3.2 Behaviour

Behavioural traits contribute to the litter effect. “Behaviour” is quite distinct to the cause. By way of example is a situation where there are adequate bins, but some individuals still litter. Alternatively, some individuals will not litter even if there are no bins. Behaviour can be the result of awareness, habit and/or motivation. Examples of behaviours include:

- Throwing litter from motor vehicles and public transport;
- Deliberate avoidance of long distance waste haulage and/or landfill charges;
- Lack of due care in the collection and transport of waste and recyclables;
- Overfilling or inappropriate use of public place litter and recycling bins; and
- Casual littering by individuals of FMCGs.

On behalf of BIEC, Community Change Consultants (CCC) (2001) has conducted extensive littering behavioural studies (LBSs) of ‘casual littering’ in particular, undertaken by recording the disposal method characteristics of people in public places. Table 2-2 describes eight littering behaviour types that have been identified through their observations.

Table 2-2: Overview of litter behaviour types (BIEC & CCC, 2001)

Behaviour type	Description
Wedging	Pieces of litter are stuffed into gaps/cracks between seats or other places.
Flagrant flinging	Litter is thrown through the air.
Inching	Litter is left and the person littering slowly moves away from the litter.
Foul Shooting	Litter is thrown at a bin and if the bin is missed the litter is just left there.
Undertaking	Litter is buried in places such as in sand at the beach.
Clean sweeping	When arriving at a table on which others have left litter, the waste is swept onto the ground.
90%ing	Most rubbish is put into a garbage bin, however, some of it, often the smaller rubbish, is left behind or dropped.
Herd behaviour	Following the lead of other people. This includes, for example, going past an empty bin to litter next to an overflowing one.

The research identified that ‘typical’ littering behaviour does not exist and that many people may display more than one of the behavioural attributes described, depending on the situation, environment and/or the type of item they are handling.

Litter management mechanisms could be targeted at behavioural modification.

2.3.3 Item

“Item” refers to the actual littered object. Littered items are the physical manifestation of the litter effect and that aspect that is most readily recognisable to members of the community. Littered items constitute the focus of litter counts such as those conducted by KABC. Some examples of commonly items littered in WA include:

- Beverage containers;
- Beverage related litter (straws, caps and tops);
- Confectionery wrappers;
- Construction-related materials;
- Cigarette butts;
- Domestic waste (general);
- Junk mail;
- Milk cartons;
- Paper (general scraps, newsprint etc);
- Plastics (assorted pieces, bags, packaging etc);
- Takeaway food packaging;
- Vehicle tyres;
- Vehicle components; and
- Vending tickets (transportation-related etc).

Some litter prevention programs specifically seek to target commonly littered items and look to product manufacturers to take some responsibility for items that reach the end of their useful lives and enter the litter stream. Understanding which items are commonly littered allows litter management mechanisms to be targeted through EPR initiatives.

2.3.4 Stream

The combination of cause, behaviour and item results in particular litter “streams” (or sub-streams of the total litter stream), which provide an additional focus area to target litter abatement efforts. Litter streams are often setting or geographically specific and are characterised by certain items that tend to accumulate together.

Accumulation of litter in different locations results from:

- Deposit of unwanted materials in either areas that are highly frequented by the public (build up of items littered by larger numbers of people) or in isolated locations where larger quantities of unwanted material is illegally dumped undetected (larger quantities of material deposited by fewer individuals); and/or
- Movement of previously littered items to areas where they become trapped, ie. the result of weather conditions and/or water run-off.

In this latter regard, some commentators often refer to litter streams as litter ‘sinks’, because where litter is found is not in all occasions a reflection of where it is deposited.

Often identified litter streams can include water catchments, beaches, road verges, vacant blocks, natural areas, shopping centres, fence and wall bases, grassy areas, car parks, transport points, automatic teller machines (ATMs), and gross pollutant traps (GPTs). Targeting particular litter streams is another strategy for focusing litter management mechanisms.

2.3.5 Mechanism

A “mechanism” is considered an intervention that seeks to address the litter effect. A mechanism can be aimed at altering either causes or behaviours of littering or cleaning up littered items or streams. In this respect, mechanisms can be broadly categorised as those that are pro-active, eg, those that seek to prevent littering from occurring in the first place, and those that are reactive, eg, those that seek to remediate the outcomes of littering.

Examples of front-end or pro-active mechanisms are educational and behavioural change initiatives or infrastructure provision programs. Examples of back-end or reactive mechanisms are clean-up days or street sweeping programs.

It should be noted, though, that there is significant overlap between the categorisation of mechanisms. For example, while a community clean up day may be primarily directed at picking up inappropriately littered items and streams, it is likely to have a residual or indirect awareness and educational effect on its participants.

The way in which mechanisms relate to the litter effect model is outlined in Figure 2-1.

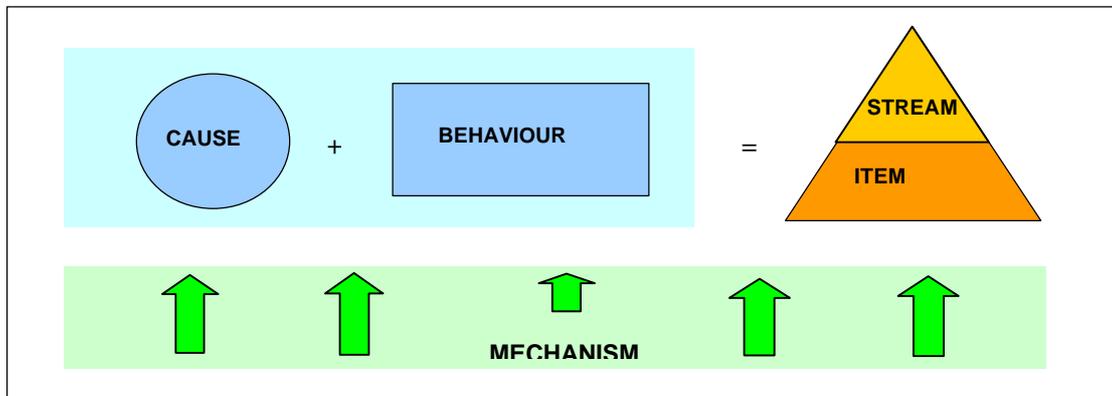


Figure 2-1: The ‘Litter Effect Model’

2.3.6 Applying the Litter Effect Model

An outline of how the described terminology will be used in the report is provided in the following examples.

Applying The Litter Effect Model: Example 1 - Smoky Joe Litters

- Cause 1: Smoky Joe believes material degrades and is therefore not a problem
- Cause 2: There are no available bins for Smoky Joe to appropriately dispose of article
- Behaviour: Casual littering through ‘fragrant flinging’ (litter is thrown through air)
- Item: Cigarette butt
- Stream: Public place – recreational park in a regional town
- Mechanism 1: pro-active = consumer education about butt’s impact and provision of pocket ashtray
- Mechanism 2: reactive = Council street sweeping program

Applying the Litter Effect Model: Example 2 – Tidy Tom

- Cause 1: There are limited public place recycling facilities where Tidy Tom is having his lunch outdoors
- Cause 2: It’s a windy day
- Behaviour: Overfilling and scattering of material from a public place recycling bin. (Thinking he is doing the right thing, Tidy Tom places an item on top of a full recycling bin.)
- Item: Beverage container
- Stream: Urban roadside
- Mechanism 1: pro-active = sufficient and appropriately designed recycling facilities
- Mechanism 2: reactive = gross pollutant trap / Council street sweeping

Applying the Litter Effect Model: Example 3 – Sneaky Sam

- Cause: The local landfill has just increased disposal fees for local residents
- Behaviour: Deliberately avoiding paying fees at the local landfill, Sneaky Sam dumps his household waste at a local deserted site
- Item: Old fridge, television and some household rubbish from a recent ‘spring clean’
- Stream: Rural derelict site
- Mechanism 1: More stringent regulation that sets greater fines for offenders
- Mechanism 2: Illegal dumping enforcement squad



Application of the litter effect model allows for a fuller understanding of the issues at hand and of the possible intervention points for improved litter management. The litter effect model has been actively incorporated into the project's Multi Criteria Analysis (MCA) of various litter management mechanisms. This is particularly relevant because:

- Financial limitations and other public priorities restrict additional resources being readily allocated to litter management in WA in the short term;
- Optimal outcomes need to be achieved with the resources available; and
- Considerable time and money is often spent on clean-up (reactive) activities, so it is important to predict if redistributing a component of that funding for prevention (pro-active) methods will produce desired outcomes.

3 THE LITTER EFFECT IN WA

Establishment of a strategic framework for future litter abatement activities in Western Australia (WA) requires a clear picture of how the litter effect applies in the state. Given the range of government and other stakeholders involved in litter abatement in WA, this is especially important for ensuring efforts are prioritised to achieve real and measurable outcomes.

It is essential to understand ‘what it is that needs to change?’ and ‘how change can most effectively be accomplished?’ in a given situation. To these ends, a review was undertaken of information compiled by the project through a large range of sources, including:

- Input from the Project Steering Group;
- Correspondence with a wide cross-section of key stakeholders through a variety of media, including survey work;
- Desktop research of available domestic and international data and literature;
- A survey of Local Government in WA; and
- Visual auditing of littered items at a sample of representative sites.

It became clear during the project that most ‘information’ about the litter effect in WA is of primarily anecdotal nature and that there is a lack of objective, reliable and comprehensive data and knowledge with which to quantitatively model the problem. Hence, the results presented here rely both on stakeholders’ *perceptions* of the litter effect and its environmental, social and financial consequences, as well as some partial *objective* description of the litter effect based on the currently limited available data.

3.1 Litter Costs in WA

The management of the litter effect has costs for various WA stakeholders – both direct and hidden. The project undertook an investigation of mostly direct costs borne by key players in WA litter abatement, including Local Government, State Government and non-government organisations (NGOs) with a litter-related mandate.

A preliminary estimate of funding currently allocated to key litter abatement programs and clean up efforts in WA has been calculated to put active litter management costs in WA into context.

3.1.1 Local Government

Collectively, Local Government is the main caretaker of litter in WA, as it is a major land and asset manager in areas where litter tends to accrue through human activity. Generally speaking, Local Government expenditure on litter abatement covers a broad scope of activities. While actual practices vary to a significant degree between Councils, responsibilities include:

- Education and advertising;
- Provision and maintenance of public place waste and recycling bins and signage;
- Installation and maintenance of stormwater systems;
- Enforcement;

- General litter clean up;
- Cleaning and repairs related to vandalism; and/or
- Site restoration to remove illegally dumped items.

Table 3-1 provides a summary estimate of Local Government annual expenditure on litter by population, based on the feedback obtained in a survey conducted by the project. Councils were asked to provide figures on items of expenditure including:

- Personnel-related costs;
- Stormwater systems;
- Maintenance/waste collection; and
- Litter prevention initiatives (including signage, education, and enforcement).

Furthermore, there are often ‘hidden’ costs associated with litter when council staff, such as parks and gardens officers, end up managing litter as part of their day-to-day activities including cleaning up after community events, rubbish bin vandalism etc. As a result, the true cost of litter may not be fully realised.

Table 3-1: Estimates of Local Government expenditure on litter abatement

Average expenditure on litter control (\$/annum)	Council Population				
	Under 5,000	5,000-19,999	20,000-99,999	> 100,000	Across WA
Total number of Councils that provided cost data	41	11	14	1	67
Average expenditure calculated from surveys	\$22,309	\$193,401	\$240,680	\$288,001	\$99,994
Total number of Councils in category	90	27	25	2	144
Total estimated expenditure	\$2,007,779	\$5,221,841	\$6,017,020	\$576,002	\$13,822,642

The average annual expenditure has been calculated at just under \$100,000 per year per Council. The amount spent annually increased in proportion to population size with a range from \$22,216 for populations of under 5,000 to \$288,001 for one Local Government with a population over 100,000.

The total estimated annual expenditure on litter abatement for the 144 WA Councils (based on the Nolan-ITU survey) is \$13.8 million per year.

For the purposes of sensitivity analysis, a comparison in Local Government expenditure on litter abatement was made between the Nolan-ITU survey and a previous survey of Local Government expenditure on litter abatement conducted by McGregor Marketing in 1994 (McGregor, 1994), which looked at all of Australia. The results of this survey, also adjusted by 30% for CPI to provide a 2002 estimate, are shown in Table 3-2 for each Australian State and Territory.

Table 3-2: Average costs of litter abatement across Australian states and territories (McGregor, 1994)

Average annual expenditure on litter abatement	Number of respondents (1994)	Average \$ spent annually (1994 estimates)	Estimated \$ spent annually in 2002 (based on 30% CPI adjustment)
NSW	39	\$189,186	\$245,942
QLD	15	\$62,303	\$80,994
VIC	30	\$47,003	\$61,104
TAS	6	\$41,850	\$54,405
SA	32	\$40,473	\$52,615
WA	35	\$36,171	\$47,022
NT	1	\$295,000	\$383,500
<i>Australia</i>	<i>169</i>	<i>\$80,816</i>	<i>\$105,061</i>

Table 3-2 reveals that WA had the lowest level of expenditure on litter abatement than any other Australian State or Territory in 1994. It is noted, however that the return rate for surveys varied across jurisdictions and there is no indication in the project methodology that jurisdictional estimates were extrapolated to take into consideration the relative size (referring to population) of the different Councils that returned surveys from the individual jurisdictions.

This is particularly important for determining a realistic estimate of the average expenditure for WA, given that there is a large number of smaller councils in the State. If surveys were returned primarily from Councils within the smaller population category, the overall State estimate is likely to be low. The McGregor survey does, however, differentiate Council costs based on population size across Australia.

Table 3-3 provides a further comparison of the results from the McGregor survey (including the CPI adjusted estimates for 2002) with the results from the Nolan-ITU 2002 survey. The comparison of the CPI adjusted data (based on average Council expenditure on litter abatement across Australia) with the 2002 estimate of costs in WA show:

- The average Council expenditure on litter abatement across Australia of \$105,061 is comparable to the WA average estimate of \$99,994;
- The average estimate for Councils with a population under 5,000 across Australia of \$17,599 is relatively comparable to the WA estimate of \$22,309; and
- There is significant difference in the results for the population categories 5,000-19,999 and over 100,000 between the two data sets.

Table 3-3: Estimated Local Government expenditure on litter abatement by population

Annual estimated expenditure on litter abatement across Australia (\$/annum)	Council Population				
	Under 5,000	5,000-19,999	20,000-99,999	> 100,000	Across all populations
<i>McGregor, 1994</i>					
Councils that provided cost data (Australia wide)	76	48	25	9	169
Average expenditure 1994 (McGregor, 1994)	\$13,538	\$51,806	\$169,844	\$474,791	\$80,816
Estimated 2002 expenditure (30% CPI adjustment)	\$17,599	\$67,348	\$220,797	\$617,228	\$105,061
<i>Nolan-ITU, 2002</i>					
Councils that provided cost data (WA only)	41	11	14	1	67
Results of 2002 WA Local Government survey	\$22,309	\$193,401	\$240,680	\$288,001	\$99,994

The comparison of the two data sets provides insight into why data samples should be treated with caution. For example, discrepancies in the two data sets are likely to be the result of:

- Sample size – the WA estimate for the population category of over 100,000 is based on one sample only;
- Methodology – the McGregor survey does not outline what constituted litter abatement costs in the council survey, ie. it is unclear whether stormwater management costs were included; and/or
- Variations in Council expenditure on improved litter management infrastructure with technological advances since 1994.

3.1.2 State Government

a) Department of Environment, Water and Catchment Protection (DEWCP) / Keep Australia Beautiful Council

DEWCP allocates funding to litter related programs primarily through its management of the Keep Australia Beautiful Council KABC, the primary vehicle for litter abatement on a State-wide basis in WA. Allocated funding for the 2002/03 financial year is \$534,000 which will mostly be used to fund three major programs – Tidy Towns, Waste Wise Schools Program and Captain Clean-up.

b) Administrative Training Service Unit / Main Roads WA

The Perth-based Administrative Training Service (ATS) Unit conducts Mobile Work Camps (MWCs) through Main Roads WA to clean up waste from the State's main roads and to preserve road reserves. The actual figure spent on the MWC program is difficult to determine because the program relies greatly on in-kind support and volunteer labour. Actual cost to Main Roads WA is \$5,000 per work camp for food, supplies and fuel only, which totals \$130,000 per year. Based on the level of in-kind support and funding from other areas a true reflection of the cost is likely to be far greater.

While the program is privately initiated, it receives joint support from State agencies for education, police, environmental protection, and roads and the Federal Department of Defence, and receives the following resources:

- \$130,000 (contributed by Main Roads WA for supplies, fuel, food);
- Coordinator wages;
- Local Government provide free tipping fees and camping facilities;
- 10 –15 volunteers per work camp;
- Army provision of supplies, equipment and support;
- \$35,200 BIEC contribution; and
- \$236,575 cost in 2001 for the removal and transport of waste materials to landfill.

Therefore, the cost of the ATS/Main Roads WA MWC program can be conservatively estimated at around \$1 million dollars per year.

c) Department of Conservation & Land Management

The Department of Conservation and Land Management (CALM) estimated that it would cost \$200,000 to remove existing deposits of rubbish in the Darling Range area of WA alone. In the 2001/02 financial year CALM spent \$45,000 to remove illegally dumped rubbish from State Forest and new national park areas just within the Darling Range region.

\$55,000 per annum has been budgeted for the next 4 years for rubbish removal by CALM in the Swan region alone. It is further reported that a state estimate is unknown given the number of different departments within different State Government agencies currently dealing with the clean up and prevention of litter and illegal dumping.

A conservative estimate of CALM annual expenditure on litter and illegal dumping in the Swan region alone is \$55,000 dollars per annum.

d) Swan River Trust

The Swan River Trust (SRT) is responsible for clearing litter from 45 beaches and approximately 300 kilometres of foreshore of the Swan, Canning, Helena and Southern Rivers within SRT's management area. The annual budget for the program is \$487,000, which is allocated to:

- Waterways and cleaning –\$110,000 salary, \$5,000 operational costs;
- Pollution response – \$37,000 salary, \$5,000 operational costs;



- Branch administration – \$19,000 salary, \$82,000 operational costs;
- Inspection and enforcement – \$54,000 salary, \$4,000 operational costs;
- Foreshore maintenance – \$100,000 salary, \$10,000 operational costs;
- Weed control – \$31,000 salary, \$5,000 operational costs; and
- Waste disposal fees – \$25,000.

The proportion of the SRT expenditure directly attributed to litter and illegal dumping is \$302,620 per year.

3.1.3 Industry

a) Beverage Industry Environment Council

BIEC conducts national education and research projects aimed at changing littering behaviour. The estimated level of expenditure, specific to WA, allocated to the implementation of programs for the 2002/03 financial year includes:

- \$647,000 for education programs – includes KABC WA Tidy Towns & Metro Pride Awards category sponsorship, Don't Waste Australian Education Campaign, Resource And Recovery Education (RARE), Predicting & Managing Littering Behaviour Workshops; and
- \$70,200 for research projects – includes ATS work camps sponsorship, litter behaviour study database, and annual reporting of research results.

BIEC's estimated annual expenditure on litter abatement in WA alone for 2002/03 is \$717,200.

3.1.4 Non-Government Organisations

a) Clean Up Australia

Clean Up Australia (CUA) is a national organisation. Hence, most program conduct – including promotional effort of CUA annual events – is administered from the head office in NSW. As a result, the main spending for WA relates to administrative costs associated with the main CUA Day event. The program further relies on the in-kind support of the community, schools, businesses and Local Government; it is beyond the scope of this project to try to value this support.

The estimated annual expenditure for CUA for administrative costs only is \$35,000.

3.1.5 Estimated Total Expenditure

The preliminary estimate of direct costs allocated to managing litter in WA is summarised in Table 3-4. Please note that this is a very conservative and provisional estimate as it does not take into account many other direct costs associated with litter management such as those incurred by special event organisers, shopping centres, transport authorities and National Parks to name a few.

Table 3-4: Preliminary estimate of litter management costs in WA

Stakeholder programs	Estimated expenditure 2002/03FY
State Government	\$1,891,620
Local Government	\$13,822,642
Industry	\$717,200
NGOs	\$35,000
Total	\$16,466,462

3.2 Stakeholder Consultation

A fundamental part of the research was seeking input from appropriate stakeholders on their knowledge and opinion about the issues associated with the litter effect in WA. Information was gathered through telephone and personal interviews, e-mail correspondence, completion of a stakeholder survey and/or participation in a focus group meeting. Though not exhaustive due to logistical limitations, the stakeholders targeted for input constitute a fair representation of litter stakeholders in WA. The full list of stakeholders approached is provided in Appendix I.

Stakeholders were questioned to gauge their general views on the litter issue and to seek available information. While stakeholders will always primarily identify aspects that are most directly associated with their relative sphere of influence and activity, there is a shared overall view that the litter effect in WA is an issue of concern and that illegal dumping is a critical focus area. Table 3-5 outlines key comments from stakeholders that responded to inquiries.

Table 3-5: Stakeholder key comments (2002)

STAKEHOLDER	RESPONSE	
	Involvement	Major Litter Issues
LOCAL GOVERNMENT		
Local Councils	Councils are the primary managers of litter as they are faced with the day-to-day challenges of maintenance, clean ups and litter abatement Primary cost of litter abatement falls back (collectively) to local Councils Some Councils have litter enforcement personnel	Litter at special events Litter from kerbside collections Litter at development sites Littering in public places Need to raise more revenue from litter fines Need a greater level of cooperation in WA for general projects such as education (Further information is outlined Section 3.4)

Table 3-5 (continued): Stakeholder key comments (2002)

STAKEHOLDER	RESPONSE	
	Involvement	Major Litter Issues
STATE GOVERNMENT		
<p>DEWCP <i>(previously the Department of Environmental Protection)</i></p>	<p>Developing a regional strategy for illegal dumping</p> <p>Conduct State-wide waste education</p> <p>Now encompass the KABC</p> <p>Currently reviewing the Waste Management Bill 2002 (draft) that looks to repeal the Litter Act</p> <p>Working with Gould League to develop a schools program that will include litter in general waste education</p>	<p>A greater level of education and awareness is needed</p> <p>Illegal dumping is a major issue – especially in high-value conservation areas</p> <p>Landfill levy can have unintended littering consequences</p> <p>Event management – there are conflicting messages from event organisers about what people should do with litter</p> <p>Consumerism is increasing litter</p> <p>Need improved policy framework – greater enforcement needed to back up any strategy</p> <p>Lack of non-English speaking background (NESB) practitioners in waste management</p> <p>Need to provide framework for Local Government litter abatement plans</p> <p>Different organisations with conflicting agendas</p>
<p>KABC <i>(now managed by DEWCP)</i></p>	<p>Well established organisation in WA that focuses primarily on litter, education, awareness and behavioural change</p> <p>Have most comprehensive litter statistics for the State</p> <p>Has recently been restructured to be managed through DEWCP; programs are currently under revision</p>	<p>Public place litter</p> <p>Believe 35% of litter is found roadside</p> <p>(More information outlined in the KABC data in Section 3.3.1.)</p>
<p>SRT</p>	<p>Established in 1989, the Trust coordinates work to ensure that the Swan and Canning Rivers are conserved</p> <p>Conduct rubbish clean-ups and collate statistics on their website</p> <p>Have historical data from 1990-2002</p> <p>Focus is prevention and clean up</p>	<p>Rubbish and illegal dumping along shorelines and in waterways</p> <p>People don't care, need more education</p> <p>Cost to manage the issue</p> <p>The issue of litter needs to be seen in the broader context of water pollution</p>

Table 3-5 (continued): Stakeholder key comments (2002)

STAKEHOLDER	RESPONSE	
	Involvement	Major Litter Issues
CALM	<p>Involved in cooperative ventures between State Government departments and other stakeholders to combat illegal dumping</p> <p>Working on a regional strategies to address illegal dumping through the Darling Range Rubbish Group and other task forces</p>	<p>Illegal dumping and littering of waterways</p> <p>Direct environmental implications of illegal dumping:</p> <p>(a) The risk of contaminating Perth's water sources;</p> <p>(b) Wildfires - it is estimated that 30% of wildfires in State forests in the Perth Hills are by burning cars</p> <p>Cost associated with clean up efforts</p> <p>Further information is provided in Section 0.</p>
ATS Unit / Main Roads WA	<p>Target the preservation of main roads through clean up of the road reserve</p> <p>Collate data from clean up efforts and devise recommendations to address main issues</p>	<p>Lack of Producer Responsibility</p> <p>Lack of civic pride, need more social pressure</p> <p>Tyres and retreads as a litter item</p> <p>Companies and individuals not covering loads when transporting wastes</p> <p>Inefficient policing of loads</p> <p>Road safety and environmental impacts</p> <p>Legislative framework and enforcement needs to be improved</p> <p>Key focus should be on infrastructure & education</p>
INDUSTRY		
BIEC	<p>National interest in litter abatement</p> <p>Provide funding for programs that relate to public place litter / recycling</p> <p>Primarily concerned with abating beverage container litter</p> <p>Financially support education and clean-up programs and conduct own data collection and research</p>	<p>Illegal dumping is a major issue in WA</p>
Motor Trade Association of WA	<p>Association for tyre and motor industries</p> <p>Charter is to assist companies to achieve cleaner production practices</p> <p>No direct involvement with litter to date but interested</p>	<p>No comments regarding the litter issue</p>
PB Foods Limited	<p>PB Foods is the single largest producer and distributor of frozen and chilled foods in WA¹ (ie. ice cream, milk, flavoured milks, desserts etc).</p>	<p>Do not currently focus on litter issues</p>

¹ www.pbfoods.com.au/about_us.asp

Table 3-5 (continued): Stakeholder key comments (2002)

STAKEHOLDER	RESPONSE	
	Involvement	Major Litter Issues
NON-GOVERNMENT ORGANISATIONS		
CUA	<p>Have a national focus and only have a small presence in WA with one part-time staff member</p> <p>Concentrate primarily on restoration projects through annual clean-up events</p> <p>Collate national litter data</p>	<p>Casual littering of items such as cigarette butts and plastics (including shopping bags)</p> <p>Illegal dumping of tyres, car bodies and building rubble</p> <p>Land contamination from illegally dumped items</p>
Planet Ark	<p>Have a national focus and do not have a large presence in WA</p> <p>General education materials are disseminated through website, direct mail and media campaigns</p> <p>Send literature to local councils about best practice kerbside recycling options to minimise litter</p>	<p>Littering from collection of kerbside waste and recyclables, which is primarily related to bin design</p>
Millennium Kids	<p>Environmental youth organization managed solely by youth</p> <p>Focus is on broader environmental issues but there are some synergies with litter</p>	<p>Need for education and community involvement</p>
COMMUNITY		
Conservation Council of WA	<p>Overall focus is on sustainability issues</p> <p>Have more of an overall waste perspective and represent the Pollution Action Network</p>	<p>Litter is a lower priority in comparison to other environment issues such as hazardous & liquid waste management</p> <p>Level of concern depends on the litter stream - significant difference between littering at a public event and illegal dumping</p> <p>Litter is more a social issue than environmental concern</p> <p>Increased landfill levy appears to be increasing dumping</p>
Perth Bushwalkers Club	<p>The Perth Bushwalkers Club is the largest bushwalking club in Western Australia with over 300 members.</p> <p>The Club has a handbook / website to educate bushwalkers about "How to be a responsible bushwalker" with some material on appropriate litter management</p>	<p>Casual littering by individuals in natural areas</p> <p>Need for more education about carrying rubbish when facilities are not provided</p>

It is interesting to note that stakeholders tend to focus on some particular aspect or some combination of aspects of the litter effect, especially littered items and streams as opposed to causes and behaviours. There is limited recognition of the inter-connection of holistic factors that create the overall litter effect and its consequences. The risk is that such a narrow focus can lead to program designers and program implementers taking a narrow approach, which can achieve little in terms of the overall litter effect.

3.3 Desktop Data Review

Beyond stakeholder perceptions of and knowledge about the litter effect, it is important to seek and analyse available factual data to establish an objective and more quantitative understanding of the litter effect in WA. Benchmarked data is also critical to be able to target efforts and evaluate the effectiveness of litter abatement initiatives. Best available litter data was obtained and reviewed to gain insight into:

- The approximate amounts and rates of litter in different geographic and demographic locations in WA and commonly littered items;
- Trends in the litter effect; and
- Other relevant information that may assist in targeting litter abatement programs.

Information and data was reviewed from the following sources:

- KABC – visible litter count surveys (the most prevalent form of quantitative litter assessment in WA);
- Main Roads WA – litter collection and analysis from on-going main roads’ clean-ups;
- SRT – litter collection and analysis from on-going river catchment clean-ups;
- CUA – visible litter count survey from samples collected during annual clean-up event;
- CALM – general (non-quantitative) observations based on overall clean-up experience; and
- BIEC – WA-specific material from national LBS and compilation of a Disposal Behaviour Index (DBI).

3.3.1 Keep Australia Beautiful Council

KABC has the most comprehensive and longitudinal litter count data available for WA and Australia with records dating back to 1984. In WA, litter data has been collected from over 63 sites claimed to be representative of the State for almost 20 years. However, no surveys have been conducted since February 2001.

Information is gathered using a visible litter survey technique, whereby littered items (larger than a matchbox) are counted at the 63 specified sites, and recorded on survey forms featuring items grouped into five major material types. Litter counts are conducted across seven site types (highways, beaches, industrial sites, retail shops, residential areas, recreational parks and car parks) at quarterly intervals (February, June, August and November) in both Perth and country areas.



For the purposes of ensuring independence and credibility, much of KABC's count information is deemed confidential and is not accessible to external parties. However, some material was unprecedentedly made available for this project and included:

- Collated data (WA & Australia - material & container type) for years 1992, 1994 & 1995;
- Collated data for WA (material type only) for the years 1995-2001;
- Site information for the 63 sites where litter counts are conducted;
- Raw data from seven sites (one for each site type) for the years 1995 to 2001; and
- Collated information showing the overall trend in littering based on KABC data.

National and WA estimates from KABC litter counts are collated in Table 3-6 for the years 1992, 1994 and 1995 to demonstrate how litter is categorised and to provide an illustrative – rather than absolute – comparison of litter in WA against the national figures. (The last set of available national figures is from 1995.) It should be noted that the data represents proportionality rather than total litter for each category.

Indeed, the comparisons should be considered broadly indicative only for several reasons. First, Keep Australia Beautiful National Association (KABNA) publications (KABNA, 1996) strongly caution against the direct comparison of data between States and Territories given variations in population, consumption patterns, anti-litter laws, packaging regulation and climate. These factors all limit the value of making direct comparisons between State, Territory and national data.

Secondly, it was beyond the scope of this project to independently ascertain / assess the comparability of potentially different KABC sampling regimes (including number of sites and their location) in different States and Territories.

Thirdly, a further section of this report will also point out some potential characteristics in KABC litter count methodologies in WA that merit further analysis.

Nevertheless, the material is provided here to gain some – if qualified – perspective on the litter effect in WA and to highlight some of the data deficiency aspects that are confronted when seeking to determine appropriate litter management mechanisms.

Table 3-6: KABC litter statistics for WA & Australia (1992, 1994 & 1995)

Material	Container Type	% total litter stream 1992		% total litter stream 1994		% total litter stream 1995	
		(WA)	(AUS)	(WA)	(AUS)	(WA)	(AUS)
Cans	Aerosol – pressure pack	-	-	-	-	0.0%	0.1%
	Beer – aluminium	2.4%	1.6%	6.4%	2.5%	4.9%	1.2%
	Food cans	-	0.1%	0.2%	0.1%	0.05%	0.1%
	Industrial cans	-	-	0.4%	0.1%	0.2%	0.1%
	Soft drink – aluminium	2.1%	2.2%	4.8%	2.9%	3.2%	1.8%
	Soft/juice steel less 375ml	-	-	-	-	0.05%	0.0%
	Total		4.5%	3.9%	11.8%	5.6%	8.5%
Paper	Cartons – fruit drink	1.4%	1.4%	1.9%	1.3%	0.8%	0.6%
	Cartons – milk	3.2%	2.1%	4.0%	2.8%	0.5%	0.2%
	Cartons – milk flavoured	-	-	-	-	3.2%	1.5%
	Cigarette packets	8.6%	5.4%	6.2%	4.9%	4.5%	4.5%
	Cups & takeaway containers	4.8%	4.9%	5.2%	5.9%	2.6%	4.9%
	Ice cream wrappers	-	-	-	-	0.2%	1.7%
	Junk mail	1.1%	1.0%	0.9%	1.1%	1.8%	1.5%
	Newspaper	0.9%	1.5%	2.2%	1.5%	1.1%	1.2%
	Other paper	17.9%	13.6%	12.9%	14.6%	15.4%	19.4%
	Packages – boxes & cartons	2.9%	1.7%	2.8%	1.5%	4.0%	2.1%
	Vending tickets	3.8%	2.8%	2.3%	3.1%	2.5%	2.6%
	Confectionary wrappers	14.4%	13.6%	10.8%	14.1%	-	-
Total		59%	48%	49.2%	50.8%	36.6%	40.2%
Plastics	6-ring can holders	0.5%	0.3%	0.5%	0.2%	0.1%	0.3%
	Bags, sacks, sheeting	1.8%	6.4%	3.6%	5.3%	4.1%	3.4%
	Confectionary wrappers	-	-	-	-	9.4%	12.1%
	Containers domestic	-	-	-	-	0.2%	0.2%
	Containers, plastic	0.9%	1.3%	0.9%	0.9%	0.8%	0.2%
	Other bottles, beverage	1.2%	1.3%	2.1%	1.2%	0.7%	0.5%
	Other plastics	4.6%	4.6%	3.2%	4.7%	4.6%	7.6%
	P.E.T. bottles	0.1%	0.3%	0.9%	0.7%	2.4%	1.8%
	Packing tape and straps	-	-	-	-	1.0%	1.5%
	Straws	7.7%	8.6%	4.4%	7.2%	9.0%	6.4%
	Styrene foam	0.2%	1.5%	1.0%	1.6%	0.1%	1.1%
	Take away food cups / containers	2.8%	3.2%	4.1%	3.6%	1.9%	2.6%
	Wine cask bladders	-	-	-	-	0.0%	0.0%
	Total		19.8%	27.5%	20.7%	25.4%	34.3%
Glass	Beer (small)	1.1%	1.6%	2.2%	1.7%	1.7%	1.6%
	Beer (750ml)	0.2%	0.3%	0.7%	0.2%	0.4%	0.1%
	Other bottles and jars	0.3%	0.2%	0.9%	0.4%	0.0%	0.3%
	Soft drink	2.4%	1.2%	2.7%	1.3%	1.5%	0.9%
	Wine and spirit	0.1%	0.1%	0.3%	0.1%	0.0%	0.1%
Total		4.1%	3.4%	6.8%	3.7%	3.6%	3.0%
Misc	Bottle/can tops	-	8.9%	4.0%	7.4%	3.9%	7.2%
	Clothing and materials	5.4%	1.4%	2.1%	1.4%	4.9%	1.7%
	Condoms	1.8%	-	-	-	0.0%	0.0%
	Construction materials	-	0.9%	0.9%	0.7%	1.9%	0.8%
	Disposable nappies	1.9%	-	-	-	0.1%	0.1%
	Ice cream sticks	-	2.4%	0.8%	1.7%	1.5%	2.0%
	Illegal dumping	1.5%	0.2%	0.3%	0.1%	0.1%	0.1%
	Metal	0.1%	0.8%	0.9%	0.8%	1.7%	1.5%
	Metal foil takeaway	1.1%	1.7%	0.8%	1.3%	0.3%	0.8%
	Rubber	0.2%	0.4%	0.5%	0.4%	0.9%	1.0%
	Syringes	0.5%	-	-	-	0.0%	0.0%
	Tyres and pieces	0.1%	0.5%	1.0%	0.5%	1.8%	0.7%
	TOTAL		12.6%	17.2%	11.3%	14.3%	17.1%

Based on the KABC count based data outlined in Table 3-6:

- “Other paper” and confectionery wrappers are the two most commonly littered items across WA and Australia in the sample years;
- Beverage related littered items such as straws and container closures are also commonly littered; and
- The paper and plastic material categories account for the vast majority of litter.

A comparison of the WA compositional data for the years 1992 to 2002 was conducted to determine if there have been any changes in the general litter stream based on material categories. Figure 3-1 demonstrates that there has not been a significant change in proportionality in the past 10 years.

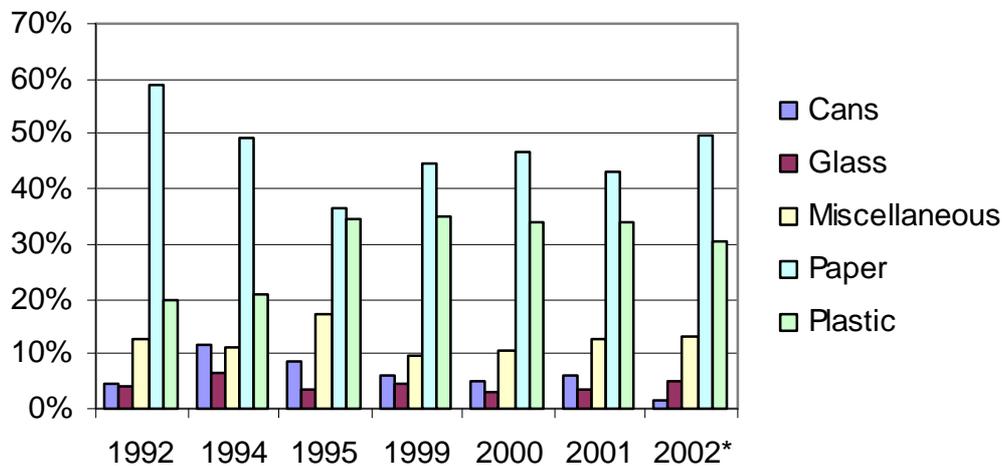


Figure 3-1: Composition of litter stream by proportion (KABC Litter Statistics)

* 2002 Figure is based on data collated during site visits to seven KABC sites by Nolan-ITU, not KABC-generated information.

Although available data indicates a steady trend in the composition of the litter stream, KABC reports that the overall rate or amount of litter is decreasing. KABC considers the average number of littered items across its four surveys in a financial year as an indicator of the amount of litter discarded improperly and the level of community involvement in litter abatement activities in WA. A further “Litter Factor” is determined as a measure of the increase/decrease of the average littered items relative to the 1984 base year (1.00).

Figure 3-2, taken from KABC WA’s Annual Report 2001 presents the “Litter Factor” against the “Total Expenditure” of KABC (taken from the audited annual financial statements).

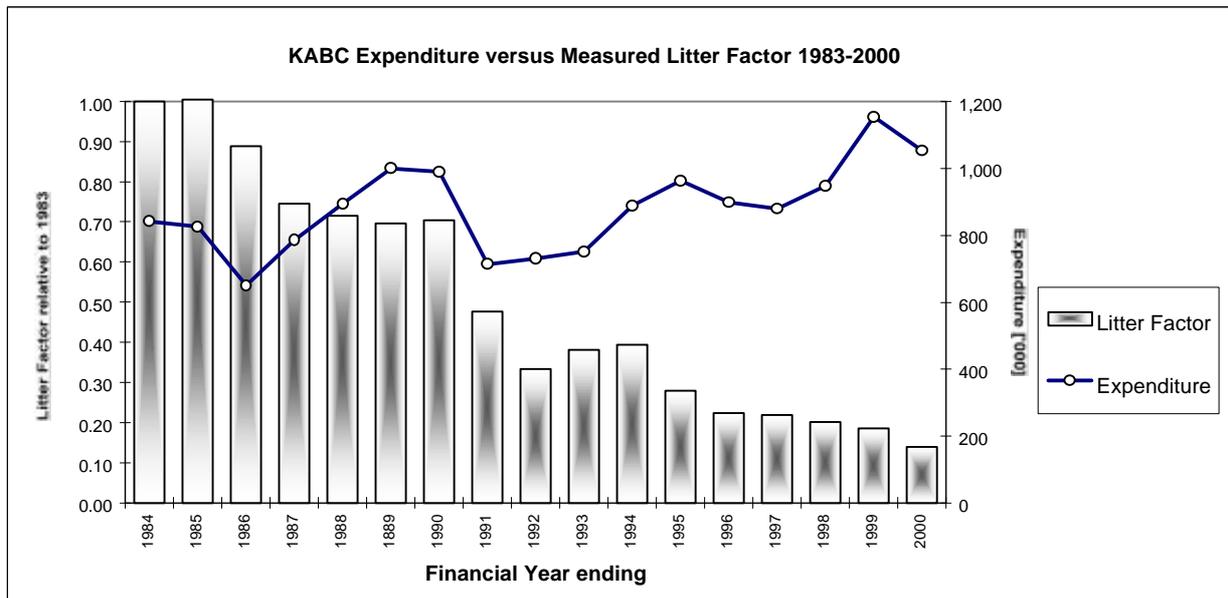


Figure 3-2: KABC “Litter Factor”

Clearly, the overall trend presented above is a positive one with the “Litter Factor” dropping from 1.00 in 1984 to 0.1394 in Financial Year 2000. The “Litter Factor” for Financial Year 2001 (not illustrated in the above KABC-derived graph) was determined to be 0.16. This indicates that, according to KABC data, there was a slight increase in the average number of littered items from 2000 to 2001.

While KABC provides collated results for the State, more detail was sought for the purposes of the project on the composition of site-specific litter streams. This was to determine if litter effect patterns might vary according to locality and/or site as a factor of site management practices, demographics, consumption behaviours (such as local consumption of fast foods and/or fast moving consumer goods (FMCGs) and other local factors.

Nolan-ITU also used the historical data from seven KABC sites and compared it against the overall trend line. While it is stressed that this information should be treated as indicative only (as it represents only a very small proportion of the total data collected by KABC between May 1995 and February 2001), the comparison showed a general correlation of results. The Nolan-ITU sample showed that there is a slight decline in the overall number of items counted at seven specified sites between 1995 and 2001, Figure 3-3.

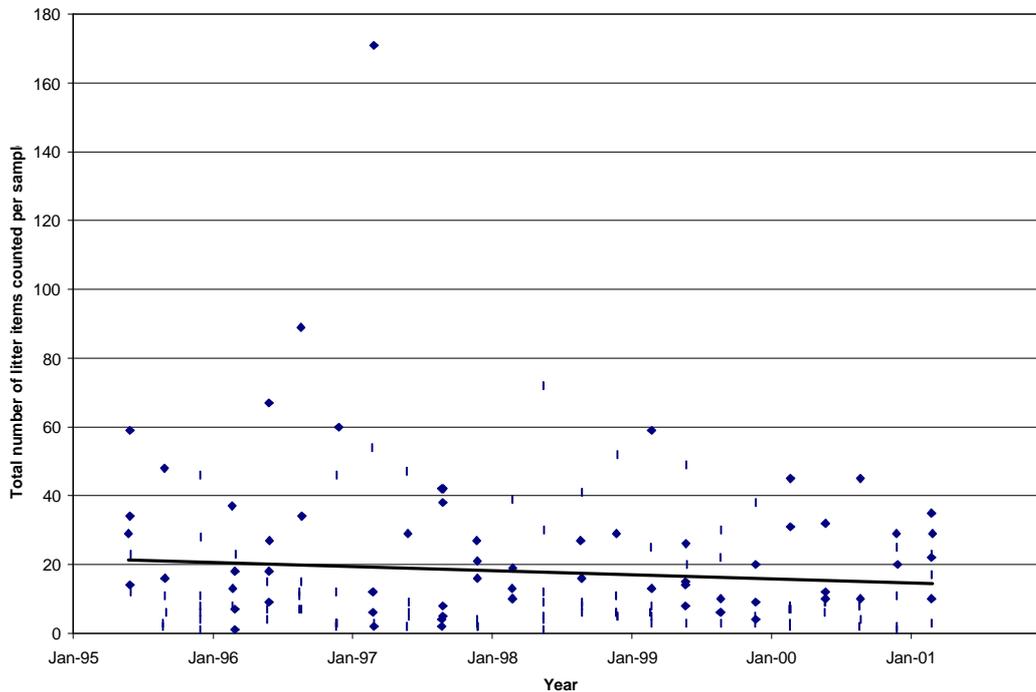


Figure 3-3: KABC trend data from seven sites 1995-2001

A more detailed analysis of the data provided for seven sample sites was also conducted to look for differences in the type of items littered at different locations, representing different litter streams (Figure 3-4).

This analysis showed that there are site-specific differences in the composition of the litter stream. This is important to understand when targeting litter abatement approaches, including infrastructure deployment. By way of illustration:

- The beach site has the highest proportion of plastic in its litter stream. This can present issues for waste management infrastructure if litter bins cannot adequately ‘keep in’ light-weight items (such as plastic) in windy weather conditions; and
- The car park location shows a high rate of glass in its litter stream. This would indicate a need for further investigation to determine if the glass is the result of car window breakage, glass containers or other sources.

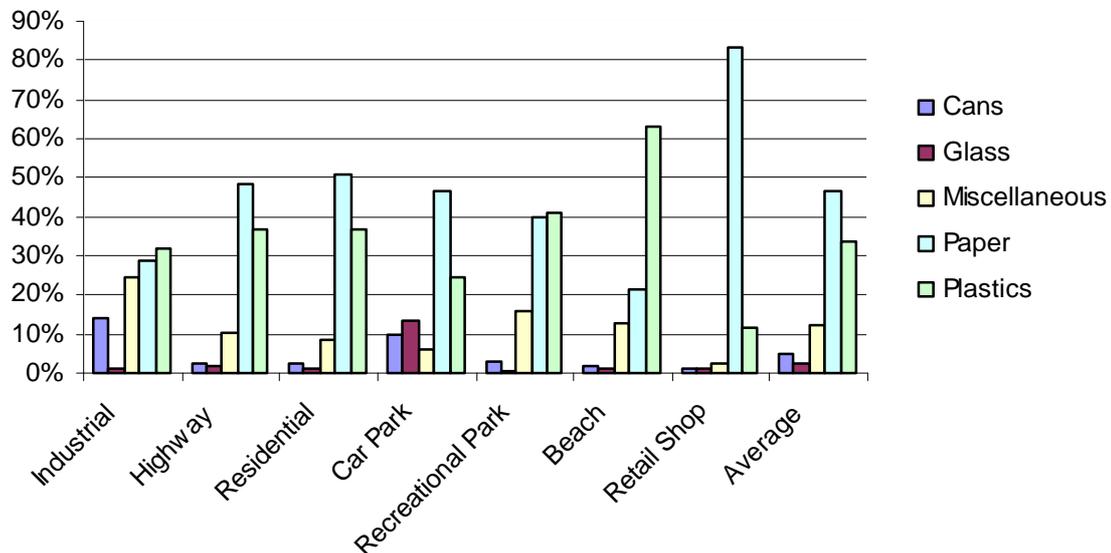


Figure 3-4: Composition of litter at selected KABC sites (1995-2001)

Given stakeholder interest in CDL as a potential litter management mechanism for WA, beverage containers as litter items were analysed within the KABC data. In particular, an indicative comparison was undertaken between the composition of the beverage container litter stream in WA and other Australian States and Territories. Several aspects should be borne in mind in this regard:

- The results are based on one year's data only and are from 1995 as it was the last year that national KABC figures were collated (pers. comm. John Philips at KABNA);
- There are some differences in methodologies for conducting litter counts between different KABCs in different States;
- There is no guarantee of inter-observer reliability between different people conducting counts in the different States (further discussion in Section 3.6.1); and
- A comparison of data between States would need to further take into consideration consumption patterns and the total number of beverage containers that could potentially enter the waste stream.

The beverage container results are summarised in Table 3-7.

For the purpose of this comparison, 'CDL compliant' beverage containers refers to the containers that were covered by CDL provisions in SA in 1995, prior to the new CDL amendments that were enacted on 1 January 2001 (to include non-carbonated waters, pure fruit juices and flavoured milks). Pre-2001 CDL compliant beverage containers included beer and soft drink aluminium cans, glass and PET bottles. Wine bottles, milk and pure juice containers were not included.

Table 3-7: Comparison of beverage containers in the litter stream²

	Percent of Total Litter Stream (1995)								
	NSW	SA	VIC	QLD	WA	TAS	ACT	NT	AUST
Total CDL compliant beverage containers	9.4%	4.0%	5.7%	6.7%	14.1%	8.5%	7.4%	7.9%	7.4%
Total CDL exempt beverage containers	4.0%	4.7%	2.1%	2.8%	5.7%	2.7%	2.1%	2.0%	3.0%
Total beverage containers	13.4%	8.7%	7.8%	9.5%	19.8%	11.2%	9.5%	9.9%	10.4%
% CDL compliant beverage in total litter stream	70.3%	46.1%	73.1%	70.2%	71.1%	76.0%	77.9%	79.6%	71.0%

Table 3-7 provides some aspects potentially meriting further investigation in terms of beverage container litter in Australia:

- South Australia, the only State in Australia that has CDL, has the lowest rate of CDL compliant beverage containers in the litter stream but one of the highest rates of other beverage containers (eg, those that were CDL exempt);
- 4% of the South Australian litter stream consists of CDL compliant containers;
- WA has the highest rate of CDL compliant beverage containers in the litter stream at 14.1%; and
- Using the 1996 KABC data as an indicative source of information only, the introduction of CDL (similar to the 1995 system) is likely to target 14.1% of the KABC surveyed litter stream, or 19.8% (based on the 2001 regulation).

3.3.2 The Administrative Training Services Unit / Main Roads WA

The Perth-based ATS Unit conducts MWCs through Main Roads WA to clean up waste from the State's main roads and to preserve road reserves. The program, currently in its seventh year, is jointly supported by State agencies for education, police, environmental protection, and roads and the Federal Department of Defence. The program is unique to WA.

Each year waste is removed from over 4,000 kilometres of the State's main road reserves. Annual statistics are compiled through the 'ATS Annual Statistics Annual Road Reserve Litter Profile'. The ATS statistics provide a combined break up of where and how litter is derived in terms of the areas where MWCs have operated. Information is provided to the WA State Government to plan better strategies in maintaining road safety as well as reducing the environmental impact and denigration of the State's road reserves brought about by travellers' neglect.

In 2001 alone, nearly 1,500 tonnes of rubbish was collected by ATS, of which one third was recycled. In collecting information, the program further seeks to identify manufacturer and consumer trends and overall littering habits.

• ² KABC (1996) Looking at Litter.

The data is itemised both in terms of material type (ie, metal can, glass or plastic bottle, tyre) and also where possible by the manufacturer and/or packaging company responsible for the littered item. As a result ATS wishes to maintain the confidentiality of the actual statistics because it does not wish to be seen as targeting companies.

Major litter issues that have been identified (in two submissions to the Minister for the Environment by the ATS in 2002) include the following:

- Tyres are a major litter issue on main roads, which impacts both road reserve litter and safety issues. In 2001, 1,000 tonne of tyres and tyre scrap consisted of re-tread (29%), car tyres (16%), truck tyres (22%) and tyre tubes (33%). ATS attributes an increase in the level of re-tread tyre scrap to unsatisfactory tyre and re-tread usage.
- Actual sources of litter have been assumed based on the development of a 'littered documentation profile'. Consignment notes, supplier documents, invoices, other company books, tags, cards, letters, maps and plans and other documentation is used to trace potential litter sources. Based on a breakdown of total reserve documentation litter in 2001, road reserve litter is attributed to transitional work force contractors (33%), transport companies (25%), mining industries (22%), town residents (13%) and motor trades (7%).
- Statistics collated between 1996-2002 estimated that up to 60% of road reserve litter could be reduced if measures were introduced to stop the transport of uncovered loads; and
- Further estimates of the potential impact on animals and native plants have been calculated, but were not made available.

Data from the years 1997 to 1999 was provided for review. Although actual data needs to remain confidential, the results have been summarised into major material categories to outline the composition of the litter stream reported for WA main roads. Information is reported by weight, in comparison to KABC data, which is reported by unit (littered item). This information should therefore not be compared to KABC data.

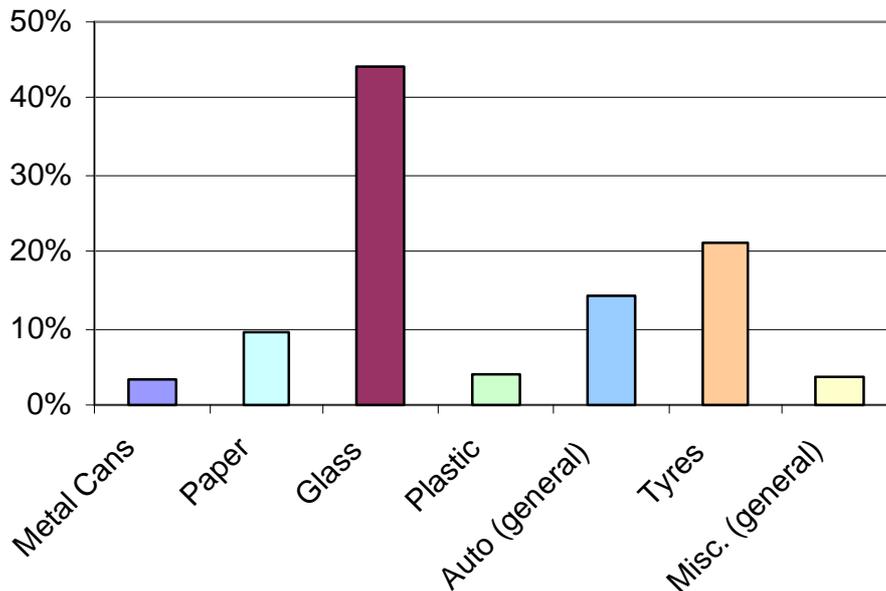


Figure 3-5: Material categories of littered items on WA main roads (1997-1999) by weight

3.3.3 Clean Up Australia National Rubbish Report

CUA is a non-profit organisation that aims to ‘clean up and fix up’ the Australian environment. CUA has collated national ‘rubbish’ data from its nationally conducted clean up events since 1998. Information was provided for the 2001 Clean Up Australia Day event in the “Rubbish Report 2001”.

Litter data in the CUA Rubbish Report is collected through a visible litter count survey that is undertaken by volunteers once a year on Clean Up Australia Day. Litter collected by volunteers is bagged and site supervisors select one in every five bags of rubbish collected for recording purposes. The rubbish is sorted and itemised on CUA survey forms. A very limited or no amount of training takes place prior to counting. The CUA national office then collates gathered information and does the final analysis.

The data is analysed in the following ways:

- Average amount of rubbish surveyed per site divided by the total amount of rubbish by the number of sites surveyed, nationally and by site category;
- Number of surveys by State;
- Number of surveys returned from rural and urban areas;
- Percentage of surveys returned as compared to the total number of sites; and
- Types of rubbish and the top ten rubbish items.

The sites are classified as:

- Parkland;
- Roadway;
- Other;
- Beach/coastal;
- River/creek;
- National park reserve;
- Roadway and other;
- River/creek and parkland;
- Roadway and parkland;
- River/creek and roadway;
- Parkland and other;
- Beach/coastal and parkland;
- Parkland and beach/coastal;
- River/creek, roadway and parkland;
- River/creek and national park reserve;
- Roadway and beach/coastal;
- River/creek and other;
- River/creek, parkland and beach/coastal; and
- Other multi categories.

The CUA analysis illustrates the trends in types of litter and the dispersal of the litter collected.

It is reported that information returned from WA and used in the 2001 report represents less than 2% of the total data collated, so final results are not considered representative of WA. Moreover, stakeholders report that for a number of reasons Clean Up Australia Day is not as well established in WA as in other Australian jurisdictions. National results are still reported here for reference purposes.

Fifty nine percent of 2001 CUA surveys returned were completed correctly and could be used for data analysis. Final information represents 10% of the 7,039 CUA sites in 2001. Major national outcomes from the data analysis include:

- National park reserve sites were found to be the most polluted sites;
- Roadways contributed to 16% of the total rubbish collected and surveyed;
- Major categories of items collected were plastic (34%) with chip and confectionery bags the most common plastic items encountered, comprising 5.5% of total rubbish by item;
- Cigarette butts continue to be collected in high proportions representing 15% of the total rubbish collected and surveyed. Cigarette butts were most commonly found in parkland and national park reserve sites;
- Glass items contributed to 12.1% of the total rubbish surveyed, with alcoholic beverage bottles the most common glass items surveyed representing 49% of all glass items; and
- Paper and cardboard items accounted for 15.23% of total rubbish surveyed.

Figure 3-6 provides an overview of the categories and major types of rubbish collected on CUA Day 2001 based on total number of items collected from representative sites.

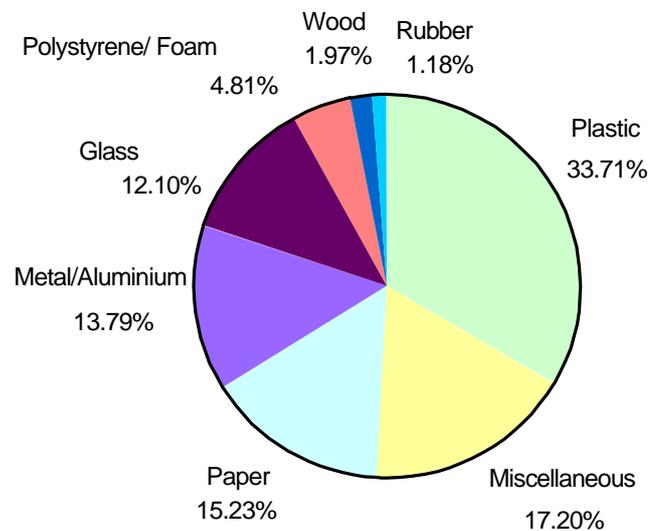


Figure 3-6: Categories of collected rubbish surveyed from CUA Day 2001

3.3.4 Swan River Trust

The SRT was established in 1989 to coordinate work necessary to balance the use and protection of the waterways and shorelines of Swan and Canning Rivers in WA. The Trust was established under the Swan River Trust Act 1988 and is responsible to the Minister for the Environment and Heritage. The Trust brings together key groups of people to coordinate the activities of community, local and State Government agencies concerned with the Swan-Canning riverine environment.

One of the SRT’s tasks is to keep the waterways and shorelines clear of rubbish. In this regard, the Trust has collated annual statistics on materials cleared since 1992. The management area where the information has been collated includes the waters of the Swan-Canning river system and adjoining parks and recreation reservations - extending upstream from the Fremantle Traffic Bridge to Moondyne Brook on the Avon River, to the lower diversion dam on the Helena River, along Southern River to the Allen Road crossing and the Canning River to its confluence with Stinton Creek.

Information has been gathered over ten years of clean up efforts, outlined in Table 3-8 which provides some insight into the types of items littered and dumped within the management area.

Table 3-8: Swan River Trust Refuse Report 1/7/1992 – 4/4/2002

SWAN RIVER TRUST REFUSE STATISTICS REPORT 01/07/1992 - 4/4/2002					
Item	Measure	Total	Item	Measure	Total
Sand Renourishment	Tonnes	6,419	Animals	Each	87
Weed	Tonnes	3,431	Chairs	Each	62
Timber	Tonnes	1,166	White Goods	Each	42
Rock Renourishment	Tonnes	995	Rubbish Bins	Each	42
Rubbish	Tonnes	748	Boats	Each	33
Rocks Removed	Tonnes	165	Witches Hats	Each	31
Bamboo	Tonnes	115	Pallets/Crates	Each	12
Fish	Tonnes	84	Tables	Each	9
Cyperus Vorstri	Tonnes	8	Vehicles	Each	8
Total		13,130	Traffic Bollards	Each	8
Other	Each	3,840	Mattress	Each	4
Syringes	Each	1,432	Life Jackets	Each	2
Birds	Each	929	Bicycle	Each	2
Tyres	Each	547	Umbrella	Each	1
Trolleys	Each	451	Hay Bale	Each	1
Drums	Each	244	Trailer Axe	Each	1
Signs	Each	103	Batteries	Each	1
			Total		7,892

It is worthwhile to note the compositional difference between the materials collected by the SRT and those counted by KABC, where there is stronger representation of casually littered FMCGs. It underscores the different qualities and attributes of different litter streams (according to site, geography, usage and causal factors) within the overall litter effect.

3.3.5 Department of Conservation & Land Management

CALM works with other State Government departments to address the issue of illegal dumping, particularly in State Forests and National Parks. CALM provide some general information to outline the extent of illegal dumping issues in WA for the Darling Range area of Perth alone:

- Up to 250 tonnes of new rubbish is being dumped in the area each year and the rate of dumping is increasing annually;
- CALM has recorded a four-fold increase in the cost of illegal rubbish removal over the past 5 years;
- There has been a rapid increase in the dumping of asbestos and vehicle tyres since fees have been introduced for their disposal at Shire landfill tips;
- Stolen and unroadworthy vehicles are being driven into forest and water catchment areas, wrecked and/or burnt;
- It is estimated that it would cost \$200,000 to remove existing deposits of rubbish; and
- CALM and Water Corporation are currently in an operation to remove approximately 400 abandoned cars, 1,200 vehicle tyres, 600 tonnes of asbestos and 1,000 tonnes of general rubbish, but it is returned at a rapid rate.

In addition to the cost of managing the problem, CALM cites environmental implications from littered items / illegal dumping including the risk of contaminating Perth's water sources and wildfires. It is estimated by CALM that 30% of wildfires in State Forests in the Perth Hills are caused from the burning of cars.

3.3.6 Littering Behavioural Studies

CCC is Australia's leading expert in public place littering behaviour in Australia. CCC has provided advice on an international basis in terms of the efficacy of litter abatement measures.

Under the auspices of BIEC, CCC has conducted a series of LBSs through the use of the Observational Approach (OA) whereby an observer (who observes actual littering behaviour) works independently of an interviewer (who interviews the people who have been observed about their littering behaviour and attitudes to littering). The OA method gathers information on disposal behaviour as it occurs to aid understanding of disposal behaviour and attitudes as they operate in public places.

CCC conducted a national study of Australian littering behaviour (Williams *et al*, 1997), which reports what people dispose of in bins versus what they commonly litter in public places. Although the findings of the report are of a national nature, WA observations are a component of the final results. Results showed that:

- People were seven times as likely to put beverage containers into bins as they were to litter them;
- People were three times as likely to put newspapers and other paper products in a bin as they were to litter them;
- People were three times as likely to litter a cigarette butt as they were to put one in a bin;
- 58% of smokers were observed inappropriately disposing butts;
- 7% of people interviewed said they did not consider cigarette butts were litter;
- 87% of people that littered a cigarette butt said they did think it was litter;
- Many people put some types of objects in bins, but littered other things, ie. most often they littered cigarette butts but took everything else to a bin.
- Not everyone agrees on the definition of litter – organic items were least likely to be considered litter (38% interviewed said an apple core could not be considered litter and 23% said dog droppings were not litter); and
- Large items were often binned (ie. beverage container) while smaller items were often ignored or left behind (ie. bottle cap or straw).

Through the LBS series, CCC have further developed a disposal behaviour benchmark called the DBI, which is a mathematical model for reflecting both littering and bin use to assess the efficiency of interventions designed to reduce littering behaviour in public places (BIEC & CCC, 2001). Seven levels of the DBI have been established whereby Level 1 is the lowest (ie. indicates minimal use of bins, majority of people littering) and Level 7 is the peak (ie. represents minimal littering with appropriate bin use).

CCC used a baseline DBI measurement recorded in 1997 against 2000 figures to assess littering trends over time in Perth (BIEC, 2001). The results from the research report that:

- Between 1997 and 2000, there was a decline in the overall DBI for Perth, which is a reflection of higher levels of littering behaviour observed in core sites;
- Despite the decline, DBI levels in Perth remain positive overall, ie. are in line with the national average of a mid range DBI of 4;
- The highest rate of littering was observed around malls and there was a significant decline in the DBI between 1997 and 2000 for this location; and
- There was a slight increase in the DBI for parks between 1997 and 2000, which indicates slightly improved disposal behaviour in these locations.

Additionally, in WA there were core sites that recorded the highest levels of environmentally desirable behaviours where a DBI of 7 was recorded. These were:

- The Swan River Ferry Terminal (2000);
- Fremantle Market (1997); and
- Cottesloe Beach (1997).

Results from the CCC LBS study conducted in 2000 further outline key demographic characteristics connected to disposal and littering methods in Australia during the research period (BIEC, 2001). The results are outlined in Table 3-9.

Table 3-9: Demographic characteristics of disposal behaviour (BIEC 2001)

Demographic Characteristic	Disposal Behaviour
Gender in Public Places	<ul style="list-style-type: none"> • People of all ages and social backgrounds littered. • 56% of people using public places were male. • Men litter more and use bins less often than women do.
Groups in Public Places Littering	<ul style="list-style-type: none"> • More than 50% of people over 45 years of age were unaccompanied in public places. • Over 86% of people under 18 used public place in groups of 2 or more. • Littering is more common in groups of 4 or more. The exception to this was for people over 65 years who littered more regularly when alone.
Age Groups and Littering in Public Places	<ul style="list-style-type: none"> • 35% of people observed were less than 24 years, 63% were less than 35 years. • Young people littered more than older people when in groups. When alone young peoples littering rates were equal to that of older people.
Age groups and Awareness of Littering	<ul style="list-style-type: none"> • Young people admit to littering more readily than older people. • Older people are less aware of their littering behaviour. Less than a third admitted to littering even though they had been observed doing so.
Age Group and Bin Use	<ul style="list-style-type: none"> • Young people use bins as often as older people. • Most age groups used bins less when in a group.
Education, Employment and Littering	<ul style="list-style-type: none"> • 55% of people surveyed were working, 22% were students. • People not working tended to litter more. • Students littered and used bins in approximately equal proportions, whereas, other groups tended to use bins more than littering. • Home-makers and retired people used bins more than littering. • People with tertiary education littered slightly less than those with secondary education.
Place of Residence and Littering	<ul style="list-style-type: none"> • Two thirds of people surveyed were local to the area. • Locals littered more than people not from the area.
Reasons people litter	<ul style="list-style-type: none"> • 24% - too lazy • 23% - no ashtray • 21% - no bin • 12% - don't know or habitual
Distance to bins	<ul style="list-style-type: none"> • 51% of littering occurred within 8 metres of a bin. • 40% of littering occurred within 6 metres of a bin. • The average bin distance for a litterer was 12 metres. • The average bin distance for a bin user was 7 metres. • 55% of people using litter or recycling bins were within 3 metres of a bin.

Nearly 23% of people observed in WA in 1997 were observed littering. When interviewers asked about the last time they littered (not revealing to interviewees that their behaviour had been observed) 21% of subjects claimed they had not littered in the last 24 hours and 18% said they could not remember the last time they had littered. People who admitted to ever littering said that 'laziness' or 'no bin nearby' was the reason they had littered.

CCC have further used the OA to assess ‘what works’ to prevent littering with regard to waste and public place recycling bins and signage infrastructure³. The findings were that no single anti-litter mechanism can address all of the issues involved in changing peoples behaviour to reduce littering, but that anti-litter and litter prevention interventions should be based an understanding of the characteristics of people using local areas including their typical activities and disposal behaviours. Table 3-10 provides examples of different types of mechanisms and their effectiveness in reducing litter.

Table 3-10: ‘What works’ to prevent littering in pubic places (BIEC)

Infrastructure	Results of Implementation
Bins	<ul style="list-style-type: none"> • Installing public place recycling bins in some situations leads to reductions in a decrease in littering and an increased recovery of resources. • As the distance to bins increases, the DBI level recorded for the site decreases.
Anti littering signs	<ul style="list-style-type: none"> • Signs that raise the awareness of the litter issue has an immediate impact on behaviour. • A slight increase in the use of street litter bins. • An increase in the proportion of objects people took away with them.
Broad Community Awareness Campaigns	<ul style="list-style-type: none"> • Educational campaigns should applaud the majority of people who display environmentally desirable disposal behaviours in public. • Campaigns should acknowledge that people from all demographics litter or use bins. • Campaigns should be based on positive role models, rather than focusing on inappropriate littering behaviour types.

3.4 Local Government Survey

A questionnaire was forwarded to all local Councils in WA to gain an appreciation of the litter effect as experienced by Local Government in WA, as well as Local Government’s current litter management practices and their costs. A questionnaire was sent to the Presidents, Mayors and CEOs of all 142 Councils in WA plus Christmas Island and Cocos (Keeling) Islands for feedback.

Of the 144 total surveys that were distributed, a total of 70 (49%) were returned. For analytical purposes, the surveys were categorised by population sizes of:

- Under 5000;
- 5,000 – 19,999;
- 20,000 – 99,000; and
- Over 100,000.

³ BIEC (no date) *What Works: NSW Littering Behaviour Interventions*.

Table 3-11 provides an overview of the level of Local Government response to the litter questionnaire by population size. Results show a total response rate of 49% and that the highest number of surveys were returned from Councils with a population under 5,000 people. Table 3-11: Local Government response to litter survey 2002

Population size	Number of WA councils in population category	% of total WA councils	Number of responses received	% population group responded	% response across all WA councils
Population under 5,000	90	63%	43	48%	30%
Population 5,000-19,999	27	19%	12	44%	8%
Population 20,000 – 99,999	25	17%	14	56%	10%
Population over 100,000	2	1%	1	50%	1%
Total	144	100%	70	-	49%

When questioned if litter is considered a problem within their Local Government Area (LGA), 74% of councils – irrespective of their size – replied that it is. Table 3-12 further outlines the responses. Councils with a population under 5,000 were the most likely to not consider litter to be a problem (30%); these would tend to be rural and remote councils.

Table 3-12: Councils that consider litter a problem or not a problem

	YES	NO	Total	% yes	% no
Population < 5,000	30	13	43	70%	30%
Population 5,000-19,999	10	2	12	83%	17%
Population 20,000 - 99,999	11	3	14	79%	21%
Population over 100,000	1	0	1	100%	0%
Total for all Councils	52	13	70	74%	26%

Councils were further asked to identify the major litter issues experienced in their LGAs. Table 3-13 summarises the LGA survey results. The collated responses show the number of times each litter issue was identified and what the level of significance was attributed to each of the litter issues (i.e. each issue was ranked from 1 to 5, 1 being the most important litter issue that was identified, and 5 being the least important litter issue that was identified).

Table 3-13: Council identification of major litter issues (2002 survey)

Major factors contributing to litter in LGAs	Number of times identified as an issue	Number of times ranked as a 'top 5' issue				
		1	2	3	4	5
Issue		1	2	3	4	5
Litter thrown from vehicles and public transport	36	4	9	7	2	0
Illegal dumping and abandonment of cars	32	6	5	1	3	6
Cigarette butt litter from smokers	30	3	2	6	1	2
Unkempt property and derelict sites	29	3	2	4	2	2
Litter from commercial and private self-haul of waste and recyclables	20	4	2	1	1	2
Litter from residential rubbish and waste collections	17	3	1	2	3	3
Litter around skips and construction sites	17	0	2	2	3	0
Inappropriate use of public place litter bins	15	3	0	1	1	1
Littering and dumping in waterways	14	0	1	0	0	3
Littering at special events	14	0	1	0	2	1
Litter from advertising (ie. junk mail)	12	0	0	0	0	0
Inappropriate disposal of syringes and hazardous items	11	1	0	1	1	1
Overfilling of public place litter and recycling bins	8	0	1	0	0	0
Littering in public places, esp:	(64) total					
- Fast food outlets	17	2	2	3	2	1
- Shopping centres	13	0	2	0	1	1
- Bus stops and train stations etc	11	0	1	0	0	0
- ATM machines	10	0	2	1	0	0
- General	9	2	0	1	1	0
- Schools	7	0	2	0	0	0
- Sporting events	3	0	1	0	0	1
- Beaches	3	2	0	0	0	0
Windblown litter	3	0	0	0	0	2
Litter from the loading and unloading of goods	3	0	1	0	0	0

Taken collectively, littering in various public places was the most often identified issue. However, the issues that were most often prioritised as problematic were:

- Litter thrown from vehicles and public transport;
- Illegal dumping and abandonment of cars;
- Cigarette butt litter from smokers;
- Unkempt property and derelict sites; and
- Litter from commercial and private self-haul of waste and recyclables.



A further analysis of the litter issue by population size was conducted with the results showing the same trends evident in the collated information.

3.5 Nolan-ITU Visual Assessment

Nolan-ITU was asked to undertake an initial visual assessment of litter in WA as part of the project. It was decided to conduct the assessment using KABC count methodology as a frame of reference.

A visual assessment of a representative sample of seven KABC sites was conducted in order to:

- Observe and document litter characteristics in different geographic and demographic locations;
- Compare results obtained with existing data for WA with regard to trends etc; and
- Further understand the litter effect in WA in different geographic or 'hot spot' locations (ie. beach, retail shops, highway, recreational area, car park, residential and industrial areas).

The visual assessment also enabled a preliminary review of the methodology used by KABC to collate the litter data (see Section 3.6.1).

The overall results from Nolan-ITU's exercise are shown in Table 3-14.

Table 3-14: Results of visual audit of seven KABC sites

NITU Visual Audit KABC Sites (20 May 2002)	Retail Shops	Industrial	Highway	Residential	Car Park	Recreation Park	Beach	Total
Other paper	24	9	19	22	1	1		76
Cups and takeaways	4	9	3	7		5	5	33
Confectionary wrappers	9	2	6	2			3	22
Beer small all colours			11	4				15
Straws	3	1	4				3	11
Packing and tape		1	4	4		2		11
Bottle and can tops	4	2	2				1	9
Construction Materials		5	1		1		2	9
Cigarette Packets	2	1	3	3				9
Metal pieces		5	2	1				8
Clothing & materials		2	2	2				6
Newspapers & Magazines			5	1				6
Cups/takeaway containers	1	3	1	1				6
Rubber pieces (not tyres)		1	1	3				5
Tickets, bus, ATM, vending	5							5
PET soft/mineral		1	2	1				4
Beer & Alum all types			2					2
Soft Alum. 375ml		2						2
Wine and spirit all				2				2
Ice cream wrappers				1			1	2
Bags-Sacks-Sheeting			2					2
Industrial all types			1					1
Tyres and Pieces			1					1
Illegal dumping		1						1
Foil takeaway			1					1
Packages and Boxes	1							1
Containers industrial eg. oil		1						1
TOTAL:	53	46	73	54	2	8	15	251

It is noted that KABC does not traditionally include cigarette butts in litter counts due to the time consuming nature of so doing. KABC generally claims that cigarette butts make up more than 50% of the litter stream by count (KABC, 1996). The count of butts is excluded to ensure that percentage composition figures are not skewed.

Nolan-ITU assessed the number of cigarette butts present at the retail shop site and stopped the count after 20% completion of the site. Within that space over 30 cigarette butts were counted, which clearly represented over 50% of the litter stream on this occasion.

The Nolan-ITU results are summarised by product category to show the relative proportions of different items in Figure 3-7. The results show that paper, fast food and confectionary packaging make up a significant component of the litter stream at the selected sites, as does beverage related litter (including bottles, cartons, caps, tops and straws).

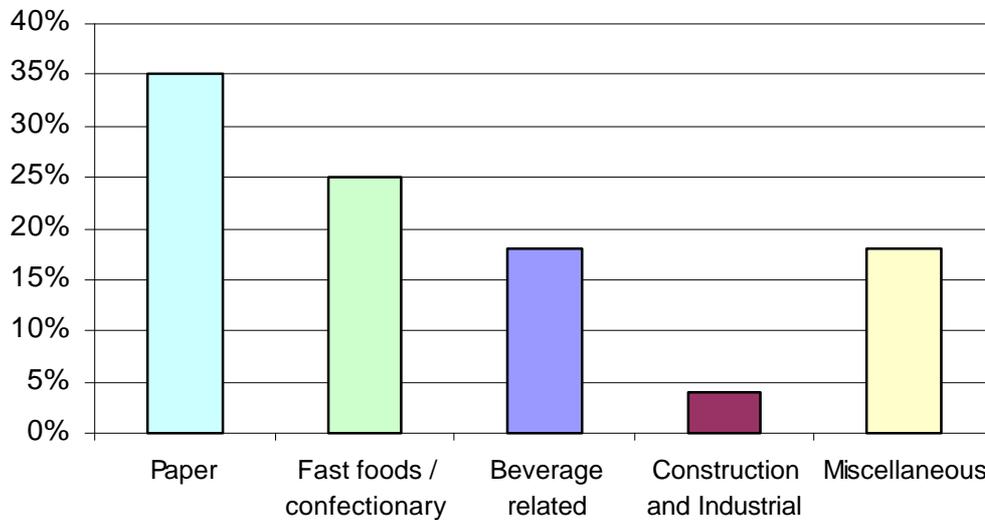


Figure 3-7: Results of Nolan-ITU visual assessment by product category

The figures determined by Nolan-ITU in terms of material proportions are similar to historic KABC data (Figure 3-1).

3.6 Deficiencies in the Available Data

The available data provides valuable insight into the litter effect in WA; however, the relative limitations of the studies must be recognised.

Table 3-15 provides a summary of the litter data reviewed which clearly highlights the differences in terms of methodology, scope, coverage and unit of measure. For all the litter information reviewed, no one set is representative of all the litter streams in WA nor are any two sets directly comparable. There is also a limited amount of transparency in the available data sets.

Table 3-15: Summary of litter data reviewed

Organisation	Methodology	Components of Analysis	Unit of measure	Scope	Coverage
KABC	Visible litter count surveys (most common form of litter assessment in WA)	Material type Product type Product grouping Site categories	Item	State (63 sites) & national	Beaches Car parks Retail shops Highways Industrial sites Recreational areas Residential areas
Main Roads WA	Litter collection and analysis from main roads clean up	Material type Product grouping Manufacturers Note: (CIC)	Weight (& item)	Regional	Main road reserves
SRT	Litter collection and analysis from river catchment clean up	Material type	Item	Regional	Swan and Canning Rivers catchments
CUA	Visible litter count survey	Site categories Material type Product type	Item	National	All areas
BIEC	Littering behaviour studies Disposal behaviour index	Material type Product type Product grouping Site categories	Personal observation of littering behaviour	National	Public places

Particular caution must be exercised when comparing data sets where different units of measure are used. This is evident in a comparison between KABC and Main Roads WA data. KABC data (based on number of littered items) reports plastic and paper items as major components of the litter stream, while glass is a small proportion. On the other hand, Main Roads WA report material categories by weight and glass is therefore a major proportion of the litter stream, while paper and plastic (which are generally light materials) score lower ratings. The further complication is that the data sets represent different litter streams also, eg, a variety of sites versus primarily roadside sites.

The relative strengths and weaknesses of the different data sets are further outlined in Table 3-16.

Table 3-16: Strengths and weaknesses of data sets

Data	Strength	Weakness
KABC	Count sites are claimed to be representative of all of WA. Consistent survey with a long track record. Collective experience of long-term ‘counters’.	Targets set litter streams only. Further information is outline in Section 3.6.1.
Main Roads WA	Provides an indication of the amount and type of rubbish found on main road reserves. Detailed analysis of the items collected identifies manufactures of commonly littered items and could help target EPR. Detailed analysis of littered items in one litter stream allows a targeted approach to address the ‘cause’ and hence target litter abatement measures.	Targets one litter stream only. Limited information was provided on the methodology, however it was reported that cataloguing of information is ‘somewhat ad-hoc’ and material storage and analysis tends to be at random ⁴ . Sites surveyed vary from year to year so annual trends lack statistical validity. Information is collated by new trainees attending the work camps.
SRT	It is an indication of the amount and type of rubbish found in the Swan and Canning Rivers catchments. Provides some indication of changes in items littered and/or dumped from year to year.	Targets a specific regional area only. Data is not specific to littered and illegally dumped items (i.e. included dead animals etc which may occur through natural causes). Annual data may vary with rigor of clean up efforts from year to year. Training regime for data collectors unknown.
CUA	Provides a ‘snap-shot’ of littered items found by volunteers one day per year (McGregor, 2000). It is an indication of the amount and type of rubbish found in different locations. Enables spatial trends such as differences in litter type from site to site. Provides insight into litter issues across a wide range of litter streams with some prioritisation of major areas of concern.	Data is not specific to WA. Data based on random sampling of the litter stream so is subject to a margin of error. Limited control over sites surveyed each year and from year to year so there no statistical consistency. Doesn’t account for site-specific characteristics and litter bins. Does not provide an absolute quantity of litter. Surveys are completed by volunteers who are not professionally trained and hence results will be subject to interpretation (this is highlighted by the fact that only 59% of the 2001 surveys were completed correctly and could be used for data analysis.
CALM	General comments based on experience – not statistics.	
BIEC	Valid measure for understanding litter behaviour in public places. Provides insight into commonly littered items in public places and behaviour traits associated with the litter offence. Measures change in behaviour and attitudes to litter, as well as efficacy of interventions. Conducted by highly trained professionals using rigorous and repeatable methodology.	Information not specific to WA. Targets the public place litter stream only. Does not establish actual levels of litter.

⁴ Pers comm. Main Roads WA 2002.

3.6.1 Comment on Keep Australia Beautiful Data

In order for Nolan-ITU to conduct a visual assessment, KABC provided site information for seven sites. These were selected based on the fact that they represented the seven different KABC site categories, were located in different Councils areas and represented different socio-demographic locations in Perth.

Prior to conducting the surveys, information was requested on the relative training procedures provided for KABC assessors and any other information relevant to conducting a KABC litter survey. It became apparent that there is no formalised training procedure or set of standard methodological instructions.

An experienced KABC counter was to accompany Nolan-ITU while it conducted the litter counts to test inter-observer reliability, eg, whereby more than one person assesses the same site at a given time. This did not prove possible at the time for reasons outside of KABC or Nolan-ITU's control.

The results from the Nolan-ITU visual assessment were compared to the KABC data sets for each site from surveys conducted from 1995 to 2001 (against the range and calculated average for each site). The comparison in Table 3-17 shows that on each every occasion the Nolan-ITU results are within the range of the results recorded for each KABC site. However, for nearly all sites, the Nolan-ITU counts are far higher than the average, which suggests that either:

- It may be inappropriate to accept that the rate of litter is decreasing as reported in collated KABC data; and/or
- There may be a difference in the way litter was counted by the Nolan-ITU and KABC counters as a function of deficient methodology.

Table 3-17: Comparison of KABC Data (1995-2001) to Visual Audit

	Beach	Highway	Industrial	Recreation Park	Residential	Retail Shops	Car Park
KABC Range:	1 to 15	20 to 171	7 to 60	1 to 38	2 to 31	3 to 25	1 to 34
KABC Average:	5.2	51.1	27.4	9.0	10.0	11.8	2.0
NITU:	13.0	121.0	46.0	8.0	54.0	53.0	7.5

In the latter regard, it should be noted that a methodology needs to be objective as possible and repeatable by anyone with the right amount of training in order to provide real insights about patterns and changes over time. Against this general rule, the KABC data collection methodology was found to be requiring further investigation in several regards.

a) Potential for counter bias

KABC advised Nolan-ITU the same individuals have counted the same sites for many years. While this has benefits in terms of ease of conduct of the survey and historic knowledge on the part of the counters, it is also somewhat problematic from an objective methodological standpoint (which should in no way be interpreted as reflecting on the undoubted personal commitment and integrity of KABC volunteers).

The fact that one counter could potentially have a particular counting characteristic (greater visual acuity, faster walking pace, unique understanding of item definitions, availability to conduct survey only on a particular day of the week or in certain weather conditions) or personal bias (antipathy to a particular economic sector, employment background) could continuously affect the outcomes for that one site. In other words, the count outcomes for a particular site – especially given that the same person could have been counting it for a long period of time – could be influenced by factors that are peculiar to that person. Moreover, as there is no set training program for KABC counters and no standard procedure to adhere to, the potential for counter bias of results further increases.

It would be worthwhile to limit the potential for counter bias of results by introducing a training program based on standardised counting instructions, rotating counters through sites, having two counters count a single site to determine the level of inter-observer reliability and conducting random verification audits.

b) Item descriptions did not cover some items

During the course of Nolan-ITU's visual assessment, it became evident that the KABC count survey form features better descriptions of some litter items than others. Some descriptions are fairly specific; others are somewhat general and unclear. As a result, some items that were difficult to itemise - due to the vagaries in descriptions - were recorded under more general categories or as 'miscellaneous'. Other litter items that were encountered were not accounted for. For example, there needed to be greater clarification on how to account for:

- Broken glass, i.e. should it be counted as one broken bottle or headlamp or a number of pieces of broken glass?
- Do items from a car accident count as litter?
- Is one bus ticked ripped into six pieces considered one littered item or six, or not at all because it is smaller than a matchbox?

An improvement of the count survey sheets' content, as well as a training program based on standardised instructions and guidelines, could address this aspect.

c) Site dimensions are vague

The site dimensions provided to Nolan-ITU were vague and not recorded in a detailed way on all site information materials. Equally, the depictions of some sites (photocopied black and white photographs) were difficult to make out clearly. Therefore, it was impossible in some cases to establish the site and its actual dimensions with any validity. Any new counter without sufficient guidance and training would encounter this same problem. Furthermore, the seven sites that were visited were all different sizes. It would therefore appear that a direct comparison of quantity of litter between sites is not possible.

In terms of continual improvement, it would be appropriate to have an improved system of site description, as well as a review of the size, location, number and type of sites to ensure the appropriate unit of measure.

d) There is a significant margin for sampling error

External influences are likely to impact the results of the litter count, such as:

- Whether Councils are diligent property managers so that particular sites are cleaner; or
- Time of day and day of the week that samples are taken.

Actual influences noted by Nolan-ITU when conducting the visual assessment included:

- The site that was classed “residential” had a row of shops within the (apparent) survey area;
- The beach site appeared to be within the tidal zone which means (a) litter surveys cannot be conducted at certain times, and (b) the site is influenced by tidal flushing, which would result in both litter washed to sea regularly and also ocean litter washed ashore. This makes it difficult to determine if the litter is directly deposited in the location or from other sources; and
- At the industrial site, a company was using the side verge for what appeared to be a combination of legitimate metal storage and potential waste dumping. Again, there was uncertainty with regard to the eligibility of the material for the count. This was compounded by a lack of clarity about the border of the count site, and whether the company’s materials were in or outside it.

A review of the location, size, type and number of sites would be worthwhile to establish a clear rationale.

e) Not all litter is recorded

KABC advised that it does not count items “smaller than a matchbox”. This effectively excludes many cigarette butts and other small items. It is noted, however, that bottle caps and lids are recorded which may often be smaller than a matchbox. Theoretically, the application of the ‘matchbox rule’ could eliminate the majority of items from a count at a highly littered site and therefore create an unrealistic picture.

Again, this factor requires clarification - potentially through standardised instructions and training of counters - to improve the objectivity and repeatability of the methodology.

f) Assumption of prior knowledge

At the beginning of each count, the counter needs to outline site ‘conditions’ as shown below. This necessarily assumes a prior knowledge of the site and is generally not easily determinable. Nor is the applicability of the requested information to the collected count statistics understood.

<p>Conditions: <i>(Mark boxes as required)</i> x</p> <ol style="list-style-type: none"> 1. <input type="checkbox"/> Area appeared to be cleaned before count. 2. <input type="checkbox"/> Deliberate dumping of rubbish. 3. <input type="checkbox"/> Area was mowed before count causing proliferation. 4. <input type="checkbox"/> Very recent storm/flood damage litter build up. 5. <input type="checkbox"/> Very recent or current high winds cause build up. 6. <input type="checkbox"/> Recent public event held in the area. 7. <input type="checkbox"/> Uncovered load spilled in area causing litter.
--

3.7 Recommendations to Address Data Deficiencies

Sound data on the current extent and composition of litter in WA is central to setting benchmarks for improvement and assessing the impact of future litter abatement programs. An overview of the strengths and weaknesses of different litter statistics data collection and analysis are outlined in Table 3-18, including the relative benefits and disbenefits of ‘count’ based litter monitoring versus behavioural observation based litter monitoring.

Table 3-18: Comparison of litter statistics data collection and analysis⁵

Data	Strength	Weakness
Visible count based litter monitoring (eg, KABC)	<ul style="list-style-type: none"> Enables spatial trends such as differences in litter type from site to site Easily reproducible Enables identification of litter sources and therefore informs litter reduction initiatives Inability to directly link results to littering behaviour 	<ul style="list-style-type: none"> Doesn't take into account litter bins at surveyed locations Does not take into account site specific characteristics Does not provide an absolute quantity of litter Cannot control external effects before or during the counting such as extreme weather, unexpected cleaning of the site or special events occurring on the site Survey subject to variances in weather conditions at the time audits are undertaken Inability to directly link results to behaviour
Full survey count based litter monitoring	<ul style="list-style-type: none"> Enables spatial trends such as differences in litter type from site to site Easily reproducible Provides an absolute quantity of litter Enables identification of litter sources and therefore informs litter reduction initiatives 	<ul style="list-style-type: none"> Survey subject to variances in weather conditions at the time materials were collected Doesn't take into account litter bins at surveyed locations Does not take into account site specific characteristics
Litter bin audit strategy	<ul style="list-style-type: none"> Used as a benchmark measure for comparing anti-littering initiatives Provides an absolute quantity of litter 	<ul style="list-style-type: none"> Does not indicate the amount of material littered in a given location
Behavioural observation litter monitoring (eg, BIEC / CCC)	<ul style="list-style-type: none"> Analyse litter behaviours Allows a comparison of the impact of interventions on changing littering behaviour from one situation to another as well as in the same type of situation under different conditions Makes use of the “Observational Approach”, which is a naturalistic approach to behaviour measurement 	<ul style="list-style-type: none"> Cannot provide an absolute quantity of litter or a breakdown of litter by material types Cannot provide a breakdown of litter types

In other constituencies, work is currently underway to assess the best approach to measuring litter and littering. Keep Australia Beautiful Victoria (KABV) and EcoRecycle⁶ are currently reviewing methodological approaches used to collate litter statistics, as well as considering the BIEC/CCC methodology (DBI index). It was reported that data collection has proved problematic over the years with the KABV litter survey subject to variances in weather conditions at the time audits were undertaken.

⁵ Information compiled from McGregor, I (2000) Review of Litter Statistics Collection and Analysis Methods.

⁶ Per comm. Jenny Pickles, EcoRecycle Victoria (17 April 2002).

Further, the KABV methodology does not take account of existing litterbins at surveyed locations or other site specific characteristics. This is where the BIEC methodology comes to the fore in looking at the behaviour of people at sites, bin siting and proximity to seating etc. Certainly, these developments in Victoria, as well as related discussions in New South Wales, should be monitored by WA stakeholders in determining the best path forward.

In that respect, it is noted that the compilation of statistically valid data often requires considerable resources and funding, which might be considered more productively spent if allocated to litter abatement programs. However, there is scope in WA to collate more robust litter data through existing stakeholders by both developing a more robust data collection methodology and achieving greater co-ordination between different agencies to produce comparable data, share the costs and produce repeatable techniques.

It is possible to develop a framework that is sufficiently detailed so that the information is meaningful, but generic in its nature so that it can be used in all regions of WA and repeatable so that direct comparisons can be made between different geographic and demographic locations and over given timeframes.

It is recommended that stakeholders currently responsible for collating litter statistics in WA work together to develop a robust litter effect measurement and monitoring framework with clear definitions for all commonly littered and illegally dumped items. Subject to a further and full review, including a detailed investigation of count-based versus behavioural observation-based methods, it would appear that a WA framework premised on continual improvement of current practices should:

- Define site types and dimensions more clearly and broaden the scope beyond traditional KABC sites to cover more comprehensive litter streams and more stakeholder audience requirements;
- Provide more specificity about site characteristics to counters;
- Review and improve the count survey form including item definitions;
- Develop and implement a training package and standardised instructions for individuals that are to participate in data gathering;
- Establish a set of guidelines that permits any stakeholder group – with appropriate training and some resources – to undertake a count in localised circumstances with comparability to the broader fixed set of sites; and
- Set conversions for volume, count, perception (visual impact) and weight, if necessary.

Further research work is needed in terms of accommodating issues within measurement and monitoring frameworks such as population growth, consumption patterns (i.e. increased availability of fast foods) and recreational activities which will all impact litter levels and the nature of the litter stream.

The scope of this project also encompasses illegal dumping, the incidents of which are not generally accounted for in traditional litter surveys. This presents some difficulty in cases where there is either no clear distinction between the two broad streams, or when locations are impacted by littering and dumping (such as on the road reserve of main roads). This too would merit consideration in developing future frameworks.

3.8 How is Litter Currently Managed in WA?

An assessment of existing WA litter management mechanisms against priority litter streams has been conducted to understand how existing programs address the litter effect and to identify any gaps in current program delivery. (For the purpose of this analysis, the existing fine structure for littering offences has not been included as it has been reported that it is largely not enforced.)

The following key applies to Table 6-1.

- C = does it address the cause?
- B = does it address the behaviour?
- CU = does it focus on clean up only?

Table 3-19: Gap Analysis – WA litter streams against existing abatement mechanisms

Major litter streams	Tidy Towns			ATS / MWC			Clean Up Australia Day			Public Place Disposal bins			General Council maintenance			Pocket Ashtrays			Stormwater Systems			Swan / CALM clean up		
	C	B	CU	C	B	CU	C	B	CU	C	B	CU	C	B	CU	C	B	CU	C	B	CU	C	B	CU
Roadside (rural)		✓	✓						✓	✓						✓					✓			
Roadside (urban)		✓	✓			✓			✓						✓	✓								
Commercial & industrial sites		✓	✓												✓	✓					✓			
Waterways & beaches		✓	✓						✓	✓					✓	✓					✓			✓
Shopping centres		✓	✓							✓					✓	✓								
Public place postings		✓	✓							✓					✓	✓					✓			
Unkempt property or derelict sites		✓	✓												✓						✓			
Fast food outlets		✓	✓							✓					✓	✓					✓			
Special events									✓	✓					✓	✓								
Remote areas		✓	✓						✓						✓	✓					✓			✓

The analysis demonstrates that programs in WA focus heavily on litter clean up, some relate to cause and very few focus on changing behaviours that result in the littering occurring.

3.9 WA Litter Effect Observations

A consideration of stakeholder views combined with the best available factual information enables some initial overall observations about the litter effect in WA:

- Albeit for different reasons and in different ways, litter is considered a genuine issue by the majority of stakeholders;
- While further exploration is required, litter would appear to receive a lower priority than other issues with environmental impact, such as hazardous wastes or water pollution;
- Many stakeholders seem primarily concerned with the social (eg, aesthetics and amenity) and economic (eg. clean up costs) dimensions of litter rather than its environmental impact per se;
- Within the overall litter issue, and although there is limited statistical proof of an increase in the practice, illegal dumping appears to be receiving an increasing priority among many stakeholders;
- A variety of programs currently exist to address the litter effect with most focussed on 'after the fact' aspects rather than the causes and behaviours that result in litter;
- More than \$16 million per year is currently being spent in WA on anti-litter initiatives by Government agencies and NGOs;
- The majority of direct costs for litter management is currently borne by Local Government;
- There is a somewhat of a 'silo effect' occurring in terms of the conduct of anti-litter programs by agencies, eg, programs are being run in parallel and with often the same overall objectives but in isolation of each other;
- The extent, rate, amount, disbursement, and type of litter cannot be absolutely quantified at this stage due to existing data gathering systems that are not comprehensive or comparable; and
- The exact environmental, social and financial impacts of the litter effect cannot be absolutely quantified for the same reason.

While it is difficult to definitively *measure* the litter effect in WA at this stage of analysis, the litter effect model can be used to describe and highlight major aspects (based on stakeholder research and existing data assessment) that require consideration in the context of anti-littering mechanisms.

Priority issues that relate to causes, behaviours, items and streams have been summarised for WA in Table 3-20. The issues that surface as most relevant to WA have been selected based on the collective feedback from stakeholders, the Local Government survey, litter data and some extrapolation of the resultant information.

Table 3-20: Litter effect aspects in WA

1. Major CAUSES
Insufficient and/or inappropriately designed disposal facilities in public place locations and on construction and demolition sites
Increases in landfill charges
Lack of guidelines and/or strict regulation for the storage and/or handling of waste materials
Distance to waste disposal bin/facilities
Negligence / habit
Lack of education / awareness
Weather conditions
2. Common BEHAVIOURS
Casual littering by individuals
Avoidance of long distance waste haulage / and or landfill charges
Lack of due care in the collection and transportation of wastes and recyclables
Lack of due care in the transportation of loads (ie. uncovered loads)
Throwing litter from motor vehicles and public transport
Placing of advertising material in open spaces (ie. under vehicle windscreen wipers, property gates etc)
Lack of due care during building construction and demolition activities
Overfilling or inappropriate use of public place litter and recycling bins
Inappropriate disposal of syringes and hazardous items
Vandalism of public bins and property

Table 3-20 (continued): Litter effect aspects in WA

3. Common ITEMS	
Beverage containers	Milk cartons
Beverage related litter (straws, caps and tops)	Paper (general – inc. newspaper and packaging)
Confectionery wrappers	Plastics (general – inc. assorted bags and packaging)
Construction materials	Syringes
Cigarette butts	Takeaway food packaging
Domestic waste (general)	Vehicle tyres
Hazardous items (general – inc. containers of liquid waste)	Vehicle components (general – inc. whole cars)
Junk mail	Vending tickets (ATM, public transport tickets, dockets, invoices)
Large household items (inc. whitegoods, appliances)	
4. Major litter STREAMS	
Roadsides	Unkempt property and derelict sites
Construction and industrial sites	Fast food outlets
Waterways and beaches	Special events (general)
Shopping centres	Remote areas (ie. nature reserves)
Bus stops, train stations and other public transport postings	

4 IDENTIFICATION OF MECHANISMS

Whether it be in Western Australia (WA) or elsewhere, a large number of public and private sector organisations have a responsibility for or hold a stake in litter abatement across all levels of government, industry, non-government organisations (NGOs) and the community. Combined with the multi-faceted nature of the litter effect, this has led to the development of many different types of mechanisms, which aim to reduce, stop and/or clean-up litter.

In order to formulate meaningful information on potential litter management options for WA, a five-staged approach was used to both identify and assess a range of mechanisms potentially suitable for the management of the litter effect in WA:

1. Initial identification and overview of a broad range of generic litter management mechanisms from Australia and overseas, presented under four key headings (Appendix II);
2. A summary of a number of mechanisms (for which reasonable information was available) with an assessment of the key strengths and weaknesses, potential costs and relevance to the WA context (Appendix III);
3. Sample selection of mechanisms from each of the four key groups in conjunction with the Project Steering Group for more stringent analysis of their potential to address the litter effect in WA, based on stakeholder prioritisation;
4. Development of an Multi Criteria MCA model with supporting evaluation criteria to formally assess mechanisms against stakeholder prioritisation; and
5. Rigorous analysis of representative mechanisms using the MCA model.

4.1 Identification of a Range of Generic Mechanisms

Identification of a range of generic litter mechanisms (national and international), including a number of generic Container Deposit Legislation (CDL) system types, was initially undertaken through:

- Internet and library research;
- An extensive literature review; and
- Personal communication with government, industry and community experts currently running litter abatement programs.

Examples were particularly sought for which evaluation results are available. In this regard, it became abundantly apparent that very few programs / mechanisms regularly undergo (or report) any formal evaluation to review actual effectiveness, eg, by how much do they actually reduce litter?

The range of litter management mechanisms potentially suitable for the WA context is described under four key headings:

1. Education;
2. Enforcement;
3. Physical Intervention; and
4. Producer Responsibility.

In using these broad definitions to describe litter management mechanisms it should be appreciated that there can often be significant overlap of mechanisms with no clear defining line. For example, a mechanism that primarily targets clean up may also have an educational component; similarly many producer responsibility initiatives support education and can encompass intervention programs.

The litter abatement model in Figure 4-1 outlines the relative inter-relationship between different categories of litter abatement mechanisms.

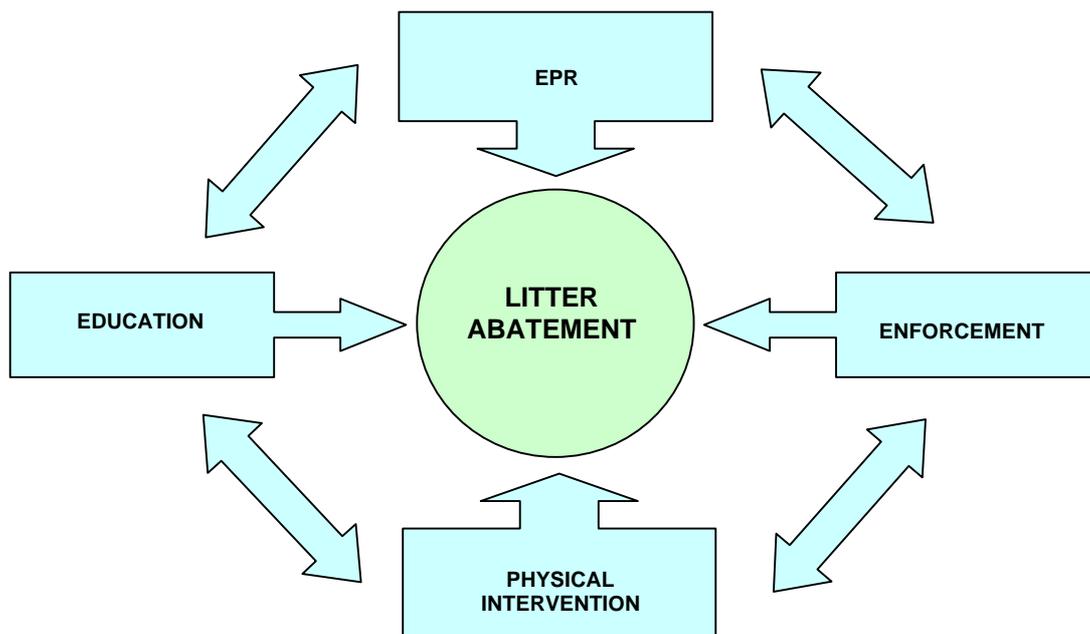


Figure 4-1: Litter abatement model

This section identifies generic litter abatement mechanisms and provides a brief description of each.

Furthermore, the focus of different mechanisms generally fall under the banner of two different approaches that each carry importance to reduce litter in the physical environment:

- *PREVENTION* – pro-active approaches which aim to reduce or stop the occurrence of litter; and
- *CLEAN UP* – reactive approaches to remove litter from the physical environment once it has occurred. Until preventative pro-active approaches are 100% effective, there will continue to be a need for clean up or reactive measures.

4.2 Education

Education is considered an important way of ‘preventing’ littering and is generally used to reinforce positive attitudes and behaviour (EPA, 1996). Education initiatives can be used as a stand-alone mechanism or to support the success of other initiatives, such as the introduction of a new bin system or legislative framework. Education programs for litter abatement further range from ‘blanket education’, which target general littering behaviour to ‘targeted education’, which specifically focus in on an issue of concern such as littering of cigarette butts or illegal dumping in a specific region.

Education mechanisms implemented to date include the following that were reviewed for the project. Again, each is often used in concert with others:

- Mass media public awareness campaigns - disseminate information to householders and the general community through a range of media, including television, newspaper, radio, magazines, newsletters, cinema and outdoor advertising (ie. on billboards, taxis and buses);
- Guidebooks and tool kits - general educational resources compiled for widespread distribution to a range of stakeholders for use in implementing litter abatement initiatives;
- School programs - general waste and litter abatement programs are increasingly being incorporated in the school curriculum;
- Drain stenciling - promotes community awareness of stormwater pollution to encourage greater care when discarding of unwanted items;
- Conferences and seminars – a means of increasing awareness of litter issues and/or promoting the latest management approaches; and
- General resources and information libraries – provide links/access to useful information to help avoid duplication of time by providing a one-stop-shop to access resources.

The Draft Waste Education Strategy for WA 2002-2007, currently under development through the Department of Environment, Water and Catchment Protection (DEWCP) and the Waste Management Board, includes litter education as an integral part of overall waste education in WA.

4.3 Physical Intervention

Physical intervention is the definition broadly used for mechanisms that feature the use of litter prevention infrastructure an/or involve the physical clean up or control of littered items.

The South Australian public discussion paper on litter strategies (EPA, 1996) identifies a number of equipment and infrastructure requirements to help control litter in key areas:

- Sufficient bins outside parking lots and retail premises;
- Litter bins for smokers in high use areas;
- Litter receptacles in vehicles, including buses;
- Bins at building sites;
- Adequate litter bins for national parks, conservation, wilderness and coastal areas;
- Increased litter traps and trash racks for gutters and stormwater systems;
- Standardised equipment to ensure that there is safe and uniform handling of litter by service providers; and
- Anti-litter signs on major highways and in public places such as railway stations, bus stops street gutters and retail outlets.

Physical intervention mechanisms researched for the project include:

- Waste and recycling receptacles - bins used to contain litter vary according to type, location and litter items targeted;
- Anti-litter signage - generally situated in strategic locations to present a particular message about littering such as general reminders not to litter, to draw attention to waste and recycling disposal facilities, and/or to communicate about fines for littering and/or illegal dumping;
- Litter traps - includes litter booms, trash racks and gross pollutant traps (GPTs) used to capture litter in the environment;
- Restoration programs - clean up or 'corrective' measures to remove litter from the environment once it has occurred, includes general council maintenance and community clean up events.

4.4 Enforcement

Enforcement measures are the 'big stick approach' to litter abatement aimed at preventing litter by providing a framework to discipline offenders and create disincentives to inappropriate behaviours. Enforcement measures identified include:

- Regulatory frameworks - litter legislation exists in all Australian States, most originating back in the early 1970's, however the extent, power and implication of these Acts vary; and
- Enforcement resources - measures to back legislation used to both catch and prosecute offenders.

To be most effective in achieving attitude and behaviour change, legislation needs to be easy to understand and enforce (EPA, 1996). Legislative requirements could incorporate incentives such as:

- Increased litter fees and penalties;
- More agencies and officers issuing fine notices;
- Clean up costs included in entrance fees to parks and venues;
- Drivers to be held responsible for the behaviour of their passengers;
- Demerit points from offending drivers licenses; and/or
- Mandatory covering of loads to eliminate spillage.

In terms of current provisions, WA has comparably low levels of litter fines. Stakeholders also report an under-resourced and sub-optimal approach to fine enforcement. The regime may be affected by the foreshadowed introduction of the (draft) Waste Management Bill 2002.

Table 4-1 details the current schedule for littering offences in WA as enshrined in the WA Litter Act 1979.

Table 4-1: Current schedule for littering offences in WA⁷

Item	Section or Regulation	Nature of Offence	Penalty (\$)
1	s.23	Littering	50
2	s.24	Breaking glass, metal or earthenware	50
3	s. 24A (1)	Bill posting	100
4	s.24A (2)	Bill posting on a vehicle	50
5	reg. 6	Depositing domestic or commercial waste in a public place receptacle	50
6	reg. 8	Transporting load inadequately secured	100

⁷ Schedule 1 inserted in Gazette 19 July 1996 p.3460; amended in Gazette 8 November 1996 p.6218.

4.5 Producer Responsibility

The Organisation for Economic Co-operation and Development (OECD) defines Extended Producer Responsibility (EPR) as '*a policy approach under which producers accept significant responsibility - financial and/or physical - for the treatment or disposal of post-consumer products*'⁸. There are two key features of EPR policy that directly relate to litter abatement:

1. Preventing waste at the source and enhancing product design for the environment, ie. taking into consideration potentially littered components of products and packaging at the design stage; and
2. Providing support for the achievement of public recycling and materials management goals, including litter abatement.

A primary function of EPR is to transfer some of the costs and/or physical responsibility of waste management, or in this case litter abatement, back to the producers of commonly littered items. EPR can take a number of forms as stand alone initiatives by a company, or group of companies, or contributions made to joint initiatives. EPR can also be applied in a mandated / legislated manner or voluntarily by companies.

In Australia, the National Packaging Covenant (NPC) can be considered a driver toward broader EPR measures related to product packaging and paper products, as it establishes a national framework for the effective lifecycle management of these items based upon the principles of product stewardship and shared responsibility. NPC signatories effectively recognise that they bear at least some responsibility for the post-consumer implications of items that are part of their supply chain.

Litter is within the ambit of the NPC and is also known to be a strong concern to several members of the Covenant Council. One means for firms to discharge their obligations under the NPC is through funding or undertaking anti-litter programs, and this will create a context of increasing non-government activity in litter prevention.

To date, several companies have enshrined litter-related commitments within their NPC Action Plans. A review of the 107 available Action Plans in February 2002 by Nolan-ITU identified 52 litter related commitments by 28 different signatories. The majority of these relate to either product labelling (anti-littering messages) or data gathering and capacity building; a much smaller number relate to the conduct of or support for direct intervention mechanisms. BIEC has the most extensive commitment to litter abatement of all signatories, including the conduct and/or sponsorship of a range of intervention mechanisms.

⁸ www.oecd.org/

EPR related mechanisms reviewed for the report include:

- CDL - legislation that provides for a refundable deposit on containers (as specified under particular Acts) when returned for reuse or recycling (it should be noted that within the assigned scope of this project CDL was considered solely in terms of its litter reduction aspects, rather than its broader resource recovery and sustainability dimensions);
- Product labeling - product brand owners, particularly of fast moving consumable goods (FMCGs) such as snack and fast foods, to include messages on products to promote correct disposal and/or recycling behaviour of products and packaging;
- Industry programs and support - general industry initiatives to take responsibility for litter and /or provide support for collaborative programs; and
- Industry Waste Reduction Plans (IWRPs) - key industry groups and government include litter prevention in broader IWRPs, or similar means that are enshrined in legislation;

A more detailed overview of the range of mechanisms identified under the four key headings is provided in Appendix II. A preliminary summary of their key strengths and weaknesses, potential costs and relevance to the WA context is further provided in Appendix III.

5 ASSESSMENT OF MECHANISMS

Attempting to formulate meaningful recommendations for litter management in Western Australia (WA) is somewhat hampered by the fact that:

- The litter effect can only be partially defined in an objective sense based on the available data;
- The wide array of litter management mechanisms cited vary considerably in terms of scope, longevity, resourcing levels and availability of required information; and
- The majority of the litter management mechanisms identified lack any formal evaluation results to determine their relative effectiveness in actually reducing litter.

Nevertheless, the available information and stakeholder priorities provide sufficient insight into target litter issues in WA with which to evaluate the potential suitability of mechanisms against key stakeholder priorities. To ensure that the evaluation process provided meaningful results, a formal evaluation methodology - Multi Criteria Analysis (MCA) - was utilised to assess a selection of litter abatement mechanisms against nominated desirable outcomes, as identified and prioritised by key stakeholders in WA.

5.1 Introduction to Multi-Criteria Assessment

MCA is a valuable tool to assist decision-makers to manage complex issues. It can be used to both improve the quality of a decision and also to justify why a particular action is taken. A significant advantage of using MCA is that it has the capacity to analyse both quantitative evaluation criteria as well as qualitative evaluation criteria (eg, yes/no, pluses and minuses, ordinal ranking) in the same framework.

The outcome of the MCA will be the identification of preferred litter management options for the WA context based on a systematic and structured method of analysing currently studied alternatives.

The MCA technique that is being used for the purpose of this project has the following components:

- A given set of alternatives (litter management mechanisms as selected by the Project Steering Group);
- A set of criteria for comparing the alternatives (evaluation criteria and their respective weightings were developed by the Project Steering Group and are shown in Table 5-1); and
- A method for ranking the alternatives based on how well they satisfy the criteria (reviewed and approved by the Project Steering Group).

The project scope limited the number of mechanisms that could be assessed through the MCA model. However, the MCA framework is suitably flexible to be modified by any stakeholder to assess any number of litter management mechanisms against their own localised priorities in future.

The steps involved in developing the MCA model and conducting the evaluation are outlined.

5.2 Step 1 – Selection of Sample Mechanisms for Review

The Project Steering Group selected a representative sample of mechanisms from a broader list of identified mechanisms. The final selection was based on:

- Potential capacity to address litter issues identified in WA – defined as cause, behaviour, item and stream;
- The availability of reasonable information so that the mechanism will fit into the MCA architecture, ie. if a mechanism cannot be assessed against the evaluation criteria due to a lack of information the resulting score will not be a realistic reflection of the mechanism's potential to reduce litter;
- Representation of local, national and international programs; and
- Representation of mechanisms from the four key groups.

Mechanisms selected for further review included:

- Mass Media Public Awareness Campaign - "Don't be a Tosser" campaign, NSW EPA;
- Guidebook and Tool Kit - Illegal Dumping Prevention Tool Kit, US EPA;
- School Program - Waste Wise Schools Program, Gould League Victoria;
- Community Program - Tidy Towns, Keep South Australia Beautiful (KESAB);
- Public Place Waste and Recycling Receptacles - Cottesloe Council, WA;
- Pocket Ashtrays - trial distribution of pocket ashtrays to smokers, NSW EPA;
- Gross Pollutant Traps - CDS Technology, Randwick City Council;
- Community Clean Up Program - Clean Up Australia Day;
- State Government Clean Up Program – Administrative Training Unit (ATS) / Main Roads WA Mobile Work Camps (MWCs);
- Regulatory Framework - NSW Litter Law, NSW Protection of the Environment Operations Act, 1997;
- Illegal Dumping Program - Regional Illegal Dumping (RID) Squad, Western Sydney;
- NPC Action Plan - British American Tobacco (BAT);
- Container Deposit Legislation (CDL) - South Australian model;
- CDL - Alberta model; and
- Municipal street sweeping program – Woollahra Council, NSW.

5.3 Step 2 – Establish the Evaluation Criteria and Weightings

A stakeholder focus group meeting was convened on April 5th, 2002 to seek input into the development of evaluation criteria to assess different litter management mechanisms for WA. The participants consisted of members of the Project Steering Committee, as well as representatives from the City of Cottesloe, Coast and Clean Seas, Rottneest Island Authority, the SRT, Department of Conservation and Land Management (CALM) and Earthcare.

The evaluation criteria and weightings to assess mechanisms were developed through the following steps:

- A range of potential evaluation criteria were nominated through group discussions at the stakeholder focus group meeting;
- Each individual nominated their top five criteria and allocated 100 points across the five, based on perceived level of importance; and
- The top responses were reviewed and consolidated by the Project Steering Group.

The resulting evaluation criteria and allocated weightings are outlined in Table 5-1.

Table 5-1: Evaluation criteria and allocated weightings

Evaluation Criteria	Weighting
<i>Financial Aspects</i>	
1. Financial cost to local government	6.5
2. Financial cost to state government	4.5
3. Financial cost to industry	4.4
4. Financial cost to community	5.5
5. Equity of financial cost distribution	5.5
Subtotal	26.4
<i>Behavioural Change</i>	
6. Effectiveness in achieving producer responsibility	8.0
7. Effectiveness in promoting consumer responsibility	8.6
8. Effectiveness in changing behaviours	12.1
Subtotal	28.7
<i>Environmental Aspects</i>	
9. Environmental benefit	8.9
10. Effectiveness in supporting visual amenity	3.9
Subtotal	12.8
<i>Scope</i>	
11. Applicability across a range of commonly littered items	6.4
12. Applicability across a range of litter behaviours	6.1
13. Applicability across a range of litter causes	4.6
14. Applicability across a range of litter streams based on prioritisation (environmental, needs basis, social priorities)	6.9
Subtotal	24
<i>Management Framework</i>	
15. Institutional complexity	4.4
16. Consistency with existing commitments under the NPC	3.7
Subtotal	8.1
TOTAL	100

5.4 Step 3 – Ranking of Potential Mechanisms to Manage Litter

The next step in the MCA process was to develop a method for scoring the alternative litter management mechanisms based on how well they satisfy each of the nominated evaluation criteria. A scoring framework (detailed in Appendix IV) - based on researched MCA practice as well as standards for impact assessment - was compiled to assess the alternative litter management mechanisms against each evaluation criterion. The framework strives to be objective and repeatable in measurement and application terms. Using the MCA framework:

- Each mechanism was allocated a score between 0 and 5 against each of the evaluation criteria; and
- Criteria weightings were then applied to the scores to calculate a final score in order to best match WA stakeholder priorities.

5.5 Step 4 – Running the MCA

There are numerous MCA techniques available, each of these varying in their suitability depending on the type of data that needs to be assessed (quantitative or qualitative or both) and the outputs sought. For this study, as the data is ordinal in nature (i.e. the assessment against each criteria provides information on rank order only), concordance analysis has been adopted.

Using concordance analysis, each alternative is compared against each other alternative on a pair-wise basis. For each pair of alternatives (e.g. Mechanism 1 versus Mechanism 2, etc) the score for each evaluation criterion for Mechanism 1 is compared against the corresponding score for each evaluation criterion for Mechanism 2.

Criteria weights are assigned to the mechanism that outperforms the other. Concordance indices are then calculated which represent the sum of the weights for those criteria where the mechanism scores are better than the other. Finally, the indices are normalised by dividing by the sum of all the weights for all criteria. An example showing how concordance analysis is applied to the assessment of a pair of mechanisms is shown in Table 5-2.

Table 5-2: Concordance analysis – sample calculation only

Criteria	Weight	Performance Score		“Better” Mechanism	Weights assigned to:	
		Mechanism 1	Mechanism 2		Mechanism 1	Mechanism 2
1. Financial cost/benefit to Local Government	6.5	4	2	Mechanism 1	6.5	-
2. Financial cost/benefit to State Government	4.5	5	0	Mechanism 1	4.5	-
3. Financial cost/benefit to Industry	4.4	1	3	Mechanism 2	-	4.4
etc..	etc..	etc..	etc..	etc..	etc..	etc..
Sum of weights					55	45
Concordance index					0.55	0.45

In the above table, at a threshold level of 0.5, Mechanism 1 is “dominant” over Mechanism 2. At a threshold level of 0.6 however, neither alternative is “dominant”. Using the concordance indices and dominance thresholds, a ranked list of mechanisms is generated on the basis of the number of pair-wise dominances over other mechanisms.

It should be noted that the developed framework for comparing litter management mechanisms is principally a tool to assist decision-makers to conduct comparative assessments. In future, Project Steering Group members and other stakeholders can use it in its current form to assess additional mechanisms; alternatively, the MCA framework can also be modified to add evaluation criteria, change weightings and/or redetermine the scoring system etc.

Moreover, as further primary data is developed and collected on the performance of litter management mechanisms, it is again stressed that scoring can be changed from an ordinal nature to a quantitative nature, e.g. actual cost figures could be used.

The results of the concordance analysis of the selected litter management mechanisms are outlined in Figure 5.1. The actual mechanism score sheet is further provided in Appendix V.

Concordance Ranking of Mechanisms

Rank	Mechanism
1	Tidy Towns, KESAB
2	Gould Leage Waste Wise Schools Program
3	Clean Up Australia Day - WA
4	NSW Protection of the Env Ops Act, 1997
5	Western Sydney Illegal Dumping Squad
6	CDL - South Australia
7	NSWEPA "Don't be a Tosser" Campaign
8	NPC Action Plan - BAT
9	USA Illegal Dumping Prevention Tool Kit
10	CDL - Alberta
11	Pocket Ashtrays - NSW EPA trial
12	WA Main Roads – Mobile Work Camps
13	Cottesloe Council, WA
14	Randwick City Council - Gross Pollutant Traps
15	Street Sweeping - Woollahra Council
* denotes Mechanisms were ranked equally using concordance analysis	

Figure 5-1: Overview of concordance rankings of selected litter mechanisms

5.6 Step 5 – Interpreting the Results

The results of the concordance analysis ranks the mechanisms based on how well they meet the stakeholder priorities outlined in the weighted evaluation criteria. It is noted that the mechanisms that scored particularly well generally:

- Have a broad focus covering a range of litter causes, behaviours, items and/or streams;
- Are well-established programs with documented evidence of success in reducing litter; and/or
- Are of a more pro-active preventative nature and generally target behavioural change.

Table 5-3 provides a summary of the various aspects that contributed to the final rank of the different mechanisms and some issues worth noting for the WA context.

Table 5-3: Interpreting the results of the concordance analysis

Mechanism	Aspects of final rank	WA considerations
1. Tidy Towns, KESAB	<p>Program scope covers commonly littered items, streams, behaviours and causes</p> <p>Well-established program with a long history of success based on the level of community, industry, local and state government involvement and genuine enhancement of the environment</p>	<p>Program currently established in WA with approximately 30% participation of rural towns - may be scope to increase participation of the existing program at relatively low cost to stakeholders</p> <p>May be scope to focus on improving the existing program to achieve more positive outcomes for the state</p>
2. Waste Wise Schools Program, Gould League Victoria	<p>Well-established program with documented evidence of program effectiveness</p> <p>Targets behaviour to prevent litter occurring</p>	<p>Potential to utilise program experience and resources in WA to minimise development costs associated with establishing a similar program</p>
3. Clean Up Australia Day National	<p>Involves in-kind and financial support from all levels of community, industry and government</p> <p>Well established program with a track record demonstrating broad participation 1989 – present</p> <p>Physically removes litter from the environment to enhance visual amenity</p> <p>Promotes general awareness through associated advertising</p>	<p>Program has existing coverage in WA but a low participation rate</p> <p>Potential scope to focus on improving the existing program to achieve more positive outcomes for the state</p>
4. NSW Protection of the Environment Operations Act, 1997	<p>Covers a wide range of commonly littered items across a range of streams</p> <p>Scope for inter-agency involvement in both the issuing of fines and benefit from revenue raised</p> <p>Targets behaviour to prevent litter occurring</p>	<p>Potential income generation or recovery of costs in WA - since July 2000, new fines in NSW have raised \$2.3 million and 65% of the total revenue of fines has gone to local councils</p>
5. Western Sydney Regional Illegal Dumping Squad	<p>Addresses limited but significant litter streams</p> <p>Is a preventative measure that targets littering behaviour and there is some documented evidence that the program is effective in achieving this objective</p>	<p>Scope for inter-agency coordination between state and local government to implement a similar program in WA</p> <p>Potential to reduce current litter management costs assuming program is successful</p> <p>Potential to raise revenue that could contribute to implementation costs</p>

Table 5-3 (continued): Interpreting the results of the concordance analysis

Mechanism	Aspects of final rank	Things to considerations for WA
6. CDL - SA	<p>Extensive collection depot infrastructure required. High capital and operating costs (based on initial cost estimates developed for NSW) and given WA's size and dispersed population.</p> <p>Financial implications primarily for industry</p>	<p>The MCA does not take into consideration the extensive infrastructure requirements necessary to implement CDL in WA or any potential impacts on existing resource recovery programs such as kerbside recycling</p> <p>Further detailed investigations required to establish potential implementation in WA and to gauge community participation (80% participation in SA)</p>
7. NSW EPA "Don't be a Tosser" campaign	<p>Targets littering behaviour however it is a relatively new program and there is only anecdotal evidence that the program promotes consumer responsibility and no evidence that it is effective in achieving behavioural change</p> <p>Financial implications primarily for state government</p>	<p>Potential to minimise campaign development costs by negotiating access to the NSW EPA resources</p> <p>Potential to utilise resources from BIEC's soon to be launched 'Don't Waste Australia' campaign to support a similar mass media campaign in WA</p>
8. British American Tobacco NPC Action Plan	<p>Demonstrated producer responsibility initiative</p> <p>Targets one commonly littered item only</p> <p>No evidence to suggest that the initiative is effective in achieving its objectives</p>	<p>'Producer responsibility' initiatives have potential to minimise costs for other stakeholders currently incurring the costs of cleaning up litter</p>
9. US EPA, Illegal Dumping Prevention Tool Kit	<p>Targets a few litter streams only</p> <p>Web-based document only with no information available to demonstrate effectiveness</p>	<p>Scope to collate information (and lessons learnt) from this tool to develop a best practice guide applicable to local issues, management structure and regulatory frameworks in WA</p>
10. CDL - Alberta	<p>Extensive collection depot infrastructure required. High capital and operating costs (based on initial cost estimates developed for NSW) and given WA's size and dispersed population.</p> <p>Although main costs are incurred by industry there is some scope to share costs between stakeholders.</p>	<p>The MCA does not take into consideration the extensive infrastructure requirements necessary to implement CDL in WA or any potential impacts on existing resource recovery programs such as kerbside recycling</p> <p>Further detailed investigations required to establish potential implementation in WA.</p>

Table 5-3 (continued): Interpreting the results of the concordance analysis

Mechanism	Aspects of final rank	Things to considerations for WA
11. Pocket Ashtrays, NSW EPA trial	<p>Trial program only so no evaluation results available to determine effectiveness</p> <p>Targets one commonly littered item and one cause only</p>	<p>Potential distribution in WA through Councils, tobacconists, state government etc</p> <p>More research is required to establish most practical design, consumer uptake, whether the pocket ashtrays themselves end up contributing to the litter stream and how much the community would be willing to pay for a well-designed item (ie. does it fit in a pocket and is it easy to empty and attractive)</p> <p>BAT is further providing funding to address the issue, ie. Butts Out.</p>
12. ATS / Main Roads WA – MWC’s	<p>Reactive mechanism only that targets one litter stream</p> <p>Removes visible litter from the environment</p> <p>Clean up only and does not directly target behaviour or cause</p>	<p>Established in WA and demonstrates a genuine cooperative approach between stakeholders</p> <p>Scope for further cooperation between stakeholders to extend the program and generate data in a consistent format to other state agencies</p> <p>Some money is raised through the sale of recyclable items Section 3.1.2.</p>
13. Public Place Disposal Facilities, Cottesloe Council WA	<p>Targets a range of items but only a few litter streams</p> <p>Preventative mechanism to avoid the occurrence of litter</p> <p>Targets one element of cause but not behaviour</p> <p>Informal visual assessment indicates no change in the level of littering after changing from several scattered bins to highly visible centralised bin stations</p>	<p>Potential for more research into most effective bin design in different locations to establish best practice</p>
14. Gross Pollutant Traps (GPTs), Randwick City Council	<p>Physically removes litter from the environment</p> <p>Is a clean up mechanism only for certain items in limited streams</p> <p>Does not target cause or behaviour</p>	<p>Local Government generally incurs the cost of GPTs, however there is some scope for state government assistance</p> <p>Infrastructure costs and ongoing maintenance needs fees would require ongoing budgeting</p>
15. Municipal Street Sweeping Program, Woollahra Council	<p>Physically removes litter from the environment</p> <p>Is a clean up mechanism only for certain items in limited streams</p> <p>Does not target cause or behaviour</p>	<p>Local Government generally incurs the cost of street sweeping programs, both in terms of investment in appropriate infrastructure and ongoing implementation and maintenance costs</p> <p>Infrastructure costs and ongoing maintenance needs fees would require ongoing budgeting</p>

Further issues to consider in the ranking of mechanisms include:

a) 'State' priorities

The final ranking of mechanisms is an indication of how well the different mechanisms met the collective objectives of the range of stakeholders that all have diverse interests in the litter effect. This has essentially resulted in the more generic mechanisms with a broad coverage gaining the highest ranking.

The result therefore reflects more generic solutions for the state, but does not take into consideration priority options that specifically address prioritised aspects of the litter effect in a given location. There would therefore be merit in further modifying the MCA framework, or developing a series of models, that rank the suitability of different mechanisms in addressing specific litter issues identified on a more localised level. For example, the issue of illegal dumping was often raised by stakeholders so there may be merit in designing an MCA framework that specifically addresses this issue.

b) Financial Costs

The mechanisms were evaluated based on the relative distribution of costs across different stakeholder groups but did not take into consideration the actual cost of implementing the different mechanisms (ie. infrastructure requirements, potential impacts on existing state initiatives) or the existing infrastructure or prevalence in WA. Furthermore, separating costs to Local Government, State Government and / or industry are not directly comparable in terms of establishing an accumulative score for 'best practice', it is simply one groups preference over another's not to have to incur the costs.

As more holistic information is compiled for litter abatement mechanisms, a more effective use of the MCA model would be to rank the actual financial cost of various mechanisms against their relative effectiveness in achieving the desired outcomes. The secondary consideration could then be 'who is likely to incur the cost', particularly when there is potential to share the costs amongst stakeholders in WA. There is scope for flexibility in sharing costs for the majority of approaches to litter abatement, particularly within a group of stakeholders that have already made a pro-active commitment to work cooperatively and share the burden of managing the issue that is litter in WA.

c) Coverage

It is noted that the top seven mechanisms represent the four mechanism categories of Education, Enforcement, Physical Intervention and Producer Responsibility. Implementation of a range of mechanisms will be required to successfully address all aspects of the litter effect, however further research into the extent of the litter issue in WA is required to more accurately establish which mechanisms will be effective for the state.

6 FINAL RECOMMENDATIONS

6.1 What has been determined about the litter effect in WA and managing it?

The preliminary review of the litter effect in Western Australia (WA) and potential mechanisms to address the problem has outlined a number of issues for managers to address. What the project has achieved is a detailed investigation into stakeholder opinions, current programs and available data, which allows for an informed, medium-term approach toward developing a comprehensive litter management strategy for WA. The project has achieved issue identification, most notably:

1. Albeit for different reasons and in different ways, litter is considered a genuine issue by the majority of stakeholders.
2. However, and while further exploration is required, litter would appear to receive a lower priority than other issues with environmental impact, such as hazardous wastes or water pollution.
3. Many stakeholders are primarily concerned with the social (eg, aesthetics and amenity) and economic (eg, clean up costs) dimensions of litter rather than its environmental impact per se.
4. Within the overall litter issue, and although there is limited statistical proof of an increase in the practice, illegal dumping appears to be receiving increasing priority among many stakeholders.
5. A variety of programs currently exist to address the litter effect with most focussed on 'after the fact' aspects rather than the causes and behaviours that result in litter.
6. More than \$16 million per year is currently being spent in WA on anti-litter initiatives by government agencies and non-government organisations (NGOs);
7. The majority of direct costs for litter management are currently borne by Local Government.
8. There is a somewhat of a 'silo effect' occurring in terms of the conduct of anti-litter programs by agencies.
9. The extent, rate, amount, disbursement, and type of litter cannot be absolutely quantified at this stage due to existing data gathering systems that are not comprehensive or comparable.
10. The exact environmental, social and financial impacts of the litter effect cannot be absolutely quantified for the same reason.
11. The current data is not sufficiently quantitative to set clear benchmarks for improvement or to definitively evaluate the effectiveness of implementing litter abatement measures.
12. Many litter abatement mechanisms generally (beyond WA) do not undergo a formal evaluation process to determine effectiveness in achieving the objective of physically reducing litter or substantially altering littering behaviour.

13. Mechanisms that scored best against the evaluation criteria developed by the Project Steering Committee (ie. Tidy Towns, Gould League Waste Wise Schools Program, Clean Up Australia Day, NSW litter legislation and Western Sydney Illegal Dumping Squad) tended to feature a holistic approach that addressed causes, behaviours, items and streams within the litter effect. The result therefore indicates more generic solutions for the state, but does not take into consideration priority options that specifically address different aspects of the litter effect in a given location.

6.2 Where to from here?

At present, there is simply no concrete rationale for concluding that WA does or does not need a radically different approach to litter management and there is no substantive way to recommend a specific approach. However, this is not to suggest that further action is not required, as stakeholders clearly see litter as an issue and it undoubtedly has real (but difficult to quantify) environmental, social and financial impacts.

For WA litter effect stakeholders to collectively decide on a final strategy for litter abatement and the appropriate blend of mechanisms (including potential new ones) to use, several outcomes need to be first achieved. At the same time that WA litter effect stakeholders are developing their final strategy for litter abatement, several initiatives can be taken in terms of continual improvement of current WA litter abatement efforts. In fact, the continual improvement of current efforts can compliment the process of deciding what is ultimately the best approach for WA.

The forward path presented here for the development of an overarching litter abatement strategy for WA considers several aspects identified during the project:

1. *Stakeholder perspectives about the litter effect – what stakeholders know about and/or perceive about the litter effect and what they think is important to do.*

According to their agencies' role, constituency and area of activity, different stakeholders interpret the litter effect in different ways. It will be important to work toward a more common and shared understanding of the problem at hand.

2. *Availability of objective information about the litter effect – what is and is not factually established about the quantitative and qualitative aspects of litter, littering, and litter abatement mechanisms.*

The project has determined that there is a lack of objective and/or comprehensive data about the litter effect in WA. This is the case for a variety of both institutional and methodological reasons. It will be important to work toward a more robust way of consistently and reliably identifying the litter effect on a state-wide basis. Establishment and multi-stakeholder endorsement of an appropriate methodology would constitute significant national leadership on the litter effect.

3. *Current WA litter abatement program capacity – what currently occurs.*

A variety of agencies and players currently contribute to litter management in WA. The project has also identified gaps in coverage by current programs including a lack of emphasis on causes and behaviours and some litter streams, as well as an apparent lack of coordination. A realistic forward path needs to acknowledge the gaps and address coordination aspects in order to be successful.

4. *Australian and international best practice – what occurs elsewhere and could occur in WA.*

The overview of existing practices from other Australian and international settings has been undertaken and shown that proof of effectiveness is lacking, as is detailed cost information. In going forward, it is therefore important for WA litter effect stakeholders to show leadership and undertake their own actions to objectively determine: a) how much litter / littering behaviour is reduced / improved by a given initiative; and b) how much does an initiative cost and how can it be distributed.

5. *A repeatable assessment framework – a way of deciding on what is most suitable for WA.*

The forward path needs to feature an accepted way of revisiting mechanisms, especially as more factual information about them is gathered. A Multi Criteria Analysis (MCA) framework has been established by the project. There are many more mechanisms that could be assessed using the MCA framework and the assessment can also be improved as more quantitative information comes to light.

The MCA framework can also be modified to incorporate additional evaluation criteria and different weightings to reflect localised priorities in WA.

Fundamentally, the forward path needs to feature the following components:

- *Structure* – how the development a WA litter abatement strategy is to be managed;
- *Information* – on what basis should the WA litter abatement strategy be developed; and
- *Programs* – how the WA litter abatement strategy will be delivered.

In light of available resources, the forward path toward the overall end point of developing an overarching WA litter management strategy is presented over a three-year timeframe. However, this could well be expedited if that is the collective will of stakeholders.

6.3 WA Litter Abatement: Forward Path

Table 6-1: WA litter abatement forward path summary

Timeframe	Target
YEAR 1	Establish appropriate multi-stakeholder forum for developing a WA Litter Abatement Strategy and overseeing all relevant development tasks (<i>Structure</i>)
	Seek optimal performance – through greater inter-agency coordination and innovation - of existing programs (<i>Programs</i>)
	Develop clear State-wide methodology to both measure current litter effect and provide benchmark information on relative effectiveness of litter abatement mechanisms (<i>Information</i>)
	Develop more refined problem definition among all stakeholders based on more comprehensive factual base (<i>Information</i>)
	Achieve stakeholder consensus about problem and outcomes that are sought (<i>Information</i>)
	Identify and prioritise small scale litter abatement trials (<i>Programs</i>)
	Explore synergies with other State-based programs that could have litter on their agenda (<i>Information</i>)
YEAR 2	Implement small scale trials of new litter abatement initiatives (<i>Programs</i>)
	Develop database for program information storage (<i>Information</i>)
	Develop guidelines to specifically assist Councils incorporating litter management strategies in waste management plans (<i>Programs</i>)
YEAR 3	Conduct evaluation of litter abatement trials using data from methodology and MCA framework (<i>Information</i>)
	Further evolve the ‘litter effect’ model and understand how it applies to different parts of the state (<i>Information</i>)
	Develop resources and guidelines on best practice litter abatement options for different circumstances (<i>Programs</i>)
	Finalise WA Litter Abatement Strategy including overall litter reduction goal and associated environmental, social, policy and institutional objectives (<i>Information</i>)
	Consider review of legislative framework (<i>Structure</i>)

6.3.1 Establish appropriate multi-stakeholder Task Force for developing a WA Litter Abatement Strategy and overseeing all relevant development tasks

a) Why?

- Litter management is undertaken by a variety of agencies in WA. Each of these agencies has knowledge and perspectives to contribute to the Strategy. An on-going Task Force provides the opportunity for this to occur.
- While developing the Strategy, the Task Force can also seek to promote greater co-operation and co-ordination in the on-going conduct of current litter abatement programs. This will reduce the potential for duplication and/or the allocation of resources in less than optimal ways.
- Co-ordinative bodies for litter management are increasingly prevalent in other Australian States. One example is the Victorian Litter Action Alliance (VLAA). It is the peak body for litter management in Victoria. It was formed in April 2000 to coordinate the implementation of programs to combat the litter problem in Victoria through a co-ordinated and consistent approach across state and Local Government agencies and the community and industry sectors. The members of the VLAA are: EPA Victoria, Parks Victoria, Melbourne Water, City of Melbourne, VicRoads, EcoRecycle Victoria, Municipal Association of Victoria, Victorian Local Government Association, Plastics and Chemicals Industries Association and BIEC.

b) Who?

- The membership of the Project Steering Committee should serve as the basis for the Task Force with additional membership being drawn from the wider stakeholders identified by the project.

c) How?

- Subject to its current review, Keep Australia Beautiful Council (KABC) would be well placed to facilitate the Task Force, as well as other strategic development tasks, due to its long-term involvement in the issue and its community credibility.
- An alternative approach is facilitation of the Task Force through the newly created Waste Management Board, which looks to play a coordinative role on a variety of waste management aspects in WA.

6.3.2 Seek optimal performance – through greater inter-agency coordination and innovation - of existing programs

a) Why?

- It is important to build on current efforts in the interim period prior to adoption of a final strategy. Once current programs are optimised, it is appropriate to then decide if a new approach is in fact merited.
- The potential for duplication is reduced by greater co-ordination.
- The potential for shared learning and continual improvement is increased by greater co-ordination and innovation. This is particularly so in terms of filling in current gaps in program delivery (eg, greater emphasis on causes and behaviours, as well as some litter streams such as illegal dumps).

- Seeking to improve what currently exists is relatively cost effective and requires little if any legislative change.

b) Who?

- Greater inter-agency co-ordination and its benefits can be pursued through the Task Force.
- Implementation of improvements can be pursued through individual program owners.

c) How?

- Several initiatives can be undertaken through the Task Force to optimise current efforts. These include:
 - Identification of specific issues and priorities and the capacity to quick react across agencies;
 - A register of stakeholder group contacts, available resources, calendar of special litter related events, litter program schedule and other related information;
 - Joint approach to grant program funding;
 - Promotion of approaches to litter management that account for non-English speaking background (NESB) communities;
 - A central focal point for engaging with industry about its role in the litter effect; and
 - Greater multi-stakeholder ‘ownership’ of individual agency initiatives.

6.3.3 Develop and trial clear State-wide methodology to both measure current litter effect and provide benchmark information on relative effectiveness of litter abatement mechanisms

a) Why?

- Litter management – both in WA and virtually everywhere else that the project examined – requires improved decision-making information.
- The project has determined that current ways of measuring the litter effect in WA are non-comprehensive and could benefit from methodological improvement.
- An agreed-to ‘ruler’ is needed to measure and monitor the litter effect and any attempts to improve outcomes.

b) Who?

- Expert consultancy should be engaged to undertake a detailed review of the relative value of current WA and other litter management measurement methodologies and to recommend a preferred approach that best suits WA.
- The Task Force should further develop and test a recommended approach to measurement of the litter effect and then formally adopt it as standard for WA. In NSW, it is likely that a measurement methodology will be enshrined as a part of the legislative framework.

c) How?

- The review should determine the relative benefits of count-based versus behavioural observation-based approaches in more detail.
- The review should determine the appropriate number, type, location and size of data gathering sites and areas on a state-wide basis.

- The review should determine the best way to gather, collate, manage and utilise measurement data.
- Once the appropriate methodology is developed, tested and determined, stakeholders who will need to utilize it as part of their on-going activities should undergo appropriate training in order that results can be generated in an objective and repeatable way.

6.3.4 Develop more refined problem definition among all stakeholders based on more comprehensive factual base

a) Why?

- The litter effect in WA is currently largely defined in anecdotal and stakeholder terms.
- A more objective, quantified definition of the problem enables a better shared understanding and a better capacity to consider solutions. For example, the SA litter management strategy (EPA, 1996) details a number of initiatives in a related regard:
 - Establish a list of items which have the potential to litter;
 - Agree on benchmarks;
 - Set timeframe for performance to benchmarks;
 - Establish statistical sampling which is agreeable to stakeholders;
 - Review benchmarks every two years in consultation with stakeholders;
 - Conduct regular ongoing audits for post consumer litter;
 - Conduct behaviour research on consumer attitudes to litter;
 - Monitor effectiveness of mechanisms used in control and prevention of litter;
 - All potential litterable items to carry anti-litter message on packaging;
 - Inform stakeholders what is being achieved; and
 - Inform stakeholders how much litter control and prevention is costing them.

b) Who?

- The Task Force should consider outcomes from the trial usage of the measurement methodology.

c) How?

- Assessment of outcomes from the trial of the measurement methodologies will lead to insights about the characteristics of the litter effect in WA and provide a clearer picture of where and how to target litter management mechanisms.

6.3.5 Achieve stakeholder consensus about problem and outcomes that are sought

a) Why?

- A variety of stakeholders in WA are involved in litter management activity, often implementing programs in a 'silo' fashion. A degree of consensus about the problem to hand and potential outcomes will improve dialogue about mutual ways forward and potentially reveal cooperative opportunities.

b) Who?

- The Task Force should facilitate a stakeholder engagement process in terms of both developing and trialling the measurement methodology and assessing its initial outcomes.

c) How?

- The stakeholder engagement process should involve the diverse range of Government agency and NGO stakeholders involved in litter abatement programs in WA. Stakeholders should be given an opportunity to understand and own the issues involved in developing an appropriate measurement methodology.

6.3.6 Identify and prioritise small scale litter abatement trials

a) Why?

- Most litter abatement mechanisms – both in Australia and overseas – lack factual evidence of achieving results in physical terms.
- To know what fundamentally works, WA stakeholders would benefit from conducting their own trial interventions and assessing them using the pre-established measurement methodology.
- It would constitute world leadership in litter management to embark on an approach that scientifically seeks to determine effectiveness.
- There are currently gaps in WA litter abatement program delivery that can be addressed.

b) Who?

- The Task Force should develop and co-ordinate a process of identifying and prioritising potential trial interventions to be conducted by a cross section of stakeholder groups.

c) How?

- The MCA framework – or a modified application or version of it – can be used to further prioritise which mechanisms are most suitable for inclusion in trial programs.

6.3.7 Explore synergies with other State-based programs that could include litter on the agenda

a) Why?

- In addition to WA, litter and littering are currently experiencing a significant degree of review-type activity at the state-wide level in several Australian jurisdictions, particularly NSW and Victoria. While there will certainly be differences in WA's experience of the litter effect for a variety of reasons, there will also be commonalities of experience with other jurisdictions.
- Information sharing could lead to improved economies of scale in determining the appropriate approach for WA.

b) Who?

- A coordinated approach to liaison and information gathering on other Australian States' experience should be conducted through the Task Force. KABC's role as facilitator of the Task Force and its natural links to other divisions of KABC provide additional opportunities.

c) How?

- It may be appropriate to consider working toward a National Litter Summit, as there are currently no significant multi-stakeholder national forums or conferences for consideration of relevant issues.
- Regular communication can be initiated with agencies in other States that lead / undertake litter abatement efforts, including Keep South Australia Beautiful (KESAB), EcoRecycle Victoria, the Gould League, Brisbane City Council, Clean Up Australia and the NSW EPA.

6.3.8 Implement small scale trials of new litter abatement initiatives

a) Why?

- See Section 6.3.6 above.

b) Who?

- While the Task Force should play a coordinative role in order to ensure consistency of roll-out, particularly in terms of ensuring application of the standardised measurement methodology, the actual trials should be conducted by agencies currently conducting litter abatement programs in WA.

c) How?

- Stakeholder ownership of the trials and involvement in their measurement and evaluation will motivate optimum performance.
- The implementation aspects of potential legislative and enforcement measures - be it Container Deposit Legislation (CDL) or stronger policing of higher fine levels - can be equally trialled. (In the first respect, country-based trials of container deposit return systems as litter management mechanisms could be useful in objectively testing potential environmental, social and financial costs and benefits. Clarity would be required in terms of reference, as CDL could also be trailed from a broader perspective, eg, its overall resource recovery aspects rather than a narrower focus on litter management).

6.3.9 Develop database for program information storage

a) Why?

- There is a lack of available objective data about the litter effect.
- It is important to create a repository of information about various aspects of the litter effect in WA, including data on litter and littering, data on program evaluation and effectiveness, and other aspects.
- EcoRecycle Victoria is moving to create a database / information capture system for litter in order to facilitate information exchange and to avoid duplication.

b) Who & How?

- The Task Force can facilitate the creation of the database utilising the in-kind support of its membership.

6.3.10 Develop guidelines to specifically assist Councils incorporating litter management strategies in waste management plans

a) Why?

- Local Government is the primary vehicle for litter management in WA.
- Local Government programs in WA are not significantly guided by any ‘best practice’ standards.
- Standardised guidelines will provide Local Government with a tested and sound approach leading to improved litter reduction and cost control outcomes.
- Positive and helpful action can be taken in the short term in providing additional resources to Local Government and assisting Councils comply with the provisions of the (draft) Waste Management Bill 2002, which will require litter management strategies as part of Council Waste Management Plans.
- Similar guidelines and instruction materials have been or are being produced in NSW (Sydney Coastal Councils) and Victoria (EcoRecycle Victoria).

b) Who?

- Project management by the Western Australian Local Government Association (the Association) would enhance the credibility of the guidelines with the target audience.

c) How?

- The guidelines – in step-by-step handbook and resource material form – can be developed based on available information, as well as insights gained through the work of the Task Force.
- The project provides ample materials to start development.

6.3.11 Conduct evaluation of litter abatement trials using data from methodology and MCA framework

a) Why?

- See 6.3.6 above.

b) Who?

- The Task Force has a critical role to play in conducting a centralised and coordinated evaluation that aims at objectively determining effectiveness of mechanisms.
- The evaluation exercise should be transparently conducted and involve stakeholders, particularly program conductors, in order to build confidence in final results.

c) How?

- The adopted state-wide measurement methodology should be used as the ‘final ruler’ for conducting the evaluation. Data from the measurement methodology can be further utilised in the MCA framework developed by this project.
- The MCA framework can also be adapted and refined to: assess a wider range of mechanisms, utilise more quantitative data including actual costs and not only their distributional implications; use a wider array of evaluation criteria, and; adjust weightings to suit stakeholder priorities.

6.3.12 Further evolve the 'litter effect' model and understand how it applies to different parts of WA

a) Why?

- There are limitations in trying to achieve a 'one-size-fits-all' approach to litter abatement across a range of stakeholders with different priorities and budgetary allocations.
- Litter is a different issue to different stakeholders and hence there needs to be greater clarification as to how to target the different aspects of the litter effect, and when the different approaches (or combined approaches) will be most effective.
- Commonly littered items and litter streams are easily identified, however the actual cause and behavioural aspects of littering are more complex and require further investigation to 'prevent' the occurrence of litter.
- The primary area of focus in WA is currently in treating the litter 'outcome' (ie. clean up measures), rather than treating the litter source (ie. cause and behaviour).

b) Who

- The Task Force can facilitate the creation of the MCA models utilising the in-kind support of its membership.
- The MCA model should be further evolved in line with more substantive information on litter abatement mechanisms that work in different circumstances, ie. what works to prevent litter in coastal areas, what works to stop the incidents of illegal dumping etc.

c) How?

- Continue to collate information in a formal database from the outcomes of litter abatement trials, personal interview and observations of littering behaviour.
- More specifically identify and prioritise problems and then feed them back into the resources and strategy process below. For example, keep documented records about littering offenses to help establish more information about the cause (ie. for illegal dumping events record items dumped, distance to nearest landfill, whether it was local resident or business responsible for the incident etc).

6.3.13 Develop resources and guidelines on best practice litter abatement options for different circumstances

a) Why?

- As previously stated, 'the litter effect' is different to various stakeholders that are working to tackle different aspects of the problem across a range of geographic and demographic settings. Individuals are looking for different answers to address their particular area of concern.
- 'Litter' management has been an issue for governments, industry and communities alike for decades, however the low level of documented research and best practice approaches for different situations is still noteworthy.
- Existing efforts to manage litter in WA are somewhat disjointed and there is potential to streamline spending and improve effectiveness of mechanisms if 'best practice options' are developed that address different aspects of the litter effect.

- The development of best practice guidelines, based on concise evaluation and documentation of litter abatement measures, will provide guidance to effectively target the range of stakeholder priorities.
- A suite of resources for what works best in different circumstances will further promote that there is no ‘one-size-fits-all’ approach.

b) Who

- The Task Force should develop the best practice guidelines as a means of formally adopting outcomes from the combined experience of monitoring litter abatement trials.
- Furthermore, a coordinated approach with other Australian States’ experience should be conducted through the Task Force to gather broader understanding .

c) How?

- Develop a list of target issues that require direct attention, ie. illegal dumping.
- Develop a pro-forma template with guidance from existing guidelines, such as the USA EPA Illegal Dumping Guidebook.
- Develop working parties within the Task Force to compile information for different guides based on particular areas of expertise and/or interest and direct experience implementing trials.

6.3.14 Consider review of legislative framework

a) Why?

- The WA Litter Act 1979 is the existing regulatory framework for litter fines in WA, however it is noted that the Act is currently being repealed by the Draft Waste Management Bill 2002, which will further specify that Council Waste Management plans include litter management strategies.
- The conduct of the tasks above may demonstrate that there is a case for further legislative amendment, particularly if there is a will to enshrine mechanisms in legislation, such as EPR-type measures. For example, in the context of planning provisions, consideration could be given to providing local councils with greater planning controls to better address litter on and from construction sites and minimise potential illegal dumping of construction materials. There is some precedent for this in the context of NSW’s ‘Waste Not’ DCP model. Subject to much further analysis, it could take the form of a deposit system whereby a company pays an up-front deposit for waste disposal as a condition of application approval. Money would then be subtracted from the deposit when materials from the building site are appropriately disposed to landfill.
- Additionally, trials of increased enforcement regimes may demonstrate a valid effect that would then have to be transferred into formal legislation. WA litter fines currently rank below those in other jurisdictions.

b) Who & How?

- The State Government is responsible for legislative reform and would wish to undertake extensive consultation on any prospective changes, as they could have significant implications for litter abatement stakeholders.

6.3.15 Finalise WA Litter Abatement Strategy including overall litter reduction goal and associated environmental, social, policy and institutional objectives

a) Why?

- The project underscores that stakeholders perceive litter as an issue of concern.
- Litter management in WA clearly requires an overarching strategic framework consisting of policy, programs, players and resources.

b) Who & How?

- Via its conduct of the above research and policy development tasks, The Task Force will build up a strong understanding of the relevant issues and priorities in order to lead and drive the development of the WA Litter Abatement Strategy.
- It will be crucial to clearly define the specific and measurable environmental, social, policy and institutional objectives that the Strategy is seeking to achieve.

7 REFERENCES

References listed are documents and resources reviewed for the purposes of the project research, but are not necessarily cited in the report.

7.1 Reports & Journals

ABA Journal (2001) "*Trashy ticket: civic minded citizen seethes*". (87) June. Chicago USA.

American City and Country (1999) "*L.A. Targets polluters with ad campaign*". Volume 114, Issue 6. Pittsfield USA

Anon (2002) "*Container Deposit Legislation*".

BIEC & Community Change Pty Ltd (2001) "*Littering Behaviour Study III. Measuring Environmentally Desirable Change in Australia*". BIEC, Sydney.

BIEC & Community Change Pty Ltd (1998) "*What works? NSW Littering Behaviour Interventions*". BIEC, Sydney.

BIEC & Community Change Pty Ltd (1997) "*Understanding Littering Behaviour: a Review of the Literature*". BIEC, Sydney.

Clean Up Australia (1999) "*Rubbish Report Overview*". Clean Up Australia, Sydney.

Container Recycling Institute (2002) "*Bottle Bill Resource Guide*".

Cork Litter Management Plan (2002) "*Action Against Litter*".

Deweese, D. (1998) Comment on Palmer, Sigman & Walls. "*The Cost of Reducing Municipal Solid Waste*". Department of Economics, University of Toronto, Canada.

EcoRecycle Victoria (1999) "*Yearly Report on Statewide Litter Surveys*". EcoRecycle Victoria, Victoria.

EcoRecycle Victoria & Resource NSW (1999) "*The 7 Steps to a Waste Wise Event*".

EPA Victoria (2001) "*The Statutory Framework for Litter in Victoria*". EPA Victoria, Melbourne.

Huffman, K., Grossnickle, W.F., Cope, J.G. & Huffman, K.P. (1995) "*Litter Reduction: A Review and Integration of the Literature*". *Environment and Behaviour*, Vol. 27, no 3, pp.153-183.

Institute for Sustainable Futures (2001) "*Independent Review of Container Deposit Legislation in NSW. Final Report, Volume II*". UTS, Sydney.



Jamal, N. “*Councils get Serious about Butt Discarders*”. Sydney Morning Herald, (Wednesday 10th October, 2001)

KESAB (1995) “*The Current Status of Litter in South Australia and the Impact of Container Deposit Legislation on Litter Reduction*”. KESAB, South Australia.

Keep Australia Beautiful National Association (1996) “*Looking at litter...whats being done about it. A survey of litter in Australia*”. KABNA, Adelaide.

Keep Australia Beautiful National Association (1994) “*Looking at litter...whats being done about it. A survey of litter in Australia*”. KABNA, Adelaide.

Keep Australia Beautiful National Association (1992) “*The litter stream – its content, sources and dynamics*”. KABNA, Adelaide.

Litter Research Association (1990) “*Recycling Beer and Soft Drink Containers: Issues and Options*”. Litter Research Association, Sydney.

Local Government Association of Queensland (2001) “*Councils to Issue Fines for Waste Dumping*”.

McGregor, I. & Eltridge-Smith, F. (1994) “*Litter Management Research, Stage 3. Local Government Controls, Regulations and Expenditure on Litter Management*”. McGregor Marketing, Australia.

McGregor, I., Truscott, M. & Starck, N. (1994) “*Summary of Litter Attitudes. Research Among Consumers, Retailers, Manufacturers and Local Government about Litter Management*”. McGregor Marketing, Australia.

Miller, C. (2001) “*Mandatory Garbage*” Waste Age, Overland Park, Vol 32, Issue 10. USA

National Center for Environmental Decision-Making Research (NCEDR) (2002) “*Decision Maker’s Guide to Controlling Litter and Illegal Dumping*”.

Public Works (1997) “*The Olympic Task of Litter Control*”. Vol 128. (Author Anonymous).

Reams, M.A. Geaghan, J.P. & Gendron R.C. (1996) “*The Link between Recycling and Litter – a Field Study*”. Environment and Behaviour, Vol 28.

Reeve, I., Ramasubramian, L., McNeill, J. (2000) “*Lessons from the literature. A Review of New South Wales and Overseas Litter Research*”. The Rural Development Centre, Armidale.

SA EPA (2000) “*Beverage Litter Charts 1998 – October 2000*”. Environment Protection Agency, South Australia.

SA EPA (2002) “*Container Deposit Legislation*”. Environment Protection Agency South Australia, Adelaide.



SA EPA (1996) "*Litter! Its your choice*". Public discussion paper. Environment Protection Authority South Australia, Adelaide.

Stutz & Gilbert (2000) "*Michigan Bottle Bill, A final Report to: Michigan Great Lakes Protection Fund*". Michigan Great Lakes Protection Fund

Sucato, K. (2002) "*A Fight to Restore Clean up Money*". New York Times, 27 January Late Edition, USA.

Williams E., Curnow R. & Streker P. (1997) "*Understanding Littering Behaviour in Australia*". BIEC, Sydney.

7.2 Internet Resources

Beverage Industry Environment Council Litter Prevention Award – details of entry

www.kabnsw.org.au/resources/BIEC_litter.pdf

Bray (Ireland) Litter Management Plan Action against litter 2001-2004

www.bray.ie/brayudc/litter2.htm

Coca-Cola Amatil

www.ccamatil.com

Clean Up Australia - getting involved, news and information

www.cleanup.com.au

Container Recycling Institute - reports, press releases, news and information

www.container-recycling.org/

Container Deposit Legislation - site containing information on benefits of CDL and supporters

www.geko.net.au/~gargoyle/CDL/

Container Recycling Institute USA - information on bills relating to CDL

www.bottlebill.com

Cork City Council (Ireland) - litter management program

www.corkcorp.ie/services/depts/litterplan_action.html

Department of Environmental Quality, Michigan State - links to news, information and press releases

www.deq.state.mi.us/ogl/michigan_bottle_bill.htm

EcoRecycle Victoria Litter Prevention and Control

www.ecorecycle.vic.gov.au/frames_litter.asp

EPA NSW Website – litter facts, laws and information

www.epa.nsw.gov.au/litter/

EPA NSW Website – campaign resource kit

www.epa.nsw.gov.au/litter/council_kit/

EPA SA Website – container deposit legislation overview

www.wastecom.sa.gov.au/wmc/FactSheets/cdl.html

EPA Victoria Website – litter site, report littering, laws and information

www.epa.vic.gov.au/Litter/

Florida Center - publications on litter

www.floridacenter.org/publications/litter_pubs.htm

Journal of Behaviour Analysis - abstracts on litter

www.envm.ed.rochester.edu/htbin/jabaif?mb=litter+&mc=100&in=jaba_Tindex

Keep America Beautiful - Home Page

www.kab.org/

Keep Australia Beautiful NSW - Home Page

www.kabnsw.org.au/

Keep South Australia Beautiful – Environmental Solutions

www.kesab.asn.au/

Making Coastal Clean-Ups Count

www.surfrider.org/makingwaves4/coastal_cleanups.htm

Michigan Bottle Bill – final report

www.deq.state.mi.us/documents/deq-water-greatlakes-protection-michiganbottle.pdf

Motor Traders Association of WA - Green Stamp program site

www.mtawa.com.au/greenstamp.htm

National Center for Environmental Decision Making Research – illegally dumped litter

www.ncedr.org/guides/litter/introduction.htm

Organisation for Economic Co-operation and Development

www.oecd.org

Packaging Council of Australia - Issues Paper on Litter

www.packcoun.com.au/issues11.html#thelitterstream

PA CleanWays Working for cleaner ways in Pennsylvania - fighting littering and illegal dumping

www.pacleanways.org

Precinct Planning Project for the Swan and Canning Rivers

www.wrc.wa.gov.au/srt

The Urban Bushland Council WA Inc - information site

www.members.iinet.net.au/~ubc/



APPENDIX