Cost-Benefit Analysis of Economic Instruments for Waste Management

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Executive Summary

Background

In October 2007, the Queensland Government Environmental Protection Agency (EPA) published a discussion paper *'Let's Not Waste Our Future'* which identified a need to develop a new waste management strategy for Queensland.

The Local Government Association of Queensland (LGAQ) recognises the need for a Queensland waste management strategy that includes policies that make the most efficient use of resources and maximise net benefit to the community, and commissioned the AEC Group Ltd to undertake a Cost-Benefit Analysis (CBA) of the economic instruments outlined in the discussion paper. The seven instruments assessed include:

- Performance-based landfill levies;
- Container deposit legislation;
- Regulations (additional instrument not outlined in the discussion paper);
- Targets and bans;
- 'Pay as You Throw' (PAYT) schemes;
- Extended producer responsibility (EPR) and product stewardship schemes (PSS); and
- Incentives/education (additional instrument not outlined in the discussion paper).

CBA Outcomes

It would be inappropriate for Queensland to simply follow other states and territories in terms of the economic instruments adopted, particularly given the Productivity Commission's recent finding that some of these instruments appear ineffective in achieving real community benefits and actually place a significant burden on the community. These findings are consistent with the outcomes of this CBA, which are outlined in the following table.

The CBA shows that the most attractive economic instruments include incentives/education (best economic outcome), regulations (best environmental outcome) and EPR and PSS (best social outcome). The least attractive economic instruments include PAYT schemes (worst economic outcome), CDL (worst environmental outcome) and a performance-based landfill levy (worst social outcome).

Table E.1: CBA Impact Ranking Across the Triple Bottom Line (1 being best)

Economic Instrument	Economic	Environmental	Social	TBL Average
Performance-Based Landfill Levy	Moderate to High Cost (2)	Negligible to Low Benefit (4)	High Cost (6)	4.0
CDL	Moderate to High Cost (2)	Negligible to Low Cost (6)	Negligible Impact (4)	4.0
Regulations	Moderate to High Cost (2)	Moderate to High Benefit (1)	Low Benefit (3)	2.0
Targets and Bans	Not Applicable	Not Applicable	Not Applicable	n.a.
PAYT Schemes	High to Very High Cost (6)	Very Low to Low Benefit (4)	Low to Moderate Cost (5)	5.0
EPR and PSS	Moderate to High Cost (2)	Moderate Benefit (2)	Moderate Benefit (1)	1.7
Incentives/Education	Low to Moderate Cost (1)	Low to Moderate Benefit (3)	Low to Moderate Benefit (2)	2.0

Key Findings

Performance-Based Landfill Levy

The analysis found that a performance-based landfill levy would result in a moderate to high financial/economic cost to the community, primarily due to additional infrastructure requirements and levy administration, as well as significant market distortion effects. Such a policy would also only result in negligible to low environmental benefit, and would actually result in a high social cost due to significant wealth transfer effects (from regional, rural and remote areas) and cost of living impacts. A performance-based levy would only be equitable and not create significant market distortion effects if it was set at a level to reflect an accurate estimate of downstream social and environmental

externality costs, not impose constraints on the landfill license holders that are not applied to the waste sector more generally, and levy funds were only used to mitigate or directly offset such costs in the location in which they are collected.

CDL

The analysis found that a CDL scheme would result in a moderate to high financial/economic cost to the community, primarily due to the requirement to establish and staff large numbers of container return depots. Such a policy may also result in a low environmental cost due to the additional transportation requirements to deliver containers to depots relative to a kerbside recycling scheme. Social impacts were found to be negligible.

Regulations

The analysis found that tighter landfill regulations would result in a moderate to high financial/economic cost to the community, due to the additional costs associated with upgrading existing landfills to meet the regulations, the potential closure of some waste facilities if unable to meet the regulations and the additional enforcement/compliance requirements of the regulator. Despite this relatively high cost, environmental benefits would also likely be moderate to high, primarily due to increased gas capture (and reduced GHG) and other 'good practice' environmental control measures. Low social benefits would also be achieved as landfill sites are upgraded to minimise public health risks and intergeneration and regional equity is promoted through localised solutions (i.e. regulations are found to be more effective in dealing with externalities and risks directly at a local level).

Targets and Bans

No CBA was undertaken for targets and bans, as targets should act as performance indicators and comparative measures only rather than drive policy decisions. High-level targets and bans are likely to ignore economic, environmental and social outcomes as they tend to drive policy decisions toward reducing waste to landfill at all costs, instead of implementing policies that will maximise community net benefit. Under targets and bans, governments will generally adopt as many policies as possible in order to scramble to meet the publicly announced target, often at considerable expense to the community. Targets and direct comparisons with other states are also likely to fail to recognise the unique characteristics of Queensland's regional, rural and remote communities.

PAYT Schemes

The analysis found that a weight-based PAYT scheme for kerbside collection would result in a high to very high financial/economic cost to the community, due to the need to upgrade the bin stock to incorporate microchips, upgrade rating software and cater for increased complaints handling. Costs would also be incurred in dealing with increased illegal dumping and other perverse behaviour. This significant cost would only achieve a very low to low environmental benefit due to a potential reduction in the volume of waste disposed to landfill and associated GHG benefits. However, a low to moderate social cost would also be incurred, with any positive impacts associated with potential reductions in the volume of waste sent to landfill overshadowed by the impacts on cost of living from facilitating the scheme and the additional risks of illegal dumping.

EPR and PSS

The analysis found that the overall net benefit associated with EPR and PSS depends on the scope of the scheme and the products covered, and whether the schemes are administered at a national level. There is the potential for moderate environmental and social benefits, due to the ability to target certain waste items that are either potentially hazardous or have significant resource value. Intergenerational equity is also enhanced as problem wastes are dealt with now. Such schemes are likely to come at a moderate to high financial/economic cost to the community.

Incentives/Education

The analysis found that incentive programs and education would incur low to moderate financial/economic costs for the community, primarily relating to advertising expenditure and the funding of incentive programs. Such programs have the potential to achieve low to moderate environmental and social benefits as they are able to target specific problem

waste items, reduce GHG (if organic waste is targeted), and targets behavioural change and reuse at the local level.

POLICY RECOMMENDATIONS

- **REC1:** That rigorous CBA drive decision-making for the new waste management strategy, with the overarching principle of maximising net community benefits, i.e. ensuring measurable environmental and social benefits can be achieved without imposing a significant financial cost on the community.
- **REC2:** That the new waste management strategy appropriately recognise that the application of potential solutions for metropolitan areas and other states may not be directly applicable to regional, rural and remote areas given the unique characteristics of Queensland regions.
- **REC3:** That, while the downstream externality impacts of landfills (e.g. GHG emissions, leachate contamination risks, amenity issues) should be considered during project/policy assessment and price setting, GHG externalities would be more appropriately dealt with through a national carbon framework rather than via a levy that only applies to the landfill sector.
- **REC4:** That upstream externality impacts (e.g. impacts of base resource extraction and production) should be dealt with by direct policies on production processes rather than at the waste disposal stage.
- **REC5:** That a performance based landfill levy should not be implemented as it would result in a considerable financial/economic and social cost to the community for minimal benefit.
- **REC6:** That a CDL scheme should not be implemented as it would result in a considerable financial/economic cost to the community and could actually have negative environmental impacts due to duplicated recycling efforts and increased transportation.
- **REC7:** That additional regulation and enforcement should be implemented as an appropriate economic instrument, focusing on:
  - Tightening landfill licence requirements for new landfills;
  - Reviewing landfill licence requirements for existing landfills of a certain size;
  - Assessing the appropriateness of mandating recycling for all properties located within areas where such services are already provided, are found to be feasible and markets exist;
  - Introducing compulsory waste management plans for commercial and industrial properties and construction activities; and
  - Reviewing existing policies and legislation to ensure that unnecessary regulatory barriers that may inhibit recycling or reuse of materials are removed.
- **REC8:** That targets should not be implemented on a broad scale to drive waste management policy and instead only be used as performance measures for particular waste items or streams, given that maximising community net benefit should be the primary objective, and that any target-setting and performance monitoring recognise underlying data limitations and the unique characteristics of Queensland's regional, rural and remote areas.
- **REC9:** That weight-based charging (PAYT) for kerbside collection should not be implemented due to significant capital and operating cost requirements of facilitating the scheme (and resulting impact on cost of living for the community), the potential for perverse behaviour and illegal dumping, and the limited impact such a policy is likely to have on the volume of general waste disposed.
- **REC10:** That basic PAYT schemes such as offering different bin sizes should not be implemented due to cost implications and the negligible impact it would have on the volume of general waste disposed, but that consideration be given to reducing the bin size for a 'normal' service over time to overcome the attitude of not getting value for money if the bin isn't full each week.

- **REC11:** That PAYT should be implemented at all landfills for self-haul waste, subject to cost effectiveness where weighbridges are not installed or sites are not supervised, and that all current subsidies applying to self-haul waste at landfills be removed (subject to potential Community Service Obligations to reflect community affordability in high cost, low volume rural and remote landfills).
- **REC12:** That EPR and PSS should continue to be investigated and implemented where considered beneficial to ensure that externality costs are included as much as possible at the product purchase stage rather than borne by the broader community at the product disposal stage, and that Queensland should work towards a nationally coordinated approach to EPR and PSS to remove the requirement on manufacturers, consumers and recyclers to comply with different provisions in different jurisdictions.
- **REC13:** That incentive schemes targeting selected problem wastes or large waste streams should be implemented, possibly including:
    - Reducing organic waste disposed to landfill and increasing onsite reuse via compost bin and mulcher subsidies; and
    - Reducing green waste disposed to landfill by including an optional green waste bin as part of the municipal waste servicing program.
- **REC14:** That education and awareness campaigns should be implemented in an attempt to achieve behavioural change for consumers and waste generators and provide information regarding appropriate and environmentally friendly waste management practices
- **REC15:** That the Queensland Government should produce a clear set of guidelines for waste service pricing for local governments to ensure prices are set on the basis of full cost recovery and/or opportunity cost (i.e. marginal cost associated with next waste disposal solution).
- **REC16:** That the new waste management strategy should focus on dealing with waste at the source (i.e. during the production process) rather than via indirect measures.
- **REC17:** That the new waste management strategy should undertake detailed investigations into the real impediments to additional recycling activity across Queensland's regional, rural and remote areas, and identify the subsidies that may be required (and resulting community financial costs) to make recycling viable in these areas.
- **REC18:** That the new waste management strategy should assess the social and environmental implications of increased recycling activity in these areas, relating to issues such as energy use/carbon emissions in transporting recyclables and recycling products to end markets, amenity, noise, congestion and safety, so that a true comparison can be made to landfilling.
- **REC19:** That the new waste management strategy should consider the underlying policies and economic instruments associated with the recent successes regarding water use efficiency, particularly in South East Queensland, which included a combination of the following:
    - Regulation through water restrictions and mandated water management plans for commercial and industrial customers;
    - Provision of incentives through subsidies for rainwater tanks, showerheads, household waterwise plumbing services, etc.;
    - Education and awareness campaigns;
    - Pricing reflective of full cost at a local level (not through artificial pricing); and
    - Funding programs out of state general revenue rather than via artificial levies.

POLICY OUTCOMES

Given the CBA outcomes and the above recommendations, a potential combination of appropriate economic instruments to consider as part of the new waste management strategy for Queensland may include:

1. ***Effective Regulation*** – potentially including landfill licensing and enforcement, mandated recycling for commercial and industrial properties in areas where recycling is found to be feasible and collection already occurs as part of the municipal system, the requirement for commercial and industrial properties and construction activities to have waste management plans in place to minimise waste generation and disposal, and the removal of any unnecessary regulatory barriers to recycling activity.

2. ***Incentives*** – potentially including compost bin and mulcher subsidies and optional green waste bin servicing as part of the municipal waste servicing program.

3. ***Education*** – education and awareness campaigns focusing on 'selling' waste minimisation to the community and enhancing awareness over recyclable waste products, the possible phasing in of smaller general waste bins to each household to overcome the attitude of not getting value for money if the bin isn't full each week, as well as assistance with waste avoidance planning for commercial and industrial properties and construction activities (particularly for small to medium enterprises and operators).

4. ***EPR and PSS*** – schemes considered beneficial to ensure that externality costs are included as much as possible at the product purchase stage for targeted products rather than borne by the broader community at the product disposal stage, with Queensland working towards a nationally coordinated approach.

5. ***Pricing Guidelines*** – development of pricing guidelines for waste services by the Queensland Government for local governments, including appropriate landfill costing procedures and the removal of pricing subsidies for waste services.

The CBA shows that policy would be most effective if it directly targets problem waste streams or waste streams where there is potential for considerable gains in terms of recycling, rather than applying an indirect blanket policy aimed at propping up the recycling industry. Looking to the future, policy should aim to address waste problems at the source, particularly given that most consumers have little choice over how a product is manufactured and packaged, and therefore little control regarding their overall waste generation patterns.

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1. Introduction

1.1 Background to the Study

1.1.1 Current Queensland Waste Management Strategy

The primary objective of the current Waste Management Strategy for Queensland (released in 1996) is to:

> …provide a framework for effectively managing waste to minimise or avoid adverse impacts on the environment, while at the same time allowing economic development and improving Queenslanders' quality of life. (EPA 2007, p.28)

1.1.2 Discussion Paper to Inform Future Queensland Waste Strategy

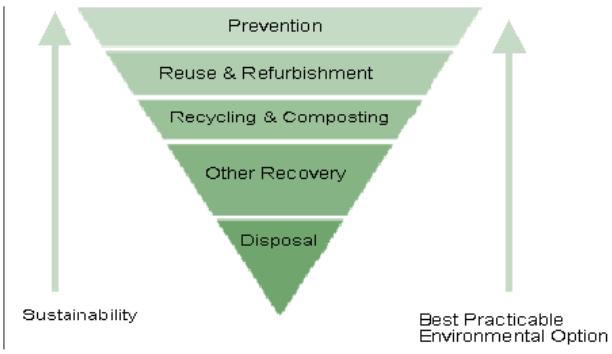
In October 2007, the Queensland Government Environmental Protection Agency (EPA) published a discussion paper *'Let's Not Waste Our Future'* which identified a need to develop a new waste management strategy for Queensland featuring the following objectives:

- Provide a clear public expression of the Government's priorities in relation to waste policy.
- Ensure that all sectors follow a coherent and united direction on waste in their many spheres of waste-related activity.
- Enable government, business and community to operate confidently in a changing environment.
- Establish an outcomes-based approach to waste management without rejecting any proven waste management technology.
- Provide a strategic context for Queensland's waste-related activities, which embrace not only waste planning, disposal and minimisation but also economic development, community safety and promotion of community-based environmental projects.
- Contribute to a safer, cleaner and healthier environment, and help to reduce greenhouse gas emissions in the light of rising concerns over climate change.
- Meet expectations from government that local governments have clear strategic statements concerning their approach to waste and ensure that waste is considered at all levels of planning. (EPA 2007; p.25)

The above objectives appear difficult to measure and seem to simply be an extension of the primary objective of the current waste management strategy. The discussion paper, however, subsequently states that the focus will now be on avoiding the generation of waste in the first place, recovering for reuse and recycling for energy for those wastes that cannot be avoided, and managing any residuals to landfill. A further objective appears to be a move towards the waste policies adopted in other states and territories.

In fact, the content, structure and positioning of the discussion paper appears to be strongly focused around the so-called 'waste hierarchy', which is replicated below.

Figure 1.1: Waste Hierarchy



EPA 2007; p.26

This is confirmed by the fact that the discussion paper goes further to highlight the following outcomes of a new Queensland waste management strategy:

- Waste generation is avoided in the first instance. This means that:
  - People will be more aware and consume less, make sustainable purchasing and management choices and dispose of their waste responsibly; and
  - Products will be designed so they can be recycled and with the waste hierarchy in mind.
- Waste that cannot be avoided is reduced.
- Resources are recovered and reused or recycled where sustainable.
- Residual waste is managed through best practice systems.
- There is increased certainty for business and government investment in innovation and technology. (EPA 2007; p.27)

Indirectly, the following outcomes are also proposed, as indicated by the Minister for Sustainability, Climate Change and Innovation in the message at the start of the discussion paper:

- Sending the correct pricing signals to reduce the amount of waste being created and encourage reuse, recycling and recovery of resources;

- Providing appropriate pricing signals to consumers and producers to demonstrate that the more waste they create, the higher the price they must pay; and

- Encouraging investment, developing opportunities and providing greater certainty for the waste sector, in particular the recycling industry.

As part of the new waste management strategy for Queensland, a series of economic instruments are proposed for potential implementation to achieve the above objectives and outcomes, including:

- Performance-based landfill levies;
- Container deposit legislation (CDL);
- Targets and bans;
- 'Pay as You Throw' (PAYT) schemes; and
- Extended producer responsibility (EPR) and product stewardship schemes (PSS).

1.1.3 Productivity Commission Report

The Queensland Government paper followed the publication in October 2006 of the *Waste Management Productivity Commission Inquiry Report*, which reviewed historic policy decisions across the states and territories of Australia and provided a series of recommendations on the most appropriate means by which waste management policy decisions should be made into the future. Overall, the Commission advised on waste generation, resource efficiency, and strategies to address market failures and externalities associated with the generation and disposal of waste within Australia.

The report found that most states and territories were placing too great a focus on reducing the amount of waste generated and sent to landfill at all costs, instead of balancing such significant policy decisions against economic, environmental and social implications. The end result was that the report indicated that there are likely to be net costs to the community from current waste policies adopted across Australia, which have primarily been based on the adoption of the waste hierarchy as the primary objective of policymaking. Landfill levies, in particular, were found to be "unsound interventions" that were ineffective in achieving community benefits.

The most significant recommendation of the Productivity Commission report was to provide direction to state and territory governments that waste management policy decisions should be subject to comprehensive cost-benefit analysis covering financial/economic, environmental and social outcomes, with net benefit to the community adopted as the guiding principle when deciding between waste management policy options.

1.2 Purpose of this Study

The Local Government Association of Queensland (LGAQ) recognises the need for a Queensland waste management strategy that includes policies that make the most efficient use of resources and maximise net benefit to the community, and has commissioned the AEC Group Ltd to undertake a Cost-Benefit Analysis (CBA) of the economic instruments outlined in the *'Let's Not Waste Our Future'* discussion paper.

Using cost-benefit analysis techniques, this report seeks to identify the most appropriate economic instruments, in the Queensland context, that maximise net community benefit, as well as reporting on those instruments likely to result in net costs to the community and/or perverse waste management/disposal behaviours. The report is undertaken at a high level and assumes each instrument is applied on a state-wide basis, as well as assessing local impacts where possible.

1.3 Report Structure

The report employs the following structure:

- **Chapter 1: Introduction**
  Provides some background on Queensland's current waste management strategy, as well as the defined objectives of any new strategy, a brief commentary on the implications of the recent Productivity Commission report, as well as the purpose of this study.

- **Chapter 2: Review of Economic Instruments**
  Discusses each of the economic instruments identified in the EPA discussion paper, including instrument description, objectives, current application elsewhere in Australia, and some of the lessons learnt from the application of economic instruments in other jurisdictions.

- **Chapter 3: Queensland Context**
  Considers the Queensland context, in terms of existing waste streams and levels of recycling compared to national benchmarks, as well as discussing some of the 'issues' highlighted in the EPA discussion paper.

- **Chapter 4: CBA of Economic Instruments**
  CBA techniques are used to assess the financial/economic, environmental and social impacts of each of the economic instruments, as well as considering potential impacts from the perspective of local government.

- **Chapter 5: Conclusions and Recommendations**
  Summarises the findings of the CBA and makes recommendations as to the most appropriate and effective economic instruments that will maximise community benefit.

Appendices are used to provide more detailed evaluations of specific issues.

2. Review of Economic Instruments

2.1 Economic Instruments Under Consideration

The EPA discussion paper identifies five economic instruments that could possibly be employed as part of a new waste management strategy. The paper states that economic instruments alone are unlikely to achieve all of the strategy's objectives, but that they are still expected to play a central role. For the purposes of this study, regulations and incentives/education are also included.

The seven instruments considered in this study therefore become:

- Performance-based landfill levies;
- CDL;
- Regulations;
- Targets and bans;
- PAYT schemes;
- EPR and PSS; and
- Incentives/education.

This chapter discusses each of the above economic instruments, including instrument description, objectives, current application elsewhere in Australia, and some of the lessons learnt from the application of economic instruments in other jurisdictions.

2.2 Performance-Based Landfill Levies

2.2.1 Instrument Description

Landfill levies are fees that the license holder for a landfill site must pay for each tonne of waste deposited. Although the landfill license holder pays the levy to the relevant authority, the additional cost is usually passed back to the waste generator either directly via higher gate fees for disposal or indirectly via higher waste management charges for kerbside waste collection. Where Councils do not pass on the cost of higher disposal fees to waste generators, the general community will be impacted by the need to fund any shortfall in waste operations out of higher general rates.

Landfill levies are generally applied uniformly across all waste generators irrespective of the type of waste being dumped and/or the technology used at the landfill, although differential levies may be applied depending on the type of generator (i.e. household vs commercial), whether the waste is inert, organic or hazardous, the location of the landfill, and the performance of the landfill.

Performance-based levies, as proposed in the EPA discussion paper, would likely involve higher levies for those landfills not adopting 'good practice', which may include a levy 'discount' to landfills demonstrating good performance in the following areas:

- Promotion of schemes for identified priority wastes and end-of-life products;
- Recycling schemes (e.g. metals, green waste); and
- Other environmental performance criteria such as landfill gas capture, leachate collection and liner systems (suitable to the size, location and type of landfill).

2.2.2 Instrument Objectives

Generally, landfill levies attempt to:

- Reflect the downstream (social and environmental) externality costs of landfill sites, including greenhouse gas (GHG) emissions, potential leachate contamination, and loss of amenity for residents and businesses located near a landfill;

- Reflect the upstream (social and environmental) externality costs of landfill sites, including the loss of resources, both in terms of the waste being deposited and the virgin materials that may be substituted by recycled inputs;

- Work to increase the cost of landfilling and therefore increase the attractiveness and competitiveness of recycling, reuse and alternative waste technologies; and

- Send a price signal to waste generators about the costs of their patterns of purchasing, consumption and disposal.

In addition, performance-based landfill levies attempt to:

- Develop a more sophisticated approach taking into account the operating characteristics of, and waste accepted by, each landfill; and

- Provide an incentive to landfill facilities to implement best practice approaches to minimise the externalities of landfilling (if in fact such externalities exist for the landfill facilities in question).

The overarching objective of a landfill levy or performance-based landfill levy, in a perfect market, is to internalise (i.e. make transparent in costing and pricing) the social and environmental impacts of waste disposal via landfill. When applied as a tax, they distort the market in favour of certain industries and provide government with general revenue.

2.2.3 Application Elsewhere in Australia

Table 2.1 summarises the application of landfill levies elsewhere in Australia. The information in the table highlights the significant variation between jurisdictions in the adoption and extent of the levies.

Four states currently adopt landfill levies, but vary the application and/or extent of the charge depending on the location in which the waste is generated. Victoria and Western Australia also vary their charges according to the source and type of waste being disposed.

Table 2.1: Application of Landfill Levies in Australian States and Territories

State	Levy	Charge/Tonne (2007-08)	Notes
NSW	✓	• Sydney metro $38.60 • Extended regulated area $31.60 • Liquid waste $38.60[(a)] (forecast to increase to approximately $60 by 2011)	• Levy aims to: o Provide economic incentive discouraging waste generation o Encourage the recovery of reusable substances that would otherwise be disposed • Liquid waste levy applies to 'trackable' wastes and was applied from 1st October 2007 • Levy raised $104 million in 2004-05 and is forecast to increase to $309 million 2009-10 (NSW Treasury in Productivity Commission 2006) • Levy funds used for general state revenue
VIC	✓	• Rural municipal $7 • Rural industrial $13 • Urban municipal $9 • Urban industrial $15 • Prescribed industrial wastes $30	• Landfill levies are used for the purposes of: o Environmental protection o Fostering environmentally sustainable use of resources o Best practice in waste management • Levies aim to provide an incentive to minimise the generation of waste, sending a signal to industry that the Government supports efforts to develop alternatives to disposal to landfill • Rural/urban split reflects the scarcity of recycling options in rural areas • Levy is said to be set at the average of landfill externalities
QLD	X	Landfill levy is not currently applied	
WA	✓	• Perth metro bio-degradable waste $6 • Perth metro inert waste $3 (staged increase recommended to $35 by 2020)	• Levy is only payable on waste received at licensed landfills in the Perth Metropolitan area, or waste collected in the Perth metropolitan area and disposed of outside the metropolitan area • In 1998, rates were $3/tonne for bio-degradable waste and $1/tonne for inert waste and the levy rate was not revised until 2006 • Levy aims to provide a financial incentive to reduce waste to landfill • Landfill levy revenue must be deposited into a 'Waste Management and Recycling Account' and can be used by the responsible Minister to: o Fund programmes on management, reduction, reuse, recycling monitoring or measurement of waste o Pay for the cost of administering the account
SA	✓	• Non-metro rate $11.70 • Metro rate $23.40 • Liquid waste $9.82/kL (staged increase recommended to $55 by 2013)	• Levy is used to part fund programmes such as: o Waste minimisation o Resource recovery o Litter reduction strategies • Levy is also used to support the EPA in administering the *Environment Protection Act 1993*, including licensing, waste tracking and compliance • No levy on clean fill • Non-metro rate includes a metropolitan depot disposing of non-metropolitan waste brought to the depot by or on behalf of an entirely non-metropolitan council
ACT	✓	• Non-Commercial users only: o Small (equivalent to sedan boot)- $8 o Medium (equivalent to sedan with trailer or utility) – $16 o Large (equivalent to van or utility with trailer) – $24	• Levy is part of ACT's Zero Waste by 2010 strategy • Levy aims to: o Discourage waste disposal by landfill o Encourage increases in the volume of towards zero waste target • Levy revenues are used to: o Fund waste education and research and development programs o Monitor illegal dumping
NT	X	Landfill levy is not currently applied	
TAS	X	Landfill levy is not currently applied	

Source: AEC Group, assorted state and territory planning documents and budgets
Notes: (a) Assumes 1,000 litres = 1 tonne of liquid waste

2.2.4 Lessons Learnt

The experience of other jurisdictions and various reports on the application of landfill levies produce a wide range of outcomes and lessons to be learnt from past experiences, including:

- Only when the levy is substantial (at least $50 per tonne) is there evidence of a reduction in the amount of waste going to landfill. (Hyder 2007)

- Landfill levies are likely to result in a net cost to the community as the externalities associated with modern landfill sites are already governed by regulation and are relatively small. (Productivity Commission 2006)

- There is often limited evidence of any connection between the levy being applied and the cost of waste management and levy funds are rarely applied to overcome the local externalities that they theoretically should represent.

- In some cases, levy funds are transferred to general government funds and spent on other areas of government responsibility outside of waste management. In a submission to the Productivity Commission, the South Australian Department for the Environment and Heritage stated that the reasons for landfill levies included the collection of funds to directly support recycling and contribute to the state's general revenue. (Productivity Commission 2006)

- There are equity issues surrounding the application of landfill levies above the readily identifiable and quantifiable level of downstream externality costs, as anyone disposing of waste is either subsidising government expenditure in other policy areas or contributing to the profits of advertisers (via waste education expenditure) and recycling companies (via recycling subsidies).

- The use of differential landfill levies between areas can lead to perverse outcomes including trucking waste considerable distances for disposal at landfill sites in unlevied/lower levied areas. This can occur on both an intra-state and inter-state scale and can actually result in significant increases in GHG emissions.

- A recent levy review in South Australia recommended that a differential levy depending on waste categories not be adopted, as any additional benefits were found to be outweighed by:
  - The additional administration costs of managing the system;
  - The risks associated with deliberate misdeclaration of waste; and
  - The reduction in competitiveness of recycling compared to landfill. (Hyder 2007)

- A levy may increase the risk of illegal dumping, e.g. there has been an appearance of asbestos in the municipal waste stream due to the high cost of disposing of the material at landfill sites and the lack of other disposal options. (Productivity Commission 2006)

- If levy revenues are earmarked for specific works, there should be a clear link between the source of the funds and their subsequent use, with this direct link effectively communicated to waste generators. The use of levy funds to support recycling awareness programmes is not considered to be sufficiently closely related to influence behaviour. (Productivity Commission 2006)

- A UK study of the impact of waste levies found that because residential/municipal waste generators are not directly impacted by the levy (i.e. the local government pays the levy and then recovers the additional costs indirectly via an increase in rates), the levy had a limited impact upon their disposal behaviour. By contrast, higher gate fees for commercial waste generators made the landfill levy much more visible and had far greater effect. In fact, the study found that the imposition of a levy on municipal waste of $34/tonne had very little impact on the amount of waste disposed, while there was a noticeable impact on commercial waste when a $5 levy was applied. (Productivity Commission 2006)

2.3 Container Deposit Legislation

2.3.1 Instrument Description

Container Deposit Legislation (CDL) schemes or Container Deposit Systems (CDS), refer to schemes where the purchase price of a good includes a small deposit which can be collected on return of the empty container to a pre-advised drop off point, usually either the product vendor or another nominated location. Depending on the product in question, the empty packaging can then be reused, recycled by the producer or a third party, or disposed of in some other way.

The deposit can be claimed by the person returning the container. In some cases, local governments sort kerbside recycling to recover these containers and generate revenues by returning them to the relevant drop-off point.

The scope of individual CDL schemes can vary significantly. In South Australia, containers are hand sorted by type and by brand. Meanwhile, in some overseas jurisdictions, containers are not sorted by brand, which significantly reduces operating costs but may lower the value of the materials to be recycled or reused. There can also be large variations in the range of containers accepted in different schemes, as schemes with a broader range of acceptable containers tend to have higher operating costs due to more detailed sorting being required.

2.3.2 Instrument Objectives

The principle objectives of CDL schemes are to:

- Provide an incentive to recycle;
- Reduce the volume of reusable and/or recyclable materials going to landfill;
- Reduce the consumption of virgin resources and associated pollution; and
- Reduce the incidence of littering.

2.3.3 Application Elsewhere in Australia

Table 2.1 summarises the application of CDL schemes elsewhere in Australia. South Australia is the only state or territory currently operating a CDL scheme, although several other states have previously considered the introduction of such a scheme.

Table 2.2: Application of Container Deposit Legislation in Australian States and Territories

State	CDL	Notes
NSW	X	• In 2001, an independent report concluded that for beverage containers, CDL could deliver economic, social and environmental benefits to the NSW community • Recommended that work was needed to test the ability of NSW to act unilaterally to introduce a mandated system, and it was proposed that the situation be monitored for future developments
VIC	X	• CDL not currently part of Victorian waste strategy but was considered in 2003 • 96% of all households in Victoria have access to a kerbside recycling system and Victorian government has provided financial assistance to local government to construct and upgrade resource recovery facilities at landfills and transfer stations • Government is trying to address litter issues through partnerships with: o Victorian Litter Action Alliance o EPA Victoria o Sustainability Victoria o Regional Waste Management Groups • The National Packaging Covenant is the preferred mechanism for minimising the environmental impacts of packaging waste, including litter • The Covenant is subject to a mid-term review in 2008, and policy options may be reviewed subject to the outcome of the review
QLD	X	• CDL has not been seriously considered, with reservations about: o High cost of providing the system in a de-centralised state o Competition between kerbside recycling and CDL (CDL has never been introduced where extensive kerbside recycling already exists) • Potential issues over securing space and planning approval for urban return sites
WA	?	• In February 2007, the WA Government appointed consultants to undertake a full economic analysis including triple bottom line consideration of CDS • Assessing appropriateness of combining CDS and kerbside recycling
SA	✓	• CDL has been in operation since the 1970s and was expanded in 2003 to capture a broader range of beverage containers • Return rates for CDL containers are around 80% • Acceptable containers now include: o All non alcoholic container types up to and including 3 litres o All types of alcoholic drink containers up to and including 3 litres • It is claimed that items covered by the legislation comprise less than 4% of litter in South Australia
ACT	X	• CDL is not part of the current waste strategy
NT	X	• CDL is not part of the current waste strategy
TAS	X	• Feasibility study into the application of CDS in Tasmania was launched in October 2007

Source: AEC Group, assorted state and territory planning documents and budgets

2.3.4 Lessons Learnt

The experience of other jurisdictions and various reports on the application of CDL schemes produce a wide range of outcomes and lessons to be learnt from past experiences, including:

- Market research on forms of recycling and waste avoidance show that CDL schemes are popular with the general public in South Australia (which has had an operational scheme for decades).

- CDL schemes can result in recovery rates of greater than 80%, significantly above those achieved in areas without CDL, but the overall impact on the municipal solid waste stream is limited given that acceptable containers typically account for a relatively small proportion of the total waste stream. (Productivity Commission 2006)

- CDL may reduce the number of accepted containers in the litter stream, although the extent of any potential reduction is limited and it fails to address the behavioural causes of littering. (EPA 2003)

- Achievable rates of recovery vary between the studies undertaken into CDL schemes, and are shown to be significantly influenced by the number and location of container collection points (i.e. the ease with which items can be returned).

- There are significant costs for all participants associated with CDL schemes, including collection infrastructure (e.g. sites and equipment), loss of retail space in point of sale collection schemes, and costs to waste generators (higher prices for service and time spent sorting containers and then transporting them to collection sites). A study in Victoria found the costs of CDL to be between $73-81 per household compared to $29 for kerbside recycling. (EPA 2003)

- Some studies have indicated that CDL schemes would have a significant impact on kerbside recycling schemes and recyclable revenue streams.

2.4 Regulations

2.4.1 Instrument Description

Regulation includes a range of management mechanisms from self-regulation with little or no government control, to statutory regulation requiring compliance with relevant legislation. Examples of regulations relating to waste management include:

- Method of disposal of prescribed wastes;
- Imposing minimum recycled-content standards for some materials;
- Imposing take back provisions on manufacturers for some products;
- Mandatory collection frequency and size of general waste bins;
- Mandatory collection frequency and size of recycling bins in certain areas;
- Controlling the movement of waste materials both within and between jurisdictions;
- Licensing conditions for landfill sites and operators through the design (including siting), operation and long-term monitoring and management phases; and
- Mandatory waste management plans for commercial/industrial premises and construction activities.

Regulations can be enforced by any level of government via Local Laws in a Local Government context to relevant legislation in a State and Commonwealth Government context. Regulations are generally only successful when they are effectively monitored and enforced.

2.4.2 Instrument Objectives

The objectives of waste regulations cover as large a spectrum as the regulations themselves and can include:

- Minimise negative externalities (social and environmental impacts) from waste collection and disposal;
- Limiting the potential environmental degradation and health risks associated with the inappropriate disposal of certain wastes;
- Reduction in the volume of waste generated by certain activities/sectors;
- Promotion of the development of markets for recycled products; and
- Encouraging redesign of products to reduce end of life handling costs.

2.4.3 Application Elsewhere in Australia

There are a wide variety of regulations currently in force to ensure appropriate waste management practices are adopted. Given that this study is targeted at achieving the desired primary objective of maximising net community benefits and considering waste reduction as a secondary objective, discussion will be limited to landfill licensing conditions, adoption of requirements to development waste management plans for certain activities/sectors, and the provision of waste collection services (particularly for recyclables).

The following table provides some information on landfill regulations currently applicable across Australia (where information was readily available). It is evident from the table that the states and territories use a similar approach to licensing and managing landfill sites.

All of the guidelines use a performance-based approach, which establishes minimum standards that must be met for a range of parameters. The guidelines advise on techniques and possible management approaches but they do not prescribe which ones must be chosen. This encourages the adoption of innovative and site-specific solutions, recognising that there can be significant differences between landfills due to different locations and/or operating characteristics. Most guidelines also make provision for different management and reporting requirements based on the size of the facility, the types of waste accepted and the potential for significant environmental damage.

Table 2.3: Application of Landfill Regulations in Australian States and Territories

State	Publication	Applies To:	Implementation Timeframe
NSW	Environmental Guidelines: Solid Waste Landfills (1996)	• Inert landfills receiving more than 20,000 tonnes of waste per year • Solid waste landfills receiving more than 5,000 tonnes per year • All hazardous waste landfills	• Applied to all new landfills immediately • Existing metropolitan sites allowed an additional 12 months to produce a management plan • Existing rural landfills which had been unlicensed but that required a licence under the new guidelines were given 2 years to prepare a management plan • Non-putrescible sites in the Sydney metropolitan area were allowed an additional 2 years to prepare a management plan
VIC	Waste management Policy (Siting Design and Management of Landfills) (2004)	• Landfill sites that accept category C industrial wastes and/or non-prescribed wastes for disposal to land • Aims to reduce the number of unlicensed sites and replace with transfer stations	• When the policy was launched, it was stated that the EPA would progressively amend existing landfill licences so that sites become consistent with the policy
QLD	Landfill Siting, Design, Operation and Rehabilitation (2006)	• Waste disposal facilities defined as environmentally relevant activities under the *Environmental Protection Regulation 1998*	• No mention of implementation timeframe, although a Site Based Management Plan is required as part of the annual license application process
WA	No information found		
SA	EPA Guidelines Environmental Management of Landfill Facilities (2007)	• All licensed landfills, with additional requirements based on capacity and rate of use as well as an assessment of associated risk factors	• Applied immediately to all new sites • All landfills required to have implemented guidelines within 3.5 years
ACT	No information found		
NT	No information found		
TAS	Landfill Sustainability Guide (2004)	• Guide applies to all landfills that are Level 2 activities (i.e. require an application for a permit under the Land Use Planning and Approvals Act 1993) however, the principles should be applied to all landfills	• Landfill siting and planning requirements – applied to all new landfills • Design requirements – applied to all new landfills and new cells and extensions at existing landfills • Operation and Rehabilitation and Aftercare requirements - applied to all new landfills immediately, existing landfills allowed additional 5 years

Sources: AEC Group, assorted planning documents

All of the guidelines are backed by reporting requirements that identify the environmental variables to be recorded and the applicable threshold limits, as well as when reports must be submitted.

A management plan must be produced for each landfill, establishing the strategic vision for the site (often requested as part of the licence application process). In the case of new sites, plans must include details of the location and siting stages as well as the operating, closure and remediation phases. For existing sites established before the guidelines, plans usually only need to cover the operating and post operating phases.

The guidelines recognise that it is impractical to force established landfills to comply with the same requirements that are imposed on new sites, especially the location and siting stages. In all of the cases where a timeframe for implementation is mentioned, existing sites are/were permitted additional time to prepare their plans and change operating practices to bring them into line with the guidelines. This recognises that the costs of immediately implementing the changes are likely to be greater than the potential reduction in environmental damages.

Only the Tasmanian guidelines make it explicit that whilst location and siting considerations may not apply to existing sites, the design of new cells and any extensions to existing sites are subject to revised guidelines and measures.

2.4.4 Lessons Learnt

The experience of other jurisdictions and various reports on the application of regulations produce a range of outcomes and lessons to be learnt from past experiences, including:

- Regulations must provide certainty to parties wishing to invest, and need to be effectively enforced to ensure that objectives are met on an ongoing basis.

- Regulations can often stifle the market, and it is generally most appropriate to set the operating environment and allow the market to determine the most appropriate means by which the operating guidelines can be met; this ensures that innovation can still be encouraged.

- Quite often, regulations are the only means by which externality costs can be instigated, particularly if market costing and pricing signals fail to provide sufficient recognition of social and environmental impacts.

- Regulations applied in the water sector in South East Queensland, including water restrictions and compulsory water management plans for business premises, have been very successful in achieving reductions in the amount of water consumed. Such success could also be achieved in the waste sector under appropriate regulation, particularly in the application of waste management plans in the commercial and industrial and construction sectors

2.5 Targets and Bans

2.5.1 Instrument Description

Voluntary targets and bans are used to measure progress in achieving policy outcomes. They are often aspirational and can be used as milestones against which actual performance can be assessed. Performance against these established targets can then be used to inform future policy making decisions, such as whether or not to increase the amount of resources in a particular area of concern. Targets and bans are the end outcomes of the implementation of other policy measures rather than policy measures in themselves.

2.5.2 Instrument Objectives

Targets and bans have three main objectives:

- **Raising Awareness –** by establishing targets, governments communicate to waste generators and the market the actions that will be taken on particular waste streams, possibly stimulating generator and/or market responses ahead of any potential statutory regulation.

- **Top Down Planning –** establishing the desired outcome from waste management policy is one method of identifying the practical actions required to achieve the stated targets or bans, and may have the advantage of allowing others to devise the most cost effective solutions to meet the outcome.

- **Benchmark for Progress –** once established, the targets can be used to assess progress especially where a series of milestones have been established at intermediate steps.

2.5.3 Application Elsewhere in Australia

The ACT, News South Wales, South Australia, Victoria and Western Australia all have targets and bans in place. These are summarised in Table 2.4.

Table 2.4: Application of Targets and Bans in Australian States and Territories

State	Target	Targets & Bans
NSW	✓	• 66% MSW recovered by 2014 • 63% C&I recovered by 2014 • 76% C&D recovered by 2014
VIC	✓	• 65% MSW recovered by 2014 • 80% C&I recovered by 2014 • 80% C&D recovered by 2014
QLD	X	• No targets
WA	✓	• 100% Inert (mainly C&D) recovered by 2010 • 85% Organics recovered by 2010 • 100% Recyclables (kerbside) by 2010 • State vision of Zero Waste by 2020
SA	✓	• 75% MSW recovered by 2010 • 30% increase in C&I recovery (2004 tonnage) by 2010 • 50% increase in C&D recovery (2004 tonnage) by 2010
ACT	✓	• 0% waste to landfill by 2010
NT	X	• No targets
TAS	?	• Revised targets being developed as part of new waste management strategy

Source: AEC Group, assorted state and territory planning documents and budgets

2.5.4 Lessons Learnt

The experience of other jurisdictions and various reports on the application of targets and bans produce a wide range of outcomes and lessons to be learnt from past experiences, including:

- There are significant issues around the recording and collection of data on the level of waste disposed to landfill and the level of waste recycled, and the latest available ABS data are for the year 2002-03. Without effective base line information, initial target setting and subsequent monitoring may not be 'comparing apples with apples'. If targets are to be effective and performance comparable over time and across states and territories, data collection should be streamlined within and between jurisdictions, and over time.

- Establishing waste reduction targets does not automatically lead to changes in waste outcomes. Targets often require additional investment in establishing alternative disposal options, publicity and education schemes. The requirement for additional expenditure also means that achieving targets may not be a cost neutral exercise and can result in a significant financial impost on the community with no reference back to whether community benefits were achieved.

- In setting targets, it is important to recognise the difference between metropolitan and regional, rural and remote areas. What is achievable in an urban area that is well served by recycling facilities with access to markets for recycled products is unlikely to be comparable with what can be achieved in a remote rural area.

- Targets should be based on rigorous CBA processes to compare the costs of achieving the targets against the likely community benefits. It appears that this approach is often ignored, with most targets (and therefore broader waste management policy) simply set according to the waste hierarchy with no reference back to community benefit.

- There is considerable variation in the way in which targets are set across Australia. Some appear solely aspirational with little chance of every being achieved, others appear to have no real basis, while others are based on unknown, and therefore uncontestable, methodologies.

- Zero waste targets are unlikely to be achieved in practice due to the diminishing returns on repeatedly recycling materials and the fact that the best-recycled materials include a mix of recycled and new inputs. There will also always be some form of 'spoil' or contamination that will require landfilling during the recycling process, and it would appear that zero waste targets are more about government self-promotion than appropriate and achievable waste management policy.

- There appears to be limited monitoring of targets and publication of the results. Given the significant financial expense to the community associated with funding government investment in initiatives to achieve established targets, performance should be regularly monitored and results communicated to the community.

- Most Australian targets are currently voluntary, and therefore accountability appears to be lacking. However, it is recognised that the achievement of targets can often be driven by external factors such as the market value of recycled products and their relative price when compared with virgin materials.

2.6 Pay as You Throw Schemes

2.6.1 Instrument Description

Under a 'Pay as You Throw' (PAYT) scheme, a unit price is determined for waste services and is then applied to the volume of waste generated/disposed to derive the overall charge to be levied on a waste generator. Different unit prices are often adopted for different types of wastes based on disposal costs and treatment, as well as potential risks/hazards. PAYT schemes can also be referred to as 'variable charging schemes' or 'unit pricing schemes'.

PAYT has the potential to provide consumers with clear pricing signals about the costs associated with the amount of waste they produce. This approach is currently most widely used at landfill sites where weighbridges are installed and measure the volume of waste being disposed.

A limited number of schemes exist that apply the same principles to kerbside collections, such that the charges levied on individual properties reflect the volume of waste collected and the frequency of bin collections. The most commonly adopted kerbside approach to PAYT involves offering properties different sized bins and discounting charges for smaller bins relative to larger bins. More advanced solutions including weighing each bin and charging a cost reflective of the weight of the waste disposed.

2.6.2 Instrument Objectives

Under a flat rate scheme, waste generators do not pay for the waste they dispose and generators with lower waste volumes who also recycle effectively subsidise others who are more wasteful, while under PAYT, waste generators only pay for the waste they dispose in accordance with user pays (or polluter pays) principles. The primary objective of PAYT approaches is therefore to establish a clear link between the waste management practices of each waste generator and the price they pay for waste that is disposed, in the hope that the price signal provides sufficient incentive for the generator to change waste generation and disposal behaviours.

2.6.3 Application Elsewhere in Australia

2.6.3.1 Municipal Waste

Councils may offer different bin sizes as a basic PAYT approach as an option to the waste generator to select their desired level of service. Optional recycling bins and green waste bins are also adopted in certain locations and charged to those properties opting in on these services within a user pays framework.

The pricing differential between smaller bins and larger bins is generally only minor, due to the fact that the majority of collection costs (up to 90%) are based on servicing frequency rather than the volume collected from individual bins. Six local governments out of the sample of 24 larger Queensland Governments in the AEC Group benchmarking assessment in Appendix B offered residents choice in the size of bin serviced. However, the price charged for smaller bin sizes was similar to that of the larger bin size, with two of the six councils actually levying the same charge for both 240L and 140L bins. The NSW Councils in the benchmarking assessment all used 140L bins for their standard municipal waste services rather than the 240L bins used in Queensland. Residents are able to choose a 240L bin but this was more expensive and only provided upon request. Differential bin sizing is offered to commercial and industrial waste generators by private contractors, and in certain instances by local governments.

Whilst variable collection frequencies have been trialled in some areas, there are significant health and safety risks associated with less frequent collections that outweigh any potential savings and so the majority of actual incidences of requested variations to collection frequencies appear to be in the event that additional services outside of the mandated weekly frequency are required by waste generators.

A series of small-scale feasibility studies and/or trials of more advanced PAYT systems weighing each bin at the kerbside and to determine a user pays charge for each property have been undertaken by individual local governments in Western Australia, Victoria (e.g. Melbourne City Council) and Queensland (e.g. Ipswich City Council). However, in each case it was found that the costs of full-scale implementation were greater than anticipated benefits and so no state or territory has yet introduced a permanent, fully fledged weight-based PAYT scheme. Despite this, some local governments in NSW (e.g. City of Ryde Council) have begun installing microchips in their new bins in case this approach be adopted in future.

2.6.3.2 Other Waste

PAYT schemes are in place across the majority of staffed landfills, where waste disposed is charged either by area (per truckload, trailer load, car-boot load) or by weight (per tonne), depending on whether weighbridge facilities are installed.

Basic PAYT schemes are also widely implemented in the commercial and industrial sectors where a range of bin sizes are made available by private contractors and collection frequencies are determined on an as-needed basis subject to basic human health requirements.

Some local governments offer free services to residents disposing of waste to landfill via self-haul, generally funded out of the general rate or allowances for such activity incorporated into the general waste management charge.

2.6.4 Lessons Learnt

The experience of other jurisdictions and various reports on the application of PAYT schemes produce a wide range of outcomes and lessons to be learnt from past experiences, including:

- There is a trade off between the anticipated savings associated with PAYT schemes and the increased administration and infrastructure costs associated with facilitating the additional 'transactions'.

- Basic PAYT schemes such as offering different sized bins can be implemented at a much lower cost than more complex PAYT solutions, but provide a much weaker pricing signal.

- The majority of the costs of providing kerbside waste collection are incurred irrespective of the volume of waste in each bin, and therefore the cost saving that can be offered to consumers either choosing a smaller bin size or reducing the weight of waste in their bins is limited. Generally, the pricing signal would be insufficient incentive to change services or adjust behaviour.

- The selection of smaller bins does not necessarily mean a reduction in the municipal waste stream, more that people are currently under-utilising their existing bin (possibly due to the fact that it is only a 1 or 2 person household) and only require a smaller bin.

- Studies from Europe and Northern America suggest full PAYT schemes can be an effective method of waste reduction and could reduce the municipal waste stream by as much as one third, but the cost of such schemes also needs to be considered. (Productivity Commission 2006)

- A number of individual local governments across a number of states have undertaken feasibility studies to assess the impacts of introducing full PAYT systems but in each case, the costs were found to be too high relative to any benefits that may be achieved and the systems were found to be unviable.

- PAYT systems are not suitable for areas with high-density housing that tend to use communal bins and where it would be very time consuming and expensive to determine the contribution of each household.

- The introduction of PAYT schemes can also promote perverse behaviour, and would increase the amount of waste being deposited in public waste bins, dumped in other people's bins, illegally dumped or burnt to reduce charges levied. Past studies have found that illegal dumping has increased when variable pricing under PAYT schemes have been introduced.

- Properties with recycling bins and green waste bins (where they exist) may transfer waste from their general waste bins to their recycling bins to reduce their general waste charges, with the secondary impact of contaminating the recycled and green waste streams. To prevent this, recycling bins could also be weighed, but then this may produce a disincentive to recycle.

- Where PAYT schemes are only applied in certain regions, this can lead to waste being transferred to other regions where PAYT doesn't exist (particularly the case for landfill disposal fees).

2.7 Extended Producer Responsibility and Product Stewardship Schemes

2.7.1 Instrument Description

Although often used interchangeably, Extended Producer Responsibility (EPR) and Product Stewardship Schemes (PSS) are significantly different.

EPRs promote the assimilation of the environmental costs of products into their market price. The firms that produce, import and/or sell a product must either take products back at the end of their useful lives or pay for some other entity to receive the spent products. The 'mobile muster' scheme, where consumers are able to return used mobile phones for recycling at the manufacturer/retailer's cost, is an example of EPR.

PSS schemes attempt to involve all participants in the product lifecycle in managing its environmental impacts. This could involve the manufacturer redesigning products to limit the amount of harmful substances used, reduce the packaging and/or reduce the impact of the distribution method. For consumers and retailers, this may mean a more active role in recycling the product at the end of its useful life or using the product in a less environmentally damaging way. An example of a PSS is the tyre levy imposed on sales of new tyres in some jurisdictions that covers the costs of recycling the tyre at the end of its useful life.

2.7.2 Instrument Objectives

EPR and PSS tend to be used in particular circumstances where:

- There is concern over the impact of improper disposal;
- The useful lives of the product in question are relatively short and therefore the volume of resources going to landfill are likely to be high;
- There are significant resources that can be reused; and
- The potential social and environmental impacts are high.

As well as seeking to address these issues, both EPR and PSS link the cost of a product to the environmental costs of its disposal, sending a clear signal to the consumers at the time of their purchasing/replacement decision about the true cost of consuming the product. The price signal is particularly effective when the cost or levy imposed on the product is clearly identified.

2.7.3 Application Elsewhere in Australia

Table 2.5 summarises the application of EPR and PSS elsewhere in Australia.

Table 2.5: Application of EPR and PSS in Australian States and Territories

State	EPR & PSS
NSW	• Current waste strategy states that the Minister will only recommend an EPR for one of the 16 'wastes of concern', where it is necessary, as a result of: o volumes disposed to landfill or their toxicity o no national scheme in place that addresses the issues in NSW o no voluntary scheme/s that seeks to achieve the desired outcomes o economic analysis supports the implementation of the scheme o there are no constitutional or other impediments to NSW acting unilaterally to implement the scheme • There is a preference for national voluntary schemes • In 2004, each industry was put on notice that action was required to reduce waste in their sector, and the Minister wrote to each sector requesting specific actions and reporting within 12 months - some sectors were found to be a long way from having a workable scheme in place
VIC	• No information available
QLD	• No information available
WA	• Aim to develop EPRs in partnership with producers on a voluntary basis • Will work with community and industries to identify priority wastes and develop schemes for that sector reflecting: o available technology o industry structure o types of waste produced and their environmental impacts o state of the resource recovery market • If industries are not reducing problem priority wastes, state will intervene and enforce mandatory EPR schemes • Range of PSSs are already in place with others under development • Attempting to ensure that any schemes developed can be integrated into national schemes which may emerge at a later date • Use 4-stage process to identify products that should be covered by PSS: o Stage 1 defines a product or waste stream, identifies its problem and scale, determines its status as an action product based on stipulated criteria and defines response objectives for identified action products o Stage 2 considers the most suitable management approach (e.g. Product Stewardship Agreements) including the development and assessment of options and ensuring that any chosen option is practical o Stage 3 requires a cost-benefit assessment of the chosen program or program options o Stage 4 leads into the design of the program
SA	• CDL is a form of EPR • As part of the SA Waste Strategy 2005-2010, extended producer/product responsibility plans are to be developed by identified business and industry sectors • Zero Waste SA, in consultation with the EPA and Office of Sustainability, are to develop a consultation paper on EPR in the SA context to identify wastes of concern and priority focus
ACT	• No information available
NT	• No information available
TAS	• No information available

State	EPR & PSS
National	• The National Packaging Covenant was established in 1999 as a voluntary arrangement between key stakeholders in the packaging supply chain and Australian, State, Territory and Local governments • The Covenant aims to minimise environmental impacts from the disposal of used packaging, conserve resources through better design and production processes and facilitate the re-use and recycling of used packaging materials • The regulatory mandate is provided by the National Environment Protection Measure on Used Packaging Materials (NEPM), which was designed to deal with free riders and non-signatories and applied at the jurisdictional level • Several other national PSSs have been developed with the voluntary cooperation of industry sectors including: o Agricultural and veterinary chemicals – the chemical supply industry is operating the ChemClear program to collect and safely dispose of unwanted chemicals o Electronic goods – Consumer Electronic Suppliers Association, Australian Electrical & Electronic Manufacturers Association and Australian Information Industry Association o End of life tyres – Joint Working Group Tyres has been established between the Australian Tyre Manufacturers Association Ltd and the Australian Tyre Importers Group Ltd o Lubricating oils – regulated through the Product Stewardship (Oil) Act 2000, which allows for oil producers and supporters to pay a levy on lubricants to support environmentally sustainable management and refining of the waste (used) oil o Medicines – established in 1998, over 760 tonnes of unused medicines have been handed in to pharmacies o Mobile phones and their batteries – Australian Mobile Phone Industry o Plastic bags – Australian Retail Association o Pesticide containers – chemical containers are being collected, recycled or disposed of through the industry drumMUSTER program o PVC products and chemicals – PVC product stewardship scheme sponsored by the Vinyl Council of Australia to promote environmentally friendly practices in the production, use and disposal of PVC products and the chemicals used in their manufacture

Sources: AEC Group, assorted planning documents, NSW EPR Priority Statement 2005-06

2.7.4 Lessons Learnt

The experience of other jurisdictions and various reports on the application of EPR and PSS produce a wide range of outcomes and lessons to be learnt from past experiences, including:

- There are a wide variety of schemes in place across various industry sectors.
- Some schemes rely on voluntary support from industry, while others have been mandated.
- Both types of schemes work best across large jurisdictions, and therefore while some states have attempted to adopt EPR or PSS individually, it is apparent that national coverage would work more effectively. This allows the setting of one standard for manufacturers, consumers and recyclers and removes any requirement to comply with different legislative requirements in different areas.
- National schemes also remove the potential for perverse outcomes such as certain waste types being trucked interstate to avoid EPR and PSS schemes.
- There are significant differences between EPR and PSS, including the allocation of final costs of disposal.
- Both types of schemes have considerable management and administration costs and are therefore most applicable to products that have the potential for significant environmental damage either through their level of toxicity (e.g. certain chemicals) or the volume being sent to landfill (e.g. tyres) and their potential resource value.

2.8 Incentives

2.8.1 Instrument Description

Economic instruments may also be in the form of incentives that either provide direct support to particular waste management activities, or work to provide sufficient incentive to waste generators to adjust behaviour.

Examples of potential incentives to encourage certain types of behaviour to enhance community benefits or help achieve desired policy objectives are outlined below:

- Promotion and education of social and environmental benefits of 'doing the right thing' with all components of the waste stream from disposable goods through to recyclables and hazardous waste items;
- Provision of optional green waste bins, possibly at subsidised rates, to reduce the extent of organic waste disposed to landfill and therefore reduce emissions; and
- Provision of compost bins and/or mulchers at subsidised rates or free of charge to reduce the extent of organic waste disposed to landfill and therefore reduce emissions, as well as encourage local reuse of food and garden waste products.

2.8.2 Instrument Objectives

The objectives of providing incentives to waste generators include:

- More direct approach than applying a flat tax or flat policy across all generators for a particular outcome, as policies are able to directly target selected waste streams; and
- Permanently altering the behaviour of waste generators in accordance with the incentive scheme being offered to achieve stated policy objectives.

2.8.3 Application Elsewhere in Australia

The following table provides a few examples of the incentives offered across Australia in relation to targeting certain waste streams.

Table 2.6: Example Incentives Adopted in Australian States and Territories

Provider	Incentive
Yarra City Council (VIC)	Residents can purchase reduced cost worm farms and compost bins
City of Port Phillip Council (VIC)	Residents can purchase reduced cost worm farms and compost bins or receive either a bin or worm farm free by signing up to Council's Sustainable Living at Home programme
City of Ryde Council (NSW)	Onsite garden waste mulching service provided free of charge
City of Melbourne (VIC)	Considering undertaking a trial of a free commercial waste and recycling collection service for businesses that store their bins in four CBD laneways. This is likely to include the collection of waste currently under contract to other service providers
City of Melbourne (VIC)	Free kerbside collection of garden waste (must be booked in advance)
Adelaide City Council (SA)	Free fortnightly kerbside collection of green waste
Penrith City Council (NSW)	Residents that select smaller garbage bin provided with a second recycling bin free of charge
Cairns City Council (QLD)	Free recycling when materials deposited at resource transfer station (fee applies if load also includes non-recyclable materials)

Sources: AEC Group, assorted planning documents

2.8.4 Lessons Learnt

The lessons to be learnt from past experiences with incentive programs are outlined below, and do not necessarily need to relate to the waste sector:

- There are a large number of incentive programs that can be established to promote waste recycling, but it is imperative that financial and other costs do not exceed the realisable community benefits from these activities, and that performance is monitored on an ongoing basis to determine whether benefits are accruing from the adopted incentive programs. Incentive programs should only continue where they provide real benefits and are cost effective for the community rather than being implemented and maintained on promotional grounds for government.

- The provision of subsidies for certain products and services can often result in the market overheating and the net price paid by the community being the same as before the subsidy was in place. For example, the recent high demands, product shortfalls, and shortages of experienced tradespersons for rainwater tanks resulted in a significant increase in the overall cost of rainwater tank installation to well in excess of $3,000, a significant increase on the cost prior to the existence of rainwater tank subsidies.

- Many of the incentives available apply to households in an attempt to reduce the extent of organic waste via green waste collection and subsidised onsite composting processes.

3. The Queensland Context

3.1 Background

Before any decisions can be made about the future of waste management in Queensland, it is important to understand the characteristics of the different waste streams generated and the factors that influence the volume of waste disposed to landfill. When making direct comparisons with other states, consideration also needs to be given to the unique characteristics of Queensland and the potential that solutions for metropolitan areas may not be directly applicable to regional, rural and remote areas given these characteristics (i.e. not 'comparing apples with apples').

3.2 Waste Stream Characteristics

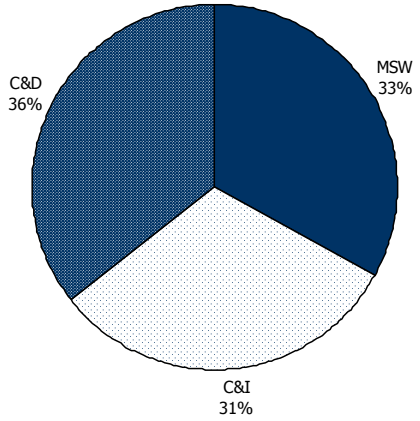
The waste streams that can be managed through waste management policy are:

- **Municipal Solid Waste (MSW)** – predominantly household waste in either solid or semi-solid form, typically containing food waste, garden materials, paper, etc.;
- **Commercial and Industrial Waste (C&I)** – waste arising from the activities of commercial and industrial operations, featuring similar characteristics to that of MSW and excluding prescribed or hazardous wastes; and
- **Construction and Demolition Waste (C&D)** – typically inert waste resulting from the construction and/or demolition of roads, buildings or other physical structures.

It is important to note that there is no discussion of fly ash (a by-product of electricity generation in coal-fired power stations) in this CBA. This waste stream can only be managed effectively through the power generation sector. Any policy change to address this should impact solely on that sector and be fed through to the community via energy pricing or avoided through adjustments to electricity generation processes. For the same reasons, there is no discussion of liquid or gas waste such as wastewater (and associated biosolids, apart from those disposed to landfill) and emissions from electricity generation and other activities.

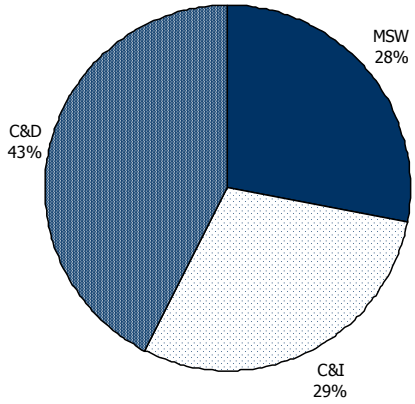
The relative contribution of each waste stream to the total amount of waste generated is influenced by a number of factors in any given year, including the rate of construction work undertaken and the presence and attractiveness of alternative means of disposal and recycling/reuse. Figures 3.1 and 3.2 demonstrate the relative distribution of the waste streams in Queensland from 2002-03 to 2005-06 and for Australia in 2002-03.

Figure 3.1: Average Distribution of Generated Waste by Stream for Queensland, 2002-03 to 2005-06



Source: EPA State of Waste and Recycling 2003-2006

Figure 3.2: Distribution of Generated Waste by Stream for Australia, 2002-03



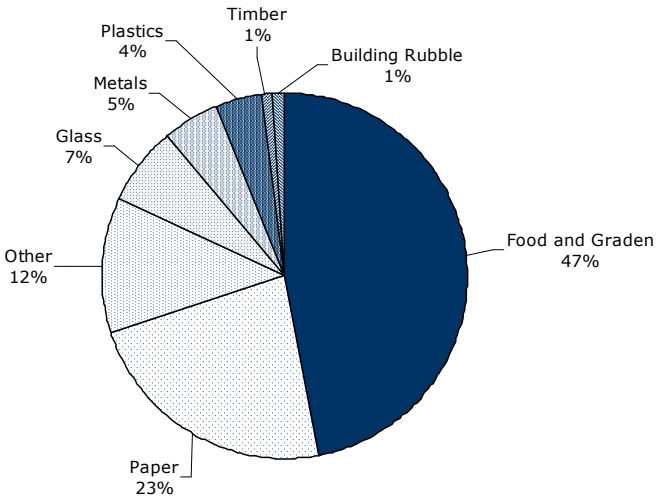
Source: Productivity Commission (2006)

In Queensland, there is an almost even distribution of waste between the three streams, although there has been significant annual variation around these averages. In 2005-06, C&I waste accounted for 42% of the total waste stream, much higher than in previous years, with the MSW and C&D streams both contributing 29%. By contrast, in 2003-04, C&I accounted for 23% of the total stream and C&D 49%. The Australian data shows a far greater proportion of the waste stream being generated by C&D, with C&I and MSW accounting for similar proportions.

To understand the factors contributing to these results, it is necessary to review the materials comprising each of the streams. Figures 3.3 to 3.5 show the breakdown of waste materials within each stream for Australia in 2002-03.

Food and garden waste is by far the largest single source of MSW generated, and when combined with paper, these materials account for 70% of the total waste stream. Glass accounts for just 7% of MSW.

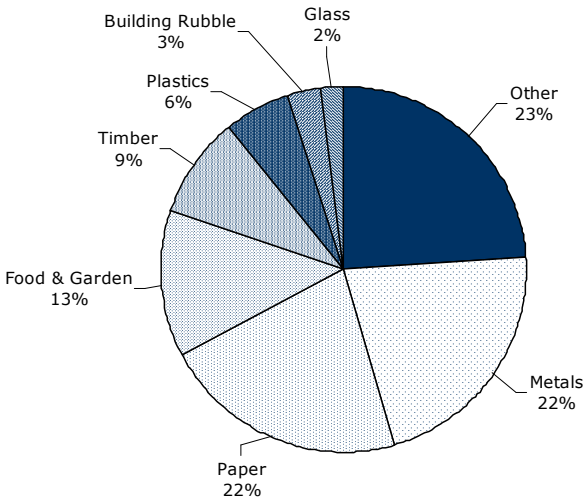
Figure 3.3: Distribution of Materials in the MSW Stream for Australia, 2002-03



Source: Productivity Commission (2006)

Although there is no dominant material in the C&I waste stream, the three most common materials (paper, metals, food and garden materials) still account for 67% of the total. Glass accounts for just 2% of the C&I waste stream.

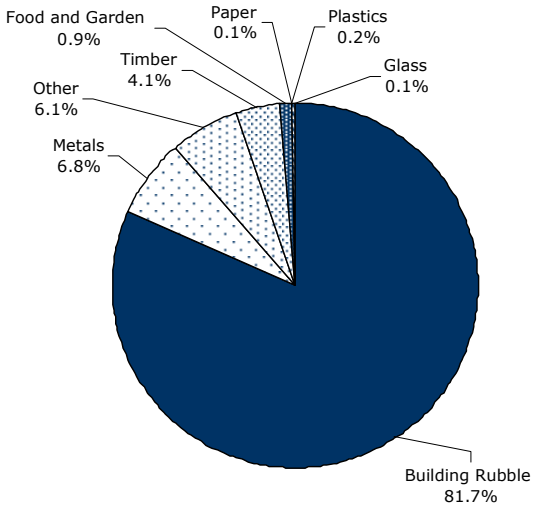
Figure 3.4: Distribution of Materials in the C&I Waste Stream for Australia, 2002-03



Source: Productivity Commission (2006)

The C&D waste stream is dominated by building rubble, accounting for 82% of total volumes. The variation in annual outcomes for this waste stream is driven by cycles in construction activity.

Figure 3.5: Distribution of Materials in the C&D Waste Stream for Australia, 2002-03

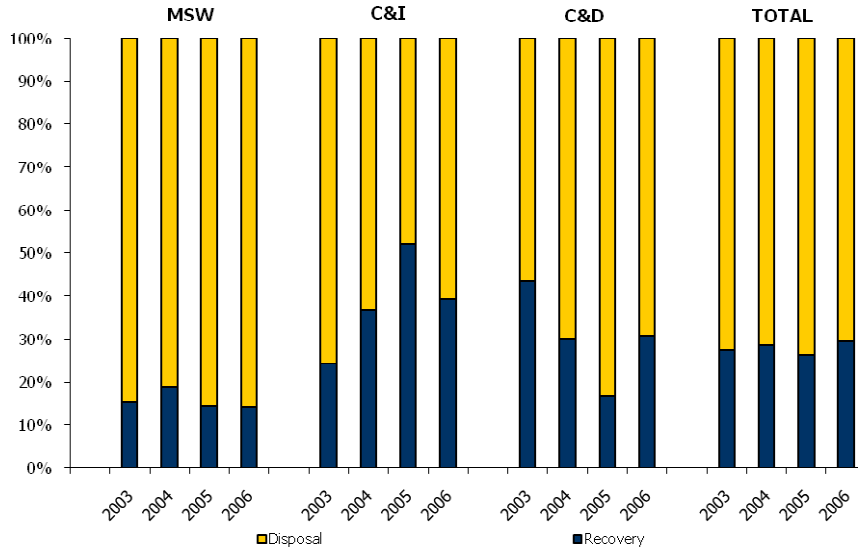


Source: Productivity Commission (2006)

3.3 Extent of Recycling in Queensland

Figure 3.6 below outlines the relative rates of recovery and disposal by waste stream in Queensland.

Figure 3.6: Waste Disposal and Recovery in Queensland by Stream, 2002-03 to 2005-06



Source: EPA State of Waste and Recycling 2003-2006

There are significant variations in the rate of recovery (and therefore the rate of disposal) as a proportion of waste generated both on an annual basis and between waste streams. In 2004-05, almost 50% of the total C&I waste produced was recovered, but in 2005-06 this fell back to 39%. In 2003-04, 40% of C&D waste was recycled, but by 2004-05 only 17% was recovered and this rebounded to close to 30% in 2005-06. The proportion of MSW waste diverted from landfill is the most stable of the three waste streams, but is also the lowest of the three streams at between 10% and 20%. Overall, around 30% of solid waste across the three waste streams is diverted from landfill.

The graph shows that there has been a slight upwards trend in overall recycling activity over the past few years. Given the potential for information provision and analysis to be inconsistent across years, and the relative stability of the overall recycling figure, it is possible that the extent of variation in the C&I and C&D waste streams is not as significant as outlined in the graph and that some of the variation is due to different categorisation of wastes between years.

Table 3.1 outlines the current rate of recycling for each waste stream in Queensland and the average rate for Australia. It also shows the range of recycling rates achieved in other states and territories.

Table 3.1: Recycling Rates in Queensland and Australia

Waste Type	Queensland	Australian Average	Australian Median	Difference vs Average	Range
MSW	26%	30%	26%	-4%	10-39%
C&I	22%	44%	40%	-22%	22-69%
C&D	42%	57%	61%	-15%	21-89%
Total	**31%**	**46%**	**50%**	**-15%**	**23-69%**

Source: Productivity Commission (2006)

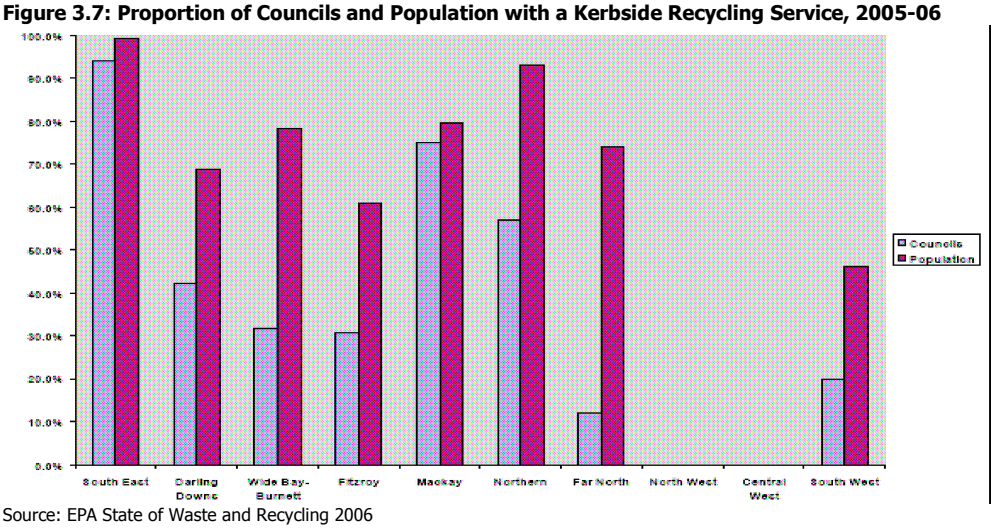
MSW has the lowest rate of recycling at the national level at 30%, compared to 44% for C&I and 57% for C&D. Recycling rates in Queensland are lower than the national rates across all three streams. The Queensland recycling rate for C&I waste appears to be considerably lower than the national average (in fact, only half the extent of recycling recorded on average across Australia and less than one-third of the highest rate of recycling recorded). Queensland is closer to the national average for MSW, although this may be a reflection of the low overall rates of recycling of this waste stream. Rates of recycling of the C&D waste stream are also low in Queensland relative to the national level.

The above analysis suggests that the extent of recovery in the C&I waste stream has improved since 2002-03, potentially closer to the national average. However, it may also be argued that the national benchmark rate of recycling is likely to have also increased. Meanwhile, the extent of recovery in the C&D waste stream appears to have reduced, potentially further widening the gap between rates achieved in Queensland versus the Australian average. However, data consistency and comparability issues are likely to exist.

3.4 Recycling in Queensland Regions

Figure 3.7 below provides an indication of the access to kerbside recycling services in Queensland regions. It is evident that a large proportion of the population has access to at least some form of recycling service, with the type of recyclables collected based on feasibility within each region. As expected, the south east features the highest level of servicing for recycling.

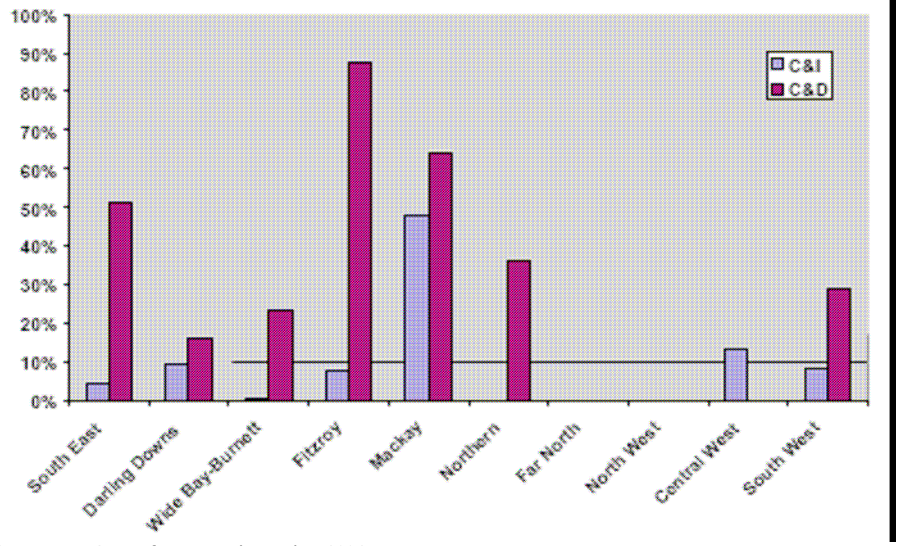
Figure 3.7: Proportion of Councils and Population with a Kerbside Recycling Service, 2005-06



Source: EPA State of Waste and Recycling 2006

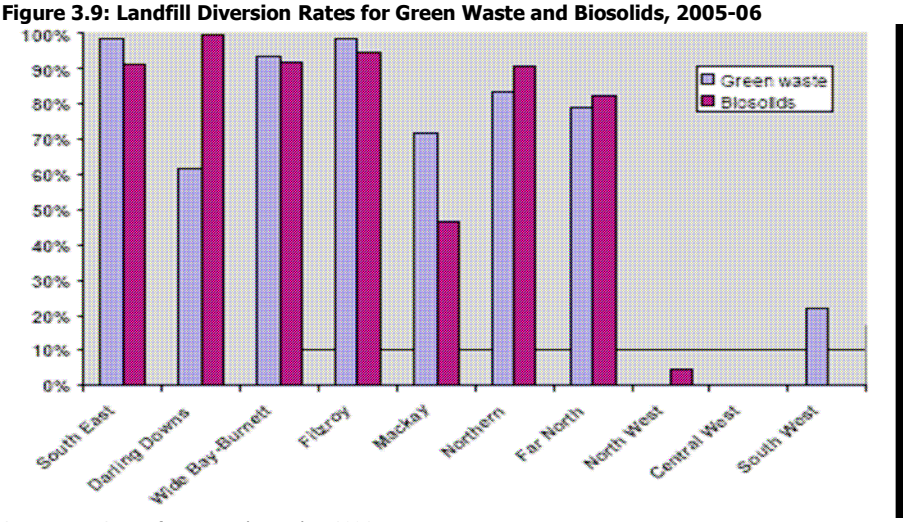
The following graphs outline the recycling and reuse rates for the C&I and C&D waste streams, and for green waste and biosolids across Queensland regions. It is evident that there are significant variations between regions, particularly for C&I and C&D.

Figure 3.8: Landfill Diversion Rates for C&I and C&D, 2005-06



Source: EPA State of Waste and Recycling 2006

Figure 3.9: Landfill Diversion Rates for Green Waste and Biosolids, 2005-06



Source: EPA State of Waste and Recycling 2006

3.5 Targeted Areas to Maximise Waste Diversion and Recycling

The preceding section highlights those waste streams that, if targeted directly, would be likely to result in the most significant increases in recycling rates and reductions in the waste sent to landfill:

- **MSW** – outside of broader recycling schemes for paper, glass and plastics, policies directly targeting food and garden waste should be considered for implementation as the removal of these waste materials will also help minimise the extent of GHGs emitted from landfills;

- **C&I** – outside of voluntary recycling schemes, the materials that should be directly targeted by policy include paper, metals, food/garden waste and timber; and

- **C&D** – building rubble is the primary contributor to C&D waste and should be directly targeted by waste policy.

The direct targeting of the above materials will result in maximum effectiveness in terms of the extent of waste diversion and recycling achieved.

3.6 Issues Identified for Queensland

3.6.1 Availability of Landfill Airspace

Some concerns exist over the rate at which landfill airspace is being consumed, and the potential for this to result in future shortages. More stringent planning regulations, increased legislative controls over the siting, operation and remediation of landfills, combined with public opposition to locating landfills near populated areas will work to further restrict potential future landfill sites.

It is important to note that while future landfill availability in certain areas is limited (e.g. Brisbane), most other parts of Queensland have considerable landfill capacity, both within existing and future brownfield sites (i.e. mines, quarries) and greenfield sites. In fact, it has been suggested that we are creating more holes than we are filling through mining and quarrying activities.

3.6.2 Landfill Practices

There is currently a range of operating practices adopted at Queensland landfill sites. Where the bulk of the population reside, 'good practice' has generally been adopted, with the exception of broad scale gas capture and electricity generation. Gas capture has, to date, only been introduced at a handful of landfills, but is increasingly being investigated and adopted at major landfills where cost effective.

Some smaller, older and more remote landfill sites do not adopt the latest approaches, although it is important to recognise that size and location mean that there are inherently lower environmental risks associated with these sites. The costs that would be incurred to bring each of these sites up to 'good practice' are likely to far outweigh the potential benefits from these upgrades in most instances.

A more effective means of improving management of landfill sites would be to enforce 'good practice' at new sites and older landfills of a certain size through the licensing system, and attempting to directly manage or mitigate risks associated with potential local externalities at older, smaller landfill sites via other means where possible. It would then be possible to target those sites with the greatest potential to cause environmental harm without imposing a significant financial burden on areas where significant capital investment is not justified by the level of risk attached to potential local externalities.

It is important to note that there is a trend towards the regional provision of landfill facilities, with intermediate transfer stations being established to act as consolidation nodes for waste before transfer to the regional landfill for disposal. This allows local governments to access economies of scale and phase out older, smaller landfill sites (whilst still requiring appropriate post closure management strategies to manage the long-term rehabilitation of these smaller sites).

3.6.3 Appropriateness of Broadscale Recycling

The optimum conditions for achieving high rates of recycling are densely populated urban areas with direct access to markets for recycled products. Recycling will generally not occur in regional, rural or remote areas with low population density. In areas of Queensland with low population density and located long distances from markets, the economic, environmental and social costs associated with waste separation, transportation to processing facilities, and then locating markets are too high for recycling to be viable even if considerable subsidies were offered.

Whilst the use of a mechanical biological treatment (MBT) facility (processes MSW leaving around 15% of the original volume as an inert compound that can be sent to landfill) may be feasible in Sydney and other large metropolitan areas, rural areas, especially

those located far from major towns and cities, do not generate sufficient waste flows to make this type of scheme viable. It should also be noted that several of the separated products from Sydney's MBT facility are shipped overseas as there is no market in Australia at this time. Further, the two major bioreactors that have been constructed in Australia are just outside of Sydney and just outside of Brisbane. It is only in these types of metropolitan locations servicing large populations where this kind of approach to waste management is viable.

3.6.4 Appropriate Costing/Pricing

The EPA discussion paper states:

> From an economic perspective, landfill disposal is largely under-priced in Queensland. Disposal prices typically take account of the running costs of the landfill but do not include either the full environmental costs of disposal nor are they based on the long-term costs of disposal; that is the costs of the next landfill that is required or the post-closure care and maintenance requirements of old landfills. This means that more waste is likely to be disposed of, relative to the material that is recycled or avoided. (EPA 2007; p.16)

While widespread adoption of lifecycle costing or opportunity cost pricing does not exist across Queensland, there are a number of local governments that do in fact price in accordance with these principles. It is also important to note that no comprehensive pricing principles or guidelines regarding landfill costing have been produced by the Queensland Government to provide direction to local governments, as has been provided for water supply.

While National Competition Policy principles have been adopted by many waste management businesses, the lack of consistency in application appears to have been more due to the lack of appropriate modelling skills and advice on appropriate pricing levels to ensure appropriate provisions for future costs under lifecycle costing methodologies. Further, it is important to recognise that most local governments are not in the business of selling landfill space and would rather conserve space for use by future generations as they recognise the increasing cost and scarcity of landfill space. As such, they would not be under-pricing intentionally.

The discussion paper also makes a tenuous link between 'under-pricing' and the volume of waste disposed. It should be noted that in most instances any under-pricing is likely to be in the order of $5-10 per tonne which would be unlikely to significantly alter disposal patterns and would more likely see greater 'shopping around' for better rates rather than behavioural change.

It is important to consider the potential for pricing guidelines to be established for the state's waste management services, in particular local government landfills, to address the perceived problem of under-pricing and to ensure that local governments have sufficient funds to ensure future liabilities in relation to landfills can be appropriately met, rather than to add another layer of tax on top of the current pricing levels where the funds would potentially go to a third party and fail to address the underlying problems at the local landfill level.

4. Cost-Benefit Analysis (CBA) of Economic Instruments

4.1 Assessment Methodology

4.1.1 Background to CBA

CBA is a tool that is used to determine the value of a project or policy option over its lifetime by comparing inputs (costs) and outputs (benefits). CBA is used to assess net benefits or costs to a range of stakeholders and can be undertaken from the perspective of an entity, community, geographic location, or a combination of these. The outcome of the process is an assessment of whether or not a project or policy is expected to produce a net benefit.

CBA guidelines exist to ensure that assessments are undertaken in a consistent manner and in accordance with government policy, and generally require the following basic framework:

- Identify the outcome to be achieved;
- Produce a list of potential means of achieving the outcome;
- Narrow the list to viable options (including the 'do nothing option');
- Assess all of the costs and benefits that accrue from each option;
- Calculate a net present value using an appropriate discount rate; and
- Assess the outcome in the context of the impact on equity.

Further information on CBA is provided in Appendix 1 to this report.

4.1.2 Assessment Process

Taking into account the above, the assessment of, and decision on, the most appropriate economic instrument/s to form part of Queensland's new waste management strategy should be considered via the following process:

1. ***What is the Problem?***
   This stage undertakes an assessment of the problem based on accurate and reliable information, and defines key issues and potential impacts. The problem in this instance relates to the externality costs associated with sending waste to landfill. As discussed earlier, failure to comply with the waste hierarchy and an attitude of reduced landfilling at all costs should not be considered a problem in itself as this ignores the underlying externality costs and provides too narrow a focus e.g. recycling wastewater at all costs doesn't appear to be a policy in itself even in the face of significant water scarcity across Queensland.

2. ***What are the Desired Outcomes?***
   This stage defines the social/environmental goals and timeframes in which they should be achieved. A number of broad goals appear to be listed in the discussion paper, but the overarching goal should be to maximise net community benefit, and to provide a true price signal regarding waste management that incorporates or effectively internalises appropriate externalities in all stages of waste management from waste creation through to waste disposal (as well as for waste recycling).

3. ***What are the Available Instruments?***
   This stage identifies and describes the potential means by which the problem may be addressed and the goals achieved. The EPA discussion paper discusses the potential application of five instruments (indicating that there are other potentially effective instruments but they are outside of the control of the Queensland Government[1]), while this CBA extends to the assessment to seven instruments, including:

[1] The EPA discussion paper also proposes the potential use of advance recycling fees, advance disposal fees, tradeable resource recovery certificates and upstream combination taxes/subsidies, but it was indicated that such instruments require a national approach. This CBA is limited to an analysis of the economic instruments in the discussion paper, but it is important to note that other instruments requiring a national approach should also be

- Performance-based landfill levies;
- CDL;
- Regulations;
- Targets and bans;
- PAYT schemes;
- EPR and PSS; and
- Incentives/education.

4. ***What are the Impacts from Each Instrument?***
   This stage undertakes an assessment of the costs and benefits of each economic instrument, taking into account:
   - Effectiveness of instrument in achieving social/environmental goals;
   - Cost effectiveness of instrument in terms of least cost solution to community;
   - Cost of implementation, administration, enforcement and monitoring;
   - Level of flexibility in the face of potential change (e.g. future carbon tax);
   - Whether there is sufficient incentive for behavioural change to occur;
   - Whether equity is promoted as a result of distribution of economic impacts;
   - Ease of understanding for the community;
   - Potential side effects/perverse behaviours; and
   - Other potential constraints (e.g. politically acceptable and feasible).

5. ***What is the Preferred Instrument (or Mix of Instruments) Based on CBA Outcomes?***
   This stage concludes the CBA by selecting the preferred instrument or mix of instruments that maximises net community social and environmental benefits within a reasonable cost framework.

4.1.3 Recognition and Treatment of Externalities

4.1.3.1 What are Externalities?

Externalities refer to positive or negative impacts on third parties from a particular activity, with the consumer or producer undertaking the activity (which may be a product generation activity or consumer decision) failing to appropriately recognise and value the externality associated with their actions. Essentially, no costing or pricing signal is associated with the externality, potentially resulting in decisions that may have negative economic, social or environmental impacts on the broader community.

The objective of economic policy is to internalise externality costs and benefits into product/service costs so that the price signal to consumers reflects all costs associated with a particular activity or decision. Obviously, there are certain externalities that are difficult to value, and history has shown that there is often significant divergence between one person's estimate and other estimates.

4.1.3.2 Valuation of Externalities

What is important is that costs and benefits are valued in accordance with the potential costs/benefits associated with the externality, adjusted by the probability of the externality occurring. For example, if increased congestion on a road could potentially result in an additional fatality, the cost of the fatality should not be included as an externality cost, but rather the likelihood that an additional fatality will result from a particular activity should be applied to this potential externality cost. A risk-adjusted cost would therefore be used as the value for the externality to be included in the pricing signal or project evaluation cost.

Given the potentially significant values applied to different externalities, valuation methodologies should be agreed by key stakeholders and be consistent with industry best practice and any national guidelines that may exist. Those externalities that cannot be valued should be assessed in qualitative terms to enable some level of comparative assessment in decision making between policy options. Only those externalities that have identifiable impacts and can be valued with a reasonable degree of confidence should be included in costing and pricing signals.

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fully investigated prior to a decision being made as to whether any of the instruments assessed in the discussion paper should be considered for implementation.

It is understood that valuation techniques of waste management externalities are currently being investigated by the Australian Government to encourage a nationally consistent framework for assessment.

4.1.3.3 *Appropriate Externalities to Consider for Waste Management*

Externalities associated with waste generation/disposal are often classified into downstream and upstream externalities. Downstream externalities relate to the direct economic, social and environmental impacts associated with waste generation/disposal, such as the GHG emissions from waste collection trucks, recycling facilities and landfills (refer to Appendix C for further information on GHG emissions relating to waste disposed to landfill), and the public amenity impacts from waste collection trucks, recycling facilities and landfills.

Meanwhile, upstream externalities relate to the impacts associated with the production of raw materials used to create and transport products to the end user. Such externalities can vary from the GHG emissions associated with transporting raw materials to the manufacturer to the extraction of potentially limited resources for use during all stages of production.

Economic policy generally attempts to only incorporate downstream externalities into pricing signals, given that upstream externalities are driven by a combination of market factors outside of the influence of the purchasing/consumer decision. Incorporating upstream externalities such as the depletion of limited base resources into pricing signals at the end of the supply chain (i.e. at the disposal phase of waste management) is considered an inefficient and ineffective way of achieving desired outcomes. This is consistent with the outcomes of the recent Productivity Commission report.

The box below provides two simple examples from the water industry that highlight the inappropriateness of attempts to influence upstream behaviour by placing a policy/pricing burden on end users.

SOURCE OF EXTERNALITY: Introduction of dam sites to produce water.

EXTERNALITY IMPACTS: Externalities associated with introducing dam sites include (but are not limited to) community impacts associated with the relocation of residents and environmental impacts associated with the flooding of flora and fauna sites.

EXAMPLE 1: *Applying an upstream externality tax on wastewater disposal to reflect the social and environmental costs of having to produce additional water via additional dam sites.*

Incorporating such externality costs into wastewater pricing would be inefficient, as such a policy attempts to influence water consumption behaviour through indirect means, i.e. higher wastewater disposal prices. Obviously, a more efficient pricing signal would be to directly target policy towards the desired behavioural change, by increasing the cost of water to reflect these externalities related to water production. This would ensure that the price shift is borne by water consumers, providing greater incentive to adjust water consumption behaviour. In this instance, appropriate downstream externalities to be included in wastewater pricing may include the potential impacts associated with the location of treatment plants on amenity and the release of effluent into waterways on the environment.

EXAMPLE 2: *Applying an upstream externality tax on meat, fruit and vegetables at supermarkets and retail shops to reflect the social and environmental costs of having to produce additional water via additional dam sites.*

Incorporating such externality costs into retail prices for agricultural products would be inefficient, as such a policy attempts to influence water consumption behaviour through indirect means, i.e. higher prices for meat, fruit and vegetables. Obviously, a more efficient pricing signal would be to directly target policy towards the desired behavioural change, by increasing the cost of water to reflect these externalities related to water production. This would ensure that the price shift is borne by irrigators, providing greater incentive to adjust water consumption behaviour or to adjust production processes to minimise water usage. In this instance, there are minimal downstream externalities that should be considered when establishing an economic pricing signal.

Overall, while it is considered essential for all downstream externalities to be appropriately considered during waste policy and project assessments, upstream externalities should be excluded from waste management policy assessment and instead dealt with more efficiently by direct policies on production and packaging processes to allow these costs to directly flow through to product pricing, and eventually through to a price signal that may work to effectively adjust consumer behaviour.

Regarding GHG emissions, it would be inefficient to enforce an externality cost on the landfill sector unless such costs were applied to the waste sector more generally (including waste transport and recycling facilities), and also via a national framework. This is consistent with the Productivity Commission report, which states that:

> ...government intervention to address climate change would be more effectively and efficiently achieved through a comprehensive national approach. (EPA 2007; p.xxxi)

4.1.4 Quantification of Costs and Benefits

The extent of valuation of social and environmental impacts in this study is in accordance with the following scale:

- ***NEGLIGIBLE*** – on balance, any net impact is likely to be insignificant/immaterial.
- ***VERY LOW*** – on balance, a net impact may exist but is only likely to be very minor and will not significantly impact on any party.
- ***LOW*** – on balance, a net impact will probably exist, but the extent of the impact is only likely to be relatively minor.
- ***MODERATE*** – on balance, a net impact will exist, with the extent of the impact likely to be noticeable and significant but not substantial enough to cause considerable harm.
- ***HIGH*** – on balance, a net impact will exist and the extent of the impact is likely to be substantial and may cause considerable harm.
- ***VERY HIGH*** – on balance, a net impact will exist and the extent of the impact will result in significant hardship.
- ***EXTREME*** – on balance, a net impact will exist and the extent of the impact will most definitely result in significant hardship that will impact on community structures and significantly threaten sustainability.

The CBA first undertakes a financial assessment of likely costs associated with each economic instrument, and then undertakes an economic, social and environmental impact assessment in accordance with the above scale. When deriving financial/cost estimates, annualised values are derived where possible and allocated an impact value in accordance with the above scale in the economic impact level assessment to allow a direct comparison with social and environmental qualitative outcomes.

4.1.5 Impact on Local Government

A brief assessment of the impact of each economic instrument on local government, as a major provider of waste services in Queensland, is also included in the following sections for base information and assessment purposes.

4.2 Performance-Based Landfill Levies

4.2.1 Available Policy Options

The EPA discussion paper suggests the potential application of a performance-based landfill levy with the paper stating:

> An effectively implemented performance-based levy would more accurately reflect externalities of landfilling (which vary by facility performance and approaches implemented) than current Australian landfill levies and, more appropriately, reward landfill facilities (whether public or private) that implement good practice approaches. (EP 2007; p.35)

It appears as though a performance-based landfill levy would simply offer a discount to those demonstrating good performance in the following areas:

- Promotion of schemes for identified priority wastes and end-of-life products;
- Recycling schemes (e.g. metals, green waste); and
- Other environmental performance criteria such as landfill gas capture, leachate collection and liner systems (suitable to the size, location and type of landfill).

This CBA assumes that a performance-based landfill levy is the relevant economic instrument considered for implementation.

4.2.2 Responsibility for Policy

The EPA discussion paper implies that the levy would be collected by the Queensland Government to fund certain initiatives, as it is in other states. However, it obviously requires landfill operators/owners to administer and collect the levy funds on behalf of the state. The majority of operators/owners in Queensland consist of local governments, with a handful of private operators.

4.2.3 Implementation Costs

The potential costs associated with implementing a performance-based landfill levy are outlined in the following table. These costs exclude the cost to the community from actually paying the levy to the relevant authority, but instead reflect the costs associated with ensuring waste facilities are able to implement the policy.

Table 4.1: Estimated Financial Costs from the Implementation of a Landfill Levy

Cost Item	Cost Parameters and Estimate
Capital Expenditure	A large number of Queensland landfills and transfer stations do not currently have the necessary infrastructure and equipment to levy charges by weight. Unless the levy was to only apply on a zonal or regional basis where the majority of waste is generated and where infrastructure already exists to facilitate the application of a landfill levy, the introduction of a levy would require significant capital improvements consisting of weighbridges and associated facilities of around $100,000 per facility, most of which will be in areas under financial stress. The following estimate assumes that there are 100-200 landfills requiring upgrades. Additional site closure costs would be incurred if landfills are closed down as a result of the policy, and additional capital upgrade costs would be required for those landfill license holders that wish to upgrade facilities to 'good practice', although these costs are excluded from the estimate below. **CAPITAL COST ESTIMATE = $10-20 million upfront capital investment, to be repeated each 20 years**
Direct Operating Expenditure	Many Queensland landfills and transfer stations are currently not staffed. The introduction of an effective landfill levy would require additional staff to monitor all facilities and weigh the waste coming in and administer any charging processes. This would result in a significant financial impact on local governments of up to $100,000 per waste facility per annum, most of which will be in areas under financial stress. The following estimate assumes that there are 50-100 landfills or transfer stations that currently either do not have staff or would require additional staff to facilitate the policy. Additional ongoing monitoring costs would be incurred if landfills are closed down as a result of the policy, and additional operational costs would likely be incurred by landfill license holders that implement 'good practice' operational procedures. **DIRECT OPERATING COST ESTIMATE = $5-10 million per annum**

Management and Administration	The introduction of a levy would introduce additional transactions in the economy relating to the disposal of waste, including the setting of the levy by the relevant authority, the assessment of each landfill against established performance criteria to determine the applicability of any levy discounts, the collection of the levy by the landfill operator/owner, the transfer of levy funds from the landfill operator/owner to the relevant authority, as well as any monitoring and enforcing compliance by the relevant authority to ensure the levy is being collected on all wastes disposed to landfill. It is assumed that on average, each local government would incur $20,000 in additional management and administration costs as a result of the levy, while the Queensland Government would require $500,000 worth of resources to administer, manage and enforce the policy. As a cross-check, it would be expected that the management and administration of such a levy would equate to around 2% of revenue collected. **INDIRECT OPERATING COST ESTIMATE = $1.5 million per annum**
TOTAL	**CAPITAL COST = $10-20 million initially and then every 20 years** **OPERATING COST = $6.5-11.5 million per annum** **ANNUALISED COST = $8-14 million per annum**

Given that the volume of waste disposed by landfill or incineration in Queensland was estimated at 7.8 million tonnes in 2005/06, the extent of the revenue collected by a landfill levy would be $78 million if the levy was $10/tonne, $156 million if the levy was $20/tonne and $389 million if the levy was $50/tonne. Obviously, any actual reduction in waste sent to landfill would reduce the extent of this revenue. While it may be argued that there are potential economic benefits from a landfill levy in the form of taxation revenue available to be spent by the relevant authority, these are excluded from the analysis as they could result in significant wealth transfer effects when assessing impacts at a regional level. These issues are described in more detail in the CBA assessment table on the following page.

4.2.4 Potential Impact on Waste Generation/Disposal

A landfill levy may assist in reducing the volume of waste disposed to landfill by increasing the attractiveness and competitiveness of recycling, reuse and alternative waste technologies. However, it is unclear whether landfill levies have actually directly impacted on the extent of waste sent to landfill in other jurisdictions, and Hyder (2007) notes that a reduction in the amount of waste going to landfill is only evident when the extent of the landfill levy is substantial (i.e. in excess of $50/tonne).

Even then, it could be argued that levies alone have not been proven to be effective waste minimisation mechanisms, and it is only when significant government subsidies are provided to costly recycling initiatives that any impact is evident and these waste reductions are often very localised rather than provide general state-wide benefits. Landfill levies are therefore unlikely to result in any material reduction in waste disposed to landfill unless a considerable tax is imposed.

A performance-based landfill levy will not work to reduce the extent of waste generation/disposal, but may instead work to encourage landfill license holders to consider the implementation of gas capture systems and other environmental measures. It is questioned why some form of effective regulation could not achieve the same objective, subject to local conditions.

The EPA discussion paper provides an indication of potential quantities of materials diverted from landfill under differential levy scenarios:

1. **Low Diversion** – no additional activities, programs or incentives targeted at waste minimisation and resource recovery.

2. **Sustained Efforts** – assumes a continuing and increasing involvement and expansion of programs with a corresponding increase in resource recovery.

3. **High Diversion** – assumes that, by 2016, Queensland reaches the average national diversion rate as it was in 2002/03.

The above scenarios do not take into account the natural progression towards recycling activity as landfill space in urbanised areas becomes less available, technologies improve, and other market adjustments occur (e.g. potential introduction of a carbon tax reducing the attractiveness of transporting waste long distances to landfill). It is also unclear as to the level of landfill levy assumed over time under the sustained efforts scenario. The

results do not appear to tie back to the results of other jurisdictions and would require further analysis.

The figures suggest that an additional 960,000 tonnes of waste could be diverted from landfill as a result of the introduction of a landfill levy by 2016, consisting of 380,000 tonnes of MSW and C&I and 580,000 tonnes of C&D. This is grown from a starting estimate in the first year of implementation of an additional 90,000 tonnes of waste, consisting of 10,000 tonnes of MSW and C&I and 80,000 tonnes of C&D. It is assumed that C&D waste is the most price sensitive of the waste streams, which is likely to be the case given the readily available local recycling options for this type of waste.

4.2.5 Estimated Policy Cost per Unit of Waste 'Saved'

If reduced waste disposal to landfill is targeted through a landfill levy, it is possible, even if the suggested targets in the EPA discussion paper are met, that the transaction cost per tonne of waste 'saved' would begin at around $90-$155/tonne (significantly higher than the levy likely to be imposed), potentially reducing to $8-$15/tonne by 2016. Consequently, a significant proportion of a $20/tonne levy would be required just to facilitate and administer the levy. This is an estimate of the transaction cost only and does not include any community impacts from having to finance the levy through higher utility charges.

4.2.6 Cost-Benefit Analysis

Table 4.2: Summary of Economic Impacts Associated with Performance-Based Landfill Levy

Impact Category	Description and Valuation
Investment Requirements	The majority of Queensland waste facilities (i.e. landfills and transfer stations) do not currently have the necessary infrastructure and equipment to measure the volume of waste disposed without significant capital investment. In addition to not being equipped with weighbridges, many facilities in regional, rural and remote areas are not supervised. As such, a state-wide landfill levy by weight could only be introduced at considerable cost to ensure that measurement systems exist and facilities have the necessary ongoing operational resources to supervise, record and charge usage. Much of the capital and operational upgrades would be required in areas under financial stress, and the introduction of a levy would be unfair and impractical, with the cost of levy collection likely to outweigh actual levy revenue. Given the resulting impact on the costs to communities in these areas, considerable capital and operational subsidies would need to be made available to facilitate and maintain these upgrades. Even if some of the existing waste facilities without the necessary infrastructure were closed, costs would still accrue from these landfill sites for ongoing monitoring and management. For those landfills able to be upgraded to meet 'good practice' and be eligible for a discount on the imposed levy, additional investment may need to be made into gas capture and other aspects to ensure environmental performance meets the relevant criteria. Again, some landfills not meeting the criteria may be closed and waste consolidated to central landfill sites to achieve the necessary economies of scale to make such measures viable, but the closure of landfills does not mean that costs will disappear as ongoing monitoring and management will still be required. In certain instances, local governments may opt to establish a new landfill site with the required characteristics which would have substantial upfront community costs. From an economic benefit perspective, levy funds may be utilised to minimise the investment requirements to grow the recycling industry, where the levy is sufficient enough to allow the collection authority to provide significant financial subsidies to enhance competitiveness of the sector. In addition, where waste volumes sent to landfill are reduced (questionable whether this would occur), the life of landfills may be extended. **NET IMPACT = MODERATE TO VERY HIGH COST**
Policy Administration and Enforcement	The introduction of a landfill levy would introduce additional transactions in the economy relating to the disposal of waste, including the setting of the levy by the relevant authority, the assessment of each landfill against established performance criteria to determine the applicability of any levy discounts, the collection of the levy by the landfill operator/owner, the transfer of levy funds from the landfill operator/owner to the relevant authority, as well as any monitoring and enforcing compliance by the relevant authority to ensure the landfill levy is being collected on all wastes disposed to landfill. It is questioned whether the Queensland Government, local governments and other landfill operators/owners have the necessary administrative and enforcement resources to manage a levy system – in particular a performance-based levy system – without significant additional investment and resourcing. Essentially, a levy system creates an additional layer of bureaucracy, in addition to increasing the compliance costs for landfill operators/owners who have no choice but to pass on these administrative costs to the customer. Such administrative and enforcement costs will reduce the net funds available from the levy to offset externalities and/or make other investments in the waste sector. **NET IMPACT = MODERATE COST**

Impact Category	Description and Valuation
Market Certainty	The introduction of a performance-based landfill levy rewards waste facilities that implement 'good practice' approaches, and therefore provides a signal to the market to consider the potential levy discount that may be accessed when determining the siting and operational phases associated with landfills. In order to ensure that the decision on whether 'good practice' is achieved is not subjective, clear guidelines need to be established that are easy to follow and easily implemented in practice to be eligible for the discount. In addition, these 'good practice' guidelines should not be adjusted over time given that investments will be made to qualify for the levy discount under the requirements. In addition to considering the impact of the policy on current and future investments, it is essential to consider the impact of the policy on past investments. Obviously, waste facilities are established to meet the relevant government requirements in existence at the time, and investments are reflective of these regulations. In essence, establishing a performance-based landfill levy will 'shift the goalposts' for the majority of landfill license holders in Queensland, and may have significant financial impacts on their operations. It may be too late for their practices to be changed now and the levy may place them at a competitive disadvantage to others in the market. Had they known about the policy change, they may have established their facilities differently to qualify for the levy discount. A landfill levy may increase market certainty for the recycling sector, as it provides an artificial competitive advantage to that sector over waste disposal. However, there would remain significant uncertainties for the recycling sector, including cyclical demands for recycled products, transportation costs, etc. **NET IMPACT = LOW COST**
Market Distortion and Economic Effects	The primary objective of a performance-based landfill levy should be to internalise externalities, and therefore the extent of the levy should not exceed the readily identifiable and measurable externality costs associated with landfilling. If this is the case, then the market distortion and economic effects are minimal. However, if the waste disposal sector is required to cost and price certain externalities, while other sectors are not, there will still be some degree of distortion in the market as it may result in inefficient investment decisions, e.g. if externality costs associated with GHG emissions are levied on the waste sector, but not on other sectors such as the recycling sector. Many other states do not link the extent of the levy and externality costs, and instead attempt to drive behavioural change in waste generation and attempt to increase the level of investment in, and 'competitiveness' of, the recycling industry through inefficient pricing signals and financial subsidies. Effectively, these objectives are only achieved if the landfill levy is considerably higher than externality costs (therefore representing a tax rather than an externality levy), creating an artificial pricing signal that will result in: • a decline in consumer spending as disposable incomes fall in response to an increase in utility charges (particularly given the lack of control over waste disposal charges for the household sector); • reduced profitability of the commercial and industrial sectors; and • impact on the feasibility of certain projects. The end result of the tax is that it will prop up the recycling industry at the expense of households, business and industry, and may result in investment being withheld and moved to other jurisdictions. From an economic efficiency perspective, attempting to prop up the recycling industry indirectly via a landfill tax appears inefficient, as it would be more appropriate to provide incentives and rewards to recycling firms. This approach would facilitate an informed decision-making process that assesses need versus community cost, as the exact level of subsidy required to ensure that the operation is feasible would be identified and overall progress towards achieving a specified end outcome or objective can be reviewed. Attempting to control the market indirectly is likely to result in the levy simply acting as general government taxation, particularly in areas where recycling is not likely to be feasible for the foreseeable future (e.g. rural and remote areas). In addition, the imposition of a landfill levy may actually make recycling operations less viable as it increases the cost of disposal of residual material from recycling and resource recovery facilities. **NET IMPACT = LOW TO HIGH COST (depending on whether the levy is set at or above downstream externality costs)**

Impact Category	Description and Valuation
Adherence to User Pays	Adherence to user pays principles is enhanced if the landfill levy covers all identifiable and measurable downstream externality impacts of landfills that currently do not form part of the cost base of landfills (which may include GHG emissions, leachate contamination risks and loss of amenity). This would provide an improved economic/pricing signal to waste generators to decide whether to pay the higher disposal charge, attempt to adjust their patterns of purchasing, consumption and disposal, or invest in cleaner production processes (if commercial/industrial businesses). However, the application of a blanket levy across the state irrespective of individual landfill site conditions and externalities will distort the efficiency of pricing signals across locations. It is important to note that the effectiveness of the landfill levy in providing a true pricing signal to waste generators also differs considerably by waste stream. While all waste delivered directly to a landfill will incur the levy in addition to existing disposal charges, with the levy incurred on the weight of waste disposed, many commercial and industrial waste generators have their waste collected by private contractors with the extent of the charge levied based on the size of the bin being serviced. The pricing signal will be muted somewhat, with the levy likely to be passed on based on the capacity of the bin supplied rather than the actual weight of waste collected. The pricing signal provided to households via municipal waste collection services would be even less effective, as it would simply result in an increase in the annual charge levied across all customers of the scheme based on average waste disposal volumes per property. Essentially, there will not be any direct link between the charges levied and the waste disposed at individual properties and therefore there is no incentive for a reduction in waste generation and disposal. In effect, the landfill levy would work as a tax on the MSW waste stream, as well as the collected C&I waste. A performance-based levy would ensure that those landfills meeting certain environmental standards and other specified targets would benefit from a discount on the levy and therefore more accurately reflect externalities associated with different types of landfill operation. It would provide an incentive to landfill facilities to implement 'good practice' approaches to minimise the externalities of landfilling, but only if the marginal cost of implementing such practices was below levy costs. However, it is questioned whether this discount would be passed onto waste generators as disposal charges will still be based on a market price or a price set by local governments to preserve landfill capacity. Therefore, it is possible that any discount may be retained by the landfill license holder rather than passed on to waste generators, further distorting pricing signals. Obviously (as outlined in Market Distortion and Economic Effects), if the landfill levy is set at a level above externality costs (therefore representing a tax rather than an externality levy), an artificial pricing signal will be sent to the market and user pays principles will not be adhered to. The inefficient pricing signals will result in inefficient resource allocation decisions. Given that choice for consumers is often limited due to packaging, waste will be produced irrespective of product choice so responsibility falls back to the government to attempt to control packaging at the source rather than simply tax the end user who may have very little control over waste generation in most instances. **NET IMPACT = LOW BENEFIT TO MODERATE COST (depending on whether the levy is set at or above downstream externality costs)**
Perverse Behaviour	A landfill levy is likely to increase the incentive for illegal dumping activity as people attempt to avoid what may be perceived as an additional government tax. Such activity would result in considerable financial costs for the responsible authority in cleaning up illegally dumped waste, and therefore for the broader community through higher rates. The policing and enforcing of littering and illegal dumping regulations may also need to be increased if the incentive to dump illegally is higher. The incentive for illegal dumping may be further increased if the application of the levy results in the closure of some waste facilities, particularly in regional, rural and remote areas that may not be able to comply with the requirements to levy charges by weight or meet specified 'good practice' across all sites, and significant increases in distances for ratepayers to travel to dispose of their waste. Other perverse behaviours that may be promoted as a result of the application of a landfill levy include: • Greater 'shopping around' for the lowest landfill price, potentially increasing transport costs and associated consumption of energy/fuel; • Incentive for industries to deposit wastes on their own land; and • Given the substantial net costs of staffing waste facilities, local governments may decide to continue not to staff facilities and just pay the landfill fees to the relevant authority thereby removing the price signal and resulting in the levy effectively acting as a tax on regional, rural and remote areas. **NET IMPACT = LOW TO MODERATE COST**
Business Competitiveness	A landfill levy will reduce the interstate and international competitiveness of business and industry in Queensland, as it would increase the input costs associated with production/operation. The greatest impact will be felt by those companies with higher levels of waste generation and disposal. The impact on interstate competitiveness is dependent on the extent of the levy adopted, however, given that many other states already adopt a levy system. Generally, beneficiaries would be the recycling industry as it may be able to develop products that are more price competitive locally and internationally, particularly if significant financial subsidies are available. **NET IMPACT = VERY LOW TO LOW COST**

Impact Category	Description and Valuation
Regional Effects	The application of a state-wide landfill levy would place a significant financial burden on Queensland's regions by increasing compliance costs associated with landfills. Currently, many landfills are not staffed and also do not feature weighbridge technologies. Charging by weight disposed would require a considerable application of funds by the local governments both initially and on an ongoing basis. Unless significant financial subsidy assistance from the Queensland Government was available, this would work to either increase landfilling costs to excessive levels (given the volumes disposed) or increase local government rates, and therefore reduce the attractiveness of residing or operating in regional, rural and remote communities. The tax could also result in negative wealth transfer effects, with the levy funds collected in regional, rural and remote areas likely to be applied in other areas where recycling schemes are deemed more cost effective (i.e. metropolitan areas), even with considerable financial subsidies. **NET IMPACT = VERY HIGH COST**
Proximity Principle	A number of factors may impact on the achievement of the 'proximity principle' as a result of the introduction of a landfill levy, including: • If the levy encourages consolidation of waste facilities, particularly in regional, rural and remote areas, generators may need to travel greater distances to access transfer stations and/or landfills; • Potential increased take-up of resource recovery as a result of higher landfill costs and potential application of significant subsidies is likely to result in greater transportation of recyclable materials to central locations; and • Markets for recycled products are still likely to be dominated by external factors, and considerable volumes will still be exported overseas, with the possible exception of C&D waste which could be recycled and reused locally. **NET IMPACT = LOW COST**
TOTAL ECONOMIC IMPACT	**A performance-based landfill levy would result in a moderate to high economic cost to the community if applied across the state, given the additional costs likely to be incurred in establishing the necessary infrastructure and facilitating ongoing administration of the policy. The levy would only adhere to user pays principles and not create significant market distortion and economic effects if it was set at a level to reflect an accurate estimate of downstream social and environmental externality costs, not impose constraints on landfill license holders that are not applied to the waste sector more generally, and levy funds were only used to mitigate or directly offset such costs in the location in which they are collected. Based on what has occurred in other jurisdictions, a levy is likely to be set artificially high, not be reflective of user pays principles, and result in significant market distortion.**

Table 4.3: Summary of Environmental Impacts Associated with Performance-Based Landfill Levy

Impact Category	Description and Valuation
GHG Emissions	Adopting a performance-based landfill levy provides an incentive for landfill license holders to upgrade their operations to potentially include gas capture, thereby potentially reducing GHG emissions. The volume and type of gas released by landfills is influenced by the design of the landfill, the presence of a gas capture mechanism, the composition of the waste and climate. The Net Balance Management Group (2007) estimated that emissions from older style landfill per tonne of waste equated to around 1.01 tonnes CO_2e, while emissions from a newer landfill per tonne of waste equated to around 0.25 tonnes CO_2e. This study implies that GHG emissions could be reduced by around 75% through effective gas capture and the adoption of 'good practice' technologies. Based on an indicative range for carbon credits of \$15-25/tonne CO_2e[2], the GHG emissions cost for landfilled waste could be \$15-25/tonne under an older style landfill and \$4-6/tonne for a 'good practice' landfill. This is consistent with the outcomes of Productivity Commission (2006), which indicates that the external costs of properly located, engineered and managed landfills incorporating gas management systems are likely to be less than \$5/tonne. The most significant benefit is that the existence of an environmental externality levy may push new landfill decisions towards 'good practice', thereby limiting future GHG emissions impacts from landfills. However, the issue of lack of economies of scale in most regional, rural and remote areas would limit any benefits. The success in landfill levies effectively reducing the volume of waste disposed to landfill is questionable, unless a considerable tax well in excess of externality costs is adopted and potentially makes recycling cost effective in certain areas. As outlined above, the GHG emission cost associated with a 'good practice' landfill (and any associated levy) is likely to be insufficient to make recycling a viable option in most areas where recycling is currently unavailable. The net GHG emission impact also needs to take into account the energy required by transportation of products to recycling facilities, the energy required during recycling processes and the transportation of recycled products to markets. It is expected that these are likely to be significant, and that a nationally accredited carbon scheme would ensure that all of these costs were incorporated into feasibility assessments for both the extraction of virgin materials and the processing of recycled products. Additional GHG emissions may occur as a result of the introduction of a performance-based landfill levy, particularly if waste generators do more 'shopping around' for lower landfill prices and regional, rural and remote communities close some of their existing waste facilities and result in greater distances between facilities. **NET IMPACT = NEGLIGIBLE TO LOW BENEFIT**
Ecosystem Effects	Adopting a performance-based landfill levy provides an incentive for landfill license holders to upgrade their operations to minimise the potential for leachate contamination and other ecosystem effects, and recognises the greater environmental externality costs associated with older landfills not meeting certain standards. A levy could also be applied selectively to hazardous or problem wastes (e.g. tyres, horticultural black plastic, abattoir and other strongly organic wastes) in an attempt to reduce their potential ongoing ecosystem effects following disposal. The most significant benefit is that the existence of an environmental externality levy may push new landfill decisions towards 'good practice', thereby limiting future ecosystem impacts from landfills. However, the issue of lack of economies of scale in most regional, rural and remote areas would limit any benefits. The extent to which ecosystems are positively impacted by the landfill levy in regions where upgrading to 'good practice' is not feasible depends on the extent to which levy funds are applied to directly offset local externalities. Based on experiences in other jurisdictions, levies are generally spent on specific programs and are not applied in this manner, and therefore the environmental benefits in these instances would be negligible. The introduction of a landfill levy may also increase the amount of illegal and uncontrolled dumping of waste to the environment, which has greater potential of contamination and negative ecosystem effects. **NET IMPACT = NEGLIGIBLE TO LOW BENEFIT**

[2] Based on information sourced from www.carbonplanet.com ($23/tonne) and www.zeroyourcarbon.com.au ($16.50/tonne).

Impact Category	Description and Valuation
Resource Sustainability	Resource sustainability would only be promoted in instances where landfill lives are extended, or demands for base materials are reduced. As outlined above, the success in landfill levies effectively reducing the volume of waste disposed to landfill is questionable, unless a considerable tax well in excess of downstream externality costs is adopted and potentially makes recycling cost effective or used to subsidise recycling processes in certain areas. While levy funds could be applied to fund research and trials of new technologies, market development for recyclables and other initiatives for sustainable development, it must be questioned whether the resources required to undertake recycling activity, including the transportation of products to recycling facilities, the energy required during recycling processes and the transportation of recycled products to markets, would exceed the resources required to produce base materials and landfill waste generated. A study of all impacts of both options would be required to determine whether upstream benefits would actually accrue from such a policy. The most significant issues include ongoing availability of landfill sites and the extraction of limited natural resources. Given that the latter is primarily an upstream issue that should be dealt with more directly through upstream policies, the focus here is on the ongoing availability of landfill sites. All available information suggests that the overall landfill capacity in Queensland is sufficient for the foreseeable future in most regions via a mix of brownfield and greenfield sites, and there are suggestions that we are creating holes through mining and quarrying activity quicker than we are filling them. **NET IMPACT = NEGLIGIBLE TO VERY LOW BENEFIT**
TOTAL ENVIRONMENTAL IMPACT	**A performance-based landfill levy would potentially result in negligible to low environmental benefit, while a general landfill levy would have negligible benefits. Internalising downstream environmental externalities into landfill charges would help convey these third party costs to waste generators. Benefits would be maximised if levy funds were only used to mitigate or directly offset environmental externality costs in the local area in which funds were collected. One problem lies with attempting to internalise externality costs associated with GHG emissions from landfills, as such a 'carbon tax' should form part of a national framework rather than being specifically applying to the landfill sector to ensure that investment decisions and resource allocation are not distorted.**

Notes: CO_2e tonnes – Equivalent tonnes of Carbon dioxide (i.e. gas released may not be carbon dioxide)

Table 4.4: Summary of Social Impacts Associated with Performance-Based Landfill Levy

Impact Description	Description and Valuation
Public Health and Safety	Adopting a performance-based landfill levy provides an incentive for landfill license holders to upgrade their operations to minimise the potential for leachate contamination and other potential public health factors, and recognises the greater social externality costs associated with older landfills not meeting certain standards. A levy could also be applied selectively to hazardous or problem wastes in an attempt to reduce their potential ongoing public health effects following disposal. The most significant benefit is that the existence of a social externality levy may push new landfill decisions towards 'good practice', thereby limiting future public health and safety impacts from landfills. The extent to which public health and safety is positively impacted by the landfill levy in regions where upgrading to 'good practice' is not feasible depends on the extent to which levy funds are applied to directly offset local externalities. Based on experiences in other jurisdictions, levies are generally spent on specific programs and are not applied in this manner, and therefore the social benefits would be negligible. The introduction of a landfill levy may also increase illegal and uncontrolled dumping activity and have resulting risks for public health. The potential for perverse behaviour (e.g. 'shopping around' for the lowest landfill price, potential closure of waste facilities) may also increase transportation, thereby impacting on congestion on roads, as well as increase the risk of accidents. The success in landfill levies effectively reducing the volume of waste disposed to landfill is questionable. It is also questioned whether public health and safety would be positively or negatively impacted by increased recycling opportunities, as they are likely to involve greater transportation requirements and potentially higher levels of workplace health and safety risk. **NET IMPACT = NEGLIGIBLE TO LOW BENEFIT**
Amenity	It is unlikely that a performance-based landfill levy will include a discount for landfills minimising amenity impacts, as these types of impacts are more related to historic siting/location rather than 'good practice' operational characteristics. It is questioned whether amenity would be positively or negatively impacted by the potential for increased recycling opportunities, as they are likely to involve greater transportation requirements and also industrial location. The introduction of a landfill levy may also increase illegal and uncontrolled dumping activity and have resulting risks for public amenity, particularly if the rubbish is visible. The potential for perverse behaviour (e.g. 'shopping around' for the lowest landfill price, potential closure of waste facilities) may also increase traffic congestion and noise on roads. **NET IMPACT = NEGLIGIBLE IMPACT**
Wealth Transfer	There are significant wealth transfer effects associated with the introduction of a landfill levy, particularly if levy funds are not directly applied to offset local externalities and/or levies are set at a level above the readily identifiable and quantifiable downstream externality costs of landfilling. The following cross subsidy and wealth transfer effects are likely to result from the imposition of a levy/tax that does not meet this criteria: • Transfer of wealth between regions if levy funds are not 100% hypothecated back to the region in which they are collected, with the most likely effect being a transfer of wealth from regional, rural and remote areas to metropolitan areas where recycling activity is likely to be promoted via levy funds due to the cost ineffectiveness of such schemes in rural and remote areas; • Transfer of wealth from the community to enhance the profits of the recycling industry (via recycling subsidies) and advertisers (via waste education expenditure), and a possible transfer of wealth out of regions, to other states or potentially overseas depending on the ownership profile of these companies; • Transfer of wealth from the waste industry to general government if levy funds are not 100% hypothecated back to the waste industry; • Transfer of wealth from the community and environment to government if levy funds are not used to directly offset the externalities which they are supposed to represent; and • Subsidisation of recycled products, many of which are exported to offshore markets, thereby exporting community wealth to the benefit of consumers in these markets. Essentially, wealth effects can only be avoided if levy funds are used to directly offset the local negative externalities that the additional costs are supposed to represent. However, practical experience in other jurisdictions would suggest that any levy would act more like a general tax with funds either used to prop up the recycling industry or fund other state government initiatives and not be hypothecated within regions. **NET IMPACT = HIGH TO VERY HIGH COST**

Impact Description	Description and Valuation
Cost of Living and Convenience	A landfill levy would add to the annual household waste services bill (with estimates ranging from $20 to $150), which would be equivalent to an increase of up to 100% from current charging levels for general waste collection. The indirect effects from the levy on households would also be considerable, as they would be required to fund the additional capital and operational costs associated with their relevant local government's compliance with the levy system as well as pay more for their retail products, personal and business services. It would be anticipated that the end incidence on households could be as much as $300 per annum. When combined with the significant increases in water and wastewater charges anticipated in the near future, and possible substantial increases in other rates and utilities over the next decade, this places a considerable financial burden on the community and will further add to cost of living pressures. The benefits for this additional cost of living burden may also be transferred to other areas, as outlined above. Convenience may also be impacted as local governments potentially close down waste facilities in regional, rural and remote areas in an attempt to minimise compliance costs and maximise compliance with 'good practice'. **NET IMPACT = HIGH TO VERY HIGH COST**
Intergenerational Equity	There are suggestions that a landfill levy would work to reduce the volume of waste sent to landfill, and therefore reduce the amount of raw material extraction and take-up of landfill airspace. As previously outlined, the success in landfill levies effectively reducing the volume of waste disposed to landfill is questionable. Further, available information suggests that the overall landfill capacity in Queensland is sufficient for the foreseeable future in most regions via a mix of brownfield and greenfield sites. The extraction of raw materials is an international issue and is difficult to assess given that we export a considerable amount of these resources and there is a very tenuous link between our consumption of resources versus a sustainable level of extraction worldwide. This is more of an upstream issue that should be dealt with more directly through upstream policies. It is recognised that the cost of landfilling will become more expensive in future periods in certain metropolitan and urbanised areas of Queensland due to the exhaustion of large landfill sites within close proximity. This is likely to result in greater transportation of waste between local government boundaries and therefore higher overall disposal costs. Such a natural market movement will increase the competitiveness of alternative disposal mechanisms such as recycling and reuse. Attempting to create an artificial market ahead of these natural market signals would essentially bring forward future costs and place an unnecessary financial burden on the current community with minimal benefit for future generations. **NET IMPACT = NEGLIGIBLE IMPACT**
Community Acceptance and Social Conscience	A landfill levy is reasonably easy to understand, although there would be a community perception that it is just another state government tax, particularly if the funds are collected in one region and spent in another. As such, it is envisaged that the levy would not be an effective waste education tool for the majority of the community, and there would be a low willingness to accept an additional government levy/tax, particularly if actual local social and environmental benefits cannot be readily identified at a local level. **NET IMPACT = LOW COST**
TOTAL SOCIAL IMPACT	**A performance-based landfill levy would potentially result in a high social cost, with any minor benefits from potential improvements to public health offset by significant wealth transfer effects and the cost of living impacts. Social costs may be limited if there is a clear link between the extent of the levy and the social externality costs the levy represents, and the levy funds are applied locally to offset these externalities.**

4.2.7 CBA Outcomes

The analysis found that a performance-based landfill levy would result in a moderate to high financial/economic cost to the community, primarily due to additional infrastructure requirements and levy administration, as well as significant market distortion effects. Such a policy would also only result in negligible to low environmental benefit, and would actually result in a high social cost due to significant wealth transfer effects (from regional, rural and remote areas) and cost of living impacts. A performance-based levy would only be equitable and not create significant market distortion effects if it was set at a level to reflect an accurate estimate of downstream social and environmental externality costs, not impose constraints on the landfill license holders that are not applied to the waste sector more generally, and levy funds were only used to mitigate or directly offset such costs in the location in which they are collected.

4.2.8 Local Government Impacts

Potential implications for local governments from the imposition of a landfill levy include:

- Need to act as collection agency for the landfill levy and associated administration, management and transaction costs;
- Need to ensure the existence of, or investment in, sufficient infrastructure/equipment and operational resources at all waste facilities to facilitate the collection of the landfill levy, including weighbridges and staffing of facilities;
- Investigation into the feasibility of upgrading waste facilities to 'good practice', any capital and operating costs associated with any approved upgrades, and compliance costs/submissions regarding eligibility for the levy discount;
- Potential backlash from waste generators and ratepayers regarding application of the tax;
- Review of the appropriateness of any Community Service Obligations (CSOs) that may apply to certain remote waste facilities or categories of ratepayers;
- Costs of cleaning up additional illegal dumping as waste generators attempt to avoid the levy, and potentially increased policing/enforcement resources;
- Impact on past landfill investments that were made at the time when a levy did not exist; and
- May need to consider a consolidation of landfills and transfer stations due to resourcing requirements and the incentive to meet 'good practice', and resulting community impacts in regional, rural and remote areas from reduced convenience and potential increase in illegal dumping activity.

Obviously, the combination of the above would have considerable financial and resourcing impacts on Queensland local governments, and substantial financial support in the form of capital and operational subsidies would be required from the Queensland Government to ensure that communities are not faced with further rate increases.

4.2.9 Issues in the Discussion Paper

The EPA discussion paper requests views on a number of issues, as outlined in the first column of the following table. A brief discussion of issues associated with each item coming out of this CBA is provided in the second column.

Table 4.5: Brief Response to Discussion Paper Issues Regarding Landfill Levy

Issue	Comments
Introducing a landfill levy in the short term (e.g. within three years)?	• The majority of landfill infrastructure in Queensland is incapable of measuring all waste sent to landfill, and significant capital investment would be required • There would also be a significant impact on ongoing operations as many waste facilities are not staffed in regional, rural and remote communities • Cost of living impacts need to be recognised in light of substantial increases in other rates and utility charges
The effectiveness of price signals on the behaviour of those who could prevent, produce or better manage waste?	• No price signal for municipal waste stream as the levy would simply flow through as indirect average flat increase in charges for households • Price signal at the landfill may result in greater 'shopping around' and potentially increased transport and associated increase in energy/fuel consumption • Could result in increased illegal dumping activity as people attempt to avoid the tax • Landfill levies have been shown to have minimal real effect on waste generation and disposal behavior in terms of encouraging greater recycling, reuse or alternative waste technologies unless the levy exceeds $50/tonne
The application of a performance-based landfill levy that 'rewards' good practice instead of the usual model of a flat levy fee?	• Definition of 'good practice' could be subjective • Some landfills may be unable to meet requirements, resulting in closure of landfills and potential new landfill sites, but costs would still accrue from closed landfill sites • The majority of the levy differential is likely to be associated with GHG emissions, which would be better dealt with by a national carbon tax or trading scheme rather than a short-term band aid fix for the waste disposal industry • Only effective in providing a signal to new landfills to adopt 'good practice', although this could also be achieved through regulation without the need for a levy
Criteria that could be used for a landfill levy that rewards good practice?	• Whether externality costs have been reduced to the extent possible within a cost effective framework, taking into account the location of the landfill (i.e. consideration of metropolitan vs regional vs rural vs remote)
How the funds collected from a landfill levy could be applied?	• Should be hypothecated back to the waste industry • Should be hypothecated back to the region in which they are collected to ensure no net transfer of community wealth between regions (particularly from regional, rural and remote areas to metropolitan areas) • Should be used to directly offset the local negative externalities that the additional costs are supposed to represent rather than act as a state tax • Should not result in a transfer of wealth from the community to the waste recycling industry or advertising companies, as this is likely to not only involve a transfer of wealth out of regional areas but potentially a transfer of wealth interstate or offshore
Further economic instrument options that could be considered for the longer term?	• This CBA finds regulation and incentives as the two key instruments that should be considered for implementation to maximise community benefit within a cost effective framework

4.3 Container Deposit Legislation

4.3.1 Available Policy Options

The EPA discussion paper highlights some potential broad level effects from the introduction of a Container Deposit Legislation (CDL) scheme and identified the following reasons for introducing CDLs:

- Reducing the portion of the litter stream caused by beverage containers;
- Increasing materials recovery rates;
- Extending the life of landfills through increased recovery rates; and
- Conserving resources.

The discussion paper appears to envisage the implementation of a scheme in Queensland similar to that currently operating in South Australia.

4.3.2 Responsibility for Policy

A collection coordinator is usually responsible for the administration of each CDL scheme, with this body responsible for the coordination of all aspects of the scheme including:

- Determining the scope of each scheme including which containers should be included;
- Brokering agreements with manufacturers;
- Establishing the scale of the deposit and management and administration costs;
- Operating and maintaining the container return depots;
- Identifying the most appropriate mechanisms for publicising the scheme; and
- Managing contracts with the recyclers who purchase the returned containers.

4.3.3 Implementation Costs

The potential costs associated with implementing a CDL scheme are outlined in the following table.

Table 4.6: Estimated Financial Costs from the Implementation of a CDL Scheme

Cost Item	Cost Parameters and Estimate
Capital Expenditure	The principal capital requirement in establishing a CDL scheme would be the establishment of container return depots. Although under some CDL schemes containers can be returned to retailers, in most require containers to be returned to a depot. To be effective, the depot would need to: • Be close to major transport routes; • Have good access and parking; and • Be capable of cash handling operations. The costs of establishing these drop off centres is likely to reflect land values around the state but assuming that two sites was established in each local government area at an estimated average cost of $300,000 per site including land purchase, construction and fit out, the total costs of the container return network would be around $30 million. **CAPITAL COST ESTIMATE = $30 million initial capital expenditure**
Direct Operating Expenditure	Employee expenses would be anticipated to account for the majority of direct operating expenditure for a CDL scheme. The container return depots may need to have extended operating hours, as well as sufficient staff numbers on duty to maintain security in a cash-handling environment and to sort the containers once returned. Assuming a staff of four at each of the locations, it would be anticipated that annual employee costs would be close to $10 million. Drinks manufacturers would also have to pay an additional charge (currently 3c/container in SA) to the scheme co-coordinator to cover the costs of running the system. The other main operating costs would be transport for the materials from the collection depots to recycling facilities. **DIRECT OPERATING COST ESTIMATE = At least $10 million per annum**
Management and Administration	The scheme would require some strategic management to carry out the functions identified in the previous section including coordinating the operation of the scheme and its promotion, as well as liaising with manufactures. This body would also need to be responsible for overseeing the operation of the container return depots. Assuming one member of management staff could cover five collection points and that an executive management body of five full time staff employee costs (including 20% oncosts) would be required, the total management and administration employee costs would be around $1 million per annum. **INDIRECT OPERATING COST ESTIMATE = $1 million per annum**

Cost Item	Cost Parameters and Estimate
TOTAL	**CAPITAL COST = $30 million, with $15 million required for replacement each 20 years** **OPERATING COST = At least $11 million per annum** **ANNUALISED COST = At least $14 million per annum**

4.3.4 Potential Impact on Waste Generation/Disposal

It would be expected that the impact of introducing a CDL scheme on waste generation/disposal would be limited. The majority of Queensland local governments have implemented kerbside recycling services, giving consumers the opportunity to recycle these materials with considerably less effort than would be required under a CDL.

The impact of implementing a CDL in an area that does not currently provide a kerbside recycling service would be expected to be much larger, but even this would only target a small proportion of the total recyclable stream. Where local governments have chosen not to implement kerbside recycling schemes, it is assumed that this is due to the absence of a local market for the collected products and the additional transport costs of moving the materials to the nearest market are prohibitive. Any CDL would be faced with the same fundamental issue in that if there were a market for recyclables, kerbside recycling would have been introduced (and it follows that if kerbside recycling is introduced, the impact of a CDL scheme is likely to be minimal).

4.3.5 Estimated Policy Cost per Unit of Waste 'Saved'

Given the low level of waste that is likely to be diverted from landfill as a result of a CDL scheme, and the relatively high establishment and operating costs of the scheme, any waste 'saved' is likely to be prohibitively expensive. The anticipated reduction in littering may result in a small saving, but given the small range of containers covered by a potential CDL scheme the impact on the total litter stream is also expected to be very small.

4.3.6 Cost-Benefit Analysis

Table 4.7: Summary of Economic Impacts Associated with CDL

Impact Category	Description and Valuation
Investment Requirements	The principal investment requirement to implement a CDL scheme would be the establishment of container return depots. For any CDL scheme to be effective the sites must be in prime locations, which would require considerable initial investment. If the network of return depots is too small or poorly located, the rate of return is likely to be low as the number and location of facilities has been shown to be critical in the success of other CDL schemes. The return facilities would also need to be sufficiently secure that they could safely hold the required cash to be exchanged in return for used containers. **NET IMPACT = HIGH COST**
Policy Administration and Enforcement	The major administration and enforcement costs of a CDL scheme would relate to: • Negotiating with manufacturers to join the scheme; • Advertising and other promotion of the scheme; and • Ensuring no containers returned were bought interstate (many states that have considered some form of CDL are put off by the lack of a nationally consistent approach). Legislative provisions may also need to be reviewed and adjusted to allow a CDL scheme to exist. **NET IMPACT = LOW COST**
Market Certainty	It is not thought that implementing a CDL scheme would have any significant impact on market certainty for recyclers. The introduction of kerbside recycling has provided them with certainty of input supply and this would be expected with or without a CDL scheme. The greatest risk for recyclers is in finding a market for their products, not in securing input supplies. Whilst greater market certainty may have been a benefit from the adoption of the South Australian CDL scheme, it may not be applicable to other states as its CDL scheme was implemented before the widespread roll out of kerbside recycling. **NET IMPACT = NEGLIGIBLE IMPACT**
Market Distortion and Economic Effects	The costs of managing and administering a CDL scheme would be expected to result in increased prices of the goods that feature containers under the scheme. Manufacturers would be expected to seek to recover the additional costs of the scheme from consumers. Any consumers that did not have access to a return depot would also effectively have the cost of each product increased by the level of the deposit, as they would have no practical means of claiming their deposit. **NET IMPACT = NEGLIGIBLE IMPACT**
Adherence to User Pays	Those consumers that use the products that feature containers under the scheme would have to fund the costs of the scheme through higher prices. As well as the higher cost of the goods sold, there are also additional 'transaction' costs that include sorting and transporting the containers to container return depots. The costs of the CDL schemes may exceed the externality cost of the end waste product and therefore may distort prices in excess of appropriate economic signals, but this assessment should be undertaken as part of any feasibility of establishing such a scheme. **NET IMPACT = VERY LOW BENEFIT**

Impact Category	Description and Valuation
Perverse Behaviour	The most significant potential perverse behaviour from implementing CDL would be a reduction in volumes of kerbside recycling as consumers choose to transport their waste personally to depots to reclaim the deposit on the CDL items. When consumer time and transport costs in sorting and then returning empty containers to a collection depot are considered, there is likely to be a considerable cost incurred. The kerbside collection would still need to take place to collect all the recyclable materials not covered by the CDL scheme and the reduction in volume of some materials may also feed through to reduced revenues for recyclables. Although CDL schemes have been found to reduce the litter stream of the containers included in the scheme, they do not address the underlying issue of littering. **NET IMPACT = LOW COST**
Business Competitiveness	Unless implemented at a national level, it is likely that CDL may have detrimental impact on business competitiveness in Queensland. Implementing and operating the scheme would be expected to entail significant additional costs which would need to be recovered in the first instance from the manufacturers that join the scheme, with these costs flowing through to consumers. Manufacturers that sign up to the scheme will also be placing themselves at a disadvantage to those that are outside the scheme. If a CDL scheme were only implemented in some areas of the state, goods in the CDL area (which would include the management and administration costs) may be more expensive than those sold outside of the scheme. **NET IMPACT = LOW COST**
Regional Effects	It would be expected that there would be few benefits from establishing a CDL scheme in areas where there is no market for recyclables and where transport costs to the nearest market are prohibitive. **NET IMPACT = NEGLIGIBLE IMPACT**
Proximity Principle	If a CDL scheme were implemented in regional areas, it would be likely that journeys would also increase both to deposit containers at the depot and then to transport the containers to the nearest market for recyclables. **NET IMPACT = LOW TO MODERATE COST**
TOTAL ECONOMIC IMPACT	**A CDL scheme has the potential to incur a moderate to high economic cost to the community, both though the initial capital investment and the additional operating costs required to sort and transport collected CDL items relative to kerbside recycling. Any costs not recovered by the sale of the collected CDL items would need to be recovered from manufacturers and would therefore be expected to result in higher prices for consumers.**

Table 4.8: Summary of Environmental Impacts Associated with CDL

Impact Category	Description and Valuation
GHG Emissions	The adoption of CDL may result in a net increase in GHG emissions as a result of: • Additional private vehicle journeys to and from the container deposit depots (the CDL scheme method of collecting containers via individual car journeys is not as efficient as a kerbside collection round where many properties can be serviced in one trip); and • Additional transport requirements from container return depots to recyclers (especially where there is no local market for the materials collected). These potential increases would be offset to some extent by reducing the quantity of materials being disposed of at landfill, although the actual reduction in GHG emissions is likely to be limited given the inert nature of the products generally associated with CDL schemes and limited proportion of the total waste stream that would be covered. The capacity to reduce the waste stream to landfill would be further reduced where kerbside recycling is already in operation. **NET IMPACT = LOW COST**
Ecosystem Effects	The impact of CDL on ecosystems is also likely to be limited because it would not result in the diversion of large additional amounts of materials from landfill. Potential reductions in littering would reduce ecosystem damage, but would be limited to the proportion of the litter stream that could be returned under the CDL scheme. **NET IMPACT = NEGLIGIBLE IMPACT**
Resource Sustainability	The impact of CDL on resource sustainability would be expected to be small because recycling is already taking place where it is viable. The same market forces that prevent the greater expansion of kerbside recycling services in remote local government areas would also impact on any CDL scheme. **NET IMPACT = NEGLIGIBLE IMPACT**
TOTAL ENVIRONMENTAL IMPACT	**A CDL scheme has the potential to result in a negligible to low environment cost, particularly where kerbside recycling is already offered in densely populated areas, as it requires greater individual journeys to container deposit depots than a broad-scale kerbside recycling program. The existence of kerbside recycling means that a CDL scheme would compete for certain materials.**

Table 4.9: Summary of Social Impacts Associated with CDL

Impact Description	Description and Valuation
Public Health and Safety	Any reduction in the amount of littering, especially glass products, would be expected to improve public health and safety by removing potential hazards from the environment. There may be some health and safety issues regarding public access to, and workplace health and safety within, the container return depots although it would be anticipated that these could addressed through appropriate onsite management practices. **NET IMPACT = NEGLIGIBLE TO VERY LOW BENEFIT**
Amenity	Amenity is likely to be improved by a reduction in littering, however this reduction would only affect the litter stream covered by the CDL scheme. **NET IMPACT = NEGLIGIBLE TO VERY LOW BENEFIT**
Wealth Transfer	There may be a very minor wealth transfer away from consumers of the products that are packaged in containers under the CDL scheme as additional costs are recovered first from manufacturers and then from consumers via increased prices. Wealth may be transferred to recycling companies who would benefit from the increased availability of containers ready for recycling. **NET IMPACT = NEGLIGIBLE IMPACT**
Cost of Living and Convenience	There is likely to be an increase in the cost of living as prices of goods packaged under the CDL scheme increase to cover costs of the scheme. As with wealth transfer, the impact of these prices increases would be limited because it would only apply to a narrow range of products. There may also be a convenience impact associated with sorting recyclables and then transporting them to the container return depot. **NET IMPACT = VERY LOW COST**
Intergenerational Equity	There is likely to be limited intergenerational equity implications, confined to a very small reduction in quantities of waste sent to landfill and the use of fewer virgin materials given that the containers generally targeted by a CDL scheme are already collected via kerbside collections where feasible. **NET IMPACT = NEGLIGIBLE IMPACT**
Community Acceptance and Social Conscience	CDL schemes have proven to be popular with the community where they have been adopted. Implementing a CDL scheme gives the community a sense of having made a contribution towards combating waste management issues, but if this involves significant costs and additional car journeys, that are probably not fully understood. Kerbside recycling would also provide similar benefit. **NET IMPACT = NEGLIGIBLE TO VERY LOW BENEFIT**
TOTAL SOCIAL IMPACT	**A CDL scheme would have a negligible social impact, as it may or may not result in very minor reductions in the proportion of the waste stream sent to landfill and would require greater sorting and transportation costs by individuals in order for the scheme to work effectively.**

4.3.7 CBA Outcomes

The analysis found that a CDL scheme would result in a moderate to high financial/economic cost to the community, primarily due to the requirement to establish and staff large numbers of container return depots. Such a policy may also result in a low environmental cost due to the additional transportation requirements to deliver containers to depots relative to a kerbside recycling scheme. Social impacts were found to be negligible.

4.3.8 Local Government Impacts

The major implication for local governments from the introduction of a CDL scheme would be on the volume of waste and composition of recyclables recovered through kerbside recycling, as there could potentially be a significant reduction in revenues resulting from a reduced volume of recyclables that could be sold. This impact would be expected to require additional support for the recycling services most likely in the form of increases in charges to ratepayers of the municipal collection system.

4.3.9 Issues in the Discussion Paper

The EPA discussion paper requests views on a number of issues, as outlined in the first column of the following table. A brief discussion of issues associated with each item coming out of this CBA is provided in the second column.

Table 4.10: Brief Response to Discussion Paper Issues Regarding CDL

Issue	Comments
The use of Container Deposit Legislation in Queensland?	• The major obstacles to the use of CDL in Queensland, and the factors that make it unviable from a community impact perspective, include: o Kerbside recycling already established where feasible o Considerable establishment and operating costs o Detrimental impact of volume of recyclables collected at the kerbside
Further exploring a national approach to the use of deposit systems?	• A national approach would overcome issues around cross border system abuses and to ensure manufacturers were dealing with one CDL scheme • However, a national approach does not address the issues outlined above regarding distance to market and impact on kerbside recycling
Investigating appropriate industry initiatives to increase recovery of specific materials?	• There may be potential to work with drink manufacturers to increase recycling rates through promoting awareness of the need to recycle container materials • PSS and EPR are likely to result in more appropriate mechanisms to target specific items
The effectiveness of voluntary industry initiatives?	• Container labels now include a recyclable symbol, which has the potential to increase the volume of containers being recycled (where recycling facilities exist and are feasible) • Use of virgin/recycled inputs is likely to continue to be driven by market forces, but there is potential for products to increase the promotion of their use of recycled products, possibly through a rating system similar to water efficiency and energy efficiency ratings on appliances

4.4 Regulations

4.4.1 Available Policy Options

Regulations offer considerable scope to drive changes in waste management practices. Relevant to the development of the new waste management strategy for Queensland, regulations can be applied at a range of levels including:

- Establishing the minimum compliance standards at all existing landfill sites, or sites over a certain size or remaining capacity;
- Establishing the minimum compliance standards at new landfill sites;
- Mandatory recycling for elements of the waste stream in certain areas; and
- Mandatory waste management plans for commercial/industrial premises and construction activities.

The CBA below focuses on landfill licensing regulations as the regulation mechanism.

4.4.2 Responsibility for Policy

The Queensland EPA would be responsible for the establishment and monitoring of regulations, while landfill license holders would be responsible for complying with these regulations.

4.4.3 Implementation Costs

Costs associated with implementing additional or enhanced regulations at landfill sites can be significant, depending on the age of the landfill, previous operating practices, the physical characteristics of the site and the extent of any upgrades that may have been undertaken in the past.

If 'good practice' is adopted as the standard for all landfill sites, this would result in considerable costs for license holders, in particular for local governments operating older sites in more remote areas. The extent of the costs required to ensure compliance with more stringent regulations, or the potential for some sites to be unable to meet the new requirements, may actually force some local governments to close existing sites and establish new sites.

The Productivity Commission (2006) indicates that an efficiently operated 'good practice' landfill with economies of scale should be able to operate at around $25/tonne disposed on a whole-of-life costing basis. However, based on past experience and current investigations into 'good practice' landfills, it is likely that this cost could range from $25/tonne to $40/tonne. Obviously, in regional, rural and remote areas, this cost would be significantly higher as economies of scale are unable to be achieved during the operational phase. There may be some potential at larger sites with bioreactor facilities to recover some of the additional costs through sales of electricity generated from captured methane gas, although the time lag between landfill establishment and effective gas generation/capture would impact on the timing of any potential benefits.

4.4.4 Potential Impact on Waste Generation/Disposal

Mandating operating practices at landfills will not impact on the extent of waste generation and disposal as it is more focused on minimising externality costs, although the higher compliance costs may increase gate fees which may in turn increase the attractiveness of alternative waste disposal options.

4.4.5 Estimated Policy Cost per Unit of Waste 'Saved'

Not applicable, refer above.

4.4.6 Cost-Benefit Analysis

Table 4.11: Summary of Economic Impacts Associated with Regulations

Impact Category	Description and Valuation
Investment Requirements	Costs associated with implementing additional or enhanced regulations at landfill sites can be significant, depending on the age of the landfill, previous operating practices, the physical characteristics of the site and the extent of any upgrades that may have been undertaken in the past. If 'good practice' is adopted as the standard for all landfill sites, this would result in considerable costs for license holders, in particular for local governments operating older sites in more remote areas. The extent of the costs required to ensure compliance with more stringent regulations may actually force some local governments to close existing sites and establish new sites able to more easily meet the new requirements. **NET IMPACT = MODERATE TO VERY HIGH COST**
Policy Administration and Enforcement	New regulations would be expected to increase the need for inspections and compliance monitoring by the regulatory body. **NET IMPACT = LOW TO MODERATE COST**
Market Certainty	Increased regulation would be expected to increase market certainty by ensuring a level playing field between competing landfill sites. All sites would be required to meet the same standards. **NET IMPACT = LOW TO MODERATE BENEFIT**
Market Distortion and Economic Effects	Generally, it is believed that regulations stifle industry and prevent innovation. However, regulation is required in markets where externalities are not appropriately recognised and community protection is warranted. There would be limited market distortion from the adoption of revised landfill regulations as long as the additional landfill charges reflected the additional costs of managing the externalities of each site. **NET IMPACT = NEGLIGIBLE IMPACT**
Adherence to User Pays	Given that landfills would be upgraded to directly overcome environmental and social risks, user pays principles would be enhanced by attempting to internalise these externality costs into landfill costs (and therefore prices) via regulation. **NET IMPACT = MODERATE TO HIGH BENEFIT**
Perverse Behaviour	If charges increased significantly as a result of compliance with the new regulations, this may increase the risk of illegal dumping, or result in greater 'shopping around' or transportation of waste to locate cheaper landfill sites. **NET IMPACT = LOW COST**
Business Competitiveness	If charges increased significantly in Queensland relative to other states, there could be a definite impact on business competitiveness. However, given that other states feature landfill levies, it is unlikely that this would be a significant issue. **NET IMPACT = NEGLIGIBLE IMPACT**

Impact Category	Description and Valuation
Regional Effects	Smaller landfills could be particularly hard hit by the need to adopt 'good practice', due to their limited revenue raising ability and the additional costs of carrying out specialist engineering works in remote areas. **NET IMPACT = MODERATE TO VERY HIGH COST**
Proximity Principle	In regional, rural and remote areas, the possible consolidation of waste facilities could result in additional transportation of waste to landfill. **NET IMPACT = LOW TO MODERATE COST**
TOTAL ECONOMIC IMPACT	**Tighter landfill regulations have the potential to incur a moderate to high economic cost to the community, depending on where the landfill is located and whether it is able to benefit from economies of scale and whether the regulations apply to all existing landfills, or new landfills and landfills of a certain size.**

Table 4.12: Summary of Environmental Impacts Associated with Regulations

Impact Category	Description and Valuation
GHG Emissions	There are significant potential benefits from regulations that include mandatory gas capture at suitable landfill sites. Even when the gas is flared rather than used in electricity generation, the environmental impact from landfill GHG emissions is significantly reduced. However, the issue of lack of economies of scale in most regional, rural and remote areas would limit any benefits. **NET IMPACT = MODERATE TO HIGH BENEFIT**
Ecosystem Effects	Tighter control over the ecosystem impacts of landfill sites, in particular leachate control, would result in significant environmental benefit. **NET IMPACT = MODERATE TO HIGH BENEFIT**
Resource Sustainability	Increased regulation of landfill sites would have a limited direct impact on resource sustainability as it is more targeted at controlling externalities rather than reducing the waste volumes sent to landfill. Increases in the generation of electricity from captured methane gas may help reduce the amount of coal required for electricity generation, but the extent of any benefits would be minor. **NET IMPACT = NEGLIGIBLE TO VERY LOW BENEFIT**
TOTAL ENVIRONMENTAL IMPACT	**Tighter landfill regulations have the potential to result in a moderate to high environmental benefit to the community, as landfill sites increasingly adopt gas capture systems and other 'good practice' environmental control measures (where feasible).**

Table 4.13: Summary of Social Impacts Associated with Regulations

Impact Description	Description and Valuation
Public Health and Safety	It would be expected that the implementation of stricter regulatory controls on landfill sites would reduce public health and safety risks. However, the level of risk reduction should be considered in the context of the actual risk posed, particularly for smaller sites which are located reasonable distances away from populated areas and catchments. **NET IMPACT = LOW TO MODERATE BENEFIT**
Amenity	Additional regulation would be expected to increase amenity by mandating siting requirements, as well as greater control of odours and other issues. A number of landfills may also close as a consolidation of waste facilities occurs, but a side effect may be increased illegal dumping as transport distances to landfills increase. **NET IMPACT = LOW BENEFIT**
Wealth Transfer	It is not anticipated that there would be any significant wealth transfer effects associated with tighter landfill regulations. **NET IMPACT = NEGLIGIBLE IMPACT**
Cost of Living and Convenience	The additional costs of operating landfill sites would be expected to be passed onto waste generators and households through higher rates and increased prices for goods and services. The impact of the increased costs would be determined by the extent of additional works that would be required and the increased competitiveness of alternative disposal methods. In addition, convenience may be impacted by the potential consolidation of waste facilities across regions. **NET IMPACT = MODERATE TO HIGH COST**
Intergenerational Equity	The appropriate operation and management of landfill sites, including post closure management, would enhance intergenerational equity by significantly reducing the risk for future rehabilitation and remediation works of current landfill sites. **NET IMPACT = MODERATE TO HIGH BENEFIT**
Community Acceptance and Social Conscience	It would be expected that increased regulation of landfill sites would be widely accepted by the community given its intent (i.e. to minimise externalities), although this is obviously dependent on the extent to which such regulation impacts on the cost of living. **NET IMPACT = LOW BENEFIT**
TOTAL SOCIAL IMPACT	**Tighter landfill regulations have the potential to result in a low social benefit to the community, as landfill sites are upgraded to reduce public health and safety risks and minimise amenity impacts.**

4.4.7 CBA Outcomes

The analysis found that tighter landfill regulations would result in a moderate to high financial/economic cost to the community, due to the additional costs associated with upgrading existing landfills to meet the regulations, the potential closure of some waste facilities if unable to meet the regulations and the additional enforcement/compliance requirements of the regulator. Despite this relatively high cost, environmental benefits would also likely be moderate to high, primarily due to increased gas capture (and reduced GHG) and other 'good practice' environmental control measures. Low social benefits would also be achieved as landfill sites are upgraded to minimise public health risks and intergeneration and regional equity is promoted through localised solutions (i.e. regulations are found to be more effective in dealing with externalities and risks directly at a local level).

4.4.8 Local Government Impacts

The impact of any additional landfill regulations on local governments and resulting investment in landfill sites is expected to be significant, particularly in regional, rural and remote areas. Local governments may also have to face additional costs of managing increased instances of illegal dumping if a consolidation of waste facilities occurs and distances between facilities increase.

4.4.9 Issues in the Discussion Paper

Regulations were not considered as an economic instrument in the EPA discussion paper.

4.5 Targets and Bans

4.5.1 Available Policy Options

Targets and bans generally involve the adoption of recycling targets or banning certain waste streams to landfill.

4.5.2 Responsibility for Policy

The responsibility of meeting targets would rest with the Queensland Government, but could also be led at a micro level by local governments if supported by the community. Obviously, a number of initiatives would need to be introduced to attempt to meet the specified targets.

4.5.3 Implementation Costs

Implementation costs will ultimately depend on the extent of the waste diversion targets and the projects or policies adopted in an attempt to meet the specified targets, as the marginal cost of diversion from landfill increases as the rate of recycling increases.

4.5.4 Potential Impact on Waste Generation/Disposal

The established targets and bans and underlying projects or policies generally drive the extent of waste diversion from landfill.

4.5.5 Estimated Policy Cost per Unit of Waste 'Saved'

Refer above – the higher the waste diversion target, the higher the cost of additional tonnes of waste 'saved'.

4.5.6 Cost-Benefit Analysis

No CBA was undertaken for targets and bans, as targets should act as performance indicators and comparative measures only rather than drive policy decisions. High-level targets and bans are likely to ignore economic, environmental and social outcomes as they tend to drive policy decisions toward reducing waste to landfill at all costs, instead of implementing policies that will maximise community net benefit. Under targets and bans, governments will generally adopt as many policies as possible in order to scramble to meet the publicly announced target, often at considerable expense to the community. Targets and direct comparisons with other states are also likely to fail to recognise the unique characteristics of Queensland's regional, rural and remote communities.

4.5.7 Local Government Impacts

If adopted, targets and bans would need to be implemented through state initiatives, which would obviously impact upon landfill operators and other waste industry stakeholders.

4.5.8 Issues in the Discussion Paper

The EPA discussion paper requests views on a number of issues, as outlined in the first column of the following table. A brief discussion of issues associated with each item coming out of this CBA is provided in the second column.

Table 4.14: Brief Response to Discussion Paper Issues Regarding Targets and Bans

Issue	Comments
The use of targets, including bans, in a new Queensland waste strategy?	• Targets should not drive policy decisions • Caution needs to be taken when comparing performance against history and other states and territories given identified data reliability issues • Need to recognize Queensland's unique characteristics (e.g. 'tyranny of distance') when comparing outcomes with other states – state-wide performance is not directly comparable to NSW, SA and Victoria • Instead of overall % recycling targets, targets should be based on such issues as "full compliance by all landfill license holders to address externalities", or the achievement of other policy measures if shown to have net community benefits (e.g. % of a problem waste diverted from landfill)
Appropriate targets, to be reached by 2020, for: • Recovery and recycling of household recyclable materials • Recovery and recycling from the commercial and industrial sector • Recovery and recycling of construction and demolition materials?	• No target is necessary as individual projects should be assessed and implemented on a net community benefits test basis • Comparison can be made to the water industry where there are currently no broad-scale wastewater recycling targets and there is a far greater shortage of water than there is of landfill airspace – instead, schemes are assessed on a scheme by scheme basis depending on cost and local factors • Overall, such statistics should be used as performance measures determining the effectiveness over time of other waste management policies rather than driving policy decisions
The use of materials-specific targets for diversion or recovery of materials and which materials should have targets applied (e.g. timber, concrete, green waste)?	• Policy decisions for different materials should be based on net community benefit rather than arbitrary targets with little basis • Hazardous wastes with definite environmental or public health risk should be the primary focus
Banning certain items to landfill by specified dates?	• Banning items to landfill may depend on the type of landfill operated, as risks may already be controlled • Banning items may also increase illegal dumping, which is of particular concern for hazardous wastes, and policy must account for this potential perverse behaviour
Targets for recycled content and the use of recycled materials to replace natural resources in applications such as road construction?	• Policy decisions for different materials should be based on net community benefit rather than arbitrary targets with little basis • The proximity principle should be considered when assessing the feasibility of any recycling activity, and the use of C&D for local applications may have merit subject to cost effectiveness • Would be better to introduce an extraction tax on virgin materials if the objective is to slow down the consumption of virgin materials rather than indirectly attempt to drive upstream changes through waste disposal behaviour, particularly given that the majority of generators have little choice over their waste streams and end uses
The mandating of diversion and recycling targets in legislation?	• As outlined above, targets should not drive policy – good policy decisions should maximise net community benefit • Given the marginal cost of recycling, such a policy could result in significant costs to the community for minimal benefit • It is questioned as to who would be accountable and what the penalties would be if such legislated targets were not met – would the state government be responsible for failing to meet the targets and therefore be penalised, or would regional, rural and remote communities be penalised due to their distant location relative to recycling markets?

4.6 'Pay as You Throw' (PAYT) Schemes

4.6.1 Available Policy Options

A number of different PAYT policy options are available, including:

- Weight-based charging at all landfills;
- Differential bin sizes for kerbside collection/MSW; and
- Weight-based charging for kerbside collection/MSW.

Altering service frequency for municipal waste collection is not seen as a viable option and is therefore excluded from this analysis given the public health implications of changing current mandated frequencies. (More regular servicing frequency or servicing on request outside of the mandated frequency should continue to exist as currently applied across Queensland local governments to promote user pays principles.)

4.6.2 Responsibility for Policy

PAYT schemes need to be implemented by landfill license holders for charging by weight at landfills and local governments for offering different bin sizes or weight-based charging for kerbside collection. The Queensland Government may provide underlying regulations or principles to provide direction, as well as monitor and enforce the scheme.

4.6.3 Implementation Costs

The potential costs associated with implementing PAYT schemes will differ depending on the type of scheme adopted.

Section 4.2.3 indicates that the cost of establishing and operating the necessary infrastructure and equipment to establish a PAYT scheme by weight at all landfills could result in a capital cost initially of $10-20 million and additional operating costs in the order of $5-10 million per annum. Obviously, some larger metropolitan and regional landfills will already have the necessary infrastructure installed to facilitate charging by weight, and most probably already have some weight-based charging mechanism in place.

The potential costs associated with implementing a weight-based PAYT scheme for kerbside collection are outlined in the following table.

Table 4.15: Estimated Financial Costs from the Implementation of PAYT for Kerbside Collection

Cost Item	Cost Parameters and Estimate
Capital Expenditure	One of the major components of capital expenditure would relate to the potential replacement of the bin stock with those that feature a recognition chip so that weight can be recorded and attributed to each property for rating purposes. Given that there are around 1.5 million properties serviced by general waste kerbside collection in Queensland, and assuming a cost of $100 per bin with chip installed, the estimated capital cost relating to the replacement of the bin stock could be as much as $150 million. Investment would also be required in rating interface software to receive the data from the collection contractor and process weight-based charging through to the rates notice. The cost of this software could be significant. **CAPITAL COST ESTIMATE = $150 million upfront capital investment, to be repeated each 10 years (although discounted somewhat by the fact that normal bins would require replacing anyway)**
Operating Expenditure	Adding PAYT to the normal kerbside collection process would significantly increase the contractor cost as it would not only require weight-based technology and data transmission software on each truck, but it may increase the time taken to collect waste. Data verification processes and additional administrative costs associated with levying differential waste charges for each property would also add to the operational cost requirement. Such costs are likely to vary between local governments, depending on the number of properties serviced. However, a base cost of $50,000 per local government plus $10 per property is used to form the following estimate. **OPERATING COST ESTIMATE = At least $17,500,000 per annum**
TOTAL	**CAPITAL COST = $150 million initially and then $50 million every 10 years** **OPERATING COST = At least $17.5 million per annum** **ANNUALISED COST = At least $34 million per annum**

For a PAYT scheme offering differential bin sizes, there would need to be some upfront investment in 140L bins to meet the demands of ratepayers wishing to replace their existing 240L bins. Meeting all demands would still involve considerable upfront investment at $50-60 per bin, particularly if the bins being replaced are not at the end of their useful lives.

4.6.4 Potential Impact on Waste Generation/Disposal

It is unclear exactly how the introduction of PAYT schemes might feed through to reduced waste generation and disposal.

Regarding ***waste disposed to landfill***, most landfills in populated metropolitan and regional areas already feature some charging mechanism based on weight or volume. Therefore, the widespread adoption of PAYT would more likely have the effect of introducing charging structures in less populated regional, rural and remote areas. Given the lack of alternative disposal options (outside of illegal dumping) in these areas, there is unlikely to be any significant impact from PAYT on waste volumes. This would be the case for all C&D and the majority of C&I waste streams.

Regarding ***weight-based charging for waste collected from properties***, PAYT provides an incentive for properties to minimise the volume/weight of waste disposed into general waste bins. The C&I sector is already offered different bin sizes, and so it is assumed that the waste volumes for this sector would be limited to 5% of the total waste stream. The MSW sector is currently not able to access PAYT methods on a broad scale and so the waste reductions may be a little higher.

Studies from Europe and North America suggest PAYT can be an effective method of waste reduction and could reduce the MSW by as much as one third. It is uncertain that this level of waste reduction would be achieved in the Queensland context in the current environment where recycling is fairly widespread, and as such it is assumed that MSW could be reduced by up to 10% as a result of the introduction of PAYT to kerbside collection. Given that consumers have little choice over how products are manufactured and packaged, often irrespective of product choice, differences in waste volumes are likely to be due to different household occupancy and lack of social conscience and education regarding recyclable products rather than different waste generation and recycling behaviours.

The combined effect of a 5% reduction in C&I and a 10% reduction in MSW could see an additional 200,000-300,000 tonnes of waste diverted from landfill.

Introducing ***differential bin sizes*** instead of true weight-based charging may not provide sufficient incentive for waste generators to adjust behaviour, and therefore there is limited capacity for such a scheme to effectively reduce the amount of waste disposed. It is likely that such a scheme will result in those with low waste levels and low utilisation of larger bins switching to a smaller bin to save money.

4.6.5 Estimated Policy Cost per Unit of Waste 'Saved'

It is possible that the transaction cost per tonne of waste 'saved' from a weight-based charging PAYT scheme for kerbside collection could be in the order of $80-$170/tonne. This is consistent with the finding from the small-scale feasibility studies undertaken by a number of individual local governments across a number of states that costs were found to be too high relative to any benefits that may accrue, making weight-based PAYT for kerbside collection unviable.

4.6.6 Cost-Benefit Analysis

Table 4.16: Summary of Economic Impacts Associated with PAYT (assumed as weight-based charging for kerbside collection)

Impact Category	Description and Valuation
Investment Requirements	PAYT would require the replacement of the bin stock with those that feature a recognition chip so that weight can be recorded and attributed to each property for rating purposes. Investment would also be required in rating interface software (which could be expensive) to receive the data from the collection contractor and process weight-based charging through to the rates notice. This capital investment would have to be repeated every 10 years, although account needs to be made for the fact that normal bins would require replacing anyway. Offering different bin sizes may be a cheaper alternative to weight-based charging for kerbside collection, although there are potential implications for servicing smaller bins, and local governments would need to invest in the production and distribution of these smaller bins for those properties requesting the service. PAYT methods already exist at most larger landfill sites, but many waste disposal facilities in regional, rural and remote areas aren't supervised and would incur considerable cost to regional communities to change practices and charge by weight. Substantial capital and operating subsidies would be required in these instances. **NET IMPACT = VERY HIGH COST**
Policy Administration and Enforcement	Adding PAYT to the normal kerbside collection process would significantly increase the contractor cost as it would require weight-based technology and data transmission software on each truck. It may also have the potential to increase the time taken to collect waste. Data verification processes and additional administrative costs associated with levying differential waste charges for each property would also add to the operational cost requirement. Such costs are likely to vary between local governments, depending on the number of properties serviced. Handling of queries and complaints will also likely increase given that a third party would be responsible for weighing waste collected and transmitting information through to the local government. **NET IMPACT = VERY HIGH COST**
Market Certainty	Levying charges in accordance with weight-based technologies would provide certainty to properties in relation to their waste charges, subject to any perverse behaviour occurring (e.g. people dumping their waste in other bins) and the technology working effectively. Contractors would also be certain of their requirements in collecting waste and transmitting information regarding waste weights to the local government. PAYT schemes will not increase the certainty of recycling levels, as these will be left to market forces. **NET IMPACT = VERY LOW BENEFIT**
Market Distortion and Economic Effects	PAYT schemes will not create any significant market distortion and economic effects, although it would add a considerable cost to waste services just to administer the measurement/transaction process. **NET IMPACT = NEGLIGIBLE IMPACT**
Adherence to User Pays	PAYT offers a user pays framework for all types of waste disposal from weight-based charging at landfills for self-haul and C&I waste to bin size or weight-based charging for kerbside collection. PAYT aims to establish a direct link between the waste management practices of each waste generator and the price they pay for waste the dispose, thereby providing a financial incentive to change waste generation and disposal behaviours to minimise waste service charges. Obviously, adherence to user pays principles is maximised when weight-based charging is applied, and where charges are based on the type of waste disposed. Offering different sized bins could be considered, although this approach provides a much weaker pricing signal given the pricing differential between a small bin and large bin would be relatively minor as the majority of collection costs (up to 90%) is incurred as a result of servicing frequency rather than the volume collected from individual bins. Price signals under weight-based PAYT systems may also be impacted in areas with high-density housing that tend to use communal bins and where it would be very time consuming and expensive to determine each household's contribution. **NET IMPACT = HIGH BENEFIT (if full weight-based charging is adopted)**

Impact Category	Description and Valuation
Perverse Behaviour	The introduction of PAYT schemes may promote perverse behaviour, as people attempt to reduce the volume of waste in their bins to minimise the charges applied by the local government. Perverse behaviours may include: • Waste being illegally dumped (past studies have shown that illegal dumping has increased when variable pricing under PAYT schemes have been introduced); • Waste deposited in public bins; • Waste dumped into other people's bins; • Waste being burnt; • Waste being transferred from the general waste bin to the recycling and/or green waste bins (where they are offered), with the secondary impact of contaminating the recycled and green waste streams (to prevent this, recycling bins could also be weighed and charged, although this may produce a disincentive to recycle); • Transportation of waste from areas with PAYT schemes to areas without PAYT schemes; and • Properties requesting smaller bin sizes to save money but having overflowing bins with increased risk of littering each service. There is also likely to be reduced access to bins for the general public or people using/visiting commercial premises such as shopping centres or retail shops as commercial and industrial properties limit their waste disposal charges and prevent use of their bins by those wanting to transfer weight. This could result in an increase in litter which incurs a considerable financial cost (as do all of the above behaviours) for the responsible authority, and therefore to the general community through higher rates. Essentially, it is important to note the fundamental difference between waste management as a utility service and other utilities such as water supply and electricity, especially in relation to alternative means by which waste can be disposed (as outlined above). For water supply and electricity, people have no real alternative in that they either turn on the tap or switch and pay for the privilege of using the service, or they don't. The only way they can 'get around the system' is by stealing water from standpipes, hydrants, neighbours taps, etc. which is extremely difficult. Attempting to steal electricity obviously has its own issues, particularly in relation to safety. **NET IMPACT = MODERATE TO HIGH COST**
Business Competitiveness	PAYT schemes will not have any significant impacts on business competitiveness given the current collection and disposal frameworks offered to commercial and industrial customers are somewhat reflective of user pays. **NET IMPACT = NEGLIGIBLE IMPACT**
Regional Effects	PAYT schemes will only have regional effects if they are applied to certain locations and not others, resulting in waste being transferred to regions where PAYT is not applied. **NET IMPACT = NEGLIGIBLE IMPACT**
Proximity Principle	PAYT schemes will not create any significant implications for the proximity principle with the possible exception of the case where PAYT schemes are only applied in certain areas and result in the transportation of waste between regions. **NET IMPACT = NEGLIGIBLE IMPACT**
TOTAL ECONOMIC IMPACT	**A weight-based PAYT scheme would result in a high to very high economic cost to the community, given the significant upfront and ongoing administration costs associated with facilitating the scheme. Even though PAYT would enhance user pays, the scheme cost is too high to make the scheme viable given potential benefits. In addition, adopting PAYT is likely to significantly increase the likelihood of perverse behaviours such as waste being transferred to public bins, other people's bins, recycling bins, and the environment.**

Table 4.17: Summary of Environmental Impacts Associated with PAYT (assumed as weight-based charging for kerbside collection)

Impact Category	Description and Valuation
GHG Emissions	Adopting PAYT may increase collection times (and therefore truck idling) as weights are processed at each property, as well as any additional transportation of waste between regions in instances where PAYT is not uniformly applied. Any increase in GHG emissions from these activities are likely to at least be offset by reduced waste to landfill. **NET IMPACT = NEGLIGIBLE TO VERY LOW BENEFIT**
Ecosystem Effects	The introduction of PAYT may encourage increased illegal and uncontrolled dumping of waste to the environment. Offsetting positive effects could be experienced by reduced waste to landfill, particularly to older landfill sites where there is a greater risk of issues such as leachate contamination. If differential bin sizing was adopted, the widespread take-up of smaller bin sizes could see a greater degree of overflowing bins resulting in a higher risk of non-deliberate littering as waste is blown out of bins or falls out during the collection process. **NET IMPACT = NEGLIGIBLE IMPACT**
Resource Sustainability	Resource sustainability could be enhanced by the extension of landfill lives resulting from potentially reduced waste streams to landfill. If differential bin sizing was adopted, the provision of smaller bins means less plastic required to be produced, although the transition to smaller bins from larger bins may see much of the larger bin stock having to be dumped or sent away for recycling, requiring either landfill airspace or product generation energy costs. **NET IMPACT = VERY LOW TO LOW BENEFIT**
TOTAL ENVIRONMENTAL IMPACT	**A weight-based PAYT scheme would potentially result in a very low to low environment benefit, with any positive externalities associated with potential reductions in the volume of waste sent to landfill offset to some extent by increased risks of illegal dumping.**

Table 4.18: Summary of Social Impacts Associated with PAYT (assumed as weight-based charging for kerbside collection)

Impact Description	Description and Valuation
Public Health and Safety	The introduction of PAYT may increase the risk of illegal and uncontrolled dumping of waste, with the extent of public health risk dependent on the type of waste littered/dumped. Offsetting positive effects could be experienced by reduced waste to landfill, particularly to older landfill sites where there is a greater risk of issues such as leachate contamination. If differential bin sizing was adopted, the widespread take-up smaller bin sizes could see a greater degree of overflowing bins resulting higher risk of non-deliberate littering as waste is blown out of bins or falls out during the collection process. **NET IMPACT = NEGLIGIBLE IMPACT**
Amenity	The introduction of PAYT may encourage increased illegal and uncontrolled dumping of waste, creating visual amenity issues. Offering differential bin sizes may improve amenity, as long as waste is appropriately captured within these bins. **NET IMPACT = NEGLIGIBLE TO VERY LOW COST**
Wealth Transfer	As user pays is enhanced, wealth transfer effects are anticipated to be relatively minor as a result of PAYT. Inter-region transfers may exist in situations where PAYT is not uniformly applied and results in the transportation of waste between regions. Given the significant financial cost of establishing and maintaining the scheme, there may be some wealth transfer issues from local communities to the producers of weight-based technology and associated billing systems. **NET IMPACT = VERY LOW TO LOW COST**
Cost of Living and Convenience	The introduction of PAYT is likely to add at least $25 in costs to each household just to facilitate the scheme, an increase of up to 25% from current charging levels for general waste collection. When combined with the significant increases in water and wastewater charges anticipated in the near future, and possible substantial increases in other rates and utilities over the next decade, this places a considerable financial burden on the community and further adds to cost of living pressures. Overall, the potential reductions in charges associated with reduced waste streams on an individual property may actually be less than the additional cost that would have to be charged to recoup the transaction cost associated with the system. **NET IMPACT = MODERATE TO HIGH COST**
Intergenerational Equity	PAYT schemes will not create any implications for intergenerational equity, apart from potentially extending the lives of landfills if the volume of waste disposed to landfill is reduced. **NET IMPACT = NEGLIGIBLE TO VERY LOW BENEFIT**
Community Acceptance and Social Conscience	PAYT schemes may be accepted by the community, but are not overly desired by the community. They may be viewed as being 'overkill' in that the extent of the waste charge is relatively low as it is, and offering very minor reductions in waste charges as a result of such an expensive system could create some community concern regarding the application of government funds. It is recognised that there may be a problem with the provision of larger bins when recycling is also available, given that certain ratepayers may believe that they are not getting 'value for money' if they do not fill their bins, which would be a perverse outcome relative to environmental stewardship. However, bins need to be provided to cater for peak demands rather than average demands and a certain amount of 'airspace' should exist most weeks. **NET IMPACT = VERY LOW TO LOW COST**
TOTAL SOCIAL IMPACT	**A weight-based PAYT scheme would potentially result in a low to moderate social cost, with any potential benefits associated with a minor reduction in the waste sent to landfill more than offset by the cost of living impacts associated with introducing the scheme.**

4.6.7 CBA Outcomes

The analysis found that a weight-based PAYT scheme for kerbside collection would result in a high to very high financial/economic cost to the community, due to the need to upgrade the bin stock to incorporate microchips, upgrade rating software and cater for increased complaints handling. Costs would also be incurred in dealing with increased illegal dumping and other perverse behaviour. This significant cost would only achieve a very low to low environmental benefit due to a potential reduction in the volume of waste disposed to landfill and associated GHG benefits. However, a low to moderate social cost would also be incurred, with any positive impacts associated with potential reductions in the volume of waste sent to landfill overshadowed by the impacts on cost of living from facilitating the scheme and the additional risks of illegal dumping.

4.6.8 Local Government Impacts

Potential implications for local government from the introduction of PAYT schemes include:

- Need to ensure the existence of, or invest in, sufficient infrastructure/equipment and operational resources at all waste facilities to enable weight-based charging to be applied, including weighbridges and staffing of facilities;
- Need to replace the bin stock to ensure the necessary microchip technology is installed in new bins;
- Need to ensure rating systems and administrative processes and resources can deal with the receipt, recording and processing of weight-based information from waste collection contractors;
- Processes to deal with customer complaints regarding the weighing and billing processes;
- Need to re-tender waste collection contracts to ensure that contractors have the necessary weight-based technology installed in trucks;
- Costs of cleaning up additional illegal dumping as waste generators attempt to 'lighten' their waste loads through illegal dumping or littering, and potentially increased policing/enforcement resources; and
- Increasing waste collection and disposal charges to reflect the additional transaction costs associated with the scheme.

Obviously, the combination of the above would have considerable financial and resourcing impacts on Queensland local governments, and substantial financial support in the form of capital and operational subsidies would be required from the Queensland Government to ensure that communities are not faced with further rate increases.

4.6.9 Issues in the Discussion Paper

The EPA discussion paper requests views on a number of issues, as outlined in the first column of the following table. A brief discussion of issues associated with each item coming out of this CBA is provided in the second column.

Table 4.19: Brief Response to Discussion Paper Issues Regarding PAYT

Issue	Comments
The feasibility of introducing a PAYT system for domestic collections?	• The introduction of a weight-based PAYT system for kerbside collection is unviable and would result in significant costs to the community • Any potential benefits to an individual property in terms of lower charges from waste reduction would likely be more than offset by the increase in charges required just to administer the system • The option of smaller bins and larger bins as a cheaper mechanism of PAYT is also unviable and would be unlikely to result in any environmental benefit or reduced waste to landfill

4.7 Extended Producer Responsibility (EPR) and Product Stewardship Schemes (PSS)

4.7.1 Available Policy Options

The EPA discussion paper identified potential types of PSS based around three options for the imposition, control and monitoring of the scheme:

- Voluntary industry initiatives;
- Full government regulation; and
- Co-regulatory approach.

The discussion paper also highlights the key differences between EPR and PSS approaches, with PSS including all users of the product throughout its lifecycle in managing its environmental effects and EPR only considering the final disposal of the product with responsibility resting solely with the manufacturer.

4.7.2 Responsibility for Policy

The type of scheme implemented would determine the responsibility for the policy:

- **Voluntary Industry Initiatives**
  It is the responsibility of the industry peak body to achieve consensus on the most effective scheme to be implemented and then to monitor and enforce its appropriate adoption and outcomes. This approach may be seen as a means of avoiding statutory controls, although the enforcement aspect may be difficult to achieve if there is resistance within the industry.

- **Full Government Regulation**
  Regulations may be implemented at any level, although most are likely at the state or federal level due to problems implementing schemes covering small areas. Government administered schemes are generally supported by legislation which may include penalties for non-compliance.

- **Co-regulatory approach**
  This approach consists of a combination of the above approaches.

4.7.3 Implementation Costs

The implementation costs would be determined by the type of scheme adopted and the materials and products to be covered. In general, EPR is more expensive to implement than PSS as the manufacturer is solely responsible for the appropriate treatment of the product at the end of its useful life. Whatever provisions the manufacturer makes are then added to the initial purchase price of the product in question. PSS transfers some of the responsibility from manufacturers to users and as such reduces the manufacturers' share of the costs.

Implementation costs are also influenced by the way in which schemes are regulated. Full government regulation is the most expensive option as it requires greater administrative support and may have more stringent targets than voluntary industry initiatives. However, this is not always the case, as industry sectors recognise that setting targets that are too easily achieved may attract government regulation.

4.7.4 Potential Impact on Waste Generation/Disposal

Product stewardship schemes work best on products that cause a disproportionate amount of environmental damage or have disproportionate amounts of reusable material compared to other components of the waste stream. The ability of these schemes to significantly impact total volumes of waste sent to landfill is limited, although they can be effective in recovering resources from particular aspects of the waste stream and preventing potentially damaging materials entering landfill.

4.7.5 Estimated Policy Cost per Unit of Waste 'Saved'

Per unit of weight or volume 'saved' from the total waste stream, these schemes can be expensive compared to the potential outcomes from undertaking more general recycling activities, such as paper recycling. However, per unit of environmental damage saved or per dollar of material recovered, these schemes can be highly effective.

4.7.6 Cost-Benefit Analysis

Table 4.20: Summary of Economic Impacts Associated with EPR and PSS

Impact Category	Description and Valuation
Investment Requirements	The investment requirements would be likely to be significant and include: • Raising awareness regarding the terms of the stewardship agreement at the time of purchase, throughout the product's use and when the product is being disposed of at the end of its useful life; and • Establishing or sourcing some means of safe disposal or reusing the products when they are returned. **NET IMPACT = MODERATE TO HIGH COST**
Policy Administration and Enforcement	It is likely that there would be a significant administration cost associated with: • Managing and administering the scheme, including liaison with individual companies in the relevant sector; • Monitoring and reporting progress; and • Developing new targets. **NET IMPACT = MODERATE TO HIGH COST**
Market Certainty	Mandatory PSS would improve market certainty for recyclers but the critical issue for recyclers is the market value of the materials. **NET IMPACT = VERY LOW BENEFIT**
Market Distortion and Economic Effects	The costs to the manufacturer of imposing PSS (voluntarily or through regulation) are almost certain to be passed on to the consumer. This has the effect of increasing the costs of goods in a particular sector relative to other sectors that are not subject to these schemes. Whilst the effect of this change may be to recognise the externalities associated with some products, if the scheme was not applied at a national level there could be significant market distortion affects. **NET IMPACT = NEGLIGIBLE IMPACT**
Adherence to User Pays	The adoption of PSS is aligned with the user pays principle in that those consumers who gain the benefit from using the good in question pay the additional costs of its appropriate end of life disposal. It also sends an appropriate price signal to manufacturers for wastes that may cause high disposal costs for local governments and other landfill license holders. This is reliant on the additional charge passed on to the consumer being commensurate with the additional disposal costs and associated externalities. If the additional charges exceed these costs, consumers of these goods would be unfairly disadvantaged. **NET IMPACT = VERY LOW BENEFIT**
Perverse Behaviour	The fact that the costs of the final stewardship of the product have been included in the initial purchase price has the potential to significantly reduce the incidence of perverse behaviour. Having already paid for the end of life disposal service upfront, it is unlikely that consumers would take any other action than appropriate disposal. This may provide significant benefits where illegal dumping of certain goods is particularly prevalent. However, where schemes are implemented at the state rather than federal level, there may be an incentive to travel interstate to buy goods that were not covered by a scheme (and therefore are likely to be cheaper) than in Queensland. When the time comes to dispose of the product, these consumers do not have access to the appropriate disposal mechanisms and may chose to dispose of the product inappropriately. **NET IMPACT = NEGLIGIBLE TO VERY LOW BENEFIT**

Impact Category	Description and Valuation
Business Competitiveness	Business competitiveness is unlikely to be adversely affected by the imposition of a nationwide stewardship scheme, although this would also need to apply to imports otherwise the cost of Australian made goods could be considerably higher. There would be significant impacts if any scheme was only implemented at the state level including a potential reduction in the competitiveness of Queensland businesses relative to interstate competitors as well as making the state less attractive to investment. **NET IMPACT = LOW TO MODERATE COST (if scheme not applied uniformly across the nation)**
Regional Effects	There may be significant cost implications associated with providing stewardship schemes in remote areas. If specialist skills are required to manage the disposal of a product and are not available in local areas, then the transport costs of moving the product to a suitable location may be considerable and could potentially outweigh any benefits associated with diverting the product from landfill. The adoption of a 'two-tier' system, in which the scheme only applies in certain areas, would have obvious impacts, with landfills outside the stewardship area possibly becoming dumping grounds for these products. **NET IMPACT = LOW TO MODERATE COST**
Proximity Principle	It is likely that there will be a shortage of suitably skilled recyclers for many products or sufficient economies of scale for the scheme to operate successfully in remote areas, and it is more than likely that products will need to be transported significant distances. **NET IMPACT = LOW TO MODERATE COST**
TOTAL ECONOMIC IMPACT	**PSS and EPR schemes have the potential to incur a moderate to high economic cost to the community, as while the schemes may reduce the need for costly remediation at landfills contaminated with particularly harmful wastes and revenues may be received by the sale of particular products, the administration and management cost of these schemes is quite high. It is also clear that the costs of such schemes would be considerably higher (and benefits lower) if implemented at a state rather than federal level.**

Table 4.21: Summary of Environmental Impacts Associated with EPR and PSS

Impact Category	Description and Valuation
GHG Emissions	The extent of any GHG emissions saving would be dependent upon the properties of the product controlled under the scheme. Any GHG emissions saving that could be achieved would need to be assessed against offsetting increases in transport requirements to dispose of/reuse products under the schemes. **NET IMPACT = UNCLEAR IMPACT**
Ecosystem Effects	There are potentially significant ecosystem benefits from the adoption of EPR and PSS for certain products. One of the key aims of some stewardship schemes is to ensure that products with particularly harmful chemicals are removed from the landfill stream. This not only has advantages for the existing ecosystem but is also likely to reduce the long-term impact of the landfills post closure. This impact may reduce over time as improved landfill management techniques limit the contamination of surrounding ecosystems from landfill sites. **NET IMPACT = MODERATE TO HIGH BENEFIT**
Resource Sustainability	Schemes may be targeted at the recovery of valuable materials which may benefit for resource sustainability. However, it is important to recognise that the extent of effective resource recovery undertaken at the end of a product's useful life will be determined by the market forces for the resource in question, and is unlikely to be influenced by a stewardship scheme given the profitability focus of private firms. **NET IMPACT = LOW BENEFIT**
TOTAL ENVIRONMENTAL IMPACT	**PSS and EPR schemes have the potential to result in a moderate environmental benefit to the community, depending on the product selected under the scheme. Benefits are maximised for those schemes targeted at diverting wastes that have a relatively high risk of contamination to the local environment.**

Table 4.22: Summary of Social Impacts Associated with EPR and PSS

Impact Description	Description and Valuation
Public Health and Safety	Stewardship schemes that cover products with the potential to cause significant environmental damage and contamination can significantly improve public health and safety by ensuring that these products are disposed of in an environmentally responsible manner. Where the products are less likely to cause significant environmental damage, the impact is lower. **NET IMPACT = MODERATE TO HIGH BENEFIT**
Amenity	Reducing illegal dumping by recovering the final costs of disposal at the time of purchase helps to improve amenity, as would encouraging consumers to dispose of products in a responsible manner at the end of the product's useful life. **NET IMPACT = LOW BENEFIT**
Wealth Transfer	There are relatively few wealth transfer effects from stewardship schemes, as long as the purchase price of the product reflects the costs associated with the product's final disposal. **NET IMPACT = NEGLIGIBLE IMPACT**
Cost of Living and Convenience	Under any stewardship scheme, there is likely to be an increase in the cost of living as the cost of certain goods increases to account for end-of-life management costs. There may also be some loss of convenience as special arrangements are required for the disposal of these goods rather than being sent to landfill. The impact may be considerably higher in regional areas if manufacturers seek to recover the additional transport costs associated with returning products from remote areas to recovery sites. **NET IMPACT = LOW COST**
Intergenerational Equity	Reducing the amount of potentially hazardous materials sent to landfill would improve intergenerational equity as these materials will not require significant long-term treatment and remediation. **NET IMPACT = LOW TO MODERATE BENEFIT**
Community Acceptance and Social Conscience	There is likely to be community support for these schemes as long as costs were considered appropriate and clearly identifiable. Further, products would have to be selected on the basis of a reasoned assessment of the environmental externalities associated with their direct disposal to landfill. **NET IMPACT = LOW BENEFIT**
TOTAL SOCIAL IMPACT	**PSS and EPR schemes have the potential to result in a moderate social benefit to the community, by improving public health and safety and intergenerational equity outcomes.**

4.7.7 CBA Outcomes

The analysis found that the overall net benefit associated with EPR and PSS depends on the scope of the scheme and the products covered, and whether the schemes are administered at a national level. There is the potential for moderate environmental and social benefits, due to the ability to target certain waste items that are either potentially hazardous or have significant resource value. Intergenerational equity is also enhanced as problem wastes are dealt with now. Such schemes are likely to come at a moderate to high financial/economic cost to the community.

4.7.8 Local Government Impacts

The impacts on local governments would be minimal as such schemes rely on the manufacturer and the consumer.

4.7.9 Issues in the Discussion Paper

The EPA discussion paper requests views on a number of issues, as outlined in the first column of the following table. A brief discussion of issues associated with each item coming out of this CBA is provided in the second column.

Table 4.23: Brief Response to Discussion Paper Issues Regarding EPR and PSS

Issue	Comments
Which end-of-life products or wastes do you think should be the Queensland waste strategy's initial priorities for EPR or Product Stewardship initiatives?	• Products should be selected based on a comparison of the costs likely to be incurred as a result of the schemes against the social and environmental benefits of diverting these products from landfill rather than products being adopted in an ad-hoc manner
Which end-of-life products and wastes do you believe are priorities to be banned from landfill within the short term (e.g. by 2010)?	• As above
The criteria you think should be used to prioritise these end-of-life products?	• As above
The ability and/or willingness of companies to effectively redesign or environmentally design products to reduce their end-of-life impacts?	• This will be largely determined by the scope of any scheme. As long as a level playing field is established across each sector impacted by the policy, then it should be possible to bring manufacturers onboard • Where competitors in other jurisdictions are perceived to be provided with a financial advantage, there could be significant resistance
Using voluntary product stewardship agreements as an alternative to statutory approaches?	• This can only be effective where there is either some benefit to the manufacturers from adopting the scheme, or where there is the threat of government regulation • Voluntary approaches would be expected to be cheaper to administer and would avoid the imposition of a scheme on a particular sector, but statutory approaches may be necessary as a last resort or where it is impossible to achieve consensus
The scope for improving the amount of waste-related information provided about products in the marketplace?	• There is considerable scope to improve consumer awareness of waste issues and the different environmental and social impacts of various waste streams once landfilled • This would also help consumers to understand that the waste hierarchy is too blunt an instrument to use as the basis for waste strategy and that a more sophisticated approach is required that recognises that not all wastes are the same

4.8 Incentives/Education

4.8.1 Available Policy Options

Economic instruments may also be in the form of incentives that provide either direct support to particular waste management activities, or work to provide sufficient incentive to waste generators to adjust behaviour. Examples of potential incentives to encourage certain types of behaviour to enhance community benefits or help achieve desired policy objectives are outlined below:

- Promotion and education of social and environmental benefits of 'doing the right thing' with all components of the waste stream from disposable goods through to recyclables and hazardous waste items;
- Provision of optional green waste bins, possibly at subsidised rates, to reduce the extent of organic waste disposed to landfill and therefore reduce emissions; and
- Provision of compost bins and/or mulchers at subsidised rates or free of charge to reduce the extent of organic waste disposed to landfill and therefore reduce emissions.

4.8.2 Responsibility for Policy

Depending on the type of scheme adopted, responsibility may rest with local, state or federal governments, or even community organisations. Ultimately, given that the instrument is not enforceable, the end responsibility rests with the waste generators themselves who will either be driven by financial incentive/potential financial gain or social conscience/environmental stewardship to respond to the incentive offered.

4.8.3 Implementation Costs

Implementation costs will also depend on the incentive/education scheme and will generally consist of advertising expenditure and any financial subsidies or incentives provided times the number of waste generators opting to take-up the program. The provision of optional green waste bins at cost recovery is an exception, as while it may require some initial upfront investment by a local government, it is anticipated that there would be sufficient take-up to enable the local government to levy charges to cover the ongoing costs of the service.

4.8.4 Potential Impact on Waste Generation/Disposal

Incentives/education can effectively target specific waste streams to meet particular objectives. While the take-up of incentives is voluntary and may take some time, the use of incentives and education will generally result in longer-term shifts in the community's waste disposal behaviour.

4.8.5 Estimated Policy Cost per Unit of Waste 'Saved'

An overarching estimated policy cost per unit of waste 'saved' for incentives/education cannot be determined for this high-level CBA given the number of options available. What can be said is that those waste streams where incentives/education are likely to have the greatest effect should be directly targeted, particularly where additional environmental and social benefits can be achieved, e.g. green waste bins, mulcher subsidies, compost bin subsidies.

4.8.6 Cost-Benefit Analysis

Table 4.24: Summary of Economic Impacts Associated with Incentives/Education

Impact Category	Description and Valuation
Investment Requirements	Investment requirements for incentive schemes will depend on the incentive scheme offered and will generally consist of advertising expenditure and any financial subsidies or incentives provided times the number of waste generators opting to take-up the program. They are likely to range from low cost to moderate cost if appropriately selected and if cost feasible. (The provision of optional green waste bins at cost recovery is an exception, as while it may require some initial upfront investment by a local government, it is anticipated that there would be sufficient take-up to enable the local government to levy charges to cover the ongoing costs of the service.) **NET IMPACT = LOW TO MODERATE COST**
Policy Administration and Enforcement	Administration requirements will include the need to create public awareness regarding the incentive scheme being offered, as well as the administration of the scheme including the provision of any financial subsidies, rebates or other assistance. **NET IMPACT = LOW TO MODERATE COST**
Market Certainty	There are no major impacts on market certainty from incentives, although the provision of a mulcher or compost bin subsidy would obviously enhance the certainty of sales for industries and businesses providing these products and associated services. **NET IMPACT = NEGLIGIBLE IMPACT**
Market Distortion and Economic Effects	The primary market distortion effects would be the provision of subsidies for certain products and/or services, although these effects would not exist if the financial assistance benefiting a particular industry is put in place to mitigate against or reduce the impacts associated with externality costs of disposing of the selected waste items, and the extent of the overall financial assistance offered is no greater than the environmental and social benefits accruing from the behavioural change resulting from the incentives/products provided. **NET IMPACT = NEGLIGIBLE IMPACT**
Adherence to User Pays	There may be some distortion to user pays principles, with government subsidies (if provided) likely to be provided on delivering products to waste generators (primarily households) to assist them in reducing waste sent to landfill and therefore offsetting the externalities that their consumption behaviour would otherwise create in the absence of the financial assistance or incentive. **NET IMPACT = VERY LOW TO LOW COST**
Perverse Behaviour	Provision of subsidies for certain products and services can often result in markets overheating, leaving the net price paid by the community the same after the subsidy is applied as it was prior to the market intervention by government, e.g. recent high demands for rainwater tanks which saw significant increases in tanks and associated installation services. Such market movements will work to negate any incentive offered and reduce the effectiveness of the program. **NET IMPACT = LOW COST**
Business Competitiveness	The provision of incentives will likely result in increased competitiveness of industries and businesses providing the products and associated services to which incentives or financial assistance apply. **NET IMPACT = NEGLIGIBLE TO VERY LOW BENEFIT**

Impact Category	Description and Valuation
Regional Effects	No significant regional effects are anticipated as a result of the application of incentives. **NET IMPACT = NEGLIGIBLE IMPACT**
Proximity Principle	The proximity principles may be promoted through certain incentives, including the provision of incentives/financial assistance for mulchers and compost bins, which would allow greater take-up of recycling of the organic waste streams of households onsite rather than having them transported to waste facilities for recycling or disposal. **NET IMPACT = LOW BENEFIT**
TOTAL ECONOMIC IMPACT	**The provision of incentives and education would result in a low to moderate economic cost for the community, primarily relating to the funding of incentive programs, public relations and awareness expenditure, and any associated financial assistance that may be offered.**

Table 4.25: Summary of Environmental Impacts Associated with Incentives/Education

Impact Category	Description and Valuation
GHG Emissions	Reduction in GHG emissions may be directly targeted as an outcome for selected incentive programs, including the potential removal of greater volumes of organic waste from the MSW stream sent to landfill. Incentive programs such as optional green waste bins and subsidies/rebates on compost bins and mulchers would help reduce the methane emissions from food and garden wastes in landfills where gas capture does not exist. **NET IMPACT = LOW TO MODERATE BENEFIT**
Ecosystem Effects	No significant ecosystem effects are anticipated as a result of the application of incentives, apart from the benefits associated with the success of incentives in reducing the volume of certain wastes sent to landfill. **NET IMPACT = NEGLIGIBLE TO LOW BENEFIT**
Resource Sustainability	No significant ecosystem effects are anticipated as a result of the application of incentives, apart from the benefits associated with the success of incentives in reducing the volume of certain wastes sent to landfill and resulting extensions in the lives of landfills. **NET IMPACT = NEGLIGLIBE TO LOW BENEFIT**
TOTAL ENVIRONMENTAL IMPACT	**The provision of incentives and education would result in a low to moderate environmental benefit for the community, primarily relating to the ability to target certain waste streams that have significant environmental externality costs including methane emissions and resultant GHG emissions impacts.**

Table 4.26: Summary of Social Impacts Associated with Incentives/Education

Impact Description	Description and Valuation
Public Health and Safety	No significant impacts are anticipated as a result of the application of incentives, apart from the benefits associated with the success of incentives in reducing the volume of certain wastes sent to landfill. **NET IMPACT = NEGLIGIBLE TO LOW BENEFIT**
Amenity	No significant amenity impacts are anticipated as a result of the application of incentives, apart from the potential for greater onsite reuse and availability of compost and mulch and resulting indirect effects on gardens in an environment of increasingly stringent water restrictions. **NET IMPACT = NEGLIGIBLE IMPACT**
Wealth Transfer	Providing incentives is a more direct approach than applying a flat tax or flat policy across all waste generators to achieve a particular desired outcome, as policies are able to directly target problem waste streams and adjust behaviour. However, it is essential that incentive programs provide real benefits to the community, with the extent of these benefits measured and reported on an ongoing basis, to ensure that the incentive programs are not implemented and maintained on promotional grounds for government and create wealth transfer effects from the community to the industries and businesses benefiting from increased demand as a result of the incentives being offered. **NET IMPACT = NEGLIGIBLE IMPACT**
Cost of Living and Convenience	No significant cost of living impacts are anticipated as a result of the application of incentives (although a green waste bin is costed at around $30-60 per household per annum if collected fortnightly with mandated frequency), although the provision of certain incentives such as an optional green waste bin or subsidised compost bins and mulchers would increase the convenience in disposing of these waste products. **NET IMPACT = LOW TO MODERATE BENEFIT**
Intergenerational Equity	Incentives aim to permanently alter the behaviour of waste generators in accordance with the incentive scheme being offered to achieve stated policy objectives, and may therefore be successful in promoting behavioural change that benefits future generations. **NET IMPACT = LOW BENEFIT**
Community Acceptance and Social Conscience	Incentive programs rely on community acceptance and the 'social conscience' in order to be successful as their uptake is voluntary. As long as incentive programs have clear social and environmental benefits and are appropriately promoted and products are affordable and provide real benefits, then community acceptance should not be a problem. **NET IMPACT = MODERATE BENEFIT**
TOTAL SOCIAL IMPACT	**The provision of incentives and education would result in a low to moderate social benefit for the community, primarily relating to the ability to target certain waste streams to remove from landfill, the ability to achieve behavioural change in waste practices and reuse at the local level, and confining externality benefits within regions.**

4.8.7 CBA Outcomes

The analysis found that incentive programs and education would incur low to moderate financial/economic costs for the community, primarily relating to advertising expenditure and the funding of incentive programs. Such programs have the potential to achieve low to moderate environmental and social benefits as they are able to target specific problem waste items, reduce GHG (if organic waste is targeted), and targets behavioural change and reuse at the local level.

4.8.8 Local Government Impacts

Local governments may be required to facilitate some incentive schemes, as well as provide some degree of financial commitment to certain programs in partnership with other levels of government, or pricing guidelines may wish to provide local governments with the option to include a small margin on waste management charges to fund certain incentive programs if clear benefits can be shown. A direct comparison can be made to the rainwater tank subsidies on offer in certain areas of Queensland.

4.8.9 Issues in the Discussion Paper

Incentives were not considered as an economic instrument in the EPA discussion paper.

4.9 CBA Summary Outcomes

The following table provides a summary of the outcomes from the CBA of proposed economic instruments for the new Queensland waste management strategy.

Table 4.27: CBA Summary Outcomes

	Performance-Based Landfill Levy	CDL	Regulations	Targets and Bans	PAYT Schemes	EPR and PSS	Incentives/Education
FINANCIAL COST							
Annualised Cost Estimate	$8-14m/annum	At least $14m/annum	Unable to be determined – dependent on regulation	Dependent on target set	At least $34m/annum	Unable to be determined – dependent on scheme	Unable to be determined – dependent on program
Transaction Cost/tonne of Waste 'Saved'	$90-$155/t in 1st year, potentially reducing to $8-$15/t by 2016	Unable to be determined – likely to be very expensive	Unable to be determined – dependent on regulation	Dependent on target set	$113-$170/t	Unable to be determined – dependent on scheme	Unable to be determined – dependent on program
ECONOMIC IMPACTS							
Investment Requirements	Moderate-Very High Cost	High Cost	Moderate to Very High Cost	Not Applicable	Very High Cost	Moderate to High Cost	Low to Moderate Cost
Policy Administration & Enforcement	Moderate Cost	Low Cost	Low to Moderate Cost	Not Applicable	Very High Cost	Moderate to High Cost	Low to Moderate Cost
Market Certainty	Low Cost	Negligible Impact	Low to Moderate Benefit	Not Applicable	Very Low Benefit	Very Low Benefit	Negligible Impact
Market Distortion/Economic Effects	Low-High Cost	Negligible Impact	Negligible Impact	Not Applicable	Negligible Impact	Negligible Impact	Negligible Impact
Adherence to User Pays	Low Benefit-Moderate Cost	Very Low Benefit	Moderate to High Benefit	Not Applicable	High Benefit	Very Low Benefit	Very Low to Low Cost
Perverse Behaviour	Low-Moderate Cost	Low Cost	Low Cost	Not Applicable	Moderate to High Cost	Negligible to Very Low Benefit	Low Cost
Business Competitiveness	Very Low-Low Cost	Low Cost	Negligible Impact	Not Applicable	Negligible Impact	Low to Moderate Cost	Negligible to Very Low Benefit
Regional Effects	Very High Cost	Negligible Impact	Moderate to Very High Cost	Not Applicable	Negligible Impact	Low to Moderate Cost	Negligible Impact
Proximity Principle	Low Cost	Low to Moderate Cost	Low to Moderate Cost	Not Applicable	Negligible Impact	Low to Moderate Cost	Low Benefit
Total Economic Impact	**Moderate to High Cost**	**Moderate to High Cost**	**Moderate to High Cost**	**Not Applicable**	**High to Very High Cost**	**Moderate to High Cost**	**Low to Moderate Cost**
ENVIRONMENTAL IMPACTS							
GHG Emissions	Negligible-Low Benefit	Low Cost	Moderate to High Benefit	Not Applicable	Very Low Benefit	Unclear Impact	Low to Moderate Benefit
Ecosystem Effects	Negligible-Low Benefit	Negligible Impact	Moderate to High Benefit	Not Applicable	Negligible Impact	Moderate to High Benefit	Negligible to Low Benefit
Resource Sustainability	Negligible-Very Low Benefit	Negligible Impact	Negligible to Very Low Benefit	Not Applicable	Very Low to Low Benefit	Low Benefit	Negligible to Low Benefit
Total Environmental Impact	**Negligible to Low Benefit**	**Negligible to Low Cost**	**Moderate to High Benefit**	**Not Applicable**	**Very Low to Low Benefit**	**Moderate Benefit**	**Low to Moderate Benefit**
SOCIAL IMPACTS							
Public Health & Safety	Negligible-Low Benefit	Negligible to Very Low Benefit	Low to Moderate Benefit	Not Applicable	Negligible Impact	Moderate to High Benefit	Negligible to Low Benefit
Amenity	Negligible Impact	Negligible to Very Low Benefit	Low Benefit	Not Applicable	Negligible to Very Low Cost	Low Benefit	Negligible Impact
Wealth Transfer	High-Very High Cost	Negligible Impact	Negligible Impact	Not Applicable	Very Low to Low Cost	Negligible Impact	Negligible Impact
Cost of Living & Convenience	High-Very High Cost	Very Low Cost	Moderate to High Cost	Not Applicable	Moderate to High Cost	Low Cost	Low to Moderate Benefit
Intergenerational Equity	Negligible Impact	Negligible Impact	Moderate to High Benefit	Not Applicable	Negligible to Very Low Benefit	Low to Moderate Benefit	Low Benefit
Community Acceptance/Social Conscience	Low Cost	Very Low Benefit	Low Benefit	Not Applicable	Very Low to Low Cost	Low Benefit	Moderate Benefit
Total Social Impact	**High Cost**	**Negligible Impact**	**Low Benefit**	**Not Applicable**	**Low to Moderate Cost**	**Moderate Benefit**	**Low to Moderate Benefit**

4.10 Potential Impacts of a Carbon Tax and Peak Oil on Proposed Economic Instruments

A quick assessment is undertaken in the table below of potential impacts of the introduction of a carbon tax on GHG and the occurrence of 'peak oil' (where oil supplies reach their peak and begin to dwindle despite increasing demand, thereby resulting in steep price increases). Obviously, localised recycling will become much more attractive in the event of one or both of these market shocks occur.

Table 4.28: Potential Impacts from a Carbon Tax and Peak Oil on Economic Instruments

Issue	GHG/Carbon Tax	Peak Oil
Performance-Based Landfill Levy	Increased benefits associated with greater gas capture at landfill sites, while attractiveness of recycling versus landfilling will depend on GHG associated with collecting and sorting recyclables, transporting to processing plants and processing into recycled products, with total costs to be compared against virgin material costs (which will also include GHG costs)	Attractiveness of recycling versus landfilling will depend on energy requirements associated with collecting and sorting recyclables, transporting to processing plants and processing into recycled products, with total costs to be compared against virgin material costs (which will also include energy costs)
Container Deposit Legislation	Additional costs associated with GHG relating to increased transportation requirements by individuals to container deposit depots	Additional costs associated with energy requirements from increased transportation by individuals to container deposit depots
Regulations	Increased benefits associated with greater gas capture at landfill sites	No significant impact
Targets and Bans	Not applicable	Not applicable
PAYT Schemes	No significant impact, potential for higher contractor costs due to greater idling time as bins are weighed	No significant impact, potential for higher contractor costs due to greater idling time as bins are weighed
PSS and EPR	Likely to increase scheme costs via increased transportation costs, although the reuse value of selected products will likely increase given the increase in the production cost of virgin materials	Likely to increase scheme costs via increased transportation costs, although the reuse value of selected products will likely increase given the increase in the production cost of virgin materials
Incentives	Increased benefits due to the ability to target specific organic waste streams and therefore reduce methane emissions	No significant impact

5. Conclusions and Recommendations

5.1 CBA Outcomes

It would be inappropriate for Queensland to simply follow other states and territories in terms of the economic instruments adopted, particularly given the Productivity Commission's recent finding that some of these instruments appear ineffective in achieving real community benefits and actually place a significant burden on the community. These findings are consistent with the outcomes of this CBA, which are outlined in the following table.

The CBA shows that the most attractive economic instruments include incentives/education (best economic outcome), regulations (best environmental outcome) and EPR and PSS (best social outcome). The least attractive economic instruments include PAYT schemes (worst economic outcome), CDL (worst environmental outcome) and a performance-based landfill levy (worst social outcome).

Table 5.1: CBA Impact Ranking Across the Triple Bottom Line (1 being best)

Economic Instrument	Economic	Environmental	Social	TBL Average
Performance-Based Landfill Levy	Moderate to High Cost (2)	Negligible to Low Benefit (4)	High Cost (6)	4.0
CDL	Moderate to High Cost (2)	Negligible to Low Cost (6)	Negligible Impact (4)	4.0
Regulations	Moderate to High Cost (2)	Moderate to High Benefit (1)	Low Benefit (3)	2.0
Targets and Bans	Not Applicable	Not Applicable	Not Applicable	n.a.
PAYT Schemes	High to Very High Cost (6)	Very Low to Low Benefit (4)	Low to Moderate Cost (5)	5.0
EPR and PSS	Moderate to High Cost (2)	Moderate Benefit (2)	Moderate Benefit (1)	1.7
Incentives/Education	Low to Moderate Cost (1)	Low to Moderate Benefit (3)	Low to Moderate Benefit (2)	2.0

5.2 Key Findings

Performance-Based Landfill Levy

The analysis found that a performance-based landfill levy would result in a moderate to high financial/economic cost to the community, primarily due to additional infrastructure requirements and levy administration, as well as significant market distortion effects. Such a policy would also only result in negligible to low environmental benefit, and would actually result in a high social cost due to significant wealth transfer effects (from regional, rural and remote areas) and cost of living impacts. A performance-based levy would only be equitable and not create significant market distortion effects if it was set at a level to reflect an accurate estimate of downstream social and environmental externality costs, not impose constraints on the landfill license holders that are not applied to the waste sector more generally, and levy funds were only used to mitigate or directly offset such costs in the location in which they are collected.

CDL

The analysis found that a CDL scheme would result in a moderate to high financial/economic cost to the community, primarily due to the requirement to establish and staff large numbers of container return depots. Such a policy may also result in a low environmental cost due to the additional transportation requirements to deliver containers to depots relative to a kerbside recycling scheme. Social impacts were found to be negligible.

Regulations

The analysis found that tighter landfill regulations would result in a moderate to high financial/economic cost to the community, due to the additional costs associated with upgrading existing landfills to meet the regulations, the potential closure of some waste facilities if unable to meet the regulations and the additional enforcement/compliance requirements of the regulator. Despite this relatively high cost, environmental benefits would also likely be moderate to high, primarily due to increased gas capture (and reduced GHG) and other 'good practice' environmental control measures. Low social

benefits would also be achieved as landfill sites are upgraded to minimise public health risks and intergeneration and regional equity is promoted through localised solutions (i.e. regulations are found to be more effective in dealing with externalities and risks directly at a local level).

Targets and Bans

No CBA was undertaken for targets and bans, as targets should act as performance indicators and comparative measures only rather than drive policy decisions. High-level targets and bans are likely to ignore economic, environmental and social outcomes as they tend to drive policy decisions toward reducing waste to landfill at all costs, instead of implementing policies that will maximise community net benefit. Under targets and bans, governments will generally adopt as many policies as possible in order to scramble to meet the publicly announced target, often at considerable expense to the community. Targets and direct comparisons with other states are also likely to fail to recognise the unique characteristics of Queensland's regional, rural and remote communities.

PAYT Schemes

The analysis found that a weight-based PAYT scheme for kerbside collection would result in a high to very high financial/economic cost to the community, due to the need to upgrade the bin stock to incorporate microchips, upgrade rating software and cater for increased complaints handling. Costs would also be incurred in dealing with increased illegal dumping and other perverse behaviour. This significant cost would only achieve a very low to low environmental benefit due to a potential reduction in the volume of waste disposed to landfill and associated GHG benefits. However, a low to moderate social cost would also be incurred, with any positive impacts associated with potential reductions in the volume of waste sent to landfill overshadowed by the impacts on cost of living from facilitating the scheme and the additional risks of illegal dumping.

EPR and PSS

The analysis found that the overall net benefit associated with EPR and PSS depends on the scope of the scheme and the products covered, and whether the schemes are administered at a national level. There is the potential for moderate environmental and social benefits, due to the ability to target certain waste items that are either potentially hazardous or have significant resource value. Intergenerational equity is also enhanced as problem wastes are dealt with now. Such schemes are likely to come at a moderate to high financial/economic cost to the community.

Incentives/Education

The analysis found that incentive programs and education would incur low to moderate financial/economic costs for the community, primarily relating to advertising expenditure and the funding of incentive programs. Such programs have the potential to achieve low to moderate environmental and social benefits as they are able to target specific problem waste items, reduce GHG (if organic waste is targeted), and targets behavioural change and reuse at the local level.

5.3 Policy Recommendations

- **REC1:** That rigorous CBA drive decision-making for the new waste management strategy, with the overarching principle of maximising net community benefits, i.e. ensuring measurable environmental and social benefits can be achieved without imposing a significant financial cost on the community.
- **REC2:** That the new waste management strategy appropriately recognise that the application of potential solutions for metropolitan areas and other states may not be directly applicable to regional, rural and remote areas given the unique characteristics of Queensland regions.
- **REC3:** That, while the downstream externality impacts of landfills (e.g. GHG emissions, leachate contamination risks, amenity issues) should be considered during project/policy assessment and price setting, GHG externalities would be more appropriately dealt with through a national carbon framework rather than via a levy that only applies to the landfill sector.

- **REC4:** That upstream externality impacts (e.g. impacts of base resource extraction and production) should be dealt with by direct policies on production processes rather than at the waste disposal stage.
- **REC5:** That a performance based landfill levy should not be implemented as it would result in a considerable financial/economic and social cost to the community for minimal benefit.
- **REC6:** That a CDL scheme should not be implemented as it would result in a considerable financial/economic cost to the community and could actually have negative environmental impacts due to duplicated recycling efforts and increased transportation.
- **REC7:** That additional regulation and enforcement should be implemented as an appropriate economic instrument, focusing on:
    - Tightening landfill licence requirements for new landfills;
    - Reviewing landfill licence requirements for existing landfills of a certain size;
    - Assessing the appropriateness of mandating recycling for all properties located within areas where such services are already provided, are found to be feasible and markets exist;
    - Introducing compulsory waste management plans for commercial and industrial properties and construction activities; and
    - Reviewing existing policies and legislation to ensure that unnecessary regulatory barriers that may inhibit recycling or reuse of materials are removed.
- **REC8:** That targets should not be implemented on a broad scale to drive waste management policy and instead only be used as performance measures for particular waste items or streams, given that maximising community net benefit should be the primary objective, and that any target-setting and performance monitoring recognise underlying data limitations and the unique characteristics of Queensland's regional, rural and remote areas.
- **REC9:** That weight-based charging (PAYT) for kerbside collection should not be implemented due to significant capital and operating cost requirements of facilitating the scheme (and resulting impact on cost of living for the community), the potential for perverse behaviour and illegal dumping, and the limited impact such a policy is likely to have on the volume of general waste disposed.
- **REC10:** That basic PAYT schemes such as offering different bin sizes should not be implemented due to cost implications and the negligible impact it would have on the volume of general waste disposed, but that consideration be given to reducing the bin size for a 'normal' service over time to overcome the attitude of not getting value for money if the bin isn't full each week.
- **REC11:** That PAYT should be implemented at all landfills for self-haul waste, subject to cost effectiveness where weighbridges are not installed or sites are not supervised, and that all current subsidies applying to self-haul waste at landfills be removed (subject to potential Community Service Obligations to reflect community affordability in high cost, low volume rural and remote landfills).
- **REC12:** That EPR and PSS should continue to be investigated and implemented where considered beneficial to ensure that externality costs are included as much as possible at the product purchase stage rather than borne by the broader community at the product disposal stage, and that Queensland should work towards a nationally coordinated approach to EPR and PSS to remove the requirement on manufacturers, consumers and recyclers to comply with different provisions in different jurisdictions.
- **REC13:** That incentive schemes targeting selected problem wastes or large waste streams should be implemented, possibly including:
    - Reducing organic waste disposed to landfill and increasing onsite reuse via compost bin and mulcher subsidies; and
    - Reducing green waste disposed to landfill by including an optional green waste bin as part of the municipal waste servicing program.

- **REC14:** That education and awareness campaigns should be implemented in an attempt to achieve behavioural change for consumers and waste generators and provide information regarding appropriate and environmentally friendly waste management practices
- **REC15:** That the Queensland Government should produce a clear set of guidelines for waste service pricing for local governments to ensure prices are set on the basis of full cost recovery and/or opportunity cost (i.e. marginal cost associated with next waste disposal solution).
- **REC16:** That the new waste management strategy should focus on dealing with waste at the source (i.e. during the production process) rather than via indirect measures.
- **REC17:** That the new waste management strategy should undertake detailed investigations into the real impediments to additional recycling activity across Queensland's regional, rural and remote areas, and identify the subsidies that may be required (and resulting community financial costs) to make recycling viable in these areas.
- **REC18:** That the new waste management strategy should assess the social and environmental implications of increased recycling activity in these areas, relating to issues such as energy use/carbon emissions in transporting recyclables and recycling products to end markets, amenity, noise, congestion and safety, so that a true comparison can be made to landfilling.
- **REC19:** That the new waste management strategy should consider the underlying policies and economic instruments associated with the recent successes regarding water use efficiency, particularly in South East Queensland, which included a combination of the following:
    - Regulation through water restrictions and mandated water management plans for commercial and industrial customers;
    - Provision of incentives through subsidies for rainwater tanks, showerheads, household waterwise plumbing services, etc.;
    - Education and awareness campaigns;
    - Pricing reflective of full cost at a local level (not through artificial pricing); and
    - Funding programs out of state general revenue rather than via artificial levies.

5.4 Policy Outcomes

Given the CBA outcomes and the above recommendations, a potential combination of appropriate economic instruments to consider as part of the new waste management strategy for Queensland may include:

1. ***Effective Regulation*** – potentially including landfill licensing and enforcement, mandated recycling for commercial and industrial properties in areas where recycling is found to be feasible and collection already occurs as part of the municipal system, the requirement for commercial and industrial properties and construction activities to have waste management plans in place to minimise waste generation and disposal, and the removal of any unnecessary regulatory barriers to recycling activity.

2. ***Incentives*** – potentially including compost bin and mulcher subsidies and optional green waste bin servicing as part of the municipal waste servicing program.

3. ***Education*** – education and awareness campaigns focusing on 'selling' waste minimisation to the community and enhancing awareness over recyclable waste products, the possible phasing in of smaller general waste bins to each household to overcome the attitude of not getting value for money if the bin isn't full each week, as well as assistance with waste avoidance planning for commercial and industrial properties and construction activities (particularly for small to medium enterprises and operators).

4. ***EPR and PSS*** – schemes considered beneficial to ensure that externality costs are included as much as possible at the product purchase stage for targeted products rather than borne by the broader community at the product disposal stage, with Queensland working towards a nationally coordinated approach.

5. ***Pricing Guidelines*** – development of pricing guidelines for waste services by the Queensland Government for local governments, including appropriate landfill costing procedures and the removal of pricing subsidies for waste services.

The CBA shows that policy would be most effective if it directly targets problem waste streams or waste streams where there is potential for considerable gains in terms of recycling, rather than applying an indirect blanket policy aimed at propping up the recycling industry. Looking to the future, policy should aim to address waste problems at the source, particularly given that most consumers have little choice over how a product is manufactured and packaged, and therefore little control regarding their overall waste generation patterns.

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Appendix A: Cost Benefit Analysis

Purpose of Cost-Benefit Analysis

Cost Benefit Analysis (CBA) is a tool that is used to determine the value of a project over its lifetime. CBA involves quantifying the inputs (costs) and outputs (benefits) of projects or policy options and then using this information to make the most efficient resource allocation or policy decisions. The analysis is logical and consistent and facilitates accurate comparison between different courses of action. CBA is used to assess net benefits or costs to a range of stakeholders and can be undertaken from the perspective of an entity, community, geographic location, or a combination.

CBA attempts to determine the value of all costs and benefits (only the flow of real resources is included, transfer payments such as taxes and interest are excluded). Some costs and benefits are 'unpriced' and not subject to normal market transactions but a value – whether quantitative or qualitative – must still be estimated so that they can also be included in the CBA. The outcome of the process is an assessment of whether or not a project or policy is expected to produce a net benefit.

Due to the fact that costs and benefits are generally specified over time, it is necessary to bring the stream of current and future benefits and costs to present values. The present value concept is based on the time value of money or other benefits, in that a dollar or other benefit received today is worth more than a dollar or other benefit received in the future. A discount rate is used to bring future benefits back to a present value.

Cost-Benefit Analysis Guidelines

CBA guidelines exist to ensure that assessments are undertaken in a consistent manner and in accordance with government policy.

The Australian Government Department of Finance and Administration guidelines include *Introduction to CBA and Alternative Evaluation Methodologies* (produced in 2006) and the companion publication *The Handbook of Cost-Benefit Analysis*. The Australian Government guidelines indicate that the proposed structure should be used for guidance only and that users are permitted to use alternative approaches. In Queensland, the Queensland Treasury Corporation released draft CBA guidelines in 2006, *Cost Benefit Analysis Guidelines – Achieving VFM in Public infrastructure and Service Delivery*.

The following table summarises the key points in both documents. Although CBAs are widely used across both the public and private sectors, the following guidelines are prepared from a public sector perspective.

Both CBA guidelines are based around the same core principles. The critical message from both jurisdictions is the need to adopt a consistent approach that allows third party scrutiny. By necessity, this type of analysis relies on a series of assumptions, regarding placing a financial value on costs and benefits which are 'unpriced' by the market and forecasts of benefits and costs into the future. The fundamental aspect in these assessments is that the same approach is applied to all projects or policy options under assessment. Both sets of guidelines use the same basic framework:

- Identify the outcome to be achieved;
- Produce a list of potential means of achieving the outcome;
- Narrow the list to viable options (including the 'do nothing option');
- Assess all of the costs and benefits that accrue from each option;
- Calculate a net present value using an appropriate discount rate; and
- Assess the outcome in the context of the impact on equity.

The guidelines also identify the need to set the outcome of the CBA in its context. They recognise that although the outcome may indicate that a project produces an overall net benefit, this does not necessarily mean that it should be approved. Some assessment must be made of distribution of the costs and benefits amongst the total population.

Table A.1: Summary of Federal and Queensland CBA Guidelines

Federal Guidelines	Queensland Guidelines
• **Determine scope and objectives –** set the project context including the appropriateness of objectives to Government policy and/or community needs and establish the forecast outcomes. Government intervention should only be pursued where market failure/imperfections have been identified.	• **Identify the outcome sought –** set out the required outcome form the project and the reasoning for government intervention: market failure and/or equity/distributive grounds.
• **List feasible alternatives –** identify potential obstacles/ constraints and assess feasible alternative approaches. CBAs should at least include a 'do nothing' option as a base case scenario, usually involves an assessment of the opportunity costs of the proposal. The range of alternatives to be assessed depends on the availability of viable alternatives and the scale of the project to be undertaken.	• **Develop project and policy options –** develop a range of possible means of delivering the identified outcome, no detailed analysis should be undertaken at this stage. The number of options considered will vary between projects depending on scale and funding but must include the status quo to use as a benchmark for other options.
• **Specify costs and benefits –** for each option, all costs and benefits must be identified, quantified and valued.	• **Undertake preliminary evaluation then detailed assessment of selected options –** undertake an initial brief analysis of the costs and benefits of each option to identify any unviable approaches. Conduct full CBA of the remaining options using the following steps:
• **Quantify costs and benefits -** best carried out using values in real terms. Where there are high risks, an average value for costs and benefits should be used to forecast an average NPV from the project. The analysis should also show a range of potential outcomes, demonstrating the impact of changes to the assumptions and forecasts used.	• **Determine the key assumptions –** identify any assumptions and explain the reasoning behind them so that an independent reader of the final report could understand them. The assumptions should also include a description of geographical context of the report (i.e. the area over which the costs and benefits will apply).
• **Calculate NPV –** the net present value (NPV) of a project refers to the sum of all of the costs and benefits from a project discounted back to current values. Discounting is the process of converting future cashflows into a current (present) value. This recognises that a cashflow of $\$x$ in five years time does not have the same value as a cashflow of $\$x$ received now. Undertaking projects with positive NPV's is expected to produce a positive return to the community.	• **Identify and estimate the expected economic benefits and costs of the project –** costs and benefits should be: o Included irrespective of who they accrue to o Valued at their economic worth (adjusted for market distortions. Any adjustments must be explained in the final report) o Not confined to transactions in the market
• **Sensitivity test for uncertainty –** there may be significant uncertainty around the likelihood of some forecasts used in the analysis actually being achieved. Sensitivity analysis helps overcome this by demonstrating the impact of changes to certain key variables. At least one optimistic and pessimistic outcome should be included. In cases with high degree of uncertainty the expected NPV should be used based on a probability weighted average of the costs and benefits.	• **Calculate net present economic value –** this calculation includes non-financial costs and benefits as identified and valued in the previous section as well as financial costs and benefits. Projects with a positive NPEV can be said to be economically viable. The discount rate/s to be used should be agreed between the agency and the Queensland Treasury Corporation
• **Outline equity issues –**CBAs do not account for the distribution of costs and benefits between stakeholders. The outcome of a CBA must be reviewed in the context of distribution of costs and benefits.	• **Assess risks and sensitivities –** additional assessments should be made based on a range of potential values for key variables to assess the sensitivity of the project outcome.
• **Report –**the final report must set out how the CBA outcome was achieved and include recommendations. There should be sufficient detail in the report to allow an interested reader to replicate the results.	• **Others:** o CBAs must recognise the opportunity cost of the best alternative o Ideally, the CBA should cover the whole life of the project although may not be appropriate for some very long projects. Any terminal values should also be included. o CBA's should be conducted on a cash accounting basis. Accruals accounting inputs such as depreciation and interest should not be included in the assessment
• **Others:** o CBAs must recognise the opportunity cost of the best alternative o Externalities can be significant and should also be recognised o Ideally, the CBA should cover the whole life of the project although may not be appropriate for some very long projects. Any terminal values should also be included. o There are several options for determining the discount rate to be used, whichever is selected the report must explain how and why the rate used was selected. o Cost benefit ratios and internal rates of return may be used for presentational purposes but NPV's should be the primary determining factor in project appraisal o CBA's should be conducted on a cash accounting basis. Accruals accounting inputs such as depreciation and interest should not be included in the assessment.	

Source: Department of Finance and Administration, Queensland Treasury Corporation

Determining Present Values

The main difference between the two sets of guidelines is the Queensland suggestion that the discount rate/s to be used should be agreed with Queensland Treasury Corporation. The Federal guidelines permit a series of options for determining discount rates and simply state that the same rate should be used for assessing all competing options.

The selection of appropriate discount rates is of particular importance because they apply to much of the decision criteria and consequently the interpretation of results. The higher the discount rate, the less weight or importance is placed on future cash flows.

The formula for determining the present value is:

$$PV = \frac{FV_n}{(1+r)^n}$$

Where:

PV = present value today
FV = future value n periods from now
r = discount rate per period
n = number of periods

Extending this to a series of cash flows the present value is calculated as:

$$PV = \frac{FV_1}{(1+r)^1} + \frac{FV_2}{(1+r)^2} + \cdots + \frac{FV_n}{(1+r)^n}$$

Once the stream of costs and benefits have been reduced to their present values the Net Present Value (NPV) can be calculated as the difference between the present value of benefits and present value of costs. If the present value of benefits is greater than the present value of costs then the option or project would have a net economic benefit.

Use of Benefit Cost Ratio

Because the NPV can result from the combination of any magnitude of benefits and costs it is not all that useful when comparing projects. A useful measure to use to compare between two different projects is the benefit cost ratio (BCR). The BCR is calculated by dividing the present value of benefits by the present value of costs. If the resulting BCR is greater than one (1) then the project has a net economic benefit. The higher the BCR the greater the quantified economic benefits compared to the quantified economic losses.

Appendix B: Benchmarking of Queensland Waste Service Charges

Kerbside Waste Collection Charges

Most Queensland local governments offer a similar waste management service including a weekly kerbside collection for municipal solid waste. In the majority of urban and surrounding semi-urban areas, a fortnightly recycling collection is also provided. Certain variations around this base service exist, with some Councils offering a range of bin sizes, kerbside collection of green waste and the choice of whether or not to sign up to the kerbside recycling service. Some local governments also offer a commercial waste service, often in direct competition with private contractors.

The following table outlines the kerbside waste collection/disposal charges and service options in 2006/07 for 24 of the largest local governments in Queensland and three New South Wales local governments.

Table B.1: Waste Collection Charges for Selected Queensland and NSW Local Governments, 2006/07

	Waste Collection Charge	Levy	Size Option	Recycling Option	Green Waste Option
QUEENSLAND					
Beaudesert Shire	$77.00	$116.00	n.a.	x	x
Brisbane City	$210.28	$19.12	✓	x	x
Bundaberg City	$165.00	$-	x	x	x
Caboolture Shire	$187.00	$-	✓	✓	x
Cairns City	$238.00	$-	x	x	x
Caloundra City	$240.00	$25.00	✓	x	✓
Cooloola Shire	$180.64	$27.30	x	x	x
Gladstone City	$153.80	$-	x	x	x
Gold Coast City	$157.30	$-	✓	x	x
Hervey Bay City	$216.95	$-	x	x	x
Ipswich City	$194.00	$-	x	x	x
Livingstone Shire	$155.00	$67.00	x	x	x
Logan City	$154.00	$-	x	x	x
Mackay City	$122.10	$79.50	x	x	x
Maroochy Shire	$148.00	$-	✓	x	x
Maryborough City	$182.00	$-	x	x	x
Noosa Shire	$136.00	$-	x	x	x
Pine Rivers Shire	$173.00	$-	x	x	x
Redcliffe City	$176.20	$-	x	x	x
Redland Shire	$216.00	$12.00	✓	x	x
Rockhampton City	$189.00	$-	x	x	x
Thuringowa City	$150.00	$-	x	x	x
Toowoomba City	$120.00	$-	x	x	✓
Townsville City	$156.94	$-	x	x	x
NEW SOUTH WALES					
Bega Valley Shire Council	$159.64(a)	$63.96	✓	✓	✓
City of Hunters Hill	$368.11(b)	(c)	✓	X	✓
City of Ryde	$282.00(b)	$46.50	✓	X	✓

Source: AEC Group, assorted service providers
Notes: (a) Only offers 140L MSW bin size, additional charges of $84.24 for recycling and $42.00 for green waste, (b) Includes recycling and green waste charges in the cleansing charge, and (c) Levy calculated as $0.00002309 per $ land value

Six local governments out of the Queensland sample in the above table offered residents choice in the size of bin serviced. However, the price charged for smaller bin sizes was similar to that of the larger bin size, with two of the six councils actually levying the same charge for both 240L and 140L bins. The NSW Councils all used 140L bins for their standard municipal waste services rather than the 240L bins used in Queensland. Residents are able to choose a 240L bin but this was more expensive and only provided upon request. Differential bin sizing is offered to commercial and industrial waste generators by private contractors, and in certain instances by local governments.

All of the local governments in the survey provided a fortnightly kerbside recycling service, with the exception of certain areas within local government boundaries due to their remote location. Only Caboolture Shire Council provided the recycling service as an optional service, with all other local governments recouping recycling costs via the general waste collection charge.

All three NSW local governments also provided a kerbside green waste collection service, while two Queensland local governments (Caloundra and Toowoomba) offered an optional kerbside collection service for green waste. This bin is collected fortnightly and the annual charges levied are $60 and $25, respectively.

The average domestic waste collection charge for the weekly kerbside removal of a 240L refuse bin was $170.76 in 2006/07. Seven of the 24 Councils supplemented the cleansing charge with an additional waste management levy (ranging from $19.12 in Brisbane to $116 in Beaudesert) to fund the establishment of new landfills, managing capped sites and supplementing revenues to support kerbside refuse and recycling collections. The waste service charges of all three NSW local governments were higher than the average of the Queensland local governments surveyed, with the charge levied by the City of Hunters Hill being nearly $200 per annum higher than the Queensland average.

The majority of Councils applied the same waste service charges to both domestic and commercial services. However, the average commercial kerbside waste collection charge was $163.82 for a 240L service, slightly lower than for the domestic service, possibly because recycling services are not included in many instances. Nine Councils offered an optional recycling service for commercial premises, with the average charge for this service being $69.60 ranging from a low of $42 in Thuringowa to $143 in Hervey Bay. Most local governments offered bin sizes to commercial properties of up to 4.5m^3.

Waste Disposal Charges at Landfills/Transfer Stations

Local governments also offer a self-haul waste disposal service at landfill sites and/or transfer stations. In some cases, waste disposal services include the sorting of refuse to identify recyclable materials and/or other waste streams that require special handling. In most instances, general waste is tipped straight to landfill without sorting. These facilities are open to residents, non-residents and commercial/industrial operators.

Landfill charges are set according to the type of waste being disposed, whether the material is being dumped by a commercial operator or private individual, and whether the waste is being disposed of by a resident or non-resident of the local government area in which the facility operates. Some of the most common waste materials disposed of at landfill sites include general unsorted waste, green waste and construction waste.

The table on the following page gives an indicative range of charges that are applied for these services for the larger local governments in Queensland. Due to the complexity of charging structure in some locations, average $/tonne rates are provided where possible. Domestic users were charged an average rate of $56/tonne for general waste disposal and $43/tonne for green waste disposal. Commercial operators were charged $62/tonne for general waste disposal and $43/tonne for green waste disposal. Construction waste was charge at $39/tonne.

Table B.2: Waste Disposal Charges for Domestic and Commercial Waste (per tonne), 2006/07

	Residential		Commercial		
	General	Green	General	Green	Construction
Beaudesert Shire	n.a.	n.a.	$55.00	n.a.	n.a.
Brisbane City	$80.70	$62.20	$80.70	$62.20	n.a.
Bundaberg City	$0.00	n.a.	n.a.	n.a.	n.a.
Caboolture Shire	n.a.	n.a.	$62.00	n.a.	$42.00
Cairns City	n.a.	n.a.	$83.70	$27.00	n.a.
Caloundra City	$44.00	n.a.	$44.00	$44.00	$44.00
Cooloola Shire	n.a.	n.a.	n.a.	n.a.	n.a.
Gladstone City	$59.00	$53.00	$70.50	$53.00	$57.75
Gold Coast City	$55.00	$33.00	$55.00	$33.00	n.a.
Hervey Bay City	n.a.	$55.40	$55.40	$55.40	n.a.
Ipswich City	$65.00	n.a.	$65.00	n.a.	n.a.
Livingstone	$86.00	$37.50	$37.50	$37.50	$33.50
Logan City	$62.00	$33.50	$62.00	$33.50	$30.00
Mackay City	$80.00	$80.00	$80.00	$50.00	$28.00
Maroochy Shire	$44.00	$32.00	$44.00	$32.00	$23.00
Maryborough City	n.a.	n.a.	n.a.	n.a.	$25.00
Noosa Shire	$44.00	$31.00	$44.00	$31.00	$70.00
Pine Rivers Shire	$0.00	$0.00	$77.50	$59.00	n.a.
Redcliffe City	$80.80	$28.80	$80.80	$64.00	n.a.
Redland Shire	$85.50	$85.50	$85.50	$48.00	$24.00
Rockhampton City	n.a.	n.a.	n.a.	n.a.	$44.00
Thuringowa City	n.a.	n.a.	$45.50	$36.00	$45.50
Toowoomba City	$59.06	$29.51	$59.06	$29.51	n.a.
Townsville City	n.a.	n.a.	$44.00	$35.00	$44.00

Source: AEC Group, assorted service providers

Appendix C: Greenhouse Gas (GHG) Emissions from Australian Landfills

GHG and the Waste Sector

Waste disposal produces three main GHGs: carbon dioxide, nitrous oxide (in relatively small quantities) and methane.

Carbon dioxide emissions from the breakdown of organic matter are generally not included in GHG inventories as they are part of the naturally occurring carbon cycle. Meanwhile, methane gas – which is produced in landfill sites when organic matter is broken down under anaerobic conditions due to low levels of oxygen – has been found to have a climate change impact up to 21 times greater than the same amount of carbon dioxide (Department for the Environment and Heritage 2006). Organic wastes include food waste, garden organics, paper, cardboard and wood.

In fact, methane was found to be the second greatest contributor to GHG after carbon dioxide, and the US Environmental Protection Agency found that landfills sites in the US accounted for 24% of all methane emissions in 2003, the largest single source (US EPA 2007).

Measuring GHGs from Landfill Sites

The US EPA has published a rule of thumb for the rate of conversion of municipal solid waste disposed by landfill into methane. They estimate the rate to be 0.01 tonnes of methane per tonne of waste. However, this rate is influenced by several factors, such as:

- **Type of Landfill**
  Older landfill sites, especially smaller sites, often release the methane they produce directly to the environment. New landfill sites are often designed to capture the methane they produce, although there is significant variation between capture rates. The latest bioreactor sites, which also increase the speed at which the waste is broken down, are capable of much higher capture rates. Gas capture sites often use the collected gas as a fuel for electricity generation and larger sites may actually produce enough gas to make commercial electricity generation a viable option. Smaller sites may only produce enough electricity to provide power for the site. Where it is unviable to use the gas for electricity production, it is possible to flare the gas to reduce overall GHG impacts by converting the same volume of methane to carbon dioxide (and reducing the climate change impact by a factor of 21). The ratio of methane produced to methane captured also varies between sites and over the lifetime of the site. Landfill sites may continue to produce methane for up to 50 years after they reach capacity and are capped. This means that current emissions are the result of current and previous landfill operations with a significant lag time between any change in operations and an impact on total methane emissions.

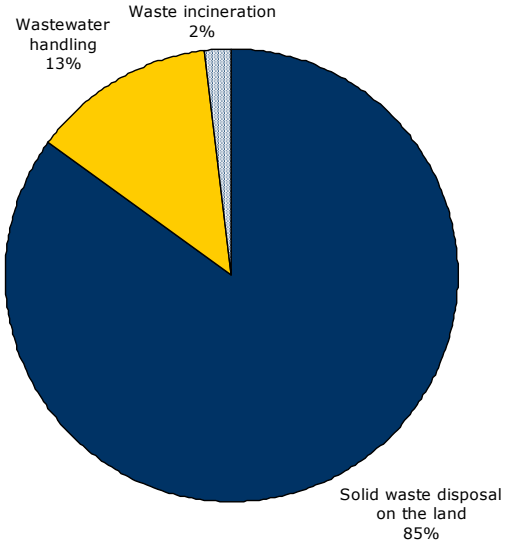
- **Type of Material Landfilled**
  The type of material deposited in landfills impacts the rate of decomposition and volume of methane produced. Generally, waste that contains a higher proportion of organic matter produces greater volumes of methane gas than materials containing inert matter. One way in which methane emissions can be reduced is by removing garden waste from the landfill stream and allowing it to breakdown under aerobic conditions as this type of material releases high volumes of methane as it decomposes.

- **Climate**
  Hot, wet climates result in faster rates of breakdown than cold, dry conditions.

Recent Trends in Australian Methane Emissions

The figure below shows the relative GHG contributions from the Australian waste management sector in 2005. It is evident that solid waste disposal on the land is by far the largest source of GHG in the waste sector.

Figure C.1: Australian Waste Sector GHG, 2005



Source: National Greenhouse Gas Inventory 2005

The following table illustrates the volume of GHG from waste disposal, the total waste sector and total emissions in 1990 and 2004 and the % change over the period studied. To allow comparison of emissions as a whole, all measurements are in Mt CO^{2-e}, mega tonnes carbon dioxide equivalent.

Table C.1: GHG Emissions, 1990 vs 2004 (Mt CO^{2-e})

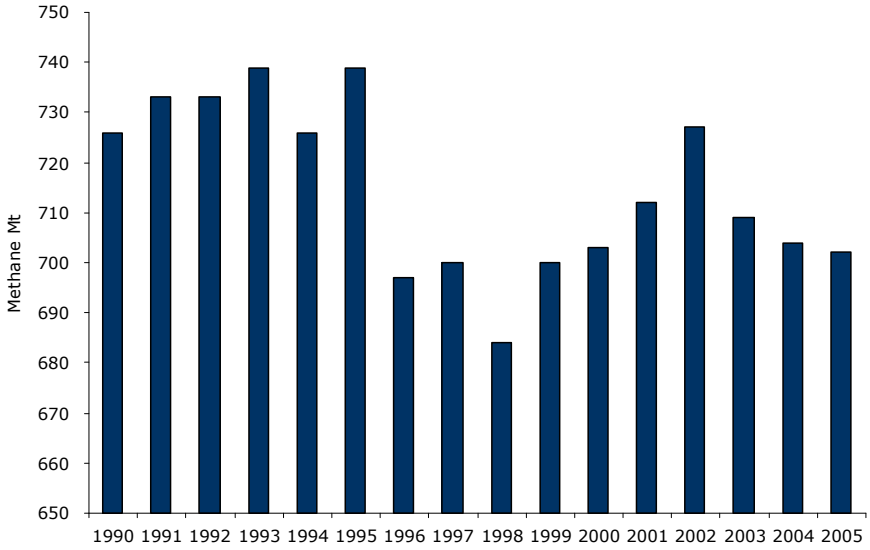
	1990	2004	Change
Solid Waste Disposal	15.4	15.0	-2.7%
Wastewater	3.8	4.2	7.3%
Waste Incineration	0.01	0.02	0.0%
Waste Total	**19.3**	**19.1**	**-0.7%**
Total emissions (including land use change)	552	565	2.3%
% Waste Share of Total Emissions	3.5%	3.4%	-0.1%

Source: Department of the Environment and Heritage Waste Sector Greenhouse Gas Emissions Projection 2006
Notes: Columns may not add up due to rounding. % Division between streams is different to the figure due to changes in the calculation methodology.

There appears to have been a slight reduction in the level of emissions over the period studied, and waste-related emissions, as a proportion of total emissions produced, decreased slightly over the period studied.

The following graph shows the volume of methane (mega tonnes) produced by solid waste disposal on land between 1990 and 2005. There have been significant annual variations in the level of methane produced by landfill activity, with an overall downward trend probably reflecting the impact of additional recycling/reuse and increases in landfill gas capture and the use of bioreactors. Over the 15 years covered, the average annual methane emission was 715 mega tonnes, 11 mega tonnes less than in 1990 and 13 mega tonnes more than in 2005.

Figure C.2: Methane Emissions from Waste Disposal on Land 1990-2005



Source: Greenhouse Gas Inventory 2005

GHG Projections From Australian Landfill Sites

In 2006, the Department for the Environment and Heritage undertook a study GHG emissions generated by the waste sector. The study used 1990 levels as a base scenario and then applied projections to assess the likely range of emissions that would be produced under a range of waste scenarios. The study also attempted to forecast future emissions from landfill sites. In assessing methane emissions from landfill activity over the next 15 years, a series of scenarios were constructed to demonstrate the impact of various combinations of variables.

The scenario analysis was based around:

1. **Business as Usual** – projected changes related to forecast population changes, economic growth and other variables (including an assumption of increased waste generated per capita) but did not reflect the projected impacts of policy measures such as the promotion of recycling schemes or economic instruments.

2. **Low Waste Disposal Case** – assumes all stated waste reduction targets will be met on schedule.

3. **Best Waste Disposal Case** – assumes all stated waste reduction targets will be met within two years of scheduled timeline.

4. **High Waste Disposal Case** – assumes all stated waste reduction targets will be met within five years of the schedule timeline.

Four types of measures could be adopted to reduce the level of emissions from waste disposal by landfill, including recycling/reuse, waste to energy measures, cleaner production techniques/processes, and methane capture for flaring or electricity generation.

Waste diversion up to 1990 generally only involved paper recycling. Although other materials could be recycled, at that time there were very limited recycling facilities and the relative prices of recycled and non-recycled goods made it uneconomical to establish recycling facilities. The following table shows the change in the rate of waste diversion by waste stream between 1990 and 2010 for the Business as Usual and With Measures scenarios.

Table C.2: % Organic Waste Diversion, 1990 and 2010 Scenarios

Scenario	1990	2010 High	2010 Best	2010 Low
Food	0	5-100	3-74	1-55
Paper and Textiles	0-61	55-100	45-83	35-75
Garden and Green	0	55-100	45-95	40-95
Wood	0	10-100	5-80	3-80
Other	0	10-100	5-83	3-72

Source: Department of the Environment and Heritage (2006)
Notes: Assumes that Business as Usual diversion rates are the same as 1990.

Meanwhile, the following table shows the predicted change in the rate of methane capture under each scenario over the same period. Increases in the proportion of landfill gas being captured were initially slow because of the limited numbers of new entrants to the market and a stable number of landfills with the available technology. However, since 2004, the rate of capture has increased at a faster rate driven by wider adoption of methane capture facilities and the introduction of bioreactors which receive a large proportion of waste from Sydney and Brisbane. Bioreactors increase the rate of decomposition and the proportion of the methane produced that is captured.

Table C.3: % Methane Gas Capture, 1990 and 2010 Scenarios

	1990	2010 High	2010 Best	2010 Low
% Methane Capture	0%	60%	40%	27%

Source: Department of the Environment and Heritage Waste Sector Green House Gas Emissions Projection 2006
Notes: Assumes that Business as Usual methane capture rates are the same as 1990.

In recent years, there has also been a trend of consolidation in waste disposal facilities, making the installation and operation of methane capture facilities more viable that if it waste is sent to greater numbers of smaller sites. Methane capture rates have been further boosted by landfill licence conditions, which set targets for the capture of methane produced. This has been particularly effective where the characteristics of the landfill make electricity generation unviable. Given the lag time between disposal by landfill and the release of methane, it is also thought that the level of methane captured will be further increased by the replacement of older style landfills with new facilities over time which are capable of capturing much higher proportion of methane produced.

The table below outline the projected emissions for solid waste disposal through to 2020 under the different scenarios.

Table C.4: Projected Emissions from Solid Waste Disposal, 1990, 2010 and 2020 (Mt CO^2)

Scenario	1990	2010	2020
BAU	15.4	22.8	31.7
Best	15.4	10.9	4.5
High	15.4	13.8	12.0
Low	15.4	6.9	0.3
Difference BAU - Best	-	11.9	27.2

Source: Department of the Environment and Heritage Waste Sector Green House Gas Emissions Projection 2006
Note: Columns may not add up due to rounding.

Under the Business as Usual scenario, it is projected that by 2010 the emissions from the solid waste sector will be 22.8 Mt CO^{2-e} and by 2020 this is forecast to be 31.7 Mt CO^{2-e}, 48% and 106% above the 1990 level respectively. By 2020, emissions under the Best with Measures scenario are forecast to be just 14.2% of emissions from the Business as Usual scenario. The Best with Measures scenario would require a reduction of 71% from the 1990 baseline emissions.

The following table shows the impact of the With Measures Best estimate of solid waste disposal measures on GHG. By 2020, under the application of the Best with Measures scenario, emission reductions of 27.2 Mt CO^2 would be possible.

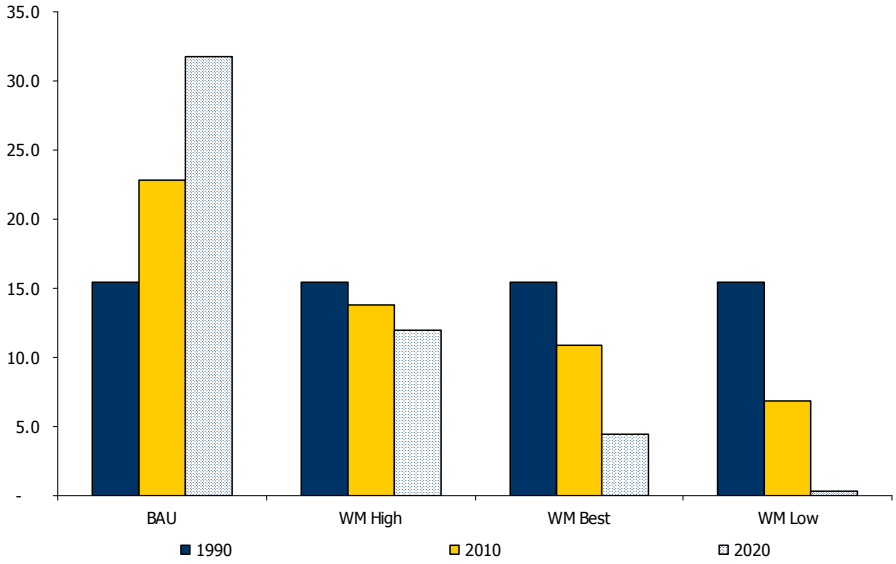
Table C.5: Emission Abatement Impact of Solid Waste Disposal Measures (Mt CO^2)

Measures	1990	2000	2005	2010	2020
Waste Diversion	0.0	0.9	2.3	4.7	13.7
Methane Capture	0.04	2.1	3.9	7.3	13.5
Total	**0.04**	**3.0**	**6.2**	**11.9**	**27.2**

Source: Department of the Environment and Heritage Waste Sector Green House Gas Emissions Projection 2006

The graph below highlights the impact of these changes of total solid waste disposal emissions for each scenario. By 2010 emissions under the Best with Measures scenario are 48% of the Business as Usual total, falling to 14% by 2020.

Figure C.3: Solid Waste Disposal Emissions, 1990-2020 (Mt CO^2)



Source: Department of the Environment and Heritage Waste Sector Green House Gas Emissions Projection 2006

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