COMMERCIAL IN CONFIDENCE

BRIEFING

Economic and environmental impacts of NSW energy from waste regulations

Prepared for
Waste Contractors and Recyclers Association of NSW (WCRA)

November 2022

THE CENTRE FOR INTERNATIONAL ECONOMICS
www.TheCIE.com.au

The Centre for International Economics is a private economic research agency that provides professional, independent and timely analysis of international and domestic events and policies.

The CIE's professional staff arrange, undertake and publish commissioned economic research and analysis for industry, corporations, governments, international agencies and individuals.

CANBERRA

Centre for International Economics
Ground Floor, 11 Lancaster Place
Canberra Airport ACT 2609

Telephone +61 2 6245 7800
Facsimile +61 2 6245 7888
Email cie@TheCIE.com.au

Website www.TheCIE.com.au

SYDNEY

Centre for International Economics
Level 7, 8 Spring Street
Sydney NSW 2000

Telephone +61 2 9250 0800
Email ciesyd@TheCIE.com.au

Website www.TheCIE.com.au

Contents

Executive summary

The NSW Government has enacted a prohibition on energy from waste (EfW) in NSW, except in specific designated locations. As part of this, NSW EPA has undertaken a Better Regulation Statement, which is intended to identify the rationale for government intervention and to assess the impacts of alternative regulatory options.

The CIE has been asked to undertake a review of the development of the regulation against the NSW Better Regulation Principles and to evaluate potential impacts of the regulation.

In our assessment, it is not clear what the basis for the regulation is and why the preferred option has been selected.

- The problem is identified as a potential oversupply of energy from waste facilities. There is no evidence of this problem and in fact NSW Government strategic planning indicates that NSW is running out of space to deal with residual waste and critical residual waste infrastructure is urgently needed. Certainty of feedstock is a key factor for businesses in developing energy from waste proposals, and there is no reason to think the government needs to manage this.
- The overarching objective is identified as to maximise efficiencies in infrastructure, waste management, innovation and energy recovery and ensure consistency with the transition to a circular economy. This is a reasonable objective to underpin regulation of EfW.
- The options developed are not aligned to the overarching objective. The regulatory change that has been made would reduce efficiency if it forces energy from waste to more distant locations, with higher transport costs (including social and environmental costs of transport).
  - Selecting specific locations does not allow for businesses to find locations that optimise on commercial costs, while accounting for the other non-commercial criteria relevant to the NSW community
  - options not considered that would better meet objectives include building relevant criteria into the assessment processes for proposals, where these are not already part of existing assessment processes. This would ensure that any proposal which meets identified criteria can proceed rather than restricting EfW to specific locations
- The regulatory change was also intended to increase certainty for potential EfW projects. However, interviews with industry showed that certainty has not been provided, largely because the basis for the regulations is weak and businesses do not believe that specifying specific locations is a credible long term regulatory framework.
  - It is evident that obtaining community support for an EfW facility or any other residual waste facility is difficult and politically challenging. Restricting locations

does not assist with this. However, there may be other government levers that could better address community concerns with EfW facilities and make the planning process less uncertain

- Outside of Better Regulation Principles, the regulatory changes enacted for energy from waste violate the *Intergovernmental agreement on competition and productivity enhancing reforms* signed by the NSW Government in 2016. The changes:
  – are a clear restriction on competition, and
  – show no evidence that the benefits outweigh the costs or that the objective could not be achieved without restricting competition.

The impacts of the regulations will depend on what EfW facilities or other residual waste facilities will occur under the regulations, versus what would occur if the regulations had not been introduced.

- Of the four specified locations, it is likely that one EfW plant (in Woodlawn Goulburn) will be able to be developed. Other locations are either not of interest from their owners or are expected to have logistics costs that make them prohibitively expensive
  – note that there remain some other issues that would need to be resolved to enable any EfW facility to reach financial close, such as clarity on long term waste levy arrangements for EfW
- There are a large number of EfW proposals that are under active development that are in locations not allowed under the regulations. The capital investment specified for proposals that are now prohibited is in excess of $2 billion. We do not expect that all of these would have become projects without the regulations, but some would have proceeded to be built.

The regulatory change that has been made has not been shown by the NSW Government to have benefits in excess of its costs, with no attempt to quantify impacts, costs and benefits of proposed options. This is a significant failure given that the regulatory option prohibits a number of proposals that are under active development.

- In our assessment, the transport costs of moving EfW to more distant locations with far outweigh air pollution impacts from EfW occurring in areas with low population density
  – based on an assessment of the transport costs of moving waste to the specified locations from the most likely source of waste (Sydney), the cost to a single EfW facility could be in excess of $25 million per year.
  – The air pollution costs from moving an EfW further from major population centres are conservatively estimated to be about one tenth of this
- There does not seem to be a robust reason to restrict EfW facilities to regional locations on the basis of the impacts on the community
  – NSW has enacted very strict pollution controls on EfW
  – the populations within a catchment of EfW plants in Western Sydney or many other potential locations is much smaller than in other countries, such as the UK. For example, most UK EfW plants have 10 000 people within a 2km catchment.

Cleanaway's proposed plant in Western Sydney is forecast to have less than 500 people within a 2km catchment by 2056.

If restrictions on EfW lead to additional landfilling, this would be inconsistent with the overarching NSW Government intentions for waste management. However, it may well have benefits in excess of its costs because landfills are lower cost to develop than EfW facilities (excluding the waste levy). A possible alternative is that no capacity is developed in the medium to longer term to deal with residual waste, leading to capacity constraints. This could lead to a waste crisis. Greater policy certainty will be required to ensure that viable options can be developed by private businesses, or governments would need to take a more proactive role in providing residual waste disposal infrastructure themselves.

1 Introduction

NSW EPA's regulatory changes

The Protection of the Environment Operations (General) Amendment (Thermal Energy from Waste) Regulation 2022 commenced on 8 July 2022. This regulation prohibits the thermal treatment of waste for energy recovery unless it is undertaken in one of the following nominated precincts:

- Parkes Special Activation Precinct
- West Lithgow Precinct
- Richmond Valley Regional Jobs Precinct
- Southern Goulburn-Mulwaree Precinct.

The EPA can also gazette addition locations covering:

- an Activation Precinct
- a Regional Jobs Precinct
- former mine premises, or
- former thermal electricity generation premises.

There are some exceptions to facilities having to be in these designated areas. Namely, energy from waste will only be permitted where:

- an activity has been specifically excluded from the definition of 'thermal treatment' as an activity that can continue to lawfully operate throughout NSW (including activities such as autoclaving, thermal treatment of biosolids and thermal treatment of waste plastic for genuine plastic recycling)
- it was lawfully established and operating before the commencement of the Regulation
- using waste would replace a less environmentally sound fuel being used to power existing industrial or manufacturing processes on site.

NSW EPA's regulations and the documentation that supports these is at https://www.epa.nsw.gov.au/your-environment/waste/waste-facilities/energy-recovery.

Better regulation principles

Under NSW Government requirements, a Better Regulation Statement (BRS) is required for significant new and amending bills. This process is simply a formal framework to help policy-makers think through the impacts of regulatory proposals in a disciplined and comprehensive way. This helps to ensure that policy decisions are based on best practice regulatory principles (see box 1.1) and the best available evidence, resulting in better policy outcomes for the community.

1.1 Better Regulation Principles[1]

Principle 1: The need for government action should be established. Government action should only occur where it is in the public interest, that is, where the benefits outweigh the costs.

Principle 2: The objective of government action should be clear.

Principle 3: The impact of government action should be properly understood by considering the costs and benefits (using all available data) of a range of options, including non-regulatory options.

Principle 4: Government action should be effective and proportional.

Principle 5: Consultation with business and the community should inform regulatory development.

Principle 6: The simplification, repeal, reform or consolidation of existing regulation should be considered.

Principle 7: Regulation should be periodically reviewed, and if necessary reformed to ensure its continued efficiency and effectiveness.

Quantifying the benefits and costs of a regulatory proposal is a key element of the BRS process. Although the benefits and costs of regulatory proposals can be difficult to quantify precisely, quantification is nevertheless desirable to help policy-makers to better understand the complex trade-offs between environmental and social benefits and economic costs. Quantification forces critical assumptions and uncertainties to be explicitly identified meaning decisions are made with regard to maximum amounts of information. The alternative is that critical assumptions and uncertainties are implied but not identified nor understood.

NSW EPA has developed a Better Regulation Statement in relation to the proposed regulatory changes. Note that NSW EPA has not undertaken (or at least this is not presented in the public domain) any quantification of costs and benefits.

[1] NSW Government, *NSW Guide to Better Regulation*, October 2016, p. 6.

2 Assessment of NSW EPA regulation against better regulation principles

The need for government action (Principle 1)

Existing energy from waste regulation

There are currently a range of regulations in place that govern energy from waste projects. These include:

- standards related to air emissions and other pollution, implemented through the NSW Energy from Waste Policy Statement[2], as well as the POEO Act and licences
- environmental planning processes that apply to large developments, including requirements to develop an Environmental Impact Statement
- environmental protection licences, which set conditions related to pollution prevention and monitoring, and cleaner production through recycling and reuse and the implementation of best practice[3]
- load based licensing, which sets limits and charge for pollutants for holders of environmental protection licences[4]
- requirements related to the feedstock for energy from waste facilities, implemented through the NSW Energy from Waste Policy Statement.[5]

These regulatory requirements are in place to ensure that energy from waste facilities do not have excessive environmental externalities, such as air and water pollution, do not divert materials from recycling and mitigate community impacts such as related to transport.

Need for additional regulation

With respect to additional regulation, the NSW EPA indicates that:

> A regulatory response is needed to implement the Waste Strategy and the Infrastructure Plan efficiently and effectively, so that energy from waste in NSW provides the greatest

2 https://www.epa.nsw.gov.au/your-environment/waste/waste-facilities/energy-recovery

3 https://www.epa.nsw.gov.au/licensing-and-regulation/licensing/environment-protection-licences/

4 https://www.epa.nsw.gov.au/licensing-and-regulation/licensing/environment-protection-licences/load-based-licensing

5 https://www.epa.nsw.gov.au/your-environment/waste/waste-facilities/energy-recovery

environmental, social and economic benefits to the NSW community and supports the transition to a circular economy.

Maximising the environmental, social and economic benefits to the NSW community is a reasonable starting premise. However, the Better Regulation Statement has not in any way suggested that energy from waste would not be undertaken in a way to provide the greatest environmental, social and economic benefits to the NSW community and to support the transition to a circular economy under existing regulations.

The Better Regulation Statement then notes the following three specific problems:

1 the current regulations do not take account of the needs or strategic direction of the NSW waste management framework as a whole
2 without intervention, there could be a significant oversupply of energy from waste facilities in NSW. This could create inconsistency with the waste hierarchy and undermine the use of higher-priority, more beneficial, waste management options (such as resource recovery and recycling), by raising the demand for feedstock for energy from waste facilities, and
3 an oversupply of energy from waste facilities risks creating a class of stranded assets as the circular model of waste and resource management takes effect and the volume of available residual waste feedstock declines.

What the first point means is not at all clear. This makes it hard to comment on.

The second point and third point are not proven (or likely) and are contradictory.

- Point 2 is already addressed in existing regulations — the NSW Energy from Waste Policy Statement has limits on different feedstocks to ensure that the waste hierarchy is not undermined.[6]
- The oversupply of energy from waste facilities identified in Point 2 and 3 is not likely. A much more significant risk is that there will be nowhere for materials to go, because landfill capacity is limited and energy from waste facilities are not built.
  – Facilities will require certainty about feedstock prior to being developed. If they cannot access a certain stream of materials then they will not be built.
  – The Waste Strategy indicates that NSW is running out of space to deal with residual waste and there is a critical residual waste infrastructure is urgently needed.[7]
  – This indicates that an undersupply of residual waste infrastructure is likely, rather than an oversupply
  – In terms of numbers, there is currently ~5 million tonnes of waste disposed of from municipal and C&I sectors.[8] If this increased at the same rate as overall forecasts of waste generated, then there would be another 3.5 million tonnes per year of

6 https://www.epa.nsw.gov.au/your-environment/waste/waste-facilities/energy-recovery

7 https://www.dpie.nsw.gov.au/our-work/environment-energy-and-science/waste-and-sustainable-materials-strategy

8 https://www.epa.nsw.gov.au/your-environment/waste/waste-overview/waste-performance-data#:~:text=The%20overall%20waste%20recycling%20rate,disposed%20has%20remained%20relatively%20level.

residual waste from municipal and C&I sectors by 2041. All the facilities proposed that take these types of waste together do not come close to accommodating that increase, let alone accounting for landfill capacity running out.

- If there was an oversupply of energy from waste facilities, then either Point 2 could be true (these facilities use materials better diverted elsewhere) or Point 3 (these facilities can't access materials), but not both.

The overall direction appears to be that NSW EPA is suggesting a dramatic shift away from allowing the type, location and number of waste management facilities in NSW to be determined by market forces. Instead, government will have a much more significant role in this through limiting what is allowed where.

The Better Regulation Statement does not in our view provide a strong premise for a need for further government intervention, along the lines of the regulatory changes made.

A more reasonable statement of problems is that NSW and Sydney in particular will run out of options for disposal of residual waste, because of a lack of certainty and timeliness for industry in developing new projects. The issues that underlie this problem are issues of government failure.

Objectives of regulation (Principle 2)

The Better Regulation Statement doesn't specifically state objectives but indicates that the regulations are designed to:

1. maximise efficiencies in infrastructure, waste management, innovation and energy recovery and ensure consistency with the transition to a circular economy
2. adhere to the 'precautionary principle', by not locating energy from waste in areas where there is a greater risk of harm to human health due to proximity to high population areas (now and in the future) and where there are regular exceedances to air quality standards from existing sources
3. improve certainty for industry operators and investors around acceptable locations and facilities, and
4. complement existing NSW Government policies and strategies, including the Waste Strategy, the Net Zero Plan 2020–2030, the NSW Clean Air Strategy 2021–30, the NSW Electricity Infrastructure Roadmap, the 20-Year Economic Vision for Regional NSW and the NSW Energy from Waste Policy Statement.

Objective 1 is a reasonable overarching objective. However, as discussed above, it is not clear what aspects of efficiency are missing given that issues such as the waste hierarchy and air pollution are addressed in existing regulations.

Objective 2 is unrelated to the stated problems and is addressed through existing regulations related to air emissions that are the "most rigorous environmental controls in the world".[9]

---

[9] Better Regulation Statement, p. 7.

Objective 3 is a good objective, but is also not related to the stated problems, which are about oversupply of energy from waste facilities. The extent to which the preferred option addresses this objective id discussed further below.

Objective 4 — complementing existing plans — is not really an objective. The objective would be related to whatever the objectives of these existing plans are.

Impacts of a range of options (Principle 3)

Regulatory options considered

NSW EPA presents three regulatory options:

- the current regulatory setting
- energy from waste limited to prescribed locations, with some exemptions, and
- placing a cap on the volume of waste used as energy from waste feedstock.

An assessment of how these options align to objectives and problems is set out in table 2.1 and table 2.2.

2.1 Alignment of options to objectives

Objective	Current regulatory setting	Limit energy from waste to prescribed locations	Place a cap on the volume of waste used as feedstock
Maximise efficiencies in infrastructure, waste management, innovation and energy recovery and ensure consistency with the transition to a circular economy	Yes, as air pollution and waste hierarchy are addressed in existing regulations. May be some inefficiencies from transport externalities	No, as govt has not chosen locations to maximise efficiency	Depends on whether the cap is set at an efficient level. Unclear why the govt is best able to determine the efficient level.
Adhere to the 'precautionary principle'	Yes, as standards are the most rigorous environmental controls in the world	Yes, as standards are the most rigorous environmental controls in the world	Yes, as standards are the most rigorous environmental controls in the world
Improve certainty for industry operators and investors around acceptable locations and facilities	Depends on whether planning system operates effectively.	Improves certainty about locations that are unacceptable. Not clear that designated locations have a more certain planning pathway.	Same as current regulatory settings

Note: Teal is where a location meets and pink where it does not.

Source: The CIE.

2.2 Alignment of options to stated problems

Objective	Current regulatory setting	Limit energy from waste to prescribed locations	Place a cap on the volume of waste used as feedstock
The current regulations do not take account of the needs or strategic direction of the NSW waste management framework as a whole	Not clear what this means	Not clear what this means	Not clear what this means
There could be a significant oversupply of energy from waste facilities in NSW	Yes, as facilities will only go ahead with certainty about material streams.	Yes, as limits number of facilities even further	Depends on how cap is allocated. Could lead to more of a problem if facilities are built and then cannot use the material
An oversupply of energy from waste facilities risks creating a class of stranded assets	Yes, as facilities will only go ahead with certainty about material streams.	Yes, as limits number of facilities even further	Depends on how cap is allocated. Could lead to more of a problem if facilities are built and then cannot use the material

Note: Teal is where a location meets and pink where it does not.

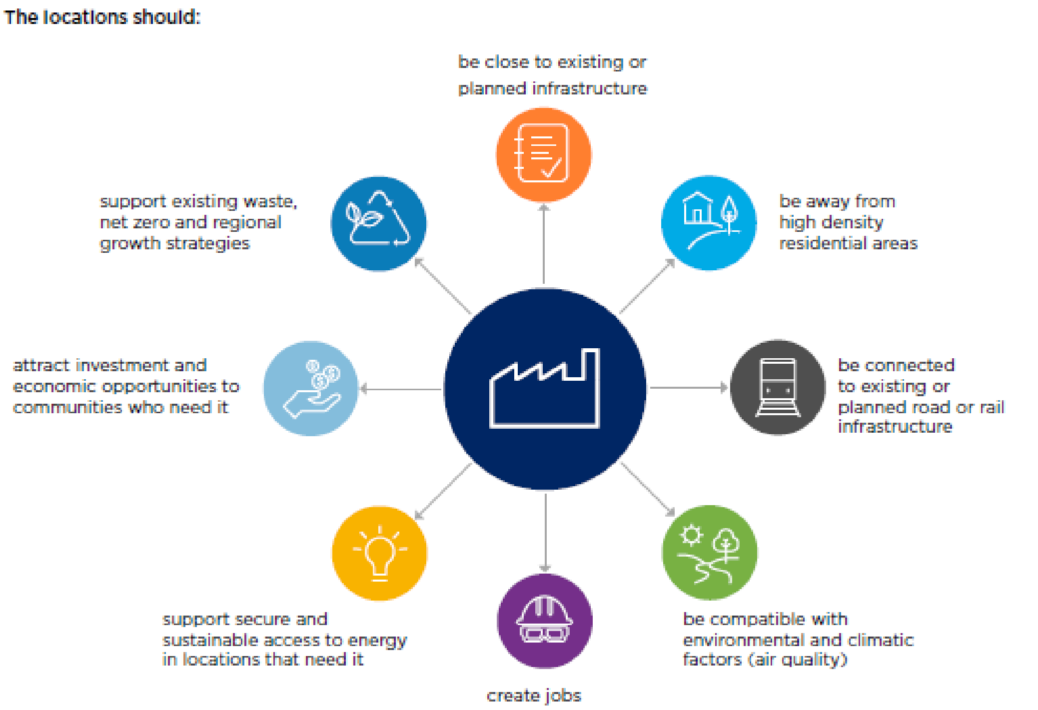
Source: The CIE.

There is a much wider range of options that could be investigated with regards to either the EPA's stated problems and objectives (or a more clearly articulated rationale for additional government regulatory intervention). The most obvious is not to pick specific locations but to detail particular conditions or criteria where energy from waste would be allowed. Then any site that met these conditions would be acceptable.

It is very clear that the preferred option is anti-competitive. Prescribing particular locations for energy from waste provides the owners of these sites with a competitive advantage, even if a site next door had exactly the same characteristics. This is more than a theoretical possibility, given that there are two proposals with the Department of Planning located in Goulburn – one of which is now allowed and one is not; and two proposals being developed in Lithgow – one of which is now allowed and one is not.

The choice of the four specific locations for allowing energy from waste is not at all obvious. The factors identified in the Energy from Waste Infrastructure Plan are shown in chart 2.3. The alignment of sites to these factors, or an assessment of a broader set of sites, has not been public provided in documentation. In Table 2.4 we set out how sites align to the criteria.

2.3 Factors identified in Energy from Waste Infrastructure Plan



Data source: NSW Government Energy from Waste Infrastructure Plan, https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/waste/21p3261-energy-from-waste-infrastructure-plan.pdf.

Of the four sites, Goulburn is most closely aligned to the assessment criteria, because it is part of an existing waste precinct, has rail and electricity transmission access and is in an LGA with relatively high unemployment. It also has a current development application for EfW.

The other three sites perform less well against the stated criteria.

Only one of the sites has a proposed energy from waste facility (Goulburn). Lithgow did have a proposal for a facility. However, the feasibility assessment, which was funded by the Australian Renewable Energy Agency, found that this was not commercial.[10] The proposal has subsequently been withdrawn and Energy Australia has indicated that it is not going to undertake any energy from waste projects at its site.[11] A notice revoking the gazettal of the West Lithgow Precinct map was published in the NSW Government Gazette on Friday 21 October 2022, removing this site.[12] However, the West Lithgow Precinct remains a priority infrastructure area, despite not identifying a site.

There has also been an EOI process run by the NSW Government for energy from waste facilities in the Parkes Special Activation Precinct.[13] This was published in 2020 and this

10 https://arena.gov.au/assets/2022/02/mt-piper-energy-recovery-project-final-report.pdf

11 https://www.energyaustralia.com.au/about-us/media/news/statement-waste-energy-projects

12 https://www.epa.nsw.gov.au/your-environment/waste/waste-facilities/energy-recovery

13 https://www.tenders.nsw.gov.au/?event=public.rft.showArchived&RFTUUID=B4565A7D-D70C-0608-D6CC8A8A3BD37F53

process is continuing. Whether this will result in a commercially feasible EfW facility and the scale of this is not clear.

Given that the environmental standards that have to be met are the most stringent in the world, we assess that all locations are compatible with environmental and climatic factors. The available air quality monitoring suggests that there is non-compliance at some of the locations for some types of air pollution.[14] However, we understand outcomes were influenced by bushfires. We are not aware of any reporting from the Waste Strategy and Energy from Waste Infrastructure Strategy that shows that the locations proposed are particularly favourable in terms of their air quality.

2.4 Alignment of sites to identified factors

Relevant factor	Goulburn	Parkes	Lithgow	Richmond Valley
Be close to existing or planned infrastructure				
Electricity transmission	Yes	No	Yes	No
Waste infrastructure	Yes	No	No	No
Be away from high density residential areas	Yes	Yes	Yes	Yes
Be connected to existing or planned road or rail infrastructure:				
rail	Yes	Yes	No [a]	Not clear
road	Yes	Yes	Yes	Yes
Be compatible with environmental and climatic factors (air quality)	Yes	Yes	Yes	Yes
Create jobs				
Relative unemployment in LGA	High	Low	Low	High
Support secure and sustainable access to energy in locations that need it	No	Not clear	No	Not clear
Attract investment and economic opportunities to communities that need it	Yes	Yes	Yes	Yes
Support existing waste, net zero and regional jobs strategies				
Expected source of waste	Sydney	Sydney	Sydney	Not clear
Distance to Western Sydney (kms)	227	324	131	726
Transport costs and emissions	Medium	Medium-High	Medium	High
Sector mentioned in its region's Regional Economic Development Strategy	Yes	No	No	No

14 https://www.environment.nsw.gov.au/research-and-publications/publications-search/new-south-wales-annual-compliance-report-2020

Current development application	Yes	No – govt run EOI process	No - withdrawn	No

[a] *The* feasibility study expected road to be used. We understand there is now some form of rail access to Mt Piper for the delivery of coal.

Note: Teal is where a location meets criteria and pink where it does not.

Source: The CIE.

A summary of planning proposals that have been submitted for various energy from waste facilities is shown in table 2.5. The Woodlawn Advanced Energy Recovery Centre is the only project that is allowed and still continuing.

Discussions with industry have indicated other projects are also being developed but are not yet in the planning system. Many of the sites for these proposals would perform just as well as those chosen but are not currently allowed. For example, Wallerawang in Lithgow is at least as good a site as Mount Piper in Lithgow, because it has better rail access and is part of a proposed new jobs-related precinct. Similarly, Jerrara in Goulburn has many similar characteristics to Woodlawn, but is not an allowed site.

2.5 Summary of planning proposals for energy from waste facilities

Energy from waste proposals in planning system	Able to be undertaken with new regulations	Location	Size	Status
Agriwaste energy from waste facility	No	Murrumbidgee	350,000 tonnes 100MW $390m	Not clear
Botany cogeneration plant	No	Sydney	165,000 $220-$400m capex	Withdrawn
Woodlawn Advanced Energy Recovery Centre	Yes	Goulburn	380,000 tonnes 39 MW $600m capex	Preparing EIS
Cleanaway Western Sydney Energy and Resource Recovery Centre	No	Sydney	500,000 58MW $645m capex	Response to submissions
Condong cogeneration plant	Yes – existing plant	Tweed	520,000 30MW	Preparing EIS
Eastern Creek Energy from Waste	No	Sydney	300,000 tonnes $290m capex 32MW	Preparing EIS
Jerrara Power Energy from Waste	No	Goulburn	330,000 tonnes 30MW $600m capex	Withdrawn
Mount Piper Energy Recovery Facility	Yes	Lithgow	100,000 tonnes $60m capex	Withdrawn

Wallerawang Energy from Waste	No	Lithgow	500,000 tonnes 55MW $700m capex	Not in planning system

Source: NSW Planning Major Projects website, https://pp.planningportal.nsw.gov.au/major-projects; https://www.greenspot.com.au/efw/.

A clear omission in comparing site locations and proposed facilities is Western Sydney, where there are already a large number of existing waste facilities and which is much closer to the source of feedstock and potential buyers of energy than the locations identified by the regulations. Reflecting that this is a more commercially efficient location for facilities, there are several proposals that have been submitted to NSW Planning in Western Sydney, which are now not allowed. Given that the environmental standards that have to be met are the most stringent in the world, these locations should be compatible with environmental and climatic factors. This location is also more efficient in terms of air and GHG emissions from transport, which is much less to Western Sydney than to the chosen locations.

A discussion of impacts is set out in the next chapter.

Other principles

Assessment of the proposed regulatory actions against Principles 4-7 is set out in table 2.6. NSW EPA has undertaken considerable consultation in developing the regulations. The issue of most impact — where energy from waste is allowed — has been raised by numerous stakeholders in consultations. NSW EPA has indicated that these options were selected by the Energy from Waste Infrastructure Plan. It has not addressed why the proposed regulation should select those locations and not a much broader range of locations.

2.6 Assessment against principles 4-7

Better Regulation principle	Assessment
Principle 4: Government action should be effective and proportional	Given that there is no evidence of the problem, our conclusion is that the regulatory action to prohibit energy from waste across most of NSW is not proportional to the stated problem.
Principle 5: Consultation with business and the community should inform regulatory development	NSW EPA has undertaken consultation on draft amendments. Approximately 400 submissions were received. On the most substantive issue – why the four sites were chosen – the BRS indicated that any change to the four precincts would be inconsistent with the NSW Government decision on the priority infrastructure zones as set out in the Energy from Waste Infrastructure Plan. This is not a response as to why regulation is prohibiting energy from waste in the remainder of NSW.
Principle 6: The simplification, repeal, reform or consolidation of existing regulation should be considered	Options to address the issue of certainty for businesses could have been through considering changes to existing regulations.

Principle 7: Regulation should be periodically reviewed, and if necessary reformed to ensure its continued efficiency and effectiveness	NSW EPA notes that there will be review of the specified precincts for energy from waste in 2025 and 2030. If additional precincts are required, they will only be considered where they meet the principles set out in the Infrastructure Plan and the requirements of the Regulation. We are not aware of any broader review requirements built into the regulation.

Source: The CIE.

National competition policy

In 2016, the NSW Government signed the *Intergovernmental agreement on competition and productivity enhancing reforms.*[15] This followed a long history of successful reforms through National Competition Policy. The Intergovernmental agreement includes the following:

> 9. Subject to the public interest test in clause 10 of this Agreement, all levels of government will be guided by the following competition principles:
>
> …
>
> b. Regulatory frameworks and government policies binding the public or private sectors should not unnecessarily restrict competition.
>
> …
>
> 10. The application of these principles is subject to a public interest test, such that regulation or government policy or practices should not restrict competition unless:
>
> a. the benefits outweigh the costs of the restrictions to the community as a whole, and
>
> b. the objective can only be achieved by restricting competition to that extent.

The regulatory changes enacted for energy from waste violate this agreement through providing a clear restriction on competition without any evidence that the benefits outweigh the costs or that the objective could not be achieved without restricting competition.

15 https://www.treasury.nsw.gov.au/sites/default/files/2017-03/IGA-productivity-reforms.pdf

3 Impacts of proposed regulatory options

The existing documentation in the Better Regulation Statement does not include quantification of impacts, costs and benefits of the regulatory options. In the absence of this, it is not clear how the NSW Government has been able to assess the trade-offs between options. The assessment provided in the BRS is particularly inadequate given that the regulation has the effect of prohibiting a range of active development applications shown in table 2.5.

The possible impacts of the regulations could include:

- changes to locations of EfW plants. E.g. materials would have gone to an energy from waste facility in Western Sydney and now goes to Parkes
- changes to the amount of material landfilled versus used in EfW facilities
- changes to the risk of major capacity issues emerging for residual waste disposal in the medium to longer term
- changes to the certainty of industry about developing proposals, and reducing the costs for nominating energy from waste projects in the specified areas and in other areas.

These direct impacts will flow through to the NSW community through changes to waste disposal charges, as well as impacts on health and the environment.

To understand the possible magnitude of these impacts, we have undertaken a limited assessment of some of the key trade-offs. This has involved modelling of relative catchments for air pollution from a variety of locations, modelling of transport costs and interviews with businesses involved in developing energy from waste proposals. In the sections below we set out:

- the trade-offs between an EfW facility in Western Sydney and the four specified locations, in terms of the health costs of air pollution and transport costs
- the trade-offs between an EfW facility and a landfill, including the potential for capacity constraints for residual waste management, and
- impacts related to certainty for EfW proponents

Key trade-offs between EfW locations

Where the regulation leads to material going to an energy from waste facility in a less preferred commercial location, then the key trade-offs are:

- the higher costs or lower value from the less preferred commercial location, against
- the change in environmental impacts from the facility itself and from transport to and from the facility.

Note that the preferred commercial location will account for a wide range of factors, as set out in table 3.1.

3.1 Commercial and other factors considered in site decisions

Factors taken into account by commercial businesses	Factors not taken into account by commercial decision
Certainty of supply of sufficient quantity of waste	Air pollution and GHG emissions from transport
Transport costs	Congestion impacts of transport
Air and water pollution, to the extent reflected in fees for load based licensing	Air pollution and water pollution impacts from plant, where not reflected in load based licensing
Infrastructure costs, such as electricity transmission costs	
Value of energy produced, including ability to use energy onsite and price paid for energy	
Site costs and ability to find suitable a site	

Source: The CIE.

Pollution impacts

A reasonable reason for restricting EfW locations is that there are pollution impacts which will have a higher cost to the community in some locations as compared to others. For example, air pollution will have a higher cost in areas with higher population density. The air pollution from energy from waste plants is an important consideration and there are many studies showing the health effects of plants with low standards (i.e. incinerators) and the huge reduction in emissions from better controls (see box 3.2).

A systematic review of current evidence on the potential health impacts of exposure to EfW related emissions indicated that findings can vary with choice of scenarios and waste inputs, highlighting the need for sensitivity analyses.[16] Therefore, while EfW operations may be a reasonable option for waste management, its implementation requires proper design, operation, and emissions management and control including ongoing environmental and health monitoring.

16 Tom Cole-Hunter et al 2020 Environ. Res. Lett. 15 123006. The health impacts of waste-to-energy emissions: a systematic review of the literature (iop.org); Li H, Nitivattananon V and Li P 2015 Municipal solid waste management health risk assessment from air emissions for China by applying life cycle analysis Waste Manage. Res. 33 401–9. Municipal solid waste management health risk assessment from air emissions for China by applying life cycle analysis - Hua Li, Vilas Nitivattananon, Peng Li, 2015 (sagepub.com); Karunathilake H, Hewage K and Sadiq R 2016 A life cycle perspective of municipal solid waste: human health risk-energy nexus: 7th Int. Conf. on Sustainable Built Environment 2016; Ollson C A et al 2014a Site specific risk assessment of an energy-from-waste thermal treatment facility in Durham Region, Ontario, Canada. Part A: human health risk assessment Sci. Total Environ. 466–467 345–56 Site specific risk assessment of an energy-from-waste thermal treatment facility in Durham Region, Ontario, Canada. Part A: Human health risk assessment - ScienceDirect.

3.2 Pollution from incinerators versus EfW plants

Older incineration technology coupled with infrequent maintenance schedules has shown strong linkage with adverse health effects.[17] Past epidemiological studies have reported weak to moderate associations between dioxin emissions and an increased incidence of cancers including non-Hodgkin's lymphoma and sarcoma among residents living nearby and incinerator workers.[18]

Over the past 25 years, technology used in modern EfW facilities has seen a significant improvement over the mass burn incinerators, in line with the enforcement of increasingly strict emission standards.[19] 'Moving grate, mass burn technology' is regarded as the most robust technology.[20] Due to its high feeding capacity and superior performance in terms of handling bulky, mixed, and contaminated waste without prior sorting or shredding, most commercially deployed EfW plants internationally use this technology.[21] All proposed EfW facilities previously and currently under assessment in the NSW planning system are moving grate proposals of some type. The first EfW plant being built in Australia (Western Australia Kwinana plant) also uses this technology.[22]

Improvement in EfW technology has led to lower emissions and consequently, improved air quality. In Western Europe, implementation of specific abatement technologies has led to a strong decrease in industrial emissions over the last two decades.[23] For instance, due to implementation of legislations and reduction measures more repressive towards dioxin-emitting sources, atmospheric dioxin emissions decreased by 98.4 per cent in France between 1990 and 2008.[24] Between 1997 and 2010, Japan achieved a 99 per cent reduction in dioxin emissions across 1000 EfW facilities through technological improvements and emission controls.[25]

Limited evidence across epidemiological studies, health risk assessments and life cycle analysis (LCA) shows that appropriately designed and managed EfW plants are critical to reduce potential adverse health impacts (cancer and non-cancer) when compared to waste management practices such as incineration of unsorted waste (without energy recovery).[26] An LCA which compared upgrades to an incinerator, thus enabling it to function as a EfW plant concluded that such EfW operations resulted in expected human health improvements due to lowered emissions and predicted improvements associated with greenhouse gas mitigation.[27] A HRA conducted in Slovakia compared a traditional MSW incinerator with a modern EfW plant. It found that cancer risk from the former ranged from 7-371 in a million while risks from an EfW plant were less than one-in-a-million.[28]

---

17 Tait P W et al 2020 The health impacts of waste incineration: a systematic review Aust. N. Z. J. Public Health 44 40–48

18 Tom Cole-Hunter et al 2020 Environ. Res. Lett. 15 123006

19 Energy from waste fact sheet (nsw.gov.au)

20 Lim, W., Yuen, E. and Bhaskar. A. 2019. Waste-to-energy: Green solutions for emerging markets. *KPMG*.

The NSW Environment Protection Authority (EPA) Energy from Waste Policy Statement adheres to the strictest requirements in the world for human health protection including proven technology, proven operator, and a proven waste stream.[29] A requirement under the EfW policy requires each such facility to have an Environment Protection License (EPL), which establishes maximum emission limits. Modern pollution control equipment uses measures to control and measure particulate and other gaseous emissions, such as using the best available controls, resulting in removal of 99 per cent or more of fine particulates from emissions.[30] Additional requirements to comply with stringent emission standards including ongoing sampling, monitoring, and reporting of pollutants in emissions ensure that such facilities pose a much reduced threat to human health.

The NSW Government frameworks for air and water pollution do differentiate across locations.

- The Load Based Licensing scheme allows the possibility of weights for particular areas where pollution is more costly. This means that the fees charged can differ by location:
  - for Nitrogen oxides and VOCs, the local government areas in the Sydney basin area, City of Blue Mountains, Kiama, City of Shellharbour and City of Wollongong have fees 7 times higher than most other areas
  - outside of Nitrogen oxides and VOCs, air pollution has the same weighting across the state

---

21 Sanjaya, E. and Abbas, A. 2020. Energy-from-Waste. Independent review and expert advice. Waste Transformation Research Hub. *University of Sydney.*

22 Sanjaya, E. and Abbas, A. 2020. Energy-from-Waste. Independent review and expert advice. Waste Transformation Research Hub. *University of Sydney.*

23 Thomas Coudon, Pietro Salizzoni, Delphine Praud, Aurélie Marcelle Nicole Danjou, Laure Dossus, et al.. A national inventory of historical dioxin air emissions sources in France. Atmospheric Pollution Research, Elsevier, 2019, 10, pp.1211-1219. ff10.1016/j.apr.2019.02.004ff. ffhal-03158104f

24 Thomas Coudon, Pietro Salizzoni, Delphine Praud, Aurélie Marcelle Nicole Danjou, Laure Dossus, et al.. A national inventory of historical dioxin air emissions sources in France. Atmospheric Pollution Research, Elsevier, 2019, 10, pp.1211-1219. ff10.1016/j.apr.2019.02.004ff. ffhal-03158104f

25 Li, X., Ma, Y., Zhang, M. et al. 2019. Study on the relationship between waste classification, combustion condition and dioxin emission from waste incineration. *Waste Disposal and Sustainable Energy.* vol. 1, no. 2, 2019/08/01, pp. 91-98

26 Tom Cole-Hunter et al 2020 Environ. Res. Lett. 15 123006

27 Passarini F et al 2014 Environmental impact assessment of a WtE plant after structural upgrade measures Waste Manage. 34 753–62

28 Krajˇcoviˇcov´a J. and Eschenroeder A Q. 2007. Comparative health risks of domestic waste combustion in urban and rural Slovakia. *Environ. Sci. Technol. 41 6847–53*

29 NSW EPA Energy from Waste Policy Statement,,https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/waste/21p2938-energy-from-waste-policy-statement.pdf

30 Energy Recovery from the Combustion of Municipal Solid Waste (MSW). *US Environmental Protection Agency*.

- The Interim framework for valuing Green Infrastructure and Public Spaces has different air pollution costs depending on the density of the urban area. For example, Sydney has a cost of $413 000 per tonne of PM2.5 (particles less than 2.5 microns in width), compared to Parkes at $17 000 per tonne.

Typically, PM2.5 is used as the indicator variable for the level of pollution from industrial plants. There is a large body of evidence that demonstrates a clear association between increases in exposure to PM2.5 and effects on respiratory and cardiovascular conditions.[31] Adverse health effects resulting in mortality are also dominated by effects of airborne particulate matter, specifically PM2.5.[32]

Using values of PM2.5, we can estimate the air pollution costs for EfW plants at various locations. This is based on a plant achieving the pollutant levels identified in the Cleanaway Environmental Impact Statement, with a capacity of 500 000 tonnes of waste input per year.[33]

- The annual average emissions of PM2.5 are estimated at 0.2 grams per second.[34] This equates to slightly more than 6 tonnes per year.
- The cost of emissions of 6 tonnes of PM2.5 in Sydney is $2.6 million per year, based on values from the NSW Government Interim Framework for Valuing Green Infrastructure and Public Spaces (table 3.3).[35]
- The cost of emissions at allowed locations is $4500 per year – i.e. negligible.

This is a very high level assessment, because it assumes population densities of Sydney, which are much higher than for where an EfW plant in Western Sydney would be located. It also uses PM2.5 as the indicator variable to value all air pollution. There are other pollutants of concern whose exposure pathway is also inhalation including Nitrogen dioxide (NO_2), Sulphur dioxide (SO_2), Carbon monoxide (CO), Ammonia and organic compounds like dioxins and furans.[36]

EnRiskS conducts a more nuanced assessment of risks as part of the EIS for Cleanaway's proposed facility. It concludes that:

---

31 World Health Organisation (WHO) (2016) *Ambient air pollution: A global assessment of exposure and burden of disease*.

32 Pae Holmes. 2013. Methodology for Valuing the Health Impacts of Changes in Particle Emissions. *NSW Environment Protection Authority (EPA).*

33 EIS, https://pp.planningportal.nsw.gov.au/major-projects/projects/cleanaways-western-sydney-energy-resource-recovery-centre

34 Todoroski Air Sciences, EIS: TR A Air quality and odour impact assessment, Table 6-9, https://pp.planningportal.nsw.gov.au/major-projects/projects/cleanaways-western-sydney-energy-resource-recovery-centre.

35 NSW Government 2021, Interim Framework for Valuing Green Infrastructure and Public Spaces (Technical appendices), Table 4.4, https://www.dpie.nsw.gov.au/__data/assets/pdf_file/0006/502773/interim-framework-for-valuing-green-infrastructure-and-public-spaces-technical-appendices-2022-03.pdf.

36 Cleanaway Western Sydney and Resource Recovery Centre: Health risk assessment report. 2020. Cleanaway Western Sydney Energy and Resource Recovery Centre: Health Risk Assessment (nsw.gov.au)

- All assessments have found that risks are in compliance with the guidelines developed by government authorities in Australia and are considered low.[37]
- Changes in PM2.5 (and, therefore, PM10) derived from this proposed facility are considered to have a negligible impact on the health of the community.[38]

This suggests that costs of $5/tonne or $2.6m for a 500 000 tonne facility are likely to be an overestimate of the monetised costs of air pollution impacts, given the actual density of possible locations in Western Sydney.

3.3 Costs of PM2.5 from EfW across various locations

Location	Significant Urban Area	Cost per tonne of PM2.5	Cost per tonne of waste	Cost for 500 000 tonnes
		$/tonne	$/tonne	$m
Western Sydney	Sydney	413 000	5.2	2.6
Parkes Special Activation Precinct	Not in any Significant Urban Area	720	0.01	0.0
West Lithgow Precinct	Not in any Significant Urban Area	720	0.01	0.0
Richmond Valley Regional Jobs Precinct	Not in any Significant Urban Area	720	0.01	0.0
Southern Goulburn-Mulwaree Precinct	Not in any Significant Urban Area	720	0.01	0.0

Note: Calculations are for an EfW plant with 500 000 tonnes of MSW capacity.

Source: The CIE; Interim Framework for Valuing Green Infrastructure and Public Spaces (Technical appendices).

Comparison with EfW plants in UK

An alternative way of thinking about what locations are suitable for energy from waste is to consider population catchments. This accounts more specifically for what is around the EfW facility, rather than generic densities of significant urban areas. We have considered the population within a 2km catchment of:

- the locations identified in the EfW regulations
- Western Sydney now and in the future, as proxied by Cleanaway's location
- UK facilities. Only EfW facilities that have an R1 status and therefore qualify as an Energy Recovery Facility (ERF) are used. This excludes facilities that are disposal facilities rather than recovery facilities.[39]

---

37 EnRiskS, EIS: TR B Human Health Risk Assessment, p. ES-7, https://pp.planningportal.nsw.gov.au/major-projects/projects/cleanaways-western-sydney-energy-resource-recovery-centre.

38 EnRiskS, EIS: TR B Human Health Risk Assessment, p. 51, https://pp.planningportal.nsw.gov.au/major-projects/projects/cleanaways-western-sydney-energy-resource-recovery-centre.

39 Waste recovery lies above disposal along the hierarchy chain provided by Waste Framework Directive (WFD). EfW facilities can be classified as either Recovery or Disposal operations.

The catchment of 2km is somewhat arbitrary, with studies indicating catchments of 1-10km for incinerators.[40] We could not see any well defined view of the appropriate catchment for EfW, so tested a number of different catchments and present a 2km catchment.

For NSW precincts, we do not know specific locations of the facilities. To be conservative, we have used a point within the site closest to residential areas. For Parkes we have used a point within the designated resource recovery area.

The populations within a 2km catchment of the NSW allowed precincts and Western Sydney are very low compared to existing UK energy from waste facilities (table 3.4). For example, most of the UK facilities have more than 10 000 people within a 2km catchment. Parkes, Goulburn and Lithgow have no population within this catchment. Richmond Valley has the highest potential population catchment, although this will depend on where within the precinct the EfW is located, as the precinct identified in the regulations is large. It could also be zero depending on its location.

The Western Sydney population within a 2km catchment, based on Cleanaway's Eastern Creek site, is very small. Today, this is 204 people. By 2056, the population within a 2km catchment increases to 422 people.

This comparison suggests that there would be many possible locations of EfW facilities that would be viewed as appropriate in the UK. Given NSW has very stringent air pollution requirements, it is not evident why many more locations in NSW would not be allowed.

3.4 Population catchments of energy from waste facilities in UK and NSW

Facility name	Population within a 2km catchment	Year started operation
	Number of people	Year
Parkes Special Activation Precinct	0	NA
West Lithgow Precinct	0	NA

Achieving Recovery status (R1) is an efficient way to achieve higher standards across the industry. (Environmental Services Association, United Kingdom. 2022. *ESA Paper on R1 Status)*

WFD allows municipal waste incinerators to be classified as recovery operations given, they contribute to energy generation with high efficiency to promote the use of waste to produce energy in energy efficient municipal waste incinerators and encourage innovation in waste incineration. (European Commission. 2018. *Guidelines on the interpretation of the R1 energy efficiency formula for incineration facilities dedicated to the processing of municipal solid waste according to annex II of directive 2008/98/EC on waste*.)

40 Bore, A. et al. 2022. Monitored air pollutants from waste-to-energy facilities in China: Human health risk, and buffer distance assessment. *Atmospheric Pollution Research.* Volume 13. Issue 7*;* Health Assessment for Thermal Treatment of Municipal Solid Waste in British Columbia. 2012. *British Columbia Centre for Disease Control;* Guidelines on the Provision of Buffer Zone Around Waste Processing and Disposal Facilities. 2017.*Central Pollution Control Board;* Z.J. Yong, M.J.K. Bashir, C.A. Ng, S. Sethupathi, J.W. Lim, P.L. Show. 2019. Sustainable Waste-to-Energy Development in Malaysia: Appraisal of Environmental, Financial, and Public Issues Related with Energy Recovery from Municipal Solid Waste.

Facility name	Population within a 2km catchment	Year started operation
Richmond Valley Regional Jobs Precinct	1 826	NA
Southern Goulburn-Mulwaree Precinct	0	NA
Western Sydney today	204	NA
Western Sydney 2056	422	NA
UK facilities		
Allerton Waste Recovery Park	342	2018
Allington EfW	21 866	2008
Ardley EfW	317	2014
Ardwick Railway Goods Yard Incinerator (Newhaven EFW Plant)	58 030	2012
Battlefield EfW	15 394	2015
Beddington EfW	47 398	2018
Four Ashes EfW (Staffordshire ERF)	1 822	2013
Great Blakenham EfW (SITA Suffolk EfW)	5 247	2014
Greatmoor EfW	1 841	2016
Javelin Park Energy Recovery Facility	908	2020
K3 CHP Facility (Kemsley EfW)	7 581	2020
Lakeside Energy from Waste Centre	17 703	2010
Lincolnshire EfW facility	16 762	2014
North East Energy Recovery Centre (adjacent to Teesside EfW)	6 849	2013
North Yard EfW (Devonport EfW CHP)	38 163	2015
Peterborough EfW facility	13 776	2016
Runcorn EfW	11 001	2015[a]
Teesside EfW	6 849	1998
Vine Street EfW (Kirklees EfW)	41 935	2002
Wilton 11 EfW	1 159	2018
Tyseley EfW plant	85 270	1996
Severnside Energy Recovery Centre	1 095	2016
Cornwall Energy Recovery Centre	4 246	2017
Sheffield ERF	45 445	2006
South East London Combined Heat and Power (SELCHP)	142 709	1994
Leeds Recycling and ERF	29 476	2016
EnviRecover EfW facility (Hartlebury EfW)	1 777	2017

[a] Runcorn EfW is one of the largest ERF facilities in UK (operational capacity of 1.1 million tonnes). It applied to receive unprocessed residual MSW waste in 2021.

Note: All Energy from Waste plants in the table above have an R1 status and thus qualify as an Energy Recovery Facility. Cleanaway's Western Sydney Energy and Resource Recovery Centre has been used as a proxy for calculating population catchment of an EfW plant situated in Western Sydney.

Source: CIE; R1 status of incinerators in England (https://www.data.gov.uk/dataset/8287c81b-2288-4f14-9068-52bfda396402/r1-status-of-incinerators-in-england); https://ec.europa.eu/eurostat/web/gisco/geodata/reference-data/population-distribution-demography/geostat; ABS Digital boundary files (MB 2021); State Environmental Planning Policy (Precincts—Regional) 2021 | Planning Portal - Department of Planning and Environment (nsw.gov.au); Energy recovery facilities (nsw.gov.au); NSW ePlanning Spatial Viewer; https://www.cleanaway.com.au/sustainable-future/wserrc-eis-announced/

Transport impacts

Transport of waste is costly and can also have environmental and social impacts, particularly from road-based transport. This is reflected in existing NSW waste management regulations, such as the Proximity Principle. The Proximity Principle broadly seeks that waste disposal should occur within 150 kilometres of where it is generated. There are a number of exceptions, the most important of which is that transport by rail is allowed.

The Proximity Principle does not apply to EfW, as it is for disposal of waste (i.e. landfilling). However, the rationale for managing waste close to where waste is generated is just as relevant for EfW as it is for landfilling — namely to avoid the large economic, social and environmental costs of long haul transport of waste.

We have used the CIE's model of the impacts of long haul transport of waste to estimate the costs of the various locations relative to a location in Western Sydney, where we would expect waste to be transferred from. The detailed assumptions are set out in Appendix A and are based on TfNSW Economic parameters for estimating transport costs.[41]

The costs are estimated at $31-$36 per tonne for Lithgow, depending on road or rail, up to $95-$171 per tonne for Richmond Valley.

We have cross-checked these costs with industry stakeholders, particularly related to Parkes. Industry estimates of rail costs are substantially higher. For example, for Parkes, estimates were typically ~$100 per tonne, compared to $50-$60 economic cost measured here. We do expect commercial rates to be higher than the resource costs being measured, because they have to include financial costs that are not economic costs. That is:

- charges for use of infrastructure, even where there are no actual costs to additional movements
- taxes, such as fuel taxes, which are not included as a resource cost, but are a financial cost for operators, and
- margins and overheads, which are not included in the CIE estimates.

Even after this, the transport cost estimates are potentially on the low side.

3.5 Costs of transport of waste

	Lithgow	Goulburn	Parkes	Richmond Valley
	$/tonne	$/tonne	$/tonne	$/tonne
Road-based travel				
Economic	21.5	32.8	58.6	126.6
Social	6.8	8.2	12.9	23.5

41 TfNSW 2022, Economic Parameter Values, https://www.transport.nsw.gov.au/system/files/media/documents/2022/TfNSW%20Economic%20Parameter%20Values%202022_1.pdf

Environmental	7.8	8.7	12.9	21.2
Total	36.0	49.7	84.4	171.3
Rail-based travel				
Economic	30.1	37.0	52.2	93.0
Social	0.0	0.0	0.0	0.0
Environmental	1.2	1.2	1.6	2.1
Total	31.3	38.2	53.8	95.1

Source: The CIE.

To put these costs into perspective, seeking to move 500 000 tonnes of waste a year to Parkes would have a cost to the NSW community of more than $25 million per year, compared to an EfW facility in Western Sydney. These costs would be borne in higher waste costs for councils and ratepayers, as well as environmental and social costs from the transportation of waste.

The transport costs are substantially higher than air pollution costs using the assumptions set out here. This suggests that the trade-off for an efficient location would seek for EfW to be located closer to where the main amounts of waste are generated and would not seek to push waste to very distant EfW locations.

Key trade-offs between EfW and landfilling

Where the regulation leads to material going to a landfill instead of an energy from waste facility, then the trade-offs are more complicated. They reflect:

- the higher costs or lower value from the less preferred commercial choice (i.e. landfill instead of energy from waste)
  - this presumes that new local landfill capacity will be made available. If this is not the case then the outcomes could be substantially worse because the landfill cost could be for landfilling in more distant locations
- changes to transfers such as the landfill levy, which are accounted for in the commercial decision but which do not reflect real costs to society
- differences in environmental impacts from landfills versus energy from waste.

The resource costs of managing a landfill are expected to be much lower than an EfW facility. The gap is likely to be substantial, with landfill costs (ex levy) of less than $100 per tonne and EfW costs of more than $200 per tonne. The waste levy is the key factor that commercially makes EfW potentially viable relative to landfilling.

Environmentally, EfW is expected to be advantageous because:

- it provides more energy, which can be used to reduce other energy sources that produce GHG emissions
- it has less negative amenity and pollution impacts compared to landfills, such as GHG emissions, odour, vermin and leachate.

We expect that the environmental advantages of EfW would not be sufficient to overcome the cost disadvantage. However, EfW would align more closely to the waste hierarchy than would landfilling.

The industry interviews conducted for this study suggested limited appetite to develop new landfill capacity. This was because of a lack of alignment between landfilling and the overall strategic vision of the businesses.

Capacity constraints for residual waste management

A number of industry participants are concerned about capacity constraints for residual waste in the absence of more flexibility in locations for EfW.

- Currently, municipal solid waste (MSW) in Sydney is destined for either Woodlawn (near Goulburn) or Lucas Heights.
  - In 2016, Lucas Heights received approval for an expansion that would allow it to continue to operate to 2037, with annual tonnages of ~600 000 tonnes per year[42]
  - Woodlawn has approval for receiving 900 000 tonnes of putrescible waste per year from Sydney
- Current MSW volumes of residual waste from Sydney are ~1 million tonnes per year, with a similar volume likely from commercial and industrial waste.[43]
- The NSW Government's Waste and Sustainable Materials Strategy 2041 released in June 2021 notes that "Critical residual waste infrastructure is urgently needed Even if NSW significantly improves its waste avoidance and recycling performance, we will still need new capacity to manage residual waste."[44]
  - It notes that by 2030, Sydney would need additional putrescible landfill capacity to accept >500,000 tpa and at least one large-scale regional energy recovery facility and Greater Sydney medium-scale 'dirty MRF'
  - By 2040, additional putrescible landfill capacity to accept >1.1 million tpa and at least three large-scale regional energy recovery facilities and one medium-scale 'dirty MRF'.

It is not clear why the NSW Government would dramatically restrict possible EfW projects given this stated critical need. Greater policy certainty will be required to ensure that viable options can be developed by private businesses, or governments would need to take a more proactive role in providing or contracting for residual waste disposal infrastructure directly.

---

42 https://pp.planningportal.nsw.gov.au/major-projects/projects/lucas-heights-resource-recovery-facility

43 NSW EPA

44 Department of Planning, Industry and Environment NSW Waste and Sustainable Materials Strategy 2041, June 2021, https://www.dpie.nsw.gov.au/our-work/environment-energy-and-science/waste-and-sustainable-materials-strategy, p. 21.

Certainty for industry

An important benefit noted from the regulations by the NSW Government was that the policy improves certainty for industry. We have tested this with industry and the predominant view wase uncertainty has increased rather than reduced. This reflected that:

- the basis for the regulations was very weak and it was not expected that the regulations could remain as they are. This meant that a business would not commit to a non-preferred site, only to find that a better site was allowed later
- some businesses were continuing to develop their projects outside of the specified locations, on the basis that a revision to the regulations would have to occur.

Many businesses noted the overriding issue in terms of certainty for energy from waste was around the 'social licence' to operate. This covered two aspects:

- health and environmental impacts from a facility, and
- non-Sydney community pushback about why they should accept Sydney's waste, if it was not allowed to be processed in Sydney itself.

Proponents did not believe that the regulations had resolved these issues. Policy changes that assist in this would be beneficial for reducing uncertainty for businesses.

Businesses also noted other possible regulatory and government changes that could reduce cost and uncertainty:

- clarity about waste levy rates for EfW — the commercial basis for EfW relative to landfill rests on landfill having a levy and EfW not having a levy. However, it is not clear that material directed to EfW will attract a zero levy. This would be required before any projects reach financial close
- revisions to air pollution requirements so that a facility can be above thresholds during non-normal operations
- lower air pollution requirements if facilities are to be in areas without human populations nearby and that would have minimal health impacts
- government taking a proactive role in contracting for EfW capacity. I.e. through aggregating residual waste volumes in councils.

A CIE waste transport cost model

Types of costs quantified

The model includes the costs set out in table A.1 and categorised as economic, social and environmental costs.

The study does not include costs associated with:

- the economic, social and environmental costs associated with the landfilling, recycling or other use of materials — these may differ for different landfills and waste operators
- the storage of waste at intermodal terminals before transport — there is insufficient information to quantify these costs
- litter — the type of waste transported is unlikely to end up as litter, as it is mainly construction and demolition waste
- any non-transport related costs from exhuming materials from landfills — that is, extracting landfill material and sending this to more distant locations to provide additional space in landfills.

A.1 Costs included in model

Cost category	Types of costs
Economic costs: resource costs associated with the transport cost	Cost to transport operators to move waste from either the origin or transfer station to distant landfills. This includes: ▪ Fuel costs ▪ Labour costs ▪ Maintenance costs ▪ Costs associated with use of capital These are the costs that will be covered by the commercial rates charged by transport operators. Note that we exclude any costs that are government charges, such as fuel excise, as these are not resource costs. Note that the movement of waste will also change where economic activity takes place in relation to landfilling and recycling. This is not a cost for the purposes of this exercise.
Environmental costs	**Impacts included as part of main estimates** ▪ Greenhous gas emissions ▪ Air pollution ▪ Noise pollution ▪ Water pollution **Other environmental costs quantified and included in high estimates** ▪ Nature and landscape - habitat loss, loss of natural vegetation or reduction in visual amenity as infrastructure is constructed

Cost category	Types of costs
	▪ Urban separation - time loss due to separation for pedestrians, lack of non-motorised transport provision and visual intrusion ▪ Upstream and downstream costs - the indirect costs of transport including energy generation, vehicle production and maintenance and infrastructure construction and maintenance
Social costs	▪ Accident costs ▪ Road maintenance ▪ Congestion
Costs to government	There may be infrastructure implications in some cases, such as from rail demand. This has not been included.

Source: The CIE.

Estimating economic costs

The economic costs associated with the long haul transport of waste are the resources used to undertake this task. This includes:

- labour used to load and unload vehicles, drive vehicles, maintain vehicles and manage the transportation task
- capital used, such as trucks, train wagons and locomotives — note that to the extent that this capital would have otherwise been left unused, the incremental resource costs only reflect the incremental depreciation of (or additional costs to maintain) the capital
- inputs such as fuel, tyres etc.

The estimates cover these costs in relation to transfer from transfer facilities, and then onward movement to receiving facilities. The component from a generator to a transfer point is not included.

The economic costs are closely aligned to the commercial costs of the transportation of waste. This is because commercial operators bear the costs identified above. The economic costs will not be exactly the same as the commercial costs because:

- a part of the commercial costs covers payment of fuel excises to Government. Fuel excise is not a resource cost, but is a transfer to government
- commercial costs will cover access fees, such as for the rail network. However, there may be only a very small or no additional costs to below rail infrastructure from additional transport.

The transportation of waste may also have other costs to government, such as for the maintenance of the road. These are included as social costs.

The approach used to estimate economic costs for road and rail are set out below.

Road

The resource costs associated with moving waste by road are set out in table A.1. This is based on an articulated six axle truck with a load of 23 tonnes. The urban cost is based on a speed of 40 km per hour and the rural cost on a speed of 90 km per hour.

A.1 Road resource costs

	Unit	Urban	Rural
Vehicle resource costs per vehicle km	Cents per vehicle km	201	236
Driver cost per vehicle hour	$ per vehicle hour	34	34
Total resource costs per tonne km	$ per tonne km	0.092	0.076

Note: For a six axle articulated truck. Urban is based on 40 km/hr and rural is based on 90 km/hr. Based on a load of 23 tonnes.

Source: TfNSW Economic Parameter Values 2022, https://www.transport.nsw.gov.au/projects/project-delivery-requirements/evaluation-and-assurance/technical-guidance, Table 13.

The estimates above are from TfNSW Guidelines, which for heavy vehicles are the same as the Australian Transport Assessment and Planning Guidelines.[45] These models are intended to include the capital costs associated with the use of the vehicle. This is appropriate for this task, as we expect that investments would be made in new fleet to undertake the waste transport task.

In comparison to commercial rates, the estimates above are lower. In quite dated work undertaken for the Australian Government, SKM reports freight rates for interstate freight of $10.50 per net tonne km for road in 2012 on average.[46] Rates for key routes relevant to waste transport are higher, with Sydney to Brisbane at ~14 cents per net tonne km. BTRE reported real rates in 2011/12 dollars for interstate road transport of 8 cents per net tonne km in 2016.[47] These rates would be higher than those estimated in our model once inflation is accounted for.

The higher commercial rates are to be expected.

- Commercial rates include fuel excise and vehicle registration charges, while the resource cost estimates do not — TfNSW estimates of financial costs are much higher than resource costs
- Commercial rates will have to cover margins, risks and periods where assets are not utilised as highly, such as empty return journeys.

We pick up some of these factors separately, such as return journeys. However, our estimates may still be somewhat conservative relative to commercial rates.

Rail

To estimate rail resource costs we use a number of approaches.

45 www.atap.gov.au

46 SKM 2013, Freight Rates Update 2012-13: Bass Strait Shipping and Tasmanian Freight Equalisation Scheme, Final report, prepared for BTRE, March.

47 https://www.bitre.gov.au/sites/default/files/is_090.pdf

- TfNSW Guidelines provide estimates of the resource costs associated with freight transport. We apply loadings and other factors relevant to the transportation of waste, plus adding costs for getting waste to and from rail.
- SKM 2013 quotes commercial rates of 8 cents per net tonne km for Sydney to Brisbane rail transport. This includes the rail and road transport to and from rail terminals.
- Public reports from two of the main rail operators, Pacific National and Aurizon, indicate freight rates between rail terminals for interstate freight of ~4.5 to 6 cents per net tonne km.

These alternative approaches are set out below.

TfNSW resource cost estimates

Transport for NSW reports on costs for aspects of freight rail as shown in table A.1. This covers rail track and locomotive maintenance, wagon maintenance, fuel consumption and crewing cost.

A.1 Rail cost estimates

	Low	Medium	High	Unit
Rail track maintenance	$1.28	$2.38	$3.57	$/000 GTK
Locomotive maintenance	$2.08	$2.08	$2.08	$/locomotive km
Wagon maintenance	$0.06	$0.07	$0.09	$/wagon km
Fuel consumption – loaded	5	5	8	Litres/locomotive km
Fuel consumption – unloaded	3	3	3	Litres/locomotive km
Crewing cost	$306.00	$354.00	$403.00	$/ train hour

Source: TfNSW Economic Parameter Values 2022, https://www.transport.nsw.gov.au/projects/project-delivery-requirements/evaluation-and-assurance/technical-guidance.

To put this into estimates of the cost per net tonne km, we add in information on wagon loads, train lengths (number of wagons) and train speeds. This gives estimates of the one way cost of ~3 cents per net tonne kilometre (table A.2).

A.2 Rail costs per net tonne kilometre

Cost per net tonne km	Low	Medium	High
	c/ntk	c/ntk	c/ntk
Rail track maintenance	0.22	0.41	0.61
Locomotive maintenance	0.30	0.30	0.30
Wagon maintenance	0.14	0.17	0.21
Fuel consumption - loaded	1.67	1.67	2.67
Crewing cost	0.42	0.49	0.56
Total	2.75	3.03	4.35

Note: This uses 46 tonnes per wagon (two containers), a speed of 35 km/hour and 3 locomotives and 45 wagons per train. The costs do not include the return journey, capital costs or terminal costs.

Source: The CIE.

The estimate of 3 cents per passenger kilometre does not include the cost of the return (potentially empty) journey or any costs related to capital for track, locomotives and wagons. It does not include any costs related to the operation of terminals and loading and unloading.

Rail transport operator's annual reports

Public, albeit dated, information exists for rail transport operators to estimate average revenues received from the transportation of goods interstate between intermodal terminals. These costs are 4.5 cents to 6.0 cents per net tonne kilometre. This revenue is required to cover capital costs (including rail access charges) and return journeys. Updated reporting from operators along these metrics is not available.

A.1 Costs reported by rail operators

	Unit transport cost	Intermodal revenue	Intermodal net tonne kms
	cents/ntk	$m	Million ntks
Pacific National Annual Report 2016	4.5	878.1	19,602.60
Aurizon Annual Report 2016	6.0	739.23	12,300

Note: Aurizon reports the unit transport cost directly. The figure for Pacific National is calculated by CIE.
Source: As noted in table.

Other reported freight rates and cross-checks

SKM 2013 quotes commercial rates of 8 cents per net tonne km for Sydney to Brisbane rail transport. This includes the rail and road transport to and from rail terminals and is required to cover capital costs and return journeys.[48]

BTRE 2016 reports rail costs of 4 cents per net tonne kilometre in 2011/12 dollars.[49] This is dominated by bulk haulage such as coal, which is substantially cheaper than would be expected for transport of waste.

The behaviour of waste operators also suggests that rail is unlikely to have as large a cost advantage over road as embodied in the TfNSW approach. Many waste operators have used road for long haul transportation.

Costs used

The range of costs for rail transport is relatively large. The resource cost estimate developed from TfNSW assumptions is substantially below commercial rates, and we expect is too low. We use these as the basis but make the following adjustments:

- apply a 50 per cent premium to account for capital costs, for capital that would otherwise not be required

48 SKM 2013, Freight Rates Update 2012-13: Bass Strait Shipping and Tasmanian Freight Equalisation Scheme, Final report, prepared for BTRE, March.

49 BTRE 2016, https://www.bitre.gov.au/sites/default/files/is_090.pdf.

- apply $10 per tonne for costs associated with the use of intermodal facilities, and
- allow for wagons to be returned empty.

Using these assumptions, the cost per net tonne kilometre excluding the road leg to and from the intermodal facilities, is closer to but still below the rates indicated by waste businesses.

Costs of municipal waste movement

MSW waste and other waste destinated for a EfW plant will likely be more costly to move than standard materials. This reflects different requirements for storage and handling.

To make some allowance for this we apply a 20 per cent premium to the cost on average of moving hazardous waste.

Estimating environmental costs

The environmental externalities from road and rail freight reflect:

- the amount of physical pollution — such as emissions of particulates and GHG emissions; and
- the impact of these pollutants on people, such as reflecting the density of population impacted by the physical pollution.

A summary of the quantifiable environmental externalities and whether they are included in estimates is set out in table A.1. We include in main estimates any environmental externality that is clearly related to the extra transport undertaken for waste. We include in high sensitivity estimates environmental externalities that relate to infrastructure, vehicle production and that are less well defined.

A.1 Environmental impacts of additional transport

Impact	Description	Included
Air pollution	Air pollution reflects the health impacts from additional rail and road vehicle kilometres. Air pollution costs are higher in urban areas, because of the greater population impacted.	In main estimates
GHG emissions	GHG emissions have global impacts in terms of costs arising from changing temperatures	In main estimates
Noise pollution	Noise pollution arises in the immediate vicinity of roads and rail lines. Its impacts are larger in urban areas than in rural areas.	In main estimates
Water pollution	Water pollution includes organic waste or persistent toxicants from run-off from roads and rail lines, generated from vehicle use. It includes engine oil leakage and disposal, road surface, particulate matter and other air pollutants from exhaust and tyre degradation for cars.	In main estimates

Impact	Description	Included
Nature and landscape	Nature & landscape impact is driven by the infrastructure 'footprint', e.g., habitat loss, loss of natural vegetation or reduction in visual amenity as infrastructure is constructed. Key impacts in rural areas are natural impacts, whilst key impacts in urban areas are mostly amenity / visual as the urban environment is already dominated by infrastructure.	In high sensitivity
Urban separation	Urban separation is an urban externality only. The unit cost is based on three elements: time loss due to separation for pedestrians, lack of non-motorised transport provision and visual intrusion.	In high sensitivity
Upstream and downstream impacts	Upstream and downstream costs refer to the indirect costs of transport including energy generation, vehicle production and maintenance and infrastructure construction and maintenance.	In high sensitivity

Source: TfNSW Economic Parameter Values 2022, https://www.transport.nsw.gov.au/projects/project-delivery-requirements/evaluation-and-assurance/technical-guidance.

Estimates of the costs of these environmental impacts are set out below (table A.2 for mid-point estimates). These break costs into:

- mode — rail and road
- rural and urban — environmental externalities are substantially higher in urban areas because a larger human population is impacted.

A.2 General environmental costs (medium)

	Urban Road	Urban Rail	Rural Road	Rural Rail
	$/000 tonne kms	$/000 tonne kms	$/000 tonne kms	$/000 tonne kms
Air pollution	29.45	4.78	0.29	0.00
GHG emissions	8.57	0.57	8.57	0.57
Noise pollution	4.91	2.03	0.50	0.00
Water pollution	4.41	0.14	1.77	0.14
Nature and landscape	0.48	1.16	4.92	1.16
Urban separation	3.28	1.16	0.00	0.00
Upstream and downstream costs	26.22	0.00	26.22	0.00

Source: TfNSW Economic Parameter Values 2022, https://www.transport.nsw.gov.au/projects/project-delivery-requirements/evaluation-and-assurance/technical-guidance.

For some types of environmental impacts, there is additional information beyond that contained in the TfNSW Guidelines.

The NSW Office of Environment and Heritage has previously compiled a detailed inventory of the physical air pollution within the greater Sydney metropolitan area from different sources, including rail freight.[50] The NSW EPA has also commissioned

50 NSW Environment Protection Authority 2008, *Air emissions inventory for the Greater Metropolitan Region in NSW: Off-road mobile emissions*, Technical Paper 6.

Environ to investigate options to reduce locomotive air and noise emissions.[51] Environ notes that

> Diesel-fuelled locomotives are an important contributor to anthropogenic fine particulate and oxides of nitrogen emissions (NO_x). The World Health Organisation (WHO) has classified diesel engine exhaust as being carcinogenic to humans. It found that exposure to diesel exhaust is a cause of lung cancer and increases the risk of bladder cancer. In Australia, there are no air emission limits for new or remanufactured locomotives.[52]

This study found that the overall health costs associated with locomotive emissions from diesel fuel were $66 million per year. This included costs related to particulates less than 10 micrometres (PM10) and Oxides of Nitrogen (NOx) only.

While it is difficult to compare across studies, the air pollution costs per tonne kilometre from Environ 2013 for urban areas appear to be smaller than those in the TfNSW Guidelines. We use the TfNSW Guideline figures as these have been developed for the purposes of economic analysis in NSW and cover a wider range of air emissions.

The transport of waste may have greater environmental impacts than the transport of general freight. Issues could include:

- greater dust issues from transport of construction waste and the potential for asbestos escaping during transportation. NSW EPA have sampled some containers containing asbestos with only tarpaulin coverings. Note that it is not possible to place a cost on this, as the extent to which asbestos may escape and cause asbestos-related disease cannot be easily estimated
- leaking of waste during transport or in rail yards, particularly from water entering unsealed containers and leaching out of containers
- biosecurity concerns around the transportation of waste, including:
  - the spread of fire ants in NSW. There is a fire ant exclusion zone in Port Botany and the EPA indicates that relevant interstate recipient waste facilities are in the Queensland fire ant exclusion zone. The Queensland Government has estimated that fire ants would impose costs of $43 billion in South East Queensland alone over a 30 year period.[53] Federal and State Governments have collectively spent $300 million in fire ant eradication, from the first known incursion of red fire ants into Australia in 2001.[54] Overseas evidence also suggests that the potential impacts are substantial.[55] The extent to which freight related to waste poses a higher risk than other freight has not been investigated by the CIE

51 Environ 2013, *Scoping Study of Potential Measures to Reduce Emissions from New and In-Service Locomotives in NSW and Australia*, prepared for NSW Environment Protection Authority.

52 Environ 2013, *Scoping Study of Potential Measures to Reduce Emissions from New and In-Service Locomotives in NSW and Australia*, prepared for NSW Environment Protection Authority, p. vii.

53 Invasive Species Council 2015, *Red imported fire ants,* Fact sheet, January.

54 Invasive Species Council 2015, *Red imported fire ants,* Fact sheet, January.

55 EPA website, http://www.environment.nsw.gov.au/pestsweeds/FireAntsSpread.htm.

- the spread of phylloxera (a type of insect) which can severely damage wine growing areas. Most areas of Sydney are infected. Regional areas to the north of Sydney are not currently infected.[56]

Estimating social costs

We estimate three forms of social cost, which apply only to road transport:

- costs from accidents
- costs from congestion imposed on other road users
- costs from wear and tear on the road.

Accidents

Additional road transportation is expected to lead to additional accident costs imposed. Accident costs are borne by both the heavy vehicle and its occupant and other vehicles involved in an accident. Note that we estimate accident costs for the additional road freight only, as the accident costs related to rail freight would be negligible.

The amount of accident costs reflects:

- the number and severity of the additional accidents related to the long haul transport of waste, and
- the costs associated with these accidents.

For our analysis, road fatalities and fatal crashes were identified through the Australian Road Deaths Database[57]. The database provides an ongoing account of all road crash fatalities in Australia as reported by the police to each State and Territory road safety authority. Details for crashes indicated the number of fatalities, whether an articulated truck, heavy truck or bus was involved in the crash as well as the region of the crash. We combine these datapoints to determine for each region the number of crashes involving trucks.

To estimate the number of kilometres travelled per year per mode of transport, we refer to the ABS survey of Motor Vehicle Use[58].

The cost of fatalities and other crashes is taken from TfNSW Economic parameters.[59] We only include fatal crashes and crashes involving hospitalisations.

The overall crash costs per vehicle kilometre are shown in table A.1. This would mean a 1000 km trip would have a crash cost externality of ~$7 per tonne from crashes.

---

56 NSW Government Gazette, No. 189, 22nd December 2006.

57 https://www.bitre.gov.au/statistics/safety/fatal_road_crash_database.

58 https://www.abs.gov.au/statistics/industry/tourism-and-transport/survey-motor-vehicle-use-australia.

59 TfNSW Economic Parameter Values 2022, https://www.transport.nsw.gov.au/projects/project-delivery-requirements/evaluation-and-assurance/technical-guidance.

A.1 Crash costs for heavy vehicles

Item	Low
Fatalities per billion vehicle kms	10.6
Cost of fatality ($m/fatality)	8 135 590
Hospitalisations per billion vehicle kms	263.9
Cost of hospitalisation ($m/hospitalisation)	521 877
Cost per 1000 tonne kms	9.7

Note: We assume each truck carries 23 tonnes on average.
Source: The CIE; as noted in text.

Note that we do not differentiate the safety impacts by urban and rural areas. The rates outside of capital cities are lower, although very close to the average rates because most vehicle kms are outside of capital cities.

Additional road congestion

Where heavy vehicle movements happen during periods when there are other road users and roads are busy, then this can lead to congestion impacts on other road users. These congestion costs include additional time (delays) and higher vehicle operating costs. These are only relevant for urban areas, as rural areas are not in general subject to congestion.

To estimate congestion costs, we start with TfNSW estimates of an average congestion cost per vehicle km of 235 cents for articulated trucks.[60]

- The TfNSW estimate is based on scaling up the congestion cost for a passenger car. We expect that the transport of waste will be less distributed to peak periods than light vehicle movements.
- The TfNSW estimate is for Sydney as a whole. We expect that the urban areas for heavy vehicle traffic will tend to have less congestion than Sydney, noting that this includes urban areas of towns that are not bypassed, such as Blue Mountains.

Given the above, we have halved and then halved again the TfNSW congestion cost figure to give an estimate of 59 cents per vehicle km. With an average assumed waste load of 23 tonnes, this gives a cost of 2.6 cents per urban tonne km.

To give an example, a 1000 km journey, in which 10 per cent was in urban areas, would have a congestion cost of $2.6 per tonne.

Road wear and tear

Heavy vehicles impose road wear and tear. The heavy vehicle charging arrangements are designed to cover these costs, such as charges per litre of fuel. We do not include the fuel excise costs and instead include these costs as a social cost.

60 TfNSW Economic Parameter Values 2022, https://www.transport.nsw.gov.au/projects/project-delivery-requirements/evaluation-and-assurance/technical-guidance.

The cost is based on TfNSW Principles and Guidelines, which estimates a cost of 20 cents per vehicle km for a six axle articulated truck.[61] This amounts to slightly less than 1 cent per tonne km.

This may overstate marginal costs, as it is based on the NTC's method of allocating out road maintenance costs, some of which may not be incremental to the amount of heavy vehicles. Hence we use this as the high estimate. The alternative method is the ARRB lifecycle costing method. This estimates a marginal cost for rural arterial roads of 0.8 cents per standard axle repetition[62] km, which gives a lower marginal cost than the NTC method. The cost for freeways would be below that for arterials. Given this, we take a lower bound as zero and an upper bound from the TfNSW Guidelines, with the mid-point as the average of the two.

Cost of return journeys

Where a vehicle returns empty many of the economic, social and environmental costs continue to be incurred. We have allowed for 90 per cent of the costs to be incurred.

Businesses interviewed with regards to EfW indicated that they expected containers would largely return empty.

61 TfNSW Economic Parameter Values 2022, https://www.transport.nsw.gov.au/projects/project-delivery-requirements/evaluation-and-assurance/technical-guidance.

62 Martin, T., Thoresen, T., Clarke, M. and Hore-Lacey, W. 2010, 'Estimating the marginal cost of road wear on Australia's sealed road network', HVTT11: International Heavy Vehicle Symposium, 2010, Melbourne, Victoria, Australia, Victorian Transport Association, Melbourne, Vic, 12pp.

THE CENTRE FOR INTERNATIONAL ECONOMICS
www.TheCIE.com.au