Calculation method for waste generation, recycling and diversion

Supporting document for the *NSW Waste Avoidance and Resource Recovery Strategy Progress Report 2017-18*

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1. Introduction

This document outlines the method used to calculate the waste generation, recycling, diversion and disposal dataset ('the dataset') for the financial years 2015-16, 2016-17 and 2017-18. The dataset was used for progress reporting against targets for Key Result Areas 1, 2 and 3 in the Waste Avoidance and Resource Recovery Strategy 2014-21 ('the WARR Strategy').

This document should be read in conjunction with the *Data quality statement*, available on the NSW Environment Protection Authority's (EPA's) website.

1.1. Scope of dataset

Waste generation was defined by the WARR Strategy as "the total amount of material that enters the solid waste management system". For the dataset, the 'solid waste management system' was defined as NSW facilities which dispose, store, process and recover solid waste. These facilities primarily encompassed sites which were licensed under the *Protection of the Environment Operations* (POEO) *Act 1997* for a scheduled waste activity (referred to as 'scheduled waste facilities'). The scheduled waste activities (as outlined in Schedule 1 of the POEO Act) were as follows:

- composting
- energy recovery from general waste
- metallurgical activities
  - aluminium production (scrap metal)
  - iron or steel production (scrap metal)
  - non-ferrous metal production (scrap metal)
  - scrap metal processing
- resource recovery
  - recovery of general waste
  - recovery of waste tyres
- waste disposal (application to land)
- waste disposal (thermal treatment)
  - thermal treatment of general waste
- waste processing (non-thermal treatment)
  - non-thermal treatment of general waste
  - non-thermal treatment of waste tyres
- waste storage.

The dataset also included data from unlicensed waste facilities, where good quality data was available.

If waste was generated then recycled or disposed on-site or underwent direct re-use (without entering a waste facility), this waste was not captured in the dataset. Litter and illegal dumping were not directly included in the dataset, but would be captured if the waste was cleaned up and disposed of legally in a NSW landfill.

Waste types

Only solid, non-hazardous waste types were captured in the recycling and diversion dataset. However, all waste types were captured within the disposal dataset.

Waste type categories used for the recycling dataset and their associated waste types are outlined in Table 1.

Table 1 Waste type categories, with associated waste types and waste type descriptions

Waste type category	Waste types	Waste type description
Glass	Glass	Glass such as windows, bottles, plate glass, glass fines. Exclusions: perspex, fluorescent tubes and light bulbs
Masonry materials[1]	Aggregate, road base or ballast	Rock and/gravel material such as asphalt, road base, railway ballast or processed sandstone. Exclusions: crushed concrete
	Bricks or concrete	Bricks, mortar or concrete including bricks with mortar and concrete containing steel reinforcing. Exclusions: fibre cement
	Ceramics, tiles, pottery	Terracotta roof tiles, pottery, porcelain products. Exclusions: bricks and concrete
	Plasterboard	Gypsum based construction sheeting. Exclusions: fibre cement, medium-density fibreboard (MDF), masonite, villa board, chipboard and asbestos
	Soil (not contaminated or VENM)	Clay, sand or topsoil. Exclusions: contaminated soil, and VENM
	Virgin excavated natural material (VENM)	Virgin excavated natural material that is not mixed with any other waste (clay, gravel, sand, soil and rock) and that (a) has been excavated from areas that are not contaminated, as the result of industrial, commercial, mining or agricultural activities, with manufactured chemicals and does not contain sulphidic ores or soils, or (b) consists of excavated natural materials that meet such criteria as may be approved by the EPA.
Metals	Aluminium (non-ferrous)	Aluminium frames, aluminium cans.
	Ferrous (iron or steel)	Steel cans, scrap steel, car bodies, steel reinforcing. Exclusions: gas bottles
	Non-ferrous (metals, not iron, steel or aluminium)	Lead, copper, brass. Exclusions: aluminium and steel
Paper/cardboard	Paper or cardboard	Paper and cardboard.
Plastics	Plastic	Perspex, PVC piping, artificial grass, polystyrene, plastic weed mat, pool liners, polypropylene, extruded plastic, plastic crates.
Organics	Biosolids or manures	Biosolids - the organic product that results from sewage treatment processes (sometimes referred to as sewage sludge). Manure - any mixture of manure and biodegradable animal bedding (such as straw).
	Composts or mulches	Organic material that has been composted, chipped or shredded.
	Food or kitchen	Food waste from manufacture, preparation, sale or consumption of food. Exclusions: agricultural waste

[1] Masonry materials received at major composting facilities (for mixing with organics to create a soil product) were included in masonry materials recycled (note – this material was excluded from the organics dataset).

Waste type category	Waste types	Waste type description
	Vegetation or garden	Soft vegetation/garden waste such as grass clippings, small prunings, seaweed, leaves, non-woody weeds, non-woody agricultural waste. Exclusions: food, compost, mulches, wood, sawdust, timber, trees and tree stumps
	Wood, trees or timber	Trees or tree stumps, raw, treated or painted timber, sawdust, wooden crates, wooden packaging, wooden pallets, wood shavings, MDF, chipboard, particle board and Masonite. Exclusions: plastic-coated timbers
Other recyclables	Ashes	Ash from any incinerator or fly ash or bottom ash
	Batteries	Batteries separated from electronic devices and vehicle batteries.
	Commingled recyclables[2]	Recyclable wastes such as plastic, glass and paper, that have been collected for recycling.
	E-waste	Electrical goods such as televisions, computers, toasters, radios, iPods, Gameboys, stereos, speakers, VCRs, DVD players, power tools, etc.
	Mattresses	Mattresses
	Mixed waste	Mixed waste is any waste that contains more than one of the waste types. Composite products such as light bulbs, plastic coated timber, mixed waste from commercial or industrial activities. Exclusions: commingled recyclables
	Problem waste	Paint (dry or wet), chemicals, fluorescent tubes, compact fluorescent lamps (CFLs), household chemicals, gas bottles, oil filters.
	Residues or rejects	Residues from industrial or manufacturing processes such as wool wash, drilling mud, pond waste, slag, filter cake, fibre cement, cell scale. Exclusions: fly ash or bottom ash
	Textiles, rags	Synthetic or natural woven material such as rags, fibreglass insulation, carpet, underlay.
	Tyres	Whole, shredded or dewalled tyres.

1.2. Data sources

The EPA's Waste and Resource Recovery Portal (WARRP) was the primary data source for the dataset. Scheduled waste facilities were required to lodge a Waste Contribution Monthly Report (WCMR) or an Annual Waste Report (AWR) within the WARRP under the *Protection of the Environment Operations (Waste)* Regulation *2014* ('Waste Regulation').

Facilities required to provide WCMRs were landfills and resource recovery facilities in the regulated area or facilities receiving waste from the regulated area.[3] Examples of monthly-reporting resource recovery facilities included transfer stations, construction and demolition waste reprocessors, material recovery facilities (MRFs), council recovery facilities and Alternative Waste Treatment (AWT) facilities.

[2] Note – the majority of commingled recyclables was captured in the dataset by the separated components (e.g. glass, plastics, paper and cardboard), however commingled recyclables sent directly interstate for recycling (without being separated), or to an unspecified location intrastate for recycling, were captured within 'other recyclables'.

[3] The 'regulated area' refers to the regions which are subject to the waste levy and comprises the Sydney metropolitan area, the Illawarra and Hunter regions, the central and north coast local government areas (LGAs) to the Queensland border as well as the Blue Mountains and Wollondilly LGAs. Facilities meeting these criteria, but subject to an exemption under Division 5 of the Waste Regulation, were required to provide an AWR rather than a WCMR.

Facilities required to provide AWRs were licensed and unlicensed landfills that were located outside the regulated area and resource recovery facilities which were in the regulated area, or were receiving waste from the regulated area, but were levy-exempted. Examples of annual-reporting resource recovery facilities included composters, paper mills and scrap metal processors.

All facilities were required to report on the waste received and transported from site. The information facilities reported through the WARRP is outlined below.

1. Waste Received - tonnes of waste received at the facility in the reporting period, by:
    a. levy area where the waste was generated[4]
    b. waste type (e.g. aluminium, plasterboard, vegetation or garden, mixed waste)
    c. waste stream[5]
    d. source of the waste (WCMRs only), from either:
        i. a specified NSW licensed waste facility
        ii. a general source (e.g. commercial collection, domestic kerbside collection, general public).
2. Waste Transported - tonnes of waste transported from the facility in the reporting period, by:
    a. levy area where the waste was generated (monthly-reporting landfills only)
    b. waste type
    c. waste stream
    d. destination, for either:
        i. disposal at a licensed waste facility, to a specified facility intrastate (WCMRs only) or an unspecified facility interstate
        ii. lawful recovery at an unspecified location intrastate, interstate or overseas
        iii. lawful recovery at a specified NSW licensed waste facility (WCMRs only)
        iv. lawful recovery of the waste under a Resource Recovery Order.

Where WARRP data was not available, data sources used to supplement the WARRP data included:

- Australian Bureau of Statistics' (ABS) export data
- recycling data requested from scheduled waste facilities that were not reporting in the WARRP
- estimates of recycling by other scheduled waste facilities that were not reporting in the WARRP, using other information sources available (see Table 2)
- consultant reports on plastics recycling, commissioned by the EPA.

[4] Metropolitan Levy Area (MLA), Regional Levy Area (RLA) or Non-levied Area (NLA)

[5] Municipal solid waste (MSW), Commercial and Industrial (C&I) waste, Construction and Demolition (C&D) waste and Unknown

2. Method of calculation

2.1. General principles

1. Waste streams

   Facilities were required to report on waste streams for Waste Received and Waste Transported. Waste streams could be reported as MSW, C&I, C&D or Unknown. This step in the method identified any significant issues in the reported streams for Waste Received and Waste Transported and adjusted the raw dataset where necessary, as outlined below.

   a. If a facility reported a proportion of its Waste Received as Unknown, the waste was allocated to the other three waste streams. This allocation was based on the proportion of the other three waste streams for Waste Received at that facility. However, if a significant quantity was reported as Unknown, the waste was allocated to the other three streams based on further investigation.
   b. Under some circumstances, a facility's reported waste streams for Waste Received from another waste facility were reallocated. The reallocation was undertaken when significant discrepancies were identified between the Waste Received streams of the origin facility and the Waste Transported streams of the destination facility. The reallocation was based on the waste type, the facility type and the origin facility's data.
   c. The reported waste streams for Waste Transported were modified when it was identified through facility interviews that the data was incorrect, or when the waste stream was reported as Unknown.
   d. When the Waste Transported stream was reported as Unknown, the waste was allocated to the other three streams. The allocation was based on the waste streams received at the facility across the relevant financial year.

2. Levy areas

   Facilities were required to report levy areas for Waste Received, however only monthly-reporting landfills were required to report levy areas for Waste Transported. Waste Transported levy areas for all other facilities were based on the levy areas of Waste Received at that facility.

   Waste originating from an interstate or overseas source was included in the dataset.[6]

2.2. Waste Recycled

Waste Recycled was calculated for each waste type category, then aggregated. Waste Recycled was the sum (in tonnes) of:

- Waste Transported from site for lawful recovery, plus
- an estimate of mass loss for organics which were processed and then transported from site for lawful recovery.

Where it was reported (or later identified) that waste was transported to another WARRP-reporting facility for further processing, this waste was removed from the dataset to avoid double-counting.

Where waste was reprocessed at a NSW facility, waste transported for disposal from that facility was excluded from the Waste Recycled calculation. However, waste transported interstate and overseas for recovery was assumed to be fully recovered due to the inability to confirm the fate of the waste.

[6] Facilities were not able to report interstate or overseas as a source, hence the actual quantity of waste originating from outside NSW was not quantifiable in either Waste Recycled or Waste Disposed. Better data capture on interstate and overseas sources may lead to exclusion of this data from future datasets.

The mass loss adjustment was included to account for mass loss during processing of organics. It was calculated as follows:

- For major composters and AWT facilities, mass loss was calculated as the balance of Waste Received minus Waste Transported over the reporting period.
- For all other facilities transporting organics, mass loss was calculated as 36% of the organics transported (36% was the average mass loss for the major composters).

As WARRP did not have full coverage of all resource recovery facilities, secondary data was used to supplement the data. The secondary data sources used for each waste type category are outlined in Table 2. The overall effect of the secondary data sources is quantified in the Data Quality Statement.

Table 2 Secondary data sources used to supplement data, by waste type category

Waste type category	Description of supplementary data
Glass	• 2017-18 data, and data collected under the registration process for the Container Deposit Scheme, were used for the 2015-16 and 2016-17 datasets for facilities which processed glass but did not report in the WARRP until 2017-18. • An additional facility was identified for the 2017-18 reporting period. Glass recycled at this facility was estimated using Environment Protection Licence data. • Glass sent directly interstate for recycling from a Container Deposit Scheme collection point was also included in the 2017-18 dataset.
Metals	• Several key facilities which processed scrap metal were not reporting in the WARRP. Comprehensive data requested from these facilities was used to supplement WARRP metals recycling data for 2016-17 and 2017-18, and the 2016-17 data was used for the 2015-16 dataset. • The difference between the WARRP data for metals exported overseas for recycling and ABS data on scrap metal exports was included, as it was identified that a significant quantity of metals exported were not processed through the facilities reporting in the WARRP.
Masonry materials	• Several waste facilities licensed to process masonry materials were identified as operating in 2015-16, 2016-17 and 2017-18 but not reporting in the WARRP. Masonry materials recycled at these facilities was estimated at 60% of each facility's licensed maximum throughput tonnage.
Organics	• Organics recycled by scheduled waste facilities not reporting in the WARRP was estimated by assuming that the facilities were processing 70% of their maximum licensed throughput tonnage. The 70% assumption was based on a comparison between the tonnes of organics received at major composters (who report in the WARRP) and the maximum licensed throughput of these facilities. For facilities that were licensed to receive only specified commercial-type wastes, it was assumed that the waste stream was entirely C&I. When 'food or garden' or 'garden' waste was also specified on the licence, it was assumed that the waste stream was evenly split between MSW and C&I.
Paper and cardboard	• 2016-17 data was used in the 2015-16 dataset for facilities which did not report in the WARRP for the 2015-16 period.
Plastics	• Due to limited available plastics data in the WARRP, a consultant was engaged to determine plastics recycling for each of the reporting periods. The consultant surveyed plastic recyclers and used import and export data to determine total plastics recycling.
Other recyclables	• No additional sources of information were identified. Investigation into this area will be improved in future datasets.

Waste stream and levy area were determined for each waste type category according to the general principles outlined earlier in this Section. Deviations from these general principles are outlined in Table 3.

Table 3 Specific assumptions for waste stream and levy area, by waste type category

Waste type category	Waste stream	Levy area
Metals	As the key scrap metal facilities were generally unable to identify the streams of their waste, the following waste stream allocation was used: • MSW – 20% • C&I – 40% • C&D – 40%. Future work will be undertaken to improve waste stream reporting for metals.	The WARRP did not have full coverage of scrap metal processing facilities and hence did not accurately capture levy area for metals recycled. To determine metals recycled by levy area, the total metals recycled was allocated to the levy areas using the population of each levy area.
Plastics	Due to limited available plastics data in the WARRP, a consultant was engaged to determine total plastics recycling, including recycling by waste stream.	To determine plastics recycled by levy area, the total plastics recycled was allocated to the levy areas using the population of each levy area.

2.3. Waste Disposed

Waste Disposed was calculated as the sum (in tonnes) of:

1. Waste Received minus Waste Transported, for annual-reporting landfills, plus;
2. Waste Received minus Waste Transported minus Waste Deducted for an approved Operational Purpose[7], for monthly-reporting landfills, plus;
3. Waste Transported interstate for disposal, from all monthly-reporting facilities[8], plus;
4. A small quantity of waste reported as transported from site for lawful recovery but was allocated to Waste Disposed due to the waste type (pharmacy or clinical, contaminated soil and asbestos).

2.4. Waste Diverted

Waste Diverted was calculated as the sum (in tonnes) of:

1. Waste Recycled, plus;
2. The tonnes recovered through thermal treatment at NSW scheduled waste facilities which were licensed to recover energy from waste.

For the reporting periods, there were no significant energy from waste activities being carried out by the facilities reporting in the WARRP, and no suitable secondary sources were identified for inclusion in the diversion figures.

Tonnes of refuse-derived fuel manufactured in NSW and transported interstate or overseas for energy recovery was reported as Waste Recycled due to the lack of visibility over this process in the WARRP dataset.

[7] Operational Purposes are approved under clause 15 of the Waste Regulation and include works such as roads, landfill lining systems, stormwater management systems and final landfill capping works.

[8] Annual-reporting facilities do not have the option of selecting ‘interstate’ as a destination for waste transported for disposal. It was assumed that this quantity would be minimal and therefore not have a significant effect on the data; facilities near the Victorian border face a levy if they transported waste to Victoria, and facilities near the Queensland border are monthly-reporting facilities.

2.5. Waste Generated

Waste Generated was calculated as the sum (in tonnes) of Waste Diverted plus Waste Disposed.

Waste Generated per capita was calculated using Waste Generated divided by population.

Population was estimated using the latest available version (post the reporting period) of the ABS Dataset 3218.0 (Regional Population Growth). The ABS data was then forecasted to the relevant reporting period using the growth factor identified in the NSW Department of Planning & Environment 2016 NSW population projections data (main series).[9]

The population data used is outlined in Table 4.

Table 4 Population data used to calculate per capita rates

Reporting period	MLA	RLA	NLA
2015-16	5,892,188	803,953	1,029,714
2016-17	5,988,442	812,112	1,036,093
2017-18	6,121,126	813,600	1,034,039

2.6. Recycling and Diversion Rates

The Recycling Rates were calculated using Waste Recycled divided by Waste Generated.

The Diversion Rate was calculated using Waste Diverted divided by Waste Generated.

[9] http://www.planning.nsw.gov.au/research-and-demography/demography/population-projections