Handout

WRITTEN BY Jimeyong Park

Community Construction and Demolition Waste Management in S.E Queensland

INTRODUCTION

This handout presents overview of "Construction and Demolition Waste Management Guideline with Community Recycling in South East Queensland". The aim of this paper is to investigate the potentials of C&D wastes at the end of life from the Life Cycle Assessment (LCA), and to verify ways to divert these materials from landfill to a circular economy.

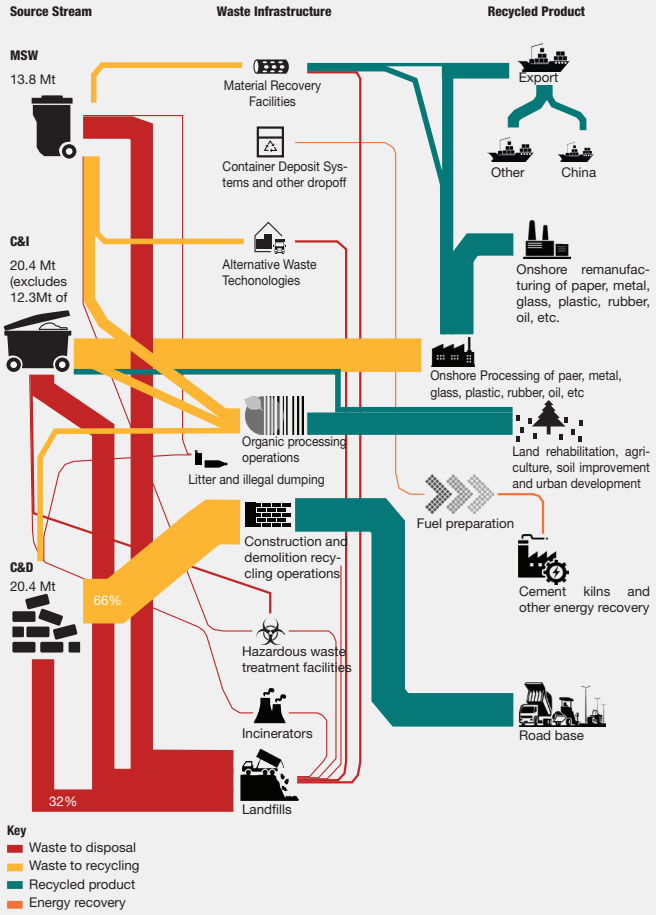
To begin with, it analyses Australia's waste streams to identify the causes of transport interstate and overseas. Second, analysis of the flow of C&D waste generated within Queensland and current recycling facilities demonstrates their capacity. In addition, the recyclable waste going to the landfill is quantified and converted into carbon emission unit to evaluate its environmental impact. The third part presents different cases of C&D waste treatment and management with the method of recycling and reuse, and suggests applicable technology and business models. Finally, the fourth part illustrates a guideline with 4 principles to improve the recyclability in community. Strategies that can be applied from the perspectives of all enablers such as, architects, recycling centres, governments, transport business company, and individual stakeholders are described.

BACKGROUND

Queensland has been the third-largest population growth in all Australian states in the past decade. While the population grew by 1.6% and the economy grew by 3.7%, headline waste generated an additional 1.1 million tonnes (11%) during the same period. The headline waste refers to the sum of MSW (Municipal Solid Waste), C&I (Commercial and Industrial), and C&D (Construction and Demolition). The overall recovery rate increased only 0.9% from 44.5% in 2016-17 to 45.4% in 2017-18, but 4,945,000 tonnes (13% increase over the previous year) of headline wastes diverted from the waste stream. When broken down, 32.4% of MSW, 47.3% of C&I, and 50.9% of C&D recovered from the waste stream. 60% of headline waste was treated and landfilled in private sector waste facilities (landfills, monofills and incinerators), a 3% increase over the previous year. And 95% of C&D waste was disposed of at the aforementioned facilities. In the case of green star certified buildings, masonry waste is often converted to a renewable state at a fairly high rate and reused. However, as materials are mixed during construction and demolition work, they are often mixed and arduous to classify, process and recyle. And public awareness that landfill C&D waste is not a big problem also makes recycling of resources difficult.

Waste generation in Australia

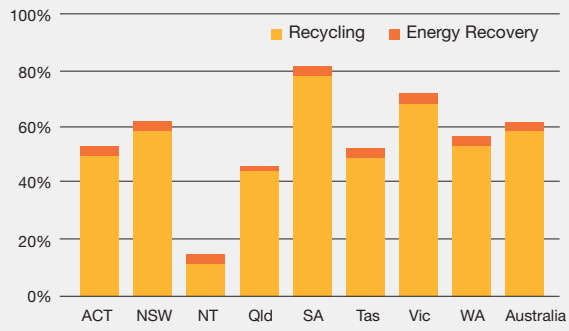
In 2016-17, Australia generated 67 Mt(million tonnes) of waste, including 17.1 Mt of masonry material, 14.2 Mt of organics, 12.3 Mt of ash, 6.3 Mt of hazardous waste, 5.6 Mt of paper and cardboard, and 5.5 Mt of metals. This is equivalent to the amount of waste generated by 2.7 tonnes per person.



Resource recovery and recycling rates by jurisdiction

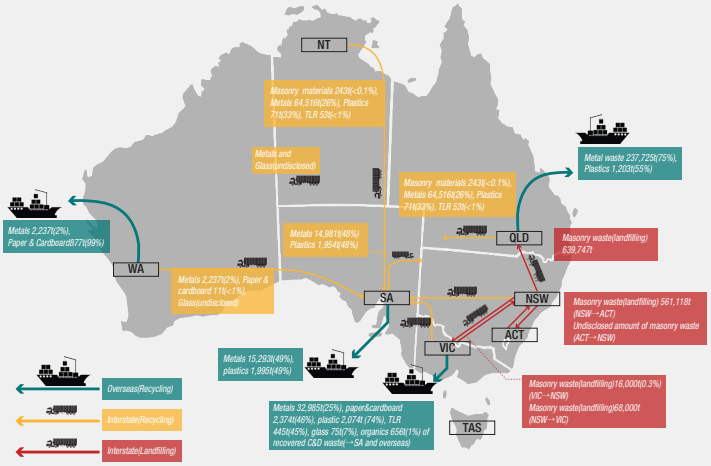
SA(82%) had the highest resource recovery and recycling rates, followed by Vic, NSW, WA, ACT, Tas, Qld and NT. Resource recovery rates across Australia are 62% and recycling rates are 58%.(2016-17)

	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	Australia
Resource recovery rate	53%	62%	15%	47%	82%	53%	72%	57%	62%
Recycling rate	49%	59%	11%	44%	78%	49%	68%	53%	58%



An Inflection point in global waste streams

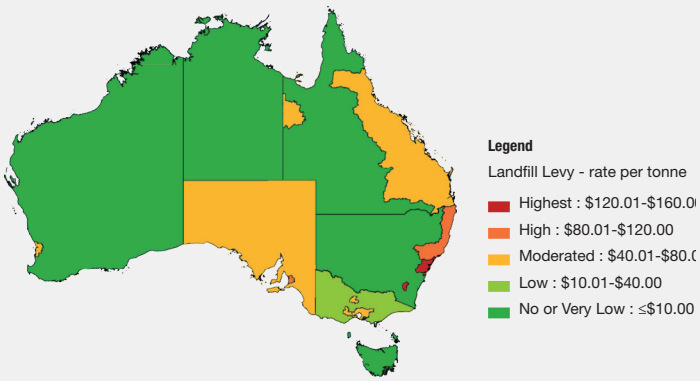
China's "National Sword" policy, enacted in January 2018, has slowed the flow of waste to countries where the world had relied on recyclable waste disposal for over 25 years. As a result, plastic waste imports to China have declined by 99%, and the UK had to burn more than 500,000 tonnes of plastics and household wastes.



Landfill Levies by Regions

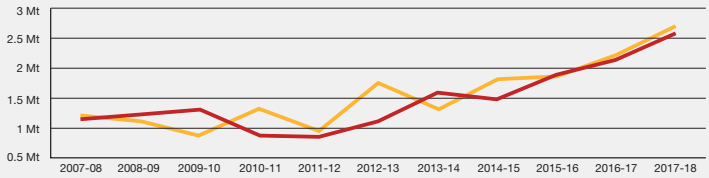
The main cause to landfill in Queensland from other states was the low disposal cost(less than $80 per tonne). Almost all of the waste transported to Queensland comes from New South Wales. This is because the cost of landfilling to Queensland is lower than the cost of disposing of waste in the area where the waste was generated.

Fortunately, the Levy zone policy commenced from June 2019 is expected to reduce this tendency. The introduction of Levy charges has been reducing the amount of waste landfilled since 2019. The effectiveness of SA's Levy levy policy is seen in increased resource recovery rates. It was skyrocketed from about 2 million tons in 2004 (60% of recovery) to 4 million tons in 2016 (81.5% of recovery).



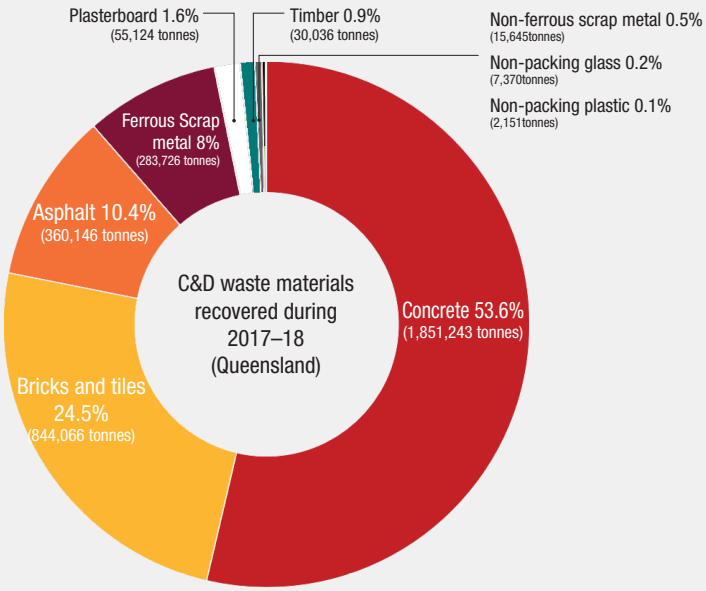
Construction and demolition waste in Queensland

The trend in C&D waste of Queensland shows a continued growth in 2017–18. The 2,592,000 tonnes landfilled was a 446,000 tonnes(24%) increase from previous year. A main factor was a 394,000 tonne increase in the amount of C&D waste transported from other state, which increased from 640,000 tonnes in 2016–17 to 1,034,000 tonnes in 2017–18. In 2017-18, the recovery rate of C&D waste is 21%. This is an increase of 477,000 tonnes compared to 2016-17, reaching 2,690,000 tonnes.12 This includes an increase of 375,000 tonnes of recovered concrete and 42,000 tonnes of recovered bricks and tiles.



C&D waste materials recovered during 2017-18

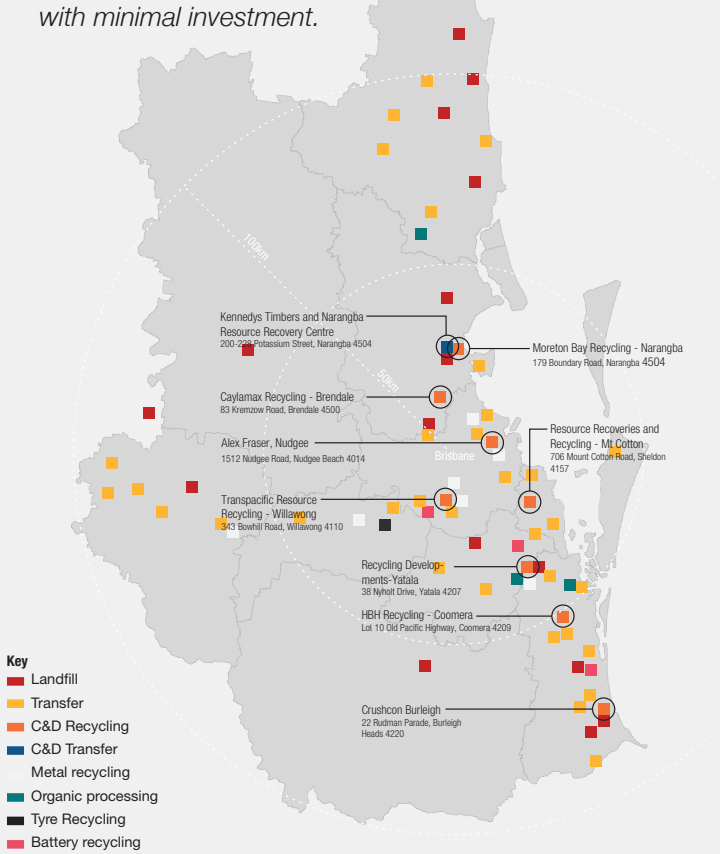
In Queensland, about 2.7 million tonnes (50.9%) of the 5.3 million tonnes of C&D waste were recovered. This is a slight increase from 50.8% reported in 2016-17. In 2017-18, the total volume of the C&D waste increased by 900,000 compared to 2016-17.However, 430,000 tonnes were transported from other states, such as NSW, representing about 8.1% of the total 5.3million. Therefore, the recovery rate for waste produced in Queensland itself may be higher, excluding the amount from outside. Conversely, except for recycled materials shipped overseas, the rate of recovery from purely Queensland itself can also be reduced.



Public waste and recycling facilities (SEQ Region)

Currently, there are 388 public waste and recycling facilities in Queensland. It is classified into landfills, transfer stations, metal recyclers, construction and demolition recyclers, organic processors, battery recyclers, tyre recyclers, and paint recyclers according to each function or waste type. The figure below shows the location of each facility in the SEQ region and the distance from Brisbane, Queensland's capital city, in the range of 50 km and 100 km.

Table below summarizes the main treatment capabilities of the C&D waste facility and information on the wastes being handled. Inert materials (concrete, brick and soils) and scrap metals can be classified to some extent as basic screening and grinding equipment in the field. These primary sorted chunks are then sent back to recycling centres and related companies for secondary processing. According to the Arcadis report, C&D recyclers in the SEQ region now have spare capacity and ability to increase throughput with minimal investment.



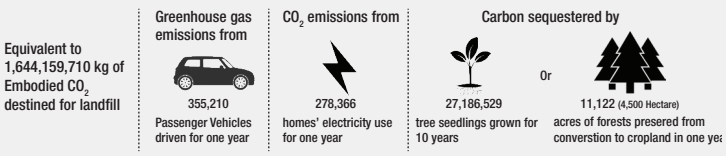
No.	Recycling Centre location	Distance from CBD	Pick up	Drop off	Major Material
1	Kennedys Timbers and Narangba Resource Recovery Centre	38.7km	undisclosed	undisclosed	Timber
2	Moreton Bay Recycling - Narangba	37.7km	undisclosed	undisclosed	Recycled Aggregate
3	Caylamax Recycling – Brendale	23.6km	O	O	Ferrous and non-ferrous metals
4	Alex Fraser, Nudgee	21.7km	O	O	Asphalt & Bitumen
5	Resource Recoveries and Recycling - Mt Cotton	34.7km	X	O	All
6	Transpacific Resource Recycling - Willawong	25.9km	X	O	All
7	Recycling Developments - Yatala	37.3km	undisclosed	undisclosed	Recycled Concrete
8	HBH Recycling - Coomera	50.0km	X	O	Crushed Rock& Concrete Products
9	Crushcon Burleigh	87.2km	X	O	Fines/20mm/20-40mm/40-70mm/road base (Recycled concrete aggregate)

Greenhouse Gas Equivalencies Calculator

The table demostrates estimated GHG emissions (kgCO2 /kg), Embodied energy (MJ/kg), and Embodied Carbon (kg) of chosen resources which represent each category.

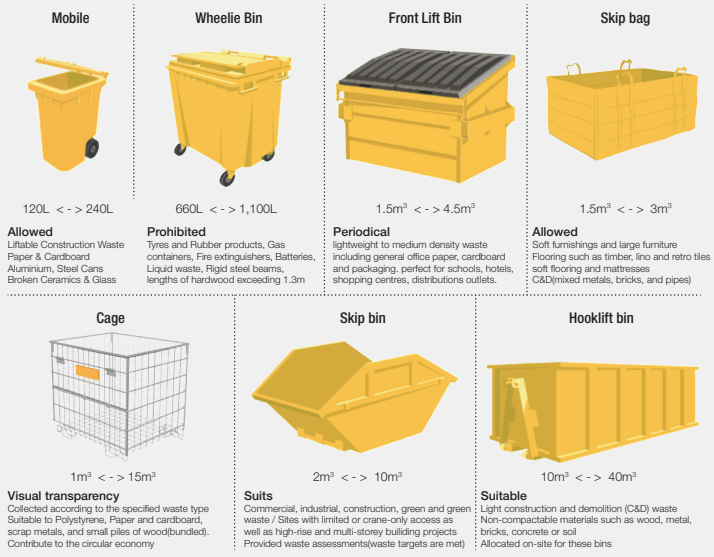
And the figure below illustrates the result when all C&D waste is diverted and salvaged from landfill. This chart allows people to guess that even a third of the landfill waste in the SEQ region has a huge impact.

Disposed materials (Tonnes)	Recovery rate	MSW	C&I	C&D	Total by category	% by category
Masonry materials	47%	37,299	229,233	1,213,081	1,479,613	27%
Metals	82%	62,662	44,443	67,976	175,081	3%
Organics	44%	893,563	531,986	115,289	1,540,838	28%
Paper&cardboard	56%	198,172	207,587	38,938	444,697	8%
plastics	6%	292,501	270,479	48,430	611,410	11%
Glass	34%	98,795	33,878	43	132,716	2%
Other	10%	39,372	103,771	0	143,143	3%
Hazardous	35%	0	556,291	382,062	938,353	17%
Total by stream		1,622,364	1,977,668	1,865,819	5,465,851	100%
% by stream		30%	36%	34%	100%	



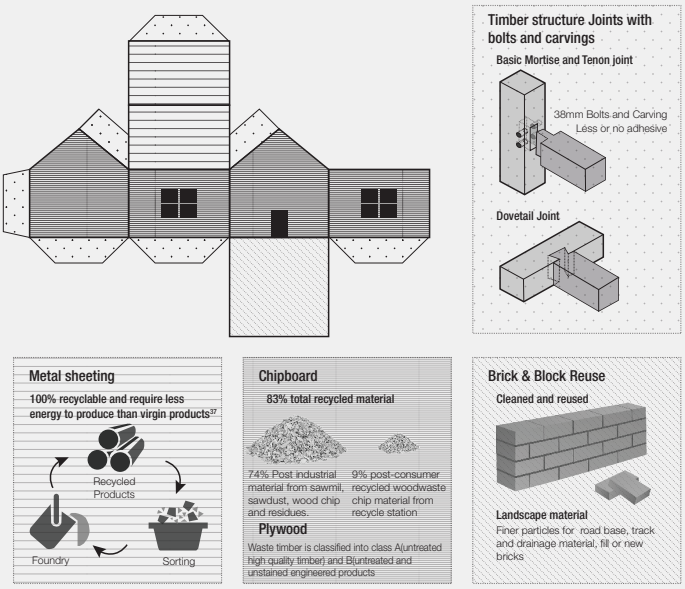
Principle 01. High purity of recyclealbe resource collection with Waste management services

Although many people want to practice recycling, they give up because of the difficulty in classifying mixed waste. It is easier to reuse and recycle materials with higher purity than materials mixed with or coated. The degree of contamination of C&D waste is affected by different stages like production, construction, and management after waste generation. The focal point is to place a waste container suitable for the site condition so that it can be classified in small-scale housing projects and refurbishment projects from the initial stage.



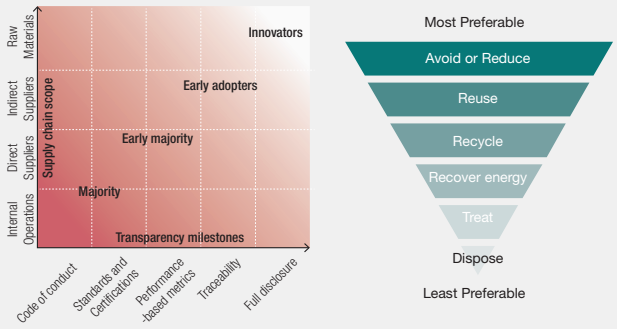
Principle 02. Design for disassembly

Design for disassembly is an overall design approach, which allows the product to be easily disassembled and subdivided into individual component units for replacement. This approach is a keystone of the circular economy, allowing each component to cycle through a closed material cycle. They are reused, reassembled, and recycled and re-created as new products.



Principle 03. Product procurement with transparent content information

Information about materials of product must be transparent so that the public can easily access it. Related information can be provided as an integrated system using information from institutions such as LCA, EPD, Ecospecifier, Building Transparency, Cradle to Cradle Certified™, and EToolLCD.

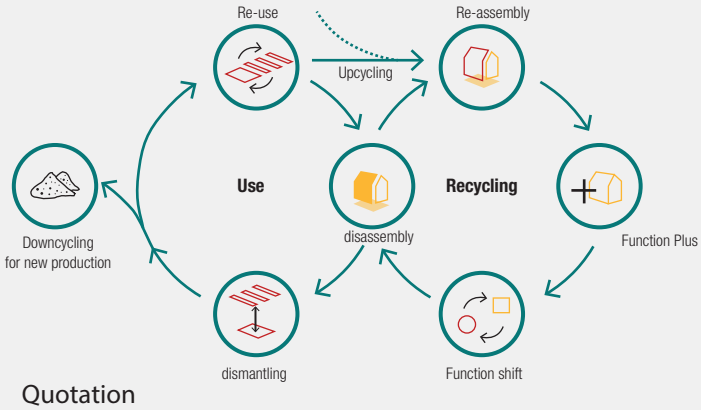


Principle 04. Product life Extension

The community engaged model aims to extend the lifespan of the products and improve the values. It is necessary to develop products that can maintain their long-term effectiveness, taking into account the operating costs of the building.

Conclusion

The relationship between production and purchase needs to be re-established. And all the enablers who involve in Waste stream need to be responsible for transforming into the circular economy



Quotation

"Recycling is the future. Businesses must use sustainable resources to ensure their ongoing success." by David Henderson, Executive Director, D&R Henderson.

REFERENCES

ABS 3218.0 Regional Population Growth, Australia, 24 April 2018

Cheryl Katz, 2019, Piling Up: How China's Ban on Importing Waste Has Stalled Global Recycling

Crawford, R., Stephan, A., Prideaux, F., & Bontinck, P. A. (2019). Environmental Performance in Construction (EPiC).

Greenhouse Gas Equivalencies Calculator, 2020

Merrild, H., Jensen, K. G., & Sommer, J. (2016). Building a circular future.

Pickin, J., Randell, P., Trinh, J., & Grant, B. J. D. O. T. E. (2018). National waste report 2018

Queensland government, 2018, Recycling waste qld report 2018

Queensland government, Public waste and recycling facilities in Queensland

QUEENSLAND TREASURY CORPORATION, 2018, Economic opportunities for the Queensland waste industry: final report

Stephan Choi, 2020, "Living Building ChallengeSM 4.0"

True Professional, Inc., "Typical "Life Expectancy" Table for common building materials & systems"

THANKS