



FACT SHEET

Market summary – recycled brick, stone and concrete

In 2013–14 Sustainability Victoria commissioned market analysis into four waste materials identified as priorities for market development and four which are emerging materials of interest. This fact sheet summarises the findings for recycled brick, stone and concrete.

Terminology

Brick, stone and concrete are described as follows.

Brick: Building bricks recovered from demolition works, usually domestic rather than commercial.

Stone: Naturally occurring rock and stone recovered from excavation and drainage works.

Concrete: Structural building material commonly recovered from commercial demolition and civil works, and typically steel reinforced.

Volumes

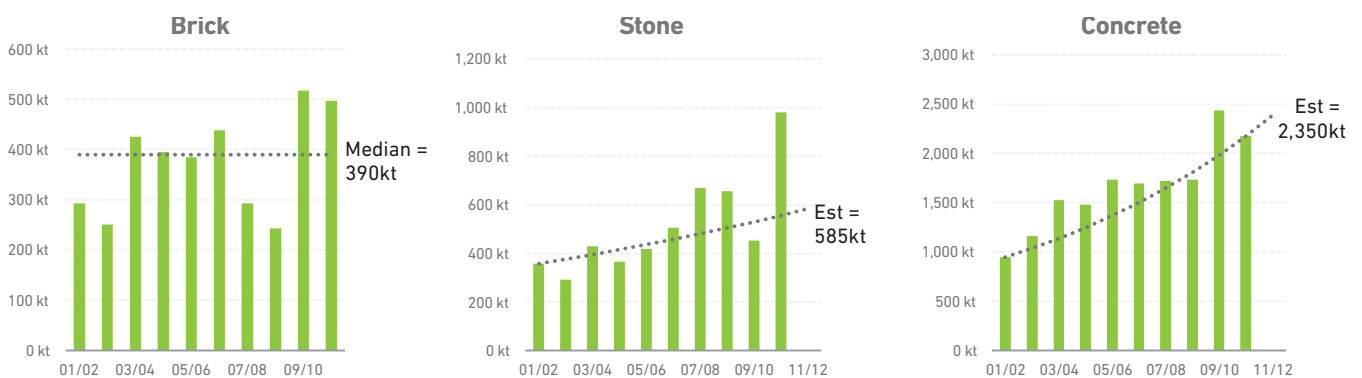
In 2010–11, the volumes recovered for reprocessing reported in the *Victorian Recycling Industry Annual Survey*¹ were:

- 497,000 tonnes of brick/brick rubble
- 980,000 tonnes of rock and excavation stone
- 2,174,000 tonnes of concrete

Analysis of 10-year volatility and trend data suggests that while recovered volumes of brick have been relatively stable, both stone and concrete recovery have had steady growth over the past decade.

¹ Sustainability Victoria (2012), 2010–11 Victorian Recycling Industry Annual Survey

Figure 1: Estimated volume of brick, stone and concrete recovered in Victoria



Source: Sustainability Victoria, 2012

Stockpiles of brick, stone and concrete (BSC) help even out fluctuations in supply and demand of materials that occur due to differences in the timing of economic activity in the supply (C&D waste) and demand (e.g. roads projects) sides of the market.

Reprocessors limit stockpiling by using economic incentives, for example increasing disposal fees for materials where there supply of materials sent for reprocessing exceeds demand.

Processing

The generic process for BSC recovery and re-use in Victoria is recovery, sorting and reprocessing. Although this process is the same throughout Victoria, transport cost is a major factor in determining whether material will be recovered, or landfilled. Similarly, the generally low value of end product (per cubic metre or by tonnage) means that transportation of products to end users is similarly impacted by relative distance that the recycled product must be transported vs a substitute product. For this reason, the location of facilities for reprocessing is particularly important, as they are the determinant of the total haulage distance from collection to recycled product end user.

BSC are usually masonry materials generated by C&D activity. Recycling facilities located close to the Melbourne CBD or urban renewal areas traditionally receive demolition waste while facilities near growth areas receive a greater proportion of construction waste.

Brick waste is generally sourced from residential demolition. Whole bricks are recovered through specialist brick recyclers and brick rubble recycled through C&D waste processors.

There is a strong preference within the reprocessing market for masonry materials to be separated at the source. This enables much simpler, cheaper and more effective processing. This is reflected in pricing mechanisms such as gate fees, which are lower for source separated loads. The C&D sector is more likely to produce source separated streams because of the quantities being generated (gate fees being a larger proportion of expenses) and availability of space on site to sort materials.

Where loads are mixed, the most common approach is for operators to segregate materials using manual labour, coupled with mechanical equipment such as excavators and front end loaders. There are limited examples of fixed equipment and automated sorting systems being employed to separate materials².

Reprocessing techniques for masonry materials are relatively uncomplicated. BSC are crushed, either as mixed loads or in source separated streams.

Products and applications

BSC are highly recycled due to their inert nature and predominantly physical reprocessing requirements, with lesser need for chemical processes compared to other materials.

Concrete makes up the greatest proportion of masonry material recycled in Australia, at around 60 per cent of all masonry material recycled³. Concrete is crushed and then reused as an aggregate with fresh cement. Aggregate products are screened to divide crushed materials into different sizes for different applications. Brick and stone can be suitable for reuse in aggregate applications including road bases, paths, backfill and drainage applications.

Aggregate products such as these may be reprocessed from single collected material sources, or blended together to produce more consistent products, to meet certain composition requirements. The final application of recycled masonry aggregate may depend on:

- the size of the crushed, screened masonry.
- the composition of recycled materials (i.e. brick, rock, sand, crushed asphalt) and the resulting physical strength of the blended product.

Primary applications for recycled BSC products are as aggregate in road sub-base, drainage, irrigation and landscaping. Accordingly, major buyers include civil engineering and construction sectors, such as water authorities and construction contractors who require product on a project basis.

Bricks may be reused intact in housing and construction, or in less structural applications if the collected bricks are excessively damaged.

The markets for recycled concrete are generally mature and strong, particularly in metropolitan areas. The C&D recovery sector is dominated by private companies where basic economic principles apply; that is, when there is sufficient market demand and the product is the right price, the supply side of the equation will, to a large extent, look after itself.

Degree of product differentiation

Recycled aggregate product (particularly stone) is considered to exhibit little difference to substitute product due to the homogeneity of inputs. However, anecdotal evidence suggests there is less likelihood that product with recycled content will be used for higher performance applications where traditional "proven" products are available. Evidence and case studies supporting the application of recycled products is gradually emerging in the market place.

2 Hyder Consulting and EnCycle Consulting & Sustainable Resource Solutions (2011). Construction And Demolition Waste Status Report: Management Of Construction And Demolition Waste In Australia, Department of Sustainability, Environment, Water, Population and Communities and Queensland Department of Environment and Resource Management.

3 Hyder Consulting and EnCycle Consulting & Sustainable Resource Solutions (2011). Construction And Demolition Waste Status Report: Management Of Construction And Demolition Waste In Australia, Department of Sustainability, Environment, Water, Population and Communities and Queensland Department of Environment and Resource Management.

Recycled Crushed Concrete: a case study

A report commissioned by construction and demolition materials recycler, the Alex Fraser Group, found that recycled crushed concrete offers superior performance compared with its virgin counterpart, is cheaper, and is better from an environmental perspective.

Key benefits are:

- > it has carbon footprint 65 per cent less than equivalent quarried material
- > it is a softer concrete material which requires less energy to crush than virgin rock
- > it is 20–25 per cent less dense than crushed rock so fewer trucks are required for delivery
- > since cost is calculated on a weight basis, it is cheaper than crushed rock
- > it can offer better performance in wet weather
- > there is reliability of supply and convenience of locations
- > cheaper disposal of waste concrete.

Many contractors use recycled crushed concrete as their first preference for materials on the basis of price. Anecdotal evidence indicates that it is quicker and easier to lay and to compact. It is thought that improved compaction is due to the product being made up of smoother and rounder particles, with a better distribution and larger percentage of fines and binder particles in the mix.

Source: Environment Protection and Heritage Council, National Waste Report 2010

Market overview

Indicative estimates of the financial value of BSC at various transactional points in the market are provided in the following table and discussed below.

Table 1: Estimated values and volumes of the recycling market for BSC

Recycling market component	Estimated value (\$ million)		Volume (tonnes)	
Collection for recovery	Brick:	~\$27.3 m	Brick:	~390,000
	Stone:	~\$40.9 m	Stone:	~585,000
	Concrete:	~\$167 m	Concrete:	~2,350,000
Reprocessing	Brick:	not known		
	Stone:	not known		
	Concrete:	not known		
End product	Brick:	~\$10 m		
	Stone:	~\$15 m		
	Concrete:	~\$40 m		

Collection for recovery

The average cost of collection, transport and resource recovery of C&D materials is in the region of \$70 per tonne, with about \$40 attributed to collection alone⁴.

Reprocessors

Stakeholders indicated that there is no price paid to reprocessors. In particularly competitive areas such as northern Melbourne, a price is paid to providers of stone and concrete.

Both virgin and recycled products are subject to the same pricing policy. Unless other arrangements are made, prices are gate prices for both materials. As transport can be costed differently by different suppliers, the general principle is that transport is added. Due to the high density and low value of construction materials generally, transport costs remain a significant part of overall pricing and therefore proximity to supply point can often determine the economics of specific choices.

End product

The market value of recycled product is segmented according to a wide range of values placed on different end products. These include crushed concrete; at around \$17 per tonne currently⁵ and aggregate, at \$20 to \$30 per tonne.

Market trends

The observed trends in recycled stone and concrete recovery are that they are both robust and increasing, while brick recovery has remained stable. This mirrors historical construction activity and the introduction of guidance on, and specifications for, the use of recycled materials such as the *Austrroads Guide to Pavement Technology Part 4E: Recycled Materials and Jurisdictional Specifications*. More generally, it can be expected that market acceptance of recycled product will continue to increase.

4 WME, WMAA and Hyder (2012), Inside Waste Industry Report 2011-12

5 Current as at August 2013

Future demand and market growth will predominantly be driven by:

- > cost of recycled materials relative to virgin materials
- > availability of virgin materials within the same geographic distance to end markets. Despite those factors previously mentioned, the cost of transport (i.e. location of source material to end use) will continue to be a governing factor in the economic viability of recycled vs substitute aggregate products.

It should be noted that the viability of recycling C&D materials could be negatively affected by changes in building technology and construction methods. Examples cited by stakeholders include the following.

- > The use of expanded polystyrene 'waffle pods' in slab construction which make it harder for the concrete to be recovered using current technology. Due to the life span of buildings only a small proportion of this material is currently in the waste stream but it is expected to increase.
- > The use of stronger binding agents (mortar) in brick construction, which makes whole brick recovery more difficult and increases the proportion of broken bricks and the difficulty of cleaning bricks for re-use.

Supply and demand

This section summarises the supply and demand conditions of the potential BSC recycling markets, together with considerations of both the economic and waste recovery heirarchies.

Table 2: Potential supply of BSC

Potential supply	Tonnes per annum	Description
Brick	210,000	Brick and stone rubble currently sent to landfill
Stone	315,000	Currently sent to landfill
Concrete	1,285,000	Currently sent to landfill

Table 3: Potential demand for BSC

Potential demand	Tonnes per annum	Waste Heirarchy
Increased diversion of concrete from landfill	not known	High: demand for recycled concrete currently equals supply so likely increased supply will be taken up. Also reprocessors currently paying for supply.
Increased uptake of recycled brick	not known	Medium: currently being stockpiled so this needs to be addressed first.
Increased uptake of recycled stone	not known	High: recycled stone competes equally with natural stone.

Considerations of economic viability and waste heirarchy

It is important that the following dynamics be considered.

- > The sector creating BSC waste is not the same as the sector using recycled BSC materials. BSC waste is generated when old buildings are demolished and new ones built. Uptake of recycled BSC material is through infrastuture projects, for example roads.
- > Economic activity does not always occur in these two sectors at the same time, leading to supply and demand inconsistencies (shortages or stockpiles).
- > Where there is no economic incentive for materials in the C&D stream to be separated and recovered, these materials are more likely to go to landfill.
- > Labour costs contribute most to the economic viability of separation and recovery.
- > Transport costs contribute most to the economic viability of recycled materials over virgin materials.
- > A shortage of virgin quarry material in close proximity to the Melbourne area will favour the use of recycled content products over time.
- > There may be opportunities for some re-use of construction materials on larger housing estates.
- > C&D waste in residential construction sector may be reduced by initiatives in the supply chain.

Market risks

The market for recycled BSC is beginning to emerge more rapidly as new applications, supported by product specifications, become more widely accepted and implemented. This type of market growth is new to the industry and is likely to affect markets for virgin products. There is a risk that artificial barriers may be created to protect traditional products such as discrediting the quality of recycled BSC products.

Market barriers and opportunities

The potential to improve recycling markets for BSC fall into two broad areas:

1. increasing the proportion (and total volume) of BSC materials diverted from landfill to the recovery and recycling stream
2. improving market pull through to increase market opportunities for recycled BSC products (in particular brick which appears to have the highest rate of stockpiling).

As stated earlier, market barriers include labour costs, changes in building technology and low demand. Respective opportunities to address these are improved separation on site to sort BSC material from other C&D waste; developing educational materials for designers and builders about material choice and waste management; and increased promotion of the use of BSC in pavement construction.

Further information

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This fact sheet summarises a more comprehensive market analysis report completed by NetBalance on behalf of Sustainability Victoria (August 2013). Due to the confidential nature of some information provided by industry stakeholders, the full market analysis report is not publicly available.