

Waste minimisation

Approximately 32.4 million tonnes of solid waste was generated in Australia in 2002–03, an estimated 42% of which was building waste (Productivity Commission 2006). Minimising and recycling this waste can have significant social, economic and environmental benefits.

A number of states, including Victoria, South Australia and Western Australia, have 'towards zero' waste strategy documents. The strategies set state-wide targets for waste reduction, resource recovery and littering, and specific targets and actions for the municipal and business sectors to deliver more sustainable use of resources. See for example Victoria's *Sustainability in action – towards zero waste strategy* or South Australia's *waste strategy 2011–2015*.

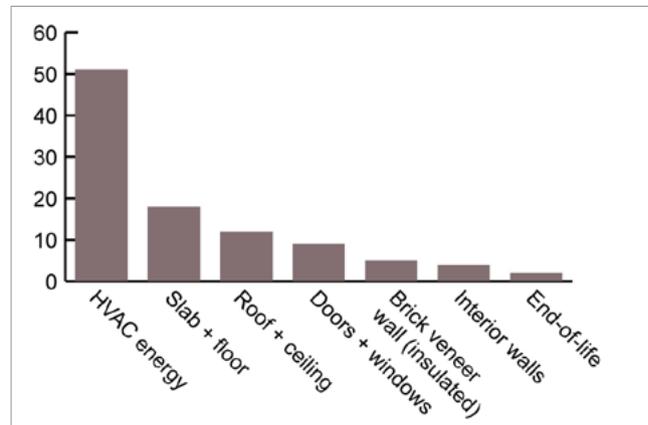
The three Rs of waste minimisation: reduce, reuse, recycle.

Reduce consumption of resources by building smaller houses that are better designed for your needs. This is the most effective way to conserve precious resources for use by future generations and reduce waste. It also lowers costs.

Improve the accuracy of your ordering so that materials are not wasted nor sit around a site for long periods where they can become damaged.

Reuse existing buildings and materials in order to reduce demand for resources, lower waste volumes and save money. A lot of energy and resources go into the materials used to construct a home and due to the mixed nature of these materials most end up in landfill. The following graph shows that the emissions from the energy of the materials required to construct a typical house are nearly equal to the emissions from the energy required to heat or cool that house over a typical 50 year life. Consider renovating an existing house, rather than demolishing the old and building from scratch as very little of the demolished house is recycled or reused.

Recycle resources that are left over or have reached the end of their useful life. This reduces demand for new materials and lowers the volume of waste going to landfill. Use materials with high recycled content to create a market for recycled resources. It raises the price paid by recyclers for recovered resources and increases the viability of recycling.



Source: Rouwette 2010

Emissions from typical brick veneer house over 50 year life.

Sending building materials to landfill is like throwing money away. You have already paid for the material, paid someone to deliver it and then paid someone to collect it and throw it away.



Landfill

Our traditional means of waste disposal to landfill is uneconomic. Costs to communities for operating and maintaining landfill sites are high and the availability of suitable land is limited. Reuse options for landfill sites are limited due to potential health hazards. Remedial action is often prohibitively expensive. Emissions and leachate from landfill sites can be highly toxic due to concentrations of heavy metals and toxic chemicals. These toxins find their way into the watertable or waterways, often with disastrous consequences.

Tipping fees are increasing rapidly to reflect the true cost of disposal. This increases the cost competitiveness of recycling options and rewards waste minimisation efforts.



What is building waste?

Percentage weight of typical building waste materials

Waste description	Waste quantity (% of total weight)
Paper/cardboard	1
Garden/vegetation	3
Wood/timber	10
Textiles/rags	1
Hard plastic	1
Ferrous	2
Soil rubble (<150mm)	34
Soil rubble (>150mm)	2
Concrete-based masonry	16
Clay-based (e.g. bricks, tiles)	16
Plasterboard	2
Other/unknown	11
Total	100

Source: Extrapolated from NSW EPA Waste Census Data 1997

Life cycle and waste

Life cycle assessment of waste streams indicates that significant energy savings can be achieved at little or no cost by considering construction and demolition waste management and planned recycling.

Materials with high embodied energy (e.g. metals, especially aluminium) or with high environmental cost in extraction can have their life cycle impact reduced by end use recycling. The environmental impact of most materials can be substantially reduced with each reuse.

Recycling – who to contact

- local councils
- regional waste authorities
- local waste station or landfill operator
- waste recycling contractors
(see www.recyclingnearyou.com.au for a list of recyclers searchable by location or product)

What can be recycled?

Most materials can be recycled. The following list demonstrates some reuse options. There are many more and the list is growing rapidly.

Steel – Electric arc furnaces produce reinforcing bar, mesh and sections from 100% steel scrap. Conventional blast furnaces can incorporate up to 30% steel scrap. Recycling steel reduces embodied energy by 72%.

Aluminium – Aluminium is 100% recyclable; recycling aluminium reduces embodied energy by 95%.

Gypsum plasterboard – CSR recycles clean plasterboard offcuts from material ordered from them; other companies are considering doing so. Check with your supplier to see if they offer this service. Plasterboard disposed of in landfill produces poisonous hydrogen sulphide, which has a foul odour.

Timber – Most timber (except treated timber) can be reprocessed into horticultural mulch. A particleboard manufacturer in Australia is developing a recycling facility that requires little or no pretreatment of the waste.

Concrete – Un-set concrete can be ‘washed’ out at the plant to remove cement. Sand and stone can be reused. Set concrete can be crushed and recycled as aggregate for new concrete or road base and fill. Rapidly developing markets for this product mean the material is now in demand and disposal costs are significantly reduced.

Materials

Waste minimisation

Glass — Most glass can be recycled. Construction glass must be separated from other glass such as drink bottles. Glass may be cut and reused or recycled as aggregate for concrete. Some patterned glass incorporates all types of recycled building glass. Recycling glass reduces embodied energy by 20%.

Carpet — In good condition, carpet can be sold and reused. It can also be recycled into secondary carpets. Some manufacturers offer a recycling or take-back service on their products. Some carpet can be recycled as a weed barrier or a covering and food for worm farms.

Bricks and tiles — These materials can be reused where appropriate or crushed on site for backfill, aggregate and gravel with portable crushing plants.

Plastics — Many plastics can be granulated and reused to make new plastic products and include:

- high density polyethylene (HDPE): rubbish bins, buckets and traffic cones
- low density polyethylene (LDPE): shrink wrap and bubble wrap
- polystyrene containers, insulation, PVC pipes, fittings, and vinyl flooring.

Making it happen

To be cost effective, waste minimisation strategies must be agreed to and implemented by all parties involved in building the home at the design, construction and operation stages.

A team approach by the owner, builder and designer is the most effective way to reduce waste.

Research has shown that opportunities for cost effective inclusion of sustainable features decline exponentially throughout the design process. Up to 90% of critical decisions, including waste minimisation, are made during the design stage. Many good household recycling and waste minimisation guides are available. Consult your local council.

The design stage

Plan ways to reduce waste before you start the job.

Designers are responsible for introducing and planning waste minimisation strategies from the earliest stages of design through to completion. This includes deciding what to build, whether to demolish, what materials to use and how they might be recycled.

The initial consultation

- Lasting decisions about whether to renovate or demolish are often made at this stage.
- Consider waste streams and life cycle benefits.

A commitment to reducing waste at the initial consultation is more likely to endure throughout the project.

Concept design

- Choose construction to minimise cut and fill.
- Plan for end use and deconstruction.
- Select building systems with low waste rates.
- Choose prefabricated products.
- Identify recycled materials that can be used.
- Source recycled materials.

Early decisions have a major impact on waste stream quantity and quality.

Design development

- Dimension to suit standard modular construction sizes and minimise waste — and create fewer plasterboard and wall lining offcuts.
- Select materials with known minimum waste rates; consider manufacturers' waste recycling schemes and recycled content or other life cycle benefits.
- Engage like-minded design professionals (e.g. engineer, interior designer).
- State and agree key waste goals before engagement (team building).

Working drawings and detailing

- Design operational waste handling facilities.
- Select energy efficient appliances (washing machine, refrigerator, dishwasher).
- Plan for waste separation and sorting on site during construction.
- Prepare accurate working drawings and nominate waste-wise fabricators.

Off-site fabrication can reduce waste, facilitate separation of waste streams and improve recovery rates.

Specification

Specify:

- materials with known minimum wastage rates, e.g. plywood, finger-jointed timber
- materials with known recycled content, e.g. paper and polyester insulation
- durable materials and finishes
- waste handling and recycling contractors
- waste streams to be recycled.

Contract documentation

- Prepare a waste minimisation plan. Identify the possible types of waste produced (e.g. bricks, timber, plasterboard), potential recyclers and methods to reduce or avoid the waste before you begin. An example of a waste minimisation plan can be found at www.mbav.com.au
- Agree which party or parties receive financial benefits of recycling.
- Provide economic incentives for recycling.
- Include waste minimisation and recycling performance clauses in the contract.

Tendering period

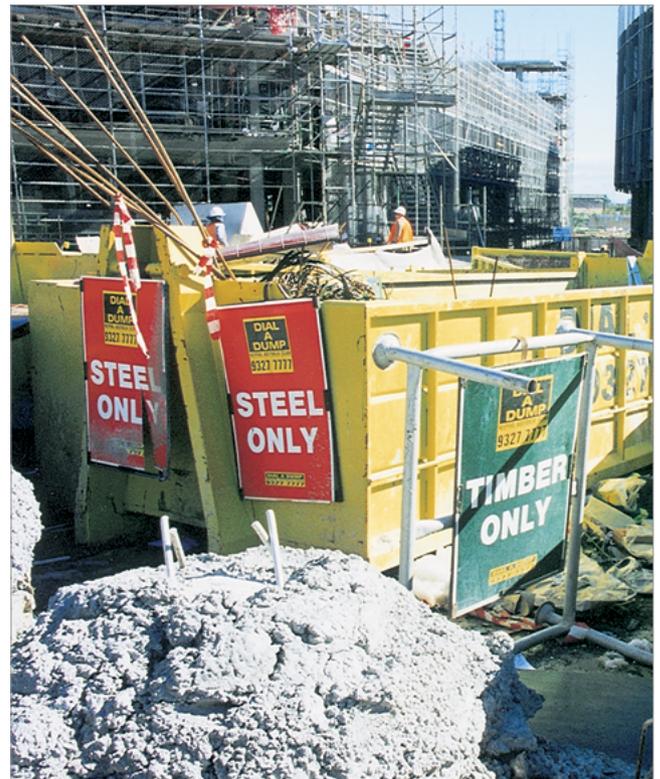
- Promote the economic benefits of waste minimisation and recycling to tenderers.
- Familiarise tenderers with recycling, waste management and waste minimisation strategies.
- Answer questions and allay concerns (costs).
- Engender a spirit of cooperation to achieve waste minimisation objectives (team building).

The construction stage

Site operations generally

- Plan locations for depositing and stacking of materials before delivery.
- Separate waste for recycling wherever possible. Provide recycling skips and ensure compliance with waste stream sorting by all trades.
- Where this is not possible engage a reputable waste disposal contractor who will take mixed waste bins, sort it on their site and provide you with a report.
- Form a compound to contain plastic film, cardboard, glue and paint tins.
- Use bins with lids to reduce windblown litter.

- Use reputable waste service providers.
- Negotiate recycling paybacks with local resource recovery firms.
- Use waste aware subcontractors.
- Use written contracts with all trades including clauses requiring waste minimisation practice.
- Require trades to dispose of their own waste.
- Back charge for sorting of waste streams not sorted by each subcontractor.
- Colour code or label waste skips and protect them from contamination, rain and wind.
- Provide regular waste bins for food scraps and household waste during construction.
- Lock special skips at night and weekends to prevent others dumping rubbish in them.
- Tidy up the site often. This encourages your trades to do the same and reduces the potential for windblown litter and safety hazards on site.



Supervision

- Monitor recycling rates and on-site sorting and storage of various waste streams.
- Verify contractor performance or certification.

Materials

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Materials storage and handling

- Minimise the time between delivery and installation to reduce the risk of damage or theft.
- Does packaging adequately protect goods? Is there too much? Can you eliminate some?
- Ask suppliers to collect or recycle packaging.
- Have fragile materials and fixtures delivered and installed close to completion date.
- Use prefabricated framing and trusses to reduce time on site before installation.
- Check quantity, condition and quality of goods on delivery. Report discrepancies immediately.
- Reject inferior goods or materials if their quality will result in additional waste.
- Refuse oversupply as compensation for inferior quality or condition.
- Report careless delivery staff to the supplier.

Concreting

- Use concrete with recycled aggregate in all viable applications.
- Use reinforcement made from recycled steel.
- Form up accurately and fine-tune estimating to minimise waste. Up to 10% is often wasted.
- Return surplus to the plant for recycling.
- Buy from plants that wash out cement to allow recycling of sand and aggregate.
- Break remnants into small pieces before final set to allow later use as backfill or recycling.
- Always form up a small area of path or low grade slab ready to accept remnants.



Carpentry and joinery

- Use engineered timber products that make efficient use of materials where possible.
- Use sustainably sourced timber.
- Encourage your supplier to find sustainable sources.
- Prepare accurate cutting lists before ordering.
- Give joiners a copy of the cutting list.
- Ensure that carpenters have a complete cutting list to allow efficient timber use.
- Use joinery profiles that can be easily and invisibly joined to reduce offcuts.
- Use offcuts wherever possible.

Measure it twice – cut it once.

Bricklaying

- Have bricks delivered around the perimeter to minimise the chance of damage from subsequent movement to place of use.
- Use mortar to produce masonry of appropriate strength and durability as required by AS 3700-2001, Masonry structures. Mortars with lower cement content are usually softer, thus helping in recycling as well as saving on cement.



Electrical services

- Use sub-boards and plan wiring to reduce wiring distances, quantities, waste and cost.
- Recycle offcuts. Strip insulation from copper.
- Consider pulse switching and intelligent controls to reduce cabling and energy use.
- Use cable products that are highly recyclable and be aware that some PVC coatings used to contain heavy metals.

Plastering

- Buy plasterboard from suppliers who recycle.
- Sort offcuts and store on site for return to recycler. Keep offcuts clean and dry.
- Carry useful sized offcuts to the next job.

Glazing

- Separate construction glass from other glass such as drink bottles. Most glass can be melted down and recycled but requires sorting.
- Glass can also be recycled as aggregate.

Waste management plans

Many local councils require waste management plans before granting development consent. They usually require the builder or designer to estimate the total waste stream volumes from both demolition and construction and nominate the means of disposal including the recycling contractor, recycling waste station or landfill site.

The site plan is often required to show waste storage facilities on site during construction and provide a schedule for delivery or pickup.

The time and cost of waste plan preparation is usually recouped through reductions in waste disposal costs or dividends from the sale of salvaged resources. If this is not possible (low tipping fee areas), charge a fee for the service to ensure that plans are properly prepared.

References and additional reading

Contact your state or territory or local government for further information on waste minimisation programs: www.gov.au

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Parts of this article have been adapted from Reddrop, Ryan and Walker-Morison 1997.