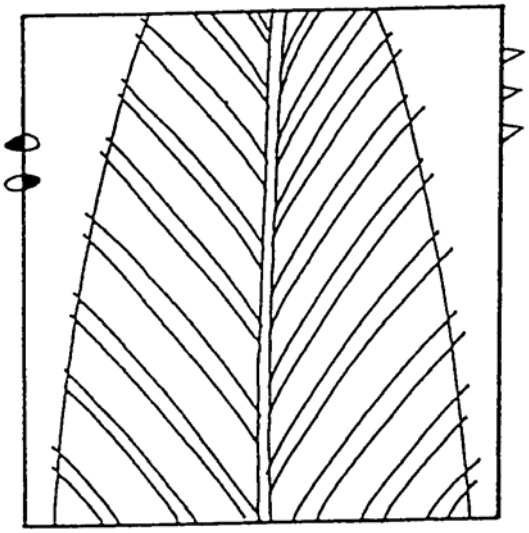
BUILDING MATERIALS



Waitakere City Council

Te Taiao o Waitakere

Contents

This chapter is part of the Waitakere City Council's Sustainable Home Guidelines. The complete set can be obtained through most libraries or from the Waitakere City Council, Private Bag 93109, Henderson, Waitakere City 0650, New Zealand, phone 09-839 0400, email: info@waitakere.govt.nz.

The guidelines are also available on the council's web site: http://www.waitakere.govt.nz

Choosing sustainable materials

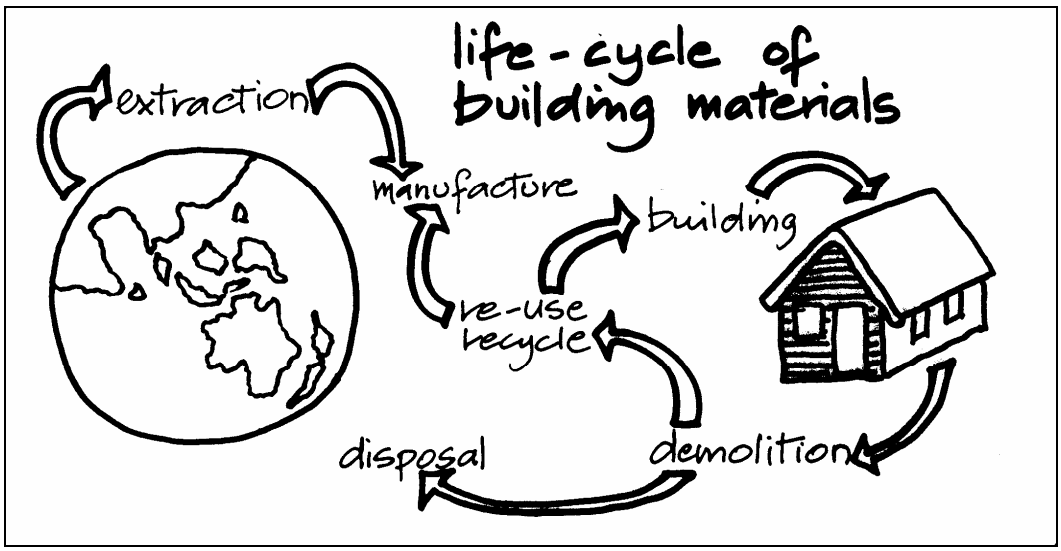
It can be difficult to assess exactly how sustainable a product is and which materials are preferable to others. Often we have to rely on manufacturers' information, which can be biased and incomplete.

This chapter aims to clarify the issue. It outlines some tools that can help you to choose your building materials, but the issues are rarely straightforward. Your decisions will depend on current information, your individual circumstances and preferences, and common sense.

Evaluation tools

Life-cycle assessment

Life-cycle assessment – or "cradle-to-grave" analysis – is a rigorous examination of the environmental impacts of a product or system at every stage of its life-cycle. This means considering the impact during the extraction of the raw materials, manufacture, transport, handling, installation, the lifetime of its use, recycling and disposal.



Life-cycle assessment can be very detailed and scientific or it can simply mean thinking the impacts through. There are two different methods, the qualitative method and the quantitative method.

The qualitative method judges how severe the impacts are at every stage without attaching an actual dollar value to the impact. It is a valuable method to compare products or systems, but is always subjective.

The quantitative method assigns actual values to the impacts. The total values can then be compared for different materials. A weighting factor can account for more important stages in the life-cycle or more important environmental concerns.

This method raises the problem of putting a cost on environmental and health impacts. You can use the dollar value society is prepared to pay for the cleanup of those effects, or you can use the amount people are prepared to pay to enjoy that environment. Evaluations can be complex and the results vary (in one classic early example – a comparison between plastic milk bottles and milk cartons undertaken in Europe – several groups of scientists ended up with opposing results). Nevertheless the approach is sound in principle and is a valuable basis for an informal assessment for the lay person.

The quantitative method can be used to measure the greenhouse gas emissions impact of a product during its life cycle.

Embodied energy

The embodied energy of a product or system is the total amount of energy that is needed to produce, transport it to site and install it. For building products, it is commonly measured in MegaJoules (MJ) per unit of product. As always with assessing the environmental impact of building materials, its function must be defined carefully, so that differing materials can be suitably compared.

Embodied energy is only one important factor to consider when choosing materials.

Environmental labelling

Environmental labelling – so long as it is assessed by an independent body – is another way of easing the selection of product. The 'Environmental Choice' label, for instance, is awarded to specific products, rather than to companies as some overseas schemes do. Paint, carpet, insulation, and laminated panel products are some of the building materials covered by it. The criteria for the label can be obtained from the website, and the environmental effects throughout the life-cycle of a product are taken into account. The award is relative rather than absolute: the aim is to award the label to those products that have a lower environmental impact than comparable products with the same function. The scheme therefore uses the term 'environmentally preferable' rather than 'environmentally friendly'.

Other criteria

You need to consider a range of criteria when choosing a product. Most importantly the chosen product needs to be suitable for its function – it makes little sense to choose an environmentally friendly material if it will not do the job satisfactorily and will have to be replaced before too long.

Using fewer materials saves resources. You should question the size of the building and the need for certain materials, such as finishes. Once you are satisfied that you need a

certain product, and that it will do the job it is designed for, there are a number of environmental criteria you could consider.

Renewable resources

These are resources that will be replenished with time, such as timber-based products. Provided the forests are managed sustainably, the trees will eventually grow back and more timber-based products can be produced. Renewable resources include plant and animal products such as timber, paper, cork, wool and leather.

Sustainable resources

These are resources that regenerate at the rate they are used or faster. Sustainable resources are the products of cyclic closed systems that do not require outside inputs, and do not generate waste. When the product is finished with, it breaks down and re-enters the cycle.

There are few truly sustainable resources used in the building industry and it might be more appropriate to talk about 'more sustainable' resources. Plantation-grown timbers, for example, are more sustainable than timber from rainforest clear-felling.

Local resources

Locally sourced products need less energy for transport and they support your local economy. It is usually easier to find out environmental information about local products. Using local labour and skills means that trades people travel shorter distances and less energy is wasted.

Toxicity

Materials such as asbestos or lead paint cause serious damage to people's health. You should consider the risk throughout a product's life-cycle, including whether the material produces toxic smoke in a fire. People react differently to toxic substances and some, such as infants and sick people, are more sensitive than others.. Products which might cause problems include solvent-based products such as paints, glues and stains. Opinions about toxicity often vary and there is considerable debate about the health effects of substances like fibreglass insulation and PVC.

Some materials are relatively harmless for humans, but their production might cause habitat destruction or release toxins into the environment. Toxic materials can also be a problem for installers or when they are disposed of at the end of their life cycle. Materials that are biodegradable (break down naturally) are generally preferable.

Quality

High quality and durable materials don't need to be replaced as often, reducing resource use. However, if the expected lifetime of the building is short, it makes little sense to use very durable materials. Products that are easy to replace or repair are preferable to those which aren't. Those that don't require finishes also reduce resource use.

Re-use and recycling

Materials that can be re-used or recycled when the building is demolished save resources. Using second-hand or recycled materials is another option for reducing resource use.

Uncertainty

Judging a material's environmental friendliness can be difficult. Scientific opinions can vary and often the debate is ongoing. If you are uncertain about a material it might be better not to use it. Materials that have been tested for a long time in your local conditions are a safer choice than new materials or those which have not been proven locally.

Commonsense

The task of assessing materials can be daunting. Relying on your commonsense is probably more effective than attempting complicated analyses. Keeping up with new developments (see *Further information* at the end of this chapter) as well as consulting building professionals can help you make informed decisions. Keep in mind that information from other countries is not always appropriate to local conditions. In the United States, for example, timber is often from old-growth forests that are logged in a non-sustainable manner. Many American 'eco buildings' therefore avoid timber for certain uses. In New Zealand there is plenty of plantation timber available and in many cases it makes more sense to use timber than alternatives such as steel framing.

The *Assessment sheet for eco building materials* at the end of this chapter can help you with the evaluation of materials.

Further information

Advice at the Waitakere City Council:

Phone the call centre (09) 839 0400
Ask for: Eco Design Advisor
Building Consents

In print

Your Home Technical Manual, Australian Government. Comprehensive printed resource, much of it relevant to New Zealand, www.yourhome.gov.au.

Green Architecture: Design for a Sustainable Future, Brenda and Robert Vale, 1991, Thames and Hudson Ltd, London

The healthy house, Sydney and Joan Baggs, 1996, Harper Collins Publishers

On the web

http://www.greenbuild.org.nz

http://www.smarterhomes.org.nz is a mine of up-to-date and independent information. Designed for the general public, it's easy to use, has case studies, and includes features such as Homesmarts, a calculator you can use to find information relevant to your needs or simply to run a home-health check.

If there are questions you can't find answers to on Smarterhomes, www.level.org.nz goes into more depth and is aimed at the design and building industries, with drawings and links to Building Code compliance documents.

Eco-building Products and Services Directory, Building Biology and Ecology Institute, phone Auckland (09) 376 6767, Wellington 0800 223 272. This is updated regularly and can be obtained from the website www.ecoprojects.co.nz.

This chapter was last reviewed in September 2008.

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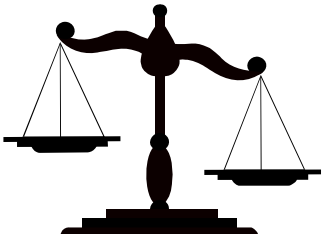

Assessment sheet for 'eco' building materials

Sometimes it's hard to know just how 'eco' a product is and which materials are best. Often we have to rely on the manufacturer's information, which can be biased and incomplete.

However, there are some commonsense criteria. The checklist on the following page contains the most important, and if you fill it out for the materials you are considering, it will help with your decisions. Photocopy the list (use recycled paper) and fill it out for every material. Everything being equal, the more 'Yes' ticks, the more 'eco' your product.

Of course this method is simplified and you should also consider any other criteria you are concerned about. There are endless things to take into account, such as embodied energy, water use, resource depletion and environmental standards in the country of origin.

When two materials you are evaluating have the same score, you could do some more research to help your decision. But often the choice is not easy, there are no clear answers, and you need to make the choice you are most comfortable with.

One conflict that often occurs is the choice between a local material and a material from Europe or America that is more environmentally friendly. The local material is not transported as far, supports the local economy, and often it is cheaper and it is easier to obtain information about it.

However the first question you should ask yourself is: 'Will this material do the job I want it to do? ' It makes no sense to choose a material just because it is environmentally friendly, when it will not perform. This means that it will have to be replaced in the future, using up more valuable resources.

If you need any help or if you would like some information on materials available here in New Zealand, please contact:

The Waitakere City Council on 839 0400, ask for the Eco-Design Advisor

Of course we would also love to hear from you if you have found any new and exciting materials or building practices.

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Does this material come from a renewable resource? Yes ☐ No ☐

Renewable resources are things that regenerate, such as properly managed timber, cork or bamboo. An example of a non-renewable resource is fossil fuels or products derived from it, such as plastics.

Was the material made or grown locally? Yes ☐ No ☐

Locally made products require less transport and therefore less energy and fossil fuel input. They also support our local economy (Buy Waitakere).

Is the material durable and of high quality? Yes ☐ No ☐

Durable materials don't need to be replaced as often, so resources are conserved.

Is the material safe (non-toxic)? Yes ☐ No ☐

Some people argue that some materials might compromise your health, such as: formaldehyde, solvent-based paint and treated timber. Look for safer alternatives or minimise their use where practicable.

Is the production of the material safe/eco-friendly? Yes ☐ No ☐

Avoid products that use large amounts of energy in production or cannot be recycled or reused at the end of their life. Minimise the use of products that include toxic components, such as treated timber. For some materials you also need to look at the extraction, such as for aggregates, or clay for bricks. You should also consider the health, safety and wellbeing of the production workers. Choose products that are made from recycled materials or reuse second-hand materials, such as old bricks or windows.

Is the disposal of the product safe? Yes ☐ No ☐

Every material becomes waste one day. Avoid materials that will become hazardous waste. Choose materials which can be reused or recycled, or those which are biodegradable.

Are you sure about your answers? Yes ☐ No ☐

This accounts for the uncertainty, be honest!
If you are not sure, you could be missing an important effect.
Asbestos and ozone-depleting chemicals are examples that show it is better to be safe than sorry!