

## Life Cycle Assessment (LCA) and buildings

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### Greenprint for Sydney 1999

Material selection is an important component of 'green construction', with designers and developers increasingly expected to consider the 'cradle to grave' environmental implications of their choices, i.e. related to the materials' extraction, manufacture, use and disposal. This includes issues such as:

- source size or renewability of the raw materials - eg whether an ingredient is in limited supply, whether timber is from a sustainably managed source, how much recycled material is used in the product, etc;
- environmental damage during extraction - such as open-cast mining or clear-fell forestry;
- energy use in manufacture - for example a tonne of aluminium might require five times more energy to produce than a tonne of steel, or nearer a hundred times more than a tonne of bricks<sup>1</sup> ;
- pollution and waste produced during manufacture - solid, liquid, or gaseous, toxic or non-toxic, etc. In Europe, for example, 20% of all hydrocarbon air pollution comes from the manufacture and use of synthetic petrochemical paints; manufacture and use of plasticisers, for example for PVC, release significant quantities of phthalates into the environment - now thought to affect human hormone production;
- transport energy - such as related to use of Canadian timber, bricks from the Northern Territory, etc;
- length of life and maintenance requirements - ie whether the material will last five years or fifty, whether it needs to be repaired or repainted regularly, and so on;
- affects on human health - both on the workforce ('Painter's Syndrome') and occupants ('Sick Building Syndrome'), from normal use (eg from lead, asbestos, formaldehyde, and many more), but also 'abnormal' impacts, such as toxic emissions in fires; and
- recyclability at the end of the product's life.

### LCA developing in New South Wales

In response to this growing awareness, Sydney's Environmental Guidelines for its Olympic developments called for building components to be subject to consideration of *"environmental implications during their manufacture, use and disposal."*

Life Cycle Assessment is a rapidly advancing body of knowledge, responding to a need to quantify such effects objectively and scientifically, instead of depending on often conflicting assumptions and opinions, from the different sides of the environmental debate.

Increasingly the approach is also being used to evaluate whole buildings, rather than just individual materials or components - for example, including environmental impacts of fuel selection and energy use. Thus in the field of greenhouse gases LCA has the potential to help choose building materials to reduce emissions from both use and construction - and was used in this way by Multiplex, as part of its tender for the Olympic Stadium. Such quantitative analysis tools are likely to gain increased importance following the Kyoto agreement.

International standards are being developed to standardise LCA processes, but the discipline is still at an early stage, and it may be some years before it is widely available and accepted. However, Sydney should take the lead.

### **Facilitating wider acceptance**

The 1997 Earth Council review of the Olympic Coordination Authority's environmental performance thus noted that tenderers had been requested to perform LCA on their design and material choices - though *"hampered by the fact that ... LCA is still at a relatively rudimentary stage internationally, and remains a time-consuming and often subjective process"*.

Beyond the Olympic developments, the NSW Public Works Department, for example, has already installed LCA software, which it has applied to a number of state-funded projects. Australian building product manufacturers, moreover, are beginning to investigate LCA, in the recognition that this can bring benefits to their own operations - such as through improved resource efficiency and improved public accountability - as well as to the environment.

A national *Institute of Material Accountability and Sustainability* (IMAS) has also been proposed<sup>2</sup>, with an intention to place Australia in a leadership position, globally, in regard to LCA and sustainable industrial production. Experience from Sydney's Olympic developments would seem to offer a potential database of green design choices to feed into such a process, as well as supporting development of improved 'green product' data, to better inform the building industry.

An ESD procurement strategy for public buildings could expand on the Olympic and PWD initiatives, requiring all government departments and agencies to develop LCA-based environmental specifications for their construction projects. Such processes for public sector buildings would be likely to encourage significant cultural change in the broader commercial development sector - where many of the same architects, contractors, engineers, manufacturers and suppliers also operate.

<sup>1</sup>. though it should be noted that the big advantage of aluminium is in its capacity for producing very light-weight components.

<sup>2</sup>. by a consortium based around the Cooperative Research Centre for Waste Management and Pollution Control, at UNSW. The IMAS would be a cooperative venture, established through joint government and industry funding. Interest in collaboration has already been indicated by a wide range of other CRCs, universities, industry bodies and government agencies.

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