



Sustainability in Design – Positive Outcomes

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Buildings are a significant contributor to energy usage in construction and operation and waste from demolition

UN Sustainable Buildings & Construction Initiative estimates that buildings are responsible for:

- 40% of total global greenhouse gas emissions
- Consuming 32% of the world's resources
- Consuming 12% of the world's water usage
- Producing 40% of waste going to landfill

The built environment offers significant potential for greenhouse gas and waste abatement

Sustainability for the built environment is defined as (UN):

“reduction in environmental impact (resource minimisation) whilst improving economic returns and extending community amenity of the built environment”

Many governments have introduced policies to encourage energy efficiency in the building sector - the drive to reduce energy usage, water usage and waste, and save money

Small increases in the sustainability of buildings, can have significant impact on their life-cycle energy consumption and future costs

The building sector is also able to provide some of the most affordable forms of greenhouse gas reductions through better designed commercial and residential buildings

Building Codes worldwide are changing to introduce recommendations or mandating requirements for sustainability in buildings (so called “green buildings”)

The drivers for sustainable design in buildings will only increase and potentially impact on every design in the future

The fire research and design community are slow to embrace sustainability in design for buildings, addressing materials and specific areas only (fire water etc)

Where are we heading ?

Fire safety design may require both safety and sustainability in the future



- **What is a “green building” ?**

- Reduced embodied energy
 - Low carbon, or zero carbon, or carbon neutral buildings
 - Energy efficient buildings
 - Reduced emissions
 - Ecologically sustainable development (ESD)
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- Sustainability in design and operation = Green building = reduction in emissions and energy consumption



■ **What are the drivers for green buildings ?**

- Green buildings can:
 - Reduce carbon dioxide emissions by more than 35%, and in some cases can be carbon neutral
 - Reduce waste output by 70%
 - Water usage by 40%
 - Energy usage between 30-50%, and in some cases producing energy that can be sent back to the grid

- The property industry is well placed to deliver significant long-term environmental improvements using a broad range of measures, both in design and through the life of the building

- United Nations is calling for a 40% improvement in energy efficiency from existing buildings by 2020 – voluntary goal
- Within many countries the drive for green buildings is not through compulsory federal / state requirements, but through tenants, architects and engineers, with government support (typical for most countries) – economic drivers required
- Within some countries / states (NZ, Aus, Germany, Scandinavia, parts of Canada and parts of the USA), the drive for green buildings is coming from building owners, tenants, architects and engineers, but with strong (and historical) support from local, state and federal governments requiring compulsory LEED / Green Star ratings

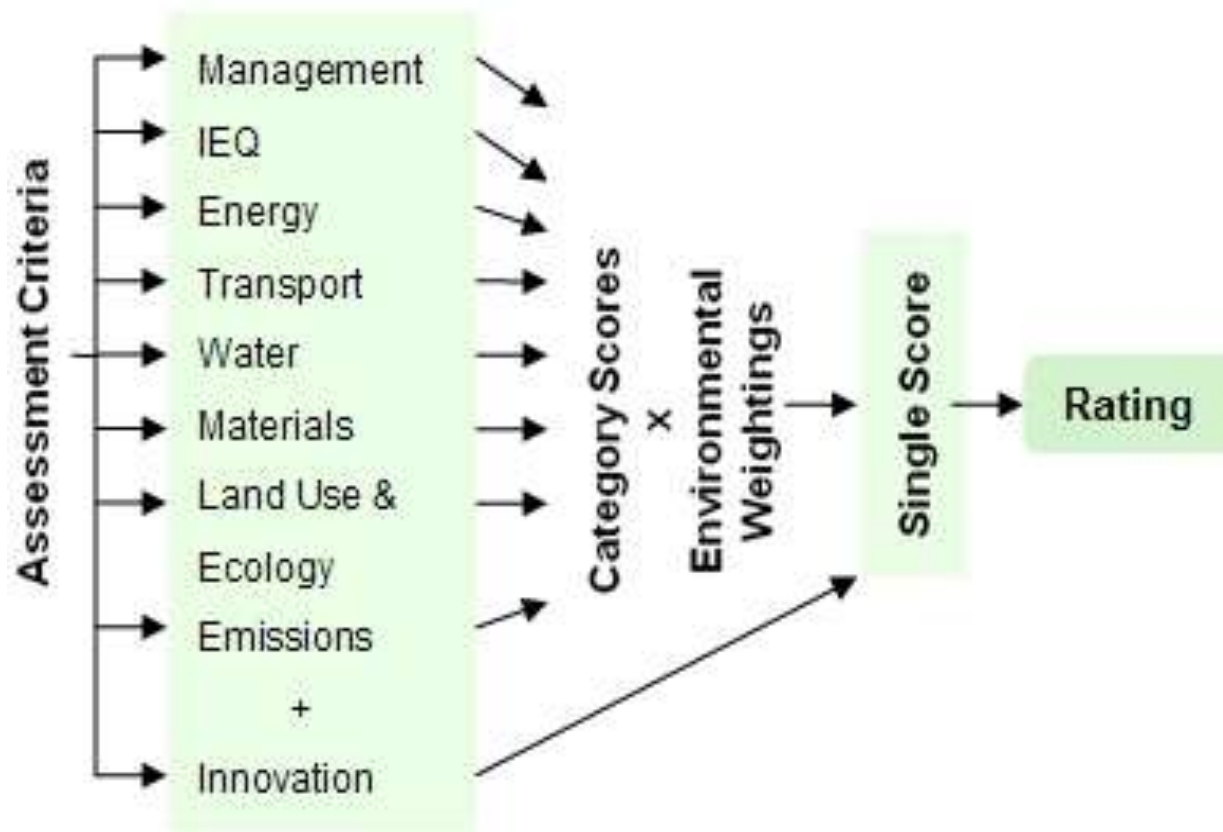
A high-angle, wide shot of a modern, multi-level atrium. The space is characterized by its extensive use of wood for flooring and railings, and glass for balustrades. The architecture is open and airy, with multiple levels connected by stairs and walkways. In the foreground, a large planter box contains various green plants. People are seen walking on the upper levels, and a seating area with tables and chairs is visible on the right. The lighting is bright and even, highlighting the clean lines and natural materials of the interior.

- How do we measure “green” ?

- There is substantial evidence that green buildings are of monetary value to owners and tenants
- Government support is a significant driver for cost-effective solution development
- The measured benefits of green buildings are (UN):
 - Operating costs can decrease by 8 to 9 per cent
 - Building values can increase by 7.5 per cent
 - Return on investment can improve by 6.6 per cent
 - Occupancy ratio can increase by 3.5 per cent
 - Rent ratio can increase by 3 per cent

- Design ratings tools:
 - Green Star, BREEAM, LEED – **Predictive**
 - Green Star “performance”, National Australian Built Environment Rating System, NABERS – **Performance**

- Green Star, LEED, BREEAM assesses the proposed environmental impact that is a direct consequence of a project's site selection, design, construction and maintenance:



- Categories are divided into credits and points are awarded in each credit for actions that demonstrate that the project has met the overall objectives of the rating system. For example for Green Star.
 - 4 Star ratings are classed “Best Practice”
 - 5 Star ratings are “Country Best Practice”
 - 6 Star ratings are “Worlds Best Practice”

- Why ratings systems ?
 - To increase awareness of sustainability
 - Provide a means to compare buildings and tenancies
 - Encourages competition in the property market
 - Added value to long term property investments and returns

- Allows owners, tenants and government bodies to state their minimum requirements for buildings i.e. Australian Government requires new offices and leases to have a minimum 5 star NABERS rating

- Fire protection is not accounted for in sustainability rating systems

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- A photograph of a modern, multi-story building interior. The space is characterized by a large, open atrium with a high ceiling and a glass skylight. Multiple levels of balconies with glass railings are visible, creating a sense of verticality and openness. The architecture is clean and contemporary, with white walls and large glass panels. The lighting is bright, highlighting the architectural details and the overall spaciousness of the environment.
- **How are new and existing buildings getting high ratings (designing green) ?**

- Passive design (orientation / sunshine)
- Reduced waste
- Greater use of natural light (atria)
- Substitution for more efficient refrigeration
- Adoption of appliances with a low standby energy use
- More efficient heating and cooling mechanical systems
- Better insulation
- Improving air conditioning systems efficiency and including 'economy' cycles
- Intelligent facades (double skin, composite glazed systems)

- Use of natural ventilation where possible
- The use of more efficient centralised equipment
- The use of efficient light fixtures
- Upgrading to more efficient water heating systems
- Use of co and tri-generation (using heat discharged from on-site power generation for water heating, and for absorption air-conditioning etc)
- Purchasing green power
- Designing to use (performance design)
- Activity based working (workers without a fixed desk)

- In summary:
- Green buildings are here to stay, are of value and will increasingly be requested by owners, tenants and governments
- Building codes will have more mandated requirements for sustainable design in the future, impacting on everything from a building's orientation to the materials used in linings
- Ratings systems to predict and measure sustainability are very effective, with building-in-use systems becoming more utilised
- Rating systems do not take into account the positive benefits that fire protection measures may provide, over the life of a building
- The fire protection community has also not provided sufficient independent research to show the “green benefits” of fire protection