Overview of green building: opportunities and constraints
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GREENBUILDING are designed and developed with much greater consideration for the full lifecycle of the building than conventional ones. Their target is to minimise construction impacts, use less resources and be healthier during the operation phase and also be suitable for recycling and minimisation of waste. They should even be designed for long life and adaptability to different uses. This concept embraces a big number of aspects such as design and management choice of materials, building performance as well as interaction with urban and economic development and management. Different approaches are followed according to the local socio-economic context; in some countries priority is given to resource use (energy, materials, water, and land use), while in others social and economic issues are the more determining factors.
GREENBUILDING in Europe opinion

- EU established in the last years a lot of directives imposing specified energy standards to all new buildings and substantially renovated structures
- An EU commission is developing a strategy to widespread very low energy/carbon footprint within 2015
- Norway, Finland, Luxembourg: the environmental quality of building materials is well established and greenbuilding debate is concentrated on energy efficiency
- Switzerland, Slovenia, Czech Republic and Liechtenstein are strengthening the role of materials’ certification in the construction sectors
- UK and Germany: the debate about energy efficiency is grown enough and leaves space to environmental qualities of materials
- Italy issued a law supporting only energy savings and officially there is no link with environmental qualities of building materials
- There is a need for a more strategic approach in EU legislation in the areas of environment and health within the framework of sustainable construction
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GREENBUILDING in North America opinion

- In US and Canada the building assessment schemes, as LEED or GBC, are widespread, with more other green building systems.
- In 2007, with the introduction of LEED certification for residential buildings, the green markets have notably increased despite the slump in US construction.
- In US green building requirements apply almost exclusively to government buildings or government-financed structures, that are in good part LEED standard certified. Adoption of green building practices remains largely voluntary for builders of dwellings and other non-governmental structures.
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INDOOR AIR Q.
ENERGY
WATER
MATERIALS
LAND USE
SUSTAINABLE SITE

ECONOMY
ENVIRONMENT
SOCIETY

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ENVIRONMENT
- Oil prices' hikes are creating new markets for energy wood and biofuels, as they are considered as renewable sources

![Graph showing the share of renewable energy consumed in the EU: status and targets, 2005, 2011 and 2020.]

Source: Commission of the European Communities, 2008.
- Rising use of wood for energy generation is triggering concern in some regions about sustainability of planned higher levels of biomass removal.
- EU says that biofuel production should be environmentally sustainable so a physical tracking will be required.
- Renewable energy from food crops is excluded, so wood and other lignocellulosic materials supplying renewable should arise on less fertile land.
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- The Renewable Energy and Climate package 2008 also stipulates an overall reduction of greenhouse gas emissions by 20% in 2020, along with a 20% increase in energy efficiency.
- Recently, an EU drive towards a new “Passivhaus level” of energy efficiency by 2015 has agreed at a European Summit meeting.
- Tackling climate change doesn’t mean only energy efficiency and renewable fuel (zero energy) but even building materials and products with low and renewable embodied energy (carbon neutral).
MATERIALS

- The Renewable Energy and Climate package 2008 also stipulates an overall reduction of greenhouse gas emissions by 20% in 2020
- As average operating energy for buildings goes down, the embodied portion of the equation goes up

Embodied energy content in houses built with different materials

Source: Athena institute, Forintek, Canada

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Energy is not the only important embodied effect. Some environmental impacts are almost entirely a function of product manufacturing.
Some green building programmes in North America use single attributes of materials as indicators of environmental preferability (recycled content, rapidly renewable, consumption or pollution of water), established intuitively rather than scientifically. In order avoid this, an LCA methodology should be adopted.

### Water

<table>
<thead>
<tr>
<th>Material</th>
<th>Energy Use</th>
<th>Greenhouse Gas</th>
<th>Water Pollution</th>
<th>Resource Extraction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood</td>
<td>4 GJ x 10^8</td>
<td>750 Equivalent CO₂ (Tons)</td>
<td>1</td>
<td>30</td>
</tr>
<tr>
<td>Steel</td>
<td>7</td>
<td>1050</td>
<td>165</td>
<td>35</td>
</tr>
<tr>
<td>Concrete</td>
<td>5.5</td>
<td>1300</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>

Source: Athena institute, Forintek, Canada
Engineered wood products are highly efficient in use of material and can incorporate wood residuals recovered from the manufacturing process as well as wood from fast-growing and under-utilised tree species.

SOLID WASTE CONTENT IN HOUSES BUILT WITH DIFFERENT MATERIALS
Source: Athena Institute, Forintek, Canada
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- Prefabrication systems can assume quality in building sector, avoiding volumes of construction wastes and hazards on building sites. They requests a more accurate design but they help in reducing building costs. Transport of heavy and big elements can be logistic constraints.
- Wood can be reclaimed from decommissioned buildings and re-used directly, an increasing niche activity, or chipped into low-grade uses or burned as fuel.
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Many researches support the benefits to human health and productivity from green features such as day-lighting, increased natural air ventilation, moisture reduction, and the use of low-emitting materials, interior finishes and furnishings. There is an increasing demand of labelling system for construction materials in EU.

<table>
<thead>
<tr>
<th>Buildings</th>
<th>Savings (€/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduced Allergies and asthma (based on a reduction of 8 to 25% of medical costs)</td>
<td>3-6</td>
</tr>
<tr>
<td>Reduced Sick building Syndrome symptoms (based on 20-50% reduction and 2% productivity improvement)</td>
<td>15-45</td>
</tr>
<tr>
<td>Increased productivity by comfort related improvements (based on 0.5-5% increase in worker performance)</td>
<td>30-240</td>
</tr>
</tbody>
</table>

Source: European Construction Technology Platform
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**HEALTH**

Poor indoor air quality exacerbates asthma, allergies, and the spread of influenza, and is the cause of sick building syndrome and contributes to Legionnaires’ disease. In the United States, the annual cost of building-related sickness is estimated to be $58 billion.

**COMFORT**

Source: Carnegie Mellon University Center for Building Performance, 2005

**HEALTH GAINS FROM IMPROVED INDOOR AIR QUALITY**

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Contest

- Air pollution
- Bio-tech farming
- Consumer design
- Deforestation
- Endangered species
- Globalization
- Global warming
- Greenwashing
- Hazardous waste
- Over-consumption
- Poverty
- Transportation
- Urban sprawl
- Waste management
- Water pollution

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Direct environmental impacts that result from the construction of buildings include greenhouse gases and other air emissions, water use and discharge, storm water runoff, impacts related to building materials, solid waste, indoor and outdoor air quality. Secondary impacts are generally associated with building product lifecycles, infrastructure development, and transportation systems.

GLOBAL WARMING POTENTIAL IN HOUSES BUILT WITH DIFFERENT MATERIALS

Source: Athena institute, Forintek, Canada

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ECONOMY

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- A building’s initial construction costs typically may represent only 20 to 30% of the building’s entire costs over its useful life, underscoring the need to consider even the operating costs through the whole life of the building and not only for the first 10 years.
- Developers are not interested in paying for green features when the benefits will be passed on to the new owners— but they can recoup the additional costs in the sale price or project income realized.
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The insurance sector can link their premiums to adoption of responsible management.

The National House-building Council uses a “premium rating” mechanism associated to the ability of contractors to construct good quality homes that do not cause problems to their owners, and “premium refunds” given to builders at the end of the ten-year warranty period for homes which have not given rise to claims during that period. One way of addressing this is to promote the use of quality schemes, often linked to insurance or warranty arrangements.
Overview of green building: opportunities and constraints

**COSTS**

- A survey by the World Business Council for Sustainable Development finds that real estate and construction players estimate the green additional cost at 17% above conventional construction, more than triple the true average cost of approximately 5%.

- The cost premium to deliver sustainable building has declined considerably in recent years, even thanks to the prefabrication, but there is a cost to organizations to gain the experience necessary to achieve it.

![Graph showing average green cost premium vs. level of green certification for offices and schools.](image-url)
Overview of green building: opportunities and constraints

**COSTS**

- Many key decisions are taken on the basis of the lowest costs instead of quality, safety and environmental criteria and life-cycle costs. There is a need to offer solutions at the advantage of both the clients and the industry. “Economical Most Advantageous Tender” (EMAT) and Life-Cycle Costing should be included.

- In Germany the government supports the construction of passivhaus buildings with 100% mortgages at fixed interest rate below the rate bank. Similar arrangements are applied to renovations. The level of financial support for renovation is given on a sliding scale according to carbon footprint achieved. It is to be hoped that this example could be followed on environmental assessment basis.
INFORMATION

- Companies and their trade associations want to demonstrate their corporate responsibility, both social and environmental, in order to send a signal to their customers. Certified products provide the building sector and consumers with the assurance that a product comes from a well-managed and legal source.
- While certified products and chain-of-custody continue to gain traction with architects and builders, these have not yet been incorporated into current building codes.
- A problem in certification is that all green building programmes require certification of wood, and wood only. This is the case despite well known environmental issues associated with the sourcing of all materials. It also makes sense that when certified construction materials are required or given preference as a matter of public policy, such certification or similar requirements should be uniformly applied to all materials.
Overview of green building: opportunities and constraints

GREEN IS THE NEW GOLD: if Tesco and Walmart have become friends of the earth, are any enemies left? (George Monbiot)
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THANK YOU FOR YOUR ATTENTION
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