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to *Innovation...*

'Green Building' - a trend or a reality?

ELORIN Conference

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National Research
Council Canada

Conseil national
de recherches Canada

Canada

“And what of us humans? we are hardly inconsequential;
..... With patience and clarity, we formulate great concepts
and theories, With insight and sensitivity we create
poetry, music, art and architecture.....

At the same time however, with incomprehensible stupidity, we
befoul and destroy our home, this beautiful planet, in a
greed-fueled quest for growth and development at any cost.

.....

Today, although living in a so called enlightened world and
unable to feign ignorance, society wears blinkers while
continuing to follow resolutely in the footsteps of our past.”

The Construction Industry

The construction industry:

- consumes 35-40% of energy
- produces 30% of the greenhouse gases
- consumes over 50% of primary natural resources
- generates over 25% of solid waste

- Canadians spend about 90% of their time in buildings

- approximately 12.5 million residential homes and around 500,000 commercial / institutional buildings

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what is “green building or green product

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Green Building is the industry's way of not "following resolutely in the footsteps of our past" as the Keoughs put it.

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want these buildings to have little negative impact on its human occupants and on the outside environment.

Many green building issues are just common sense.

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green building attempts to balance the
triple bottom line – the outcomes for
environment, social and economic
performance

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Integrated Design Process

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Canadian Green Building Council (CaGBC)

***Leadership in Energy and Environmental
Design***

**Green Building Rating System
(LEED)**

Credits or points are organized in the five principal categories:

- **Sustainable Site Planning (22%)**
- **Water Efficiency (8%)**
- **Energy Efficiency, Renewable Energy and Atmosphere (27%)**
- **Materials and Resources (conservation & efficient use) (20%)**
- **Indoor Environmental Quality (23%)**

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Identical **LEED** certification levels on different buildings would not likely be indicative of identical “green” building characteristics.

Other rating systems

- **Go Green / Go Green Plus**
- **Green Globes**
- **Green Building Challenge**
- **Green Leaf**
- **BREAM**
- **International Initiative for a Sustainable Built Environment**
- **NABERS**
- **Audubon Green Leaf™ Eco-Rating Program**
- **EUROPROSPER**

Life Cycle Analysis

fundamental to justifying the triple bottom line

fundamental in the decision-making process

‘cradle (to cradle) to grave’ analysis

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Challenges of rating systems

Risks of Green Building

Barriers to Green Building



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“while most of us want to protect the environment, we operate in an economic system that encourages us to harm it. Our moral and economic motivations point in opposite directions.”



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Many activities are delivered
cooperatively and separately by
government technology groups within
NRCan,
Public Works Government Services
of Canada,
and the **National Research Council.**



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National Research Council (NRC)

http://www.nrc-cnrc.gc.ca/main_e.html

Institute for Research in Construction (IRC)

http://irc.nrc-cnrc.gc.ca/index_e.html

Industrial Research Assistance Programme (IRAP)

http://irap-pari.nrc-cnrc.gc.ca/main_e.html

Institute for Research in Construction (IRC)

- **Sustainability and Climate Change, Mitigation & Adaptation, Green Buildings and Life Cycle Performance.**
- **Healthy Buildings**
- **Infrastructure**
- **Indoor Environment.**

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- **Concrete is the most used construction material in the world.**
- **Annual global production of concrete** is about 5 billion cubic yards.
- **Portland cement is manufactured by**
- igniting (at 1300-1500°C) a mixture of raw materials, mainly composed of limestone (calcium carbonate) and other aluminium silicates such as clays and shale.

**Cement production is a leading
contributor
to
green house gas production**

- **accounting for about six per cent of the
annual global total**

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Supplementary Cementing Materials (SCM)

Engineering Economic and Ecological benefits

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Environmental benefits

The production of every tonne of Portland cement results in the release of a nearly equivalent amount of carbon dioxide to the atmosphere

Engineering benefits

- **improve the workability**
- **reduce the water requirement at a given consistency**
- **an enhancement of ultimate strength,**
- **impermeability, and**
- **durability to chemical attack.**
- **improved resistance to thermal cracking**
- **increased tensile strain capacity**

Economic benefits

- **SCMs are industrial byproducts**
- **cost significantly less than Portland cement.**

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Natural Resources Canada (NRCan)

Office of Energy Efficiency

<http://www.oeenrcan.gc.ca/english/>

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ecoENERGY Renewable Initiative

ecoENERGY Retrofit Initiative

ecoENERGY Technology Initiative

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Public Works Government Services Canada (PWGSC)

<http://www.tpsgc-pwgsc.gc.ca/comm/cn-cu-eng.html>

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NRC's Industrial Research Assistance Program

http://irap-pari.nrc-cnrc.gc.ca/main_e.html

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NRC Key Construction Sector

IRAP Construction Sector Team

Economics of Green Building

Seven kinds of costs

1. **Capital costs**
2. **Operating costs**
3. **Life cycle costs (as opposed to life cycle analysis)**
4. **Productivity costs**
5. **Property value increase**
6. **Retail sales increase**
7. **3rd party costs (infrastructure, GHGs, health costs,.....)**

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Think globally

.....act locally

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**‘green building’ has grown up
more than a trend
could stand on its own feet**

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Adaptation



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“The stakes are so high, the implications so profound, and the results so very worthwhile for ourselves and future generations if we act expeditiously.”

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Thank you.

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