Canada-Italy: 
Arctic Science and Technology Collaboration Workshop

SUSTAINABLE BUILDING DESIGN 
IN DIFFERENT CLIMATIC ZONES

Wednesday, October 22, 2014

Ottawa Convention Centre
55 Colonel By Drive
Rooms 209 and 210

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01. SUSTAINABLE BUILDING IN ITALY THROUGH EUROPEAN DIRECTIVES

02. BUILDING SUSTAINABILITY ASSESSMENT

03. COLLABORATION PROPOSALS ITALY-CANADA
ABOUT SUSTAINABILITY

INTERNATIONAL OBJECTIVE OF CONSTRUCTION SECTOR:

LIMIT THE ENVIRONMENTAL IMPACT OF BUILDINGS

HOW?

- Save resources
- Avoid pollution
- Reduce energy consumption and CO$_2$ emissions
- Provide comfortable and healthy living space for users
- Minimize life cycle costs of construction
SUSTAINABLE BUILDING DESIGN IN DIFFERENT CLIMATIC ZONES

SUSTAINABLE BUILDING IN ITALY THROUGH EUROPEAN DIRECTIVES

EUROPEAN DIRECTIVES

DIRECTIVE 2002/91/EU
- Methodology of calculation of the integrated energy performance of buildings
- Setting of minimum requirements on the energy performance of buildings
- Energy certification of buildings
- Regular inspection of heating and of air-conditioning systems

DIRECTIVE 2006/32/EU
Energy Efficiency Action Plan to maximize efficient end use of energy:
- Provide necessary targets as well as mechanisms, incentives and institutional, financial and legal frameworks
- Remove existing market barriers and imperfections

DIRECTIVE 2009/28/EU
Promotion of use of energy from renewable sources

ITALIAN IMPLEMENTATION

Energy performance verification
Mandatory Thermal Transmittance limits
Mandatory Sun shade and Solar Thermal System

DPR50/2009
Confirmation of the minimum requirements of DLGS 192
Minimum cooling energy performance standard requirements

DM 26/06/2009
National Guidelines for Energy Certification

DLgs 155/2008
Volumetric increase is allowed for more insulated envelope and floor slabs
No DIA (mandatory documentation addressed to municipality for beginning design) if thermal solar and photovoltaic systems are used

DLgs 28/2011
New buildings have to supply part of the electric and thermal energy needs with renewable sources
**EUROPEAN DIRECTIVES**

**DIRECTIVE 2010/31/EU**
- Improvement of energy performance considering:
  - external and internal climatic conditions
  - optimal cost levels

**Objective: Nearly zero-energy buildings**
- As of 2021 new buildings in the EU will have be NZEB
- As of 2019 all new public buildings
- Mandatory energy certification advertisements

**ITALIAN IMPLEMENTATION**

**DL 63/2013 and Law 90/2013**
- Evaluation of economical feasibility: Best cost-effectiveness
- Mandatory energy performance certificate

- NZEB: all new public buildings as of 2019 and as of 2021 all new buildings
- National programs for increasing the number of nearly zero-energy buildings by 31/12/2014
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TOWARDS A BETTER LEVEL OF SUSTAINABILITY

WHAT IS REQUIRED TO FACILITATE MARKET MOVEMENT TOWARDS A BETTER LEVEL OF SUSTAINABILITY AND NEARLY ENERGY ZERO BUILDING?

Synergic actions and initiatives of all stakeholders of building sector: experts, users, politician, big companies, family house owner.
TOWARDS BETTER LEVEL OF SUSTAINABILITY

HOW?

Common language to evaluate both environmental and construction complexity

BUILDING SUSTAINABILITY ASSESSMENT IS A CRUCIAL TOOL TO FACE THIS COMPLEXITY
SUSTAINABLE BUILDING DESIGN IN DIFFERENT CLIMATIC ZONES

BUILDING SUSTAINABILITY ASSESSMENT

GREEN BUILDING CHALLENGE

R&D international process

- Started in 1996
- Included more than 25 countries
- Involved Italy and Canada

- Common international methodological approach (SBMethod)
- Sustainability evaluation and certification tool, suitable for any local conditions (SBTool)
<table>
<thead>
<tr>
<th>Country</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>CSTB</td>
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<tr>
<td>U.S.A.</td>
<td>Department of Energy</td>
</tr>
<tr>
<td>Canada</td>
<td>NRC</td>
</tr>
<tr>
<td>Japan</td>
<td>Utsunomiya University</td>
</tr>
<tr>
<td>Italia</td>
<td>ITC-CNR+iiSBE IT</td>
</tr>
<tr>
<td>South Korea</td>
<td>Ministry of Environment</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Cheng Kung University</td>
</tr>
<tr>
<td>Norway</td>
<td>Norwegian Building Research Institute</td>
</tr>
<tr>
<td>Sweden</td>
<td>Royal Institute of Technology</td>
</tr>
<tr>
<td>Germany</td>
<td>University of Karlsruhe</td>
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<td>Netherlands</td>
<td>Novem</td>
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<td>Argentina</td>
<td>University of Buenos Aires</td>
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<td>South Africa</td>
<td>CSIR</td>
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<td>Australia</td>
<td>University of New South Wales</td>
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<td>Austria</td>
<td>Ökologie Institut</td>
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<tr>
<td>Finland</td>
<td>Motiva</td>
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<td>Greece</td>
<td>University of Thessaloniki</td>
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<td>China</td>
<td>University of Hong Kong</td>
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<td>Poland</td>
<td>University of Warsaw</td>
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<td>UK</td>
<td>BRE</td>
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<td>Israel</td>
<td>iiSBE Israel</td>
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<tr>
<td>Mexico</td>
<td>GBC Mexico</td>
</tr>
<tr>
<td>Brasil</td>
<td>University of San Paolo</td>
</tr>
<tr>
<td>Chile</td>
<td>Chilean Chamber of Construction</td>
</tr>
</tbody>
</table>
SUSTAINABILITY ASSESSMENT TOOL

**AIM**
Evaluation of building sustainability level

**HOW**
Analysis of performance using criteria based on objective indicators. Their values are calculated or measured with specific instruments.

**RESULT**
Assessment and rating
BUILDING SUSTAINABILITY ASSESSMENT

STRUCTURE OF ASSESSMENT TOOLS BASED ON SBMETHOD

THEMATIC AREAS
(higher level)

A. Site selection, project planning and urban development
B. Energy and Resource Consumption
C. Environmental Loadings
D. Indoor Environment Quality
E. Service Quality
F. Socio-economic aspects

CATEGORIES
(intermediate level)

B.1. Total Life Cycle Non-Renewable Energy
B.2. Electrical Peak Demand
B.3. Renewable Energy
B.4. Materials
B.5. Potable water
B.6. Passive cooling

CRITERIA
(detail level)

B.5.1 Use of potable water for site irrigation
B.5.2 Use of potable water for occupancy needs
**ASSESSMENT CHECK**

- **Select of criteria from a general masterlist with a contextualization process concerning:**
  - Specificity of local context (climatic, political and economical)
  - Use destination of building
  - Possibility to provide objective evaluation of criteria

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**MASTERLIST**

<table>
<thead>
<tr>
<th>A</th>
<th>Site Selection, Project Planning and Development</th>
<th>GENERAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1.1</td>
<td>Pre-development ecological value or sensitivity of land.</td>
<td>√</td>
</tr>
<tr>
<td>A1.2</td>
<td>Pre-development agricultural value of land.</td>
<td>N/A in Italy - local regulation</td>
</tr>
<tr>
<td>A1.3</td>
<td>Vulnerability of land to flooding.</td>
<td>N/A in Italy - regional regulation</td>
</tr>
<tr>
<td>A1.4</td>
<td>Potential for development to contaminate nearby bodies of water.</td>
<td>N/A - to be developed</td>
</tr>
<tr>
<td>A1.5</td>
<td>Pre-development contamination status of land.</td>
<td>√</td>
</tr>
<tr>
<td>A1.6</td>
<td>Proximity of site to public transportation.</td>
<td>√</td>
</tr>
<tr>
<td>A1.7</td>
<td>Distance between site and residential occupancies.</td>
<td>N/A - to be developed</td>
</tr>
<tr>
<td>A1.8</td>
<td>Proximity to commercial and cultural facilities.</td>
<td>N/A - to be developed</td>
</tr>
<tr>
<td>A1.9</td>
<td>Proximity to public recreation areas and facilities.</td>
<td>N/A - to be developed</td>
</tr>
<tr>
<td>A2.1</td>
<td>Feasibility of use of renewables.</td>
<td>N/A - just for pre-design</td>
</tr>
<tr>
<td>A2.2</td>
<td>Use of Integrated Design Process.</td>
<td>N/A in Italy - no IDP</td>
</tr>
<tr>
<td>A2.3</td>
<td>Potential environmental impact of development or re-development.</td>
<td>N/A in Italy - national regulation</td>
</tr>
<tr>
<td>A2.4</td>
<td>Provision of surface water management system.</td>
<td>N/A in Italy</td>
</tr>
<tr>
<td>A2.5</td>
<td>Availability of potable water treatment system.</td>
<td>N/A in Italy</td>
</tr>
<tr>
<td>A2.6</td>
<td>Availability of a split grey / potable water system.</td>
<td>N/A in Italy</td>
</tr>
<tr>
<td>A2.7</td>
<td>Collection and recycling of solid wastes in the community or project.</td>
<td>√</td>
</tr>
<tr>
<td>A2.8</td>
<td>Composting and re-use of sludge in the community or project.</td>
<td>N/A in Italy</td>
</tr>
<tr>
<td>A2.9</td>
<td>Site orientation to maximize passive solar potential.</td>
<td>N/A - just for pre-design</td>
</tr>
</tbody>
</table>
Establish reference performance with which to compare those of building

<table>
<thead>
<tr>
<th>Performance</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Performance below of standard practice</td>
<td>-1</td>
</tr>
<tr>
<td>Standard practice</td>
<td>0</td>
</tr>
<tr>
<td>Moderate improvement of standard practice</td>
<td>1</td>
</tr>
<tr>
<td>Significant improvement of standard practice</td>
<td>2</td>
</tr>
<tr>
<td>Best practice</td>
<td>3</td>
</tr>
<tr>
<td>Moderate improvement of best practice</td>
<td>4</td>
</tr>
<tr>
<td>Excellence</td>
<td>5</td>
</tr>
</tbody>
</table>

- Legislative framework
- Technical standards
- Scientific literature
- Statistical analysis
- Simulation model
Assign percent weights to all levels of evaluation (thematic areas, categories and criteria)

- Climatic, social and economic context
- Policy choices
- Technical choices related to extent, intensity and duration of environmental impact
SUSTAINABLE BUILDING DESIGN IN DIFFERENT CLIMATIC ZONES

BUILDING SUSTAINABILITY ASSESSMENT

MAIN CHARACTERISTICS OF THESE ASSESSMENT TOOLS

1. Evaluate sustainability level in relation to local context
2. Analyze quality in terms of performance
3. Consider the whole life cycle
4. Support integrated design process
SUSTAINABLE BUILDING DESIGN IN DIFFERENT CLIMATIC ZONES

BUILDING SUSTAINABILITY ASSESSMENT

SUPPORT INTEGRATED DESIGN PROCESS

- Definition of performance targets
- Selection of optimal energy and environmental design strategies
- Monitoring of behaviour of use stage building to guarantee sustainability level reached at design stage
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Vision:
“A Europe where high quality living in a sustainable built environment is common standard practice”.

Mission:
- Facilitate the diffusion and adoption of sustainable built environment principles
- Involve all stakeholders of building sector in using harmonized assessment systems
On the 1st of July 2014 the European Commission published the COM(2014) 445 calling for the establishment of a common flexible framework of core indicators that consider the whole building life cycle.

Need for action coincides with the CESBA goals and philosophy
Common Sustainable Building Assessment in Alpine Regions
Development of a set of harmonized regional assessment tools to be validated in public initiatives

Planning Sustainable Neighborhoods
Development, integration and test of assessment tools at urban scale in urban planning processes

Funding programs:
✓ Interreg Alpine Space,
✓ Interreg Central Europe
✓ Interreg MED
✓ Europe H2020
Common Sustainable Building Assessment: R&D process Italy-Canada to develop core indicators for the evaluation of sustainability level in Arctic climate.

Standardized calculation method to compare building performance.

Transnational minimum building monitoring to face the complexity of NEZB.
THANK YOU!

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