OPEN HOUSE – Benchmarking & Mainstreaming Building Sustainability in the EU

REHVA Annual Conference 2011, Tallinn, Estonia
May 20, 2011

Prof. Dr.-Ing. Holger Wallbaum, ETH Zurich, Switzerland

Overview

I. General Information Certification Systems

II. Overview OPEN HOUSE

III. OPEN HOUSE Partners

IV. Overview Work Packages & Tasks

V. Parallel Project SuPerBuildings

Swiss Federal Institute of Technology Zurich

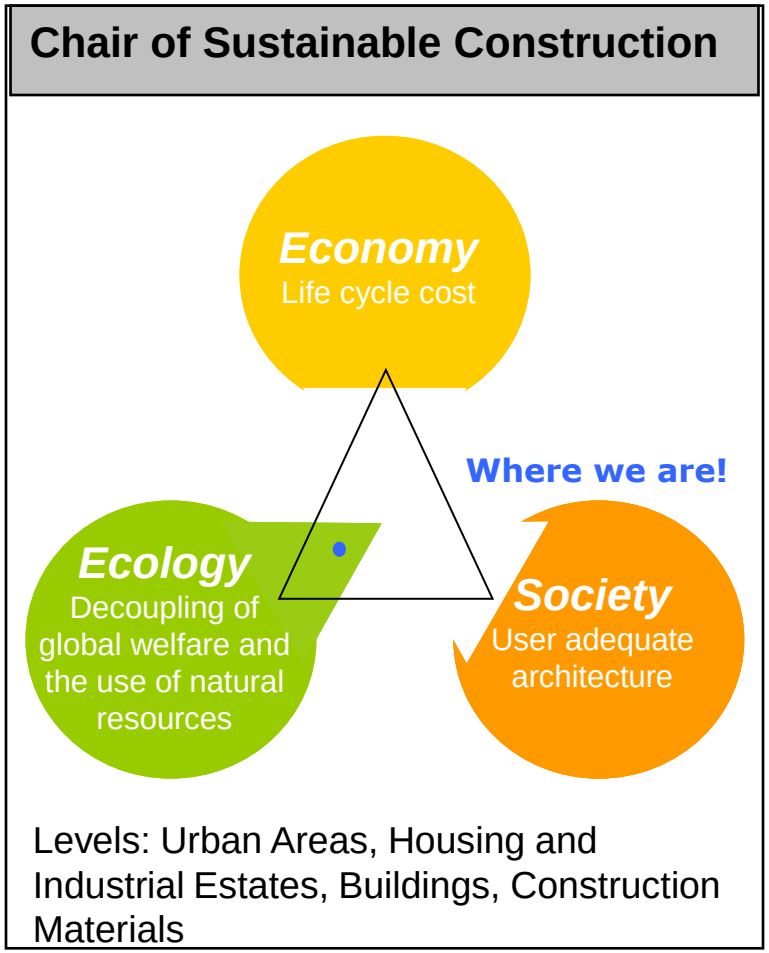
- One of the most prestigious scientific and technical universities in the world.
- 18'000 people from 80 nations (researcher, students, staff…).
- About 400 professorships in 16 departments.

The **Chair of Sustainable Construction** is at the

- Department of Civil, Environmental and Geomatic Engineering within the
- Institute of Construction and Infrastructure Management.

Welcome to Zurich!

Chair of Sustainable Construction



Main research areas:

- Concepts and instruments for sustainable construction (LCA, LCC, SLCA…)
- Sustainable construction materials, building products and processes
- Advanced Building Stock Modelling
- Indoor environmental quality
- Sustainability in Low Cost Housing
- Socio-cultural dimensions of sustainable construction
- …

The 20-20-20 Targets

In January 2008, the European Commission presented a legal package on climate protection the **20-20-20 targets**. The proposals focus on a restrictive climate and energy policy and set new goals.

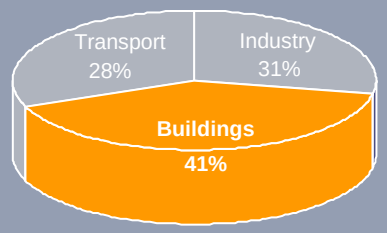
By **2020**, **Europe** shall thus:

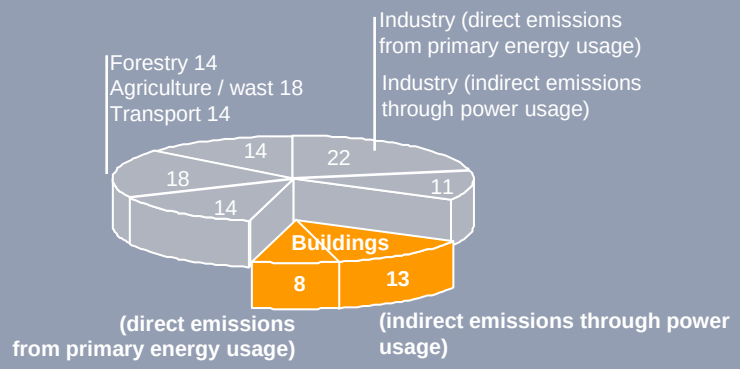
- **20%** GHG emissions (compared to 1990)
- **20%**Renewable resources
- **20%**Primary energy use (compared to projected levels)

Source Picture: www.fuelcelleurope.org/index.php?m=4&sm=16

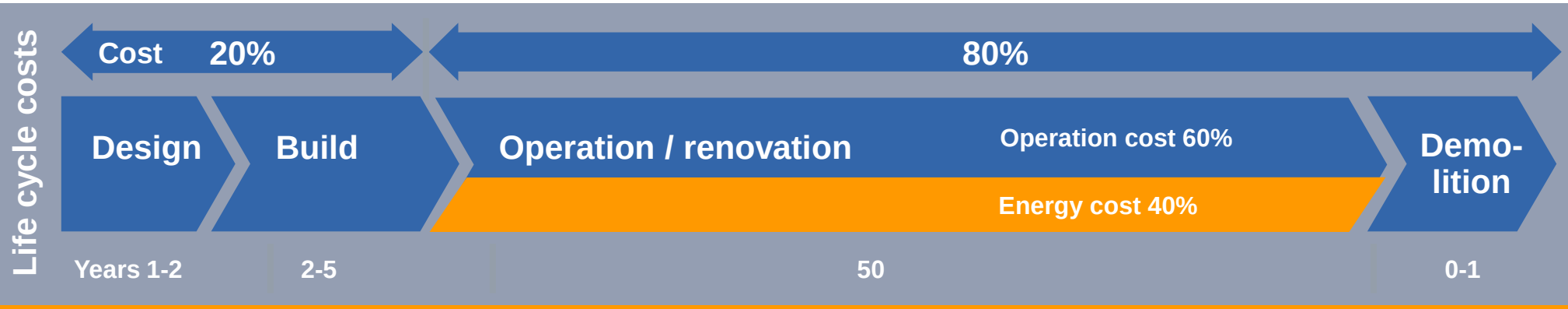
Main drivers over the entire life cycle

Energy efficiency and Building Performance





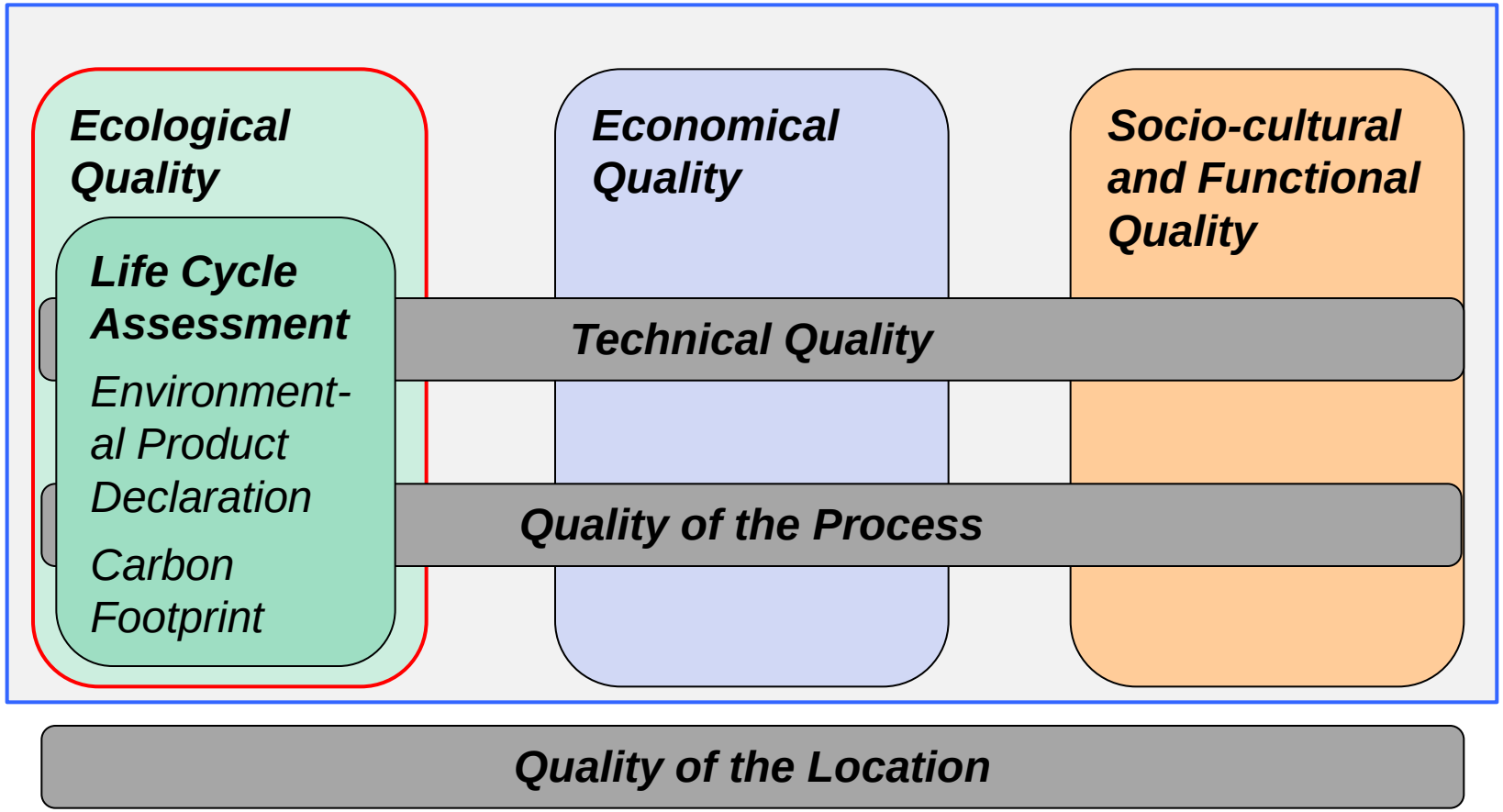
40% of all energy world wide is consumed in buildings



Up to 40% of life cycle cost of a building is consumed in energy

Building Certification Systems

Structure & Processes



1. Generation System: "Green Buildings"

2. Generation System: "Sustainable Buildings"

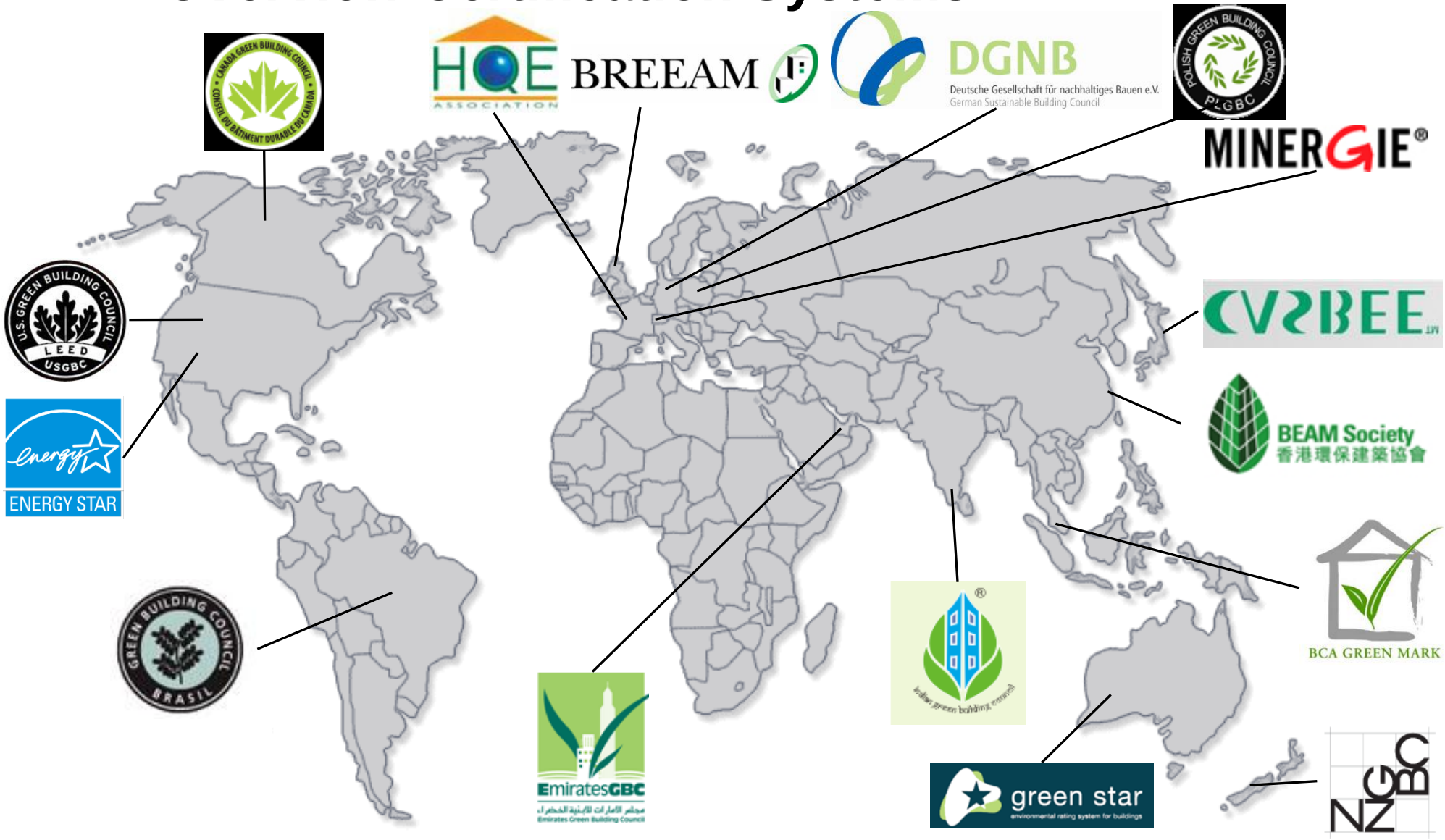
Source: DGNB

Development Certification Systems

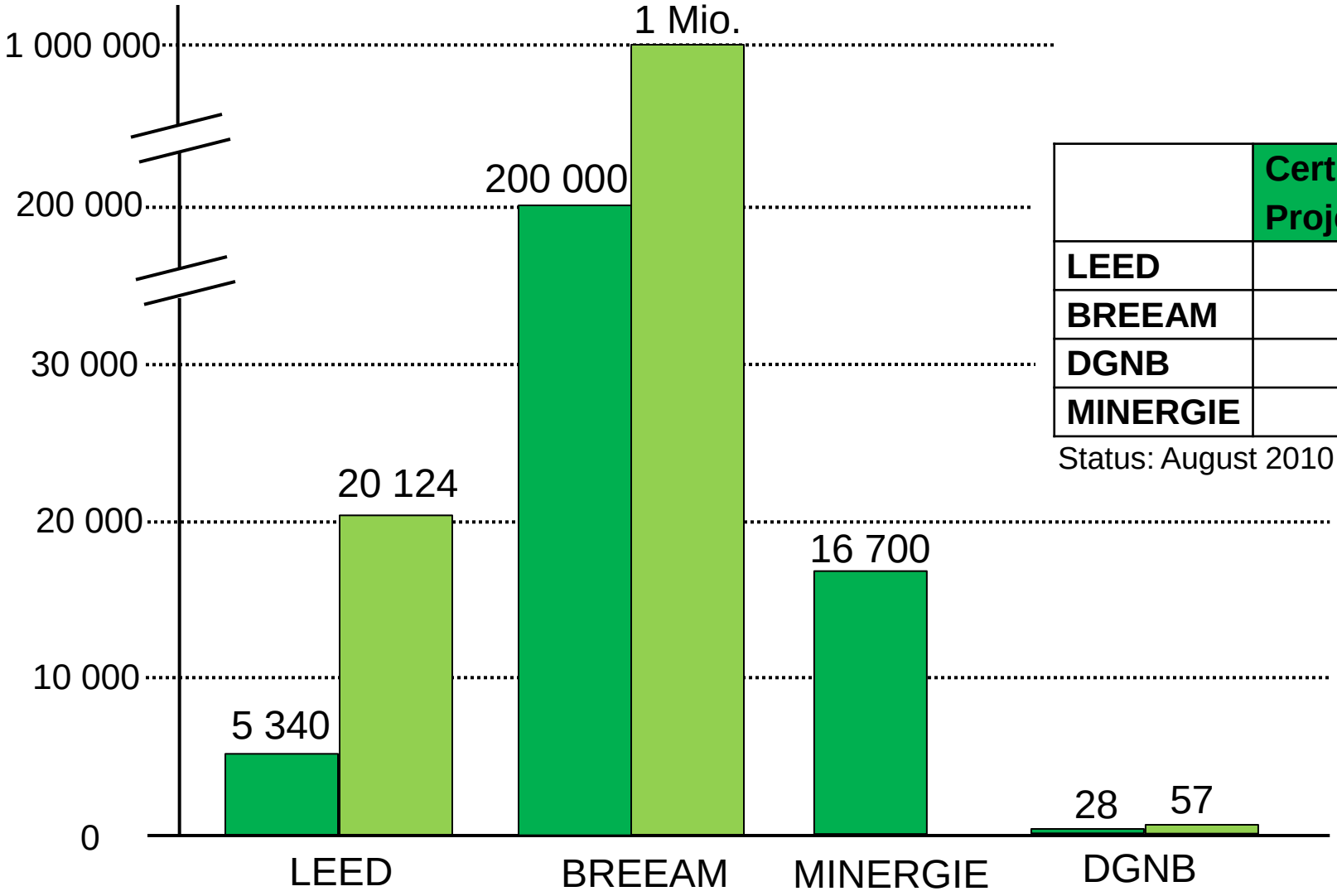
1990	1996	1998	2001	2002	2004	2005	2006	2007	2008	2009	2010
											DGNB International
											BREEAM Spain
											BREEAM Russia
											BREEAM Lativia
		MINERGIE						DGNB	BREEAM Europe	LEED Mexiko	BREEAM France
BREEAM	HQE	LEED	CASSBEE	Green Star Australia	LEED Canada	BREEAM International	LEED Emirates	MINERGIE-ECO	LEED India	LEED Brazil	BREEAM Netherlands

Source: Figure in accordance to figure. 1.32 from «Zertifizierungssysteme für Gebäude», Detail Green Books, 2010

Overview Certification Systems



Current Certification Systems



	Certified Projects	Registered Projects
LEED	5 340	20 124
BREEAM	200 000	1 Mio.
DGNB	28	57
MINERGIE	16 700	-

Status: August 2010

Information

- **EU-Project:** 7th Framework Programme
- **Project full title:**

  Benchmarking and mainstreaming building sustainability in the EU based on transparency and openness (open source and availability) from model to implementation.
- **Duration:** Feb. 2010 – Feb. 2013
- **Reference:** FP7-ENV-2009-1
- **Related project:** SuPerBuildings
- **Coordinator:** Acciona Infrastructuras, Spain
- **Website:** www.openhouse-fp7.eu
- **Wikipedia:** http://en.wikipedia.org/wiki/OPEN_HOUSE

Partners 1/2

18 Organisation from 11 EU Countries:

- Large companies
- High-tech SMEs
- Research organisations
- End users
- Policy makers

OPEN HOUSE Partners 2/2

ETH Eidgenössische Technische Hochschule Zürich Swiss Federal Institute of Technology Zurich

Fraunhofer IBP

BOUYGUES CONSTRUCTION

Fundación Agustín de Betancourt

DGNB Deutsche Gesellschaft für Nachhaltiges Bauen e.V. German Sustainable Building Council

EDF

SP your Science Partner

ARCHITECTS' COUNCIL OF EUROPE CONSEIL DES ARCHITECTES D'EUROPE

ITB Building Research Institute

acciona Infraestructuras

Mostostal WARSZAWA

APINTECH SUSTAINABLE SOLUTIONS FOR THE INTERNATIONAL COMMUNITY

D'APPOLONIA

EUSKO JAURLARITZA GOBIERNO VASCO

ZRMK INSTITUT Gradbeni inštitut ZRMK d.o.o. Building and Civil Engineering Institute

ARUP

visesa

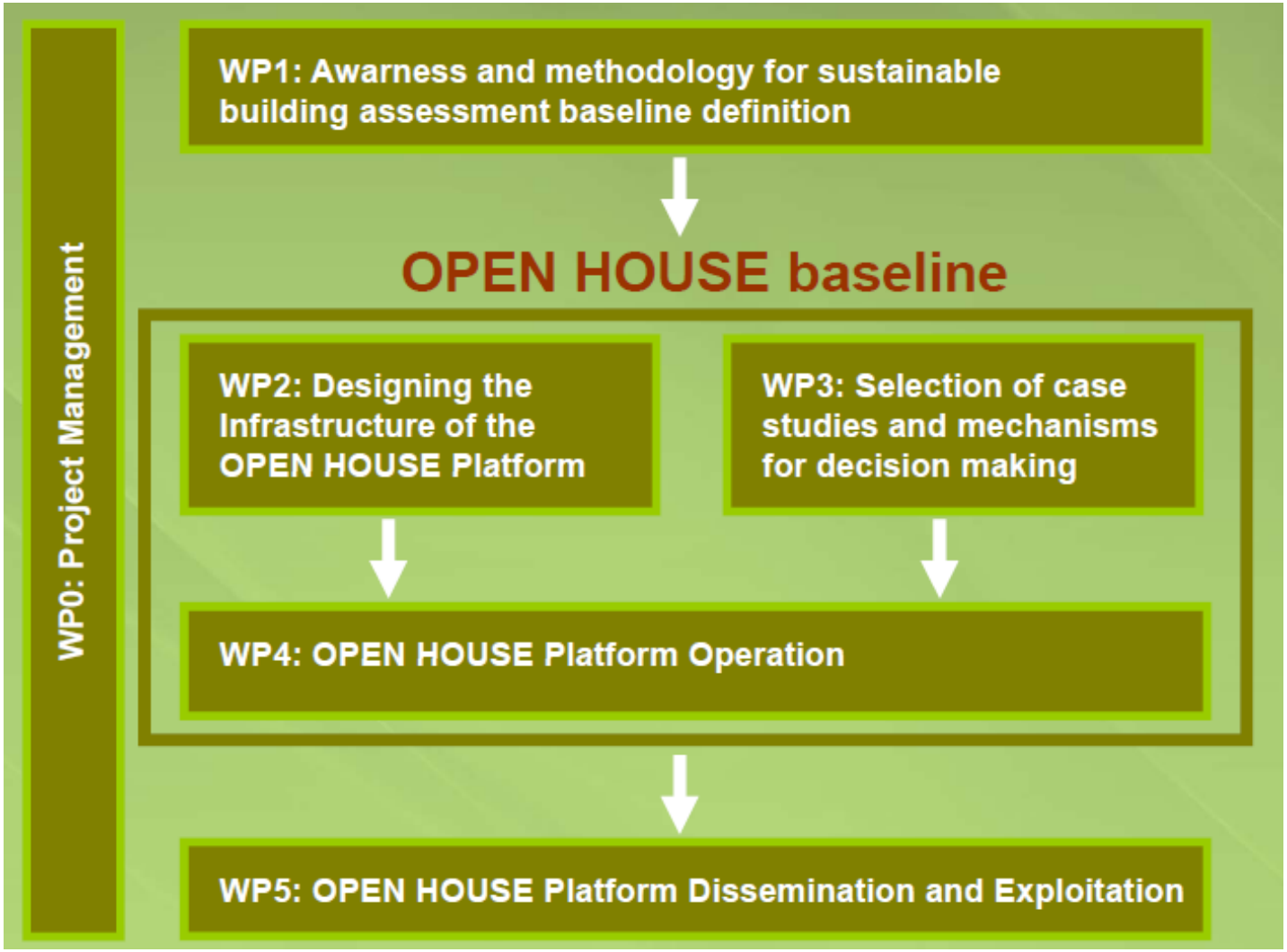
Overall Objective of OPEN HOUSE

Develop and to implement a common European transparent building assessment methodology, complementing the existing ones, for planning and constructing sustainable buildings by means of an open approach and technical platform.

Baseline OPEN HOUSE:

- **CEN/TC 350** and **ISO TC59/SC17**
- **EPBD** Directive and its national transpositions and methodologies for assessing building sustainability at international, European and national level.

Methodology



Source: Fraunhofer Institute for Building Physics (IPB), Presentation OPEN HOUSE, Consense, June 2010

Work Packages 1/2

WP 1: Awareness & Methodology for sustainable building assessment baseline definition (DGNB)

Define an open and transparent concept for building sustainability, “OPEN HOUSE baseline” and to widely communicate it among stakeholders.

WP 2: Designing OPEN HOUSE model and tools (APINTECH)

Create the conditions for the new methodology able to emerge into an effective moderator of a pan EU effort towards a common view on building sustainability making possible the use of the methodology by all the stakeholders of the whole value chain.

Work Packages 2/2

WP 3: Selection of case studies & mechanisms for decision making (ACE)

Implementing and evaluating the methodology: Selection of case studies, getting commitment from Public bodies for real cases and mechanism for decision making.

WP 4: OPEN HOUSE platform operation (FRAUNHOFER IBP)

Evaluate and refine the base line methodology by the feedback resulting from case studies and real sustainable public procurement cases and other stakeholders inputs.

WP 5: OPEN HOUSE platform dissemination and exploitation (CCS)

Further dissemination and secure continuity of the OPEN HOUSE open approach and current model assessment methodology status.

Tasks 1/2

WP 1: Awareness & Methodology (baseline definition)

Task 1.1: Creating awareness & mobilising public

Task 1.2: Analysis & Evaluation of existing methodologies and standards

Task 1.3: Definition of indicators & Sustainability performance levels

Task 1.4: Analysis & selection of Best Practices on green or sustainable public procurement

Task 1.5: Development OPEN HOUSE baseline

WP 2: Designing OPEN HOUSE Model and Tools

Task 2.1: Technical development, secure model & assessment methodology transparency on the web

Task 2.2: Building up interactive environments providing enabling technology to manage emerging collaborative environments

Task 2.3: OPEN HOUSE Platform

Tasks 2/2

WP 3: Selection of case studies & Mechanisms for decision making

Task 3.1: Tender process & selection of case studies outside the consortium

Task 3.2: Selection of case studies inside the consortium

Task 3.3: Getting commitment from public bodies for real building public procurement cases in the consortium countries

Task 3.4: Building up mechanisms for managing inputs of the Consortium

WP 4: OPEN HOUSE platform operation

Task 4.1: Case studies along Europe done by actors inside and outside the consortium

Task 4.2: Implementation of the refined methodology in real sustainable building procurement cases in the consortium countries

Task 4.3: Pre-Normative Research towards standardisation

Task 4.4: Final refinement of the model and assessment methodology

WP 5: OPEN HOUSE platform dissemination & exploitation

Task 5.1: Dissemination and training plans

Task 5.2: Exploitation & Continuity Plan

Responsibilities Case Studies

- **ACCIONA and VISESA (Spain):** Spain, Portugal, Malta, Ireland, Iceland
- **ACE (Belgium):** Belgium, Netherlands
- **APINTECH (Greece):** Greece, Bulgaria, Cyprus
- **BOUYGUES and EDF (France):** France, Hungary, Luxembourg
- **CCS and ZRMK (Slovenia):** Slovenia, Bosnia ,Croatia, Serbia
- **DAP (Italia):** Italy, Romania, Turkey
- **DGNB and IBP (Germany):** Germany, Austria, Denmark
- **ETH (CH):** Switzerland, Estonia
- **MOSTOSTAL and ITP (Poland):** Poland, Chequia, Slovakia, Lithuania, Letonia
- **SP (Sweden):** Sweden, Finland, Norway

OPEN HOUSE & Thermal Comfort

Indicator 2.3 Thermal Comfort (Draft!)

Consideration of:

- Operating Temperature
- Radiant Temperature and floor temperature
- Draught, air velocity
- Humidity in indoor air
- Sensation of Thermal Comfort (questionnaire)
- Controllability of thermal comfort systems

OPEN HOUSE & Thermal Comfort

Indicator 2.3 Thermal Comfort (Draft!)

Sub indicator	DGNB
Operating temperature (Winter, Summer)	1. Calculation - EN ISO 7726 2. Measurements – EN ISO 7726 3. Questionnaire – satisfaction 4. Thermal building simulation (DGNB) 5. Measurement in accordance with EN 15251 (DGNB) 6. Heating load calculations according to EN 12831 for buildings with a window area of < 40% of the interior surface (DGNB)
Radiant temperature asymmetry and floor temperature	In practice, the following guideline surface-temperature values can be applied to building components with large surface areas based on recommendations extracted from ISO 7730 (DGNB): - Ceiling, winter max. of 35°C, summer min. of 16°C - Glass façade surface/walls, min. 18°C - Glass façade surface/walls, max. 35°C - Floor, winter max. of 29°C, summer min. of 19°C
Drafts – air velocity	- Compliant with ISO 7730, Cat. B (DGNB): - Non-compliant - Buildings without HVAC systems are considered compliant
Relative humidity	The upper limit for absolute humidity (perceived humidity) of 12 g of water per kg of dry air should not be exceeded (DGNB): - Compliant - Non-compliant

OPEN HOUSE & Indoor Air Quality

Indicator 2.4 Indoor Air Quality (Draft!)

The following sub indicators will be assessed:

2.4.1 Indoor air contamination with the most relevant indoor air pollutants

2.4.2 Contamination levels of non-specific allergenic, pathogenic or toxic fungal spores

2.4.3 Indoor air quality – occupancy-based ventilation rates

2.4.4 Subjective reaction as classification of the indoor air quality

2.4.5 Recommended CO_2 concentrations above outdoor level

OPEN HOUSE & Indoor Air Quality

2.4.1 Indoor air contamination with the most relevant indoor air pollutants

Formaldehyde	→	high: >100 µg/m³ (public buildings), low: <10 µg/m³
Naphtalene	→	high: >10 µg/m³ (public buildings), low: *<2 µg/m³*
Toluene	→	high: *>250 µg/m³ (public buildings), low: <5 µg/m³*
Xylene	→	high: *>150 µg/m³ (public buildings), low: <5 µg/m³*
Styrene	→	high: *>30 µg/m³ (public buildings) , low: <2 µg/m³*

2.4.2 Contamination levels of non-specific allergenic, pathogenic or toxic fungal spores

European Union mold exposure standards (for apartments):

- Indoor mold spore counts of < 50/m³ very low
- Indoor mold spore counts of > 10000/m³ very high
- …

OPEN HOUSE & Indoor Air Quality

2.4.3 IAQ – Occupancy-based ventilation rates

- IAQ = Required level of ventilation. Ventilation in the building should considering all sources of pollution incl. material emissions and adequate air for every person.
- IAQ + ventilation rates are based on EN 15251, Annex B
- 4 categories (high, normal, acceptable level and outside the criteria) of recommended IAQ are given and for each category different values are established.
- Evaluation of IAQ is made by evaluating the indoor environment of typical rooms representing different zones in the building.

EN 15251 (2007) "Indoor environmental input parameters for design and assessment of energy performance of buildings- addressing indoor air quality, thermal environment, lighting and acoustics".

OPEN HOUSE & Indoor Air Quality

2.4.4 Subjective reaction as classification of the indoor air quality

- Use of subjective evaluations based on EN 15251.
- Occupants fill in the questionnaires during winter-spring-summer-fall.
- The percentage of people voting acceptable (air quality) is calculated for each of the spaces in the buildings.
- 80% positive votes = high air quality level.

2.4.5 Recommended CO_2 concentrations above outdoor level

- The levels are based on the recommended measured indoor CO2 concentrations above outdoor concentration for non-residential buildings with mechanical ventilation.

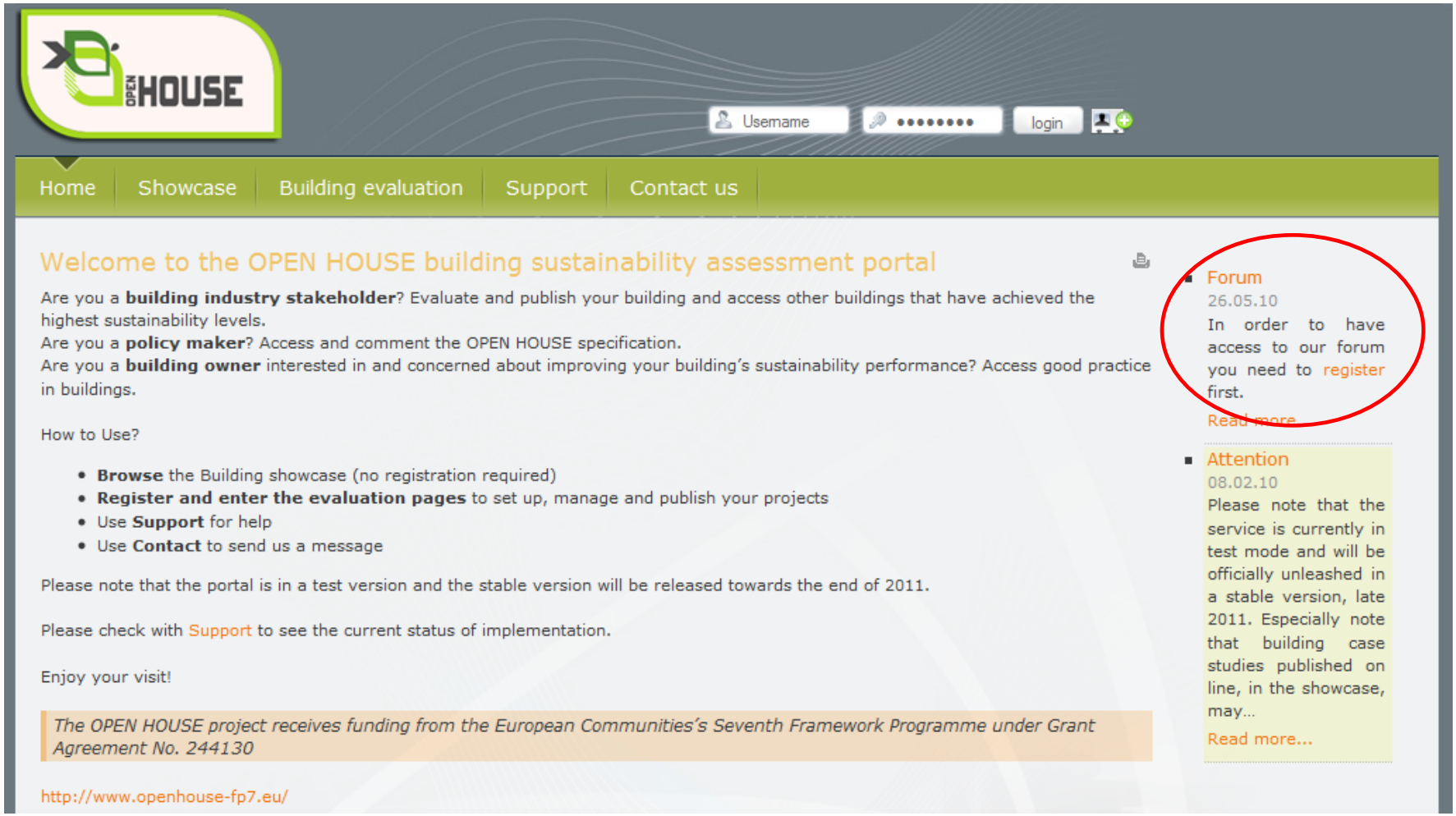
  >800PPM ➔ high CO_2 concentration

  350PPM< ➔ low CO_2 concentration

OPEN HOUSE Website

www.openhouse-fp7.eu

OPEN HOUSE Forum



http://openhouse.building-21.net/

Parallel Project SuPerBuildings 1/2

- **EU-Project:** 7th Framework Programme
- **Project full title:** **Su**stainability and **Per**formance assessment and benchmarking of **Buildings**.
- **Duration:** Jan. 2010 – Jan. 2013
- **Coordinator:** VTT Technical Research Centre of Finland
- **Website:** http://cic.vtt.fi/superbuildings/node/2

- **Main objectives:** Develop sustainability indicators for buildings, understanding about the needed performance levels considering new and existing buildings and methods for the benchmarking of sustainable buildings.

SuPerBuildings

Parallel Project SuPerBuildings 2/2

Consortium of 13 European stakeholders

Contact

Coordinator:	Acciona Infraestructuras S. A.
Project coordinator:	**Daniel Hiniesto Muñoz de la Torre**
Email:	dhiniesto@acciona.es
Phone:	+34 91 791 20 20

Partner CH:	Swiss Federal Institute of Technology Zurich
Contact:	**Prof. Dr. Holger Wallbaum**
Email:	wallbaum@ibi.baug.ethz.ch
Phone:	+41 44 633 28 01