

OPEN HOUSE: INDICATORS FOR SUSTAINABILITY OF BUILDINGS IN REGARD TO CLIMATE, POLITICAL, SOCIAL AND CULTURAL CONDITIONS

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Summary

The European project OPEN HOUSE aims at merging existing methodologies for sustainability assessment of buildings towards a common view. The research focused on harmonisation and developed a common structure composed of six categories and a set of 56 sustainability indicators on the basis of existing and recognised methodologies. The OPEN HOUSE methodology was tested with the help of 68 case studies distributed all over Europe to study its applicability in diverse climate, political, social and cultural conditions. A first feedback analysis reveals a great acceptance and assessment feasibility in Europe.

Keywords: building sustainability assessment; life cycle assessment; European standards;

1 OPEN HOUSE: harmonizing sustainability assessment in Europe

1.1 Need for an harmonized sustainability assessment in Europe

Buildings play a central role in societies and they will always do, but they are also responsible for important impacts on natural environment in terms of pollution and resources consumption. With the growing global population aspiring for high-level health and comfort, resources will have to be managed more efficiently in order to ensure a sustainable development. In particular, a life-cycle-thinking approach has to be adopted in the building sector in order to encourage decisions minimising long-term impacts.

Decision-making requires knowledge on building performance and many assessment methodologies have been developed world-wide to evaluate the sustainability of buildings.

In the last years, there has been a multitude of labels developed around the world to answer the high market demand for such building sustainability verifications. Many countries have developed their own tool based on national building standards, regulations and benchmarks.

More than 60 assessment methodologies have been identified in Europe [1] and this leads to a very fragmented market with a poor visibility of each label outside national boundaries. Moreover, the diversity of existing labels creates confusion on the market as there is no comparison possible between the results of these different assessments

Thus, to increase awareness and communication about sustainability in the building sector in Europe, a common European structure for building labels is needed, as well as

a practical tool to implement it. With European research projects like OPEN HOUSE [2] and SuPerBuildings [3] or the standardisation work of ISO TC 59/SC 17 and CEN/TC 350, a process has been initialised to harmonise the different approaches to building sustainability assessment.

1.2 OPEN HOUSE assessment methodology

The European project OPEN HOUSE has been established under the framework of a FP7 R&D programme by a European consortium of 19 partners from research institutions, the building industry and the political sector. Running from February 2010 to July 2013, its objective is to merge existing methodologies for sustainability assessment of buildings towards a common view.

One main part of an assessment is the communication of the results and OPEN HOUSE therefore proposes a harmonised framework based on standards and existing methodologies. The OPEN HOUSE methodology has been developed on the basis of renowned certifications like BREEAM [4], LEED [5] or DGNB Certificate [6], international initiatives like iiSBE [7] or SB Alliance [8] as well as standards from ISO TC 59/SC 17 and CEN/TC 350. It also includes outcomes from other EU projects, like LEnSE [9] or SuPerBuildings, with the adoption of a common structure for sustainability assessment of buildings. This structure is composed of six categories:

- Environmental Quality
- Economic Quality
- Social/Functional Quality
- Technical characteristics
- Process Quality
- The Location.

The three pillars of sustainable development are assessed with the same weight while other categories are evaluated separately (**Fig 1**).



Fig. 1 OPEN HOUSE categories for the sustainability assessment of buildings [10]

The OPEN HOUSE assessment methodology is composed of 56 sustainability indicators. They were selected after being tested for their acceptability and feasibility in different European countries. This set of indicators is optimised for office buildings and versions for other building types will be developed in the following phases of the project. Furthermore,

30 indicators were identified by the project partners as essential for the sustainability assessment and named ‘core indicators’. The list of indicators can be found in Fig 2.

		OPEN HOUSE Full Sytem	OPEN HOUSE Core System
Environmental Quality	1.1 Global Warming Potential (GWP)		
	1.2 Ozone Depletion Potential (ODP)		
	1.3 Acidification Potential (AP)		
	1.4 EutrophicationPotential (EP)		
	1.5 Photochemical Ozone Creation Potential (POCP)		
	1.6 Risks from materials		
	1.7 Biodiversity and Depletion of Habitats		
	1.8 Light Pollution		
	1.9 Non-Renewable Primary Energy Demand (PEnr)		
	1.10 Total Primary Energy Demand and % of Renewable Primary Energy		
	1.11 Water and Waste Water		
	1.12 Land use		
	1.13 Waste		
	1.14 Energy efficiency of building equipment (lifts, escalators etc.)		
Social / Functional Quality	2.1 Barrier-free Accessibility		
	2.2 Personal Safety and Security of Users		
	2.3 Thermal Comfort		
	2.4 Indoor Air Quality		
	2.5 Water Quality		
	2.6 Acoustic Comfort		
	2.7 Visual Comfort		
	2.8 Operation Comfort		
	2.9 Service Quality		
	2.10 Electro Magnetic Pollution		
	2.11 Public Accessibility		
	2.12 Noise from Building and Site		
	2.13 Quality of the Design and Urban Development of the building and Site		
	2.14 Area Efficiency		
	2.15 Conversion Feasibility		
	2.16 Bicycle Comfort		
	2.17 Responsible Material Sourcing		
	2.18 Local Material		
Economic Quality	3.1 Building-related Life Cycle Costs (LCC)		
	3.2 Value Stability		
Technical Characteristics	4.1 Fire Protection		
	4.2 Durability of the structure and Robustness		
	4.3 Cleaning and maintenance		
	4.4 Resistance against hail, storm high water and earthquake		
	4.5 Noise Protection		
	4.6 Quality of the building shell		
	4.7 Ease of Deconstruction, Recycling, and Dismantling		
Process Quality	5.1 Quality of the Project's Preparation		
	5.2 Integral Planning		
	5.3 Optimization and Complexity of the Approach to Planning		
	5.4 Evidence of Sustainability during Bid Invitation and Awarding		
	5.5 Construction Site impact/ Construction Process		
	5.6 Quality of the Executing Contractors/Pre-Qualification		
	5.7 Quality Assurance of Construction Execution		
	5.8 Commissioning		
	5.9 Monitoring, Use and Operation		
The location	6.1 Risks at the Site		
	6.2 Circumstances at the Site		
	6.3 Options for Transportation		
	6.4 Image and Condition of the Location and Neighbourhood		
	6.5 Vicinity to amenities		
	6.6 Adjacent Media, Infrastructure, Development		

Fig. 2 OPEN HOUSE indicators: Full system and Core system [11]

2 OPEN HOUSE case studies all over Europe

2.1 Overview of the case studies

In order to refine the methodology and identify national practices, the OPEN HOUSE assessment methodology has been tested in 68 case studies distributed all over Europe reflecting different climate, political, social and cultural conditions (see **Fig 3** and **Fig 4**). Two kinds of assessments have been conducted during the case studies:

- Basic & Quick Sustainability Assessment: to get a first idea of the sustainability level and propose actions to improve it. Evaluation of the building performance is based on assumptions.
- Complete Sustainability Assessment: to give a whole overview of the sustainability performance of a building. Evaluation of the building performance is based on detailed documentation.

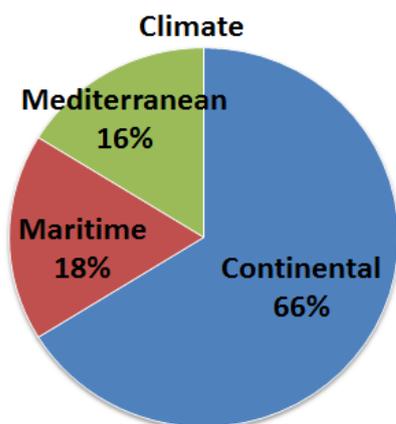


Fig. 3 Distribution of case studies relatively to climate conditions

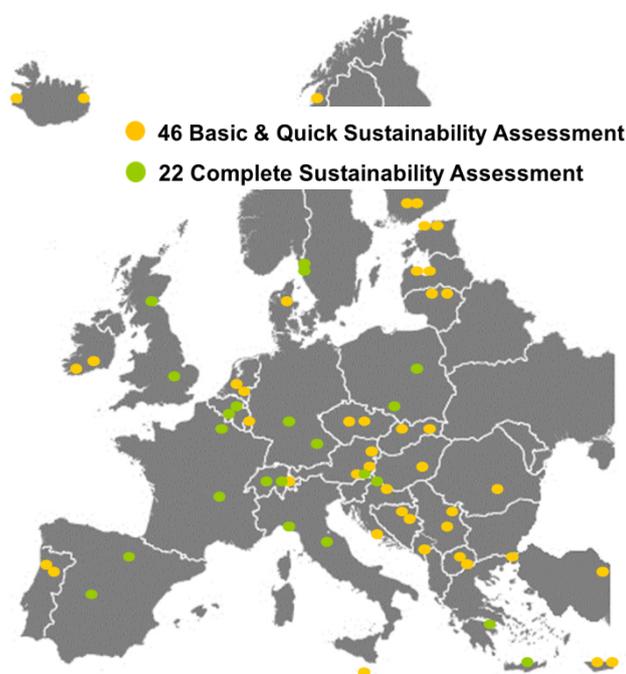


Fig. 4 Case studies all over Europe [11]

2.2 Analysis of the case studies

The feedback collected from the 68 case studies in 35 European countries is being analysed and will allow a general improvement of the assessment guideline as well as the integration of recommendations for national peculiarities in terms of calculation methods and documentation requirements.

Moreover, the collection of data from varying climate, political, social and cultural conditions will serve as a basis for the development of benchmarks at European and national level. In addition, thanks to feedbacks from around 50 sustainability experts, it will be possible to develop specific weights for each European country in order to take in account regional particularities and adapt the results of the assessment to local priorities.

A first analysis of the feedback reveals a high applicability of the set of indicators all over Europe even if barriers are sometimes met because of differences in building regulations and standards. The methodology is seen as very compliant with the experts' vision of sustainability assessment, covering all aspects in a comprehensive and holistic way. Therefore, a large majority of experts considers using the OPEN HOUSE methodology to conduct building sustainability assessments in the future, once the project is finalised and refined.

3 Conclusion

The refinement process of the OPEN HOUSE methodology started with the detailed analysis of the feedback from case studies, and will continue as an on-going process beyond the end of the project. The methodology will change as the research, technology and political landscape evolve.

The OPEN HOUSE project will give birth to a European methodology and open online platform for the sustainability assessment of buildings, providing free tools and guidelines as well as an open discussion platform. Therefore, it will set the basis for a better communication and comparison of building performance in European countries, paving the way for more sustainable construction practices.

Acknowledgement

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