ENERBUILD

Result 6.2-4

# ENERBUILD Tool: Transnational Pilot Testing on 46 Buildings and Experiences on Advisory Services

February 2012





Alpine SPACE
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# ENERBUILD Tool: Transnational Pilot Testing on 46 Buildings and Experiences on Advisory Services

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managing director of the NENA Network, planner and project manager, accompanying the Regional development association of Vorarlberg. With his office he supports organizations, regions as well as communities in the field of sustainable development of living habitats. He is president of the newly founded Institute for sustainable management of recourses.

## Introduction

In the future, it will be unavoidable to construct energetically optimized buildings. It is appropriate to edify these buildings as ecological as possible, considering the construction, their operation and their later disposal.

With the „ENERBUILD Tool", an Alpine-wide tool was designed that approves a simple and still informative energetic and ecological evaluation.

I am appreciated that the KGA (Kommunalgebäudeausweis Vorarlberg, a municipal buildings pass) could be developed by accompanying arrangements in the project ENERBUILD. The KGA can be designated as a model solution for sustainable construction in the public sector. Within the framework of the ENERBUILD project it was possible to evaluate the tool at 46 projects which means that the pool could be ensured. Furthermore, due to the ENERBUILD-project, 6 technical offices could be qualified as „KGA certification service".

The KGA was introduced in Vorarlberg in the beginning of 2011as a funding-relevant instrument. The levels of funding communities get for new construction and general refurbishment of public buildings depends on the amount of points obtained for the public building.

The ENERBUILD Tool is an „open-source-product". It is available for all European institutions as basis for appropriate adaptions and evaluations. The aim is not to implement the tool by 100% in all European countries. On the contrary, regional adaptions due to different climatic, legal and normative standards are required. But the classification scheme of the evaluation is supposed to be always the same. The ENERBUILD Tool can prosper if is applied and adapted in as many regions in Europe as possible.

Mayor. Ing. Rainer Siegele,
Chairman Umweltverband „Vorarlberg„

**Note on further results of ENERBUILD**

**Education**

- Overview of education programs and vocational trainings for energy saving and producing buildings in the Alpine Space

**Examination**

- Summarizing survey on existing buildings on healthy living with new and advanced construction technology
- Killer arguments and opportunities for energy-efficient construction and the passive house
- User habits, impact on energy consumption in passive houses - results of a comprehensive long-term measurement

**Efficiency**

- Certification of energy-efficient public buildings Summary of instruments in the Alpine Space
- Transnational comparison of instruments according to ecological evaluation of public buildings
- **ENERBUILD Tool: Transnational Pilot Testing on 46 Buildings and Experiences on Advisory Services**

**E-Producing**

- Synthesis on producing energy on buildings in the Alpine Space
- Green Electricity? - Yes, please! 100% local Green Electricity in combination with private funding for the development of power plants on buildings using the example of Vorarlberg
- Eco Power Stock Exchange – In-depth information for monitoring offices

**Innovation**

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# ENERBUILD Tool: Transnational Pilot Testing on 46 Buildings and Experiences on Advisory Services

## Preface

This report prescribes the results of the creation-process of the ENERBUILD Tool, its pilot application on 46 public buildings as well as its regional adaptation and integration in the subsidy system of the government of Vorarlberg for community based public buildings. It is the work done in the workpackage 6.2 and 6.3 of the ENERBUILD project.

A common tool for the evaluation of public buildings shall be

- the bases for exchange among experts from different regions
- the bases for the comparison for different regional standards for public buildings
- a practical attempt to harmonizes ecological assessment tools for public buildings in the Alpine region.

The goal was to learn from this process about the regional needs, the responsibilities for an European harmonization process, and the strength and weaknesses of the ENERBUILD-approach.

Public buildings have are role models for high quality in the building sector. The PPs decided themselves which pilot building they use. For this project a public building is a building on which a public authority defines directly the (ecological) quality of the building; all buildings that have a public use: schools, hospitals, offices, museums, even if they have a private owner; or could be a public owner with a private use (social housing); the public authority has to define the building performance target before the design process begin and follow it during the its several phase; for which we intend the result of planning design and work developed by public authority or private institution in order of public interest (a school, an institutional palace, a bank, a swimming pool, a museum, a barracks ...).

This report goes along with the comparison study in workpackage 6.1 and the feedback of the advisory service and certification body in workpackage 6.4 of the ENERBUILD project.

The work has been carried out by a team of 9 project partners coordinated by the lead partner Regional Development Vorarlberg. The team included: Rhônalpénergie-Environnement, Regione Piemonte, Energy Agency Upper Styria, Tyrolean Future Foundation, Provincia Autonoma di Trento, European Academy Bolzano (Eurac), Provincia di Alessandria and Central Swiss economy-directors-conference.

## Introduction

All participating regions have different experiences, tools and procedures for the assessment of buildings. In the project preparation the partners agreed to use the NENA-Tool as a base for the development of the common ENERBUILD -Tool. The base of the tool has been developed in the INTERREG IIIB project NENA and regional associations in Vorarlberg.

Since 20 years the Government of Vorarlberg applies and develops continuously a system of building assessments for nearly all housing buildings (new and refurbishment). This system is linked to the building law as well as to the governmental subsidy system. The objectives are highest building standards applied by building owners, SMEs and administration. Therefore the system should have low entry barriers, easy to adapte and low cost in the execution.

During the project the ENERBUILD Tool has been regionally adapted in Vorarlberg towards the KGA – Komunaler Gebäude Ausweis. Since January 2011 the Government of Vorarlberg has linked its subsidy system for community based public buildings (municipal office building, compulsory schools inclusive general-purpose and gymnasia, cultural halls, nursing homes) with the KGA.

Along with the tool a set of services, computation tools and data bases were developed. They can be used for public procurement and decision making processes. For the municipality that offers a transparent and comprehensible basis for the evaluation of the application of sustainability goals. Further it offers an understandable basis for communication and switching of the qualities of a public building.

The ENERBUILD Tool has been evaluated twofold:

**a) Comparision Study**

by the comparison study done by Andrea Moro (project partner Regione Piemonte) in workpackage 6.1: „The ENERBUILD Tool results well structured with regard to its scope: assessment of public buildings. In particular:

- the compact number of criteria facilitate its application on public buildings (time effective);

- the tool reflects all the sustainability issues: environmental, economic and social;
- the tool results well contextualized for the Alpine regions (well balanced weight distribution among the criteria);
- most of the criteria are quantitative (more objective assessment);
- the time and physical boundaries are aligned with the majority of the existing labels.

ENERBUILD Tool is already a synthesis of the most important building assessment criteria in the Alpine region, having been recognized by all the project partners. From ENERBUILD Tool it would be possible to extract the most significant indicators that could be part of the European common set.

**b) Pilot Assessments**

via 46 pilot assessments in different regions. The results of these pilot activities are shown in the following chapters.

# The ENERBUILD Tool

The ENERBUILD Tool and its catalog of criteria serves for to the documentation and evaluation of the energetic and ecological quality of newly built public buildings. The tool takes over on the one hand international standards (e.g. passive house standard) and/or on the other hand regional adaptable standards.

The tool can be easily adapted towards other building types or regional demands.

The evaluation of buildings takes place two steps:

- At the time of the submission
- At the time of the completion of building

The assessment of buildings is based on a point system of a maximum of 1.000 points. Those points are divided into five assessment categories:

| | | |
|---|---|---|
| A | Quality of location and facilities | max. 100 |
| B | Process and planning quality | max. 200 |
| C | Energy & Utilities | max. 350 |
| D | Health and Comfort | max. 250 |
| E | Building materials and construction | max. 200 |

In general these points exceed the maximum score per category and in total. Sometimes quality investments exclude each other while both are wise for fulfilling the general target. Therefore the investor shall have the possibility to choose without losing the opportunity to achieve maximum score. Too the strength in one category shall be limited and in harmony with the other categories.

In each evaluation column there are differently weighted criteria. The criteria are differentiated between must critera and auxiliary criteria. The sum of the scores of all single criteria of a column can lie more highly, than the maximum score specified above.

The tool illustrates the number area 0 to 1.000, whereby it is valid that higher sustainability standard is linked to higher points.

For the determination of the points of evaluation in the individual categories a manual with a detailed description is provided. The declaration of the building quality is based the criteria and its explanations in the manual. In the manual too the list of nessessary documents is specified. The documents are needed to counterproof the assessment by a certification body.

Individual categories are determined on basis by computation tools. For individual categories computation programs (Excel based tools e.g. Ecosoft 4.0.) are necessary for the calculation of the points.

# ENERBUILD Tool and existing labels

Andrea Moro, PP Piemonte discussed in the study „Transnational comparison of instruments according to ecological evaluation of public buildings", the position of the ENERBUILD Tool among other important assessment tools in the Alpine area. Following is an excerpt from this study.

(Criteria May 2010)

| Nr. | | Title | Must criterias (M); Minimum standard | max. Points |
|---|---|---|---|---|
| **A** | | **Quality of location and facilities** | | **max. 100** |
| A | 1 | Access to public transport network | | 50 |
| A | 2 | Ecological quality of site | | 50 |
| **B** | | **Process and planning quality** | | **max. 200** |
| B | 1 | Decision making and determination of goals | | 25 |
| B | 2 | Formulation of verifiable objectives for energetic and ecological measures | M | 20 |
| B | 3 | Standardized calculation of the economic efficiency | M | 40 |
| B | 4 | Product-management - Use of low-emission products | | 60 |
| B | 5 | Planning support ofr energetic optimization | | 60 |
| B | 6 | Information of users | | 25 |
| **C** | | **Energy & Utilities** | | **max. 350** |
| C | 1 | Specific heating demand (PHPP) | M | 100 |
| C | 2 | Specific cooling demand (PHPP) | M | 100 |
| C | 3 | Primary energy demand (PHPP) | M | 125 |
| C | 4 | $CO_2$-emissions (PHPP) | | 50 |
| **D** | | **Health and Comfort** | | **max. 250** |
| D | 1 | Thermal comfort in summer | | 150 |
| D | 2 | Ventilation - non energetic aspects | | 50 |
| D | 3 | Daylight optimized (+ lightening optimized) | | 50 |
| **E** | | **Building materials and construction** | | **max. 200** |
| E | 1 | $OI3_{TGH-lc}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building) | | 200 |
| | | | **Sum** | **max. 1.000** |

In the WP6.2/6.3 of the Enerbuild project, it has been implemented the ENERBUILD Tool, an interregional assessment tool to evaluate the environmental, social and economic performance of public buildings in the Alpine regions.

The base of the ENERBUILD Tool has been developed in the INTERREG IIIB project NENA and the region of Vorarlberg. The preliminary tool has been applied in the region.

The framework of the ENERBUILD Tool is the following:

## Users

| | |
|---|---|
| Designers | ■ |
| Consultants | ■ |
| Construction companies | ■ |
| Investors | ■ |
| Public institutions | ■ |
| Consumers / end -users | ■ |
| Researchers | ■ |
| Others (please specify) | |

As for all the other compared labels (excluding Protocollo ITACA Regione Piemonte), the potential users of ENERBUILD Tool are all the main stakeholders of the building sector.

## Time and physical extends

### Pysical boundaries

| | |
|---|---|
| Building | ■ |
| Site | ■ |
| Neighbourhood | |

As the majority of the compared labels, the physical boundaries ENERBUILD Tool are the building and its relative site. The tool is not applicable at the neighborhood scale.

### Time boundaries

| | |
|---|---|
| Pre Design | ■ |
| Design | ■ |
| Construction | ■ |
| Operation | |
| Refurbishment | ■ |
| Existing buildings | ■ |

As the majority of labels, ENERBUILD Tool is applicable to all life cycle stages of a building, excluding operation.

The building assessment takes place in two main stages:

- presentation of the design technical documentation for validation;
- construction completion.

The Pre-design phase is considered of particular importance in the tool and this aspect reflects the intended use of the tool mainly for public buildings.

### Building uses

| | |
|---|---|
| Residential/dwellings | ■ |
| Offices | ■ |
| Schools | ■ |
| Retail | |
| Industrial | |
| Healthcare | |
| Hotel | |
| Other (please specify) | |

Also in this case, ENERBUILD Tool as the majority of labels is applicable to the uses that generally are considered the most important: offices, schools and residential buildings.

## Structure of the assessment system

### Building use: all

| | |
|---|---|
| Number of hierarchic levels | 2 |
| Number of issues at top level | 5 |
| Number of issues at middle level | 0 |
| Number of criteria (low level) | 16 |
| Number of environmental criteria | 11 |
| Number of social criteria | 4 |
| Number of economic criteria | 1 |
| Percentage of quantitative criteria | 69% |
| Number of mandatory criteria | 5 |

The mean number of issues for the compared labels is 3. ENERBUILD Tool presents only two levels: assessment areas and criteria. This aspect reflects the simple structure of the tool that includes only 16 criteria. The compact size of ENERBUILD Tool should favour the time efficiency in its application.

The majority of criteria are related to the environmental issues. But, nevertheless the small total number of criteria in the tool, all the sustainability issues are taken in account.

The percentage of quantitative criteria is very high, in comparison with the labels analyzed in the study. This means that ENERBUILD Tool allows performing god objective assessments, requiring the calculation of many quantitative indicators. Most of the qualitative criteria are in the „Process and planning" assessment area that, in a coherent way, has more an educational scope.

The mandatory criteria indicate that the focus of the tool is on energy, that is considered the most important issue in the tool. At contrary, because ENERBUILD Tool is contextualized to Alps, there aren't criteria dealing with water consumptions. Water has not been considered a relevant sustainability aspect for buildings in the Alpine regions.

On the base of criteria weights in the tool, the most important criterion results to be the E1 „OI3TGH-Ic ecological index of the thermal building envelope (respectively OI3 of the total mass of the building)". The indicator associated to the criterion is quite complex and significant for the whole performance of the building with regard to construction materials. This is the reason of the high weight of the criterion. The energy issues are assessed by several criteria and their combined weight makes energy the most important aspect.

# ENERBUILD Tool and existing labels

**Criteria by issues (Environmental, Social, Economic)**

| Nr. | | Title | Environmental | Social | Economic |
|---|---|---|---|---|---|
| **A** | | **Quality of location and facilities** | | | |
| A | 1 | Access to public transport network | ■ | | |
| A | 2 | Ecological quality of site | ■ | | |
| **B** | | **Process and planning quality** | | | |
| B | 1 | Decision making and determination of goals | ■ | | |
| B | 2 | Formulation of verifiable objectives for energetic and ecological measures | ■ | | |
| B | 3 | Standardized calculation of the economic efficiency | | | ■ |
| B | 4 | Product-management - Use of low-emission products | | ■ | |
| B | 5 | Planning support ofr energetic optimization | ■ | | |
| B | 6 | Information of users | ■ | | |
| **C** | | **Energy & Utilities** | | | |
| C | 1 | Specific heating demand (PHPP) | ■ | | |
| C | 2 | Specific cooling demand (PHPP) | ■ | | |
| C | 3 | Primary energy demand (PHPP) | ■ | | |
| C | 4 | $CO_2$-emissions (PHPP) | ■ | | |
| **D** | | **Health and Comfort** | | | |
| D | 1 | Thermal comfort in summer | | ■ | |
| D | 2 | Ventilation - non energetic aspects | | ■ | |
| D | 3 | Daylight optimized (+ lightening optimized) | | ■ | |
| **E** | | **Building materials and construction** | | | |
| E | 1 | $OI3_{TGH-lc}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building) | ■ | | |

**Criteria by weight**

| | | | |
|---|---|---|---|
| **200** | | | |
| E | 1 | OI3TGH-lc ecological index of the thermal building envelope (respectively OI3 of the total mass of the building) | |
| **150** | | | |
| D | 1 | Thermal comfort in summer | |
| **125** | | | |
| C | 3 | Primary energy demand (PHPP) | M |
| **100** | | | |
| C | 1 | Specific heating demand (PHPP) | M |
| C | 2 | Specific cooling demand (PHPP) | M |
| **60** | | | |
| B | 4 | Product-management - Use of low-emission products | |
| B | 5 | Planning support for energetic optimization | |

| | | | |
|---|---|---|---|
| **50** | | | |
| A | 1 | Access to public transport network | |
| A | 2 | Ecological quality of site | |
| C | 4 | CO2-emissions (PHPP) | |
| D | 2 | Ventilation - non energetic aspects | |
| D | 3 | Daylight optimized (+ lightening optimized) | |
| **40** | | | |
| B | 3 | Standardized calculation of the economic efficiency | M |
| **25** | | | |
| B | 1 | Decision making and determination of goals | |
| B | 6 | Information for users | |
| **20** | | | |
| B | 2 | Formulation of verifiable objectives for energetic and ecological measures | M |

## ENERBUILD Tool

The ENERBUILD Tool results well structured with regard to its scope: assessment of public buildings.

In particular:

- the compact number of criteria facilitate its application on public buildings (time effective)
- the tool reflects all the sustainability issues: environmental, economic and social
- the tool results well contextualized for the Alpine regions (well balanced weight distribution among the criteria)
- most of the criteria are quantitative (more objective assessment)
- the time and physical boundaries are aligned with the majority of the existing labels

## General

The transnational comparison of main the existing labels shows the absence of a common approach and the impossibility to compare the assessment results produced by the different tools. The scenario appears very confused.

The main critical issues that emerged from the study are:

- very different structures of the assessment tools
- different assessment methods: coexistence of performance based and strategy based tools
- different issues included in the tools
- different ways to score the performance

On the other hand, there is a convergence regarding the potential users, the physical and time boundaries, the building uses that are possible to assess.

These substantial differences between the assessment systems are not facilitating their wide diffusion at the European level. Common public policies and common market actions would need a common reference certification.

The first steps toward the needed harmonization of the sustainability certification systems should be:

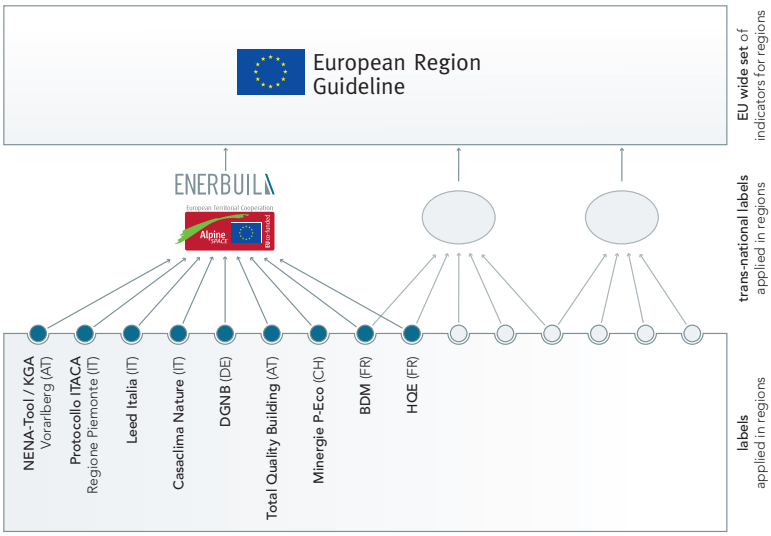
- to define common principles regarding building sustainability certification;
- to define a core of common criteria and indicators that would allow a comparison between the performances of buildings certified with different labels.

The first point concerns the need to agree for instance about the sustainability issues that should be taken in account, the assessment methodology, the contextualization procedures and the structure of tools.

The second point means that it would be necessary to identify at European level a common set of key criteria (and relative indicators) that should be adopted by the national/regionals labels in the way to allow the comparison of buildings performance.

In this sense an interregional tool like Enerbuild Tool can play a key role. ENERBUILD Tool is already a synthesis of the most important building assessment criteria in the Alpine region, having been recognized by all the project partners. From ENERBUILD Tool it would be possible to extract the most significant indicators that could be part of the European common set. It would be fundamental to activate an interaction with other European projects that have similar objectives than Enerbuild and focused on different geographical areas in the way to define a consensus based set of core criteria applicable and significant for all Europe.

The European regions have the opportunity to play a key role to facilitate a harmonization of certification systems.




To reach this objective it would be necessary to implement a common platform between the European regions with the objective to follow in the definition of a common approach to environmental building certification and to promote the harmonization of certification systems.

February 2011

# Exemplary Assessment Reports

In this chapter exemplary assessment reports are reported. All 46 assessment reports without details are shown in the evaluation report.

## Polytechnical School, Landeck (existing building) - Tyrol

Source: Energie Tirol

**Basic Information about the Building**

**Name of the building**
Polytechnical School Landeck

**Address of the building**
Prandtauerweg 19, 6500 Landeck

**Owner/investor**
Gemeinde Landeck

**Year of construction**
2007 - 2008

**Building type**
massive construction, timber frame construction

**Building method**
-

**Number of buildings**
1

**Number of levels above earth**
4

**Number of levels underground**
1

**Kind of the public use**
school

**Effective area for public use in m ² (net)**
3.700 m²

**Additional private uses**
-

**Effective area for private use in m ² (net)**
-

**Total effective area in m ²**
3.700 m²

**Source of energy for heating**
Wood pellets

**Heating system**
Wood pellet heating

**Water heating system**
Wood pellet heating

**Date of the building evaluation**
2011

**Execution of the building evaluation with the ENERBBUILD tool**

Responsible Organisation

Energie Tirol, Südtiroler Platz 4, 6020 Innsbruck

Contact person:
DI Matthias Wegscheider
+43-512-589913-13
matthias.wegscheider@aon.at

Temperature for thermal comfort in summertime:
26 °C

Local limits for heating demand
37,05 kWh/m²
(limit OIB RL 6, HWB* new building)

**Results**

| Nr. | | Title | Must criterias (M); min. standard | max. Points | evaluated Points |
|---|---|---|---|---|---|
| **A** | | **Quality of location and facilities** | | **max. 100** | **62** |
| A | 1 | Access to public transport network | | 50 | 12 |
| A | 2 | Ecological quality of site | | 50 | 50 |
| **B** | | **Process and planning quality** | | **max. 200** | **160** |
| B | 1 | Decision making and determination of goals | | 25 | 25 |
| B | 2 | Formulation of verifiable objectives for energetic and ecological measures | M | 20 | 15 |
| B | 3 | Standardized calculation of the economic efficiency | M | 40 | 0 |
| B | 4 | Product-management - Use of low-emission products | | 60 | 45 |
| B | 5 | Planning support ofr energetic optimization | | 60 | 60 |
| B | 6 | Information of users | | 25 | 15 |
| **C** | | **Energy & Utilities** | | **max. 350** | **350** |
| C | 1 | Specific heating demand (PHPP) | M | 100 | 100 |
| C | 2 | Specific cooling demand (PHPP) | M | 100 | 100 |
| C | 3 | Primary energy demand (PHPP) | M | 125 | 125 |
| C | 4 | $CO_2$-emissions (PHPP) | | 50 | 41 |
| **D** | | **Health and Comfort** | | **max. 250** | **120** |
| D | 1 | Thermal comfort in summer | | 150 | 65 |
| D | 2 | Ventilation - non energetic aspects | | 50 | 25 |
| D | 3 | Daylight optimized (+ lightening optimized) | | 50 | 30 |
| **E** | | **Building materials and construction** | | **max. 200** | **123** |
| E | 1 | $OI3_{TGH-lc}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building) | | 200 | 123 |
| | | | **Sum** | **max. 1.000** | **815** |

**Conclusions from the building evaluation with the ENERBUILD Tool**

Generally
The evaluation is quite practicable in an adequate working time. Getting all the necessary information and documents is the most difficult part of it. Even if the documents are complete, it is necessary to do interviews with the planner or the owner of the building.

About the planning process

To evaluate the planning process it is helpful to do interviews, because written documents don't exist or it is not possible to get them.

About the building itself

Doing the evaluation for an existing building is only the second best way. Nevertheless the result of 815 points seems to be realistic for this building.

### About the evaluation process

Some criteria is quite hard to evaluate. For example the calculation of the mean daylight factor is quite hard to do. It is also very hard, if there is no PHPP-calculation done for the project.

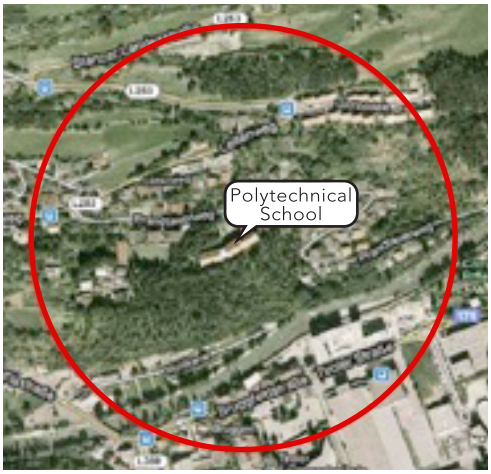
Maybe it would be possible to give some tools with the ENERBUILD Tool to make the evaluation process easier.

### Suggestions for improvement of the ENERBUILD Tool

Some additional tools would make it easier to handle the ENERBUILD Tool. At the moment some calculations are very complex. For this reason some architects or planners may be discouraged to do the evaluation. It would also be helpful to do trainings for planners who want to work with the ENERBUILD Tool. Some additional or other criteria for reconstructed buildings should be added.

### Detailed evaluation results

| A | Quality of location and facilities |
|---|---|
| A 1 | Access to public transport network |




Source: http://maps.google.com

The public transport was evaluated within the surrounding bus stations in a diameter of 300 meters. There are two bus-stations with an hourly frequency serving the school. There is also a school bus service for the children.

| | Points |
|---|---|
| Access to public transport network | max. 50 |
| Points for each bwus-station in a radius of 300 m with hourly frequency or shorter frequency | 6 |
| Points for each bus-station in a radius of 300 m with half-hourly frequency or shorter frequency | 10 |
| Points for each train-station in a radius of 500 m with hourly frequency or shorter frequency | 5 |
| Points for each train-station in a radius of 500 m with half-hourly frequency or shorter frequency | 8 |

| A | Quality of location and facilities |
|---|---|
| A 2 | Ecological quality of site |

The function of the site was not changed. The ancient school was demolished and the new politechnical school was built on the same surface.

| Performance score | Calculated Ecological value of land |
|---|---|
| -1 - negative | >5 |
| 0 - standard | 5 |
| 3 - good | 2.6 |
| 5 - excellent | 1 |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 50 |

| B | Process and planning quality |
|---|---|
| B 1 | Decision making and determination of goals |

An architectural competition was carried out and a documentation of the decision making process exists. Different variants have been studied and evaluated in the planning phase. The 0-variant was evaluated and considered as not relevant.

| **Criteria** | Max. Points | Obtained Points |
|---|---|---|
| Exists a documentation of the decision making process? | 10 | 10 |
| Did variants be considered and evaluated? | 5 | 5 |
| Evaluation of the 0-variant | 5 | 5 |
| Exists a documentation of the evaluation scheme of the variants? | 4 | 5 |
| Does it contain:<br>Urbanism<br>Access to public transport<br>Use of area and floor<br>Energy efficiency<br>Ecological use of materials | <br>2<br>2<br>2<br>2<br>2 | <br>2<br>2<br>2<br>2<br>2 |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 25 | 25 |

| B | Process and planning quality |
|---|---|
| B 2 | Formulation of verifiable objectives for energetic and ecological measures |

Definition of minimum criteria by fixing some limit-values:

- The municipality fixed at the beginning of the planning process a limit for the energy consumption for heating < 25kWh/m²a.
- Later they defined the Passive House limit with 15kWh/m²a as standard for the new school.
- During the planning process the municipality also decided to evaluate the building with the klima:aktiv haus criteria catalogue.
- The air tightness was fixed within the passive house label: n50,lim < 0,6 h(-1).
- Efficiency of the ventilation system: the planner chooses a product with a high efficiency. The energy for the ventilation system is supplied with a photovoltaic system.

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 20 | 15 |

| | | |
|---|---|---|
| The tender for all craftworks have been declared ecologically? | | |
| 100% of works | 20 | 15 |
| 90% of works | 15 | |
| 70% of works | 10 | |
| Have all products of all craftworks been declared ecologically? | | |
| 100% of works | 30 | 10 |
| 90% of works | 20 | |
| 70% of works | 10 | |
| Does an ecological building supervision exist? | | |
| Did the supervisor do regularly inspections on the building site? | | |
| Total construction process. | 20 | 10 |
| Parts of the construction process. | 10 | |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 60 | 45 |

| B | Process and planning quality |
|---|---|
| B 3 | Standardized calculation of the economic efficiency |

The life cycle costs and the economic efficiency were not calculated in the planning phase.

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 40 | 0 |

| B | Process and planning quality |
|---|---|
| B 4 | Product-management - Use of low-emission products |

As the klima:aktiv haus criteria catalogue was used, the planner and the municipality decided from beginning on, that products with low emission should be used (insulation material, floorings, windows).

| Criteria | Max. Points | Obtained Points |
|---|---|---|
| Exists a documentation of the ecological optimization of the materials during the planning phases? | 10 | 10 |

| B | Process and planning quality |
|---|---|
| B 5 | Planning support for energetic optimization |

The energetically aspects during the planning and construction phase were considered and optimized. The independent institution Energie Tirol supplied the planner and the municipality through the hole project.

| Criteria | Max. Points | Obtained Points |
|---|---|---|
| Compilation of a space allocation plan | 5 | 5 |
| Roomly distribution of air-flows as calculated in PHPP | 5 | 5 |
| Establishment of internal heat gains | 5 | 5 |
| Consideration of thermal bridges with 0,003 W(m²K) | 5 | 5 |
| Description of energetically requirements (Uw, Ug, g-value, effectiveness heat recovery) in tendering | 5 | 5 |
| Control of energetically aspects in offers | 5 | 5 |
| Support of site manager in energetically aspects with meetings on building site | 5 | 5 |

| | | |
|---|---|---|
| Protocol of the initial measurement of the ventilation system | 5 | 5 |
| Protocol of the blower door test | 5 | 5 |
| Protocol of hydraulically adjustment of heating system | 5 | 5 |
| Compilation of energy requirements calculation after the construction phase, blower door test | 5 | 5 |
| Independent evaluation of the energy requirement calculation | 5 | 5 |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 60 | 60 |

| B | Process and planning quality |
|---|---|
| B 6 | Information for users |

A user manual does not exist for the building. However when the building was delivered an informative meeting was held to inform the teachers and pupil about the use of shadings and window ventilation. Also the caretaker was instructed and he still participates in training to optimize the operation of the building.

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 25 | 15 |

| C | Energy & Utilities |
|---|---|
| C 1 | Specific heating demand (PHPP) |

Specific heat demand: 14 kWh/m²a

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 100 | 100 |

| C | Energy & Utilities |
|---|---|
| C 2 | Specific cooling demand (PHPP) |

Specific cooling demand: 0 kWh/m²a

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 100 | 100 |

| C | Energy & Utilities |
|---|---|
| C 3 | Primary energy demand (PHPP) |

Specific primary energy demand: 105 kWh/m²a

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 125 | 125 |

| C | Energy & Utilities |
|---|---|
| C 4 | $CO_2$-emissions (PHPP) |

$CO_2$-emissions: 37 kg/m²a

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 41 |

Source: Energie Tirol

| D | Health and Comfort |
|---|---|
| D 1 | Thermal comfort in summer |

Relation of opaque and transparent surfaces: 3.789 m² of opaque surfaces and 630m² of transparent surfaces. 14,25% of the surfaces are transparent, therefore the overheating analysis was made with the non dynamic calculation software PHPP. The result of the overheating frequency is: 5 %

| Criteria | Points |
|---|---|
| Building with less than 35 % Windows surfaces and without active cooling system | |
| Analysis based on ON B8110-3 | 50 |
| Or analysis OIB RL-6; KB* < 0,4 kWh/m³a | 50 |
| Or analysis OIB RL-6; KB* < 0,6 kWh/m³a | 35 |
| Or Analysis PHPP, exceeding 26 °C < 5 % | 65 |
| Dynamical building simulation (at least for critical rooms) considerating the local climate, flexible shading systems and the respected usage of the buliding. | |
| exceeding 26 °C < 5 % without active cooling system (e.b.free night cooling) | 150 |
| exceeding 26 °C < 10 % without active cooling system (e.b.free night cooling) | 50 |
| exceeding 26 °C < 3 % with active cooling system | 75 |
| Analysis to prevent air currents (v < 0,1 m/s, ΔT < 2 K at the domicile) | 75 |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 150 | 65 |

| D | Health and Comfort |
|---|---|
| D 2 | Ventilation – non energetic aspects |

Relation of opaque and transparent surfaces: 3.789 m² of opaque surfaces and 630m² of transparent surfaces. 14,25% of the surfaces are transparent, therefore the overheating analysis was made with the non dynamic calculation software PHPP. The result of the overheating frequency is: 5 %

| Criteria | Points |
|---|---|
| Sound transmission calculation (depending on the room use), prognostic of expected sound presser level LA,nT < 30 dB and LC(50-4000),nT < 50 dB | 25 |
| Sound emission calculation on most exposed working place LA,nT < 30 dB and LC(50-4000),nT < 50 dB | 40 |
| Sound emission calculation on most exposed working place LA,nT < 30 dB und LC(50-4000),nT < 50 dB | 50 |
| Or analysis OIB RL-6; KB* < 0,6 kWh/m³a | 35 |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 25 |

| D | Health and Comfort |
|---|---|
| D 3 | Daylight optimized (+ lightening optimized) |

Result: Mean daylight factor: 3,4%

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 30 |

| E | Building materials and construction |
|---|---|
| E 1 | $OI3_{TGH-lc}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building). |

The points for evaluation with the ENERBUIL-Tool are calculated $OI3_{TGH-BGF\ WG\ Ref.}$ –between 38 and 295:

$Points = 2 * (0{,}0007 * OI3_{TGH-BGF_h}^{2} - 0{,}623 * OI3_{TGH-BGF_h} + 123)$

$Points = 2 * (0{,}0007 * 113^2 - 0{,}623 * 113 + 123) = 123$ Points

$OI3_{TGH-BGF}$ WG Ref. ≤ 38 = 200 points

$OI3_{TGH-BGF}$ WG Ref. ≥ 295 = 0 points

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 200 | 123 |

# Exemplary Assessment Reports

## Vigo Rendena town hall (planning phase) - Trento


Source: University of Trento

**Basic Information about the Building**

**Name of the building**
Town Hall

**Address of the building**
via IV Novembre, 38080 Vigo Rendena (Tn) Italy

**Owner/investor**
Municipality of Vigo Rendena

**Year of construction**
2009-2010

**Building type**
Lightweight construction

**Building method**
Platform frame

**Number of buildings**
1

**Number of levels above earth**
3

**Number of levels underground**
1

**Kind of the public use**
Public use: offices with multifunctional rooms.

**Effective area for public use in m ² (net)**
505,96 m²

**Additional private uses**
-

**Effective area for private use in m ² (net)**
-

**Total effective area in m ²**
505,96 m²

**Source of energy for heating**
Natural gas

**Heating system**
Central-heating boiler powered by natural gas.

**Water heating system**
Hot water generator powered by biomass (wood chips and pellets), heat pump with puffer store.

**Date of the building evaluation**
Received label LEED Gold in October 2011

**Execution of the building evaluation with the ENERBBUILD tool**

Responsible Organisation

University of Trento – Department of Civil and Environmental Engineering - Italy

Contact person:
Prof. Antonio Frattari
+39 046 128 26 68 antonio.frattari@unitn.it

Temperature for thermal comfort in summertime:
27 °C

**Results**

| Nr. | | Title | Must criterias (M); min. standard | max. Points | evaluated Points |
|---|---|---|---|---|---|
| **A** | | **Quality of location and facilities** | | **max. 100** | **50** |
| A | 1 | Access to public transport network | | 50 | 0 |
| A | 2 | Ecological quality of site | | 50 | 50 |
| **B** | | **Process and planning quality** | | **max. 200** | **170** |
| B | 1 | Decision making and determination of goals | | 25 | 25 |
| B | 2 | Formulation of verifiable objectives for energetic and ecological measures | M | 20 | 20 |
| B | 3 | Standardized calculation of the economic efficiency | M | 40 | 40 |
| B | 4 | Product-management - Use of low-emission products | | 60 | 50 |
| B | 5 | Planning support ofr energetic optimization | | 60 | 35 |
| B | 6 | Information of users | | 25 | 0 |
| **C** | | **Energy & Utilities** | | **max. 350** | **330** |
| C | 1 | Specific heating demand (PHPP) | M | 100 | 100 |
| C | 2 | Specific cooling demand (PHPP) | M | 100 | 55 |
| C | 3 | Primary energy demand (PHPP) | M | 125 | 125 |
| C | 4 | $CO_2$-emissions (PHPP) | | 50 | 50 |
| **D** | | **Health and Comfort** | | **max. 250** | **50** |
| D | 1 | Thermal comfort in summer | | 150 | 0 |
| D | 2 | Ventilation - non energetic aspects | | 50 | 0 |
| D | 3 | Daylight optimized (+ lightening optimized) | | 50 | 50 |
| **E** | | **Building materials and construction** | | **max. 200** | **75** |
| E | 1 | $OI3_{TGH\text{-}lc}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building) | | 200 | 75 |
| | | | **Sum** | **max. 1.000** | **675** |

**Conclusions from the building evaluation with the ENERBUILD Tool**

Generally

The building scored 675 points – well representative of its high level of environmental sustainability even if a higher score with ENERBUILD Tool could be expected.

Since the building analyzed is relatively small, this evaluation process was feasible and practicable.

The great majority of points are lost in part D „Health and comfort". In particular:

For what concerns the criterion „optimized Daylight", LEED do not consider acoustic criteria, so no calculus is available at the moment on this issue.

Regarding „Thermal comfort in summer", even if T upper limit has been raised to 27°C (in order to consider higher summer temperature in Italian situation), the upper allowed temperature

is overshoot for the 14,1 % of time. In Mediterranean countries it is quite difficult that upper temperature is overshoot less than 5% of time in summer, so this limit should be raised even taking into account only the effective period of usage.

Considering „Daylight optimized", Leed certification considers only regularly occupied spaces, and it requires daylight factor up to a maximum percentage of 2% in 75% of these spaces, while according to ENERBUILD certification this factor has to be as possible equal to 5%, and superior to 2%, calculated on entire area, that is effectively a too severe request. Being the Daylight factor 4,98%, we considered fulfilled the criterion.

Source: University of Trento

### About the planning process

The building was designed to obtain a Leed NC 2.2 Silver certification but, after a series of improvement, in October 2011 it has been certified Leed Gold.

For what concerns the planning process, it has been done using LEED as reference and not ENERBUILD Tool, that has been applied in a second moment and so it can be considered more an evaluation tool than a planning tool. However, the following considerations about ENERBUILD Tool can be done:

Point A1 is clear and easy to be faced.

Point A2 is well defined and the proposed index is easy to be used.

Points B1 and B2 are very detailed and well done. All the most important aspects of planning phase are taken into consideration. Each point has a proper reference with LEED tool (see even following detailed considerations).

Point B3 has been quite difficult to be done. LCC is a procedure more and more important in the planning phase (together with LCA) and it is important that in ENERBUILD it has a good relevance, but the ISO Standard and the Austrian standard has been difficult to be applied. For this reason, a simplified method has been followed considering the classical value analysis theory.

Point B4 is very important concerning human health in indoor spaces. ENERBUILD is quite complete even if the definition of the percentage of structures with ecological declaration is not clear. It could be easier to have reference to European standards and not to local ones. Even a list of most common building components could be useful.

Point B5 is of course an important issue and it has clear reference, point by point, with LEED protocol. It is sufficiently clear and not difficult to be faced.

Point B6 is clear and very important. Unfortunately, not all the energy and environmental tools consider this aspect.

Point C1 to C4. This is the most problematic section of the tool. In fact, we agree that, in order to have comparable results, the same energy calculation tool should be used. However, PHPP is a good tool only if a passive building has been designed, and the pilot building considered is not a passive one. Moreover, cooling demand is often overestimated and low points are given. It is our opinion that other software should be used, even national ones, taking into account that all the partners should agree on some „fixed points" so that final results of the energy calculation could be compared. For example, it is important to consider international standards. But the choice of the energy calculation tool should be free.

Point D1: refer to previous comment.

Point D2: in this case, it should be better to leave the partner free to consider national legislation and not fixed values. Also the acoustic index

used should refer to international standards. In the case of the pilot building considered, no calculations were made so it is quite impossible to calculate the correct indexes.

Point D3: the point is simple and using the EN standard it is easy to calculate. Anyway, the 5% of DF required seems to be too high. In our opinion, following LEED specifications, a daylight factor up to a maximum percentage of 2% in 75% of frequently used spaces should be sufficient.

Point E1: the procedure for calculating the OI3 index is quite simple and it is an important aspect of building construction.

### About the building itself

Vigo Rendena town hall is an innovative project of prefabricated wooden building, cutting edge in terms of environmental sustainability and use of renewable energy. In fact, characteristic of this building is the use of traditional building materials – as stone, wood, plaster – and the use of optimization systems of energy performance.

- In particular, its specific construction techniques are: concrete structure just in the basement, while in remaining floors structure is wooden;
- use of renewable energies such as photovoltaic and heating boiler with wood chips and pellets;
- high internal environmental comfort provided by a forced-air ventilation with heat recovery;
- use of regional materials;
- automatic checks for a reduction in power consumption.

### About the evaluation process

In the case of small buildings like this, evaluation process is feasible and practicable.

The most problematic aspects of the research have been those related to the collection of all necessary documents and information – that sometimes must be too detailed. For this reason, we chose to perform ENERBUILD evaluation process using data provided by Leed certification protocol. So, we had to verify where these two systems overlap and which Leed credits correspond (even partly) to ENERBUILD criteria and which have been tried for the considered building. However, if there is no correspondence (as in the case of credit D2, and, partly, credit B1) or a Leed credit has not been tried, we considered the correspondent ENERBUILD criterion as not satisfied. Section C and criteria B3 and E1 – which have no Leed equivalent – are instead calculated separately, according to the instructions of the manual.

### Suggestions for improvement of the ENERBUILD Tool

Mandatory criteria shouldn't have a score.

Criterion B3: life cycle cost analysis is a mandatory criterion, but in practice LCC are rarely calculated. Moreover, prescriptions and assumptions for profitability calculation are not clear and ISO 15686-5 is not sufficient;

Section C: some PHPP layers require information too detailed and very difficult to collect for already designed and built constructions, especially if nor passive buildings;

Criterion D3: only regularly occupied spaces and not entire area should be considered in order to calculate the average daylight factor.

### Detailed evaluation results

| A | Quality of location and facilities |
|---|---|
| A 1 | Access to public transport network |


Source: http://maps.google.com

A1 criterion score was zero since the building is not adequately served by public transport (not verified hourly transport).

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 0 |

| A | Quality of location and facilities |
|---|---|
| A 2 | Ecological quality of site |

The function of the site was not changed: the pre-existing town hall was demolished and the new building was built right on the area previously occupied, which is then assigned low ecological value (a1- area with zero ecological value). So, it was awarded the highest score for the A2 criterion, of 50 points.

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 50 |

| B | Process and planning quality |
|---|---|
| B 1 | Decision making and determination of goals |

Decision-making documentation coincides with the checklist developed in pre-design phase. In this case, variants were evaluated by all ENERBUILD accounts, except the term relating to variant 0 which was not evaluated (Leed certification do not requires it). It has been partly allowed the use of ecological materials as regional materials, having been tried Leed credit MRC5.

| Criteria | Max. Points | Obtained Points |
|---|---|---|
| Exists a documentation of the decision making process? | 10 | 10 |
| Did variants be considered and evaluated? | 5 | 5 |
| Evaluation of the 0-variant | 5 | 0 |
| Exists a documentation of the evaluation scheme of the variants? | 4 | 4 |
| Does it contain:<br>Urbanism<br>Access to public transport<br>Use of area and floor<br>Energy efficiency<br>Ecological use of materials | <br>2<br>2<br>2<br>2<br>2 | <br>2<br>2<br>0<br>2<br>0 |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 25 | 25 |

| B | Process and planning quality |
|---|---|
| B 2 | Formulation of verifiable objectives for energetic and ecological measures |

Reports BOD and OPR (EA Prerequisite 1) define the characteristics of the project, including energetic and environmental measures. In particular, objectives of this project are:

- use of renewable energies such as photovoltaic and heating boiler with wood chips and pellets
- efficiency of the ventilation system
- use of regional materials and products

So, ENERBUILD criterion may be fulfilled in accordance with the goals contained in the two reports and in checklist required by Leed certification system.

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 20 | 20 |

| B | Process and planning quality |
|---|---|
| B 3 | Standardized calculation of the economic efficiency |

The life cycle costs and the economic efficiency were not calculated in any Leed certification phase. However, since the criterion ENERBUILD is mandatory, the analysis has also been carried out: the building is constructed with good materials and so its life cycle costs are lower than those of reference model (OIB6) and the ENERBUILD criterion is fulfilled.

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 40 | 40 |

| B | Process and planning quality |
|---|---|
| B 4 | Product-management - Use of low-emission products |

The Leed credits tried for this building project are related to use of recycled, regional and rapidly renewable materials. 100% of the structure is declared but documentation of construction process is partial.

| Criteria | Max. Points | Obtained Points |
|---|---|---|
| Exists a documentation of the ecological optimization of the materials during the planning phases? | 10 | 10 |
| The tender for all craftworks have been declared ecologically? | | |
| 100% of works | 20 | |
| 90% of works | 15 | |
| 70% of works | 10 | |

| | | |
|---|---|---|
| Have all products of all craft-works been declared ecologi-cally?<br>100% of works<br>90% of works<br>70% of works | <br>30<br>20<br>10 | <br>30 |
| Does an ecological building supervision exist?<br>Did the supervisor do regularly inspections on the building site?<br>Total construction process.<br>Parts of the construction process. | <br><br>20<br>10 | <br><br>10 |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 60 | 50 |

| **B** | **Process and planning quality** |
|---|---|
| B 5 | Planning support for energetic optimiza-tion |

EA Credit 5 was not tried and Blower Door test was not developed (Leed evaluation process doesn't require it).

| **Criteria** | Points | Leed credits | Ob-tained points |
|---|---|---|---|
| Design by specifying type, size, frequency and intensity of use of the rooms, and their internal temperatures | 5 | EAC1 | 5 |
| Design of air flow to room according to hygiene requirements | 5 | EQPr1 | 5 |
| Identification of inter-nal heat source | 5 | EAC1 | 5 |
| Calculation of ther-mal bridges by means of a default value of 0.03 W / (m2 K) and detailed verification of thermal bridges | 5 | - | - |
| Description of energy parameters in the contract | 5 | EAPr1 | 5 |
| Verify of energy aspects of the tenders with the requirements of the contract | 5 | EAPr1 | 5 |
| Visits to the site to support local management about energy issues | 5 | EAC5 | 0 |
| Provide to conduct a Blower-Door Test | 5 | EQPr2 | 0 |
| Measure of ventilati-on system | 5 | EAC1 | 5 |
| Hydraulic balancing of the heating | 5 | EAC1 | 5 |
| Update of the cal-culations of energy requirements at the end of the work and conduct a blower door test to control | 5 | - | - |
| Verification of energy requirements at the end of the work | 5 | EAC5 | 0 |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 60 | 35 |

| **B** | **Process and planning quality** |
|---|---|
| B 6 | Information for users |

A user manual does not exist for the building, since it has not been tried Leed credit EA c3 „Commissioning advanced".

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 25 | 0 |

| **C** | **Energy & Utilities** |
|---|---|
| C 1 | Specific heating demand (PHPP) |

Specific space heat demand: 12 kWh/m²a

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 100 | 100 |

| **C** | **Energy & Utilities** |
|---|---|
| C 2 | Specific cooling demand (PHPP) |

Specific cooling demand:5 kWh/m²a

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 100 | 55 |

| C | Energy & Utilities |
|---|---|
| C 3 | Primary energy demand (PHPP) |

Specific primary energy demand: 83.9 kWh/m²a

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 125 | 125 |

| C | Energy & Utilities |
|---|---|
| C 4 | $CO_2$-emissions (PHPP) |

$CO_2$-emissions: 20.8 kg/m²a

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 50 |

| D | Health and Comfort |
|---|---|
| D 1 | Thermal comfort in summer |

PHPP software has calculated the value hθ (overshoot the maximum allowable temperature in the summer) equal to 14,1% superior than 5% required by ENERBUILD certification system. Therefore, D1 criterion score is zero (T upper limit set to 27°C).

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 150 | 0 |

| D | Health and Comfort |
|---|---|
| D 2 | Ventilation – non energetic aspects |

In this case, the two certification systems are not comparable and so, missing necessary data, D2 criterion score is zero.

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 0 |

| D | Health and Comfort |
|---|---|
| D 3 | Daylight optimized (+ lightening optimized) |

The daylight factor was calculated with following formula from UNI EN 15193, 2008 for each room:

Daylight factor result: $\overline{D} = \frac{A_g \cdot \theta \cdot \tau_{D65}}{A \cdot (1 - R^2)}$ =4,98%

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 30 |

| E | Building materials and construction |
|---|---|
| E 1 | $OI3_{TGH-lc}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building). |

The points for evaluation with the ENERBUILD Tool are calculated $OI3_{TGH-BGF}$ WG Ref. – between 38 and 295:

Points = 2 * (0,0007 * $OI3_{TGH-BGF_h}$ ² - 0,623 * $OI3_{TGH-BGF_h}$ + 123)

Points = 2 * (0,0007 * 113² - 0,623 * 113 + 123) = 123 Points

$OI3_{TGH-BGF}$ WG Ref. ≤ 38 = 200 points

$OI3_{TGH-BGF}$ WG Ref. ≥ 295 = 0 points

In this case: $OI3_{TGH-BGF}$ result=170

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 200 | 75 |

## Hospital Triemli (planning phase) - Zurich

Source: Stadt Zürich – Amt für Hochbauten

**Basic Information about the Building**

**Name of the building**
Stadtspital Triemli – Neubau Bettenhaus

**Address of the building**
Birmensdorfer Strasse 497, CH-8063 Zürich

**Owner/investor**
Stadt Zürich, Amt für Hochbauten

**Year of construction**
2008 - 2015

**Building type**
New hospital building at 460m a.s.l.

**Building method**
Massive construction

**Number of buildings**
1

**Number of levels above earth**
15

**Number of levels underground**
2

**Kind of the public use**
City Hospital

**Effective area for public use in m² (net)**
approx. 900 $m^2$ restaurant/ guest areas
approx. 29.000 $m^2$ patient stations

**Additional private uses**
-

**Effective area for private use in m ² (net)**
approx. 19.400 $m^2$ medical stations and facilities

**Total effective area in m ²**
approx. 49.300 $m^2$

**Source of energy for heating**
Thermal ground probe with heat pump and biomass (wood) boiler; emergency backup with gas/ oil (biomass, gas/oil backup are also supplying steam for hygienic applications)

**Heating system**
Thermal ground probe with heat pump (80%, also used for cooling) and biomass (wood) boiler (20%)

**Water heating system**
Heat pumg (100%)

**Date of the building evaluation**
2010/2011

# Exemplary Assessment Reports

## Hospital Triemli (planning phase) - Zurich

**Execution of the building evaluation with the ENERBBUILD tool**


Responsible Organisation

Lucerne University of Applied Sciences and Arts – Lucerne School of Engineering and Architecture – Competence Center Topology & Foresight Planning in Architecture

Technikumstrasse 21, CH-6048 Horw

Contact person:
C.Lars Schuchert
+41 41 349 34 96 lars.schuchert@hslu.ch


Temperature for thermal comfort in summertime:
25°C, the standard room temperature is adjusted to 22°C for hospital buildings according to Swiss SIA 380/1:2009, 3.5.1.2.

Local limits for heating demand: in Switzerland, the local limit for the heating demand is determined by the building's location (mean annual temperature), the building surface-to-heated floor area ratio, and its use. Also the limit differs according to the energy standard. Since the treaded floor area is calculated differently and the basic data is also taken into account differently, the values cannot be directly compared to the values of the calculation via PHPP. (The calculation according to Minergie(-P) standard usually achieve lower values.
(refer to: Zentrum für Energie und Nachhaltigkeit im Bauwesen. Minergie und Passivhaus: Zwei Gebäudestandards im Vergleich – Schlussbericht. 2002. Page 6)
The limits for this hospital building are: 38 kWh/m²a (according to SIA 380/1:2007, converted from 136 MJ/m²))

**Results**

| Nr. | | Title | Must criterias (M); min. standard | max. Points | evaluated Points |
|---|---|---|---|---|---|
| **A** | | **Quality of location and facilities** | | **max. 100** | **100** |
| A | 1 | Access to public transport network | | 50 | 50 |
| A | 2 | Ecological quality of site | | 50 | 50 |
| **B** | | **Process and planning quality** | | **max. 200** | **200** |
| B | 1 | Decision making and determination of goals | | 25 | 25 |
| B | 2 | Formulation of verifiable objectives for energetic and ecological measures | M | 20 | 20 |
| B | 3 | Standardized calculation of the economic efficiency | M | 40 | 40 |
| B | 4 | Product-management - Use of low-emission products | | 60 | 55 |
| B | 5 | Planning support ofr energetic optimization | | 60 | 55 |
| B | 6 | Information of users | | 25 | 25 |
| **C** | | **Energy & Utilities** | | **max. 350** | **350** |
| C | 1 | Specific heating demand (PHPP) | M | 100 | 85 |
| C | 2 | Specific cooling demand (PHPP) | M | 100 | 91 |
| C | 3 | Primary energy demand (PHPP) | M | 125 | 125 |
| C | 4 | $CO_2$-emissions (PHPP) | | 50 | 50 |
| **D** | | **Health and Comfort** | | **max. 250** | **225** |
| D | 1 | Thermal comfort in summer | | 150 | n/a (150) |
| D | 2 | Ventilation - non energetic aspects | | 50 | 25 |
| D | 3 | Daylight optimized (+ lightening optimized) | | 50 | 50 |
| **E** | | **Building materials and construction** | | **max. 200** | **104** |
| E | 1 | $OI3_{TGH-Ic}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building) | | 200 | 104 |
| | | | **Sum** | **max. 1.000** | **979** |

## Conclusions from the building evaluation with the ENERBUILD Tool

### Generally

Retrieving the required information was quite difficult. Different sources had to be requested, reviewed and compared. If further tools are needed as part of the ENERBUILD Tool evaluation (particularly PHPP and the OI3 calculator), the corresponding data for those tools has to be gathered, determined via auxiliary calculations, or estimated if not available.

### About the planning process

The information about the planning process of the building, further data concerning the location, health and comfort was requested from architects/ planners of the building using a questionnaire. If available, they kindly provided the relevant information, so the values could be implemented into the ENERBUILD Tool.

### About the building itself

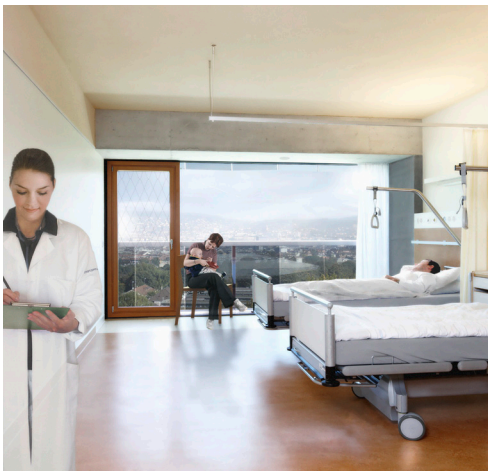
Since not all data, which the PHPP calculation would need, could be retrieved, there might be deviations. Also, the Swiss Minergie-P standard consults other floor areas (heated gross floor area) and calculates the demands differently. Thus, a comparison between the results of PHPP and Minergie-P cannot be taken to draw conclusions from. Since the PHPP only accounts to about one third of the possible points of whole ENERBUILD Tool, those deviations were considered to be insignificant.

Assigning e.g. the value of „C1 - Specific heating demand", the target value of 15 kWh/m$^2$a is based on PHPP calculation, while the initial value (local limit for heating demand) is based on other national calculation methods (SIA 380/1). Therefore, determining the score for the ENERBUILD Tool will most likely always be subject to deviations.

### About the evaluation process

The relevant information about the building consists of gathered results (e.g. national/ local certification standards) and, thus, calculated values, which depend on their calculation method. This means they cannot be transferred directly into the ENERBUILD Tool. Tracing them back to their origin to finally use them for PHPP and OI3-Index calculations, which themselves are part of the ENERBUILD Tool, is quite time-consuming.

Also, the evaluation relies on the help of planners and architects, who need to provide further information which was not relevant for the local certification process (e.g. the „Ecological quality of the site"). If data is missing, there is little room for estimates.



Source: Stadt Zürich – Amt für Hochbauten

### Suggestions for improvement of the ENERBUILD Tool

There could be an option to adjust the maximum score if not all criteria could be evaluated, so that with a potential maximum „800 points" and achieved „600 points", the overall achievement would still be 75%.

Furthermore, e.g. for „D1 - Thermal comfort in summer" the maximum score cannot be reached without dynamic calculation. Thus, maxing out the potential score, another more complex tool would have to come into consideration. This seems not to be very user friendly, comparing the cost-benefit ratio.

Another suggestion is to clarify the distribution of the score for each portion of the Enerbuilld-Tool. The descriptions how to distribute the points of the „Prescription ENERBUILD Tool Criteria" are diverse: one uses a formula, while

another one has to be interpolated, and a third one needs another complex tool etc. Also „D2 – Ventilation – non energetic aspects" two times lists the same criteria for sound imission measurements while assigning different scores.

Providing a list and overview of the required (sub) tools to convert basic data/ information into scores for the ENERBUILD Tool would be helpful as a checklist for involved institutions or planners/ architects etc.

The „E1 – $OI3_{THG-Ic}$ ecological index…" uses contradictory indices. All of the following indices are mentioned: $OI3_{TGH-Ic}$, $OI3_{TGH-BGP}$, $OI3_{TGH-BGF\ WG\ Ref.}$ = there should be clarification. Maybe also the possibility of (just) calculating the surfaces and their specific OI3 of the construction without another tool would help to lighten the process. If Ecosoft is used, the OI3 index for „construction & maintenance" could also be an interesting addition to the broad approach of the ENERBUILD Tool.

**Detailed evaluation results**

| A | Quality of location and facilities |
|---|---|
| A 1 | Access to public transport network |


Source: http://maps.google.com

Bus line 80, Zurich, Triemlispital to Zurich Oerlikon distance < 300 m, every half an hour = 10

Tram line 9, Zurich, Triemli to Zurich, Hirzenbach, distance < 300 m, every half an hour = 10

Tram line 14, Zurich, Triemli to Zurich, Seebach, distance < 300 m, every half an hour = 10

Bus line 73, Zurich, Triemli to Zurich, Milchbuck, distance < 300 m, every half an hour = 10

Train line S10, Zurich Triemli to Zurich main station, distance < 500 m, every half an hour = 8

Train line S10, Zurich, Triemli to Uetliberg, distance < 500 m, every half an hour = 8

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 50 |

| A | Quality of location and facilities |
|---|---|
| A 2 | Ecological quality of site |

Before construction, the function of the site was buildings, infrastructure, streets („Code a1 – area with zero ecological value"). Thus, the pre development ecological value of the site was calculated „1.0", resulting in the maximum performance score of „5.0" using the „Land ecological value calculator".

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 50 |

| B | Process and planning quality |
|---|---|
| B 1 | Decision making and determination of goals |

Decision-making documentation coincides with the checklist developed in pre-design phase. In this case, variants were evaluated by all ENERBUILD accounts, except the term relating to variant 0 which was not evaluated (Leed certification do not requires it). It has been partly allowed the use of ecological materials as regional materials, having been tried Leed credit MRC5.

| Criteria | Max. Points | Obtained Points |
|---|---|---|
| Exists a documentation of the decision making process? | 10 | 10 |
| Did variants be considered and evaluated? | 5 | 5 |
| Evaluation of the 0-variant | 5 | 0 |
| Exists a documentation of the evaluation scheme of the variants? | 4 | 4 |
| Does it contain:<br>Urbanism<br>Access to public transport<br>Use of area and floor<br>Energy efficiency<br>Ecological use of materials | <br>2<br>2<br>2<br>2<br>2 | <br>2<br>2<br>2<br>2<br>2 |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 25 | 25 |

| B | Process and planning quality |
|---|---|
| B 2 | Formulation of verifiable objectives for energetic and ecological measures |

The following goals have been defined:

- A space allocation plan, including the determination of values concerning room size, use, temperature, and ventilation rates was defined for the whole building
- Energy and energy efficiency goals were set according to the Swiss Minergie-P (passive house) standard. Among others, they include the specific heating demand, the specific cooling demand, the specific total primary energy consumption, and the air tightness rate (in coordination with the Minergie association)
- Ecological goals were set according to the Swiss Minergie-P-eco (ecological passive house) standard. Building materials, which must not be used, were defined and the use of regional building materials was determined

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 20 | 20 |

| B | Process and planning quality |
|---|---|
| B 3 | Standardized calculation of the economic efficiency |

The life cycle cost and the economic efficiency were calculated according to the standardized method of the ISO 15686-5.

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 40 | 40 |

| B | Process and planning quality |
|---|---|
| B 4 | Product-management - Use of low-emission products |

| Criteria | Max. Points | Obtained Points |
|---|---|---|
| Exists a documentation of the ecological optimization of the materials during the planning phases? | 10 | 10 |
| The tender for all craftworks have been declared ecologically? | | |
| 100% of works | 20 | 20 |
| 90% of works | 15 | |
| 70% of works | 10 | |
| Have all products of all craftworks been declared ecologically? | | |
| 100% of works | 30 | |
| 90% of works (80%) | 20 | 15 |
| 70% of works | 10 | |
| Does an ecological building supervision exist? | | |
| Did the supervisor do regularly inspections on the building site? | | |
| Total construction process. | 20 | 20 |
| Parts of the construction process. | 10 | |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 60 | 55 |

| B | Process and planning quality |
|---|---|
| B 5 | Planning support for energetic optimization |

Since the construction of the building will probably be ongoing until 2015, some answers are stating that tests and protocols will be conducted upon completion of the building

| Criteria | Max. Points | Obtained Points |
|---|---|---|
| Compilation of a space allocation plan | 5 | 5 |
| Roomly distribution of air-flows as calculated in PHPP | 5 | 5 |
| Establishment of internal heat gains | 5 | 5 |
| Consideration of thermal bridges with 0,003 W(m²K) | 5 | 5 |
| Description of energetically requirements (Uw, Ug, g-value, effectiveness heat recovery) in tendering | 5 | 5 |
| Control of energetically aspects in offers | 5 | 5 |
| Support of site manager in energetically aspects with meetings on building site | 5 | 5 |
| Protocol of the initial measurement of the ventilation system | 5 | 5 |
| Protocol of the blower door test | 5 | 5 |
| Protocol of hydraulically adjustment of heating system | 5 | 5 |
| Compilation of energy requirements calculation after the construction phase, blower door test | 5 | 0 |
| Independent evaluation of the energy requirement calculation | 5 | 5 |

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 60 | 35 |

| B | Process and planning quality |
|---|---|
| B 6 | Information for users |

The users' needs were met in 55 work groups. The users were informed and given a handbook that covers space air temperature (adjustment of heating/ cooling), mechanical ventilation and window ventilation, glare and sun blinds, general lighting and localized lighting, and energy efficient use of appliances and power consumers (e.g. computers)

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 25 | 25 |

Section C: Since not all data, which would be needed for an absolute concluding PHPP calculation could be retrieved, the values given must not be equated with an official Passive House (PHPP) certification!

| C | Energy & Utilities |
|---|---|
| C 1 | Specific heating demand (PHPP) |

Local limits for heating demand: in Switzerland the local limit for the heating demand is determined by the building's location (mean annual temperature), the building surface-to-heated floor area ratio, and its use. Also the limit differs according to the energy standard. Since the treaded floor area is calculated differently and the basic data is also taken into account differently, the values cannot be directly compared to the values of the calculation with PHPP. Still, due to lack of other limits, this value has been taken as base for the determination of the ENERBUILD Tool points.

- The limits for this hospital building are:
- New building, hospital:
  38 kWh/m²a (according to SIA 380/1:2007, converted from 136 MJ/m²)
- For comparison the following limits are also given: Minergie (low energy) standard, hospital: 70 kWh/m²a (according to SIA 380/1:2009) Minergie-P (passive house) standard, hospital: 45 kWh/m²a (according to SIA 380/1:2009)
- Specific heating demand Minergie-P:
  15 kWh/m²a (according to SIA 380/1:2007, converted from 54 MJ/m²)
- Specific heating demand PHPP:
  19 kWh/m²$a_{EBF}$ (calculated with PHPP)

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 100 | 85 |

| C | Energy & Utilities |
|---|---|
| C 2 | Specific cooling demand (PHPP) |

Specific cooling demand: 1 kWh/m²a

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 100 | 91 |

| C | Energy & Utilities |
|---|---|
| C 3 | Primary energy demand (PHPP) |

Specific primary energy demand: 76 kWh/m²a

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 125 | 125 |

| C | Energy & Utilities |
|---|---|
| C 4 | $CO_2$-emissions (PHPP) |

$CO_2$-emissions: 19 kg/m²$a_{EBF}$

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 50 |

| D | Health and Comfort |
|---|---|
| D 1 | Thermal comfort in summer |

Relation of opaque surfaces (48%) to transparent surfaces (52%) of the façade. A dynamic simulation was not conducted. Several indicators make it plausible, that the thermal comfort in summer will most likely be guaranteed: The overheating frequency result applied to 26°C from PHPP is stated 0%. A pilot and demonstrational mock-up up (scale 1:1, incl. façade, patient rooms, and service areas) was used for testing. The building will have structural sun protection, adjustable sun blinds, clay plastered ceilings for thermal mass and active cooling via thermal ground probes. Thus, the thermal comfort in summer is expected to achieve the maximum score within the ENERBUILD Tool calculation.

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 150 | n/a (150) |

| D | Health and Comfort |
|---|---|
| D 2 | Ventilation – non energetic aspects |

A pilot and demonstrational mock-up (scale 1:1, incl. façade, patient rooms, and service areas) was built. A prognosis on sound immission was established, and the mock-up was also measured and documented concerning sound aspects.

The data regarding the measurement was n/a.

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 25 |

| D | Health and Comfort |
|---|---|
| D 3 | Daylight optimized<br>(+ lightening optimized) |

The daylight factor is ≥ 5%

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 50 | 50 |

| E | Building materials and construction |
|---|---|
| E 1 | $OI3_{TGH-lc}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building). |

Using Ecosoft, the OI3-index was calculated. No further adjustments according to the life span of materials have been done. Since the hospital is a high-rise building, certain requirements for building materials occur.

$OI3_{TGH-BGF_h}$ = 264 [$OI3_{TGH-lc}$ = 74]

Points = 2 * (0,0007 * $OI3_{TGH-BGF_h}^2$ - 0,623 * $OI3_{TGH-BGF_h}$ + 123)

Points = 2 * (0,0007 * $268^2$ - 0,623 * 265 + 123) = 15 Points

| | max. Points | obtained Points |
|---|---|---|
| **EB-Points** | 200 | 15 |

# Summary and Findings of 46 Pilot Evaluations

## General Overview on the assessment results

| Nr. | | Title | Must criterias | max. Points | Vorarlberg - Austria **Bizau** | Vorarlberg - Austria **St. Gerold** | Vorarlberg - Austria **Thüringerberg** | Vorarlberg - Austria **Rankweil** | RAEE - France **Combe** | RAEE - France **Bassens** | RAEE - France **Chambéry le Haut** | RAEE - France **Les Jardins d'Eden** | RAEE - France **Operation Buisson** | RAEE - France **La Terassse** | RAEE - France **Maison Vercors** | RAEE - France **Pappillons** | Regione Piemonte - Italy **Mazzé** | Regione Piemonte - Italy **PUEEL** | Regione Piemonte - Italy **Torre Balfredo** | Regione Piemonte - Italy **Passiv house Cierié** | Regione Piemonte - Italy **Mondovì** | EAO Styria - Austria **Weißkirchen** | EAO Styria - Austria **Eppenstein** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **A** | | **Quality of location and facilities** | | **max. 100** | **50** | **47** | **60** | **84** | **25** | **76** | **68** | **100** | **58** | **86** | **80** | **96** | **48** | **48** | **48** | **50** | **70** | **86** | **62** |
| A | 1 | Access to public transport network | | 50 | 20 | 12 | 12 | 48 | 0 | 26 | 18 | 50 | 20 | 36 | 30 | 46 | 10 | 10 | 10 | 0 | 20 | 36 | 12 |
| A | 2 | Ecological quality of site | | 50 | 30 | 35 | 48 | 36 | 25 | 50 | 50 | 50 | 38 | 50 | 50 | 50 | 38 | 38 | 38 | 50 | 50 | 50 | 50 |
| **B** | | **Process and planning quality** | | **max. 200** | **200** | **200** | **180** | **155** | **135** | **60** | **145** | **110** | **150** | **200** | **174** | **90** | **190** | **180** | **150** | **189** | **190** | **180** | **168** |
| B | 1 | Decision making and determination of goals | | 25 | 15 | 25 | 15 | 0 | 25 | 10 | 25 | 25 | 25 | 25 | 24 | 25 | 25 | 15 | 25 | 24 | 25 | 25 | 23 |
| B | 2 | Verifiable objectives for energetic and ecological measures | M | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 0 | 0 | 20 | 25 | 20 | 0 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| B | 3 | Standardized calculation of the economic efficiency | M | 40 | 35 | 35 | 30 | 30 | 0 | 0 | 0 | 0 | 40 | 40 | 40 | 0 | 20 | 20 | 20 | 40 | 20 | 0 | 0 |
| B | 4 | Product-management - low-emission products | | 60 | 60 | 60 | 60 | 60 | 60 | 10 | 60 | 0 | 10 | 60 | 60 | 10 | 40 | 40 | 30 | 20 | 40 | 50 | 60 |
| B | 5 | Planning support ofr energetic optimization | | 60 | 60 | 60 | 30 | 20 | 30 | 20 | 60 | 60 | 30 | 60 | 30 | 30 | 60 | 60 | 30 | 60 | 60 | 60 | 40 |
| B | 6 | Information of users | | 25 | 25 | 25 | 25 | 250 | 0 | 0 | 0 | 25 | 25 | 25 | 0 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| **C** | | **Energy & Utilities** | | **max. 350** | **264** | **350** | **324** | **191** | **350** | **321** | **128** | **243** | **327** | **219** | **350** | **350** | **94** | **213** | **162** | **350** | **185** | **316** | **193** |
| C | 1 | Specific heating demand (PHPP) | M | 100 | 84 | 100 | 100 | 40 | 100 | 46 | 0 | 76 | 52 | 92,5 | 100 | 100 | 30 | 88 | 22 | 100 | 10 | 100 | 10 |
| C | 2 | Specific cooling demand (PHPP) | M | 100 | 50 | 100 | 49 | 73 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0 | 0 | 0 | 91 | 0 | 64 | 37 |
| C | 3 | Primary energy demand (PHPP) | M | 125 | 100 | 125 | 125 | 68 | 125 | 125 | 0 | 24 | 125 | 16,5 | 125 | 125 | 64 | 125 | 90 | 125 | 125 | 125 | 101 |
| C | 4 | $CO_2$-emissions (PHPP) | | 20 | 30 | 50 | 50 | 10 | 50 | 50 | 28 | 43 | 50 | 10 | 50 | 50 | 0 | 0 | 50 | 50 | 50 | 27 | 45 |
| **D** | | **Health and Comfort** | | **max. 250** | **60** | **155** | **105** | **115** | **150** | **0** | **200** | **0** | **150** | **50** | **200** | **175** | **135** | **125** | **85** | **85** | **150** | **250** | **235** |
| D | 1 | Thermal comfort in summer | | 150 | 0 | 65 | 65 | 65 | 150 | 0 | 150 | 0 | 150 | 0 | 150 | 150 | 75 | 75 | 50 | 50 | 75 | 150 | 150 |
| D | 2 | Ventilation - non energetic aspects | | 50 | 50 | 40 | 40 | 40 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 25 | 30 | 25 | 25 | 25 | 25 | 50 | 50 |
| D | 3 | Daylight optimized | | 50 | 10 | 50 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 50 | 50 | 0 | 30 | 25 | 10 | 10 | 50 | 50 | 35 |
| **E** | | **Building materials and construction** | | **max. 200** | **174** | **194** | **184** | **148** | **115** | **175** | **140** | **162** | **140** | **200** | **177** | **139** | **180** | **180** | **150** | **140** | **150** | **164** | **181** |
| E | 1 | $OI3_{TGH-Ic}$ ecological index of the thermal building envelope | | 200 | 174 | 194 | 184 | 148 | 115 | 175 | 140 | 162 | 140 | 200 | 177 | 139 | 180 | 180 | 150 | 140 | 150 | 164 | 181 |
| | | **Sum** | | **max. 1.000** | **748** | **946** | **853** | **693** | **775** | **632** | **681** | **615** | **825** | **755** | **981** | **850** | **647** | **746** | **595** | **814** | **745** | **996** | **839** |

| EAO Styria - Austria **Scheifling** | EAO Styria - Austria **ITZ Zeltweg** | EAO Styria - Austria **Neumarkt** | TZS Tyrol - Austria **Zams** | TZS Tyrol - Austria **Medical Centre Ried** | TZS Tyrol - Austria **Landeck** | TZS Tyrol - Austria **Kramsach** | Prov. of Trento - Italy **Romarzollo** | Prov. of Trento - Italy **Floriani** | Prov. of Trento - Italy **Mezzolombardo** | Prov. of Trento - Italy **Mayer** | Prov. of Trento - Italy **Vigo Parsonage** | Prov. of Trento - Italy **Vigo Town Hall** | Prov. of Alessandria - Italy **Ovada I** | Prov. of Alessandria - Italy **Ovada II** | Prov. of Alessandria - Italy **Ovada III** | Prov. of Alessandria - Italy **Peano Enlargement** | Prov. of Alessandria - Italy **Peano Gymnasium** | Prov. of Alessandria - Italy **Palazzo Edilizia** | Prov. of Alessandria - Italy **Sobrero Gymnasium** | EURAC - Italy **Brunneck** | EURAC - Italy **Mühlen** | EURAC - Italy **Lajon School** | EURAC - Italy **Lajon Rest Home** | ZVDK - Switzerland **Zermatt** | ZVDK - Switzerland **Eichmatt** | ZVDK - Switzerland **Triemli Zürich** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **100** | **50** | **100** | **50** | **56** | **62** | **62** | **88** | **60** | **92** | **100** | **50** | **50** | **88** | **88** | **88** | **87** | **87** | **58** | **100** | **56** | **82** | **56** | **56** | **62** | **76** | **100** |
| 50 | 0 | 50 | 0 | 6 | 12 | 12 | 50 | 18 | 50 | 50 | 0 | 0 | 50 | 50 | 50 | 50 | 50 | 20 | 50 | 6 | 32 | 6 | 6 | 12 | 36 | 50 |
| 50 | 50 | 50 | 50 | 50 | 50 | 50 | 38 | 42 | 42 | 50 | 50 | 50 | 38 | 38 | 38 | 37 | 37 | 38 | 50 | 50 | 50 | 50 | 50 | 50 | 40 | 50 |
| **160** | **160** | **160** | **133** | **130** | **160** | **130** | **170** | **140** | **195** | **180** | **135** | **170** | **80** | **170** | **180** | **104** | **130** | **185** | **104** | **130** | **130** | **140** | **165** | **106** | **163** | **200** |
| 25 | 25 | 25 | 18 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 15 | 25 | 25 | 14 | 25 | 25 | 14 | 15 | 5 | 15 | 20 | 16 | 25 | 25 |
| 20 | 20 | 20 | 10 | 15 | 15 | 10 | 20 | 20 | 20 | 20 | 20 | 20 | 0 | 20 | 25 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 18 | 20 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | 0 | 40 | 40 | 40 | 40 | 0 | 40 | 40 | 0 | 0 | 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 |
| 40 | 50 | 30 | 40 | 25 | 45 | 25 | 50 | 50 | 50 | 50 | 50 | 50 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 30 | 30 | 30 | 55 | 0 | 50 | 55 |
| 50 | 40 | 60 | 50 | 55 | 60 | 55 | 35 | 45 | 35 | 45 | 0 | 35 | 20 | 40 | 45 | 25 | 25 | 55 | 25 | 55 | 60 | 60 | 55 | 50 | 55 | 55 |
| 25 | 25 | 25 | 15 | 10 | 15 | 15 | 0 | 0 | 25 | 0 | 0 | 0 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 10 | 15 | 15 | 15 | 20 | 15 | 25 |
| **209** | **50** | **314** | **194** | **137** | **350** | **350** | **303** | **312** | **235** | **246** | **285** | **330** | **82** | **97** | **71** | **82** | **10** | **230** | **116** | **329** | **336** | **350** | **302** | **350** | **350** | **350** |
| 91 | 0 | 100 | 100 | 82 | 100 | 100 | 100 | 100 | 40 | 100 | 64 | 100 | 0 | 10 | 23 | 0 | 0 | 100 | 0 | 54 | 76 | 100 | 87 | 76 | 100 | 85 |
| 28 | 0 | 55 | 37 | 55 | 100 | 100 | 28 | 37 | 55 | 73 | 46 | 55 | 82 | 60 | 10 | 82 | 10 | 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 91 |
| 76 | 0 | 125 | 47 | 0 | 125 | 125 | 125 | 125 | 93 | 34 | 125 | 125 | 0 | 0 | 0 | 0 | 0 | 85 | 0 | 125 | 125 | 125 | 65 | 125 | 125 | 125 |
| 14 | 50 | 34 | 10 | 0 | 41 | 37 | 50 | 50 | 47 | 39 | 50 | 50 | 0 | 27 | 38 | 0 | 0 | 45 | 16 | 50 | 35 | 50 | 50 | 50 | 50 | 50 |
| **250** | **250** | **250** | **105** | **100** | **120** | **120** | **0** | **10** | **30** | **50** | **50** | **50** | **165** | **75** | **145** | **132** | **152** | **175** | **145** | **111** | **140** | **120** | **117** | **65** | **65** | **225** |
| 150 | 150 | 150 | 50 | 65 | 65 | 65 | 0 | 0 | 0 | 0 | 0 | 0 | 65 | 0 | 45 | 52 | 52 | 75 | 65 | 65 | 65 | 65 | 65 | 65 | 65 | 150 |
| 50 | 50 | 50 | 25 | 25 | 25 | 25 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 25 | 50 | 50 | 50 | 50 | 50 | 25 | 25 | 25 | 25 | 0 | 0 | 25 |
| 50 | 50 | 50 | 30 | 10 | 30 | 30 | 0 | 10 | 30 | 50 | 50 | 50 | 50 | 50 | 50 | 30 | 50 | 50 | 30 | 21 | 50 | 30 | 27 | 0 | 0 | 50 |
| **156** | **185** | **175** | **77** | **102** | **123** | **42** | **0** | **130** | **55** | **109** | **75** | **75** | **133** | **172** | **85** | **192** | **183** | **132** | **175** | **129** | **129** | **50** | **132** | **53** | **123** | **104** |
| 156 | 185 | 175 | 77 | 102 | 123 | 42 | 0 | 130 | 55 | 109 | 75 | 75 | 133 | 172 | 85 | 192 | 183 | 132 | 175 | 129 | 129 | 50 | 132 | 53 | 123 | 104 |
| **875** | **695** | **999** | **559** | **525** | **815** | **704** | **561** | **652** | **607** | **685** | **595** | **675** | **548** | **602** | **569** | **597** | **547** | **778** | **640** | **755** | **817** | **716** | **772** | **636** | **777** | **979** |

# Summary and Findings of 46 Pilot Evaluations

## General Overview on the assessment results

The assessment has not been certified by a common certification body and therefore may have different interpretation of basis measurements or calculation basis.

The PP decided themselves which buildings they evaluate. The author expects that the PPs have choosen buildings above standard. In particular the total points of the evaluated buildings lies between 525 points and 999 points with an average of 725 points. Therefore the total amount of points is reasonable. There is no project which is under the 10 best or 10 worst of all categories.

Comparing the results on single thematic averages has been reached between 41 % and 91 %. The criterias seems to be reasonable.

**Summary of Evaluations**

| Nr. | | Title | Must criterias (M); min. standard | max. Points | evaluated Points | % of max. |
|---|---|---|---|---|---|---|
| **A** | | **Quality of location and facilities** | | **max. 100** | **71** | **71%** |
| A | 1 | Access to public transport network | | 50 | 26 | 51% |
| A | 2 | Ecological quality of site | | 50 | 45 | 90% |
| **B** | | **Process and planning quality** | | **max. 200** | **153** | **77%** |
| B | 1 | Decision making and determination of goals | | 25 | 21 | 85% |
| B | 2 | Formulation of verifiable objectives for energetic and ecological measures | M | 20 | 18 | 89% |
| B | 3 | Standardized calculation of the economic efficiency | M | 40 | 16 | 40% |
| B | 4 | Product-management - Use of low-emission products | | 60 | 38 | 63% |
| B | 5 | Planning support ofr energetic optimization | | 60 | 45 | 74% |
| B | 6 | Information of users | | 25 | 23 | 91% |
| **C** | | **Energy & Utilities** | | **max. 350** | **246** | **70%** |
| C | 1 | Specific heating demand (PHPP) | M | 100 | 66 | 66% |
| C | 2 | Specific cooling demand (PHPP) | M | 100 | 65 | 65% |
| C | 3 | Primary energy demand (PHPP) | M | 125 | 84 | 67% |
| C | 4 | $CO_2$-emissions (PHPP) | | 20 | 35 | 71% |
| **D** | | **Health and Comfort** | | **max. 250** | **123** | **49%** |
| D | 1 | Thermal comfort in summer | | 150 | 69 | 46% |
| D | 2 | Ventilation - non energetic aspects | | 50 | 26 | 51% |
| D | 3 | Daylight optimized (+ lightening optimized) | | 50 | 28 | 57% |
| **E** | | **Building materials and construction** | | **max. 200** | **135** | **67%** |
| E | 1 | $OI3_{TGH-lc}$ ecological index of the thermal building envelope (respectively OI3 of the total mass of the building) | | 200 | 135 | 67% |
| | | | **Sum** | **max. 1.000** | **726** | **73%** |

# Summary and Findings of 46 Pilot Evaluations Results and feedback from the assessing bodies

The results and feedback on partner level are more illustrative for pointing on possible tribulations.

## LP Vorarlberg

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The results of the evaluation with the ENERBUILD Tool by LP Vorarlberg are above average and with strengths in Process and planning quality and Building materials and construction as well as weaknesses in Quality of Location and site.

### General feedback

One of the buildings was first planned as a regular building according to legal efforts. After internal discussion it was decided to build a „healthy and sustainable" building according to the directives of Nachhaltig Bauen in der Gemeinde" - regional adaption of the ENERBUILD approach.

A process of optimizing the material input, chemical input and reducing energy demand was initiated by the local adaption of the ENERBUILD Tool. As a result of the process the energy demand could be halved, the input of indoor air pollution could be reduce about 90 %.

One of the buildings combines a kindergarten with a fire department. Therefore it was a challenge to separate the parts in the building with different needs and demands in room temperature and comfort aspects. Also the ecological efforts had to be separated concerning the different parts and usage of the building.

An important advantage oft the ENERBUILD Tool compared to other assesment systems is, that it has been specialy developed for public buildings. As for public buildings the decicion making and the planning process is different from other builodings, it is important to consider these special aspects in the assessment system. As the decision making process for public buildings is more complicated for public building, the need for a quality control for decision making process and planning process is higher.

The ENERBUILD Tool helped in describing the aims of the project. So it helped in the decision making process in the municipality. The ENERBUILD Tool leads the planning team to improvements of the building envelope and arrangement of windows.

For future use, it would be helpful to adapt the ENERBUILD Tool to the needs of refurbishments. Another important aspect concerning the tool is its open source approach: only this approach allows for regional adaptations in the assessment system.

### Feedback towards certain criterias

**A Quality of location and facilities**

A1: Reduce Points for access to public transport network – too much weight in rural areas. For rural aeras it is difficult to achieve high score in criteria „A1 - access to public transport network": Even if the building of interest can be reached frequently but only by one single bus line, only 20 points can be achieved.

**B Process and planning quality**

In general, the criteria halped very much to define controllable aims fort he energetic and ecologic qulity.

- Side sheets for calculation of the points, for finding the points for each sub-criteria
- Side sheets for further information about the fulfilling of the criteria

**C Energy & Utilities**

As PHPP has been sucessfully evaluated by comparisons with measured values oft he energy consumtion, it is an appropriate choice of calculation programm.

For European projects, the use of phpp seems tob e the only chance to do any comparisons of the energetic quality of projects. Apart from the correctness of the results, the availability in many european languages is a big advantage.

Quality management in calculation of energy demand is necessary respectively recommended. It would be of great advantage to include a criterion quality control for calculation of energy demand calculations. In the Vorarlberg regional version oft he ENERBUILD Tool, it turned out, that this criterion is of great importance.

**D Health and Comfort**

Make a suggestion how to deal with different results for indoor air quality in different rooms with different surfaces. How to get the points – is it the average, is it the worst value?

D2: error in the formulation of highest quality criteria. It must say „Noise imission measurement on the most exposed working space".

LA,nT < 25 dB und LC(50-4000),nT < 45 dB =>50

| E | Building materials and construction |
|---|---|

In criteria „E1 – Building materials and construction„ the formula for calculation of OI3 needs to be adapted.

An adoption of Ecosoft 4.0 necessary (already done by LP Vorarlberg process)

## PP2 RAEE Lyon

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PP2 RAEE Lyon reported results above average with strengths in Building materials and construction and Energy and Utilities and mixed results in all other categories exspecially in Health and comfort either very good or very bad once. Full points have been noticed in C2 specific cooling demand among all projects.

### General feedback

The criteria of the ENERBUILD Tool allowed to value the key points of this building: envelop, choice of materials, air quality and the results of the evaluation reflect objectively the global performance of the project.

The most difficult part of the evaluation is the one concerning the planning process. It is not still evident to be able to get back documents necessary for this evaluation. The evaluation is facilitated when local energy agency participated in the evolution of the discussions and the decisions and if it is made while the project is in progress.

The evaluation of the process of planning is not evident because the main criteria is based on the presence or not of „documents„ of planning without estimating really the relevance of their contents in the decision-making support and which do not necessarily report „continuous-flow„ exchanges realized during the first phases of the project. The presence of an environmental „dashboard" gives a large number of information but is not always realized.

To improve the ENERBUILD Tool, it would be good to base on figures common to the European level as the conversion primary energy/ final energy, eq$CO_2$ energies, etc. It is also necessary to first list documents and studies and their specifications indispensable to realize to facilitate the evaluation a posteriori.

General Suggestion: Proposal to differentiate criteria depending on the nature of building: social housing building, commercial building, technical building

Three stages are necessary for the evaluation of the building: collect the data and the information (written documents and exchange); redefine certain criteria of the assessment grid so that it is more coherent with the available data; complete the assessment grid. The longest part is the collection of the information.

Some data are complicated to obtain even unsuitable for local different contexts as the indicator D2 on the acoustics of the ventilation. It is not evident to connect the acoustic quality of the ventilation with the quality of internal air. Other difficulties can appear by a cultural approach different from the building as for the indicator E1 because the grey energy is a new notion in France contrary to the other European countries.

The time spent to the evaluation is essentially based on the search for information and the adaptation of the criteria to the project. Once the data collected, the evaluation is rather simple and seems good to report the quality of the project. On the building, the number of points well reports a successful project on the energy sector (current labeling Passiv' haus ) but which is also in phase with environmental considerations on the choices of materials and the management of the construction site

The ENERBUILD Tool remains essentially adapted to the projects having turned to the passive approach by PHPP. In an approach other one than PHPP, the adaptations are sources of estimates to suit to the local context and so makes the comparison between European projects delicate even not relevant. The global number of points represents well the good quality of project. For the energy part, the adaptation with the French statutory calculation must be clearly identified because at present only the values stemming from PHPP are considered in this assessment grid.

**Feedback towards certain criterias**

| A | Quality of location and facilities |
|---|---|

A1: Proposal to extend this criterion to other infrastructures valuing friendly transport (cycling and train station in particular).

A1: data difficult to evaluate and taking a lot of time, to list all the lines, to find schedules for the frequencies, etc.

| B | Process and planning quality |
|---|---|

Proposal to add a criterion on water (management, recovery ...).

Proposition to consider the social aspect: coeducation of housing, nearness of the businesses or the creation of spaces reserved for the business / service industry aiming, among others, to reduce the environmental impact of the movings, the work in partnership with the municipality for the opening up of the district, on the management of the waste, the integration of the renovation of the school.

B1 and B2: It can be difficult to get certain documents needed to assess when the project already exists: for example the documents proving the decision-making, determination and definition of the initial objectives

B2 to B5: need to define more exactly the expected documents

B2: It seems more difficult to estimate a planning process when the building is already finished, initial objectives were able to evolve in the first phases of the project and the criterion B2 does not report this type of evolution of the objectives. For the evaluation of this planning the expected written documents are not always available

B3: the economic profitability calculation was integrated into an approach of global profitability of this social project. It is so difficult to estimate over-investments connected to the energy efficiency and to the solutions of the variants.

B4: Proposition to value the local origin of materials and to find a simpler tool of evaluation.

B5: Proposition to widen this criterion to the specific electricity. For example, proposition to take into account equipments allowing the reducing of the consumptions of lighting in common sections: lighting by bright button and timer; the number of levels ordered simultaneously does not exceed 3 levels or every floor is independent from the others, above the ground floor. There is also lighting by detector of presence including a crepuscular switch.

B5: To value the energy quality of the building (ship), we propose three options of evaluation; the answers to the following questions ventilate points:

- A document of energy optimization 10 pts
- A planned test for airtightness 20pts
- An instrumentation-monitoring planned 30pts

| C | Energy & Utilities |
|---|---|

The evaluation of the energy performances (need of heating and need in primary energy from PHPP) is not still adapted to the local regulation tool. Difficulties remain to convert these data to keep a global coherence in the evaluations.

To value the implementation of equipments using renewable energies sources by the evaluation of a ratio according to the total consumption.

C1: conversion from local thermal regulation to PHPP difficult

C2: need of air conditioning, proposition of 3 options without calculation: Passive refreshment: 100 pts, Active refreshment: 60 pts, Air conditioning: 10 pts

C3: estimation by ratio of the specific electricity is source of error

C4: Homogenization of the ratios of conversion for $CO_2$ emissions.

| D | Health and Comfort |
|---|---|

D1: Dynamic simulation is very costly

D2: Difficulties to estimate because of the absence of technical data on the system of ventilation.

D2: It is not evident to connect the acoustic quality of the ventilation with the quality of internal air.

D2: data difficult to obtain

D2: Proposition to decompose this criterion into 2 sub-levels:

- Preservation of the criterion on the acoustic measures by softening and by simplifying the indicator criteria.
- Addition of a line on the quality of the ventilation, according to the activity of the building.
- Proposition to insist more on the evaluation of the air quality by an analysis of the air quality on site for example.

| E | Building materials and construction |
|---|---|

E1: data difficult to obtain

# Summary and Findings of 46 Pilot Evaluations
Results and feedback from the assessing bodies

## PP3 Piemonte

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Average assessment results have been delivered by PP3 Piemonte. The strengths are in Process and planning quality and Building materials and construction as well as the weakness in Quality of location and facilities. Mixed reports have been shown in the category Energy & Utilities.

### General feedback

ENERBUILD Tool showed to be an effective evaluation tool, especially applied to low energy buildings located in the alpine space. The results achieved seem to correctly reflect the performance of the assessed building. Its application to „standard practice" buildings could be more critical, considering for instance that all the energy related criteria are calculated using the PHPP software that is specifically targeted to passive houses.

In general, the results of the ENERBUILD Tool assessment reflect the green building strategies implemented in the building.

If the future intent is to use ENERBUILD Tool to assess buildings in regions where the passive house is not a mandatory standard, the main issue is to revise the performance scales of the criteria to allow a more suitable assessment of more conventional construction.

In the energy criteria and transportation criterion it should be more properly considered the use of the building. For a school the public transportation availability is important only in specific times. The building is not used in summer time and so the cooling energy demand is not fully appropriate

The tool has helped during the planning phases to define the performance targets and to monitor their achievement. The decision process results to be quite difficult to document because it is formulated trough different kind of documents (public acts, meeting minutes, etc.). The LCC analysis has been focused mainly on the cost/benefit analysis for energy consumptions. Product management seems to be critical to handle, due to the scarcity of eco-labels for building products in Italy. A very detailed manual for users has been developed.

The criteria more challenging are the ones related to the PHPP and OI3 calculations, because it has been necessary to learn the related software. Also the assessment of the criteria linked to the process has been difficult because a structured process/planning because the practice described in ENERBUILD Tool is not standard. But for this reasons, ENERBUILD Tool can contribute effectively to move the standard building practice to better levels.

The cross assessment (ENERBUILD Tool / Protocollo ITACA) has facilitated the process. The main issue is the clear scope of ENERBUILD Tool for assessing passive houses while the Protocollo ITACA has a broad scope.

### Feedback towards certain criterias

| B | Process and planning quality |
|---|---|

The criteria should be more deeply described for a more effective application.

| C | Energy & Utilities |
|---|---|

The evaluation of the energy criteria has been carried out using a calculation procedure for passive constructions. But because the school has not a „passive" performance, the calculation resulted too much detailed for this kind of construction.

For the energy related criteria ENERBUILD Tool assumes that the assessed building reaches a minimum performance that for a standard building is not usual. If ENERBUILD Tool has to be the base for a building certification system, it should be revised the level of the minimum performance requested.

| E | Building materials and construction |
|---|---|

The OI3 index should address the issue to have a EU reference database for building products.

## PP6 Styria

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PP6 Styria declared the best performing buildings in this panopticon. Nevertheless the full points in D1 Thermal comfort in summer and D2 Ventilation and all best ranks in Health and Comfort shall be questioned again. The strength lies in Health and Comfort and Building materials and construction as well as the weakness in Energy & Utilities. Mixed results have been delivered in Quality of location and facilities.

### General feedback

The evaluation of the building both in current and as planned condition with the ENERBUILD Tool emphasizes the importance not only of sustainable energy measures but an energy aware course of action in the life cycle of a building, planning, construction, use and demolition, as a whole. The evaluation procedure successfully highlighted the conditions and implications of successful thermal insulation.

The reconstructed school in Neumarkt is the building most fitting for the requirements of the ENERBUILD Tool in our region. The efforts in meticulous planning and construction produced great results in the evaluation. The project deserves to be recognized as best practice example for public buildings in Murtal.

In the planning phase, the ENERBUILD Tool is used as mean for pointing out options and consequences of building and reconstruction solutions. This valuable function could be improved in its effect with a graphical depiction of result and conclusions. Customers are already used to the energy classes and respond very well to simple yet informative illustrations.

The evaluation of the event hall in Eppenstein with the ENERBUILD Tool however revealed a great potential for improvements considering Rational Use of Energy (RUE) and Renewable Energy Sources (RES) in planning and construction.

The high-value reconstruction includes a ventilation system with heat recovery and daylight management. Additionally, a PV installation is integrated in the façade that adds to the goal of energy self-sufficiency of the building. The ENERBUILD Tool has proved itself in the evaluation of these features.

In the project, it has been paid special attention to the use of regional resources and implementing companies from within the region. Short transport ways ensure to minimize the $CO_2$-output during the reconstruction and the grey energy of the rebuilding. A full life-cycle analysis incorporated in the ENERBUILD Tool would enable us to integrate this effort in the project.

For the application of a district heating connection there are only the options of fossil fuelled heat sources in the PHPP, but no consideration for a biomass CHP, as in case of the ITZ. However, biomass district heating is in some regions a rather popular technology and should be incorporated in the ENERBUILD evaluation procedure.

Even though there is plenty of consideration on the planning process, the possibility for improvements during the use of the building has been completely neglected. There should be at least an option for the recording of later added technology, even in regards to the focus being on new constructions.

With regard to successful projects like the reconstruction of the school centre in Neumarkt, it would be good to be able to refer to such best practice examples as a way to promote the further use of the ENERBUILD Tool. A representation of different public buildings could be incorporated in training materials for the use of the ENERBUILD Tool in order to:

- Demonstrate the feasibility of the tool in practice
- Show the function of the tool in real-life examples as introductory exercise

## PP7 Tyrol

PP 7 Tyrol reported results below average with weaknesses in Quality of location and facilities; Process and planning quality and Building materials and construction as well as mixed results in Energy & Utilities.

### General feedback

The evaluation is quite practicable in an adequate working time. Getting all the necessary information and documents is the most difficult part of it. To evaluate the planning process it is helpful to do interviews, because written documents don't exist or it is not possible to get them. The result seems to be realistic.

There should be a bonus for reconstructions. Some additional or other criteria for reconstructed buildings should be added.

Some additional tools would make it easier to handle the ENERBUILD Tool. At the moment some calculations are very complex. It would also be helpful to do trainings for planners who want to work with the ENERBUILD Tool.

### Feedback towards certain criterias

| D | Health and Comfort |
|---|---|

D3: criterion is quite hard to evaluate.

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# Summary and Findings of 46 Pilot Evaluations
## Results and feedback from the assessing bodies

## PP8 Trento

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PP8 Trento has examined the ENERBUILD Tool with results below average mainly because of 0 points in D1 Thermal comfort in summer and D2 Ventilation of all projects. Their projects strength is Process and planning quality. The weakness is Health and Comfort and Building materials and construction as well as mixed results on Quality of location and facilities.

### General feedback

For what concerns the planning process, it has been done using LEED as reference and not ENERBUILD Tool, that has been applied in a second moment and so it can be considered more an evaluation tool than a planning tool.

The most problematic aspects of the research have been those related to the collection of all necessary documents and information – that sometimes must be too detailed –. For this reason, we chose to perform ENERBUILD evaluation process using data provided by Leed certification protocol. So, we had to verify where these two systems overlap and which Leed credits correspond (even partly) to ENERBUILD criteria and which have been tried for the considered building. However, if there is no correspondence (as in the case of credit D2, and, partly, credit B1) or a Leed credit has not been tried, we considered the correspondent ENERBUILD criterion as not satisfied. Section C and criteria B3 and E1 – which have no Leed equivalent – are instead calculated separately, according to the instructions of the manual.

Since the building analyzed is relatively small, this evaluation process was feasible and practicable. Mandatory criteria shouldn't have score

### Feedback towards certain criterias

| A | Quality of location and facilities |
|---|---|

A1: is clear and easy to be faced.

A2: is well defined and the proposed index is easy to be used.

| B | Process and planning quality |
|---|---|

B1 and B2: are very detailed and well done. All the most important aspects of planning phase are taken into consideration. Each point has a proper reference with LEED tool

B3: has been quite difficult to be done. LCC is a procedure more and more important in the planning phase (together with LCA) and it is important that in ENERBUILD it has a good relevance, but the ISO Standard and the Austrian standard has been difficult to be applied. For this reason, a simplified method has been followed considering the classical value analysis theory.

B3: life cycle cost analysis is a mandatory criterion, but in practice LCC are rarely calculated. Moreover, prescriptions and assumptions for profitability calculation are not clear and ISO 15686-5 is not sufficient;

B4: is very important concerning human health in indoor spaces. ENERBUILD is quite complete even if the definition of the percentage of structures with ecological declaration is not clear. It could be easier to have reference to European standards and not to local ones. Even a list of most common building components could be useful.

B5: is of course an important issue and it has clear reference, point by point, with LEED protocol. It is sufficiently clear and not difficult to be faced.

B6: is clear and very important. Unfortunately, not all the energy and environmental tools consider this aspect.

| C | Energy & Utilities |
|---|---|

C1 to C4: This is the most problematic section of the tool. In fact, we agree that, in order to have comparable results, the same energy calculation tool should be used. However, PHPP is a good tool only if a passive building has been designed, and the pilot building considered is not a passive one. Moreover, cooling demand is often overestimated and low points are given. It is our opinion that other software should be used, even national ones, taking into account that all the partners should agree on some „fixed points" so that final results of the energy calculation could be compared. For example, it is important to consider international standards. But the choice of the energy calculation tool should be free.

Some PHPP layers require information too detailed and very difficult to collect for already designed and built constructions, especially if nor passive buildings

| D | Health and Comfort |
|---|---|

D1: even if T upper limit has been raised to 27°C (in order to consider higher summer temperature in Italian situation), the upper allowed temperature is overshoot for the 16.4 % of time. In Mediterranean countries it is quite difficult that

upper temperature is overshoot less than 5% of time in summer, so this limit should be rosen even taking into account only the effective period of usage.´

D2: in this case, it should be better to leave the partner free to consider national legislation and not fixed values. Also the acoustic index used should refer to international standards. In the case of the pilot building considered, calculations were not made so it is quite impossible to calculate the correct indexes.

D3: the point is simple and using the EN standard it is easy to calculate. Anyway, the 5% of DF required seems to be too high. In our opinion, following LEED specification, a daylight factor up to a maximum percentage of 2% in 75% of frequently used spaces should be sufficient.

D3: only regularly occupied spaces and not entire area should be considered in order to calculate the average daylight factor.

D3: Leed certification considers only regularly occupied spaces, and it requires daylight factor up to a maximum percentage of 2% in 75% of these spaces, while according to ENERBUILD certification this factor has to be as possible equal to 5%, and superior to 2%, calculated on entire area, that is effectively a too severe request. Being the daylight factor 4,98%, we considered fulfilled the criterion.

D3: LEED do not consider acoustic criteria, so no calculus is available at the moment on this issue.

| E | Building materials and construction |
|---|---|

E1: the procedure for calculating the OI3 index is quite simple and it is an important aspect of building construction.

## PP9 Alessandria

PP9 Alessandria indicated results below average. The strengths of the projects are Quality of building materials, location and facilities, Health and Comfort. The weaknesses are Process and planning quality as well as Energy & Utilities.

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### General feedback

The planning process required by ENERBUILD Tool is similar to that one used in common administration process in Italy.

ENERBUILD Tool has been one interesting transnational system for knowing many energy technicians and experts from other Countries, and also from different Italian areas, and so for comparing the level of designing and working in Provincia di Alessandria.

ENERBUILD Tool use has not been simple for Provincia di Alessandria, because technicians are involved in calculations with PHPP which has not known in our design and working studios. In particular we have noticed strong differences between common Italian evaluations and C2, C3, C4 and E1 values provided by ENERBUILD Tool.

ENERBUILD Tool can't be generally used in our regions, with particular references to materials and ecological index catalogue by IBO BOOK which provides only for Austrian or German areas. In particular LCA – Life Circle Assessment-, about which OI3 is evaluated, is only based over Austrian data basis.

ENERBUILD Tool could be an additional tool, not unique, in evaluating public building – offices, schools, gymnasiums – towards local tools.

The evaluation was quite laborious for the amount of information that was necessary to find and sometimes difficult for the foreign laws with which we had to compare.

For the evaluation of the planning process is essential to have written documentation produced during the entire design process that does not always exist. Some criteria have therefore been discussed to see if some types of available documents (minutes, reports, etc. ...) could be considered suitable the size of the building project, important both in terms of size and shapes, technological solutions and systems adopted, helped make quite complex to evaluate.

We believe it's basic to provide to all technical ENERBUILD compilers and users of related software (suggested or required by the catalog) all indispensable instruments so that the response criteria may be unique, comparable and therefore not susceptible to subjective free interpretation. To this end, for example, would be useful to attach to the catalog of criteria ENERBUILD user manuals for suggested softwares or cited laws's extracts, if foreign.

### Feedback towards certain criterias

| B | Process and planning quality |
|---|---|

B3: the formula given for the simplified calculation of the cost of the life cycle was not immediately clear because of lack of methodological information attached;

| E | Building materials and construction |
|---|---|

E1: it was quite complicated to use the software for calculating ECOSOFT not having been provided a user manual of the program.

## PP10 EURAC

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PP10 EURAC has stated very close numbers above average with very few extreme (good or bad) results. The strengths of the projects lie in Energy & Utilities and Health and Comfort as well as the weaknesses in Process and planning quality and Building materials and construction.

### General feedback

The evaluation seems feasible and practicable in an appropriate working time. The grading is quite realistic and gives a good statement about an ecological overview of the building.

The most problematic part was to gather all necessary documents and information. Part B, the Process and planning quality was evaluated within an interview with the architect. Written documentations about the single criteria were in part missing.

### Feedback towards certain criterias

| B | Process and planning quality |
|---|---|

B1: criteria should be formulated more precise: division of the competitions into public competitions for architectural ideas and preliminary design, preliminary competition, executive competition, public tendering.

B3: The criterion of economic efficiency is a must criterion, but in practice not always economic efficiency is followed for smaller public buildings, like in this example.

B3: The tool of Frankfurt for calculated the economic efficiency could be added in the appendix.

B3: The criterion of economic efficiency is a must criterion, but in practice not always economic efficiency is followed for smaller public buildings.

| D | Health and Comfort |
|---|---|

D2: The calculation from Uni EN 12354-5 was not done, but the planners respected principal planning strategies to avoid sound transmissions. The calculation from Uni EN 12354-5 seems very laborious.

D2: As sound-measurements could not be done, an evaluation was done by interviewing the architect and figuring out the employed measures to avoid sound transmissions of the ventilation machine.

D2: A simplified method for calculating the sound transmission should be implemented into the ENERBUILD manual.

D3: Is the average daylight factor meant for the whole surface of the building or only rooms were daylight is necessary (no corridors, technical rooms, WCs)?

D3: The daylight calculation with the described procedure of the manual is not always applicable, for example when having spaces with windows oriented in different orientations. Maybe a daylight calculation of the most important spaces with the ad of a simple software calculation (freeware Dialux or Relux) gives a more realistic result of the used spaces

## PP13 HSLU Switzerland

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PP13 Switzerland reported very mixed results on project level as well as on partner level. The common strengths lie in Quality of location and facilities and Energy & Utilities, the weakness in Building materials and construction.

### General feedback

Retrieving the required information was quite difficult. Different sources had to be requested, reviewed and compared. If further tools are needed as part of the ENERBUILD Tool evaluation (particularly PHPP and the OI3 calculator), the corresponding data for those tools has to be gathered, determined via auxiliary calculations, or

estimated if not available.

The relevant information about the building consists of gathered results (e.g. national/ local certification standards) and, thus, calculated values, which depend on their calculation method. This means they cannot be transferred directly into the ENERBUILD Tool. Tracing them back to their origin to finally use them for PHPP and OI3-Index calculations, which themselves are part of the ENERBUILD Tool, is quite time-consuming.

Also, the evaluation relies on the help of planners and architects, who need to provide further information which was not relevant for the local certification process (e.g. the „Ecological quality of the site"). If data is missing, there is little room for estimates.

Since not all data, which the PHPP calculation would need, could be retrieved, there might be deviations. Also, the Swiss Minergie-P standard consults other floor areas (heated gross floor area) and calculates the demands differently. Thus, a comparison between the results of PHPP and Minergie-P cannot be taken to draw conclusions from. Since the PHPP only accounts to about one third of the possible points of whole ENERBUILD Tool, those deviations were considered to be insignificant. Assigning e.g. the value of of „C1 - Specific heating demand", the target value of 15 kWh/m2a is based on PHPP calculation, while the initial value (local limit for heating demand) is based on other national calculation methods (SIA 380/1). Therefore, determining the score for the ENERBUILD Tool will most likely always be subject to deviations.

There could be an option to adjust the maximum score if not all criteria could be evaluated, so that with a potential maximum „800 points" and achieved „600 points", the overall achievement would still be 75%.

The descriptions how to distribute the points of the „Prescription ENERBUILD Tool Criteria" are diverse: one uses a formula, while another one has to be interpolated, and a third one needs another complex tool etc.

Providing a list and overview of the required (sub) tools to convert basic data/ information into scores for the ENERBUILD Tool would be helpful as a checklist for involved institutions or planners/ architects etc.

**Feedback towards certain criterias**

| D | Health and Comfort |
|---|---|

D1: the maximum score cannot be reached without dynamic calculation. Thus, maxing out the potential score, another more complex tool would have to come into consideration. This seems not to be very user friendly, comparing the cost-benefit ratio.

D2: two times lists the same criteria for sound imission measurements while assigning different scores.

| E | Building materials and construction |
|---|---|

E1: uses contradictory indices. All of the following indices are mentioned: OI3TGH-lc, OI3TGH-BGF, OI3TGH-BGF WG Ref. There should be clarification. Maybe also the possibility of (just) calculating the surfaces and their specific OI3 of the construction without another tool would help to lighten the process. If Ecosoft is used, the OI3 index for „construction & maintenance" could also be an interesting addition to the broad approach of the ENERBUILD Tool.

# Summary and Findings of 46 Pilot Evaluations

## Comparison between ENERBUILD criteria and Leed credits by Trento

| A | Quality of location and facilities |
|---|---|
| A 1 | Access to public transport network |

Leed evaluation process requires easy access to public transportation through SS Credit 4.1 „Alternative Transportation: Public Transportation Access". To get this criterion, Leed and ENERBUILD evaluations use very similar approaches; both require placing the project near an existing public bus or train stop. However, compared to Leed certification, ENERBUILD evaluation process also requires a transport minimum hourly frequency.

| A | Quality of location and facilities |
|---|---|
| A 2 | Ecological quality of site |

There is no direct correspondence between LEED credits and ENERBUILD A2 criterion. However, it is possible to calculate area's ecological index by Leed certification, and in particular through SS Credit 1 „Site Selection„ and through SS Credit 2 „Density & Community Connectivity".

| B | Process and planning quality |
|---|---|
| B 1 | Decision making and determination of goals |
| B 2 | Formulation of verifiable objectives for energetic and ecological measures |

Decision making is defined by Leed evaluation process through an initial diagram and through two reports („Basis Of Design", BOD, and „Owner's Project Requirements", OPR, defined by EA Prerequisite 1, „Fundamental Commissioning of the Building") that contain the objectives to be pursued. Checklist is also a Leed tool which allows to evaluate the project team's choices and to get B1 and B2 ENERBUILD Criteria.

In particular, for credit B1 assessment important criteria are SSPr1, SSPr2, SSC2, SSC4, SSC5 into the SS Section „Sustainable Sites", criteria EAPr2, EAC1 into the EA Section „Energy and Atmosphere„, criteria MR C4, MRC 5, MRC6 into the MR Section „Materials and resources„ and IEQ Criterion 4 into the EQ Section „Indoor Environmental Quality".

B2 credit is met by two Leed reports – BOD and OPR – defined respectively by the owner and by the design team. These tools are a necessary prerequisite for Leed certification and so B2 criterion is always get.

B2.3 Photovoltaic system

The ENERBUILD criterion is comparable to EA Credit 2 „On-site Renewable Energy". However, Leed criterion aims at increasing not only photovoltaic energy, but all renewable such as solar, wind, geothermal, biomass and bio-gas energy.

| B | Process and planning quality |
|---|---|
| B 3 | Standardized calculation of the economic efficiency |

Standardized calculation of the economic efficiency (LCC) is not considered by Leed certification and so it was calculated separately.

| B | Process and planning quality |
|---|---|
| B 4 | Product-management - Use of low-emission products |

Product management is defined into the MR Section „Materials and Resources" and into the EQ Section„ Indoor Environmental Quality" through different criteria. In particular, Leed evaluation process requires to use materials with recycled content, rapidly renewable and regional as defined, respectively, by MR Criterion 4, C5 and C6.

However, Leed evaluation process requires full documentation of all materials used but it requires Low-Emitting Materials only for building's interior and in particular, for adhesives and sealants, paints, and coating, carpet systems composite wood, agrifiber products (and according to the manual „Leed for School„, furniture ) as required by Credits 4.1, C4.2, C4.3, C4.4 into the EQ Section.

Therefore, although the correlation between Leed evaluation and credit B4 is not direct, it is possible to compare these two protocols and ENERBUILD criterion B4 is get if all Leed criteria have been tried.

| B | Process and planning quality |
|---|---|
| B 5 | Planning support for energetic optimization |

B5 criterion requires satisfying the following conditions (each associated with 5 points):

- design by specifying destination, size, frequency and intensity of use of the rooms, and their internal temperatures. This criterion is quite similar to Leed Credit EA1, because building energy simulation requires the same information;
- design of air flow room according to hygiene requirements, as required into the EQ Section, „Indoor Environmental Quality", and in particular by EQPr1 (that requires to establish minimum indoor air quality);
- identification of internal heat sources, condition necessary to develop building energy

simulation and so condition already required by Leed Credit EA1;

- calculation of thermal bridges by means of a default value of 0.03 W / ($m^2$ K) and detailed verification of thermal bridges. There is no correspondence to Leed certification system;
- description of energy parameters in the contract, as required by Leed EA Pr1;
- verification of energy aspects of the tenders with the requirements of the contract, condition satisfied because it gets EA Prerequisite 1;
- visits to the site to support local management about energy issues, required also by Credit EA C5;
- provide to conduct the Blower Door test, that is an option required by Leed certification just in case of residential buildings, through EQ Prerequisite 2 (Option 3);
- measure of ventilation system, as required by Leed evaluation with EA Credit 1;
- hydraulic balancing of the heating, as required by Leed EA Credit 1;
- update of the calculations of energy requirements at the end of the construction and conduct a blower door test as final control. This criterion get Leed EA Credit 1;
- verification of energy requirements at the end of the work, as required by Leed EA Credit 5 „Measuring and verification".

| B | Process and planning quality |
|---|---|
| B 6 | Information for users |

Leed evaluation process requires developing an usage and operating manual just if you want to get the EA Credit 3 „Enhanced Commissioning". So, its development – very rare – depends on project team's choice, on building's complexity and on its destination.

| C | Energy & Utilities |
|---|---|
| C 1 | Specific heating demand (PHPP) |
| C 2 | Specific cooling demand (PHPP) |
| C 3 | Primary energy demand (PHPP) |
| C 4 | $CO_2$-emissions (PHPP) |

Section C on the energy requirements (C1, C2, C3) can not be compared directly with EA Leed section „Energy and Atmosphere". In fact, ENERBUILD certification system requires an analysis developed by using PHPP software, whereas Leed evaluation process just requires (EA C1) to observe the minimum prescriptive measures. Also, if you want to obtain the maximum score, Leed requires to develop a dynamic simulation ( EA C1, Option 2) that involves comparison of the building with a basic model defined by prescriptive measures ( ASHRAE 90.1.2007 norm, Appendix G).

| D | Health and Comfort |
|---|---|
| D 1 | Thermal comfort in summer |

Although into the EQ Leed section credits EQ C7.2 and EQ C7.1 define all the requirements for summer thermal comfort, it is necessary to use PHPP software to calculate value h0 (percentage overshoot the maximum allowable temperature in summer) required by ENERBUILD certification system. Therefore, D1 ENERBUILD criterion doesn't find a match with Leed certification.

| D | Health and Comfort |
|---|---|
| D 2 | Ventilation – non energetic aspects |

Leed evaluation process defines the requirements for sound insulation just when the building is a school. Again, however, there is no correspondence to ENERBUILD evaluation process: Leed certification requires to achieve in classrooms a background noise up to a maximum level of 45 dBA, equivalent to standards required by ANSI S12.60/2002 (EQ Pr3); instead, ENERBUILD requires not only a background up to a maximum level of 30 dBA, but also that sound pressure level (not exceeding 20 dB) is evaluated with the weighting curve „C". In particular, this second aspect is not considered by Leed evaluation process and so these two evaluation processes are not comparable.

| D | Health and Comfort |
|---|---|
| D 3 | Daylight optimized<br>(+ lightening optimized) |

D3 criterion is similar to Leed EQ Credit 8.1 „Daylight and views". However, Leed certification considers only regularly occupied spaces, and it requires daylight factor up to a maximum percentage of 2% in 75% of these spaces, while according to ENERBUILD certification this factor has to be as possible equal to 5%, and superior to 2%, calculated on entire area.

| E | Building materials and construction |
|---|---|
| E 1 | OI3TGH-lc ecological index of the thermal building envelope (respectively OI3 of the total mass of the building). |

Although the Leed evaluation process rewards the use of ecological materials (MR C4, MR C5 and MR C6) Leed doesn't requires the calculation of ecological index of the thermal building envelope. So, ENERBUILD E1 criterion doesn't find a match with Leed certification system.

# Summary and Findings of 5 Pilot Advisory and Certification Bodies

## Certification Body by LP Vorarlberg

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Since the end of the 1990 years private builders in Vorarlberg receive housing subsidies, in case a high energetic and ecological standard is converted. Due to this long experience of the consideration of energetic and ecological building criteria the planners and craftsmen are familiar with it. In the past years the call became loud for an adjustment of the guidelines for the payment of state promotions for municipalities for buildings above ground level. Municipalities, which generate a higher energetic and ecological building standard than others should receive higher subsidies.

Since 2006 an „advisory service" exists as support for public buildings on community-level. Therefore a „certification service" was established in the ENERBUILD project. Object and task of the certification service is to issue an independent building certification „Kommunalgebäudeausweis - KGA". The state subsidies for community buildings depend on the results (points) of the KGA certification.

In December 2010 the Vorarlberg federal state government decided the adjustment of the guidelines for the grant of federal state subsidies concordantly. The basis promotion according to different building types was reduced by 2%. In reverse extra amounts up to 4% can be generated in dependence of the energetic and ecological performance of the buildings (calculated points in the KGA). Additionally the height of the upper limit of the accepted building costs has been increased in dependence of the points in the KGA.

Under the leadership of the „Environmental Federation of Vorarlberg" (Umweltverband Vorarlberg - an association of all 96 municipalities in Vorarlberg) 6 private technical offices were trained to offer this certification service. These small offices are not involved in the planning and execution process of the respective building.

Step 1: The municipality/city defines in advance an appropriate number of points to achieve in the KGA as an „ecological goal„.

Step 2: During the planning and execution process of the building-project the appropriate measures are converted. If desired the environmental federation of Vorarlberg supports the municipality/city.

Step 3: Within 3 months after deployment of the building the KGA certification document has to be submitted. While facilitating all relevant documents the costs for the KGA certification are limited to 1.600 Euros.

For a broad application of a certification tool for buildings it is important that the criterion set is not too complex. The process should be highly cost effective. The criteria should be generally understandable and be clearly described in the application explanations. If possible common building calculation methods should be used. A special challenge was to guarantee the greatest possible simplification with as less losses of the content as possible.

During the establishment of the certification service it appears very important, that the persons, which should be trained, are familiar with the contents „energy efficiency„ and „building ecology„. Appropriate practice tests (application of the tools) during the training appeared to be as essentially important.

An annual exchange between the KGA issuer and the public authorities secure the quality of the certifications. Due to experience data there is an annually (slight) adjustment of the criteria and their weighting within a multi stakeholder process scheduled. The guidelines for the grant of subsidies will be decided also annually by the Vorarlberg Federal State Government.

Due to technical developments and changes of the legal basic conditions it appears necessary to hold contents of the ENERBUILD Tools updated. Constant adjustments and coordination of regional and national activities are necessary. For this synergies can be used and a drifting apart of the used tools can be avoided at a long-term transnational exchange. The ENERBUILD Tool was developed together with transnational project partners within the ENERBUILD project. It was adjusted to the basic conditions of Vorarlberg in coordination with the local and federal state authorities. The goal should be an international platform, on which all regionally used building rating tools are shown.

Pilot applications of the ENERBUILD Tools - special for outstanding projects - should be further supported and marketed. Regionally (in Vorarlberg) the tool should be used also for non-municipality public buildings (e.g. national- and federal schools). This should be promoted accordingly. The public work inclusive marketing of the results should be forced.

## Advisory Service by PP2 RAEE Lyon

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Metropole Savoie, observer of ENERBUILD project, decided in 2009 to advise projects to be energy efficient and had also the will to implement an eco-conditionality of public subsidies at the same time.

Rhônalpénergie-Environnement, through ENERBUILD project, added to this „energy target" the concept of Environmental Quality of Building (EQB), which goes much further than the classical energy target. This EQB could also help Metropole Savoie to define some criteria of eco-conditionality for public subsidies.

The first steps of an advisory service had been established. Metropole Savoie implemented an energy advisory service for schools and public buildings. During ENERBUILD Rhônalpénergie-Environnement convinced Metropole Savoie to go further towards EQB, trained 3 local energy agencies, who where the traditional structure of energy advisory towards EQB via the tests of 8 buildings and implemented the advisory service through the local energy agencies.

Implementing an advisory service about Environmental Quality of Building with a local energy agency such as ASDER and through tools like ENERBUILD Tool is an innovation in the Rhône-Alpes Region and it could grow easily.

The works started with Metropole savoie and could easily be extended to the whole part of Savoie territory (200 municipalities). It could also be extended to other territories of Rhône-Alpes, because there are already local energy agencies in all Départements (8 Départements, 12 local structures). These local energy agencies are organised through a network, and work together in many fields. What ASDER learnt and implemented in advisory services will be an example for other structures and can be disseminated.

ASDER has always advised Metropole Savoie in the Energy field. RAEE convinced ASDER to work on tools such as ENERBUILD and trained them to the ENERBUILD Tool. ASDER developed skills about this subject and is now convinced of the interest of such tools.

During the ENERBUILD project RAEE discovered that an EQB assessment tool must be elaborated at regional level and not at municipal level. So RAEE started discussion with the regional council to implement a tool on the ENERBUILD frame, at the regional level. This regional tool could be therefore adopted by local authorities.

The definition of a set of criteria must come from a public authority bigger than a local authority. Indeed, architects, engineers and companies working on the buildings usually works at a much wider scale than the local authority, at least at the regional level. Because all actors of building have a range of action wider, they must not be in front of many different tools.

The sooner a building benefits from advice from an advisory structure, the best chances it has to have a good score at the ENERBUILD Tool. It means that the establishment of an advisory service is crucial for the results, and this advisory service has to be involved since the beginning of the project. And it's more complicated to operate as advisory service when the project is already started.

An environmental quality of building tool should be shared by all actors of buildings, meaning that in the definition of criteria should be involved professional such as architects, engineers, craftsmen, companies and users. This is an important question of governance of such a tool, and in the certification process, all these actors should be also involved.

There should be a pedagogic work done towards the contacting authority, especially if the building comes from a small local authority, with not so many competencies in low energy building. It's important to „train" the contracting authority and to provide them some pedagogical material.

RAEE has suggested to the regional Council to implement a regional EQB assessment tool in 2012. It will present all the works done in ENERBUILD to the whole regional network of local energy agencies to extend that competency in EQB to all these actors. RAEE will work in 2012 at the French inter-regional level, trying to get the same approach in all French regions, to get a shared tool. This tool would be the basis for an eco-conditionality of subsidies.

What is a great strength of ENERBUILD Tool is its compactness, with a limited number of criteria and simple to use.

The time spent to collect all data can be very long in some cases (data for the transport criteria for instance). Some criteria can take a lot of time to be assessed, meaning that the process of evaluation is more expensive.

To calculate the OI3 index was quite difficult, because the calculation of embodied energy is not usually made by engineers in France. The calculation of the OI3 index is based on German or Austrian projects, not for France. The tool should allow the calculation with national tool, giving the same hypothesis for all tools (life duration of the building, scope of the calculation etc…). Using such tools raises the question of tools and databases of products at European level.

# Summary and Findings of 5 Pilot Advisory and Certification Bodies

The tool is mainly suited to projects with the approach used by passive PHPP. In another approach, adjustments are sources of approximations to fit the local context and makes the comparison difficult with European projects (energy mix for $CO_2$ emissions, primary energy/final energy…) When there is no PHPP calculation on the building, if another software is used for the passive conception, it is very difficult to make the link between the software used and the points scored.

The evaluation of the planning process is not obvious because the main criteria are based on the presence or absence of planning documents without actually assessing the relevance of their contents into the decision support. This does not necessarily reflect the exchange „man to man„ made during the preliminary design phase of the operation. It is necessary to list before documents, studies and specifications necessary to achieve in order to facilitate subsequent assessment.

## Advisory Service by PP3 Piemonte

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An advisory service has been established by Regione Piemonte to support the use of ENERBUILD Tool in the region. On a base of a specific agreement, the service has been operated by ITACA (Federal Association of the Italian Regions) that already has the responsibility of an advisory service for Protocollo ITACA assessments on public buildings in Regione Piemonte.

The advisory service has also acted as contact point for the ENERBUILD Tool, providing information to interested professionals and organizations. The service has been established also to check the feasibility of a possible future certification process based on ENERBUILD Tool approach.

The advisory service has been operated by 4 architects/engineers skilled in the use of ENERBUILD Tool.

The advisory activities have been carried out in three different modalities:

- phone – a dedicated number has been associated to the advisory service. The service has been operated every Monday, Wednesday and Friday from 10 am to 12.30 pm;
- e-mail – a specific e-mail address has been associated to the advisory service;
- meetings – several meeting with the designers and organizations involved in the application of ENERBUILD Tool have been carried out.

The service has contributed, trough the ENERBUILD Tool, to disseminate the sustainable building principles among the main stakeholder of the building sector. The service was available for any interested professional and organization. This last aspect has been appreciated from different involved public organizations that now intend to use the ENERBUILD approach to assure the process and planning quality of future buildings.

The importance of the synergy between the technical work of designers and the quality of process managed by the organizations to assure a high level performance of the building emerged clearly. The application of ENERBUILD Tool to existing buildings has given the possibility to identify possible improvement in the design quality for the future buildings and also in the whole planning process. From this point of view the experience gained by all the participants to the initiative has been recognized of high value.

The experience carried out with ENERBUILD Tool will allow to improve the regional tool for building assessment – Protocollo ITACA. Criteria from ENERBUILD Tool will be implemented in the future versions of Protocollo ITACA for public buildings, in particular with regard to the process and the construction materials performance.

The assessment system used in Regione Piemonte is actually not including criteria on the process and planning quality, neither criteria based on the LCA approach. For this reason the assessment activities carried out in ENERBUILD have given the possibility to experiment new indicators that will be proposed to the Italian regions trough Itaca for their inclusion in Protocollo ITACA. Regione Piemonte intends also to promote ENERBUILD Tool at international level in the way to recognize it as a possible common platform for sustainable building assessment in the European regions. From this point of view the Region has facilitated the interaction with ENERBUILD and the IRH projects.

ENERBUILD Tool has showed to be an effective tool to assess the environmental performance of low energy buildings. Nevertheless the experience carried out has given the opportunity to identify some possible improvements.

A different version of the Tool should be defined following the different uses of buildings (office, school, residential, etc.). Not all the criteria are relevant for all uses and, more important, different performance benchmarks should be fixed.

For some kind of buildings, due to the use, is more easy to reach a better performance for instance with regard to the energy criteria than others. An unique energy consumption target seems not adequate.

The Tool assumes that the assessed building has a very good energy performance. The minimum score is given to buildings performing much more than the standard buildings that in any case are fulfilling the energy regulations requirements. For this reason we suggest to recalibrate the performance scale to valorize the buildings that are not able to reach a passive house performance but that in any case are better than the standard practice.

Due to the fact that ENERBUILD Tool is used also in geographical contexts other that only the mountain, it would be necessary to include a criterion on water consumptions that could be eliminated in specific situations.

## Advisory Service by PP6 Styria

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The ENERBUILD project has given EAO (Energieagentur Obersteiermark) the opportunity to further educate their advisors, particularly on passive house and modern building technology. These have been previously neglected technologies, since there is a lack of awareness about them in our region. The EAO has planned to improve that awareness along with the development of our advisory service within the framework of ENERBUILD.

The advisory service is open for private persons as well as business enterprises during the office hours from 8 am to 4 pm. Due to the financing of the association through municipalities; the energy counseling on basic level is free of charge for citizens of member communities. However, special or more extensive advisory service is liable for costs. The EAO also maintains good relationships with the municipalities in our region. The EAO supports municipalities and regional initiatives as advisor for energy related solutions from public building energy analysis to support in regional development planning. The experts also give lectures on passive house building, high ecological reconstruction and the use of passive technologies and components in reconstruction.

The work with the ENERBUILD Tool prototype has lead to the adoption of the PHPP-Program for the calculation of buildings. The test of the tool and the improved advisory service has lead to a new calculation scheme for planned building and reconstruction projects. The extensive and detailed data, derived from the tool, are very helpful for the comparison between different possibilities of implementation. The gained insight also inspired a new consultation approach on municipalities.

The advisory service with the ENERBUILD Tool was overall very fruitful and informative. The improved advisory service is well received by public and private customers. The ENERBUILD Tool is very extensive and yields results on a very detailed level. This creates awareness for building technology that has hitherto not existed in our region. The good acceptance of solutions on such a high level is also owed to our good personal contacts to regional businesses. This has lead to a network of innovative companies that are committed to the development of new tools and products.

The information, communicated in the advisory service and the extensive and detailed data provided by the ENERBUILD Tool will stimulate the market by creating exacting demand from private and public building owners. The continued advisory service itself will raise the awareness of builders directly. The sum of all activities will provide incentives for a higher quality in house building and house reconstruction in the region overall.

The analysis of settlements, the incorporation of a closer look of the infrastructure in the area of the analyzed building would be the consequent extension of for the evaluation of the impact of a building on the environment.

An ecological analysis in form of lifecycle analysis would put into account the otherwise external costs of production, transportation and disposal of all building components. This improvement would put more emphasis on the use of regionally available, renewable resources and local know-how on the processing of such goods. Since the cooperation with local companies is essential for the successful implementation of the ENERBUILD process in the region the highlighting of regional, eco-friendly components for buildings would not only complement the purpose of ENERBUILD but would also be very well received.

Even though it's most difficult to implement, the acceptance of ENERBUILD Tool evaluation for subsidy application would be of greatest significance for the improvement of the ENERBUILD-process in our region. This point has been proven in the district Vorarlberg, where the subsidy for building measures depends on the rating of the respective building through the ENERBUILD Tool.

# Summary and Findings of 5 Pilot Advisory and Certification Bodies

## Certification Body by PP9 Alessandria

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In recent years the Region of Piemont, like other Italian regions, has started performing energy saving assessments on buildings based on the ITACA Protocol. The awarding of financial grants from the Region is subject to the attainment of a determined score fixed by the ITACA Protocol.

The Province of Alessandria does not have juridical power to enforce a new certification system based on the ENERBUILD Tool or to propose its enforcement at a Regional level, except in special cases as is the one reported above, in which the buildings are owned by the Province. For these buildings, the Province of Alessandria has chosen to apply the ENERBUILD Tool in addition to the ITACA Protocol.

Future reflections will facilitate decision on whether or not the criteria introduced by the ENERBUILD Tool can be suitable for the Region of Piedmont and the Province of Alessandria.

The experience gained in evaluating sample buildings through the use of the ENERBUILD Tool within the activity of the ENERBUILD project has resulted in a close cooperation with a number of professionals and firms (1 to 5 staff members each) who have developed the capacity to provide assistance in the use of the ENERBUILD Tool as a certification tool for buildings.

A series of meetings will be held, which will promote the ENERBUILD Tool as a working instrument for the professionals involved in the energy reclamation projects that the Province of Alessandria is planning to submit. The evaluation of the project results will be carried out by the consultants.

Technical developments and changes in the legal groundwork impose that the content of the ENERBUILD Tool be regularly updated. Constant adjustments and coordination of regional and national activities are necessary. To this end, synergies are recommended to prevent the tools from „drifting apart" in a long-term transnational exchange. The goal should be to create an international platform, displaying all the evaluations tools used at regional levels. Pilot applications of the ENERBUILD Tools should be further promoted and supported.

The Province of Alessandria will take action to disseminate the ENERBUILD Tool among the communes comprised in its jurisdiction.

# Resumee and Conclusions

The testing of the ENERBUILD Tool documents the operable structure of the tool. In particular the comprehension, usability, cost effectiveness, regional adaptability of the tool. This is supported by the positive feedback of the established advisory services and certification bodies. Additional the project partners made some suggestions for improvements on criteria level.

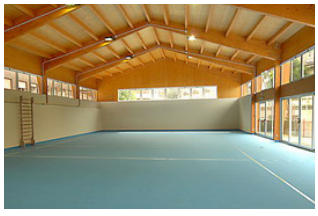
The regional adaptation and implementation of the ENERBUILD Tool into the public subsidiary system of public buildings in Vorarlberg in 2011 and the scheduled implementation of the ENERBUILD Tool in the province Alessandria in 2012 shows the applicability within the existing building market.

Andrea Moro integrates the ENERBUILD Tool into the international debate on the assessments of buildings. In his study „Comparison of Assessment Labels" he prescripts the position of the ENERBUILD Tool as following „The transnational comparison of main the existing labels shows the absence of a common approach. […] Common public policies and common market actions would need a common reference certification. […] It would be necessary to identify at European level a common set of key criteria (and relative indicators) that should be adopted by the national/regional labels in the way to allow the comparison of buildings performance. In this sense an interregional tool like ENERBUILD Tool can play a key role. ENERBUILD Tool is already a synthesis of the most important building assessment criteria in the Alpine region, having been recognized by all the project partners. From ENERBUILD Tool it would be possible to extract the most significant indicators that could be part of the European common set."

## Next steps are

1. the improvement of the tool (water – consumption, spatial planning, energy efficiency and energy production (photovoltaic))
2. the exchange of the ENERBUILD Tool and its evaluation results on the European level
3. capitalizations of the positive experiences and knowledge in the different Alpine regions as well as in other European areas

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