



Result 4.2-4

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

March 2012



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## Editors

Standortagentur Tirol  
Autonomous Province of Trento  
Energieagentur Obersteiermark  
Energieinstitut Vorarlberg  
European Academy of Bolzano (EURAC)

Fachhochschule Rosenheim  
Pososki Razvojni Center  
Province of Alessandria  
Rhônalpénergie-Environnement (RAEE)  
Techno Innovation Südtirol (TIS)

## Introduction

According to the actual European directive on energy performance of buildings these are responsible for 40% of energy consumption and 36% of EU CO<sub>2</sub> emissions. Energy performance of buildings is perceived a key to achieve the EU Climate & Energy objectives, namely the reduction of a 20% of the Greenhouse gases emissions by 2020 and a 20% energy savings by 2020. Improving the energy performance of buildings is a cost-effective way of fighting against climate change and improving energy security, while also creating job opportunities, particularly in the building sector.

Progress can begin immediately because knowledge and technology exist today to slash the energy buildings use, while at the same time improving levels of comfort. Behavioural, organizational and financial barriers stand in the way of immediate action and different approaches can help overcome them.

One way of transforming behaviour is seen by changing behaviour by educating and motivating the professionals involved in building transactions to alter their course toward improved energy efficiency in buildings.

Standortagentur Tirol  
Norbert Gleirscher

The NENA network is an association of organizations involved in the project. The network provides experts in connection with the demand for talks, lectures and individual consultations. For more information: <http://www.nena-network.eu>

## 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
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Editor:  
Standortagentur Tirol  
Ing.-Etzel-Straße 17  
6020 Innsbruck  
+43 512 576262  
office@standort-tirol.at  
[www.standort-tirol.at](http://www.standort-tirol.at)

Design:  
Peter Steurer  
Regionalentwicklung  
Vorarlberg  
Hof 19  
6861 Alberschwende  
+43 5579 7171  
[www.leader-vlbg.at](http://www.leader-vlbg.at)

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[www.alpine-space.eu](http://www.alpine-space.eu)

# The importance of education and training according the planning and construction of ESAP buildings in the alpine space

The aim of the ENERBUILD project was to facilitate know-how transfer and training of human resources through specialized courses, vocational trainings, excursions and the provision of teaching material in the field of planning and the construction of energy saving and producing buildings (ESAP buildings) in the alpine space.

Therefore within the ENERBUILD project different activities have been undertaken to support the projects objectives.

In a first step an assessment of existing training possibilities in participating countries has been conducted, resulting in at least 300 training modules identified. The assessment was analysed according to thematic focus and target group.

In a further step results were integrated in the development and implementation of specific training modules in the participating countries. In this regard the ENERBUILD project focused on priorities:

- To set up training activities on ESAP technologies on apprenticeship level in cooperation with schools and professional education services
- To set up initial training on ESAP buildings for architects and engineers, professionals and craftsmen; in order to design educational materials tailored to suit market needs, this was done with support from professional training institutions and stakeholders in the field of energy efficient buildings.
- To inform the general public, public administration and public authorities about energy efficient buildings, with a specific focus on improvement of actual legislation and public call for tenders.
- To foster knowledge transfer on academic level via target-orientated training programs as well as international conferences and meetings.
- The booklet in hand aims to highlight the main results of the ENERBUILD project regarding the undertaken training activities.



Excursion „Air tightness“ Vocational School 1 Dornbirn

# Analysis of educational programs in the Alpine Space

The education work package (WP4) in general is aiming to facilitate know-how transfer and training of human resources through specialized courses, vocational trainings, excursions and the provision of teaching material, especially in a transnational way. One of the central aims of WP4.1 was to evaluate educational requirements in the field of ESAP buildings in order to complement existing training modules in partner countries and find possibilities for transnational know-how transfer.

## Milestones during WP.4.1

- Elaboration of excel-template for education program survey, which was sent out to partners in August 2009

- Agreement of evaluation method and integration of experts at the project meeting in Kramstach 22-23 September 2010
- Partners conducted their regional surveys till December 2009
- Analysis of results – elaboration of overview of educational programs in participating countries finalized in January 2010
- Presentation and discussion of results at the meeting in Innsbruck in February 2010
- Beginning elaboration and implementation of educational programs by partners as an integrated process with WP4.2, WP4.3, and WP4.4

## Summary results of the analysis

In total 425 education programs and vocational trainings were reported, whereas the quality of data was quite different from partner to partner. The conducted analysis therefore must be seen as benchmark for each partner.

	academics	craftsmen	apprenticeship	other	Total
Vorarlberg	9	9	0	0	<b>18</b>
South Tyrol	15	23	0	5	<b>43</b>
Rhone Alps	34	112	18	0	<b>164</b>
FH Rosenheim	23	8	0	1	<b>32</b>
Slovenia	7	0	0	0	<b>7</b>
Tyrol	4	16	2	0	<b>22</b>
Trento	0	2	0	0	<b>2</b>
Alessandria	4	4	0	0	<b>8</b>
Piemonte	n.a.	n.a.	n.a.	n.a.	<b>129</b>
Total	<b>96+</b>	<b>174+</b>	<b>20+</b>	<b>6+</b>	<b>425</b>

Regarding target groups an over proportional focus on educational programs for handcrafts could be identified in nearly all partner countries and nearly no activities have been reported on apprenticeship level. Main target groups were identified as academics and craftsmen e.g. planners, architects, engineers and experienced professionals. Main forms of educational programs were seminars up to 40 hours, part time programs, vocational trainings up to two weeks and partly academic study programs (part time/full time).

Regarding the range of contents in total no significant thematic focus could be analyzed as nearly all aspects of ESAP buildings were pointed out e.g.:

- Building physics (building and isolation materials)
- Housing services with focus on heating, ventilation
- Building physics and construction materials/technology
- Building services engineering incl. planning/simulation
- Quality assurance and certification
- Housing services with focus on passive house technology, healthy and ecological living
- Basics of energy efficiency
- Legislation, regulations
- Construction technologies (wood, passive house)

# Analysis of educational programs in the Alpine Space

A detailed compilation of all reported educational programs per project partner country is available on the ENERBUILD website [www.enerbuild.eu](http://www.enerbuild.eu)

## Alessandria

In the region of Alessandria seven education programs reported. Main target groups were identified as craftsmen in the field of building construction technologies and academics, also for unemployed people. The thematic focus is laid on renewable energies (PV, solar panels) and energy efficient housing services building certification. The form of education was identified as seminars with up to 40h and two long term courses up to 800h. For Partners in Alessandria further to preliminary contacts with schools, vocational training centres, and Builders' Associations, a first recognition of the existing and planned vocational training initiatives was made, which resulted in seven courses: four on academic level and three on craftsmen level.

## Piemonte

In the region of Piemonte the importance of trainings was analyzed according to the regional law 63/95 with 129 courses identified in total. Main target groups were identified as professionals, students, unemployed people and extra occupational trainings (refresher courses). Thematic focus was laid on photovoltaic and solar thermal plants especially its planning, installing and maintenance. Additionally courses were identified in the field of renewable energy, heat pumps, energy certification of buildings and energy saving issues. The form of education was identified mainly as seminars with a duration of 36 up to 1.000 h.

In particular the analysis shows a high interest on Energy Certification (related to the recent L13/2007 that states the need of energy certificate for selling or renting a house), basic building physics and photovoltaic. Main education deficits were identified regarding a) the integration in the planning phase between architects and thermal engineers b) in deep examination of ventilation, air tightness, air quality c) energy use in other sectors (industry, sport facilities, large commercial, etc.) d) ex-post examination of performances of the building as well as e) technical support for politicians and public administrators to take decisions.

## Rhone Alps

In the region of Rhone Alps 164 education programs were reported. Main target groups were identified as engineers, housing services, architects and local authorities. Main education deficits were identified regarding: ventilation, air tightness, air quality, co-conception between architects and thermal engineers, eco-materials

and of energy content for materials production and installation of renewable energies. Partners from Rhone Alps region have established a training data base listing regional training sessions. Additionally a meeting with training providers and regional stakeholders was organized to present different training data bases and discuss about educational requirements in the field of ESAP buildings in order to complement existing training modules.

## Rosenheim

In the region of Rosenheim 32 education programs were reported, with main target groups identified as academics (students of architecture and engineering) and craftsmen in the field of construction. A clear thematic focus was laid on building physics and construction materials/technology, building services engineering incl. planning/simulation, housing services as well as quality assurance and certification. The form of education was identified as academic studies (full time) and vocational trainings up to 2 weeks.

## Slovenia

In the region of Slovenia seven education programs were reported. Main target groups were identified as academics (architects and engineers) with a thematic focus on basics of energy efficiency, legislation, regulations as well as construction (wood, passive house). The form of education was identified mainly as one day seminars and an academic study program on passive house architecture.

## South Tyrol

In the region of South Tyrol 43 education programs were investigated by TIS and EURAC. Main target groups were identified as craftsmen (architects, engineers, craftsmen in the field of construction, housing services and installation) and academics. Thematically the focus is laid on building physics (building and isolation materials), housing services with focus on heating, ventilation, and the certification system of Climate house. The form of education was identified mainly as short time courses from 8h up to 40h. TIS innovation park carried out an overview of all the existing possibilities of formation and further education in its region in order to assess the needs and potentials for a know-how transfer within ENERBUILD. According to that analysis a list of possible education modules was generated.

## Trento

In the region of Trento two education programs were reported. Main target groups were identified as craftsmen in the field housing services and building construction with a thematic focus on basic knowledge and planning of energy efficient housing services. The two seminars with lasted 122h (basic) and 26h (advanced). Partners in Trento focused its work on an integrated approach among different specializations and roles. They already are experienced in „horizontal“ integration among craftsmen (house builders, wood carpenters, fenestration manufacturers, plumbers and electricians) with innovative training programs applied both to cross-related (common) and specialized topics. Active integration in ESAP buildings has priority also for all development policies and decisions regarding energy efficiency made by the Autonomous Province of Trento: the adoption of the Leadership in Energy and Environmental Design (LEED®) protocol for new public buildings, the institution of the Green Building Council Italy and other important choices show the importance of this approach. Partners in Trento proposed to work on a pilot training program concerning three levels of integration: inter-professional integration (intra designers and intra craftsmen only), inter-specialization integration (ex. plant designer and plumbers), common knowledge and skills (full teamwork integration).

## Tyrol

In the region of Tyrol 22 education programs were reported. Main target groups were identified as craftsmen in the field of construction and housing services, academics, architects and engineers. Thematic focus was laid on housing services incl. planning, renewable energy tech-

nologies (PV, Heat pump), building physics (materials, wood-constructions) and certification systems of buildings. The form of education was identified mainly as seminars up to 40h and academic studies. Tyrolean partners were aiming at facilitating know-how transfer to handcrafts by the development and implementation of a specific course on passive house planning, which was supported also financially. The course was held in February/March 2010 and organized as a cooperation of Energie Tirol, a regional energy advisory service, and the IG Passive house, a consortium of planners and builders of passive houses. Secondly activities supporting the preparation of specific information materials regarding new technical and legal developments re-garding passive house technology in cooperation with the IG PassiveHouse Tirol have taken place. Main contents and the elaborated educational materials were present at the „Passive-House Forum Tirol“, 25-27 November 2010.

## Vorarlberg

In the region of Vorarlberg 18 education programs were reported, with a strong focus on academics and craftsmen level (planners, architects, engineers and experienced professionals) as main target groups. Thematic focus was laid on housing services with focus on passive house technology, healthy and ecological living; the form of education was mainly seminars and or part time programs. In Vorarlberg the Institute for Building Biology and Building Ecology Austria and the Energy Institute Vorarlberg in close cooperation with the Craft Association Vorarlberg „Holzbau-Kunst“, the Vorarlberg Chamber of Commerce and lecturers have evaluated the gaps in terms of training modules and exchanged information transnational.

# Good practice examples of successful educational and training programs initiated in the ENERBUILD project

One aim of the ENERBUILD project was to design and implement various education programs and vocational trainings in the field of energy saving and producing buildings. The focus in all activities was laid mainly on four different target groups:

- apprentices in the field of building construction as well as building services

- craftsmen, architects, engineers, planners and experienced professionals
- academics and researchers
- professionals in the public administration

The following overview aims to demonstrate some selected good practice examples implemented within the ENERBUILD project.

# Good practice examples of successful educational and training programs initiated in the ENERBUILD project

## Good practice examples on apprenticeship level

Energieinstitut Vorarlberg  
Stadtstrasse 33 / CCD  
6850 Dornbirn  
+43 5572 31 202  
info@energieinstitut.at  
www.energieinstitut.at



Excursion „Airtightness“ Vocational School 1 Dornbirn

### Prenote

Airtightness is essential for energy-efficient construction. Airtightness must be not only carefully planned, but especially carefully done. Leaky performed building envelopes can cause structural damage as a result, when warm moist air can seep through the building design to the outside and as a consequence of the cooling and gaseous water vapor condensates and moist building material will be the result. Enduring or frequently recurring moisture without proper drying possibilities will not only lead to an higher energy consumption, but also can lead to mold growth and rotten wood, etc.

### Starting position

The apprentices in Vorarlberg are trained in their craft in the so-called dual education system. In the vocational schools the apprentices learn in addition to the practical skills of occupational education the technical theoretical subjects and general knowledge. In the curriculum the subject of „air tightness“ as well as „e-production“ is not explicitly provided. According to the teachers of vocational schools, the topics are mentioned by some, but not trained.

### Preparation

In a workshop together with the IBO - Institute for Building Biology and Building Ecology the following principles and objectives for the lessons were established:

- Easy to understand, straightforward, comprehensible explanations of the partly very complex physical relationships
- Practical examples with pictures
- Information for the future unknown users of the slides should be made in the so-called memo area below the actual slide. The information in this memo field consist of both in-depth information as well as recommendations for action and time for teaching people
- A web-based self-test for trainees to check for themselves if they have understood the topic
- The self-test is due to automatic feedback responses another form of active learning

### Realization

The first test class with two lessons of 45 minutes was held on 19 October 2010.

The second test class with two lessons of 45 minutes was held on 28 October 2011.

An additional excursion attended by 22 apprentices (carpenters, electricians, plumbers, bricklayers) with four lessons was carried out on Friday 11 November 2011.

In the first two cases, the lessons took place at the Regional Vocational School 1 in Dornbirn / Vorarlberg. The practice part „Excursion“ was carried out in a structural work. At that time the construction was in a building state that the n50 differential pressure test could be performed. On the basis of the building the connectivities could be explained: Energy for the construction, material selection, design concept and energy concept, ventilation design, material, ecological construction concept.

The training modules were realized by Energieinstitut Vorarlberg, the Austrian Institute for Healthy and Ecological Building (IBO) in cooperation with the Landesberufsschule Vorarlberg.

In addition a vocational training on e-production (green electricity products) was implemented for apprentices (carpenters, electricians, building exterior constructors) on 18.11.2011. The main contents were basic knowledge about energy production with photovoltaic devices, components of photovoltaic installations, monitoring, legal frameworks, subsidies and marketing instruments. The training modules consisted of parts on energy policy, technology, legal frameworks and economics.

The realization was done by the Arbeitsgemeinschaft Erneuerbare Energien Vorarlberg in cooperation with the Austrian Institute for Healthy and Eco-logical Building (IBO).

### Experiences

The amount of presentation slides was reduced after the first test lesson to create time for more explanations. Especially the fact that relative and absolute humidity are very different things, that a very wet cold outside air in the room is a very dry air, takes time to understand.

After class, a debriefing was done with the class teacher that shows that there are basically two basic types of teachers regarding the use of teaching materials: those who prefer to use their own material because they identify themselves better and those who like to access to existing material. These must be treated very well, so that no unanswerable questions may arise during the teachers' preparation.

Above all, the excursion was a resounding success. The trainees were very interested and asked many more questions than during the theoretical instruction in class.

### Recommendations

To assure that the teaching materials are used in the vocational schools a personal contact must be established to one of teaching staff. This person should be accepted and have a high acceptance by the other staff. By doing this a good multiplier is found.

If it is possible to find a site that shows as much of the sustainable construction issues this would be of the biggest value. A collaboration with the local energy agency should make it possible to provide the apprentices with an appropriate project documentation for study.

Info and course material is freely available under <http://kurse.ibo.at> in the Enerbuild section.

## Tyrol

In the region of Tyrol a special training on energy efficient buildings for bricklayers was organized in April 2011. 16 bricklayers in the 3<sup>rd</sup> year of their apprenticeship got an impression on the necessity of detailed planning as well as an exact implementation on a high quality level. The one day-training on EASP buildings was focused on

- Energy efficient building materials
- Insulation materials
- a common understanding of building quality and interaction of different craftsmen groups

Additionally to the theoretical part some practical exercises regarding air tightness (blower door test) as well as thermography are part of the training. The course was designed and implemented as a cooperation of the Tyrolean Future foundation, the local energy agency Energie Tirol and the Bauakademie Tirol.



Training on Energy Efficiency in Knittelfeld, Styria

Standortagentur Tirol  
Ing.-Etzel-Straße 17  
6020 Innsbruck  
+43 512 576262  
office@standort-tirol.at  
[www.standort-tirol.at](http://www.standort-tirol.at)

# Good practice examples of successful educational and training programs initiated in the ENERBUILD project



Knittelfeld - Savonius Wind Turbine and movable photovoltaic plant

Energieagentur  
Obersteiermark  
Holzinnovationszentrum 1a  
8740 Zeltweg  
+43 3577 26 6 64  
office@eoao.at  
www.eao.at

## Styria

In Styria a training for apprentices of the vocational school (LBS) Knittelfeld was implemented by the Energieagentur Steiermark. The intention was the education of apprentices in the planning and installation of RES technologies. The objective was to plan and install together with the apprentices applications of solar and wind power. The apprentices actively participated in all planning and implementation steps of the project. By the method of „learning by doing“, the apprentices became familiar with principles and manual skills. The contributions of the apprentices were evaluated in class. The operation of the facilities is an essential part of various lectures. As part of the training sessions at least two photovoltaic plants, one fixed, one moveable and a Savonius Wind Turbine have been installed at the school area.

## Good practice examples on craftsmen level

### Trento

In the province of Trento an integrated approach for the training of craftsmen, architects, technical building planners, building developers was developed and implemented from autumn 2010 to May 2011.

In total 20 participants carried out 172 hours of training units , including team building activities and common workshops depending on different specializations:

- 114 hours (around 14 days) architects and geometers
- 102 hours (around 13 days) structural engineers
- 106 hours (around 13 days) HVAC and electrical technicians
- 74 hours (around 9 days) Craftsmen: house builders, carpenters, fenestration layers, plumbers, electricians

The training modules were based on the integration among different professionals, which is more and more required in energy-saving building construction. The training design was divided into different steps. In a first step the assessment of training needs (October 2009-June 2010) involving all main stakeholders (the local Association for Craftsmen and Small Enterprises was done.

The training group consisted of 10 designers (2 HVAC technicians, 2 electrical technicians, 2 structural engineers, 4 architects/geometers) and 10 craftsmen (2 house builders, 2 carpenters, 2 fenestration layers), already specialized in energy-saving techniques

The training activity was focussed on a three level integration:

- inter-professional integration (intra designers and intra craftsmen): it concerned a higher exchange between architectural and plant designers / workers, one developing knowledge and practices of the other, and vice versa
- inter-specialization integration (ex. plant designers and plumbers): it regards full comprehension of the underlying design principles and problem solving bound to operational process
- common knowledge and skills (full teamwork integration).

- actual scenario for energy-saving buildings and its key features both on a law-and politics-basis
- roles and juridical responsibilities for designers and craftsmen
- the competencies to be developed via teamwork (both technical and communicational skills)
- 20 participants were divided into two teams (each formed by 5 Designers and 5 Craftsmen) and took part in workshop activities: both teams were asked to design and find operational solution to an old rural house to be reconstructed and provided with a wooden extension. They were given specific rules, various starting data, max. energy-consumption values etc. On the last course day (14<sup>th</sup> May 2011) each group presented its reconstruction project and the results of the integrated teamwork
- the final work session concerned integration-process evaluation and further actions to maximize the learning experience of the group and the acquired skills

Provincia Autonoma  
di Trento  
Piazza Dante, 15  
38100 Trento  
+39 0461 495111  
daniele.biasioni  
@provincia.tn.it  
[www.provincia.tn.it](http://www.provincia.tn.it)

The course coordinator has followed the implementation of all training phases, supporting and tutoring the group and the teams. The learning process was constantly maximized and enriched by

- written syntheses of learning summarized by the participants in each technical module (designers' inter-professional integration)
- written synthesis of debriefing meetings
- written synthesis of final evaluation (integration concept and future vision of the participants)

# Good practice examples of successful educational and training programs initiated in the ENERBUILD project

Overview on phases and modules of the integrated training approach

Phase	Modules	Contents / Activities and Reporting	Participants time
1. GLOBAL VISION (common part)	1.1 SCENARIOS	Scenario of energy-saving politics on EU, national and regional level (update) Scenario of laws and norms (update) Scenario of roles and responsibilities (designers and craftsmen)	ALL PARTICIPANTS (20)  22 HRS
	1.2 RELATIONAL ASPECTS	Practices, experience and behavioural stereo-types of roles Integration and communication skills Action Plan and indicators	
	1.3 EVALUATION	Survey on efficacy, assessment Output: Report on assessment and materials produced	
	1.4 THE PROJECT TO BE DEVELOPED	Project presentation: tasks and goals to be reached by each team (an old rural house to be restored and transformed into an energy-saving building) Teambuilding (2 teams, 10 person each)	
2. PROFESSIONAL INTEGRATION: DESIGNERS (subgroups)	2.1 PLANT DESIGN KNOWLEDGE for architects and geometers + structural engineers	Energy performances of building-plant systems: the point of view of the plant designer (functional sub-systems, power loss and causes, balance and compensations; integration between building envelope and plants, energy and power required, etc.) <ul style="list-style-type: none"> <li>• Indoor Quality Control – Controlled ventilation systems</li> <li>• Plants types and implications</li> <li>• Thermo-hydrometrical and acoustic aspects</li> <li>• Electronic aspects</li> <li>• Learning</li> </ul> Sub-group: 30 HRS	DESIGNERS (10)  Sub-groups: 30 + 24 HRS  All designers: 16 HRS
	2.2 ARCHITECTURAL DESIGN KNOWLEDGE for HVAC and electrical technicians	Forms and Orientation: fundamental aspects to design passive buildings and to integrate building envelope and plants Concepts, conditions, materials and practical solutions to grant heating, cooling, hygrometric and acoustic comfort Insulation coating and thermal bridges Integrated Systems Sub-group: 24 HRS	
	2.3 STRUCTURAL KNOWLEDGE for architects and geometers + HVAC and electrical technicians	Static inertia: geometrical aspects (internal spaces, overall dimensions, wind bracing structures, confrontation between reinforced concrete and wooden structures,  Sub-group: 6 HRS	
	2.4 COMMON ASPECTS FOR ALL DESIGNERS	Air tightness of the building Electric consumptions Sub-group: 8 HRS	
	2.5 TEAM WORK ON THE PROJECT	Design for a restoration project Acting integration <i>Each team is videotaped while working on the project</i> 2-Teams' Work: 12 HRS	
	2.6 EVALUATION	Debriefing on „acted“ integration: watching shoots, commenting the integration process (members' involvement and coordination, decision making, given roles and tasks) Survey on efficacy, assessment All Designers (10): 4 HRS	
3. SPECIALISTIC INTEGRATION (subgroups)	3.1 TEAM WORK ON THE PROJECT	Design, operational details, materials' characteristics, devices Team work (subgroups for each specialization plants / building envelope: Designer with Craftsmen) <i>Each team is videotaped while working on the project</i>	DESIGNERS + CRAFTSMEN / specialisation  TEAM WORK (sub-groups) 8 HRS
	3.3 DEBRIEFING	Debriefing on „acted“ integration: watching shoots, commenting the integration process (members' involvement and co-ordination, decision making, given roles and tasks)	

5. INTEGRATED PLANNING (common part)	4.1 ENHANCING COMMUNICATION SKILLS	Training to help craftsmen to make proposals (possible changes, operational solutions, suggestions, materials, details, etc) and negotiate them with designers	CRAFTSMEN (10) TEAM WORK (sub-groups) 12 + 4 + 4 HRS
	4.2 TEAM WORK ON THE PROJECT	Analysis of operational details and processes Elaboration of proposals	
	4.3 EVALUATION	Debriefing on „acted“ integration Survey on efficacy, assessment Output: Report on assessment and materials produced	
	5.1 TEAM WORK ON THE PROJECT	Integrated work teams (2) preparing their own definite solutions / proposal and materials (SUBGROUPS)	
	5.2 PRESENTATION STRATEGY	Communication skills: public speaking, use of materials and images Interaction between the 2 teams, presenting each other their work	ALL PARTICIPANTS (20) 24 HRS
	5.3 PROJECT PRESENTATION	Both teams present their own project solutions / proposals (each team member – designer and craftsman – presents his/her own part) Comments of and Discussion with the Commission Evaluation of the Commission: Consistency with the commitment (goals, consumption values, etc)	
	5.4 EVALUATION OF THE PILOT EXPERIENCE AND FUTURE SCENARIOS	Participants <ul style="list-style-type: none"><li>• evaluated the integration-process (common meaning of integration; positive and critical aspects, learning, evaluation questionnaires and results) and</li><li>• identified further actions to maximize the learning experience of the group and the acquired skills (creative work session)</li></ul>	

## Tyrol and Styria

In Austria in Tyrol as well as in Styria several special trainings called „International Certified Passive House Planer“ have been implemented in 2010 and 2011. The demand for passive house technologies is on increase and members of the building industry are increasingly aware of this fact. The construction of passive houses requires a sound knowledge of the technology and the transfer of this knowledge is the intention of the Passive House Planner Course.

The course consists of 80 training units (10 training days) and covers the following areas:

- The Passive House Standard – A foundation seminar
- Passive House Planning Package (PHPP)
- The Passive House Shell
- Passive House Utilities
- Ventilation - Practical Workshop
- Introducing Passive Housing into existing buildings – Foundation seminar



Special trainings called „International Certified Passive House Planer“

Standortagentur Tirol  
Ing.-Etzel-Straße 17  
6020 Innsbruck  
+43 512 576262  
office@standort-tirol.at  
www.standort-tirol.at

Energieagentur  
Obersteiermark  
Holzinnovationszentrum 1a  
8740 Zeltweg  
+43 3577 26 6 64  
office@eo.st www.eo.st

# Good practice examples of successful educational and training programs initiated in the ENERBUILD project

## Rhônealps

Rhônalpénergie-  
Environnement (RAEE)  
10, rue des Arches  
69002 Lyon, FRANCE  
+33 4 78 37 29 14  
raee@raee.org  
www.raee.org

The project partner RAEE focused its activities on the training for representatives of local authorities of Metropole Savoie, implemented in February 2011.

These trainings were the first sessions of a full training cycle in Savoie. The goal of these trainings were to aware representatives of local authorities of climate change generally, but in particular the need of building energy saving buildings with a great environmental quality.



Training for representatives of local authorities of Metropole Savoie

The strategy of these training was first to train/aware representatives for increasing the demand in ESAP public buildings. In a further step the aim was to train technicians in these local authorities on how to write the call for tenders and

how to follow all steps of the implementation of an ESAP building. In parallel, some conferences with local experts on ESAP buildings were created, targeting public representatives but also technicians, engineers and handcrafts.

The training sessions followed a 3 step approach

a) presentation of the Association Savoyarde de Développement des Energies Renouvelables (ASDER) on

- Impacts of climate changes in Savoie
- Factor 4: signification for people living in Savoie
- French law grenelle: new objectives and tools
- New thermal regulation in 2012
- ESAP: main targets, financial approach
- ESAP: envelop and technical systems

b) The presentation was followed by a presentation from a local mayor who managed an operation of ESAP building (45 minutes)

c) This presentation was followed by some discussion and exchanges between participants, trainers and the mayor.

The training sessions with public representatives have been quite successful with more than 70 participants attending. It is planned to organize more sessions next autumn, with little changes in the general presentation. The trainings were very appreciated by the participants, specially the intervention of the local mayor. With this „testimony“ local representatives see that's they are also able to build ESAP buildings.

Fachhochschule Rosenheim  
Hochschulstraße 1  
83024 Rosenheim  
+49 8031 805 831  
www.fh-rosenheim.de

## Rosenheim

Also the University of Applied Sciences Rosenheim did some similar training modules in the Traunstein region because the administrative

district of Traunstein and its cities and municipalities want to invest into energy conservation in their buildings.

In October 2010, 42 employees of architecture offices and 35 employees of district municipalities took part in the two-day seminar, where hand-picked experts on „Building refurbishment“ gave lectures. Participants were welcomed by the district administrator Hermann Steinmaßl and the President of the University Professor Heinrich Köster.

In addition to the course „Energy and building technology“, various seminars were designed in the field of energy. These seminars are planned to be extended to the Planning Region South East Upper Bavaria, the members are the districts of Traunstein, Mühldorf, Altötting, Berchtesgaden and Rosenheim and the city of Rosenheim.



Course „Energy and building technology“

## Slovenia

A specific training session on „passive house and cultural heritage“ mainly for architects and engineers was prepared by experts from the Ljubljana Faculty of Architecture and Civil Engineering Institute (ZRMK) in June 2010.

The Bovec house (Bovška hiša) is the most commonly used term for traditional house that is typical in the Bovec area. The basic elements and design constants of Bovec house are: the steep roof with even steeper ends at lateral sides, outlined and disproportionately raised roof with a large projection over the entrance facade, small projecting roofs over the other facades, lack of the „attic“ wall, flat light-gray decking, balcony with stairs on the longitudinal entrance facade with direct entrance into the kitchen and small windows with side aspect ratio 2:3, which are aligned with the facade. The only traditional building materials are limestone and wood.

The ground floor was usually used as stables for sheep and upper for storing hay during winter. Aspect ratio between longitudinal and lateral side is from 2: 1 to 2.5: 1, back side of the ground floor is often full or halfdug into the slope, as house often stands on a tilted ground. Walls are strong and massive, made of stone, bonded with lime mortar and limestone moraine sand which is abundant in the area.

### Energy design of the bovec house

In rural homes the awareness and knowledge of healthy and energy-efficient construction is clearly visible and because of hard climatic conditions in the mountains such awareness was a necessity. Southern slopes were populated first and many buildings are located just below the forest edge and still at the appropriate height above the river (in the thermal belt), so that in winter even in cloudy days, the climate is few degrees warmer than in the valley. The frontal side of the house with all the major openings is facing south towards the sun. The side facades usually have only one window, required for cross-lighting and ventilation. Such distribution of windows was useful also because the prevailing winds in the area are blowing from east to west and vice versa. Small wall surface with a single window was preventing unnecessary cooling of the house. People planted linden, maple, geek and walnut trees at side facades for extra protection.

### Design of the training

The main focus of the training course was held



Specific training session on „passive house and cultural heritage“ mainly for architects and engineers

on the construction of passive houses and in particular, on the advantages of such construction. Professor Martina Zbašnik Seneganik, PhD. from the Faculty of Architecture presented passive house as a standard and an imperative for construction in the near future. Since the main advantages of a passive house are particularly in low operating and maintenance costs and ecological contribution to the environment, as CO<sub>2</sub> emissions are fifteen times lower than usual, passive house is gradually paving its way to Slovenia. Experts from the ZRMK institute, Silvija Kovi m.sc. and Miha Praznik m.sc., presented a program PHPP 07 and the difference between the heating and ventilation systems in modern and classical buildings.

The event was attended by 50 participants and served as an introduction to the upcoming architectural competition (call for tenders), which was presented by the author of the call Mr. Mitja Skubin. One of the goals was certainly to consolidate the landscape image and preserve (as well as recreate) harmony in the environment.

Pososki Razvojni Center  
Trg svobode 2  
5222 Kobarid  
+386 5 38 41 500  
info@prc.si  
www.prc.si

# Good practice examples of successful educational and training programs initiated in the ENERBUILD project

## Alessandria

Province of Alessandria  
Piazza delle Libertà 17  
15100 Alessandria  
+39 0131 304 658  
europa@provincia.alessandria.it  
www.provincia.alessandria.it

In the region of Alessandria a training module on „best construction techniques for energy efficiency in buildings“ was developed and implemented in autumn 2010. In different courses 102 technicians, professionals, architects and surveyors got an overview on ESAP-technologies via practical lessons on energy saving, renewable energy and best practices. The aim was to enhance knowledge of best available techniques in the market in energy performance certificates, energy efficiency and renewable energies.

The first module focused on the following topics:

- Analysis of energy certification In the
- Energy certification: EU Directives, National Laws, Regional Laws
- Basics of technical physics

- Characteristics of the building envelope
- Energy-efficient planning
- Software applications
- Practical examples

The second module focused on the following topics:

- Glass Closing Systems
- Foundation Thermal Insulation and Thermal Bridges
- Roof Insulation
- Façade Insulation

Teaching staff was composed of professionals and experts in the energy sector.

## Piemonte

Regione Piemonte  
Via Lagrange 24  
10123 Piemonte  
+39 011 432 38 07  
direzioneB08@regione.piemonte.it  
www.regione.piemonte.it

In the province of Piemonte it was experienced that actually the possibility of activating courses on passive house topics is seen interesting for associations, but not a priority. In fact market partners consider passive house standards not as common practice because of cultural, technical, economic and regulatory barriers present in the regional area. Piemonte legislation is actually not providing prescriptive limits as e.g. established by the Passive House Institute. Furthermore, there is not a market demand for the construction of passive houses. However, it is clear how the general interest for technology and plants adopted for passive houses is replicable even in buildings with lower energy efficiency standards. Concerning passive house, the topics about building envelope (opaque and transparent) and tools / techniques for the elimination of thermal bridges are of great interest for associations. Secondary interests are manifested in issues as ventilation system, and air leakage. Therefore two specific training activities have been implemented:

### a) a training on technical elements in passive houses

The intention of the training activity has been involved different professions (architects engineers, handcrafts apprentices) in the same course analyzing e technical aspects related to the design and realization of high performance thermal envelopes of thermal insulation. The course aims to analyze, through in-depth theo-

retical and practical elements, all aspects of the proper implementation of the housing thermal sizing, the resolution of thermal bridges, the installation of mechanical systems for the replacement of the air, heat fluxes between the interior and exterior and indoor quality of air. In total 80 participants (42,65%, architects, 32,35%, surveyors 2,94%, regional/municipal staff, 5,88% territorial agency 7,35, private 2,94%, handcrafts 5,88%) attended the trainings from 02-10 November 2011. The course has been developed in cooperation with Environment Park S.p.A., IPLA and Politecnic of Turin. It is planned to replicate the course by the Piedmont Region in early 2012.

### b) Passive house – case studies

The workshop held on 27th November 2012 was attended by 30 participants and aiming to disseminate and to compare the last experiences in the construction of social housing characterized by high performances in terms of energy efficiency. The workshop compared some of the most significant experiences of public and private operators in the Alpine Space. The workshop has revealed the different strategies adopted both by funding bodies and operators, to realized passive houses, the performance achieved and costs incurred. In a perspective of exchange of good practices it was aimed to improve the quality of constructions, reduce construction costs and create innovation for companies operating in our territory.

## Good practice examples on academic level

### Rosenheim

At the University of Applied Sciences in Rosenheim within the ENERBUILD project a study program on energy and building technology was designed and implemented. Actually 110 students are engaged in the bachelor program.

The bachelor program includes a study period of seven semesters and includes an internship. The internship is within the 5<sup>th</sup> Semester and is designed to sensitize students to the work of a budding engineer.

The practical semester consists of the accompanying classes (PLV) and the practical training (internship in the 5th semester). Overall, for the internship and the PLV 30 credit points are foreseen. The completion of the course is the Bachelor's thesis. The Bachelor's thesis numerous practical projects enable the students a professional, skills-oriented and practical implementation of the curriculum in their following employment.

The study program on energy- and building technology (Energie- und Gebäudetechnik) can also be completed extra-occupational with in-depth practice as well as academic studies.

The study program was developed in close coordination with trade associations, energy suppliers, industry partners and planners and is designed to meet the future requirements of industrial, commercial and public sector employers.

Students become acquainted with the necessary tools and instruments that are required for cross-system planning and consulting. This combines a broad and basic engineering education with a

focus on energy supply and energy transport as well as the energy use in buildings. The focus is laid on

- renewable energy technology
- building services
- Building Automation
- Building physics and building construction.

The ability to understand complex processes are related to modern methods of building component simulation. In addition, the program combines engineering subjects with contents of modern technical, organizational and managerial methods.

Up to his personal inclinations, the student can choose a broad variety of individual curriculum areas. For example, the program offers the possibility itself to deepen the knowledge in local energy supply, to delve into the dynamic building simulation or in the wind and solar power plants.

Detailed information on study program and curriculum can be found under [www.fh-rosenheim.de](http://www.fh-rosenheim.de)

Within the ENERBUILD project several international conferences for researchers have been organized. One of the biggest events supported within the project was the 15<sup>th</sup> international passive house conference in Innsbruck/Tyrol in May 2011.

Fachhochschule Rosenheim  
Hochschulstraße 1  
83024 Rosenheim  
+49 8031 805 831  
[info@fh-rosenheim.de](mailto:info@fh-rosenheim.de)  
[www.fh-rosenheim.de](http://www.fh-rosenheim.de)

### Tyrol

The 15<sup>th</sup> International Passive House Conference can rightly be called the world's largest conference on energy-efficient construction as a result of its awesome agenda. Half of the 1.200 Conference participants from 50 countries came from non-German-speaking countries. The most comprehensive conference program that has ever been presented at a Passive House Conference was offered this time. Over 80 international „Passive House Beginners“ attended an English-language Passive House Basics Seminar on 25<sup>th</sup> May, which took place at the Faculty of Civil En-

gineering at the University of Innsbruck. On 26<sup>th</sup> and 29<sup>th</sup> May, a total of 9 Passive House Excursions were organized for about 450 participants, so that all the information gathered during the many presentations could also be actually experienced by them, in the true sense of the word. This also included some special excursions, like the visit to Passive House public buildings that was organized for the local government representatives of the City of Oslo, and the visit to the world's largest Passive House residential complexes, the Lodenareal and O3 Olympia Vil-

Standortagentur Tirol  
Ing.-Etzel-Straße 17  
6020 Innsbruck  
+43 512 576262  
[office@standort-tirol.at](mailto:office@standort-tirol.at)  
[www.standort-tirol.at](http://www.standort-tirol.at)

# Good practice examples of successful educational and training programs initiated in the ENERBUILD project



International Passive House Conference

lage in Innsbruck that was organized for a group of Korean conference participants and a Russian delegation, including members of the State Duma.

More than 1.200 participants from more than 50 countries met to discuss sustainable solutions at the world's important convention for energy efficient construction in Innsbruck. Eight plenary talks, 72 presentations, 30 poster presentations and a freely accessible components exhibition rounded off the event.

In addition to the academic program more than 300 participants from all over the world attended a series of excursions, which were organized in the frame of the ENERBUILD project. Therefore also an excursion guide in German and English language was produced.

## South Tyrol

TIS  
Siemens-Strasse 19  
39100 Bozen  
+39 0471 56 81 44  
[www.tis.bz.it](http://www.tis.bz.it)

EURAC  
Viale Druso 1, 39100 Bozen  
+39 0471 055 055  
[info@eurac.edu](mailto:info@eurac.edu)  
[www.eurac.edu](http://www.eurac.edu)

was the knowledge transfer, in particular with regards RES and energy saving and producing building, that entails integration and managing of solar energy. Such a knowledge transfer wanted pushing a novel and aware design approach as well as a stronger collaboration among the several stakeholders. The workshop was also a chance to exchange experiences and methodological approach among the actors involved in the building process.

## Conclusion

There will likely be significant growth in employment in the energy efficiency services sector in the next decade, also in the alpine space. The results within the ENERBUILD project with more than 29 different training activities in the field of ESAP buildings highlight the need for additional education and training to meet the demands of a growing workforce to provide energy efficiency services. The project results indicates that diverse solutions will be necessary, including the development of new education and training programs to increase the skills of those already active in the field and to help prepare new employees.

The analysis of different training programs showed clear differences between the market developments in participating countries. Whereas in the region of Vorarlberg, Tyrol, South Tyrol and Bavaria show a clear market driven need for training programs, some regions in Italy or in France are still at the beginning of market development. The need for educational programs in these regions is mainly driven by new regulations and laws stimulating market growth in a top-down approach.

The experience in the project shows different levels of education modules and fields of interaction.

## **1. Provide training possibilities to public administration**

Especially regions with strong emerging markets driven by new laws and regulations show a clear need for training activities for public administration. It seems substantial for starting market growth that especially the public procurement sector gets the possibility for education and training in the field of ESAP buildings. Training activities should both target professionals in the public sector as well as sensitizing politicians and decision makers for the advantages of ESAP buildings.

## **2. Provide energy efficiency education and support targeted at architects, engineers and professionals**

The results of the project show that more than 70% of the total training activities have been implemented for craftsmen, architects, engineers and professionals.

Much of the growth according to ESAP market development will come from new entrants who already have some applicable skills (e.g. building and construction SMEs who might become efficiency retrofit specialists). There is also a strong demand for periodic training for those who are currently employed in this field but who need to update or augment their skills. In both cases, short duration courses on specific, applied topics will be more relevant than a two- or four-year degree program. These types of offerings will need to be significantly ramped up in the next few years.

Missing awareness and a rapid technological development in the field of EASP building technologies show a clear need for further training activities, especially for professionals. Because building and construction companies and architects constitute approximately 65-75% of the overall, it is important to educate and support the building and construction SMEs to make sure they are able to provide a trained workforce to support this growth. This problem appears more severe in regions that do not have long-running and public financed programs or where new regulations overburden technical skills of local SMEs.

## **3. Integration of ESAP topics in already existing education systems – „train the trainers“**

A successful approach to enable sustainable market development for ESAP buildings proved to be the integration of actual technological developments and innovations into already existing education programs. In this case no separate educational infrastructure is necessary, which makes it time and cost effective. The disadvantage of such measures is that results will appear only in the long run. The project results indicate that there is a lack of qualified trainers to train the workforce respective a lack of possibilities for specific advanced training for existing staff. The areas of integrating actual topics in vocational trainings can be done on different levels:

- a. training of apprentices
- b. training in technical schools
- c. training in universities and academic trainings

## **4. Foster interregional know-how exchange via common training programs and conferences**

Many regions are initiating a range of training and education activities that target workforce development for ESAP buildings. However, it proves challenging to identify and determine those courses that are relevant to other regions, both due to different market development as well as legal regulations in each country. Finally, it is also important to note that similar efforts are happening in a number of states so increased sharing of best practices and high-quality curriculum could help lead to more rapid launch of effective training programs.

International conferences turned out to be a successful instrument to foster knowledge transfer especially for researchers and academics. In some cases this seems also to be an option for SMEs, but due to travel and language problems only to a minor part.



ENERBUILD Project Partner:

**Regionalentwicklung Vorarlberg** <http://www.leader-vlbg.at>

**TIS Techno Innovation South Tyrol** <http://www.tis.bz.it>

**Rhônalpénergie-Environnement** <http://www.raee.org>

**Regione Piemonte** <http://www.regione.piemonte.it>

**Fachhochschule Rosenheim** <http://www.fh-rosenheim.de>

**Posoški razvojni center** <http://www.prc.si>

**Energieagentur Obersteiermark** <http://www.eao.st>

**Standortagentur Tirol** <http://www.standort-tirol.at>

**Autonomous Province of Trento** <http://www.provincia.tn.it>

**Province of Alessandria** <http://www.provincia.alessandria.it>

**Accademia Europea Bolzano** <http://www.eurac.edu>

**NENA Network Enterprise Alps** <http://www.nena-network.eu>

**Zentralschweizer Volkswirtschaftsdirektorenkonferenz** <http://www.itz.ch>

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