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# IEE PassREg

## PASSIVE HOUSE REGIONS WITH RENEWABLE ENERGIES

**D2.1d**

**Analytical report to reflect the outcomes of the study tours and  
international workshops in the frontrunner regions**

Prepared by EnEffect

Data relevant as of 2014

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## Introduction: Frontrunners, Success Models, Study Tours and International Workshops

During the first half of the Passive House Regions with Renewable Energies (PassREg) project, the Success Models of the implementation of PassREg concepts in the three selected Frontrunner Regions (FRRs) - Hanover, Brussels and Tyrol - were analysed and described in detail by the responsible WP leader (EnEffect) with the support of staff members of the FRRs and 3 study tours and 3 international workshops. During these project events the FRRs allowed a look behind the curtain and opened up their successful model structures, thus helping to identify the involved stakeholders, to evaluate the driving factors and to collect appropriate solutions that might be applicable in other urban and economic contexts. These events demonstrated the achievements of the frontrunner regions to the decision makers from the aspiring regions.

During the 3 study tours and 3 international workshops organized in the first half of the project, numerous beacons opened their doors and demonstrated successful implementation of Passive House technology supported by renewable energies. Valuable information was given about the enabling structures, but also about failures and barriers overcome. The frontrunner success models in Hanover, Brussels and Tyrol were presented, exchange was facilitated and the basis for valuable contacts between players of the frontrunners and the aspiring regions could be established. Two members of the staff from each partner organization were attending the events, as provisioned in the PassReg project concept, but also politicians and other important stakeholders were invited, in order to transfer as much experience as possible to the key decision makers. As the experience has shown, these events provided an excellent basis for further exchange and for the success of the PassReg project.

### Why These Countries and Regions?

On one hand, the selection of pilot countries and regions it is based on the remarkable results achieved in the field of passive buildings. On the other, it reveals approaches and solutions formed at various initial conditions and to various national and local legal and economic frameworks.

**Germany / Hanover:** Born in Germany the 'passive house' concept is implemented in a consistent and sustainable national climate and energy policy that is constantly updated. Hanover is one of the pioneer regions in Germany, where the promotion of 'passive house' and the use of renewable energy in buildings began in the mid-80's of XX century. The 'success model' of Hanover is largely built **top-down**, with national strategies consistently integrated into local policies and approaches. However, one of the keys to success in

climate protection, energy efficiency and sustainable development is rooted in longstanding consensus of political forces in the region in terms of long-term policy objectives.

**Belgium / Brussels:** Belgium progressively harmonizes its legislation in the field of buildings, but in terms of the 'passive house' standard achievements are much more limited than those in Germany and Austria. Until recently Brussels was one of the most backward regions as related to insulation of buildings, and by 2007 there is still not a single one passive building. Amid less active national policy, in 2004 the regional authorities in Brussels formally commit to the 'passive house' standard in the construction of all new public buildings since 2010. As a result, Brussels quickly established itself as a leader in the application of the passive house in Belgium and six years ahead of the requirements of the EPBD. The example of Brussels is to some extent illustrating the bottom-up approach in which long-term commitment by regional authorities in the initial stage of the process is a key factor for the success of the region.

**Austria / Tyrol.** Austria is the country with the highest density of passive buildings world wide - the number of these buildings per capita is five times higher than in Germany or Switzerland. These achievements are the result of years of deliberate national policy on energy efficiency in buildings. Against this background, Tyrol has long been lagging behind in implementing the 'passive house' concept and at the beginning of the new millennium began rapidly gaining momentum to go to remarkable results today. Tyrol's example confirms that even in the presence of persistent long-term national policies, regulations and practices in the field of low-energy buildings, active involvement of regional and local authorities has crucial importance.

## Chronology: Organization and Event Details

### Hannover, 06-08 May 2012

The PassREg kick-off meeting, the first PassReg International Workshop and the respective first study tour were organized by proKlima (supported by PHI) in May 2012 in Hannover. The Workshop presented the roadmap of Hannover towards the Passive Houses and renewable energies with a special focus on policy instruments and the processes behind the curtain. To present another local point of view and open up one's horizons, an example from the City of Hamburg was also presented with special energy saving projects from IBA Hamburg.

Invited local guests like the former politician Mr. Manfred Müller (SPD) and Mr. Manfred Görg (former director of proKlima) explained and discussed with the participants the starting point in Hannover in the late 90-ies and the experience and knowledge gained. This made a strong impact on the development of the Success Guide (WP2) and Solutions Open Source Wiki (WP4). Mr. Görg was also invited to the Brussels workshop (2nd Partner Meeting) to give more input into the success models and to support discussions.

One of the key players in Hannover's policy towards Passive Houses supported by RES, as well as a key partner in the PassREg project - **the proKlima fund** - was presented by Matthias Wohlfahrt (Manager of section for non-residential buildings of proKlima). The proKlima fund serves as a model for the voluntary, local and cooperative implementation of climate protection targets and remains to be unique in Germany. Together with the municipalities Hannover, Hemmingen, Laatzen, Langenhagen, Ronnenberg and Seelze, the municipal utility „Stadtwerke Hannover AG“ offers unique service packages within the climate protection fund proKlima. The range of services includes financial subsidies, expert information and project advice.

The **Climate Alliance Hanover 2020**, focused on building sector and energy standards, was presented by Elisabeth Kirscht (City of Hanover, Climate Protection Unit). She offered a broad review on a selection of topics, as the most important of them were the energy efficient and solar optimized town planning and the energy standards fixed in acts of sales and contracts with the participation of the local authorities.

In his turn, Udo Scherer presented the **Climate Protection Agency Region Hanover**, focusing on the local concepts for climate protection based on impacts on the building sector and the supply of renewable energy. As mentioned above, Simona Weisleder from **IBA Hamburg** presented her organization's activities in the light of the goal for CO<sub>2</sub> neutral energy supply to the Elbe Islands.

Additional inputs during the international workshop included a discussion on the roles and impact of the regional/local building and energy policy regarding energy efficiency and renewable energy and the key stakeholders involved; an overview of the economic and financial factors – support and incentives, with their impact on local market; an exchange on the planning and design capacities, construction technologies and quality assurance; and, last but not least, on the role of the public acceptance and support and the communication strategies with different stakeholders.

To get in contact with the local beacons proKlima organized three study tours to current projects. The first study tour in May 2012 was mainly organized to inform the PassREg-group during the Kick-off-Meeting in Hanover. The second and third sessions successfully focused on the implementation of the passive house concept with non-residential buildings and their technical solutions. More than 100 participants, local planners, architects, investors, members of municipalities and politicians were informed and projects were presented as follows:

- Primary school In der Steinbreite, Hannover-Davenstedt (05/2012)
- Day care center Im Wiesengrunde Hannover – Bothfeld (05/2012)
- REWE Passive House Supermarket, zero:e-park Hanover (06/2013)
- Housing development at zero:e-park Hanover (06/2013)
- Office building of the waste management Hanover Region, Hanover (06/2013)
- Newly built and retrofit of the Memorial Ahlem, Hanover-Ahlem (07/2014)
- Day care center at Ahlemer Holz, Hanover-Ahlem (07/2014)
- Day care center in Otto-Reinhold-Weg, Hanover – Vahrenwald (07/2014)

The study tours equipped the participants with expert knowledge of the development of architecture, building technologies and requirements of the owners and investors. Several renewable energy appliances were presented:

- Heat pumps and chillers connecting with heat recovery (supermarkets)
- District heating and absorption chillers
- PV and solar appliances

### **Brussels, 02-04 October 2012**

On 02-04 October 2012, PMP organized the second PassREg international workshop and study tour in Brussels to demonstrate the policy the Region pursued to achieve the passive standard so rapidly. A series of study visits were also organized in this connection, taking the project team and the invited politicians to some of the most impressive beacon projects and providing a conference setting with all major stakeholders of the Brussels' model of success.

The international workshop was opened by an introduction by Smael Daoud, Sustainable Building Advisor of the Minister Evelyne Huytebroeck. The "Brussels goes Passive" initiative was put into focus, as the history of the process was described in detail by Gregoire Clerfayt (Brussels Environment office).

The keynote speeches were followed by speed talks (3x10 min.) about special "top down" measures in Brussels with duos (Minister and Administration):

- From Minister Evelyne Huytebroeck: Antoine Crahay, complemented by Nathalie Renneboog from SDRB (Brussels Region Development Fund).
- From Minister Christos Doulkeridis: Bernard Van Nuffel of SLRB (Brussels Region Housing Fund), complemented by Thibaut Hermans, a representative Brussels Environment and the "Exemplary Buildings" ("BatEx") programme.

A special session was organized on the capacity building activities in Brussels - Capital region, entitled "Training the market: lessons to take". Particular examples and distinctive approaches were presented by Benoit Quevrin (PMP), Sophie Salle (CDR Construction-Regional Training center), and Charline Boyer (CCB Construction confederation – responsible Alliance Employment Environment).

The afternoon session was dedicated to practical lessons (do's and don't's) in three separate panels:

- Panel "Designers", with speakers Vincent Szpirer (R2D2) and Sebastian Moreno Vacca (A2M)
- Panel "Real Estates", with speakers Jean-Paul Putz (Nelson Canal) and Paul Muyldermans (Immobel)

- Panel “Contractors”, with speakers Frédéric Bynens (Democo), Etienne Banse (M&M Sitty), and Christophe Cardinael (Dherte)

The study tour in Brussels presented a variety of buildings from different types and functionality and at different stages of construction, which allowed not only for review of the impact of the regional policy but also for specialized technical questions to the hosts. The sites visited were as follows:



ELIA, an office building in construction phase, a large scale private development supported by BatEx + Subsidies. Designer: Architectes Associés



BRUYN OUEST, a recently completed social housing complex, a public (Brussels Welfare) large scale development supported by BatEx + Subsidies. Designed: Blondel architects



MARLY, a completed headquarters office building, a medium scale private (investor: FBZ) development supported by BatEx + Subsidies. Designer: A2M



ESPOIR, a completed apartment complex, a medium scale private development supported by BatEx + Subsidies, initiated by passive house ambassadors who are among the inhabitants. Designer: Damien Carnoy



MDE, a nursery & employment office to be delivered in the coming days, a medium scale public development (Forest Municipality) supported by BatEx + Subsidies + neighbourhood contract. Designer: A2M

### Tyrol, 09-12 April and 09-11 October 2013

In **April 2013** a fact finding mission with the participation of WP2 leader EnEffect started in Vienna at FFG (Forschungsförderungsgesellschaft) and ended 4 days later at Innsbruck University. The meeting was provoked by the need to present the success model of Tyrol (draft) within the first year of operation and before the regular PassREg workshop takes place in the region, so that the aspiring regions could use the conclusions and recommendations coming from this FRR. A lot of national and regional stakeholders were involved in dates and discussions, the team from PassREg Partner EnEffect in common with the coordinator of FFR Tyrol, both responsible for analyzing the FRR Tyrol, had the opportunity to discuss objectives and background but also the assessment of the FRR Tyrol within Austria with the following organizations:

- FFG Österreichische Forschungsförderungsgesellschaft mbH
- ÖGUT Österreichische Gesellschaft für Umwelt und Technik

- BMVIT, Bundesministerium für Verkehr, Innovation und Technologie, Abteilung für Energie- und Umwelttechnologien
- Lang Consulting, Ingenieurbüro für technischen Umweltschutz
- IG Passivhaus Österreich, IG Passivhaus GmbH
- Freisinger Fensterbau GmbH
- Rieder Bau GmbH & Co KG
- WKO Tirol, Innung Bau
- Standortagentur Tirol, Tiroler Zukunftsstiftung
- ATL Amt der Tiroler Landesregierung, Abteilung Wohnbauförderung
- ATL Amt der Tiroler Landesregierung, Energiekoordination
- Energie Tirol
- NHT Neue Heimat Tirol
- IIG Innsbrucker Immobiliengesellschaft
- Raiffeisen Wohnbaucenter, Raiffeisen-Landesbank Tirol AG
- IG Passivhaus Tirol

Within these meetings there was time to figure out, why and how, compared with other Austrian regions, Tyrol achieved this outstanding position. Thanks to very active key actors as Standortagentur - an agency mainly founded from the federal government to stimulate and assist in economic development and research, the housing subsidy office of the Federal Government of Tyrol, NHT and IIG, Energie Tirol, IG Passivhaus Tirol and also innovative private companies as ATB Becker and Freisinger Fensterbau GmbH, passive house standard combined with renewables could be implemented quite successfully in our region.

In **October 2013**, the regular (fourth) PassREg international workshop and study tour took place in Innsbruck, based on the already available first draft of the SM of Tyrol.

The workshop was opened by Christoph Kaufmann, responsible for construction planning for Innsbruck, Vice mayor of the City of Innsbruck, speaking on behalf of Mayor of the City of Innsbruck Mag.a Christine Oppitz-Plörer. He recounted that the City of Innsbruck started its environmental protection policies back in the 90-ies, and distinguished the Innsbruck Energy Development plan, which plays a major role in this process. The plan itself was started in 2007, with the aim to reduce CO<sub>2</sub> emissions radically to 2025, and has a strong emphasis on awareness building. Mr. Kaufmann stated that the Passive House concept fits into this sustainable plan as it works with all types of buildings and forms the basis for sustainable energy concepts.

The first session of the workshop was dedicated to the “Energy efficiency for buildings with the Passive House Standard supplied by Renewable Energies” from the perspective of the policy of the federal state and the municipality of Innsbruck. It was particularly focused on the legal and economical framework on energy efficiency in buildings in Austria and Tyrol, the structure and targets of the funding of energy efficient construction and refurbishment,



the federal and municipal policies, the options of urban planning, steering options for urban planning policies to support energy efficient construction standards, the public bodies in their role as example, and the impact on local economy.

The available incentives, research activities and networking opportunities in Tyrol were presented by DI Norbert Gleirscher, Department manager of Renewable Energies in Standortagentur, which is funded by Tyrol and works with companies wanting to do business here. With its focus on renewables and work in many EU research projects, Standortagentur has established 5 competence clusters representing main branches of Tyrolean economy.

These clusters unite many of the most influential actors in the Tyrolean Energy Strategy 2020 (Tiroler Energiestrategie 2020) and Energy Efficiency and Renewables in Tyrol, which was presented by Deputy Tyrolean State Governor Josef Geisler. Based on the goal that by 2050 Tyrol shall be energy self-sufficient, Mr. Geisler stated that Tyrol is very well on the way to reducing its energy consumption to a significant extent. Although the population and the economy have grown the consumption of fossil energy shows stable trend of reduction.

These targets however cannot be achieved without a coherent regional system for energy consulting, which was presented by DI Bruno Oberhuber, Chairman of Energy Tirol. Energy Tyrol is the regional energy agency, founded in 1992. It is 40% funded by government, 60% project-based. It's a non-profit association with members including the regional government, energy suppliers, commerce/labour/agriculture chambers, association of municipalities. Its goal is quite simple: to save energy! About 50% of the activities of Energy Tyrol are dedicated to buildings - both in terms of RES and energy efficiency. They have about 18 part-time employees and 25 external consultants. Their main target group is the private household and they are linked to many architects, the government, and stakeholders' associations like IG Tirol.

During an intensive session, many other topics were discussed, including (but not limited to):

- The Implementation of EBPD, OIB Directives within Tyrol, presented by DI Franz Vogler, Department manager of Building Department in the Building Inspection Government of Tyrol;
- How to implement EE/RES in Urban planning, presented by Dr. Rainer Vallentin, VRAIE Vallentin Reichmann Architects;
- The importance of energy efficiency for the achievement of the regional energy targets, presented by Prof. Wolfgang Feist;
- The Innsbruck's Energy Strategy, presented by DI Stefan Siegele from the Municipal Council of Innsbruck;
- The housing grants and subsidies as instrument improving Energy Efficiency, presented by Mag. Otto Flatscher from Wohnbauförderung Federal State Tyrol;

- The cost efficiency and feasibility of Passive House Standard/RES within Social Housing, presented by DI Geisler Heidi from Neue Heimat Tirol NHT, a non-profit housing development company,
- An Investment for the Future: Lifecycle Costs of Energy Efficient Building Standards, presented by the University of applied Science Kufstein, DI. Emanuel Stocker.



A very exciting study tour was organized, starting with the probably most famous example of a Passive House multi storey family building in the Lodenaareal Innsbruck supplied by renewable energy. The story and the process of the design and the construction of the complex were presented by Neue Heimat Tirol.



The next site was a cultural heritage school in Innsbruck, renovated to ambitious energy efficiency norms using PH components and implementing distinctive energy efficiency and RES approaches and solutions. More about this school can be found at

<http://www.3encult.eu/en/casestudies/default.html> and  
[http://www.youtube.com/watch?feature=player\\_detailpage&v=eh6ypAUXyE](http://www.youtube.com/watch?feature=player_detailpage&v=eh6ypAUXyE)



As a next step, DI Rutzunger from Neue Heimat Tirol presented Passive House projects in Jenbach (2 apartment blocks: one new building and one refurbishment, typical style of the 1940-ies) and a PH construction from wood, again in Jenbach. These examples were followed by Passive House projects in Achenkirch: one new constructed building and one typical building of the 1940-ies.

## Comparative Analysis

***Presented at the 3<sup>rd</sup> PassREg project meeting and the 17<sup>th</sup> International Passive House Conference***

### Regulations vs Incentives

Each of the three regions reaches the 'passive house' standard in its own way, creatively interpreting and adapting it to local conditions. Their experience shows that the desired result is achieved most effectively through an appropriate combination of mandatory **regulations** and effective **incentives** to encourage passive buildings established at both national and local level. It is interesting to observe whether the pursuit of the three regions to establish the 'passive house' standard will be sufficient for its integration in national definitions of 'nearly 0-energy buildings', which would send an important signal to many other European regions and municipalities.

**Germany / Hanover:** In line with federal policy and taking advantage of the relative independence of local authorities in Germany, Hannover City Council develops long-term regional Energy Concept. It includes refusal to develop nuclear energy, gives a new role for the local utility company Stadtwerke Hannover AG and creates proper regulation and tools to promote passive buildings. Several policy instruments are used: Local Agenda 21, Hanover Ten Plus, Integrated Resource Planning, Hanover CO<sub>2</sub> Audit. With a new regional regulatory framework three **standards** for all new buildings on municipal land are introduced: Low Energy House (LEH), Low Energy House Plus (LEH-plus) and Passive House (PH). In addition, the municipality approved a set of environmental requirements, covering both buildings and urban plans (building density, orientation to the sun, technical infrastructure, etc.). In the late 90's, Hanover Municipality and Hannover Stadtwerke AG create the unique instrument **proKlima**. The fund proKlima provides annually € 5 million to support the renovation of buildings and to establish the 'passive house' standard and related construction technology. Every Euro of financial assistance provided by proKlima has helped to mobilize € 12.7 of additional investments. Following the example of Graz (Austria), Hanover municipality creates the public-private partnership **Ecoprofit**, which provides technical and financial support to SMEs in their efforts to limit production costs by reducing waste and emissions. In 2003, the city government initiated the program **ImpulsProgramme Passive House** to support the creation and development of SMEs in the field of energy efficiency, in particular passive buildings.

**Belgium / Brussels:** The new policy framework adopted by the regional authorities in Brussels in 2004 include: mandatory local **regulations** on energy performance of buildings (EPB), introduction of eco-building elements, financial incentives, inter-agency cooperation to promote environmental construction, free technical support for training and professional development. Although creatively interpreted, the main indicators of the passive house standard became the basis for the new regulations. The implementation of a series of **real projects** through the Exemplary Buildings (BatEx) programme (2007-2009) showed that passive building does not increase the cost of renovation and new construction to unacceptable levels. Officials in Brussels first adopt the new standards and rules in their municipal buildings, thus stimulating their penetration. Such a **'lead by example'** approach is essential to Brussels, where the share of public procurement is significant. Local Action Plans for Energy Management (P.L.A.G.E.) are based on this approach, while "Contracts for sustainable neighbourhoods" encourage broader initiatives to update the traditional neighbourhoods. Essential to the success of Brussels are the **financial incentives** available in the form of **tax breaks** (created by the federal government in 2009), **grants** (to cover part of the additional investment required to meet the new standards for energy efficiency in buildings) and **'green' credits / prêt vert social** (for the most vulnerable social groups). When in the middle of 2012 the federal government abolished tax breaks, Brussels regional government decided to double local subsidies to keep the interest of investors, thus reaffirming its commitment to energy efficiency in buildings.

**Austria / Tyrol:** The Austrian Climate Protection Initiative (**klima:aktiv**) stands out among the national programs, boosting awareness on energy consumption, and supporting energy checks for every household in Austria (2004). It consists of a bundle of regulations, taxes,

and subsidies. The klima:aktiv 'passive house' criteria is similar to German 'passive house' standard and will become mandatory for receiving social housing subsidies. While 'low-energy' performance is already standard in all Austrian regions, Tyrol (together with the region of Vorarlberg) has accepted mandatory 'passive house' standard for all subsidized multi-apartment housing construction. In 2006 the Tyrol Parliament launched an initiative named **Energy Efficiency and Energy Conservation in Tyrol Households**. Space heating *objectives* for households were established as follows: for new buildings at maximum 25 kWh/m<sup>2</sup>year (Category A) and for good-quality comprehensive renovation at 50 kWh/m<sup>2</sup>year (Category B). It is particularly important that the annual number of renovated residential buildings, which currently amounts to less than 1%, shall be increased to at least 3% in order to achieve the 5% share laid down in the Action Plan. Programmes for EE and RES in the building sector introduce a series of **incentive instruments**, such as the *social housing subsidy scheme* (grants being awarded for energy related measures); subsidy schemes for **new buildings**; additional **eco-subsidies**; subsidies for **building renovation** (the highest being available for a renovation according to 'passive house' standard). Housing subsidies (both federal and regional) are widely accessible for a big part of the population, thus strongly influencing market prices of commercial housing and protecting the markets from downturns. Demand side housing allowances are another effective financing incentive, targeted to dwellings, which were constructed with subsidies. In comparison with the other provinces Tyrol is even now capable of ensuring a share of energy of local production of nearly 40%. Nevertheless, Tyrol Energy Strategy 2020 envisages also incentives for the **use of RES** (solar energy, biomass), connected to both level of efficiency and limits for emissions. In this way energy generation from local RES (less transport) will increase to more than 50% of the final energy demand.

### Capacity for Change

If we assume that (regional) regulations and various stimuli are already in place, stemming from the top-down approach that would probably look most convincing in less developed regions, would that be enough to reach the heights described above? Our appreciation is that this would not be the case: there is another set of vital ingredients, which enable the uptake of 'passive house' concept. We call this set of ingredients '**capacity for change**': it includes, without any limitations, **all stakeholders**, institutional arrangements, educational establishments and professional networks with their information and knowledge, **skills and abilities**, attitudes and connections. It is evident from the examples that markets are developed on the base of extended awareness raising, educational and consultation activities, in most cases lead by local/regional authorities but always supported by different interest groups, providing for the accessibility and quality of the information offered.

**Germany / Hanover:** As early as mid-1990's, Hannover local authorities recognize that implementation of the goals of their ecological and energy policy is unthinkable without active public support. A broad circle of stakeholders was attracted in the design of Local Agenda 21 and active **public dialogue** on climate protection issues was provoked. The implementation of Agenda 21 is based on the establishing of permanently functioning **networks** (e.g. "Environmental Communications Network), directly involving citizens in the sustainable development of the region. Other instruments include the "Environmental Hot

Line”, the “City Forum” and the Planning Ombudsman institution. Specific attention is paid to the involvement of businesses and local industries through PPPs, branch initiatives and consultations. The permanent exchange of environmentally sound technologies is also a main priority, as support efforts for continuing education of professionals in the area of EE and RES are maintained. Specific measures have been taken to ensure participation of women and children in the sustainable development of the city. Hanover Municipality has also improved of its own administrative **capacity**. Its specialized unit “Energy and Climate Protection Section” encourages changes in the end energy users’ behaviour, provides consultations on local energy standards in buildings, participates in energy planning, and supports use of RES. A system of institutions has been developed and coordinated by Climate Protection Agency Hanover region (CPAH), while the programming tasks are implemented in the framework of Climate Alliance Hanover 2020. Locally, the Kronsberg Environmental Liaison Agency (KUKA) performs relations with the broad public and ensures its direct involvement. Additionally, a system of consultation centres for different stakeholder groups (households, investors, builders, etc.) was built in the municipality, and a special national network for professional orientation attracts young people to training opportunities. Hanover municipality is also engaged in active cooperation with PHI, taking advantage of opportunities on specialized trainings for designers, engineers, construction workers, etc.

**Belgium / Brussels:** The rapid growth of low-energy building in Brussels-Capital region, which followed the high-level political commitment and the resulting new strategic and legislative frameworks, also required a significant change in the institutional arrangement. **Brussels Environment** office multiplied its capacity in terms of experts and financing, which was a necessary step to test the ability of businesses and end-users to realize high-end energy efficient projects. A set of additional **institutional measures** was realized: the Sustainable Building Facilitator Network, the Employment-Environment Alliance, Brussels Enterprise Agency (BEA), Plateforme Maison Passive (PMP) and Passiefhuis Platform (PHP) are working towards smooth transition to more energy-efficient building practices, covering all relevant stakeholders in public, private and non-governmental sectors. Usually offering free consultation services, these institutions exemplify the attempts of regional authorities to support the supply side of passive building. The need to **train building professionals** via universities, vocational schools and training centres was timely realized, and in 2009 Brussels Environment decided to develop a professional development program for designs, engineers, architects, and contracting authorities. Additionally, PMP introduced training for designers in 2005 and for builders in 2007. Today, the training program involves the entire sector (developers, investors and promoters, building managers, property managers, notaries, maintenance companies, etc.), as a part of the legalization of the ‘passive house’ standard, also supported by the Professional Reference Centre for Construction. As regards higher education courses, at the Department of Architecture of the Université Libre de Bruxelles, PMP has integrated passive house training, as designers and builders apply the learned concepts into practice, collaborating on real ‘passive’ projects.

**Austria / Tyrol:** The institutional arrangement in Austria and in the region of Tyrol did not fall behind strategic and regulatory development. A famous example is the Austrian Energy Agency (AEA), in which federal and provincial administrations and a number of important

institutions and companies **cooperate and exchange** knowledge and experience. This way, they are capable to provide information to all target groups, ensuring the engagement of public society and influencing decision-making in public administration and industry. The institutional structure of AEA is itself an illustration of the importance of engagement of all stakeholders: along with politics, AEA brings together the economy (OMV, EVN, TIWAG, etc.), scientific institutions (WIFO, EIV, LEV) and stakeholders' organisations (WKÖ, Fachverbände, AEE, etc.) in three working areas: Innovative Energy Technologies, Energy Efficient Systems and RES. AEA is also strongly supported by a multitude of **training and capacity building** activities. As an example, klima:aktiv provides qualifications in the area of sustainable building and coordinates training and education activities. Consultancy services and trainings are offered by Energie Tirol and its 'Energy Academy', focusing on professional development of planners and construction-related industries. Professional networking is exemplified by EcoPlus Cluster, Green Building Cluster of Lower Austria, and Low-Energy-Building Cluster Tirol, with the understanding that innovative and economically sound projects between business and research community are becoming increasingly important for the building sector. Training opportunities are also offered by IG Passivhaus Austria and IG Passivhaus Tirol, in close cooperation with PHI and University of Innsbruck.

## Highlights from the Regions

### Region of Hanover, Germany



*Hanover-Kronsberg, Photo © PHI*

The regional development on Passive Houses was paved in the 1980's when the Hanover City Council took a decision for rational energy use and broad introduction of renewable energy sources on the territory of the city. The long political process was strengthened by several activities while the EXPO 2000 took place in Hanover. In context of the EXPO an ecological urban neighbourhood Kronsberg was built with renewable appliances (solar, district heating, PV, wind power). This could also be considered as the starting point of the passive house

process in Hanover and demonstrates a direction towards NZEB. Within the Kronsberg neighbourhood a project of 30 passive house row houses was realized in 1998. Since the passive house development started proKlima supports more than 98,000 m<sup>2</sup> of new residential passive house space in proKlima's supporting area, Hanover and five surrounding municipalities. In 2014 one out of three new residential housing units in the City of Hanover is a Passive House.<sup>1</sup>

### Hannover-Kronsberg - a model for sustainable urban development

Two favorable factors are usually put forward for the establishment of Kronsberg as a model of sustainable urban development. One of them is undoubtedly the fact that Hanover

<sup>1</sup> More Information about passive houses in Hannover: [www.passivhaus-plattform.de](http://www.passivhaus-plattform.de)

was the venue of EXPO 2000. The second one is the fact that 80% of the area of the housing estate is municipal property. These two factors, along with the strong support from Stadtwerke Hanover AG and the newly created Climate Protection Fund proKlima, enabled the municipality to apply on a large scale the new standards for low-energy buildings. In addition, the energy supply to the housing estate has been optimized through the construction of a new hydro-power plant, two new wind power plants, considerable amount of photovoltaic capacities, as well as a system of decentralized co-generators. Parallel with the efforts for optimization of energy supply and consumption, innovative solutions are being implemented for evacuation of rainwater, for protection of the properties of the soil and for processing and utilization of solid urban waste. The results in Kronsberg have become an example worth replication not only in the framework of Hanover Municipality, but also all over Germany and beyond its frontiers.

### **Success story zero:e-park**

With experience and results of the first passive house settlement the City of Hanover started a further development of a new urban quarter with more than 300 passive house units using renewable energy sources. The urban development considered a ten years perspective, to sell out all plots in 2021. In 2010 the first house constructions sites started. Nevertheless after just four years, in summer 2014, all single plots were successfully sold out.

The principle of the zero:e-park energy concept is firstly based on the reduction of heating demand to a minimum by using the passive house design. Combined with the use of renewable energies (mainly solar energy: solar thermal and/or PV) only a small energy demand remains. Therefore the urban planning concept observes a building envelope line to guarantee that every house gets the solar earnings needed. Despite every housing unit will be passive house, additionally supplied by renewable energies, a remaining energy demand for heating and domestic electricity exists in order to achieve the zero-emission-targets. To cover this residual energy demand the city plans to reactivate a regional hydroelectric power to achieve the zero-emission-target. It is remarkable that even some new houses use more renewable energy appliances than stipulated (e.g. with wooden pellet appliances) and support a direct zero-emission-concept or even plus-energy-concepts. Monitoring results of some houses show that in connection with the passive house standard, a grid-connected plus-energy-concept is feasible.

proKlima attends this development with special framework, financial incentives and supporting studies. Besides supporting the owners with subsidies to passive house design (e.g. 5000 EUR/single passive house) an attending quality assurance program was developed to increase the quality of construction. The quality assurance program reaches for two effects, helping and supporting the owners and construction companies with special know-how, but also forces the companies to deliver high quality work. Therefore the quality assurance serves as a condition for the proKlima incentives. The quality assurance is carried out by local planners and experts listed by proKlima.

The Hanover process shows how important beacons are to convince potential investors and owners. While the passive house construction at zero:e-park hesitantly started at first and

was mostly done by “ecological motivated owners”, the potential investors of the third section were especially convinced by their neighbours along the lines of: “Why shouldn’t built a passive house when the neighbour did?”

With the experience of Hanover’s passive house development the PassREg group was supported and motivated to build beacons. In general the process of the Kronsberg neighbourhood and zero:e-park shows how important beacon effects are.

Since the City of Hanover has started a new building offensive (over the last years the annual new built rate with approx. 250 units per year was under 0.1%) more housing projects are becoming passive house standard: As of 2014 a 50 M EUR building complex has been constructed in the city center: 100 Housing units, 4,500m<sup>2</sup> Office Building, one day care center, 1,150m<sup>2</sup> business area. proKlima supports this project with more than 400,000 EUR to push the development with studies, quality assurance and to balance the more costs of the investment partially. But it also shows that still financial incentives are necessary to stimulate investors building high energy standards, particularly in the social housing sector. New rental models would overcome the barriers of limited investment decisions and pay back challenges. Although even in Hanover examples exist, warm rental models are not usual in Germany. Normally cold rents are limited to a maximum, while the local social authorities don’t really pay attention to energy costs. Only a nationwide reform of social house grants and rent subsidies and cold rent limitation would strongly solve the problem, a perspective to further projects.

### **Brussels Capital Region, Belgium**

By 2007, not a single building in the Brussels-Capital region complied with the passive standard. Nonetheless, today the Region is a leader in passive building, having outstripped by 6 years the EU directives for low energy construction.

At this moment, the Brussels authorities initiated large-scale experiments to determine the ability of businesses, public services and citizens to realize high energy efficient projects: behavior change (Energy Challenge), PLAGÉ program, call for exemplary buildings. Without such high level political commitment, the existing potential to embrace the very high energy efficient solutions may have gone unnoticed. Thus, the sustained engagement of the Brussels authorities at the initial stages of the process is a key factor in the Brussels model.

The Region officially committed to the passive standard only after having experimented with the first three Calls for Proposals for Exemplary buildings. The success of the Exemplary Buildings program showed that passive standards are affordable, and do not raise renovation and construction costs to unacceptable levels.

Based on three rounds of successful trials with Exemplary Buildings (in 2007, 2008 and 2009), on July, 2010 the Brussels government passed an order imposing the passive standard on all regional new public buildings by 2010, and on May 3, 2011 adopted new energy target regulation for all new construction (housing, offices and schools) by 2015 (There are some exception rules for buildings with a bad orientation and/or with a bad capacity).



## Economy and financing

The “**Exemplary Buildings**” program (Bâtiments Exemplaires, or BatEx) is the main financial incentive instrument of the Brussels regional government to encourage demand for very high energy and environment efficiency construction based on a yearly call for proposals since 2007 (except in 2010). The planned duration of the program is May 2007-December 2014, with a total budget of 45 million Euros.

To be eligible for BatEx funds, projects must be located within the Brussels-Capital region, and comprise new building, renovations, or a combination of the two. Importantly, projects must fall within one of the following categories: single-family or collective housing unit, collective facility (e.g., school, hospital, or nursery), office, commercial or industrial facility.<sup>1</sup> To be approved, a proposal must adhere to four specific criteria:

1. All new construction and renovation must be informed by passive standard guidelines (it must strive to be a zero-emission building);
2. The project must prioritize the use of eco-friendly construction materials, and to consider natural cycles and biodiversity;
3. The project must demonstrate a high architectural quality, good visibility, and a satisfactory level of integration into existing stock;
4. Rather than a “high tech solution,” the project must be simple and feasible in technical and financial terms, with reasonable payback timelines.

Approved projects are awarded a subsidy of 100 €/m<sup>2</sup>, which is divided between the contracting authority (90 €/m<sup>2</sup>) and the developer (10 €/m<sup>2</sup>). Moreover, winners receive technical assistance and public visibility of their initiatives.

Another key financial incentive, introduced in the 2004 policy framework of the Brussels-Capital Region, is the system of **energy subsidies**. These subsidies aim to cover part of the excess costs necessary to make high energy efficiency investments in buildings. 80% of the beneficiaries are individuals, but groups and businesses that wish to renovate buildings to reduce energy consumption and CO<sub>2</sub> emissions are also eligible. Among the types of activities covered by the subsidies are: insulation, energy audits, ventilation and the installation of high-performance boilers and super-insulating glazing,<sup>1</sup> which can also apply to passive new buildings (100 €/m<sup>2</sup>) and for low (100 €/m<sup>2</sup>), very low (130 €/m<sup>2</sup>) and passive renovation (160 €/m<sup>2</sup>).

The increase in energy subsidies (2013) after the elimination of the federal tax breaks related to low energy building, which aimed to avoid a crisis in passive construction, once again illustrates one of the key success factors in the Brussels model: a high-level commitment of the regional government. Also part of the 2004 policy framework package, the green social loan (prêt vert social) is a zero-interest loan provided to individuals who wish to isolate their homes, thereby reducing energy consumption in line with the passive standard criteria.

## Visibility and public support

To raise awareness of energy-efficient construction, Brussels Environment features the Exemplary Building winners in articles, project files, seminars, the ‘Green Brussels, Inspiring Architecture’ book, and other publications. Visits are organized for the public

during or after the execution of the project. Below are some other activities that the Brussels-Capital Region organizes to stimulate low-energy construction.

Created in 1999, the **Ecodynamic Company Label** is an initiative of Brussels Environment. Its goal is to encourage companies and organizations to actively commit to improving their environmental performance (especially energy consumption, waste management, and the efficient use of raw materials). The target groups are all enterprises and organizations (large and small, private and public, regardless of their area of expertise).

The **Ice Challenge** event was organized by PHP in Brussels and Antwerp. It aimed to raise public awareness and illustrate firsthand the benefits of the good building insulation. The event consisted of placing two 1,3 tone blocks of ice in two separate makeshift constructions – one very well insulated, and the other one – not insulated. The two constructions are placed side by side on a main downtown street for everyone to see. The goal is to illustrate in this way how more rapidly the ice in the non-insulated construction melts during the summer months. Observers have to guess how much ice would be left in each shack after 40 days. For example, during the 2007 Ice Challenge, more than 450,000 kilograms of ice still remained in the well-insulated cabin, whereas the ice in the non-insulated one had completely melted for 11 days only. But the main objective of the event is promotional: by the guessing competition, the participants obtain useful tips for energy saving and house insulation.



be.passive #19  
- what else?



special issue #01  
Brussels goes passive !



be.passive #18  
- no nonsense



be.passive #17  
- architects having fun



be.passive #16  
- social



be.passive #15  
- 10 years



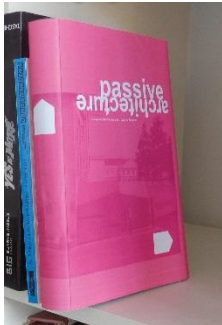
be.passive #14  
- materials



be.passive #13  
- big

Since November 2009, PMP and PHP have been issuing “**Be Passive**”, a quarterly magazine dedicated entirely to low-energy building, and the passive standard in particular. The target audience is: architects, the public authorities, building societies, regional development agencies, engineers, construction manufacturers, real estate actors and all others involved in construction. The magazine aims to serve as a “one-stop shopping” center for all that relates to energy-efficient building. The goal is to present the information

in a clear, concise, and jargon-free way so as to be comprehensible to individuals without technical training. The website (free details and free issues) has more than 20 000 downloads. The magazine is distributed to all target audiences without exception (approximately 15 000).



**A book** has been created in 2015 by 'be passive', called "architecture passive". Translated in Dutch and English. 300 pages, talking about what we know in Passive House constructions the year of the Passive law in Brussels.

*Passiefhuis-Platform* (PHP) and *Plateforme Maison Passive* (PMP) jointly organize an **annual Passive House Fair**: a building technology forum that showcases the latest developments in energy-efficient construction. The Fair targets construction professionals and the general public alike.

Among the activities of the happening are open houses, free readings, information and planning advice, and meetings with the professional members of PMP/ PHP.



Photos © pmp

**Ecobouwers** is an annual conference with loads of technical information and practical experiences on sustainable building. Visitors come into contact with the most engaged and environmentally conscious builders and professionals. Ecobouwers has only one goal: more sustainable and energy efficient homes in Flanders. Because they are urgently needed!

The initiative also supports a large network, as its members can find construction advice over 10,000 threads at the forum and share their experiences with many other professionals in the area. On Ecobouwers.be, more than 800 construction professionals, who have proven their expertise and can provide independent advice, can be contacted. The photo-blogs, showing construction of energy-efficient homes, are one of the most visited sections of the website, which is also the most visited independent construction site of Flanders with more than 1.2 million visitors per year.



One of the first large-scale public advertising initiatives is the “**Are you normal?**” campaign ([www.areyounormal.be](http://www.areyounormal.be)). The campaign was carried out during the 2012 Passive House fair. It included a flashmob, moving advertising (in rollers) along the main pedestrian popular zone in Brussels (where more than 30,000 people pass by every day), T-shirts, and a quiz on the event website, among others. The goal of the campaign was to show that nowadays, a PH is mainstream - the only thing special about it is the inhabitant.



After raising the initial interest, informing and provoking the public a comic video entitled “**I visited a passive house**” produced by PMP became the next step of the communication strategy. With more than 200,000 hits on YouTube, it proved to be a huge success and the reason is quite simple: we can only make jokes with what we know, accept and appreciate. Already well known in the PH community you could check it in English at <https://www.youtube.com/watch?v=ms9piTYk2Os>.

## Region Tyrol, Austria

Tyrol is one of Europe’s regions with the highest density of nearly zero energy buildings, one of Europe’s most “developed” regions in terms of energy efficient constructions in large scale residence and non-residence buildings. This outstanding position is owed not only to legal framework and stimulating incentives as a very attractive federal housing subsidy, but also to committed local actors as the federal government, social housing companies, the federal energy saving agency “Energie Tirol”, private contractors and initiatives as IG Passivhaus Tirol, and many other stakeholders which took part in the PassREg study visits and international workshops.

The success of Tyrol was made possible due to the fruitful atmosphere, created by the Austrian policies for climate protection, energy efficiency and sustainable development. Austria ratified the Kyoto Protocol in March 2002, which requires the country to reduce its greenhouse gas (GHG) emissions by 13% below 1990 levels during the period from 2008 to 2012. A climate change strategy was developed during the same year in order to reach the Kyoto targets. It is performed on three levels: national (federal), regional (provincial) and local (municipal) and has been adopted by all provincial governors and the federal government.

The evolution actually started in the mid 90ties, when the biggest Tyrolean Social Housing company NHT, focusing on low rents, energy and running costs of their building stock, tried to implement the principles of nearly zero energy standards in their new apartment buildings “Mitterweg” and “Lohbach”. This first attempt was quite successful, the “Lohbach” apartments reached a measured heat demand of 17 kWh/m<sup>2</sup>a, and Passive House Standard seemed to be within range.

It was the merit of all involved actors of the first step, that the second could be done: Experienced planners, engaged contractors, motivated social housing companies and – decisive – a new housing subsidy in 2007, which covered most of the additional costs of nearly zero energy standard and was owed to the federal government of Tyrol. PassREg was one of the next steps, making the Tyrolean examples visible not only to decision makers from other Austrian regions but also for those from other European regions through study tours and dissemination events.

The main policy instrument at regional level for the province of Tyrol is "Energy Strategy 2020" with the primary purpose to reduce the dependence of the province on imported energy sources, among other measures by increasing energy efficiency and changes in the

behaviour of the users. An important element of the strategy is the construction of new buildings, complying with the passive house standard and renovation of existing buildings with use of passive house components with the aim to reduce energy consumption in buildings (mostly for space heating and air conditioning) without reducing the comfort of the occupants. The use of renewable energy sources (RES) is promoted as well. Additionally, with its new 10 - point action programme Tyrol aims to cover all its energy needs in the future with locally produced energy.

Energy Strategy 2020 is based on a package of measures for energy efficiency improvement, promotion of energy production from RES and guaranteeing of energy supply for the purposes of implementing the requirements of the EU Directive concerning energy efficiency improvement and increase by more than 50% of the share of energy from RES. With regards to measures for buildings Energy Strategy Tyrol 2020 is mainly focused on space heating and air-conditioning of buildings (residential and intended for services), electricity, RES, and capacity building activities.

This quite successful story could be achieved through persuasion and awareness rising of important stakeholders as of the general public and capacity building within those involved in planning and constructing. Architects, planners, executive companies and their employees had to be brought on this high level of knowledge and experiences, which now allows a cost efficient and reliable implementation and maintenance of nearly zero energy constructions.

## **Achievements**

The number of subsidized passive house homes in Tyrol has more than doubled from 18,1% in 2012 up to 41% in 2013 and is still rising due to in 2015 extended housing subsidies for NZEB's. Visits from European and international delegations, study tours and information events within PassREg helped to rise the interest also within Tyrol, offered new connections and new market for local manufactures of Passive House components as architects, planners and engineers. Local Politicians and decision makers had been encouraged, that their way is the right one in improving the energy efficiency of the building stock.

Within the PassREg Project the local focus in planning and construction moved more and more from residential to non-residential buildings, beside the beacons, mostly residential buildings, it was possible to realize new schools, kinder gardens, office buildings and even supermarkets and – very important for Tyrol's tourism – also hotels, leisure and recreation purpose buildings in Passive House standards using also renewable energies.

Here are some of the most successful exemplary projects (also PasREg beacons):

## **Housing Complex “LODENAREAL” in Innsbruck**

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### **General Information**

ID: 1225 (<http://www.passivhausprojekte.de/> / [www.passivehouse-database.org](http://www.passivehouse-database.org))

Number of dwelling units: 354

TFA (PHPP): 27804m<sup>2</sup>

Construction type: Massive construction

Year of construction: 2009

Property developer and owner: Neue Heimat Tirol (NHT), Social Rental Housing



Source/Copyright PHI

## Description

The biggest non-profit property developer of Tyrol – Neue Heimat Tirol – built passive house rental apartments at the comprehensive 33.000m<sup>2</sup> “Lodenareal”, where a factory for loden clothes (clothes made of sheep wool) was situated earlier before. Each two L-shaped wings form a building enclosing two courtyards. An additional park with about 8.200 m<sup>2</sup> was built as well.

The most important objectives of the project were: efficient envelope – low technology – easy to operate – low heating and running costs – environmental protection – independence from energy suppliers.

## Energy Efficiency

Air tightness:  $n_{50} = 0,18/h$

Heating energy demand: 14,5 kWh/(m<sup>2</sup>a) PHPP

Heating Load: 9 W/m<sup>2</sup>

Passive House certified

**Energy Supply and Renewables:** Solar thermal system + biomass (pellets) + gas

## Housing Complex “O3 – Olympic Village 2012” in Innsbruck

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### General Information

ID: 3856 (<http://www.passivhausprojekte.de/> / [www.passivehouse-database.org](http://www.passivehouse-database.org))

Number of dwelling units: 444 in 13 apartment blocks

TFA (PHPP): 32229m<sup>2</sup>

Construction type: Mixed construction (massive and timber)

Year of construction: 2012

Property developer: Neue Heimat Tirol (NHT), Social Rental and Ownership Housing



Source/Copyright PHI

## Description

The residential housing complex on the area of former military barracks is composed of 13 cuboid building structures with heights of 6-8 storeys. 12 houses assemble in groups of three to four shared forecourts. The "Three houses - Neighbourhoods" embrace different sized courtyards. In the centre of the complex is the large common green area with playground. The balconies have been placed on the greatest possible privacy.

## Energy Efficiency

Air tightness:  $n_{50} = 0,3/h$

Annual heating demand PHPP: 18 kWh/(m<sup>2</sup> a)

Heat load: 13.3 W/m<sup>2</sup>

Total primary energy demand (domestic hot water, heating, cooling, household electricity)  
PHPP: 108 kWh/ (m<sup>2</sup>.a)

Energy Saving House with Passive House Components

**Energy supply and Renewables:** Solar thermal system (DHW) + district heating

## Apartment House in Jenbach

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### General Information

ID: 1710 (<http://www.passivhausprojekte.de/> / [www.passivehouse-database.org](http://www.passivehouse-database.org))

Number of dwelling units: 12, TFA (PHPP): 1073m<sup>2</sup>

Construction type: Timber construction

Year of construction: 2009

Property developer and owner: Neue Heimat Tirol (NHT), Social Rental Housing



Source/Copyright PHI

## Description

Multi-storey residential complex with 67 apartments in wood construction, built with the passive house standard. In the first construction stage 42 units were built. This stage forms a courtyard, from which all apartments are accessible. Also all the great apartments are arranged there, a family-friendly living here is the main theme. House No. 4 with 12 residential units is certified. The second construction stage with 25 units was possible to plan linearly with good southern orientation because of the form of the property. All apartments are placed in three overlying floors. The houses are designed as passive houses with controlled ventilation with heat recovery. The remaining energy demand is covered by gas; the heating system is underfloor heating. The DHW is heated by solar panels decentralized for each house. The exterior facade is covered by natural larch wood planking.

## Energy Efficiency

Air tightness:  $n_{50} = 0,44/h$

Passive House certified

**Energy supply and Renewables:** Solar thermal system & gas

## Renovation of the Faculty of Civil Engineering Science, University of Innsbruck

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### General Information

TFA (PHPP): 8897m<sup>2</sup>

Construction type: Mixed construction

Year of renovation: 2013/14

Property developer: BIG – Bundes Immobilien Gesellschaft m.b.H.





Source/Copyright PHI

## Description

The building was built 1970 of reinforced concrete frame construction with an axis system of 7.50m, which allowed a prefabricated precast façade. The original structure had escape balconies around the building, fixed on concrete consoles, which were huge thermal bridges.

The winning project of an international architecture competition planned to remove those balconies and design a thermal bridge free envelope. A sprinkler system has been retrofitted for the fire safety.

A crucial component of the retrofitting is the window system, which has been especially developed for this project. Because of a higher air change rate for the passive cooling at night, lowering top-hung windows were installed. In spite of high internal heat sources the building doesn't need an active cooling system.

## Energy Efficiency

Air tightness ca. 0,6 /h (50 Pascal)

Heating Energy demand is below 25 kWh/(m<sup>2</sup>a) (PHPP)

The building is going to be certified according to EnerPHit retrofit standard

## Conclusion

PassReg has been a project which required a wide field of expertise and has incorporated very different field of activities. Starting with the technological knowledge of Passive House and renewable energies, political and economic literacy and insight, it included also a wide range of PR work, stakeholder empowerment, and administrative and professional capacity building. These aspects were very well illustrated in the Success Models of the FRRs and presented and discussed in details during the international workshop in Hannover, Brussels

and Innsbruck; in addition, the results of the interplay of the described factors were clearly reflected in the beacon projects visited during the dedicated study tours. The vision of PassREg that Passive House + Renewables is the most suitable blueprint for NZEB or even Plus-energy buildings is becoming more and more clearer.

Although several regions have already adapted this approach, there are still a huge amount of regions which could benefit from projects like PassREg in a deep and sustainable way. Some cities and regions have taken on the frontrunner role; others will surely follow in their efforts to help the civil society in this deep transition process which it currently faces. Despite the significant differences between 'success models' of Hanover, Brussels and Tyrol, they send some clear common messages to those cities, regions and event nation states:

- Implementing 'passive house' standard supported by RES in the definition of national standards for 'nearly zero-energy building' (NZEB) is a **major opportunity and challenge** for each EU member state.
- **Financial incentives** help and encourage decisions for more beacon buildings more quickly. Incentives are important as a helping hand for the beacon/example projects, which in turn help develop supply chains and gain support across the industry and stakeholders by demonstrating their success. This is clearly shown in the Success Models of the frontrunner regions Hanover, Tyrol and Brussels.
- Political will is decisive. The availability of appropriate national regulatory framework is a favourable condition, but it does not reduce the need for active **involvement of regional and local authorities**. Short time for implementation of the NZEB national standards involves extreme 'bottom-up' activity with the crucial role of regions and municipalities.
- The role of municipalities cannot be fully achieved without attracting a wide range of local **partners and stakeholders**. Competence (capacity) of these actors is an important prerequisite for their effective contribution.
- The PassREg team believes that the **first Passive House projects** have to be **built as beacons in the regions** with convincing architecture, build quality, affordability, user-friendliness, etc. Good information material on the projects helps to disseminate the knowledge and to answer additional questions.
- The compulsory regulation of passive buildings / NZEB would be effective only when implemented together with appropriate **promotional tools**.
- Awareness-raising information and **targeted/tailored training for architects and tradespeople relating to Passive House + renewables has to be available locally**. Raising capacity with training courses, visits, event activities are important to gain confidence in executing high quality NZEBs using the Passive House Standard and renewable technologies.
- Striving for sustainability and passive (and 'green') buildings creates **new industries and jobs**, and does not contradict to economic growth. Meanwhile, the **market** for 'low-energy' (and 'passive') buildings still needs support and protection in order to gradually cover the entire construction sector.