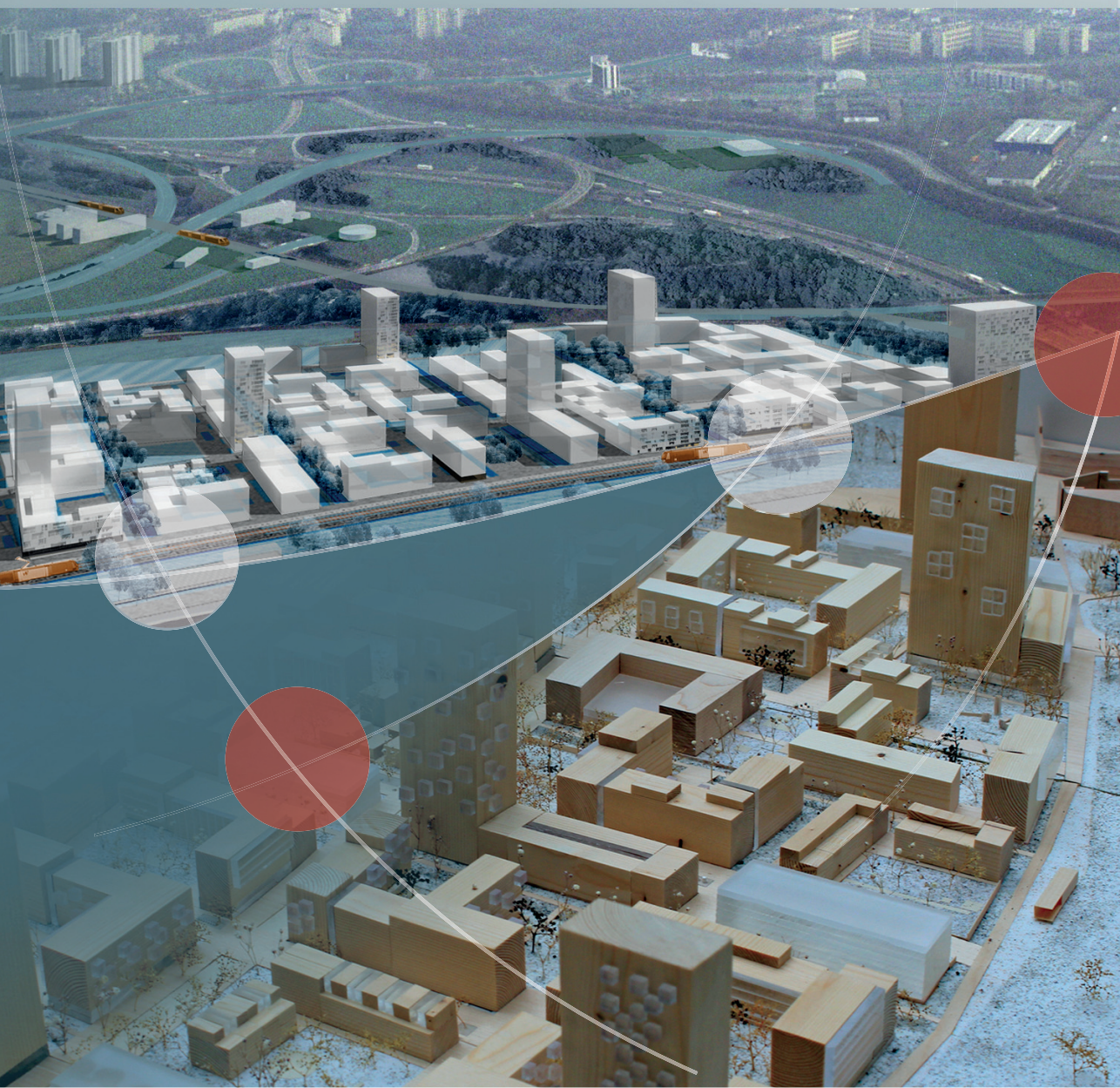


Passive House Regions with Renewable Energies:

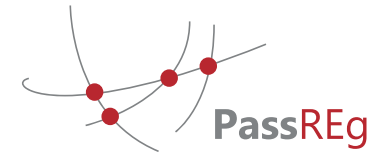
Building for the energy revolution

A Guide to Success



Passive House Regions with Renewable Energies:

Building a sustainable energy future



A Guide to Success

PassREg project paves the way to NZEBs

Dear reader,

The little book you are holding is the product of an extraordinary collective effort of a group of enthusiastic building experts from 14 European organizations, supported by numerous cities and regions from 11 European countries. Inspired by the desire to shorten the path to the buildings of the next decades, we joined forces in one memorable project: 'Passive House Regions with Renewable Energies' (PassREg), conducted with the invaluable support of the Intelligent Energy Europe programme of the EC.

Within this remarkable project, we studied the experience of three European frontrunner regions with undoubted success in Passive House and NZEB design and encouraged other aspiring regions to follow. We exchanged ideas and practical experience, shared solutions and approaches, assessed the achievements and planned the next steps together.

While some of the aspiring regions made their first steps towards 'passive' and 'nearly zero-energy' buildings, other accelerated their movement forward. In the meantime, frontrunners widened their efforts to larger urban areas. Starting from the design of separate passive buildings, we moved through carbon-neutral neighborhoods and even evidenced entire cities of passive buildings. The Passive House standard was confirmed as a solid foundation of the long-term energy and building strategies and development plans of a number of European cities and regions.

In this book you will find a wide range of policies and concrete actions that can inspire new followers. From here you can head to other valuable sources of knowledge and information you may need on the road to the 'nearly zero-energy' building. You can also use the electronic version of this guide, which is accessible on www.passreg.eu.

Good luck and be inspired!

The PassREg project team

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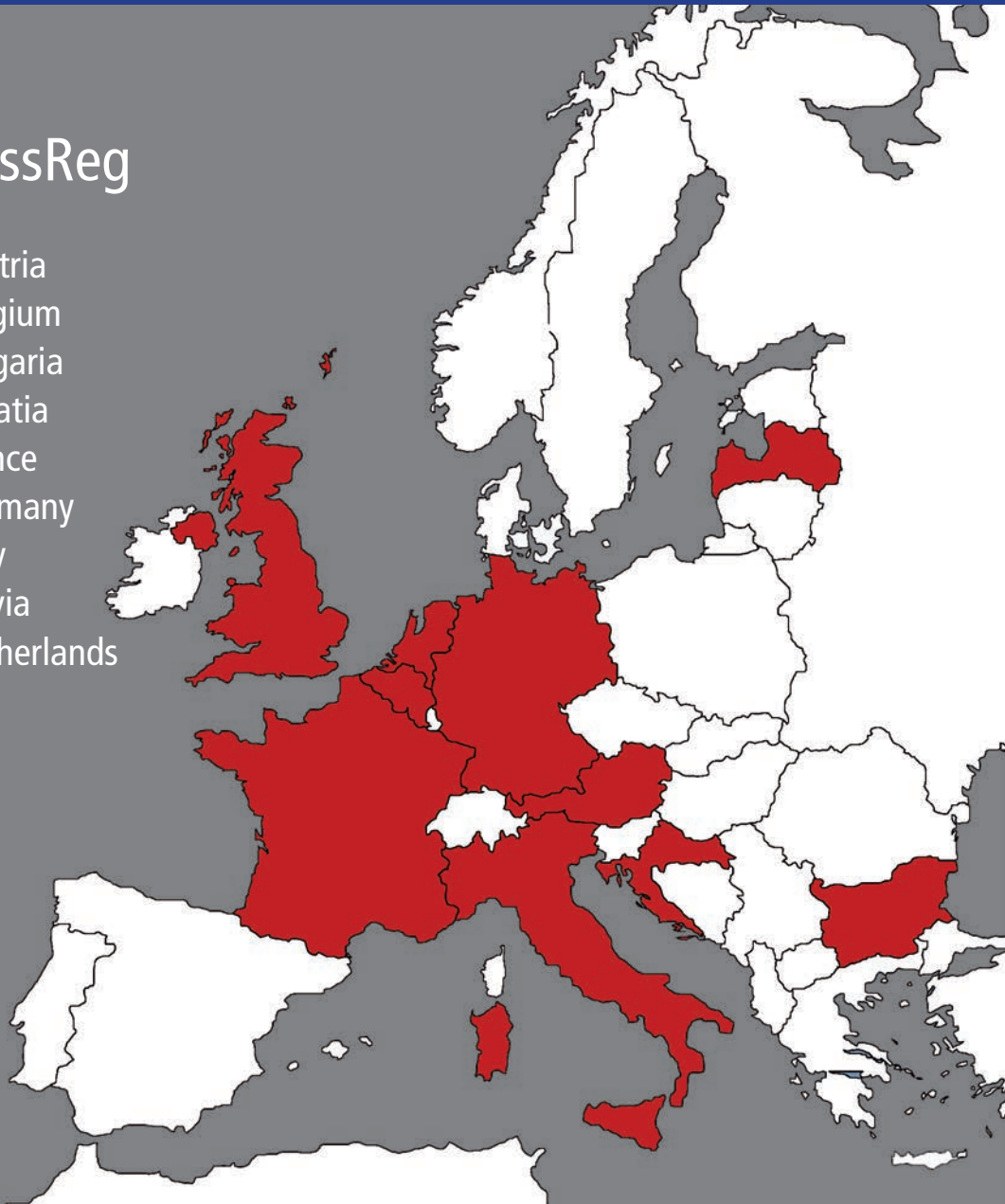
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01 The Vision of PassREg

PassReg

Austria
Belgium
Bulgaria
Croatia
France
Germany
Italy
Latvia
Netherlands
UK



The PH concept and the PH Standard

The Passive House Concept (PH concept) is built upon six basic design principles (viewing the building as a physical object): (i) making optimal use of solar gains, (ii) super insulated building envelope, (iii) quality windows and doors with high energy performance, (iv) minimal (or no) thermal bridges, (v) high airtightness of the building envelope and (vi) ventilation with heat recovery. This concept leads to the achievement of a building, for which thermal comfort as per ISO 7730 can be reached solely by post-heating or post-cooling of the fresh air mass volume is required to achieve sufficient indoor air quality conditions without need of additional air recirculation.

The Passive House Standard (PH Standard) has been set initially for Central European countries, later on being proved and theoretically spread throughout the world and virtually in all climatic regions inhabited by people. This standard requires less than 15 kWh/m² annually for heating or a peak heating demand of less than 10W/m². Roughly the same is true for cooling (www.passivehouse.com).

Which are the Passive House (PH) regions?

PassReg Frontrunner regions (FRRs): Hannover (Germany), Brussels-Capital Region (Belgium) and Tyrol (Austria).

PassReg Aspiring regions (ARs): the city of Antwerp (Belgium), Arnhem-Nijmegen (Netherlands), Aquitaine (France), Burgas (Bulgaria), Cesena (Italy), Latgale and Vidzeme (Latvia), Wales (UK), Zagreb (Croatia); Associated regions: Gabrovo (Bulgaria), regions Sicily and Lombardia and districts Catania, Foggia and Pesaro and Urbino (Italy).

The Vision of PassREg

The PassREg project aims to offer a direct and efficient way for the execution of the overall European goal – the introduction of Nearly Zero-Energy Buildings (nZEB) as regular design and construction practice by 2020 on the base of the Passive House Standard (PH Standard) supplied by renewable energies. In order to define the most suitable approaches, the project explores the experience of several European regions with undoubted success in the implementation of extremely low-energy standards in buildings (frontrunner regions, FRRs). By analysing these experiences, specific cross-sector conclusions have been made on whose basis policy recommendations for the achievement of comparable results in other regions are formulated. A series of specific building developments (“beacons”) in the participating cities and regions illustrate the PassREg project objective in practice.

01

Why “Passive House”?

Nowadays, various concepts for energy-efficient buildings exist, including “passive”, “low-carbon”, “solar”, “green”, and “sustainable”, among others. Any of these concepts can be illustrated by distinct positive examples. In this diversity, “Passive House” stands out as not only the most precisely defined concept, but also the most convincing, successful and widespread approach in the world. Its popularity is due to a great extent to the comprehensive nature of the concept, based on extensive scientific research, practical tests and tens of thousands of realised and monitored building projects.

Passive House buildings combine unparalleled comfort with very low energy consumption. Building to the PH Standard can lead to more than 90% reduction of space heating and cooling energy use as compared to the typical building stock. At the same time, Passive Houses are characterised by consistent temperatures on all interior surfaces and comfortable indoor climate without temperature swings or draughts. Their superior ventilation systems ensure ample fresh air at room temperature and provide high indoor air quality, leading to better health and productivity of the occupants.

The PH Standard and the Passive House concept (PH concept)

The PH concept takes into account the energy performance of the building as a whole, setting it at a very high level. This can be achieved through integrated planning and quality workmanship. The PH Standard, initially conceived for Germany and Austria, subsequently spread throughout Europe. Today, this standard has been achieved and proven in a large number of buildings worldwide. The vitality of both the concept and the standard on which it is based is confirmed by continuous monitoring at numerous sites.

Passive House buildings achieve the extremely low energy demand for which they are recognized around the globe through the application of specific design principles. However, the successful implementation of these principles requires an

PassReg team

Source: PHI



integrated approach to planning and building design. These proven principles, on which the frontrunner regions in the PassREg project have based their activities, are perceived as applicable in diverse political and financial conditions, providing the best technical approach for the implementation of Nearly Zero-Energy Buildings (nZEB) standards at European, national and regional levels.

The analyses of the experience gathered in the selected frontrunner regions define the PH concept and the related PH Standard as the most practical starting point for the development and implementation of complex and ambitious policies in the building sector. The examples from the frontrunners and many other cities in Europe and the whole world, demonstrate that the planning and building design principles associated with the PH concept are of universal nature and should be adopted as early as possible – in the best-case scenario, even before 2020. This undoubtedly gives the PH concept additional value and makes it the logical blueprint of nZEB as well as for the adequate professional and technical capacity building for their practical implementation.

02 What PassREg stands for?

(Tanya Hristova, Mayor of Gabrovo, Bulgaria)

“Policies happen when they are quickly, efficiently and effectively applied in our communities. Municipalities are the natural partners in this process. In the new programming period, which has already started and will be under the focus of the EU 2020 strategy, there are extremely important commitments related to both energy efficiency and responsible use of resources, as well as commitments to inclusive growth, sustainable development and employment. In the area of energy efficiency, we are particularly looking for optimal use of EU funding opportunities, as we continue with our efforts to position Gabrovo as a pilot municipality and a model for success”.

We do not have to look too far to be convinced that changes in our society occur at the local level - in the cities, local communities, small businesses... in the people around us. Our recent history abounds with examples where the most impressive success stories in the field of energy efficiency and Renewable Energy Sources (RES) happen in cities and municipalities. Interestingly enough, these cities are usually not the largest and most financially viable ones; some of the smaller communities often display the most interesting and impressive development curves. However, what is shared between all of them is the strong ambition and dedication to use the limited available resources and opportunities to improve the lifestyle and living conditions of their citizens in the most efficient way. These “bottom-up” changes provoke the national governments as well: it is frequently the most powerful incentive to update the legal and regulatory base in any given country. The role of local and regional authorities remains crucial for both the understanding and the actual conducting of energy efficiency policies and measures, often in a way that builds on and exceeds the requirements of the central government.

The PassREg community believes that local authorities can provide the most direct road to real, tangible savings in final energy consumption. The benefits are mutual and already well realized: expenses on fuel and electricity, which now flow abroad, will remain in the local economy and citizens will enjoy more comfort of living and better social services. The enormous social energy generated in our cities, transformed into sustainable local practices, might even become the driving

The “Bahnstadt” in Heidelberg (Germany) is the world’s largest Passive House district. At the International Passive House Conference 2014 it received the “Passive House Award” (in the category “regions”) for its exemplary nature. Source: PHI



force for new energy policy at the national level. However, if we want this positive change in urban environment and conditions for doing business and living to take place, a considerable amount of preparatory work would be required. First, of course, is the local political will and continuity, without which any large-scale initiative is doomed to failure. Along with this, the expert capacity building of the municipal administration should be target number one for any ambitious political leadership which in terms of energy management issues often takes unexpected dimensions. Energy touches every part of public life and the mere existence of an energy manager or an energy unit is highly insufficient: what we need is the active involvement of the leaders and experts from all spheres of our social environment.

Success at the local level: the bottom-up approach of the Covenant of Mayors

The Covenant of Mayors is the mainstream European movement, involving local and regional authorities voluntarily committing to increase energy efficiency and use of renewable energy sources on their territories. By their commitment, the Covenant signatories aim to meet and exceed the European Union 20% CO₂ reduction objective by 2020.

It is not surprising that many of the PassREg partners and associates have also adopted the Covenant, putting extra effort on the “Building sector” sections of their Sustainable Energy Action Plans (SEAPs). PassREg cities Antwerp, Burgas, Cesena, Frankfurt, Gabrovo, Hannover, Heidelberg (also Chair of the European network Energy Cities) and Zagreb have already ensured that sustainable buildings – in many cases complying with the PH standard – are secured in their long term strategic planning. In the SEAP of the Bulgarian city of Burgas, for example, the savings from energy efficiency measures in the residential sector alone amount to 266 860 MWh/a, and the GHG emissions savings are expected to be 739.3 ktonnes of CO₂ equivalent by 2020 – again, mostly coming from the residential sector responsible for 78% of the emissions and 73% of the total energy consumption.

Energy in local policy making



02

(From interview of J. Volks, Rēzekne, Latvia)

"I was in Brussels where we visited Passive Houses and could visually verify the technical solutions and materials in use. The main thing is that we were able to talk to occupants of the buildings, because that gave us the confidence why "the future house" is exactly the Passive House".

What is the political value of the sustainable management of energy? As already mentioned above, many mayors - more than 6 000 in the EU and abroad - were attracted by the positive public image created by the Covenant of Mayors. On some (thankfully limited) occasions, the painfully familiar truth that political declarations without real coverage of will and actions carry more negatives than benefits was demonstrated. But as a rule, this agreement gives the cities a powerful political tool for mobilization of all stakeholders and communities in the name of a common cause – the sustainable energy development. And it is up to us to make the best of this huge social energy that continues to be generated in Europe, and to transform the municipal energy plans from annoying obligation to a functioning mechanism that deals with the real problems of the places where we live and work. And even though someone could argue that for example the Sustainable Energy Action Plans (SEAPs), required by the Covenant of Mayors, might have their own imperfections, this could be easily overcome with the years of accumulated experience.

Many European cities and regions, including several PassREg partners, have already announced their plans to become "climate neutral" until 2050; in some small local communities, this is already a reality. In most of the cases, however, energy efficiency measures in the local building stock still have a major role to play if we are to achieve our ambitions. nZEBs, based on the PH Standard supplied by RES, give our cities a solid new base for the building of our common energy future and we strongly believe that they are the stepping stone for the gradual transition to the new sustainable energy map of Europe.



PH life in the city centre of Frankfurt

Source: PHI

Long-term local ambitions: the example of Frankfurt

The **City of Frankfurt** is committed to climate protection based on the PH Standard and renewable energies. It is one of the 19 German municipalities participating in the "Master Plan for 100% Climate Protection" programme, set by the Germany Federal Ministry for Environment, Nature Conservation, Building and Nuclear Safety. These municipalities are each developing a master plan to reduce greenhouse gas emissions by 95% by the year 2050 and to point the way towards a climate neutral society. Frankfurt's plan calls for the use of PH Standard in the building sector section and sees the city being fully supplied by renewable energies by 2050.

Such exemplary actions are, however, nothing new for the city of Frankfurt. This very successful development was initiated as early as 1991, and the current building policy today consists of two main pillars: the Climate Protection Concept and the Passive House Act. The Climate Protection Concept covers a wide range of measures for reducing CO₂ emissions, including among other things an integral concept for communication relating to climate protection, a quality standard for energy-efficient renovations in Frankfurt, quality assurance by means of energy passports, an ecological rent index, capacity building campaigns for multipliers, and financial support for PH - "Frankfurt's Passive House Loan".

The second fundamental pillar is the Passive House Act. The City Council of Frankfurt decided that all municipal buildings, whether new or refurbished, and whether owned or newly rented, as well as all buildings belonging to the city's own associations must be realized to the PH Standard. It also stipulates the use of renewable energies for new non-residential buildings. As of 2014, more than 100,000 m² of PH floor area have been built in a wide variety of buildings. The municipal housing association, AGB Holding Frankfurt, proudly calls itself "The Passive House builders" – a tag line that stands as a testimony of the city's dedication.

A sustainable policy and a wise investment



02

(From the interview of E. Kirscht, Hanover, Germany)

“We as City of Hanover focus on high efficient building like passive houses with renewable applications. In our sphere of influence we try to convince or negotiate with investors to build to higher standards than those requested by national regulations. We hope the gap between national regulations and our regional goals will disappear in the years to come.

One of our main arguments is life-cycle balancing. Here the PassReg activities helped to discuss it among the stakeholders e.g. during the summers study tours”.

Energy efficiency is at the centre of the regional development policies and territorial cohesion of the EU, and we have all the evidence that this will continue to be the case for many years to come. Funds for energy efficiency and sustainable urban development have been almost doubled in the 2014-2020 financial framework. But there are no gifts in real economy and the European taxpayers want to know on what the Union is spending their money.

Unfortunately, there are still some cases, when European funds continue to be spent unwisely and there is no long-term vision for the development of the national housing strategies. In some of the new member states, there are still national support programmes for renovation of private buildings with up to 100% grant financing, aimed at quite unambitious energy saving targets. But the times of such political approach seem to be in past: in the best practices studied within PassREg, the public investments in sustainable energy attract significant private funds, energy poverty is minimized to socially acceptable values and messages like “energy revolution” mean a better standard of living for all.

It is already well recognized that investments in energy efficiency and RES do not contradict to economic growth, but actually stimulate the economic development. The long-term effects of these investments spread over to even broader dimensions: they become crucial for the security of the energy supplies and thus receive even stronger political and social impetus. However, in many EU countries and regions this understanding is still to be transformed in real political actions.

The Nieuw Zuid development in Antwerp, Belgium: an example of urban district designed entirely according to the Passive House Standard within a successful mode of public-private partnership.

Source: Studio Associato Secchi - Viganò



Large-scale city development through market support policies

With its Climate Plan (2011), the city of Antwerp has committed itself to using energy and resources sparingly and sustainably, and moreover to achieve CO₂ neutrality in 2050, the city leads by example and designs all municipally owned buildings to the PH Standard including schools and kindergartens. Antwerp also steers the private market towards highly sustainable projects by formulating appropriate preconditions and procurement criteria in competitions and contracts.

Nieuw Zuid, a new mixed residential quarter in the south of the city, is a prime example of the type of development being promoted. The realization of this project is currently in progress and entails 2,000 dwellings, offices, amenities, and a large park. The former railway site is strategically located between the city itself, the suburbs, and the River Scheldt, as well as some important green buildings and main traffic infrastructure.

A large part of the area, around 16ha, is owned by a private developer. As agreed upon by the city and the developer, all buildings must be designed to PH level with a maximum heating demand of 15 kWh/m²/year. Nieuw Zuid is also the starting point for the development of a city-wide heating network, and a district heating plant at the edges of the park will ‘feed’ the network, providing heating and hot water.

The decision to develop a heating network for Nieuw Zuid is unique. Networks of a comparable size, serving a comparable mix of functions, cannot be found currently anywhere in Belgium. In this case, it was the explicit choice of the city and the developer to create a win-win situation: the city can realize its climate goals and gradually develop a collective heating network while the developer can market a product with added commercial and financial value in the short and long term.

Energy transformation... but where, to what, how?



02

(From the interview of E. Kirscht, Hanover, Germany)

“Because of actual projects (e.g. Klagesmarkt project) in Hanover and because of a political discussion [that is still taking place in Hanover on] passive house apartment buildings, we took a special look at the Project Bahnstadt in Heidelberg and other projects in Frankfurt. These projects are communicated by PassREg. But also the “Brussels model” gives us suggestions”.

What does actually an “energy transition” mean and imply to? It definitely requires qualitatively new thinking and radical change in the philosophy of regulations for energy efficiency in buildings. In practice, energy efficiency can no longer be an appendage to building projects; it must be the driving force in every stage of the design process. Rules and regulations must be developed to allow integrated design and the whole building approach to rule the work of all experts involved in any building project. The “passive” measures for use of solar heat and light, on which we will increasingly focus our attention, should be complemented by intelligent systems for heating, cooling and ventilation, with the possibility for integration of renewable energy in buildings. It is necessary to introduce requirements for airtightness and levels of dust and harmful gases in the buildings; the quality of construction activities must be monitored more closely and intensively. For this purpose, we need to enhance the qualifications of a huge number of construction workers and craftsmen with qualitatively new knowledge and skills. And all of this should be just the beginning ... The terms, however, are clear - after 2020 all new buildings must comply with these and even more ambitious quality conditions, directly related to their specific energy consumption. Public buildings should reach this goal even before that, in 2019. It is both a challenge and an opportunity for all engaged in the construction sector, but for one thing that is sure - we better start to work today because all this is for our own benefit.

But if we really want this transformation to take place in a steady manner, first of all, we should change our public – and personal – priorities. We have to put energy and climate issues at the fore of our public and political agendas and to convey the right messages to the local communi-

Bryun Ouest, Social housing in Brussels

Pierre Blondel Architects

Source: EnEffect



The commitment of Brussels-Capital Region

When in September 2009 the new Government of Brussels-Capital Region, motivated at that time by the charismatic Minister of the Environment Evelyne Huytebroeck, published a declaration of its policy towards mandatory implementation of the PH Standard, at the beginning for its own buildings, the major stakeholders’ groups were, least to say, surprised – some to the extent of not believing. However, in May 2011 the Government adopted the new energy target regulation for all new construction (housing, offices and schools), taking effect from 2015 on.

Now, since 1st of January 2015, all new buildings and “deep renovations” in Brussels already comply with the PH standard. But the enormous growth of PH construction was not just a straightforward consequence of the governmental decision: a number of incentive schemes and capacity building programs were initiated to promote the “energy transition”. The new law itself provisioned for a 3 years period of “soft landing”, allowing the gradual accumulation of best practices and experience. This enabled all sector representatives (construction, real estate, architects’ and engineers’ federations, national scientific and technical institutes, NGOs - PMP and PHP involved, and the Minister) to become convinced in the long-term judiciousness of this policy and sign a common agreement for the implementation of the new regulations. As a result, there are already more than 1,000,000 m² of passive buildings built (data as of 2014), and the number is growing with every single day.

ties and the end energy users in our cities. It is us, the European citizens, who will invest their money in energy efficiency and RES in buildings, so we will be the ones who will actually “finance” the energy transformation. We all need to make sure our money is invested in the right way.

How much will it cost?



02

(From the interview of E. Kirscht, Hanover, Germany)

“Passive houses and renewables have to convince by operation: their profitability, energy results and comfort still have to be proven and published. proKlima may help to follow up the projects with monitoring”.

It will most probably not be cheap. There is however a strong business and societal case to be made to pursue an energy transition and the benefits are unquestionable. But if we choose to live in passive houses supported by RES, it is not only possible that we will not need new plants, but most probably, we will have a surplus of energy from our own resources. However the financing of energy efficiency projects must be converted from European to national and local policies, with the additional condition that all funded projects utilize the maximum energy savings potential of the buildings.

Investments in energy efficiency are extremely well positioned to be profitable in the long term, especially with regard to the entire lifecycle of the projects. Most often, the projects do not even require additional funding to prove their viability to banking institutions. Usually we do not need a high level of subsidies to stimulate the market. In many cases, subsidies covering only part of the interest on the bank loan attract huge private investments. On the other hand, in some occasions traditionally very high levels of subsidization stop the execution of projects with very good economic parameters due to the expectation of new “free” public money. This phenomenon effectively hinders the sustainable development of the market. In those cases, the understanding that the purpose of the subsidy is to actually encourage the markets is sometimes left far behind. What happens in reality is that subsidies like these are mostly used for low-quality repairs without any apprehension for the possible benefits of the “deep” energy renovation. What is worse, these works cause the so called “sealing effect”. After such repairs are executed, the buildings will not achieve their potential for energy savings in the next decades or even in their whole lifetime due to the financial and technical constraints related to further renovation.

One of the most famous social housing residential complexes reaching the Passive House Standard: Lodena-real, Innsbruck, Tyrol, a project of the limited-profit housing association Neue Heimat Tirol.

Source: PHI



Residential subsidies in Tyrol

Various subsidies exist at provincial level in Austria, mostly linked to housing support, especially concerning thermal insulation, use of biomass for heating and solar energy for space heating and domestic hot water production, but also for energy consulting and issuing of Energy Performance Certificates. Provinces provided € 1 950 M in 2010 for subsidizing of new construction. Roughly 1/3 went to companies, constructing affordable houses, 1/6 to commercial housing developers and the remaining more than 1/2 to individual households and municipalities. In 2010 as many as 28,000 houses were subsidized. This is roughly 60% of all new construction. Subsidies is usually linked with limitations of purchase prices and rents. Subsidies for renovation of buildings are put into effect either as investment grants (usually between 10% and 25%) or soft loans (with 1% to 4% interest for a period of 10 to 20 years). Almost half of the housing subsidies by the provinces are granted for new construction in the multi-apartment sector, another 11% are spent for the sector of detached houses. The expenditures for housing renovation are quickly increasing (28 %).

New guidelines for housing subsidies in Tyrol came into force on October 1, 2013. Attractive subsidies are provided for renovation of residential buildings. With extensive renovations up to 2/3 of the heating costs can be saved. In addition, developers are rewarded for quality renovations with an eco-bonus of up to EUR 8,000 per family house. To obtain the subsidies for new housing the applicants must have a family income between EUR 1,310 and EUR 2,660 per month, depending on the number of family members and the exact amount of the monthly income. There are also restrictions on the sale cost of the housing and the amount of the rent. Compliance with certain minimum requirements for space heating is a precondition for receiving subsidies: from January 1, 2012 the maximum annual heating demand should not exceed 20 to 36 kWh/m²a (approximately 33% lower than the rate of the Austrian OIB regulation). The loan may not exceed EUR 980/m². The second level is a grant subsidy to be obtained in order to cover the higher criteria for energy consumption of building. The subsidy amount is calculated as the total number of points is multiplied by the eligible area and multiplied by the point value of EUR 8.

Revolution or evolution: support for local markets and SMEs



02

(From the interview of Custers and van Regenmortel, Antwerp, Belgium)

“The building sector will always say it’s not achievable as will the social housing authorities say it’s not fundable. They will always say that their people can’t live in such types of buildings. So if you don’t force them, they will keep saying this. I organized a trip to Brussels to social housing (...) We went to visit 3 other projects in Brussels and then the argument was no longer the question of fundability, they just said our vocational workforce can’t build that. But at the end they gave in reluctantly. (...) They’re big machines, they don’t change that easily”.

Partners in PassREg believe that European public funds (which are actually our own) must be invested rationally in order to stimulate the national economies, to develop the local markets and to support small and medium businesses. Energy efficiency is one of the best areas for investment, as funds targeted to solutions for sustainable energy remain in the local communities (and do not flow abroad, as in the case of purchasing energy resources), create new jobs in cities and regions and attract innovative enterprises and research centres – which eventually improves the citizens’ quality of life. Energy efficiency and green development are not contradictory to economic growth – just on the contrary, they are the agents of change which could reverse the downward trend of the past several years.

However, this must be done with the goal to tap in the whole available potential for energy efficiency in every project - just as required by the EC. This will lead us out of the vicious circle in which the mantra “insufficient funds” is used to justify short-sighted decisions and to provide an escape from the responsibility. The experience of some of the leading European cities and regions proves that money for energy efficiency can be found, and if something is missing, it is the desire and capacity to accelerate change. And this is where the role of the civil society is to be found – we all should use its energy to transform the “energy revolution” into economic development and improved living standard for all. In this process, local actors and SMEs will continue to be the driving force of innovation and economic growth, as has been the case in the whole history of the EU. In many PassREg regions, this has been the case so far: now, the challenge ahead is to replicate this development path on a broader scale.

A new Passive House settlement in the PassREg frontrunner Hannover: the zero:e park, the European largest zero-emissions development (<http://www.zero-e-park.de/en/home/>).

Source: Matthias Wohlfahrt, proKlima / www.passreg.eu



Involving the business community: the key to sustainability

In 2007 **Hannover Municipality** decided to reduce its CO₂ emissions by 40%. This was accompanied by the „Passive House Resolution“ of the City Council and its decision for utilization of “ecological standards for building construction in the municipality’s sphere of influence”. In connection with this the same year the Climate Alliance Hannover 2020 was founded. Its objective is to unite the efforts of some 80 public institutions and private companies for implementation of this strategic task. The partners are representatives of the industry and services sectors in Hanover, of the municipal administration, the energy and other utilities, etc. The Hannover City Council and Stadtwerke Hannover AG city energy utility again joined forces and became the major drivers of the new association, which on September 12, 2008 launched the ambitious Climate Protection Action Programme for the period 2008-2020. According to the programme by 2020 the CO₂ emissions in the City of Hanover will be reduced by 40% as compared to their 1990 level. This means that the City of Hanover will emit 1.8 million tons greenhouse gases per year less than the emitted in 1990. The implementation of the programme is performed in the framework of three main networks, which are the pillars of the Climate Alliance Hannover 2020 – the Energy Efficiency Network, the Partnership for Climate Protection and the Opinion Leaders’ Network.

Additionally, in order to support its efforts to mitigate CO₂ emissions and achieve more efficient energy use, Hannover Municipality established close operating collaboration with the business community and in particular with the SMEs in the region. Already in 2006 the campaign “e.coBizz” was established by the Climate Protection Agency Hannover and proKlima to support the SMEs with an energy consulting programme. The City also established a local public-private partnership for sustainable development Ecoprofit. It is based on a tripartite co-operation between the municipality, the local companies and experts and is oriented towards raising the knowledge and preparedness of the enterprises for curtailing their energy consumption and reduction of the volume of solid waste as a result of the production processes.

What do we actually miss?



02

(From interview of G. Bernabini, Cesena, Italy)

“The project has allowed us to study “passive house issues” and to apply these in a new public building’s design. Taking the lessons learned during the PassREG programme to heart, we’ve decided to apply some of the standards for passive buildings to a new nursery school”.

Who would not want to live in a house where in the winter temperatures do not fall below 20°C; in which there isn’t even a theoretical possibility of moisture and mould and the air conditioner is replaced by a silent compact ventilation system which constantly maintains low levels of dust and CO₂? Who would not want to send their children to a kindergarten or school in without drafts, tossed doors or windows, and the air even in the gym is much cleaner than the outside air? Who would not want to work in an office with optimal temperatures and lighting of the work place, without even having to press a button? Is it so expensive? Is it true that we cannot afford to invest in buildings, where we spend the most of our lives?

At European level, buildings are already well positioned in the focus of the climate and energy policies; significant amounts of public funds are allocated for energy efficiency and RES support schemes. In many of the PassREG partner regions, the potential of these policies is recognized and even more ambitious measures and regulations and implemented in order to stimulate sustainable development in the building sector. And results are already showing: in PassREG frontrunners – and beyond – there is already a tangible market demand for passive house buildings supported by RES, preferably within climate-neutral urban districts.

The reason for this is simple: energy efficiency in buildings is actually a worthy investment. This statement is valid not only because the incremental cost is paid back through the energy savings within a reasonable period of time, but also because of the benefits we gain in terms of health, productivity and quality of life. In cases where long-term investment is needed, the state and local authorities are the ones that have to show us why it makes sense; they are the ones to grant us



Bonapace Hotel,
Lake Garda, Italy

Source: PHI

Hotel I Arch. Nicola Alberti-Armalab I www.passivehouse-database.org ID 2521 I Nago Torbole, Lake Garda I Italy

“Our greatest satisfaction in having built a Passive House hotel comes from our customers’ smiles – happy to have had the chance to stay in a building that cares for those who inhabit it. Now that is pure energy!”

Klaus Arrigo Jacobitti and Elisabetta Marinelli, investors and owners of the Bonapace Hotel, Lake Garda, Italy

the experience of energy-efficient homes and offices through their own buildings, supported by judicious use of available public funds in “deep” renovation projects and new buildings. What we really still miss at many places are convincing, vibrant examples of nZEBs that use with RES, initiated and supported firstly by the public authorities. Then, all barriers that we often use as an excuse for the late market uptake – the reluctance of citizens and lack of funds, the deficiency of suitable products and qualified builders– will disappear faster than we could imagine.

The Road to NZEB based on PH standard + RES

On the one hand, the selection of participating frontrunner countries, regions and cities is based on the remarkable results achieved in the field of passive buildings. On the other hand, it reveals approaches and solutions formed at various initial conditions and under different 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 20th century.

Belgium / Brussels-Capital Region: Belgium progressively harmonizes its legislation in the field of buildings to the EU directives, but until recently, in terms of the 'passive house' standard the achievements were much more limited than those in Germany and Austria. In the beginning of the millennium, Brussels-Capital Region was one of the comparatively backward regions as related to insulation of buildings, and by 2007 there was still not a single passive building. But amid less active national policy, in 2009 the regional authorities in Brussels formally committed 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, now, six years ahead of the requirements of the EPBD, all new buildings and major renovations comply with the standard.

Austria / Tyrol. Austria is the country with the highest density of passive buildings worldwide - the number of these buildings per capita is five times higher than that in Germany or Switzerland. These achievements are the result of years of deliberate national, regional and local policies on energy efficiency in buildings. Against this background, Tyrol has long been lagging behind in the implementation of the 'passive house' concept, but at the beginning of the new millennium began rapidly gaining momentum to go to remarkable results today. While in 2002 only 2% of all newly constructed buildings in Tyrol offered the comforts of a Passive House, by 2010 this number rose to 10%, and, as some reports suggest, was expected to reach 50% in 2011 - at the time when PassREg' concept was born.

A seven-story wood frame building at the heart of Bordeaux

Source: bordeauxNLA_Eur-Atlantique



(From the interview of Custers and van Regenmortel, q. 3)

What we are doing with Cadix and New South will give us experience in energy neutral construction in the next 5 years. That will make the follow up easier. From then on we can guide all the other urban development projects, preparing us for the future perspective 2020".

A seven-story wood frame building at the heart of Bordeaux

Within Bordeaux Euratlantique National Interest urban renewal operation, the real estate company PICHET Group will build a 4,500 m² Nearly Zero Energy Building (nZEB) or even positive energy balance office building on a timber structure. The high performance envelope is designed to be very close to PH standards, by integration of RES and use of bio sourced insulating materials from local origin. This action is part of a comprehensive approach in Aquitaine that aims to develop and strengthen a broad engineering expertise in the field of high energy efficiency and timber frame construction, using local resources from industrial timber production such as maritime pine, and bio-based insulation materials. The approach also aims to build capacity for the implementation and organization of multi-storey buildings with timber structure, thus paving the way for a strong positioning of actors on the regional housing and tertiary market. These are forecasted to feature in the coming years an annual rate of 25,000 dwellings and 159,000 m² of office floor. This project is part of major operations and in particular of the National Interest urban renewal operation Bordeaux Euratlantique (2,500,000 m² building), or the Bordeaux Metropolitan area (CUB) housing activity featuring more than 9,500 units/year. The systems and construction processes that will be implemented will help to ensure reproducibility as well as adaptability to use timber structures in different types of buildings and in particular in collective housing. This program must confirm the adaptability of local species, namely maritime pine, to modern construction principles and high energy efficiency standards, with the goal to offer the timber locally and nationally. Project team: PICHET Group Technical Assistance: FCBA (timber) + NOBATEK (Energy efficiency & sustainable construction) + BEHI (environmental certification); Engineering: Nicolas Laisné Associés, Ecotect, Pouget Consultants, Terrell, EM'acoustique.

Aspiring for success



03

(From the interview of D. Jaques, Cardiff, Wales, UK)

“Taking part in one of the study tours to a frontrunner region was useful in order to see the many different building types and particularly to see inside Passivhaus homes and talk to residents confirming that they were happy to live in the homes. It is reassuring to learn that Authorities in other countries have taken the PassREg approach and that it has worked and they have now become very advanced in low energy building”.

For all experts involved in PassREg, it is already clear that the empowering of local and regional authorities and the active involvement of local policy makers is crucial for the actual introduction of the nZEB concept (based on PH standard supplied by RES) in the regular design and construction practices across Europe. During the whole project, the involvement of decision makers at high political level was specifically targeted in the PassREg Aspiring Regions of the City of Antwerp (Belgium), Aquitaine (France), Arnhem-Nijmegen (Netherlands), Burgas and Gabrovo (Bulgaria), Cesena (Italy), Latgale and Vidzeme (Latvia), Wales (UK) and Zagreb (Croatia). As confirmed by the analyses of the current stage of development received from all regions (the so called “Success Models”), this approach already leads to tangible results, which is clearly visible in the current edition and in all publications produced with the support of PassREg¹. But while the existing political will continues to be a leading factor for the sustainable energy development, the availability of financial incentives to build to PH standard (especially in regions subject to EU Cohesion Policy support) is still a major factor for the increasing number of excellent building projects throughout Europe. In fact, one of the most important achievements of PassREg is the support to the so called “beacon” projects in the aspiring regions - new Passive House buildings and retrofits, which demonstrate the actual impact of the “Success Models”. It is already well recognized that the first-hand experience in terms of both high living comfort and optimal costs is essential for the sustainable market uptake of the nZEB concept; without providing such close experience within a touching distance, policy-making efforts could easily lose their effectiveness to undesirable levels.

¹ See more at www.passreg.eu.

The First Certified PH in Bulgaria: Kindergarten “Sun”, Gabrovo

Source: SolAir Architects



The breakthrough: the first certified PH in Bulgaria as a result of long-term sustainable policies

“Sun” kindergarten, a PassREg beacon located in the city of Gabrovo, is the first certified PH in Bulgaria and the first and only public building designed and constructed to the PH Standard as of 2014. The key for the success of the project was the political will and determination of the Mayor of the city Mrs. Tanya Hristova, who had to overcome a number of administrative, financial and technical barriers in order to achieve the goal set at the beginning. However, following a long tradition of successful energy efficiency projects in the past two decades, the city is now proudly claiming the leadership in low-energy building practices in the country.

As the very first of its kind – and not only in the region of Gabrovo – the “Sun” kindergarten is drawing the attention of many professionals in the building sector in Bulgaria. The construction works were performed in close collaboration with the designers to avoid major mistakes in the execution. The process related to construction, engineering, architecture and city planning was followed cautiously by the municipal experts. Trainers from the Technical University – Gabrovo and the local Vocational High School of Architecture and Construction took part in the train of trainers course conducted by the Passive House Institute (PHI) in the framework of PassREg project. A number of regional building forums, trainings and study visits were conducted along with other capacity building events related to energy efficiency in buildings. “Sun” kindergarten is also presented at major national conferences and events with the participation of the main partners in the project – the Center for Energy Efficiency EnEffect and the Municipal Energy Efficiency Network EcoEnergy.

Political will and consensus



03

(From the interview of E. Kirscht, Hanover, Germany)

“The regional Passive House process started in Hanover in 1998. We are still on the way. One of the main factors is the political will and the policy process. This should not be underestimated”.

(From the interview of G. Battistini, Cesena, Italy)

“Regarding the construction of the new school, for which the design was made according to the standards of a passive house, it was possible to implement only by the will of the municipal administration and of the technicians to anticipate regulatory requirements that will come into effect by the end of December 2018”.

As the project moves on, it becomes clearer that the choice of regional and local focus is highly successful. Although each of the participating countries shall endeavour to transpose the EPBD into the national laws, it is unlikely that the “passive house” standard will be immediately adopted as the basis of national definitions of the nZEB standard in most of them. However, most of the countries declare their will to adhere to the deadlines and targets set by the Directive, but some still remain in captivity of general and vague formulations with too many uncertainties in the definitions.

Although not in all regions and countries – Germany, Austria, and Belgium are a clear exception - the prevailing impression in most cases is that the “passive house” concept is insufficiently known at the national level, there are many misconceptions about its applicability in different climatic regions, and it is perceived as expensive and difficult, particularly in times of economic crisis. Surprisingly, although the countries declare striving for nZEBs, this aspiration is not yet connected with the PH concept.

Against this background of restrained conservative attitude of national policies towards the PH concept, regional and local authorities in the participating regions show a much greater willingness and ambition to adopt the concept and the standard. In many PassREg cities and regions, the PH Standard has become mandatory for the new buildings and complete renovations, especially in regard to the public building stock; in others, special local incentives are provided to those willing to achieve more ambitious energy performance levels. From Hannover and Antwerp, where new PH districts are being developed, to Latgale and Gabrovo, where the passive house principles just

Case Finali Social Housing,
Cesena Cesena: a beacon
on PassREg

Source:
studio Archefice associati



Putting it all together: long-term energy planning in Cesena, Italy

The Municipality of Cesena is currently working on the new “Structural Plan” in accordance with the environmental targets of the council’s political programme for 2014-2019 so as to guarantee sustainable urban development and improve the citizens’ quality of life. The new municipal Structural Plan envisages zero use of new territories and instead of this focus on nearly zero energy buildings, social housing, sustainable mobility, and architectural quality.

Additionally, the Sustainable Energy Action Plan drafted in 2011 following the endorsement of the Covenant of Mayors, considered the energy retrofitting of existing buildings and construction of new according to A class as priority actions. The challenge is therefore the reaching of nZEBs supplied with renewables based on the PH Standard, both in the residential and commercial/services sectors in line with the targets set by the EU for 2020. This will surely require the involvement of all relevant stakeholders. In addition to the implementation of the Case Finali project, Cesena has initiated a number of informational events and trainings.

enter the building practice through measures in public schools and kindergartens, local political action is crucial for the success and public recognition of the projects. In all cases studied, political will and determination are unanimously defined as key driving factors for success, starting from the first passive house building and reaching as far as new passive house cities and climate neutral communities.

Local authorities take action: the new Passive House Regions



03

(From interview of G. Battistini, Cesena, Italy)

“Italy developed an Action Plan for the implementation of the standards NZEB, given that the Italian government did not yet make available a set of technical standards necessary for a building to be considered NZEB so far”.

Numerous regions and municipalities have already adopted Passive House as a binding requirement for all new public building projects, embracing the concept that, using this approach, a significant contribution to climate protection can be made, with very little extra effort required. Frankfurt (Germany) was one of the first such municipalities that passed legislation as far back as 2007 ensuring that all new builds built by the city or for the city are constructed to the PH Standard. Communities, cities and regions which, like Frankfurt, have decided to promote Passive House by setting an example with their own public buildings, are rewarded continuously by extremely low running costs. This benefit enables them to divert funds to other important endeavours.

Other regions have not only followed this approach, they have gone even further by mandating Passive House not only for public buildings, but for all buildings in general. In Belgium, for example, the Brussels-Capital Region has made the standard mandatory for all new builds as well as for all major retrofits, whether public or private, residential or non-residential, as of January 2015.

While not necessarily having written Passive House into law, a variety of communities have recognised the advantages of the standard and officially support Passive House construction, either financially, by recognising the standard in their building codes, or by provision of information and consulting. The very high density of Passive House buildings visible in Hanover (Germany), in the region of Tyrol (Austria), and in the city of Antwerp (Belgium) for example, is due to a great extent to the financial incentives and informational materials on offer in these locales.

Low energy refurbishment of two buildings: school and dormitories, Latvia

Source:
AnsisStarks



Energy Strategy Tyrol 2020

The dependence of Tyrol on imported energy sources should in the long- be kept to a minimum and the necessary energy supply infrastructure should be ensured. To this end, it is necessary to increase the energy efficiency through innovative energy generation technologies and changes in energy end-users' behaviour, but also by construction of local energy generation facilities. The Energy Strategy Tyrol 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 Energy Performance of Buildings Directive (EPDB) concerning energy efficiency improvement and increase of the share of energy from RES by more than 50%. With regard to measures in the building sector, Energy Strategy Tyrol 2020 is mainly focused on space heating and air-conditioning of buildings (residential and intended for services), electricity and RES. According to the strategy, the maximum heating demand of the buildings should be 25 kWh/m²year, as incentives are provisioned for achievement of higher standards (including the PH standard) and introduction of RES. The principle that is really interesting and shows a great replication potential is that the level of incentives increases with the achievement of better energy standards (for both newbuilds and renovations), thus promoting further development and quality of the building projects.

It is clear that the number of local authorities taking notice of the PH Standard and the benefits it brings is on the rise. The above are but a few examples of various model cities and regions worldwide.

Long-term strategic thinking



03

(From the interview of E. Kirscht, Hanover, Germany)

“Hanover has a lot of work ahead to retrofit our city quarters to higher energy standards and to implement decentralised renewables (e.g. solar panels on roofs). Therefore we run several info campaigns and [urban] quarter projects. Meanwhile, proKlima reports of a study focusing on the possibilities of zero emission”.

The most successful regional and local climate and energy policies are usually based on a sustainable political consensus, leading to a long succession of specific policies for energy efficiency. Thus, the introduction of the PH standard is a logical result of the penetration of these policies in most of the strategic documents for the development of the communities. In other regions, the desire to reduce energy costs and to tackle energy poverty, fuelled by the inspiration of the frontrunners, generates the recent strong interest towards the passive house. At the same time, the achievement of cost optimality remains an essential reference for all aspiring regions. An interesting approach is described in Antwerp, where cost effectiveness is planned to be secured by improvement of the energy efficiency of buildings, thus decreasing the necessary investments in energy production by RES. The examples of buildings with minimal appreciation of the initial investment and even of lower cost than the average for this type of construction (90% in the frontrunner Brussels) are also very encouraging.

In contrast to the conservative national policies, some regions set very high goals, such as switching to “energy plus” building by 2020 (Aquitaine). Since 2013, the regional nZEB standard became mandatory in Antwerp for all new public buildings and for those public buildings that will be subject to complete renovation. The interest in PH concept penetrates into the policies for sustainable urban development that aim to achieve CO₂ neutral city by 2050 (Antwerp) or sustainable districts with low-energy buildings (Zagreb). Most of the local authorities pay special attention to the good examples and encourage their multiplication. Increasingly high interest receives the application of the PH concept in the renovation of existing buildings (Wales). Ad-

New development
in Tyrol , Austria

Source : EnEffect



Tyrol 2050 – working together to achieve the big goal: energy autonomy

It is an exciting time in front of Tyrol. The state government has manifested its commitment to energy independence and is vehemently striving for a move away from fossil fuels such as petroleum. The challenge now is to inspire people in the country for this idea and to pick up their visions and contributions. Energy Autonomy for Tyrol in 2050 is a process that integrates the general public and all interested stakeholders and decision makers. By bringing them together, it intends to find ways to explore the enormous undiscovered potential of Tyrol, making domestic energy resources readily available. Water, wood, solar and geothermal - all this is available in abundance in Tyrol. With the increased expansion of the available, environmentally friendly, safer energy sources and reducing the energy consumption by 50 percent, Tyrol can produce the required energy itself just in a few decades. This promotes the local economy, creates jobs, saves money and protects the climate and environment.

So, the vision is: by 2050, the energy consumption in Tyrol is already halved and the proportion of renewable energy is increased by 30%. The transition to a society friendly to our grandchildren could only be achieved through a diversity of positive actions and many individual steps, which will certify that the people are responsible for their own living space and are able to provide a livable and secure future for the next generations. From the population through the companies, the tourism industry and the R&D sector, to the country and the communities, the challenge is to get all in one boat together and carry out effective future projects. The platform www.tirol2050.at enables the active participation and involvement of all interested parties in the region.

ditional positive momentum is gained by the accession of some cities to the Covenant of Mayors and the subsequently developed Sustainable Energy Action Plans (Antwerp, Zagreb, Cesena, Gabrovo, Burgas).

Top-down / bottom-up approach



03

(From interview of S. Ivanov, Sofia, Bulgaria)

“An important result of the PassREg programme for Bulgaria was the understanding that local governance has a major role to play in the integration of energy efficient concept in the building market”.

There is a long-standing discussion on the best approach for the implementation of “green” policies throughout Europe. Often we see the Covenant of Mayors cited as the most successful bottom-up initiative in this area, and rightfully so. However, one may argue that a national framework and commitment to long-term strategic goals is also a major driving factor, especially looking at the countries which are at the frontline of European green development. Different political traditions also play role in these discussions, as traditionally centralized societies often find it difficult to allocate more power and resources to the local authorities, allowing them to implement sustainable policies at the local level.

Looking at PassREg examples, the ‘success model’ of Hanover is largely built top-down, with national strategies consistently integrated into local policies and approaches. It is widely accepted that one of the keys to success in climate protection, energy efficiency and sustainable development is rooted in the long-standing consensus of political forces in the region in terms of long-term policy objectives. On the other hand, the peculiar example of Brussels is illustrating to some extent a bottom-up approach in which the key factor for the success of the region is the continuous commitment of the regional authorities against the relatively conservative stance of the national authorities. But the straight-forward legislative approach of the regional policy-makers and the personal engagement and charismatic leadership also play significant role in this development model. Tyrol’s example, on its turn, confirms that even in the presence of stable long-term national policies, regulations and practices in the field of low-energy buildings, the active involvement of both regional and local authorities has crucial importance and demonstrate

Meeting of
EcoEnergy
Municipal energy
efficiency network,
Bulgaria

Source : EnEffect



Local authorities influence national policy making

The **Municipal Energy Efficiency Network EcoEnergy – Bulgaria** (www.ecoenergy-bg.net) - also a PassREg supporter - is a voluntary non-profit association of Bulgarian municipalities for mutual support and activities related to the local policies for effective use of traditional and alternative energy resources and for ensuring energy safety and opportunities for sustainable development of the municipalities. Established in 1997, it is a contemporary and active participant in basically all developments in the area of energy efficiency in the post-communist era. Based on the excessive expertise in municipal energy planning of its technical secretariat, many of its members developed local energy efficiency action plans long before they were introduced as mandatory by the national legislation, and this legislative change was actually provoked by the bottom-up approach demonstrated by the network.

At the moment, EcoEnergy is the supporting structure of the Covenant of Mayors for Bulgaria and the major player in many projects under IEE and Horizon 2020 programmes. It finds its new mission in the ongoing discussions on the design of the incentive schemes for renovation of the existing building stock in the country, promoting ambitious energy efficiency targets, continuous capacity building and sustainable market development as the foundations of the national and local energy and climate policies.

the vast and still largely untapped potential of multilevel governance.

The best possible scenario, of course, is the integration of policy tools at all levels, exploiting the synergies of collaboration and networking among all stakeholders. The commitment of the local authorities is however proving to be the ultimate condition for success - and this is so not only because buildings happen at the local level, but also because trust and social capital are strongest in the local communities. And this is what really brings change forward.

The EU dimension: environmental, social and economic implications



03

(From the interview of Custers and van Regenmortel, Antwerp, Belgium)

“Watch out, Passive may be blown away by NZEB. In our city, the municipality still offers a subsidy for projects that reach the less stringent energy Belgian norm of E30 while we are promoting build passive and almost energy neutral. I think it will be very important that the European Commission set the tone. Otherwise NZEB is becoming standard and passive is for the frontrunners. The perception is starting to be that when you build low energy, it isn't that much worse than passive. They think they're there”.

A comprehensive set of strategic and legislative documents approved by the EC and adopted by the EU Parliament in the past decade or so set the scene for dramatic surge of the “green economy”, related not only to energy and climate issues, but also to industry, employment and other broader societal challenges. In particular to the building sector, the Energy Performance of Buildings Directive (EPBD) recast from 2010, the RES Directive (2009) and the Energy Efficiency Directive (2012) proved to be the major driver of changes in spite of the unfavourable economic climate. What is really important in these legislative norms (which are still to be fully transposed to EU member states legislations) is the combination of technical with social, economic and environmental requirements, which are intended and expected to respond to the national specifics and to provide for sustainable growth.

With respect to the nZEB definition which has to be developed by each member state according to the EPBD and which will come into force since 2020 throughout Europe, the PH Standard stands in an extremely favourable position. Achievement of the PH Standard is determined by a set of objective performance-based criteria and the achievement of these criteria is made possible via the six basic design and construction principle. While the performance limits are the same worldwide and the underlying principles remain unchanged, the provision of “nearly zero” energy demand, the actual design and execution of a Passive House is tailored to its surroundings and will thus vary with the building location, local climate and usage patterns. The PH Standard's uniform definition and clear criteria make it especially suitable for the harmonised European market, enabling international players to speak the same language and strive for the same defined goals.

As related to the economic and environmental criteria, the situation is even more beneficial for the wide-spread use of the concept. The use of RES in combination with PH Standard further reduces the already low CO₂ emissions of Passive Houses. Moreover, when the use of renewable energy meets a significant portion of already reduced energy needs, Passive Houses also cover the requirements for optimal profitability over the life cycle of the building. The limited cost of small-scale RES installations and the big energy savings both contribute significantly to the constantly decreasing payback periods for the slightly increased incremental cost. With thousands of closely monitored examples, it has become increasingly evident that the Passive House is in full compliance with the EU Directive on Energy Performance of Buildings (EPBD recast of 2010). The excellent building physics, quality and comfort of Passive Houses buildings are added bonuses.

As evidenced by the experience of the frontrunner regions, the application of the entire

Major Highlights of EPBD:

- As of December 31, 2020, all new buildings in the EU will have to consume as little energy as possible, according to new national standards for “Nearly zero-energy buildings” (nZEB).
- The energy needed will be “to a very large extent” supplied from renewable sources, produced on-site or nearby.
- Public authorities should set an example by building, buying or renting all their new premises according to the new nZEB standard as of December 31, 2018.
- A harmonized calculation methodology to push-up member states' minimum energy performance requirements towards a cost-optimal level is set out in the Directive in a definition and an annex.
- The cost-optimal levels should be defined taking into account the life-cycle of the buildings;
- A more rigorous procedure for issuing energy performance certificates will be required; the correctness of the performance certification will be strictly checked.
- Penalties for non-compliance will be introduced by each member state. The penalties must be effective, proportionate and dissuasive.

complex of principal requirements is an excellent basis for the immediate implementation of nZEBs. Therefore, the PassREg project suggests direct adoption of the PH Standard as a way to considerably speed up the implementation process of nZEBs. The PassREg project perceives the PH Standard as an ideal benchmark for any further work on the establishment and implementation of the national nZEB definitions according to the common EU framework set out by the EPBD. As mentioned before, the PH concept is very much in line with the EPBD's call for optimal profitability. The concept also lends itself extremely well to the use of RES and further decrease of CO₂ emissions.

Passive House and RES: the perfect match



03

(From the interview of
L. Custers and D. van Regenmortel, Antwerp, Belgium)

“With respect to RES, energy potential maps were created. These provide an overview of renewable energy potential on and near the site. PV panels, bio thermal, geothermal and residual heat are included. It brings together supply and demand so that we can, on the level of city development, say this is what the neighborhood can produce and this is its likely consumption.”

It was already mentioned that passive houses with integrated installations for renewable energy are “the perfect match”, a combination which will provide sustainability and economic feasibility to our efforts for gradual transformation of the European energy markets. Going in this direction, energy efficient design is constantly evolving with new building concepts targeting “net-zero” or even “plus energy” buildings continually being presented. Such buildings, however, can only be self-sufficient if their energy demand is extremely low. The current practice of balancing surplus electricity production from renewables in the summer with increased demand in the winter is quite misleading, as no grid can adequately store this surplus for the winter months without huge losses. Intelligent building concepts are thus increasing leaning towards compact design and superior efficiency, as this allows renewable energy systems to be smaller and as a result, much more affordable. In addition, the storage capacities required to bridge the seasonal gap between high production of electricity produced by PV in summer and peak heating demand in winter can be much smaller if superior efficiency is the aim. By targeting efficiency first, winter demand can also potentially be covered by energy harvested on-site.

Passive House, with its focus on efficiency, stands as ideal basis for all similar energy concepts, both present and future, and certainly for the nZEB standards currently elaborated throughout Europe. It is the shortest way towards true zero or even plus energy, resulting in “future-proof” buildings, especially in the light of the even tighter energy legislation towards 2030 and beyond. On the other hand, neglecting efficiency and focusing solely on renewables (or, in other words, on energy production as opposed to energy savings) inevitably leads to higher energy costs along with

Fiorita Multiresi-
dence Project,
Cesena, Italy

Source:
Municipality of
Cesena



A PH with RES: the road ahead

The Fiorita Multiresidence project foresees the demolition of an old private building with a high level of energy consumption and the realization of a new PH building. The building will be optimized in terms of number of flats and energy efficiency. According to the PH database, it will be the first wooden multi-residence building certified to the PH standard, which makes it an outstanding and shining example not only in Italy, but in a broader territorial scale. On the political scene, it will contribute to the fulfillment of the Cesena SEAP that considers the energy retrofiting of existing buildings to be the main priority action for reaching the Europe 2020 Directive. The project is also a pilot example of the Urban Regeneration Protocol promoted by the Artisans National Confederation of SMEs (CNA) of Forlì-Cesena Province, already signed by cities, trade associations, architects, SMEs and public bodies to support a more sustainable use of landscape and territory.

The Fiorita Multiresidence project involves the realization of 8 apartments under the PH certification protocol that will be certified by the local company Zephir. The building will be realized with a dry system of wooden load bearing panels. The project foresees a wide application of RES to satisfy the energy demand. A PV plant will be installed on the roof supplying 10 kW of energy. A heat pump will provide the hot water. The thermal energy need is currently estimated to be around 11 kWh/m²/year. The project will be certified with PH standards by the local company Zephir.

larger investments and, very often, use of valuable additional space. Saved energy – without compromising quality of life – is still and will always be the cheapest and most sustainable energy “source” on our planet; but while it is so, much more efforts should be targeted to successfully integrate RES installations in our regular design and construction practices. And it is not hard to imagine that this integration could easily become the leitmotiv of the building design development in the decades to come.

A future-proof investment



03

(From the interview of P. Attanasi, Milan, Italy)

“We learned from other regions active in PassREg that it is possible to build in a new way, also for social housing. The PassREg programme allowed us to verify that the Passive House approach is possible with a low budget”.

While Passive Houses may come at a slight cost premium due to the higher quality planning and components required, there are more and more examples of Passive Houses built at or even below the costs of similar conventional buildings. The availability of affordable components certainly influences the investment costs, yet the determining factor for building as cost-effectively as possible often hinges on intelligent design and, more generally, the design team’s experience. Those who want to build a Passive House must carefully coordinate planning from the very start. While thicker insulation layers may cost a bit more due to the additional materials required, the related installation costs do not increase significantly. The costs of higher quality components can be at least partially offset by the reduced dimensions of Passive House heating and cooling systems.

When combining investment costs with running costs over a building’s lifecycle, the Passive House buildings usually come out on top, costing less than their conventional counterparts. With its focus on the building envelope, which has much longer life span than the building systems, it requires less maintenance and replacement efforts during the whole life cycle. Thus Passive House makes clear economic sense. Reduced energy use translates into lower bills and protection from future energy price shocks, making occupancy affordable. The business case for a Passive House becomes even clearer when the financial incentives are taken into account, and several countries and municipalities now offer support for buildings constructed to the PH Standard. Many more are just beginning to include this standard in their subsidy schemes, a trend that is sure to continue.

Burry Port school,
Wales, UK

Source:
© Architype



Safeguarding the future

Sustainability is a core principle of everything the Welsh Government and its Local Authorities implement, and the **Council of Carmarthenshire**, located in Southwest Wales is keen to strive for high environmental standards across all construction activities in the region. Since 2009, the majority of developments have been required to achieve BREEAM certification to demonstrate their environmental credentials. However, the Council now wishes to strive for very low energy in public buildings, supplemented by renewable technologies to set an example for the region and to ensure **their own ongoing running costs are manageable now and in the future.**

At present there are no national or regional financial incentives for private developers to aim for near zero energy standards in construction. However, by considering the lifecycle costs within the Council’s own buildings, they have been able to justify piloting the PH Standard on a new junior school project in the small coastal village of Burry Port. The scheme also aims to utilize PV to supplement the energy demand of the school. If successful, the Council intends to embrace these principles on all future Local Authority projects and help develop a local skill base and supply chain for nZEBs that will improve construction standards and quality in wider building projects in the region. They are thus looking to improve regional standards beyond national/Welsh regulatory standards, at least on the building projects they can influence (i.e. for which they provide funding or development land).

Even without such financial support, however, the reduced energy costs in Passive House buildings compensate for the additional investment costs over the lifetime of the building. When retrofitting as well, aiming for nearly Passive House efficiency pays off from the start. High quality, energy efficient renovation measures will yield benefits, both economic and otherwise, throughout the building’s lifespan.

New passive houses and PH renovations



03

(From the interview of G. Battistini, Cesena, Italy)

“Through comparison with other European regions we learned of the possibility to apply the passive house approach to existing buildings, such as school buildings; not only to new buildings”.

(From the interview of T. Kruste, Rēzekne, Latvia)

“[PassREg showed us] the courage, [new] knowledge and patience of municipalities to implement EnerPhit projects”.

In all developed countries a much larger number of buildings are being refurbished than being newly built each year. Most people in such areas will therefore continue to live and work in the already existing buildings over the next few decades. In general, in 2050 we will still live in 75% of the buildings we inhabit today. And not many of them are even close to nZEB... It is no surprise that many of the EU and state-supported energy efficiency programmes are concentrated on energy retrofitting, that movements like “Renovate Europe” gain massive political and public attention, and, last but not least, the existing support schemes and Success Models of many PassREg partner regions and cities are focused on the same issue.

It is already well recognized that older buildings consume significantly more energy than conventional new builds, so they offer an even greater potential for energy savings. What works for new buildings can be applied to existing ones as well, and this is the good news, as deep energy refurbishments are both profitable and further reduce our dependence on energy imports. Additionally, retrofitting an existing building with Passive House components, based on Passive House principles, brings almost all advantages of a new built Passive House.

The deep energy retrofit projects supported by PassREg confirm the conclusion that whenever a building component needs to be replaced, the materials used and the workmanship involved should be of optimal quality. By using Passive House components for each refurbishment measure, one will arrive, step by step, at an optimum mix of improved energy efficiency, higher user satisfaction, and favourable economic results. When we engage with building renovation, we'd better do it right.

Thermal image of a 1899 Brooklyn brownstone renovated to Passive House level on a cold evening

Source: PHI



With a view to the Energy Union

“Can we afford to spend 46% of our energy bill on heating and cooling our buildings? Is that not a little too expensive when we are spending almost EUR 400 billion a year on energy imports? How much can we save? What enormous potential we have in this area if we really increase the efficiency of our buildings. (...)

Maybe we should think more about incentives. (...) Therefore I think if we could consider the schemes and learn from each other in Europe – because we have good schemes in our member states – how to motivate households, how to motivate municipalities and local authorities to actually work better on the energy efficiency of buildings, this may be one of the arguments which could help us to convince the member states to be more serious and positive about these policies.”

Hearing of Maroš Šefčovič, Commissioner for Energy Union, October 20, 2014, Strasbourg

Quality matters

Certified PH components offer further security in the design of highly efficient buildings. Certified by the PHI, these products have been thoroughly examined in terms of their energy performance. There are three categories of certified PH components:

- Opaque building envelope (Construction and insulation systems | Connections).
- Transparent building envelope (Glazing | Windows | Doors).
- Mechanical systems (Ventilation systems | Heat pumps | Compact units).

Today, designers can choose from hundreds of Certified PH components manufactured by a large variety of companies in ever more countries worldwide. All certified components, completed with certificates, efficiency classes, and special product features, are available in the Components database under the certification section of www.passivehouse.com.

Economic feasibility with the EnerPHit standard



03

(From the interview of G. Battistini, Cesena, Italy)

“Through comparison with other European regions we learned of the possibility to apply the passive house approach to existing buildings, such as school buildings; not only to new buildings”.

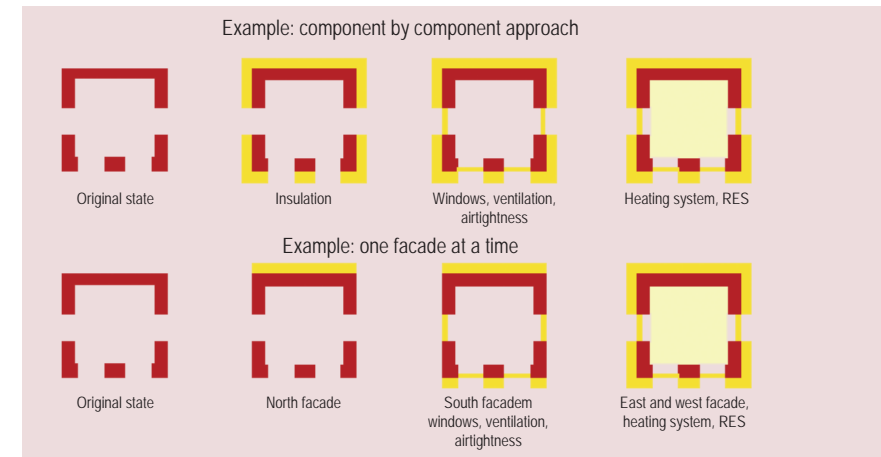
Renovations according to the Passive House principles are made possible by retrofitting to the EnerPHit Standard. Developed by the Passive House Institute in 2010, the EnerPHit Standard is especially designed for retrofits. Unlike in new builds, retrofits often come with challenging conditions that make the PH Standard prohibitive. The impact of built-in thermal bridges, sub-optimal building orientation, and non-compact building designs could not be always sufficiently mitigated in existing buildings. EnerPHit makes allowances for this while remaining true to the Passive House principles and ensuring that a building's comfort levels, structural longevity, and energy efficiency are drastically improved.

In terms of energy efficiency criteria, buildings meeting the EnerPHit criteria must either exhibit a heating demand of no more than 25 kWh per square meter of living space per year (as opposed to 15 kWh/m²/a for the PH Standard for new buildings) or be fitted with Passive House suitable components. But retrofitting to the EnerPHit Standard with Passive House components and principles also increases the value of the building considerably. A building that has been refurbished with an eye to energy efficiency as well as high comfort levels and low running costs is significantly more attractive for tenants and buyers. The chances of successfully renting out the property or selling it improve considerably.

Optimally refurbished buildings lessen both the financial burden carried by their occupants and the environmental impact, and energy retrofitting is often supported regionally and nationally through financial assistance programmes. Such programmes help mitigate the somewhat greater investment costs of high performance retrofitting. With or without such support, however, well-

Variants for step-by-step renovation

Source: PHI



Step-by-step building renovations

In order to meet the ambitious energy targets set for buildings EU-wide by 2020, significant leaps in the energy efficiency of our retrofitting efforts are necessary and research on deep refurbishments has yielded many successful examples. Whereas most such examples come from complete retrofits of buildings conducted all at once, step-by-step retrofits conducted over a period of years or even decades are far more common. The long life-cycles of buildings means that every step counts: low quality renovation measures, once conducted, are there to stay for the next generation or more.

The **IEE-supported project EuroPHit** aims to significantly increase the quality and energy efficiency of perhaps the most common type of refurbishment: retrofits conducted gradually, over a period of years. It uses the step-by-step approach, based on “refurbishment roadmaps” with appropriate individual steps for renovation which are to be followed until the whole building is renovated to the EnerPHit standard. Thus, the so called “lock-in effect” caused by the application of suboptimal measures is eliminated, thus allowing the exploitation of the full energy saving potential of the buildings. The intent is to provide both a certification of such overall roadmaps as well as an energy assessment of the individual refurbishment steps in the Passive House Planning Tool (PHPP).

planned EnerPHit retrofits with Passive House components are worthwhile, not only because of the energy savings they bring, but also because of the improved comfort and reduced risk of structural damage that come with them. As energy efficiency measures for any part of a building are always most affordable when that part is already in need of renovation, it becomes obvious that anything worth doing is worth doing well. High quality, deep energy retrofits done to the EnerPHit Standard all in one go may be the best option. When this is not feasible, however, a step by step approach to quality renovation is preferable to mediocre renovations done all at once, as these can compromise any future efforts to achieve low energy consumption.

Financial and economic support

(From the interview of S. Ivanov, Sofia, Bulgaria)

“What is important to us is that availability of new solutions, technologies and components is increasing while their prices are gradually decreasing. In the end, the willingness of construction companies to engage in such projects is directly related to demand. This is not new. What is new to us is the understanding that all measures should support the market and not individual projects”.

While the total investment costs of Passive Houses are sometimes a bit higher due to the necessity of better quality products and more detailed planning, this is not always the case: many Passive House buildings have been built at costs comparable to or even under those for similar conventional buildings. But when taking capital costs and running costs into account, Passive Houses usually cost much less over their lifecycles. Factors influencing this cost balance include not only the skill of the design team, but also the construction prices, interest rates, available financial incentives, future energy prices, and even individual client wishes. The increasing availability and decreasing costs of suitable components, combined with the growing number of experienced designers and craftspeople, are making the cost balance of Passive Houses ever more suitable to benchmark the design of innovative and ambitious support schemes.

On many occasions, financial and economic support at state, regional and local level is necessary to counteract the slightly increased cost of the initial investment. At this point, the political reasoning and philosophy behind the support schemes and incentives plays a very important role for the continuity of the support measures. The long-term benefits in terms of cost-efficiency, environmental impact and energy savings are major factors, often driving public support policies in this direction; however, it is not rare that in times of economic and financial

30 Apartments and
eco-neighbourhood
in Harenberg

Source: a2m



crisis climate change issues step a bit behind. In such cases, the sustaining political will and engagement becomes crucial, which is proved by the contributions of many of the participating regions.

Exemplary buildings

In the face of all the uncertainty about the future, is it possible to imagine a city becoming more beautiful, more practical and more economical to live in, while at the same time becoming more sustainable? This was the challenge the Brussels-Capital Region set itself in 2007 and the response was the launching of BatEx call for projects targeting everyone who wants to build or refurbish a building in Brussels.

The “Exemplary Buildings” program was the main financial incentive instrument of Brussels regional authorities to encourage the demand for very high energy efficient construction. Since 2007, the region had organized five annual calls for proposals (with the exception of 2010), disbursing € 5 million per year. The term “BatEx” is the abbreviation for “Bâtiments exemplaires” or “Exemplary buildings”, and the whole idea is to leverage each project, whether large or small, private or public, to spread the word eco-construction, what it involves and how it can help transform the city, building by building.

BatEx funds were available for single-family or collective housing units, collective facilities (e.g., school, hospital, or nursery) and offices, commercial or industrial facilities. All projects had to be designed according to the **PH Standard** guidelines (they must strive to be a zero-emission buildings), must prioritize the use of eco-friendly construction materials and to consider the natural cycles and biodiversity. Additionally, the projects had to demonstrate a **high architectural quality, good visibility**, and a satisfactory level of **integration into the existing stock**; they had to be **simple and feasible in technical and financial terms**, with reasonable payback timelines.

National, regional and local level incentives



04

(From the interview of J. Volks, Rēzekne, Latvia)

“We learned to advocate Passive House principles in the face of sceptics and to explain why people should live in a Passive House”.

The different administrative structures and traditions throughout the EU unconditionally lead to different approaches for the accessible financing schemes and incentives. As expected beforehand, the regional and local-level incentives designed in traditionally decentralized societies like Germany and Austria are not directly transferable to other, more centralized governing styles, for example in East European countries. However, steady interest is evidenced in solutions related to local and regional actions in the impact area of municipalities and regional administrations. In times of slow recovery from the financial crisis, direct subsidies or local financing were not to be widely expected, but support measures through urban planning favourable to passive houses (Cesena, Antwerp), demonstration public buildings (most Aspiring regions - ARs) and even whole districts (Nieuw Zuid, Antwerp; Zero-E park, Hannover) abound. Consequently, desired measures for influencing the national authorities for provision of government-level support are described in almost all regions (a great example of the interplay between national and regional level support is to be found in the Success Model of Wales). National financing funds and schemes are also brought out as best practice examples on many other occasions (Latvia, Bulgaria, etc.). In support of the EU debate on sustainable urban development, the Covenant of Mayors is recognized as a major driving factor for provision of incentives at the local level (City of Antwerp, Cesena, Burgas, Gabrovo, Zagreb). The rational investment of accessible EU funds and programmes in less developed countries is also outlined as mandatory condition for the accelerated introduction of passive houses.

Nieuw zuid,
Antwerp

Source:
Studio Associato
Secchi - Viganò



The city of Antwerp: the frontrunner of Flanders

For the one of the most advanced PassREg ARs – the city of Antwerp, the implementation of the EPBD is determined by the Flemish Energy Agency (VEA). According to the Flemish policy, all new public buildings should be nearly zero-energy by 2019, and all other new buildings by 2021. Furthermore, from 2014 new houses and major home renovations must have a minimum renewable energy share; in 2015 minimal requirements for installations in renovations will also be introduced.

Beyond the Flanders Region process of defining nZEB approaches, the **Province of Antwerp** announced in June 2013 its decision to apply the PH Standard in all public new buildings and complete renovations. This decision supports the ambitious province’s climate plan to reach carbon neutrality by 2020.

Even earlier, on January 9, 2009, the **City of Antwerp** has signed the Covenant of Mayors, targeting reduction of at least 20% of CO₂ emissions compared to 2005, covering the whole urban territory, and reduction of 30% for the city itself. The final objective is to become a CO₂-neutral city by 2050. In pursuit of these ambitious goals, in 2010 the local city authorities decided that a collective heat production unit must be installed in the newly built private developments and the buildings must allow for easy connection to a district heating network in the future. This policy is implemented in the PassREg beacon “Nieuw Zuid”, as well as in the “Cadix” area. The PH Standard and a renewable energy share are also mandatory requirements for the new buildings in these large developments.

Additionally, a special attention is paid to the renovation of old and historic buildings, as it is well understood that the ambitious local goals could be achieved only through significant energy savings in the existing building stock. In 2015, a new funding channel called “Project Funds Sustainable City” was launched by city of Antwerp with the goal to stimulate local sustainable actions. Although not directed especially to passive buildings, ideas that support energy savings based on the PH principles and facilitating deep renovations can be eligible for funding.

Level of support related to achieved energy efficiency standards



04

(From the interview of K. Nakova, Sofia, Bulgaria)

“We need to make sure that public moneys are used to support highly ambitious building projects – e.g. projects meeting the Passive House standard”.

It is well recognized within PassREg community that the most successful support schemes have been related to the achieved level of energy demand, and, correspondingly, to the level of integration of RES. Unfortunately, there are still countries in Europe, in which public money is invested in projects designed to reach the obligatory levels of energy efficiency, especially as related to renovations. As well demonstrated by the example from Frontrunner regions (FRRs), the financial support should always be targeted to the achievement of energy demand levels which are much more ambitious than the national standards, independently whether we are discussing national, regional or local incentives or support for new built or retrofit projects. Even further, a differentiation of the subsidy amount could be designed in relation to the achieved standard, as more ambitious projects should respectively be subject to increased public support.

One of the best examples in this direction is the Austrian province of Tyrol, where 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 national and regional) are widely accessible for a big part of the population, thus strongly influencing the market prices of commercial housing and protecting the markets from downturns. In most of the cases, the ambition of the project in terms of energy savings is directly proportional to the amount of subsidy received.

The same goes for the support of introduction of energy from renewable sources. In comparison with the provinces, Tyrol is even now capable of ensuring a share of locally produced energy of nearly

Deep energy renovation with PH components in a school – a monument of culture, Innsbruck, Tyrol, Austria

Source: EnEffect



Renovation subsidy in Tyrol

The amount of the subsidy for renovation in Tyrol depends on the Eco level, the floor space and the level of improvement of the heating demand (HD_{GFA} before the renovation and HD_{GFA} after the renovation).

	Eco level 1	Eco level 1	Eco level 2	Eco level 2	Eco level 3	Eco level 3
Improvement level	≥ 50%	≥ 65%	≥ 50%	≥ 65%	≥ 50%	≥ 65%
Floor area ≤ 300 m ²	€ 3,300	€ 4.400	€ 4.950	€ 6.600	€ 6.600	€ 8.800
Floor area >300≤1000m ²	€ 5,500	€ 7.700	€ 8.250	€ 11.000	€ 11.000	€ 15.400
Floor area > 1000 m ²	€ 8,250	€ 11.000	€ 12.100	€ 15.950	€ 16.500	€ 22.000

Subsidy for quality renovation

Building renovations with particularly high level of planning, execution, and energy and environmental quality will receive additional subsidy, if they reach the Eco level 3 and the requirements of the klima:aktiv house or the corresponding building certification systems (e.g. Passive House, Total Quality Building, Austrian Society for Sustainable Building). The proof must be provided via certificate by an independent, authorized institution. The funding will be provided in the form of one-time subsidy in the following amount:

Floor area ≤ 300 m ²	€ 1,000
Floor area > 300 ≤ 1000 m ²	€ 1,500
Floor area > 1000 m ²	€ 2,000

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 will increase to more than 50% of the final energy demand.

Attraction of major private investments through public funds



04

(From the interview of E. Kirscht, Hanover, Germany)

“The most important barriers for investors are the investments. Investment costs depends on a number of factors. PassREg cannot influence cost-factors in our region. It can provide information about the scope of calculation methods. In doing that, PassREg underlines the importance of life cycle cost analyses. In partnership with proKlima, we try to convince investors to change the basis for their decisions. We hope banks and credit rating agencies will pay more attention to this”.

Certainly, the limited public resources would not be sufficient to finance all necessary measures for successful implementation of EU policies in the area of climate and energy. Sustainable change could be brought forward only by successful attraction of major private investments, using the leverage effect of the public funds. There is no better evidence for this statement than the viability and positive appreciation of the financial instruments designed on this principle found in the SMEs of Antwerp, Cesena, Wales, Vidzeme and Latgale, etc. It is more than certain that a working market could not be established without the active involvement of the private capital and entrepreneurship. However, the high-level energy performance of the projects is a must (e.g. as projected in Arnhem-Nijmegen), and no public money should be spent without contributing to overall EU policies and goals towards sustainable development and rational use of resources.

Probably the most impressive example for successful attraction of private resources through public funds is in Hannover (Germany). 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 the related construction technology. Every Euro of the financial assistance provided by proKlima has helped for the mobilization of €12.7 of additional investments. Additionally, Hanover municipality establishes the public-private partnership Ecoprofit, which provides technical and financial support to SMEs in their efforts to limit the production costs by reducing the waste and emissions. In 2003 the city government initiated the ImpulsProgramme Passive House to support the establishment and development of SMEs in the field of energy efficiency, in particular passive buildings.

A supermarket built in Passive House Standard in Hanover – the first of its kind in Germany.

Source : PHI



Utilizing public resources efficiently: the answer of Hannover

The Climate Protection Fund “proKlima” in Hannover operates on the basis of public-private partnership, in which the municipality and the local energy supplier Stadtwerke Hannover AG plays a key role together with 5 more neighbour municipalities. The proKlima Fund provides annually € 4,4 million, thus supporting the energy renovation of buildings, the introduction of the PH Standard, as well as of energy efficient technologies and renewable energy. proKlima subsidy conditions include: (a) a special certification procedure for the PHs construction methods and (b) energy efficiency quality assurance for structural insulation, heating and ventilation.

The Climate Protection Fund “proKlima”, set up in 1998, is the outcome of the perfect collaboration and interaction between the Hanover Municipality and Stadtwerke Hannover AG. It combines management interests, consumer needs and local activities in the City of Hannover. This unique policy instrument plays a key role in the practical implementation of a series of projects by providing financial support for the design and construction of low-energy buildings and for overcoming of certain inevitable market barriers.

In a period of 15 years the proKlima fund has subsidized over 24,000 single climate protection measures, more than 750 special climate protection projects and allocated over € 53 million. As of 2014 proKlima fund saves more than 118,000 tons of greenhouse gas emissions per year. Every Euro financial support, allocated by proKlima, helps mobilize € 12.7 in investments, which is the most convincing evidence of the high effectiveness of this instrument.

Subsidies, tax breaks, affordable crediting and innovative financing schemes



04

(From the interview of D. Jaques, Cardiff, Wales, UK)

“To subsidise our pilot development, we have offered an agreement with the developer of our Partnership Programme to overcome financial uncertainties. We are prepared to take an additional risk that we may not receive the full market value for the sale of our land to the developer. An agreement will be in place that if the developer is able to sell houses built on the land for a rate higher than anticipated, we will receive a share of the additional profit. If any sites do not appear to be financially viable to develop, we will accept a lower land value in order to facilitate high quality, low energy housing developments in our region”.

In general, the PassREg experience puts us across a large number of distinctive financial solutions and specific incentives which, combined with a multitude of national and European-wide approaches, situate the external observers within a universe of tools and schemes in which one could easily get confused. A situation of well-developed financial system in general but with limited experience in financing of energy efficiency projects brings out an intensive debate on the most appropriate form of financial incentives. Well, in fact there is none: each country and region has its own specifics, traditions and approach in this area; the levels of economic development and political and financial stability also enter the equation. None of the various forms of financial support should be underestimated, as they all have their application in different contexts and situations and, theoretically, open the space for enhanced multilevel governance systems. However, in addition to regional support schemes, the existence and operation of specialized financing funds and the introduction of new forms of financing as EPCs, ESCO schemes and bridge financing come to the fore in almost all regions.

A very interesting example is provided by Brussels-Capital Region, where the political determination is successfully combined with a multitude of financial incentives. The implementation of a series of actual building projects through the Exemplary Buildings (BatEx) programme showed that the passive building does not increase the cost of renovation and new construction to unacceptable levels. Additionally, the regional administration first adopted the new standards and rules for the public buildings, thus stimulating the market penetration and the attraction of the market players' attention. Such a 'lead by example' approach is essential to Brussels, where the share of public

procurement is significant. Further on, Local Action Plans for Energy Management (P.L.A.G.E.) were initiated based on this approach, while “Contracts for sustainable neighbourhoods” encouraged broader initiatives to update the traditional neighbourhoods. Essential to the success of Brussels were 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). Even when in the middle of 2012 the federal government abolished the 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.

Specializing in sustainable energy financing

The **Latvian Environmental Investment Fund (LEIF)** was established on April 28, 1997. The Ministry of Environmental Protection and Regional Development of Latvia owns 100% of the Fund's shares. Since February 5, 2004 the Fund has implemented quality management system of its operations in accordance with ISO 9001:2008 standard.

The Fund has worked on the development of different environment protection and environment friendly projects from the idea until its implementation for over 15 years. Its activities are directed to reach maximal environment improvement supporting commercial activities in public and private sector, stimulating fund raising for project realization of environmental and business infrastructure developments. Since 2010, the Fund provides supervision of the implementation and post-implementation monitoring of projects co-financed by the Climate change financial instrument (Green investment scheme - co-financing approximately € 200 million).

LEIF's partners include private enterprises, public utilities, local authorities, associations and research centers. Working on a lot of energy related projects the Fund has amassed remarkable experience and a wide network of contacts. It works in close collaboration with many local authorities regarding project development and project management, event and trainings organization and knowledge transfer actions.

In one of its latest programmes supported by the Climate change financial instrument, under the tender “Low Energy Buildings” LEIF has implemented 14 nZEB projects selected among 82 applications (70 corresponding to the programme's requirements). All of the projects meet the PH standards, having annual heating demand of less than 15 kWh/m²/a.

In search of complex support schemes



04

(From the interview of G. Battistini, Cesena, Italy)

“There are no incentives or tax deductions in our city for new buildings. There should be some in order to stimulate NZEB. This barrier could be overcome if the Italian government were to allocate incentives for the construction of new buildings with high energy performances. For example, the same tax deductions could be applied for the construction of new buildings that are already provided for the refurbishment of existing buildings meeting high energy standards”.

Surprisingly or not, despite the introduction of EU directives on energy efficiency, RES and most notably energy performance of buildings, it seems that there is hardly a region which could present a comprehensive support scheme for nZEBs, encompassing both new constructions and deep energy renovations of public and private buildings for residential and non-residential use. And this is where the example of FRR comes in handy: integrated national and regional policies, accompanied with relevant financing schemes, prove to be a necessary prerequisite for introduction of passive houses as standard construction practice. Hand in hand with the current EU policies, a special attention has to be paid to building renovation to a high energy efficiency standard. A special point of interest here is the investment of resources coming from EU financing funds. On many occasions, lack of support to a specific sector of building activities (e.g. for new residential buildings, for administrative or commercial buildings, etc.) is perceived as barrier to the implementation of nZEB and PH concept at regional level (Zagreb, Gabrovo, Wales, etc.).

A strong push towards a whole building design through the EPBD means that a total redesign of the support measures and incentives is needed in many EU countries. Especially important issue (but not the only one) is the right form of support of RES in buildings, which are quite often promoted by separate schemes and instruments, potentially impeding their integration into the building design. A lot has to be done in this area, but the evidence coming from the participating regions is unequivocally in support of the whole building design approach, as administrative barriers for coordination of specific support measures are described as a major stumbling block on more

Passive House building in Korneuburg near Vienna that received the Austrian National Award for Architecture and Sustainability in January 2015

Source: PHI



Attracting financing for regional investments in energy efficiency and RES

Although the conditions are very stiff for bank loans to communities, in 2013-2014 the Aquitaine Region, proving its financial health, was able to invest in energy efficient aid loans and operations. For the 2013 budget the European Investment Bank (EIB) has been committed to deliver € 800 million (including € 400 million funded by regional banks). A major undertaking, being one of the largest sums of EIB for a French region, from which will benefit schools, training organizations, and small and medium enterprises for the implementation of their projects for renewable energy production.

To finance the expansion, upgrading and improving of the energy efficiency of schools and training organizations € 500 million of EIB loans will be allocated. Among the selected projects are the construction of a “positive energy” school in Bergerac or the installation of photovoltaic panels on the roofs of many regional schools. The first credit of € 150 million was allocated in late 2012.

In addition, the region, the EIB, alongside with Crédit Agricole, Banque Populaire and Caisse d’Épargne banks, have engaged themselves to support the small and micro businesses in their projects of renewable energy production and energy renovation of buildings. Energy efficiency projects will be funded jointly by the EIB with € 150 million and an overall additional funding of € 150 million by the two banking partners thus bringing an overall budget of € 300 million which will be allocated in the form of loans at favorable rates.

Moreover, the regional guarantee fund, in partnership with OSEO, will also be mobilized to support the initiatives of the small and micro businesses.

than a few occasions (e.g. Zagreb, Cesena). It is however to be expected that most future policies will take into account these barriers and predominantly provide incentives for integrated energy efficiency and RES projects, and not for separate measures.

05 Who's in?

(From the interview of D. Jaques, Cardiff, Wales, UK)

"An important step, given the present developmental phase in our region, will be the training of key personnel within the Local Authority (particularly maintenance teams and tenancy managers) to ensure they understand new building methods and services. Without their ability to manage the buildings in the long run and to inform occupants how they should be using the systems there would be a high risk of the buildings not being used correctly and considered a failure".

If we assume that national/regional regulations and various financial 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 could 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.

The PassREg beacon of Burgas, Bulgaria: a new art gallery in the center of city.

Source: Burgas Municipality



Building local capacity through European projects

City of Zagreb has a proven track record of implementing energy efficiency projects on the local and EU levels (e.g. ZagEE - Zagreb Energy Efficient city; TRACE - Transnational cooperation for the improvement of buildings energy performance and efficiency; EnVision; LEAP - The Leadership for Energy Action and Planning; Energy for Mayors; NiCE - Networking intelligent Cities for Energy Efficiency; i-SCOPE - Interoperable Smart City services through Open Platform for urban Ecosystems; E2STORMED; Ele.C.Tra - Electric Transport in Cities; EURONET 50/50max.).

Zagreb implemented over 50 individual RES and refurbishment projects in public buildings, but none of the projects fully applied the principles of the passive buildings and at the moment there aren't any planned. The target of the refurbishment of public buildings projects is reaching energy grade B after the modernization.

The city of Zagreb staff is regularly participating in expert seminars, workshops and educational activities related to the field of energy efficiency and RES. The technical employees in public buildings have undergone one day training courses on energy management in buildings and have been given instructions for further maintenance of the technical systems. Employees of the municipal departments have attended five day course and have acquired the title of energy manager. Usually these persons are the local contacts for the national energy efficiency programs and the development of information systems for energy management – EMIS <http://www.ee.undp.hr/isge>.

Administrative capacity



05

(From the interview of G. Battistini, Cesena, Italy)

"There aren't many trained specialists on passive house and NZEB, especially in public Administration. However, having understood, thanks to the project PassREg, the importance of training of technical specialists, two of Cesena's designers have become certified Passivhaus designers".

It seems that it is universally accepted that the administrative capacity of the local authorities related to the introduction of nZEBs is essential for its success. However, the declaration itself is never enough – and the fact is that in many regions in Europe, the knowledge related to PH concept and principles is quite limited, to say the least.

Here, again, the example given to us by the FRRs comes in quite useful. Looking at Hanover region, one cannot fail to notice the continuous efforts for improvement of the city's administrative capacity. Standing at the frontline of the energy transformation, 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 the use of RES. A system of institutions has been developed and coordinated by the Climate Protection Agency Hanover region (CPAH), while the programming tasks are implemented in the framework of the Climate Alliance Hanover 2020. Locally, the Kronsberg Environmental Liaison Agency (KUKA) was in the heart of the relations with the stakeholders, ensuring their direct involvement at the beginning of the process of introduction of PH concept in the region. 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 the opportunities on specialized trainings for designers, engineers, construction workers, etc.

In Brussels-Capital Region, the rapid growth of low-energy building which followed the high-level political commitment and the resulting new strategic and legislative frameworks also required a

On 27 June 2014, Heidelberg's mayor, Dr. Eckart Würzner, and Dr. Wolfgang Feist, Director of the Passive House Institute, unveiled the official Passive House Award plaque.

Source: PHI



Use of Building Information Modeling (BIM) to aid Passivhaus design

The UK Government is looking to make use of the collaborative 3D BIM mandatory on all Government projects by 2016 (with all project and asset information, documentation and data being electronic), with the aim of delivering more efficient ways of working at all stages of a project life cycle. There are examples of PH projects in the UK (e.g. Bushbury Hill Primary School, Oakmeadown Primary School, Wilkinson Primary School and Chester Balmore housing, all designed by Archetype – see www.archetype.co.uk) that have utilized BIM during the planning stages to aid design. The detailed, 3D models developed enable the visual interrogation of the building and allow consideration to be given to the important construction details in 3D (particularly where 2D drawings may not capture the potential difficulties faced on site by installers), while also providing accurate numerical data for input in PHPP modeling, such as areas and volumes and the length and routing of duct and pipe runs, etc. However, the real benefit of BIM is that the whole design team can work from a single shared model to aid information transfer, which can then be carried through for use in the running and maintenance of the building by the users.

To make BIM a more powerful tool for use with Passivhaus, research has been carried out at Cardiff University to investigate how BIM can be better integrated with Passivhaus assessment and how the necessary data for PHPP energy calculations can be directly extracted and calculated from BIM models. Progress on this research has been reported in the following journal article: A. Cemesova, C.J. Hopfe, Y. Rezgui, "Passive BIM – a new approach for low energy simulation using BIM", *eWork and eBusiness in Architecture, Engineering and Construction – Gudnason & Scherer (Eds), 2012 Taylor & Francis Group, London, ISBN 978-0-415-62128-1*.

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 efficiency projects. A set of additional

(to next page)

(From the interview of G. Battistini, Cesena, Italy)

“There aren’t many trained specialists on passive house and NZEB, especially in public Administration. However, having understood, thanks to the project PassREg, the importance of training of technical specialists, two of Cesena’s designers have become certified Passivhaus designers”.

05 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. In the Belgian the city of Antwerp, one of PassREg’s most advanced ARs, the processes have similar dimensions: PHP, AG Vespa and Ecohuis (EHA) provide the necessary support network for sustainable improvement of the building practices.

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 the society and influencing the decision-making of public administration and industry. The institutional structure of AEA is itself an illustration of the importance of administrative capacity building, combined with the engagement of all stakeholders: along with policy-makers and public officials, 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.

As recognized by the PassREg community and clearly stated in the success model of Cesena, it is the goal (and mission) of the municipal administration to create a network of professionals able to support all stakeholders on themes like energy savings in buildings and nZEB. As evidenced by FRRs and in most advanced ARs (e.g. the city of Antwerp), the renowned professionals with experience and established expertise in the area of energy efficiency are usually keen to offer impartial, independent consulting services on energy consumption management, rational use of energy and promotion of RES. However, such practices should be motivated, supported and coordinated by the local or regional authorities in ARs (the city of Antwerp, Cesena, Arnhem-Nijmegen). Additionally, it is widely confirmed that cases of training of administrative experts in sustainable building issues are exceptions, and further capacity building initiatives are provisioned for in all success models. Here, the strategic energy and urban planning activities play an important role, further supported by political initiatives like the Covenant of Mayors (the city of Antwerp, Cesena, Burgas, Gabrovo, Zagreb, cities in Latvia).

One of the first large-scale PH developments – terraced houses in PH Standard in Kronsberg, Honnover, Germany.

Source : PHI



Integrated design and management practices

In Arnhem-Nijmegen the PassREg project has also been used to experiment with alternative forms of cooperation and project management. Its main goals are to increase the customer satisfaction, shorten delivery times, reduce investment costs and risks of failure in the nZEB building projects. This makes nZEB and nZE-Retrofit more competitive on the market and supports the building partners to cope with the challenges of executing high energy standards. DNA in de Bouw promotes a combination of techniques from the agile-scrum movement, systems engineering and morphological design. The so called scrum-team approach has been implemented in several (beacon) projects and is being adapted by several members of DNA in de Bouw.

The preliminary results of the networking activities of DNA in de bouw at all policy levels are promising, too. Due to the very active communication activities the awareness of PH methodology and integral design, being the logical approach for designing nZEB, is steadily rising. This also affects the lobby around the national amplification of high energy-levels in the context of EPBD-adaptation.

To meet the high demand in capacity building the training institution KERN (Kennisinstituut voor energetische renovatie en nieuwbouw) has been founded.

Moreover, the regional guarantee fund, in partnership with OSEO, will also be mobilized to support the initiatives of the small and micro businesses.

Planning and design capacity



05

(From the interview of G. Bernabini, Cesena, Italy)

“The study tours allowed our municipal technicians to visit the passive buildings already [completed] in other European regions and already in operation. The visits were guided by the designers [who explained] the design choices and [actual] construction. Moreover, it was interesting to hear the residents about their experience of the everyday running of such buildings”.

Unlike the situation in FRRs, in many ARs the general professional capacity of architects and designers for implementation of passive house projects is frequently put under a question. At some points, it is specifically described as a weak point (Zagreb, Burgas, Gabrovo) and further efforts are being planned through nearly all success models (e.g. Arnhem-Nijmegen, Cesena, etc.). Stable integrated design patterns are scarce and this is another area in need of further interventions, both in terms of legal substantiation and increased capacity. Cooperation with other players as higher education establishments is important (Wales), but there are also other solutions coming from the participating regions. Many training courses are provided by facilities certified by PHI; PH interest groups and dedicated NGOs are also providing information support and consultations alongside dedicated training courses (Antwerp, Arnhem-Nijmegen, Wales, Gabrovo, etc.). It is a firm conviction that such efforts should be supported by the local authorities on all cases but especially at beacons, which must be executed in a way eliminating any bias against passive house principles.

The results which intensive professional training efforts could bring in terms of market development and introduction of the PH concept are clearly demonstrated by Brussels-Capital Region. The need to train building professionals via universities, vocational schools and training centres was timely realized, and in 2009 the Brussels Environment office decided to develop a professional training program for designers, engineers, architects, and contracting authorities. Additionally, PHP and 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

One of the most successful and recognized PassREg beacons-
Generatiewooncomplex Landgoed Oosterhout ,
Netherlands

Source: Azimut Bouwbureau



Generatie Wooncomplex Landgoed Oosterhout in Nijmegen (GWLO)

Passiefhuis Oijen was developed along a performance requirements demanding life cycle costs been taken into account. It was built according to the PH concept with a pellet stove and serves as inspiration for GWLO. The project was organized in a Lean-like cooperation. The building team consisted of the executing parties, the clients, the lean-planner, the PH advisor and the building inspector. The contracts were based on prescription of performance. The bouwteam was challenged to find best and innovative solutions during the designing phase and reduce execution time, waste, failures and thus costs (See also Lean at GWLO). This project was privately financed. It was valued during the planning phase which was leading for the price-setting and contracting with the building companies. The valuation took into account the low-energy-use in the operational phase.

managers, property managers, notaries, maintenance companies, etc.), as a part of the whole process of implementation of the PH 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 and designers and builders apply the learned concepts into practice, collaborating on real ‘passive’ projects. PHP has also a broad range of courses (available from www.passiefhuisplatform.be), and training cycles take place in Antwerp at least several times per year.

Similarly, in Austria, the activities of AEA are 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 the training and education activities. Consultancy services and trainings are offered by Energie Tirol and its ‘Energy Academy’, focusing on the professional development of planners and construction-related industries. Training opportunities are also offered by IG Passivhaus Austria and IG Passivhaus Tirol, in close cooperation with the PHI and the University of Innsbruck.

The role of the construction sector



05

(From the interview of D. Jaques, Cardiff, Wales, UK)

“One problem to be solved is the lack of skills: There are not many contractors with experience of delivering Passivhaus. Contractors will need to be willing to learn and commit to adopting new methods and techniques to ensure quality. Skills can be supplemented with training courses but the best way to ensure adequate skills and understanding is through working on real projects”.

High levels of onsite workmanship and attention to detail are required to achieve a Passive House in practice. The construction workforce thus makes a critical contribution to the overall delivery of such low energy buildings. At EU level, it is already well recognized that in order to reach the ambitious targets for energy efficiency in the building sector, the qualification of the construction workers and specialists should be significantly increased. The large-scale BUILD UP Skills initiative, which started in 2011 with the support of Intelligent Energy Europe Programme, is already achieving its goal to develop new local capacities and stimulate new knowledge and skills within the sector, but even more efforts will be necessary. With new designs and detailing being developed to help deliver ever-tighter environmental standards, builders possessing mastery of the requisite construction techniques and expertise in implementing them on site will constantly be in great demand.

To raise awareness about the important features of the nearly zero energy construction and provide craftspeople with the skills needed to implement the PH Standard on site, courses tailored to site workers are being rolled out via PassREg in the participating regions. The courses, offered in the local languages of the participating countries, include a general overview of the relevant construction principles and details as well as in-depth, trades-specific lectures and exercises, focussed on either the building envelope or the building services systems. Craftspeople thus receive tailor-made training and certification in their specific fields of expertise.

The above argument for the required perfection of the pilot passive buildings comes even stronger when it comes to the quality of the construction works. Even the best passive house

design would be compromised by inadequate construction works, so the continuing training of the working force is crucial for the implementation of high-quality building projects. Two major solutions are clearly outlined, namely the cooperation with the BUILD UP Skills initiative (Latvia, Bulgaria) and the support for the Certified Passive House Tradesmen courses provided by PHI-licensed institutions (e.g. Cesena). Here, the train-the-trainer courses lead by PHI specialists in the framework of the PassREg project turned out to be very special events for the involved regions. Another major issue clearly described in the analyses from the participating regions (the Success Models, available at www.passreg.eu) is the increasing need for strict quality control at the building sites, which is a solution often residing in the impact area of the local and regional authorities.

New skills for the construction workers

BUILD UP Skills is a strategic European initiative under the Intelligent Energy Europe (IEE) programme (Calls for proposals 2011-2013) to boost continuing or further education and training of **craftsmen and other on-site construction workers and systems installers in the building sector**. The final aim is to increase the number of qualified workers across Europe to deliver renovations offering a high energy performance as well as new, nZEBs. The initiative addresses skills in relation to energy efficiency and renewables in all types of buildings.

BUILD UP Skills has two phases

First, the objective is to set up **national qualification platforms and roadmaps** to successfully train the building workforce in order to meet the targets for 2020 and beyond (Pillar I). Pillar I constitutes of separate national projects in each EU member state.

Based on these roadmaps, the second step is to facilitate the introduction of new and/or the upgrading of the existing **qualification and training schemes** through a second series of projects, both national and international (Pillar II).

Throughout the whole duration of the initiative, regular exchange activities are organized at EU level to underline the European dimension of this important initiative and to foster the learning among countries.

The BUILD UP Skills Initiative will contribute to the objectives of two flagship initiatives of the Commission's "Europe 2020" strategy — "Resource-efficient Europe" and "An Agenda for new skills and jobs". It is part of the Commission's Energy Efficiency Action Plan 2011. It will also enhance interactions with the existing structures and funding instruments like the European Social Fund (ESF) and the Lifelong Learning Programme and will be based on the European Qualification Framework (EQF) and its learning outcome approach.

Moreover, the regional guarantee fund, in partnership with OSEO, will also be mobilized to support the initiatives of the small and micro businesses.

PH trainings and strict quality control



05

(From the interview of L. Custers and D. van Regenmortel, Antwerp, Belgium)

"We set up courses for the 'ecobuild doctors'. That's necessary, they need that. We have organized this on their request, tailored to their needs. In the past we had a workshop run by PHP but this was a single course for all the employees of the different services. Now we have separated this into 3 courses: Single family housing, multiple family housing and tertiary (non-residential) buildings. This corresponds better with the needs of the different departments, because someone working on tertiary buildings (e.g. schools) isn't necessarily interested in single family housing".

Indeed, one of the greatest challenges faced in this regard lies not in the technical details but in the training of qualified professionals. Through PassREg, aspiring regions are being supported in the development of long term training strategies based on the successes of front runners. Courses, making use of and building on readily available material for designers and tradespeople, are being translated and adapted as needed to fit the regional requirements. These offerings, supplemented by a range of informational sessions and forums, will serve as the basis for the general uptake of Passive House training by educational systems as well as by the building sector throughout the EU.

Buildings whether new build or retrofit, must perform as expected if we are to ensure sustainable energy supply into the future and improve our standard of living in so doing. Proper performance, in turn, can only be ensured if quality in design, construction and the materials chosen is taken seriously.

PassREg builds upon existing Passive House design tools as well as quality assurance procedures and certification criteria for both buildings and components. Through PassREg, these criteria are being optimised for application throughout the EU, guided in part by the monitoring results of selected case studies. In addition, PassREg strengthens the appropriate quality assurance infrastructure in partner countries while driving increased availability of qualified materials and products on the regional markets.

PH Train the trainer course for future trainers of PH designers and tradespeople in Sofia, Bulgaria



Source: EnEffect

Course offerings for PH Tradespeople multiply

In a climate where nZEBs are to become the rule, there is a definite need for skilled on-site professionals. PassREg is filling this gap: in each of the 11 partner countries, PH Tradespersons' training materials have been translated and adapted for regional use. Pilot courses with the new materials are starting to be held by regionally-based training bodies throughout the EU. The feedback from these courses will be used to further improve the materials. The key now: getting new regional training institutions on board to deliver courses.

Train the Trainer course for future trainers of Certified PH Designers and Tradespeople

Qualified designers and craftspeople are key to the large scale implementation of nZEBs. Within PassREg, the existing courses for PH designers and tradespeople, previously developed by PHI, are being translated into various European languages and adapted to the regional climatic conditions and building traditions. In order to ensure that these trainings will be rolled out on a large scale beyond the three years duration of the PassREg project, future course providers from different EU countries are being trained to hold these courses throughout Europe.

Trained to secure quality

Accredited PH Certifiers may certify in the name of PHI anywhere in the world according to PHI standards for PH buildings and EnerPHit renovations. They are key to ensuring quality and thus it is important that the number of authorized certifiers (currently around 30 worldwide) increase to meet the demand. Until now, each certifier has gone through a rigorous internship at the PHI but now, through PassREg, a Building Certifier course is being developed. The first course will likely commence in spring 2015.

06 Sustainability through market development

(From the interview of S. Ivanov, Sofia, Bulgaria)

"PassReg supported the first certified PH building [in Bulgaria] but there are now several of them, funded by private entrepreneurs, which is good. I believe what is most remarkable is that PH attracts a lot of attention among the construction companies which now understand that the lowest cost is not always the best decision".



The condition of the existing building stock and the current national energy efficiency standards outline significant market potential for the introduction of the PH standard. In some regions, serious attention is paid to the development and promotion of a market for materials and components for passive houses, which in a situation of supply shortages are likely to remain relatively expensive. The understanding that the main obstacle to markets is the insufficient knowledge of the nature and advantages of the PH concept is more or less unanimous. It is proposed more than once that national governments should pursue active policies on information and skills to build more confidence to PH. Additionally, shortage of specialists, lack of knowledge of the effects of passive houses within the life cycle of buildings (especially by banks), and scarce real examples of passive houses in many countries are identified as significant barriers to the development of the markets - and all the PassREg regions offer various forms of impact.

Saving energy, protecting the environment, transforming the city landscape – all in one big step

Bahnstadt, a new city district, is arising on the area of a former freight and switch yard in Heidelberg. It will be the first district consisting entirely of buildings constructed in the PH Standard. With its 116 hectares, it is one of the largest urban development projects in Germany and, as far as we know, it will be the largest area of PHs in the world. More than 100,000 square metres of useable surface are planned to be completed, consisting of residential buildings, kindergarten, retail outlets (building supplies store, DIY store, home improvement store), hotels and supermarkets. Only five years after the start of the project, on the former wasteland numerous offices and laboratories, service providers, bakers and cafes are sprouting. At the end of 2014, nearly 2,300 people already lived in Bahnstadt, as nine residential fields have been completed with a total of 1,500 apartments.

The energy strategy does not only involve technical standards but also obligations in the property purchase agreements, city development contracts, energy consulting, quality management, public relations and financial incentives. The energy quality management was developed based on PH Standard. Further steps of quality management are advice and control at the building sites, Blower-door tests, final acceptance and a final update of the mandatory PHPP calculations.

Thanks to its district heating and electricity supply based on CHP from a wood cogeneration plant, Bahnstadt is a zero-emission district. In the marketing strategy, the Bahnstadt is praised as a particularly ecological district. The image of a carbon neutral and ecological district is promoted actively in leaflets and during events. Purchasers name the PH norm as an important reason for their buying of accommodations in Bahnstadt during sales conversations.

Market support policies / Market incentives (no direct financing involved)



06

(From the interview of D. Jaques, Cardiff, Wales, UK)

“We accepted that we would sell our land to developers at a reduced rate under our Partnership Programme to effectively subsidise the increased construction costs so as to facilitate low energy developments”.

It is quite logical that, especially in regions with low level of decentralization, non-financial stimuli are preferred in the policy-making efforts of the local and regional authorities. There are several directions in which these efforts could be classified under the common denominator that they are targeted to ensure a stable institutional and organizational framework for market uptake of low-energy solutions in the building sector.

Of course, long-term strategic planning is a necessary prerequisite for the attraction of major market players. Sustainable development strategies, including such targeted at broader issues like the protection of environment and climate (Hannover), are key for provision of security and stability, so important for the large investors' interest. The approach for implementation of the concept of energy independence is the next logical step, which is already undertaken by several PassREg regions. Staying at local/regional level, political solutions for obligatory achievement of the PH Standard (or EnerPHit for renovations), especially for the public buildings – and especially when public money is invested – rightfully attract the attention in many of the success models developed through PassREg. Directly related to this, the decision to build only to PH standard on municipal land, as initiated by Hannover, is also well appreciated by the participating partners. As mentioned above, for example, in the city of Antwerp the PH standard applies for all new public buildings and major renovations since 2013. Setting a strict target to reduce the energy consumption in the residential sector is also viewed as a positive step in this direction.

To no less extent, measures to stimulate the networking among related stakeholders and capacity building activities are well understood as necessary for the continuous development of the market

and elimination of the weak points in the PH market supply chain. Memoranda with local NGOs and civic associations (Hanover, Tyrol); alliances for Sustainable Development with companies operating in the municipality (Hanover, Brussels); support for innovative companies - manufacturers and distributors of components, materials and technologies for low-energy construction, with a focus on SMEs; establishing of “ecoclusters” (Hanover) are just some of the examples for such activities with the participation of the local authorities, stimulating innovative patterns for public-private partnerships. Of course, these efforts are well combined with organizing and conducting of specialized construction fairs, conferences, seminars, etc. and engaging in knowledge sharing initiatives, e.g. through European projects. What is most promising, however, is the well-spread conviction that the best working market instrument is the direct experience, for which exemplary building projects has to be delivered – and most of all, by the local authorities themselves.

PH + RES districts: an undisputed market success

By building nothing but PHs in the zero:e park in southwestern of Hanover, the city faces the challenge of building a new residential area with over 300 single family homes and row houses as a zero-emissions neighborhood. The plan is based on an innovative concept whose ecological objectives are derived from the Kronsberg neighborhood, which was built more than ten years ago for Expo 2000. As a whole, the new neighborhood will not emit any carbon from heat supply and household electricity. The zero:e park is thus another milestone for Hanover's climate protection objectives. The basic principle of the energy concept is to bring the houses' heat demand to a minimum thanks to energy efficient construction with passive and active use of solar energy. Taking the use of renewables into consideration, only a small amount of the energy needed should be compensated outside of the neighborhood. For heat supply, the average residual carbon emissions were calculated to be 900 kg/year per house. Compared to the neighborhood built only to the current legal standard (EnEV 2009), the consistent application of the PH Standard reduces the greenhouse gas emissions from heating by 65% to 87%. Important aspects of the zero:e park include:

- Constructing all buildings as PHs.
- Using solar thermal or PV energy to reduce the residual energy demand.
- Using household appliances that consume electricity efficiently.
- Compensating the remaining carbon emissions from heat and household electricity demand with renewable energy production facilities.

For the entire neighborhood to achieve climate neutrality compensation for heating and household power was calculated to be on the average 1,300 MWh of electrical energy; this amount is to be covered with electricity from a hydro powerplant in Hannover.

The zero:e park has been divided in three separate section, to be developed one after another. The work on the third section was planned to finish in 2021. However, the market demand was stronger: **in the late summer of 2014, all single plots have been sold out.**

Networking and partnerships with market actors



06

(From interview of G. Battistini, Cesena, Italy)

“PassREg gave us the opportunity to interface with other European regions and analyse successful models and best practices in terms of the dissemination of passive houses and renewable energy. In addition, the project has allowed us to study “passive house issues”, which led to the certification of two of our designers by the Passive House Institute”.

The widespread uptake of the Passive House as a means of delivering nZEBs across Europe inevitably leads to an increased demand in suitable products and services. However, many of the required products are not yet common in the mainstream construction, yet they will need to be available at an acceptable cost in order to allow nZEBs to be delivered affordably. The Passive House approach is flexible enough to accommodate the entire range of construction methodologies and designs, whilst delivering cutting edge environmental performance across buildings of various uses and scale. For example, there is a great potential for manufacturers of building products to adapt and diversify their offerings with vast opportunities to expand into new markets. Such manufacturers play a critical role in the successful EU-wide delivery of nZEBs on the basis of Passive House supplied by renewables.

Raising awareness amongst designers and clients as well as exchange with other experts will be key to delivering needed products. This drives forward the availability of suitable products critical for wider EU uptake, while at the same time offering enhanced market opportunities and recognition to manufacturers who demonstrate performance in line with Passive House criteria.

Within PassREg regions, both frontrunners and aspiring, there are many initiatives in support of the market uptake of the available solutions. As early as mid-1990's, Hannover local authorities recognize that implementation of the goals of their ecological and energy policy is unthinkable without the active public and market support. The implementation of the environmental programme Agenda 21 was based on the establishment of permanently functioning networks (e.g. “Environmental Communications Network), directly involving citizens and market players in the

sustainable development of the region. Other instruments included 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 public-private partnerships, 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. The situation is quite similar, for example, in Tyrol, where 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. In Antwerp, the planning and execution of the district Nieuw Zuid is one of the most valuable examples for implementation of large-scale public-private partnership projects in the area of urban development, with a strong focus on energy efficiency and environmental protection.

Our children are our future: raising awareness in schools

Energie per la Città s.p.a., in-house company of the Municipality of Cesena, is developing a series of events and training courses aimed at children, teachers, parents, educators and those involved in education. This is linked with communication activities and awareness-raising in Cesena's primary schools and in public events addressed to citizens.

The project's main objective is to communicate what the City Council concretely realized in the last years, through the action of “Energie per la Città”, on renewable energies (particularly photovoltaic) and energy saving, and in this way to raise the awareness on these issues so that they can spread further, creating a greater confidence of the importance of daily choices in this regard.

During 2014 the project implemented the following activities:

- 36 workshops with 12 secondary school classes in Cesena, (three per class.
- 12 evening meetings in the city's districts.
- 2 public events with installations, games for children and families and presentation of the documents produced by the classes involved. (“Energy Education Day” on d March 22, 2014 and “With energy we can all be superhero” on d May 3, 2014).

For the year 2015 the following activities are planned:

- 24 workshops with 8 secondary school classes in Cesena.
- 21 workshops with 7 secondary school classes in other small neighbouring municipalities.

Impact of Beacons



06

(From the interview of D. Jaques, Cardiff, Wales, UK)

“The many benefits of having pilot/ trial projects to demonstrate the methodology for achieving NZEB and raise awareness of what can be achieved was apparent from how the front runner regions began their approach. This encouraged me to develop a trial Passivhaus project in our city”.

One of the highlights of PassREg, the so called “Beacon Projects” represent distinguished best practice examples of nZEBs implemented in the European “Passive house regions” - both frontrunners and aspiring - which make exemplary use of the PassREg strategy: Passive House principles plus renewables to cover the remaining energy demand, reaching optimal profitability and significant GHG emissions savings. These case studies teach us a lot about the applicability and effectiveness of solutions for both the development and the continuous optimization of PassREg success models; moreover, they provide an insight into the future of the European urban development and building practice.

The PassREg beacon projects are either new builds or renovations, ranging from larger individual buildings to entire urban settlements. While many of the beacons have benefitted from support by the municipalities/regions in which they are located, some of them are private undertakings without any special public support. All of them, however, are shining examples of Passive House and RES principles and are all implemented within the scope of a “success model”: a regional development framework applying various financial, capacity building, technical, quality assurance, political and communication solutions and approaches. This complex approach, in fact, is what makes them so valuable in terms of market support: without combining and analysing the synergy effects of the different factors, their impact on the actual building market would be limited.

Developed as detailed case studies, the analyses of the beacon projects provide valuable information about the applicability and effectiveness of the solutions applied in the PassREg regions and serve as a source of tested, effective examples for execution of ambitious building projects in vari-

The first certified Passive House in Sicily. Detailed information on the project: www.passivhausprojekte.de/#d_2123

Source: Sapienza & Partners



A celebration of architecture

The PassREg beacons are truly a celebration of architecture – a triumph of the integrated approach combining design, efficiency, comfort, cost-effectiveness and care for the environment. It is not a matter of chance then that many of the beacons entered and ranked quite high in the 2014 Passive House Award competition. Supported by the EU through the PassREg project and under the auspices of Sigmar Gabriel, German Federal Minister of Economic Affairs and Energy, the Award demonstrated the great potential and versatility offered by the PH solutions with renewable energy. Its winners have again proved that world-class architecture and PH Standard complement each other perfectly.

ous conditions. Additionally, they all play a major role as information and know-how exchange hubs, practically transferring effective solutions and approaches onto the actual building sites. Indeed, for some of the less advanced regions, successful beacon projects proved to be the best possible driver for the energy revolution in the building sector.

From “Success models” through “Beacon projects” to a definition of nZEB



06

(From the interview of D. Jaques, Cardiff, Wales, UK)

“Taking part in one of the PassREg study tours where we saw Passivhaus construction projects provided confidence that Cardiff Council could take similar steps towards achieving our goals. It was a little frustrating that many of the solutions that have worked in other regions we cannot directly transfer to our situation (e.g. we cannot offer equivalent funding grants that have proved so useful elsewhere). However, the value of having ‘beacon’/ trial projects to allow the industry to learn and to set an example for others to follow was a clear advantage, so that is what we have chosen to do in our city (a pilot project), even if it will cost more in the short term”.

Actually, it is really the implementation of whole models and not of single solutions which leads to the building of optimal nZEBs. Each regional model of success makes use of a complex set of approaches (financial, technical, political, communicative, etc.) and rely on particular infrastructure (capacity building in Passive House and renewables, legislation, financial incentives, etc.), required for the successful uptake of PassREg concepts. The beacon projects provide the best possible illustration of the interplay between all factors of success, a large window into the models in which they fit so well, thus allowing for a deeper look at the approaches and infrastructure used – and sometimes in the new solutions needed. And this is what the European approach is all about.

The analyses of the specific technical solutions implemented in the beacon projects (including implementation of RES) and the aggregated results of these projects with reference to specific socio-economic and climatic conditions brilliantly showcase the feasibility and economic viability of the approach. They aim to show how the PH concept, applied in accordance with the requirements of the EPBD (recast of 2010) and supported by renewable energy, can serve as a proven model for the nZEB. The facts are already more than convincing: it is not only the energy efficiency that wins over the curious reader; PassREg beacons are also comfortable, healthy, environment-friendly and cost effective.

If we take a closer look, we will definitely find that these are also the goals of the EU energy efficiency policy, reflected in the EPBD: sustainability, cost-efficiency and CO2 emissions reductions, combined with the leading passive house principle, all demonstrated and proven in practice, will inevitably lead to the perfect nZEB.

The first Passive House, built 1991 in Darmstadt, Germany.

Source: PHI



Communications (r)evolution in Belgium: the stories of Brussels-Capital Region and the City of Antwerp

The active promotion of the benefits of energy-efficient construction is a priority for the Brussels regional authorities. One way of doing so is by raising the profile of the “Exemplary Buildings” program. 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.

Furthermore, Brussels Environment has developed AlterClim, which is a software that helps determine whether premises of certain characteristics can avoid air conditioning (partially or fully). Available through the Brussels Environment website, AlterClim contains the results of 50,000 dynamic simulations, as well as substantial technical and educational documentation in the form of sheets that can be read online or printed. Other concrete initiatives of the Brussels-Capital Region to stimulate and increase the low-energy construction visibility are described below.

Ecodynamic Company Label

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 the energy consumption, waste management, and 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).

Stimulating public demand (awareness raising activities)



06

(From the interview of S. de Jong, Ede, Netherlands)

“There is still a need for awareness raising on savings and long term benefits. More information and consulting campaigns are needed”.

Often underestimated by public authorities and professionals alike, the raising of end-users awareness is a key factor for sustainable market uptake of the nZEB concept. In many European regions, there are tangible shortages in citizens' culture in respect to energy savings in everyday life, in information about the effects of the use of new materials, technologies and solutions, in understanding of the environmental and social impact of the EU policies...

Although there are opinions that excellent building projects are the best (and self-sufficient) communication by themselves, it is evident that execution of multi-level communication strategies is crucial for the achievement of the strategic goals set in the regions. In many cases, the central government is the only actor having the necessary resources and channels to push energy efficiency and RES-related issues higher up in the public and media agenda. However, in order to stimulate the actual end-user's uptake, the local authorities should fulfil their communication potential in terms of demonstration activities, consulting services and building of trust within the local communities.

This major challenge to both market uptake and multilevel governance should be faced now, without any delay. Although it may seem that the year of 2020 is still too far away for heavy investments in intensive communication activities, this notion is quite misleading: the goals, action plans and supporting instruments of the national climate and energy policies are set-up today. Changes in the attitudes and social values require fair amounts of time and efforts, so, in the highly competitive European market space of ideas and concept, any advance is worth taking on.

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“I visited a Passive House”, a short comic video produced by PassREg partner Plateforme Maison Passive (PMP), has already reached more than 200,000 visits on YouTube. Available in French, English, German and Dutch, you can check it at <https://www.youtube.com/watch?v=ms9piTYk2Os>



Communications (r)evolution in Belgium (cont.)

The “Ice Challenge” Special Event

The Ice Challenge event is organized by PHP in Brussels and Antwerp. It aims to raise public awareness and illustrate firsthand the benefits of the good building insulation. The event consists 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.

PMP/PHP Events

PHP and 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. In addition, the two networks also organize an annual Passive House Symposium: a more specialized event than the Passive House Fair, targeted specifically to construction professionals. More than 30 prominent Belgian and international speakers give lectures on a variety of aspects concerning passive construction and share their experiences with the audience.

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Of course, there is no general recipe for success of a communication campaign: it should be tailored towards its goals, target audiences and context. However, lessons learned from PassREg show that the political acts at all levels of governments could (and should) serve as serious incentives for the start – or reinforcement – of the communication efforts targeted to increased market demand. This conclusion should be seriously taken into account as the respective resources should be allocated up front in order to set the space for actual success of the policies: it is well-known that if the civil society's attitude is not favourable towards a policy action, it starts working against itself – and its initiators.

06

Ecobouwers

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.

“Populist” Actions

One of the first broad public advertising initiatives was the “Are you normal?” campaign (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 the passive house is mainstream practice - the only special thing about it is the inhabitant.

I visited a PH

After raising the initial interest, informing and provoking the public a comic video 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. The video is available in English at <https://www.youtube.com/watch?v=ms9piTYk2Os>.



Co-funded by the Intelligent Energy Europe
Programme of the European Union

