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IEE PassREg

PASSIVE HOUSE REGIONS WITH RENEWABLE ENERGIES

Task 2.1.2: DESCRIBE THE CRITICAL FACTORS OF EXISTING SUCCESS MODELS IN FRONT RUNNER REGIONS

Input to deliverable D2.1b: Detailed description of the Success Model of Brussels

Prepared by EnEffect

THE SUCCESS MODEL OF BRUSSELS

CASE STUDY

C O N T E N T

4. PLANNING AND DESIGN CAPACITY

5. CONSTRUCTION AND TECHNOLOGIES

6. VISIBILITY AND PUBLIC SUPPORT

1. ENERGY AND BUILDING POLICIES

Describe the process of political discussions on local climate and energy policies to achieve high-level political commitment of the regional government to control greenhouse gas emissions in the Brussels-Capital region.[1] Critical policy documents to be selected and pointed out as critical factors for the success of the Brussels model.

In less than 7 years, the Brussels-Capital Region has transformed from "the worst student in Europe" to a laudable front-runner in matters of energy policy and energy efficient building. Currently, there are 860 new passive projects that are being built in Brussels, to add to more than 2,300 passive houses in the social housing sector. Evidence exists that that the additional costs for building passive is decreasing more and more. The Brussels government has made a conscious decision to be a role model in the process. Nonetheless, convincing the market to move in that direction has not been easy.[2]

Behind Brussels' success lays a pragmatic decision of Brussels authorities to be cautious in pushing for energy policies, and to use accompanying support measures. Thus, people who lived in passive houses become ambassadors of the passive standard. Most of them low-income residents, they debunk the myth that passive buildings are a luxury only reserved for the rich. Other key ingredients for success are long-term vision, good training, and guidance and support initiatives. Data collection has a crucial place in the process, as it provides tangible reference for future endeavors.[3]

Such progress is remarkable and worthy of attention, not least because Brussels took considerably less time to move ahead than other front-runner regions. As a matter of example, the energy efficiency success model of Hanover was initiated in the 1980s - it took the Hanover region more than 25 years to become a front-runner. In contrast, the Brussels model developed much more rapidly, starting in 2004. In view of the above, a question looms before aspiring regions: which model should they follow, the slow one (Hanover) or the fast one (Brussels)? The decision will depend on each case, as particular conditions and success factors may vary greatly across aspiring regions.[4]

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[1] http://www.xpats.com/en/features/home-eco-housing

[2] Doulkeridis, Christos. 2012. "Who Wants a Passive House?" Making Frontrunners Visible, Supporting Future Frontrunners (Part 2)." Presentation at the *PassREg 2nd International Workshop*, *Brussels* (October 5).

[3] Doulkeridis, Christos. 2012. "Who Wants a Passive House?" Making Frontrunners Visible, Supporting Future Frontrunners (Part 2)." Presentation at the *PassREg 2nd International Workshop*, *Brussels* (October 5).

[4] Genchev, Zdravko. 2012. "Welcoming words," *PassREg 2nd International Workshop*, *Brussels* (October 5).

1.1 Nearly Zero Energy Building Policy Legislation

The evolution of low energy building legislation in the Brussels-Capital Region is in line with Directive 2002/91/EC of the European Parliament, which requires Member States to apply legislation relating to the energy performance of buildings (EPB) based on 4 key pillars:[5]

- Establishing a methodology to calculate the energy performance of buildings;
- Setting minimum performance requirements which all new buildings, as well as existing buildings undergoing major renovation, must meet;
- Offering energy performance certification if buildings are sold, rented, or new;
- Implementing a regular inspection system for boilers and air conditioning systems in buildings, as well as an assessment of the entire heating installation under certain conditions.

In order to transpose EU Directive 2002/91/EC into Belgian law, on June 7, 2007 the Brussels regional authorities passed the Energy Performance and Indoor Climate of Buildings Order (OPEB/*Ordonnance relative à la performance énergétique et au climat intérieur des bâtiments*). The general principles of OPEB are:

- To promote the improvement of the energy performance of buildings, taking into account outdoor climatic and local conditions, as well as indoor climate requirements and cost effectiveness;
- To promote the improvement of the indoor climate of buildings;
- To minimize primary energy requirements;
- To reduce CO2 emissions;
- To determine a certification procedure for the energy performance of buildings.

More than a simple transposition of EU law, OPEB goes beyond the requirements of the EU Directive in several areas. For instance, while the Directive imposes energy performance requirements for new and renovated buildings over the 1000 m2 threshold, OPEB incorporates two additional conditions that apply to buildings of less than 1000 m2. Furthermore, the feasibility study stipulated in the EU Directive is extended in OPEB to the energy design of buildings, specifically to overheating and passive cooling studies. It also applies to major renovations over 5000 m2. Basic renovations are subject to heat insulation and ventilation requirements. Finally, OPEB includes requirements that apply specifically to new technical installations (new construction or major renovation), and lays down energy-saving requirements: boiler burner, insulation of heat and cold distribution pipes, partitioning, and distribution system regulation obligations.[6]

[5] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 20, www.medemip.eu
[6] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 20, www.medemip.eu

Therefore, current legislation in the Brussels-Capital region outstrips by 6 years the EU directives for low energy construction.[7] Yet paradoxically, in 2007 Brussels was still nowhere close to the lead in energy-efficient construction. Not a single building in the region complied with the passive standard. Companies, industries, architects and end consumers perceived low energy housing as a luxury item, and were deeply skeptical of it.[8] Nonetheless, Brussels is a front-runner in eco-construction today.

The following paragraphs will trace the roots and evolution of Belgian federal and Brussels regional legislation, culminating in the adoption of passive construction standards. The analysis will show that in the Brussels-Capital Region, political action on the regional (and not necessarily on the Federal) level has been the catalyst behind the rapid progress in low-energy policymaking. In theory, the Federal government and the regions share responsibilities for environmental matters. In practice, however, eco-building has remained a regional competence, and progress in this area continues to depend on regional governments. Two key factors: a firm political commitment of the regional authorities, and a fruitful exchange of best practices with other EU regions (particularly Franche-Comté), are the reasons for Brussels' progress in maters of low energy legislation.

In the 1990's, Brussels authorities considered integrating sustainability into regional development. Consequently, the Region initiated a broad sustainability program. In 1998, Brussels-Capital joined Energy Cities, the European Association of local authorities for sustainable energy. Energy Cities is a European Union initiative aiming to connect local governments, to promote and support sustainable energy initiatives, to influence policymaking, and to serve as a forum for exchanging ideas in the area of sustainable energy.[9] For Brussels-Capital, joining Energy Cities proved to be a milestone in the development of low energy building legislation. The idea for the Exemplary Buildings project, which is at the base of today's legislation, was a result of cross-regional exchange of best practices within Energy Cities (for details, see **2.1 "Exemplary Building" (*BatEx*) Program**).[10]

Simultaneously, in the early 2000's, Belgium's Federal government issued the "2nd Federal Plan for Sustainable Development 2004-2008." This policy framework expressed a Federal commitment to the 2000 Millennium Development Goals, and the decisions of the World Summit on Sustainable Development (2002), particularly in the areas of living environments, energy and climate change. The plan was subsequently extended to 2009, and contained provisions on energy and environmental protection.[11] Such a policy shift

[7] http://www.bepassive.be/viewer/07/fr/ pg. 24
[8] http://www.xpats.com/en/features/home-eco-housing
[9] http://www.energy-cities.eu/
[10] http://www.energy-cities.eu/Brussels-leader-in-the-race-to
[11] http://diplomatie.belgium.be/en/policy/policy_areas/striving_for_global_solidarity/sustainable_development

towards energy-efficiency is noteworthy, especially in light of Belgium's very limited potential for renewable energy use. Belgium lacks large hydro resources and lands for biomass plantations, and its coastline is small (which constrains wind resources). Despite these challenges, Belgian policymaking since the early 2000s reflects a growing interest in renewable energy use.[12]

In the early 2000s, building insulation in Brussels-Capital was still among the poorest in the European Union. In 2001, the energy loss through walls in the Brussels-Capital Region amounted to 250 MJ/m2 per year, the worst performance in Western Europe.[13] However, a concern about high consumption of energy, particularly its impact on the air quality in the urban areas of Brussels, was growing within policy circles. It was this preoccupation with air quality that lead to the adoption of the first structural air quality improvement plan, *Plan d'amélioration structurelle de la qualité de l'air et de lutte contre le réchauffement climatique 2002-2010* (or Plan Air-Climat)[14] on November 13, 2002. Plan Air-Climat contained several provisions that dealt with energy efficiency and demand management, thus giving a push to policymaking in these areas.[15]

Despite these slow developments, energy issues did not firmly make it onto the regional policy agenda until 2004, when a new Regional government took office. The political discussions at that time did not include energy issues, however there was a realization that climate change is real, and that energy prices were about to skyrocket. There was a desire to act on energy efficiency, but not a clear idea of what is there to do. So, the government set facilitation services for anyone who had questions about energy (public and private companies, etc.).[16]

Thus, 2004 saw the adoption of a new regional policy that incorporated energy and environmental issues into the building sector. This new policy framework was directly motivated by a consensus among regional authorities that:

- Energy consumers were still not convinced of the significance of energy efficiency;
- Those that did wish to invest in energy efficiency did not always have the technical information required for demand-side management;
- Professionals who were called on were not fully competent to meet energy efficiency demand;
- Even if investment were viable, it still was not enough of a priority in resource allocation;
- Technical solutions that made use of renewable energy sources were still not well-

[12] See "Renewable Energy Policy Review, Belgium: May 2004," www.erec.org/

[13] Daoud, Ismaël. 2012. "Brussels goes passive: Adoption of Passivhaus as the Brussels EPB standard in 2015." Presentation at the *PassREg 2nd International Workshop*, *Brussels* (October 5).

[14] For the full text, see www.documentation.bruxellesenvironnement.be

[15] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 13, www.medemip.eu

[16] Hermans, Thibaud. 2012. Presentation at the PassREg 2nd International Workshop, Brussels (October 5).

known, and remained relegated to obscurity due to poor economic viability.[17]

As a result, the 2004 Brussels energy policy aimed to develop an energy-saving culture, to stimulate demand for energy efficiency, to provide expert technical support, as well as financial aid to consumers, and above all, to lead by example in matters of energy efficiency, and the use of renewable energy resources. The 2004 framework included: the legal framework for Energy Performance of Buildings (EPB), the integration of eco-construction elements (such as green roofs) into the building sector, financial incentives, public inter-agency cooperation to instill norms of eco-construction, free technical support, and a reference centre for technical training and professional development.[18] In order to implement the new policy, regional budgets were increased from € 3.6 billion in 2004 to € 16.7 billion in 2007, and the financial aid scheme from € 1 billion to € 11 billion between 2004 and 2007.[19]

As part of the 2004 policy framework, regional authorities initiated large-scale experiments to determine the ability of businesses, public services and citizens to realize highly energy-efficient projects.[20] Without such high level political commitment, the existing potential to embrace the passive standard may have gone unnoticed. Thus, the sustained engagement of the Brussels authorities at the initial stages of the process is a key factor in the Brussels model.

The Region officially committed to the passive standard only after having experimented with the first three calls for proposals for Exemplary Buildings. The success of the Exemplary Buildings program showed that passive standards are affordable, and do not raise renovation and construction costs to unacceptable levels.[21]

In 2006-2007, there were major climate disasters, such as hurricane Katrina, which sparked public awareness initiatives. In this context, the Brussels-Capital Region government decided to push for even further development of the local market. The effort was specifically targeted to younger professionals from the construction sector.

In 2007, the Passive Buildings idea started to take shape in Brussels, but not on such a high technical level as in Germany, which was good, because had Brussels applied the German model literally, it would not have worked. That is how BatEx emerged. If we

[17] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 13, www.medemip.eu

[18] http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Particuliers/02_Th%C3%A8mes/Climat_en_construction/04_Les_engagements_internationaux_de_la_R%C3%A9gion/03_Le_pacte_des_Maires/IF_CoM_ExamplaryBuildings_EN.pdf pg. 2

[19] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 13, www.medemip.eu

[20] http://eusew.eu/component/see_projectview/?view=see_projectdetail&projectid=7491&catId=5&pageNum=0&index=1

[21] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 5.

compare 2004 and 2009, it is clear that energy efficiency is on the government agenda, with very specific targets.[22]

Based on three rounds of successful trials with Exemplary Buildings (in 2007, 2008 and 2009), on July 12, 2009 the Brussels government passed an order imposing the passive standard on all regional new public buildings by 2010, and on May 3, 2011 adopted new energy target regulation for all new construction (housing, offices and schools) by 2015.[23] The EPB recast directive imposed the zero energy standard, and the "passive" standard became an important first step towards achieving the zero energy standards in insulation.[24]

The legislation installs:

- A net heating requirement of less than 15/kWh/m2/yr
- A net cooling requirement less than 15/kWh/m2/yr (only for offices and schools)
- An air tightness of 0,6 volume $.h^{-1}$
- An overheating over 26*C time -limited to 5%
- A primary energy consumption limited to:
  - 45 kWh/m2/yr for housing (heating, hot water, ventilation, pumps and fans);
  - 90 – (2,5 x compacity) for offices and schools.

For newer buildings with a better exposition (i.e. with easier access to natural light), it is easier to apply the passive standard. But this is not the case for older buildings with insufficient solar gains, too much solar shadow, bad compacity, etc. Thus, the rules for construction in the Brussels-Capital region have been adapted to reflect the situation of these disadvantaged buildings. The passive standard, adapted to reflect the particular situation of buildings with bad compacity or a bad orientation is under review at the time of writing, and should be approved by the Brussels government by the end of 2012.[25]

The calculation takes account of renewable energy devices installed in buildings (thermal and photovoltaic panel, heat pump, geothermal system, and biomass).

This new piece of legislation is the last piece of the strategy. Boosting the demand for passive building from the top down, and improving the supply (through such actors as the Employment-Environment Alliance) was a top priority. The second step was to move to a more horizontal model, encouraging grassroots solutions first with public buildings and

[22] Hermans, Thibaud. 2012. Presentation at the PassREg 2nd International Workshop, Brussels (October 5).
[23] Region de Bruxelles-Capitale – Brussels Hoofdstedelijk Gewest, Ministerie Van Het Brussels Hoofdstedelijk Gewest N. 2011 — 2445 [C − 2011/31430], May 5, 2011. See Article 5a and 6a. www.emis.vito.be. See also http://www.ejustice.just.fgov.be/cgi/article.pl
[24] Daoud, Ismaël. 2012. "Brussels goes passive: Adoption of Passivhaus as the Brussels EPB standard in 2015." Presentation at the *PassREg 2nd International Workshop*, *Brussels* (October 5).
[25] Daoud, Ismaël. 2012. "Brussels goes passive: Adoption of Passivhaus as the Brussels EPB standard in 2015." Presentation at the *PassREg 2nd International Workshop*, *Brussels* (October 5).

secondly with regulation. Finally, the legislation served as a timely warning for all developers, architects, and design firms who were preparing their applications for planning permission after December 31, 2014.[26]

At first, the market did not embrace the idea of going passive in 2015 – professionals thought the policy was moving too fast. There was insecurity and fear about certain aspects. For instance, real estate companies were very worried about airtightness tests. But in the end, all buildings submitted and successfully passed the airtightness tests.[27]

Despite a rocky start and a few obstacles in-between, the new "passive" legislation was eventually well received by the key stakeholders in the Brussels-Capital region. To appease rising fears and smooth out the implementation process, regional authorities relied in large part on their collaboration with the Employment-Environment Alliance (for details, see **3.2 The Employment-Environment Alliance**).[28]

Brussels officials explain that further advancements in low energy legislation will surely allow for different definitions of "energy-efficient building," depending on urban and rural settings, as well as on the type of building.[29]

The shift towards nearly zero energy legislation does not by itself explain how the Brussels-Capital region became a front-runner in low energy construction. The legislation changes were accompanied by a series of financial, consulting, and public support programs that offered a series of incentives to investors interested in saving energy. These will be described in detail in the following paragraphs.

1.2 Local Action Plans for Energy Management (P.L.A.G.E.)

A key premise of the Brussels model is that the first to adopt proper energy efficiency measures and practices should be the authorities. Such a "lead by example" approach is of particular importance in Brussels, where the share of public purchasing is significant. 15% of the Belgian GDP is allotted to public purchasing, and the Brussels-Capital Region alone generates 20% of the GDP.[30] Thus, without a *de facto* switch to passive building in the public sector, the overall success of the low energy construction legislation would remain highly questionable.

The Local Action Plans for Energy Management (P.L.A.G.E.) illustrate how authorities lead by example. P.L.A.G.E. programs are specifically targeted to public and private buildings with very high energy consumption that will not be renovated soon. The main underlying

[26] http://www.bepassive.be/intl/special01en/ pg. 18.
[27] Hermans, Thibaud. 2012. Presentation at the PassREg 2nd International Workshop, Brussels (October 5).
[28] http://www.bepassive.be/viewer/12/fr/ pg. 16.
[29] http://www.bepassive.be/viewer/12/fr/ pg. 16.
[30] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 10.

premise is that, according to recent research, the energy performance of certain buildings can be improved by 20-30% even without major investment. Thus, P.L.A.G.E. programs have the following objectives:

- To provide information on energy efficiency;
- To organize internal management around energy-efficient maintenance of facilities;
- To identify the potential energy savings and the priority actions, in particular through building audits;
- To raise awareness amongst occupants of how to behave;
- To involve energy efficiency in investment choices (new construction and renovation, refurbishment of facilities);
- To ensure transparency of information through the publication and promotion of a regular summary of results.[31]

Since 2006, P.L.A.G.E. has funded energy reduction measures and training of building administrators in the passive standard. The Region covers 50 to 100% of the expenses incurred for up to 3 years.[32] All P.L.A.G.E. applications are reviewed by a jury, consisting of:[33]

- 1 representative of Brussels - Environment;
- 1 representative of the Minister of Energy;
- 1 representative of the Secretary of state for housing;
- 1 representative of the Brussels Regional Housing Authority (SLRB) (for social housing project applications only);
- 1 external expert.

P.L.A.G.E. projects follow four phases of execution, which may be carried out simultaneously:[34]

- Create an energy consumption cadastre of the building complex. Thus, it is possible to identify the more problematic buildings, which clarifies the priorities for action.
- Establish a concrete action plan for those buildings that are considered top priority (usually because they are large energy consumers with an equally large potential to save energy).
- Carry out the action plan above.

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[31] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 15, www.medemip.eu

[32] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 10-11.

[33] See "PLAGE SISP 2011-2015: information (.ppt)," pg. 24, available at: http://www.bruxellesenvironnement.be/Templates/Professionnels/informer.aspx?id=32601

[34] See PLAGE Communes Info-Fiche, pg. 2, available at: http://www.bruxellesenvironnement.be/Templates/Professionnels/informer.aspx?id=32601

- Follow up with the regional authorities by reporting on progress in project implementation.

Energy consumption is closely monitored during project implementation. In addition, a *Responsable Energie* (energy consultant) is available to help with project implementation. It is the responsibility of the energy consultant to provide:[35]

- Methodological support;
- Assistance in putting together the energy cadastre;
- Help in setting up an energy accounting system;
- Assistance to staff members with energy audits;
- Facilitation of best practice exchanges;
- Assistance to managers on how to use the tools provided by Brussels Environment.

Thus far, 15 municipalities, 5 hospitals, 2 collective housing organizations, and the schools of the mandatory education system have benefitted from P.L.A.G.E. programs.[36]
The first round of P.L.A.G.E. projects was launched in 2006. In 2006-2009, seven municipalities participated: Anderlecht, Berchem-Ste-Agathe, Ixelles, Molenbeek-St-Jean, Schaerbeek, St-Gilles, and Watermael-Boisfort. The municipalities received a subsidy ranging between € 36.000 and € 130.000 (depending on the particularities of each application), divided amongst a total of 70 buildings.[37] The overall results from these seven municipalities in 2005-2009 are:[38]

- 15,82% less gas consumption;
- 4.3% less electricity consumption;
- € 1.326.000 saved;
- 2.574 tons of CO2 emissions avoided.

In 2007, five hospitals, representing a building complex of 483.000 m2, also received P.L.A.G.E. funds. Although project implementation was uneven across the board, the results were promising. The hospitals managed to lower electricity consumption by 0.6%, gas consumption by 14.3%, and to avoid 4.000 tons of CO2 emissions. These results are equivalent to 4.400 Brussels homes reducing their total consumption by 20% over three years.[39]

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[35] See "PLAGE SISP 2011-2015: information (.ppt)," pg. 14, available at: http://www.bruxellesenvironnement.be/Templates/Professionnels/informer.aspx?id=32601
[36] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 10-11.
[37] See PLAGE Communes Info-Fiche, pg. 1, available at: http://www.bruxellesenvironnement.be/Templates/Professionnels/informer.aspx?id=32601
[38] See PLAGE Communes Info-Fiche, pg. 5, available at: http://www.bruxellesenvironnement.be/Templates/Professionnels/informer.aspx?id=32601
[39] See PLAGE Hopitaux Info-Fiche, pg. 1, available at:

In 2008, collective housing buildings also received P.L.A.G.E. funds through the Public Social Action Centre (*Centres Publics d'Action Sociale*, or CPAS).

Given the potential for energy savings in schools, in 2009 the Region decided to disburse the funding needed for the implementation of P.L.A.G.E. projects in compulsory education establishments. The school projects are expected to run for a period 4 years. All school systems are represented, and could employ one or more energy consultants to help with project implementation. A limited but representative number of schools were initially selected. Provided these pilot projects go well, the initiative will be expanded. The goal is that, in time, all compulsory education schools in the region (around 600 establishments, spread over 800 sites) will also become pioneers in energy savings.[40]

In 2011, a new P.L.A.G.E. call for proposals targeting social housing was launched. The campaign focuses on the 33 Public Service Housing Associations (SISP) of the Brussels-Capital Region. Six full-time energy consultants will work with the selected SISPs, introducing a medium-term approach to active participation in energy savings in the social housing sector.[41]

To provide additional assistance, Brussels Environment has created a P.L.A.G.E. manual for building managers, as well as another one for energy consultants. Both manuals are accessible through the Brussels environment website.[42]

1.3 Brussels Regional Development Agency (*Société de Développement pour la Région de Bruxelles Capitale*, SDRB)

Created in 1974, the Brussels Regional Development Agency (SDRB) has a mission to facilitate the establishment of high value-added services to companies in the Brussels-Capital Region by providing real estate infrastructure at attractive prices. The SDRB acquires plots of land, which it makes viable and offers to businesses in the form of long-term leases. The organization also re-purposes former industrial sites as multi-purpose premises for economic activities that meet the needs of businesses, and puts them on the market at attractive rates. Currently, the SDRB manages a total area of nearly 200 ha with over 270 companies that provide approximately 18,000 jobs.[43]

In the past 25 years, the SDRB has emerged as a major actor in promoting eco-friendly construction. Through public-private partnerships, the SDRB builds housing for average-

[40] http://www.bruxellesenvironnement.be/Templates/Professionnels/informer.aspx?id=32601
[41] http://www.bruxellesenvironnement.be/Templates/Professionnels/informer.aspx?id=32601
[42] http://www.bruxellesenvironnement.be/Templates/Professionnels/Informer.aspx?id=32601
[43] http://www.pro-realestate.be/ecbp/ecbp.asp?id=136&L=

income families in neighbourhoods with a shortage of residential buildings. These families can thus obtain housing at 30% below the real estate market price.[44]

All houses the SDRB builds are either passive or low energy. Sustainable construction is a pillar of SDRB activity: the agency holds an Ecodynamic Company label since 2001 (for details, see **6.1 "Ecodynamic Company" Label**).[45] SDRB is also one of the two principal financing institutions of the "Exemplary Buildings" program.[46]

1.4 Brussels Regional Housing Authority (*Société du Logement de la Région de Bruxelles-Capitale*, SLRB)

A regional umbrella organization for 33 Public Service Housing Associations (SISPs), the Brussels Regional Housing Authority (SLRB) is in charge of low cost housing.[47] Its mission is to reduce the cost of occupancy (i.e. the sum of rent and energy bills), thereby providing the lowest possible cost to future occupants. Since 2010, the SLRB has incorporated sustainable development and low energy building standards as a major points in its strategic plan. Together with the SDRB, the Brussels Regional Housing Authority is a major financing institution of the "Exemplary Buildings" program.[48]

The following are some of SLRB's passive or low energy building projects:[49]

Project 1: A double-duplex building at 42 rue Loossens.
This project was a BatEx laureate in 2007. It envisions the construction of two large, "passive" apartments (both 4-5 rooms each). Heat losses are reduced to such an extent that, due to the insulation and airtightness of the building area, it can do without conventional heating. To meet the minimal heating needs (12 kWh/m2), a double-flow ventilation system with heat recovery, and a small heating battery, are enough. The only radiator in the bathroom is electric. The façades and roof are isolated with 40 cm of extruded polystyrene, the foundation is wood with triple glazing, and a sliding panel prevents overheating in summer. To make the building autonomous, there are 20 m2 of solar panels to satisfy hot water needs, and 70 cm2 photovoltaic panels to cover electricity needs. Each accommodation has a storage of hot water integrated into the bathroom. The project is considered to be a zero CO2 emission building.

Project 2: A 12-apartment complex at rue Georges Moreau.

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[44] http://www.pro-realestate.be/ecbp/ecbp.asp?id=136&L=
[45] http://www.brussels.irisnet.be/about-the-region/regional-bodies/societe-de-developpement-pour-la-region-de-bruxelles-capitale-sdrb
[46] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 15.
[47] http://www.slrb.be/la-slrb/nos-missions
[48] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 15.
[49] http://www.slrb.be/publications/articles/slrb-info-en-ligne/nb062/at_download/file pg. 15-18.

This project contemplates building 12 passive homes facing the street, as well as three low energy houses around an interior courtyard. Following a budget review, it was decided that the interior homes would be build in line with the “low energy” standard, due to the disproportionate additional costs that passive standards would require in this case. As regards the dwellings facing the street, the façades boast a partially prefabricated wooden skeleton, which ensures a reduction in installation and drying time. The building facing the street follows all the usual “passive” criteria. As to insulation, the timber frame façades are isolated with 30 cm of cellulose, the flat roof with 30 cm of mineral wool, and the floor above the porch, with 16 cm of extruded polystyrene. The triple glazing and frames will be selected in such a way as to ensure a superior performance. The risk of overheating will be reduced by the judicious placement of balconies and open spaces. A system of ventilation with heat recovery, and 40 m2 of solar panels for part of the production of hot water, will also be installed.

Project 3: Construction of an 8-unit building at 5-25 rue de la Plume.
The project consists of two separate buildings on a residual plot of land. It allows the creation of four private gardens for the ground floor dwellings, as well as an opening in the urban area (bringing light to the school located in the back). Each building contains four units: two duplexes on the ground floor parallel to the street, and two more on the floors perpendicular to the street. The four duplex superiors boast roof terraces, and extensive green roofs. The plot surface is almost entirely green, and provides a natural habitat for biodiversity. It also helps infiltration into the soil and the decongestion of sewers. In addition to this "green" aspect, the buildings meet the passive standard. To achieve this standard, the project focuses mainly on insulation. A 25-cm façade insulation, a 30-cm roof insulation and a high-performing frame allow the reduction of heat loss by 70%. Very small heaters will be installed in the living rooms in order to ensure thermal comfort. 50% of the hot water needs are covered by solar panels. Double flow ventilation with heat recovery, a condensing boiler, collective solar protection, and a rainwater recovery system complete this project.

Project 4: Construction of an 8-unit apartment building at 4-10 rue de Deux Tours.
This project responds both to the passive standard and the eco-construction standard. The eco-construction standard is achieved by paying particular attention to the choice of materials. Thus, the wood siding is made of locust, the façade siding is brick, the base is blue stone, and the supporting walls are sand-lime blocks. The project boasts gardens, extensive green roofs, and green walls. The “passive” aspect was achieved thanks to the installation of 16 cm of façade insulation, 22 cm of roof insulation, double-flow ventilation with heat recovery, a large thermal inertia of materials, and sunscreens against overheating. Heating energy consumption is limited to 14 kWh/m2/year. Solar panels cover 30% of hot water needs.

The SLRB was initially lagging behind at first in terms of regional energy policy.[50] From 2004 to 2009, there were big improvements. In 2009, a formal contract was signed between the SLRB and the Brussels Regional Government. As social housing constitutes approximately 8.3% of Brussels Capital Region housing overall, the goal of the Brussels authorities is to reduce the energy consumption of social housing tenants. To do so, the Region has devised a strategy in the form of a Management Agreement with the SLRB. According to the management agreement, the social housing sector must adopt passive house standards for all new construction, and low energy standards (60kWh / m² / year) for retrofit. Heritage projects can also be included in the low energy retrofit requirement. Project designers are obliged to use a book of standard specifications. PHPP calculation is imposed upon social housing projects. Initially, government policy met with resistance from the social housing sector, but eventually this problem was overcome.

The goals of the Regional Housing Plan are to create 5.000 new homes (3.500 of social housing and 1 500 middle). So far, the energy outcomes of the 62 Regional Housing Plan projects are, as follows:[51]

- EPB standard: 12 projects, 580 homes
- Low energy standard: 9 projects, 866 homes
- Passive house standard: 41 projects, approx. 2.360 homes
- Price of low energy and/or Passive House new construction (gross area above ground): 1.250 €/m² reference price (housing surface, common zone, access).

1.5 Sustainable Neighbourhood Contracts

In 1993, the Brussels-Capital Region initiated a policy of targeted interventions to renovate and improve traditional Brussels neighbourhoods. Since 2009, this initiative bears the name "sustainable neighbourhood contracts." Using a participatory approach, the regional authorities stimulate grassroots solutions to the environmental, social and economic challenges that are typical for Brussels' old quarters. Residents and neighbourhood users come together to propose, design, and carry out initiatives that improve their living environment. Among the types of implemented projects are: construction of public parks, production of low energy housing, energy savings, waste reduction and air quality initiatives, rationalization of consumption, and promotion of the neighbourhood heritage.

The first sustainable neighbourhood was bought in 2004 and low-energy homes were built on it. It took 6 years to obtain all the right licenses. As a result of this experience, the

[50] Brussels Regional Housing Authority (SLRB). 2012. Speed talks about "top down" measures in Brussels. Presentation at the PassREg 2nd International Workshop, Brussels (October 5).
[51] Brussels Regional Housing Authority (SLRB). 2012. Speed talks about "top down" measures in Brussels. Presentation at the PassREg 2nd International Workshop, Brussels (October 5).

authorities noticed two promoters in the Region who were really interested and believed in passive building. This was a stepping stone for launching the BatEx program 3 years later. Today, there is a large sustainable neighbourhood project underway, where 450 accommodation units will be built. Thanks to the experience authorities gathered with *BatEx*, they imposed maximum limits on urban and architectural requirements of construction projects.[52]

Since 2010, over € 60 million per year have been invested in such contracts, whereby the terms of references impose passive standards for new buildings and low to very energy standards for renovated buildings.

At the same time, since 2008 Brussels Environment has been promoting "Sustainable Neighbourhoods" call for proposals, which are addressed to inhabitants, and aim to stimulate local sustainable improvement initiatives. Each year, the top five proposals are awarded € 15,000 each.[53] The winners receive not only funds, but also a "basket of services" (e.g. nine training and awareness activities), an organiser (a specialist), and help with project follow-up and coordination. Brussels Environment also helps the winners promote their projects and raise awareness within the neighbourhood, as well as in the Region. By the end of 2012, the Sustainable Neighbourhoods Network will have 20 members.

To participate, neighbourhoods must respond to Brussels Environment's "Sustainable Neighbourhoods" call for proposals, which the regional authorities have organized since 2008. Each year, the top five proposals are awarded € 15,000 each.[54] Since 2010, over € 60 million per year have been invested in such contracts. The winners receive not only funds, but also a "basket of services" (e.g. nine training and awareness activities), an organiser (a specialist), and help with project follow-up and coordination. Brussels Environment also helps the winners promote their projects and raise awareness within the neighbourhood, as well as in the Region. By the end of 2012, the Sustainable Neighbourhoods Network will have 20 members.

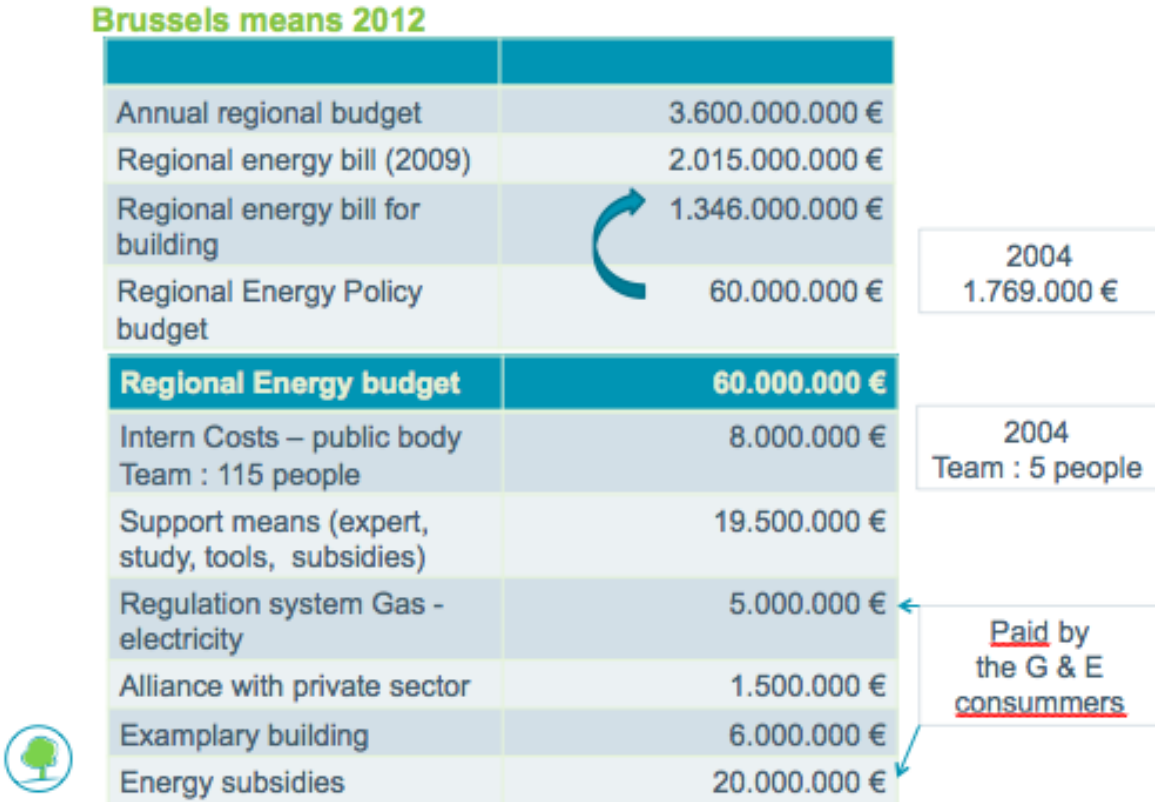
To take the initiative even further, regional authorities also provide a "Sustainable Neighbourhoods Facilitator," to support the construction of new neighbourhoods on vacant urban land.[55]

2. ECONOMY AND FINANCING

[52] The SDRB. 2012. "Speed talks about "top down" measures in Brussels." Presentation at the *PassREg 2nd International Workshop, Brussels* (October 5).
[53] http://www.sustainablecity.be/content/news-brussels/call-proposals-more-sustainable-neighbourhoods
[54] http://www.sustainablecity.be/content/news-brussels/call-proposals-more-sustainable-neighbourhoods
[55] http://www.sustainablecity.be/themas/sustainable-neighbourhoods

Compared to 2004, the current regional budget for helping households adopt energy saving measures is ten times larger.[56] The following figure details the regional energy policy budget:

Figure 1: Brussels Regional Budget and Energy Subsidies



The €60 million in financial assistance that the Brussels-Capital Region puts aside each year is deducted from the total energy bill of all energy consumers in the year. The private companies (energy providers) receive about €1.5 billion per year, of which they are obliged to return approx. 0.04% of the total energy bill amount to the Brussels Government. It is from that money that the financial help for environmental measures comes.[57]

The following section describes the main financial incentive instruments that Brussels regional authorities use to stimulate the market for low energy construction.

2.1 "Exemplary Buildings" (*BatEx*) Program

The "Exemplary Buildings" program (*Bâtiments Exemplaires*, or *BatEx*) is the main financial incentive instrument of the Brussels regional authorities to encourage demand for very high energy efficient construction. Since 2007, the region has organized five

[56] http://www.xpats.com/en/features/home-eco-housing

[57] Moreno-Vacca, Sebastian. 2012. Welcoming words: "Making Frontrunners Visible, Supporting Future Frontrunners (Part 2)." Presentation at the *PassREg 2nd International Workshop, Brussels* (October 5).

annual calls for proposals (with the exeption of 2010), disbursing ☐€ 5 million per year. By September 2012, 44 projects had been completed, representing 88.000 m2, and 44 projects were under construction, representing 99.000 m2. 15 projects have been rejected. During the fifth call for proposals in 2012, the regional authorities plan on disbursing €18 million in premiums, which correspond to an investment of €500 million of the construction sector.[58] The following paragraphs will outline the origins, development, and particulars of the *BatEx* program.

In 2006-2007, there were major climate disasters, such as hurricane Katrina, which sparked public awareness initiatives. In this context, the Brussels-Capital Region government decided to push for even further development of the local market. The effort was specifically targeted to younger professionals from the construction sector.

The change of government in 2009 was a real opportunity to launch the *BatEx* project. Brussels authorities worked very hard on fostering demand by designing a proper program, and providing adequate training to architects and other construction specialists.[59]

The exemplary building concept is not Brussels-born. It is a result of successful networking and policy exchange among regional authorities across the European Union. In 2006, Grégoire Clerfayt, manager of Energy, Air, Climate, Sustainable Construction and Economy at Brussels-Capital, recalls participating in in the IMAGINE initiative of Energy Cities. There, an official from the Franche-Comté region introduced Clerfayt to the principle of calls for proposals in the sustainable building sector. Clerfayt liked the concept of promoting the passive standard by an open competition. The idea was also embraced by Evelyne Huytebroeck, Minister of the Environment of the Brussels-Capital Region, who has subsequently become one of the most important political activists for energy efficient construction. Thus, in 2007 the Passive Buildings idea started to take shape in Brussels, but not on such a high technical level as in Germany. This approach was good, because had Brussels applied the German model literally, it would not have worked. Thus, as a result of the "Brusselization" of an idea borrowed from Germany, the *BatEx* program emerged.[60]

[58] http://www.bepassive.be/viewer/12/fr/ pg. 17.
[59] Hermans, Thibaud. 2012. Presentation at the *PassREg 2nd International Workshop, Brussels* (October 5).
[60] Hermans, Thibaud. 2012. Presentation at the PassREg 2nd International Workshop, Brussels (October 5).

The long-term objective of the *BatEx* program is twofold. On the one hand, Brussels-Capital wished to stimulate the supply for eco-construction (that is, to push the building sector towards producing more energy-efficient buildings). On the other hand, the authorities also aimed to increase the market demand. The short-term objective was to reach an initial critical mass of energy efficient buildings, which would be easily replicable and serve as an example for the future. To achieve these goals, Brussels-Capital works simultaneously on three fronts, as follows:[61]

- **Financial assistance:** providing funds for new construction and retrofit in line with the passive standard;
- **Technical assistance:** expert help for organizations involved in building or refurbishing passive houses;
- **Increased visibility:** raising the public profile of passive building owners and their designers.

At the time of launching the first *BatEx* call for proposals in 2007, the authorities had no clear idea of how the market would respond. Hence, the first edition of the calls for proposals served to test the capacity of the market. The intent was to avoid experimental architecture: the proposals had to be simple, efficient and above all affordable. No minimum performance standard was set in the first call for proposals – only a cap, and indicative targets. The authorities wanted to see what the market could do, and compare the results.[62]

Since 2007, Brussels-Capital has organized four annual calls for proposals (one per year, except in 2010).[63] So far, 294 candidates have submitted proposals, and 192 have been approved. Financed projects cover 470 000 m² of construction or renovations, of which 250 000 m2 are fully passive.[64]

Each year, the quality of *BatEx* applications has improved, and the goals have become more ambitious. For instance, while only 21% of the laureates in 2007 and 2008 complied with the passive standard, in 2009 63% of *BatEx* winners were fully "passive."[65] Upon completion of each edition of the calls for proposals, the technical requirements were

[61] http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Particuliers/02_Th%C3%A8mes/Climat_en_construction/04_Les_engagements_internationaux_de_la_R%C3%A9gion/03_Le_pacte_des_Maires/IF_CoM_ExamplaryBuildings_EN.pdf pg. 1.

[62] http://www.bepassive.be/intl/special01en/ pg. 50-51.

[63] http://www.bruxellesenvironnement.be/Templates/Particuliers/Niveau2.aspx?id=4626&langtype=2060

[64] Daoud, Ismaël. 2012. "Brussels goes passive: Adoption of Passivhaus as the Brussels EPB standard in 2015." Presentation at the *PassREg 2nd International Workshop*, *Brussels* (October 5).

[65] http://www.livios.be/fr/_build/_dozz/_build/_lowe/9907.asp?content=Bruxelles%20d%C3%A9gage%20une%20enveloppe%20de%205%20millions%20pour%2041%20projets%20en%20vue%20d%E2%80%99%C3%A9conomiser%20l%E2%80%99%C3%A9nergie

reviewed, improved, and updated for the next one.[66] This way, the lessons learned have been systematized, and used to constantly urge *BatEx* laureates to carry out superior performance projects.

The fifth (and most recent) call for proposals closed on June 28, 2012. 49 applications were received,[67] 28 of which were for new buildings, and 21 for retrofit. As for the types of buildings, 13 applications were for residential housing, (3.181 m2), 17 applications were for collective housing (59.660 m2), 6 applications were for the tertiary sector (88.349 m2), and 13 applications were for other housing with collective purposes (schools, childcare centres, senior homes, etc.)[68]

To be eligible for *BatEx* funds, projects must be located within the Brussels-Capital region, and comprise new buildings, retrofit, or a combination of the two. Furthermore, the buildings must have one of the following uses:[69]

- Housing: house, apartment, collective housing, or other;
- Teaching facilities (schools, preschools, childcare centres, etc.);
- Offices;
- Health facilities;
- Hotels;
- Seminar and cultural facilities;
- Sports facilities;
- Exhibition halls with systems for regulating the interior climate;
- Covered swimming pools.

To be approved, a proposal must adhere to four specific criteria:

- All new construction and renovation must be informed by passive standard guidelines (it must strive to be a zero-emission building);
- The project must prioritize the use of eco-friendly construction materials, and to consider natural cycles and biodiversity;
- The project must demonstrate a high architectural quality, good visibility, and a satisfactory level of integration into existing stock;
- Rather than a "high tech solution," the project must be simple and feasible in technical and financial terms, with reasonable payback timelines.[70]

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[66] http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Particuliers/02_Th%C3%A8mes/Climat_en_construction/04_Les_engagements_internationaux_de_la_R%C3%A9gion/03_Le_pacte_des_Maires/IF_CoM_ExamplaryBuildings_EN.pdf pg. 3.

[67] http://www.bepassive.be/viewer/12/fr/ pg. 10.

[68] http://www.bepassive.be/viewer/12/fr/ pg. 53.

[69] http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Particuliers/02_Th%C3%A8mes/Climat_en_construction/04_Les_engagements_internationaux_de_la_R%C3%A9gion/03_Le_pacte_des_Maires/IF_CoM_ExamplaryBuildings_EN.pdf pg. 2.

[70] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 4.

The *BatEx* project review procedure is as follows:

- External technical experts review all application files.
- A jury then evaluates all projects in view of the four eligibility criteria outlined above. The jury may request additional feedback from the technical experts.
- Successful candidates must sign a contract with Brussels Environment, which outlines commitments and obligations.
- The subsidies are paid out after the inauguration of the project.
- During the first 5 years, the winners of *BatEx* funds are obliged to submit regular energy consumption reports to Brussels Environment Administration.[71]

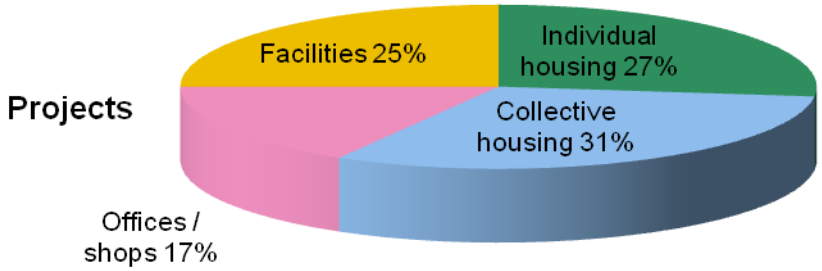
Approved candidates have 4 years to finish their projects. After construction is over, an inspection follows to evaluate the energy efficiency of the building, and the site is officialy labeled an exemplary building.[72] Winners also receive technical assistance and increased public visibility of their initiatives.[73]

The planned duration of the BatEx program is May 2007-December 2014, with a total budget of € 45 million.[74] Approved projects are awarded a subsidy of 100 €/m2, which is divided between the contracting authority (90 €/m2) and the developer (10 €/m2).[75] There is a subsidy cap of € 500.000 and € 100.000 for the contracting authority and the developer, respectively.[76]

So far, *BatEx* projects amount to € 24 million, invested into 354,000 m2 of new or refurbished passive buildings.[77] By October 2012, there were 52 finished projects, and 44 are under construction. Statistical data shows that by the end of 2010, 65% of *BatEx* funds had been invested in new construction, and 35% in retrofit. A look at the division of exemplary buildings per sector reveals that the tertiary sector has clearly won the largest amount *BatEx* funds, outstripping other types of housing:

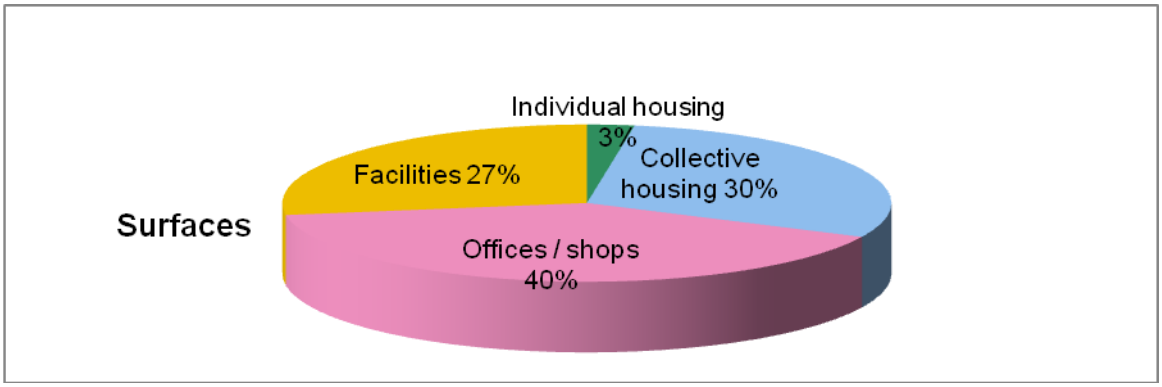
Figure 2: Types of BatEx buildings

[71] www.housingeurope.eu/www.housingeurope.eu/uploads/file_/agenda.pdf pg. 1.
[72] http://www.bepassive.be/viewer/12/fr/ pg. 51.
[73] http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Particuliers/02_Th%C3%A8mes/Climat_en_construction/04_Les_engagements_internationaux_de_la_R%C3%A9gion/03_Le_pacte_des_Maires/IF_CoM_ExamplaryBuildings_EN.pdf pg. 1.
[74] http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Particuliers/02_Th%C3%A8mes/Climat_en_construction/04_Les_engagements_internationaux_de_la_R%C3%A9gion/03_Le_pacte_des_Maires/IF_CoM_ExamplaryBuildings_EN.pdf pg. 1.
[75] www.housingeurope.eu/www.housingeurope.eu/uploads/file_/agenda.pdf pg. 1.
[76] http://www.bepassive.be/viewer/12/fr/ pg. 55.
[77] http://www.sustainablecity.be/content/news-brussels/39-new-%E2%80%9Cexemplary-buildings%E2%80%9D-brussels-region



Source: Hermans, Thibaut. 2012. "Exemplary Buldings: Sussess Stories From Brussels." Presentation at the *PassREg 2nd International Workshop, Brussels* (October 5).

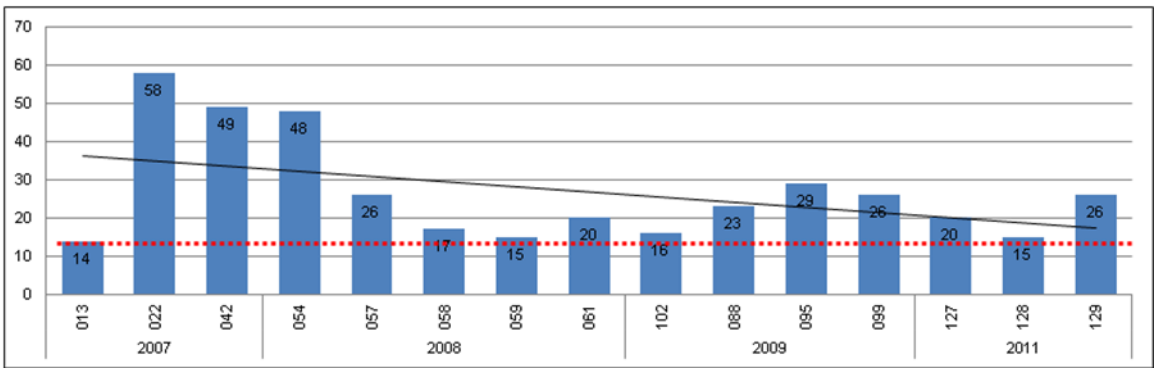
Figure 3: Surface Shares of BatEx buildings



Source: Hermans, Thibaut. 2012. "Exemplary Buldings: Sussess Stories From Brussels." Presentation at the *PassREg 2nd International Workshop, Brussels* (October 5).

The table below illustrates the evolution of passive building in the 2007-2011 period. By 2014, Brussels will have grown from 0 m2 in 2007 to well over 500,000 m2 of passive house construction.

Table 1: Evolution of Passive Building, 2007-2011



Source: Hermans, Thibaut. 2012. "Exemplary Buldings: Sussess Stories From Brussels." Presentation at the *PassREg 2nd International Workshop, Brussels* (October 5).

Interestingly, the most economically disadvantaged municipalities are among the most active in applying for *BatEx* funding.[78] Statistics show that the *BatEx* program is better known in low-income neighbourhoods where the residents are usually younger, than in richer and "older" communities.[79] At first glance, this may appear contradictory, not least because energy-efficiency renovations are expensive, and the benefits are not immediate. A significant proportion of end users have little incentive to invest in energy improvements. Most people in Brussels are either renting, or are "need buyers" (that is, buyers for whom purchasing a house comes out cheaper than paying rent, yet they are left with no additional funds for any energy-saving renovations). For these users, renovations may amount to 10% of the housing costs, but the lower energy bills will only come after 7-10 years. Understanding the need to reach these "need buyers" is a key success factor in the Brussels model.[80]

After the success of the first few *BatEx* calls for proposals, Studies have been launched to see if it is possible to build a passive skyscraper in Brussels.[81]

2.2 Energy Subsidies

Another key financial incentive instrument of the Brussels-Capital authorities is the energy subsidies system. It started with financial aid for solar panels in 2002, and was extended to close to 20 types of subsidies in 2007. The subsidies aim to cover part of the initial expenses necessary to make the transition to passive standards. 80% of the beneficiaries are individuals, but groups and businesses that wish to renovate buildings to reduce energy consumption and CO2 emissions are also eligible for these funds.[82] To

[78] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 8.
[79] http://www.bepassive.be/viewer/12/fr/ pg. 57.
[80] http://www.xpats.com/en/features/home-eco-housing
[81] Daoud, Ismaël. 2012. "Brussels goes passive: Adoption of Passivhaus as the Brussels EPB standard in 2015." Presentation at the *PassREg 2nd International Workshop*, *Brussels* (October 5).
[82] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 12

ensure equity among candidates, with a special focus on low-income families, the subsidies are adjusted according to household income.[83]

Below is a detailed description of the regional subsidies available in 2007, when the subsidy system was in its prime. Note that since 2012, the federal tax breaks, outlined in many of the subsidies below, have been eliminated (for details, see **2.5 Federal Tax Reductions for Passive Construction**).

2.2.1 Residential Subsidies[84]

Subsidy 1: Roof insulation for households
In general, most heat is lost through the roof. Therefore, careful effective insulation means a shorter heating season, reduced heating installation power, and a higher temperature of the interior walls. Consequently, energy bills can be significantly reduced and comfort increased while protecting the environment. There is a € 12 subsidy per m2 of insulated surface, with a € 1 000 ceiling per dwelling. It is also possible to benefit from a 40% tax deduction under certain conditions.

Subsidy 2: Roof insulation with green roofing for households
A green roof allows a building's temperature and humidity to be regulated naturally. It increases the building's thermal inertia and can improve its insulation. It provides a significant thermal effect in summer through evaporation meaning that occupants are not tempted to fit air conditioning. There are two types of green roofing: the intensive roof (or roof garden) and the extensive green roof (or vegetated roof). For extensive green roofing, the subsidy is € 7.5 per m2 of insulated surface, with a minimum of 10 m2 and a maximum of 100 m2 per dwelling. For intensive green roofing, the subsidy is € 15 per m2 of insulated surface, with a minimum of 10 m2 and a maximum of 100 m2per dwelling.

Subsidy 3: Insulation of external walls for households
After the roof, most heat tends to be lost through the walls. It is not always easy to insulate walls and it is sometimes better to enlist the help of a professional to assess and carry out the work. In existing constructions, there are three main ways to improve wall insulation: filling of existing cavity walls with an insulating material, wall insulation from the outside and wall insulation from the inside. There is a € 25 subsidy per m2 of insulated surface, with a € 2 500 ceiling per dwelling.

Subsidy 4: Floor insulation for households
The choice and laying of floor insulation are often a matter for an expert. There is a € 25 subsidy per m2 of insulated surface, with a € 2 500 ceiling per dwelling.

Subsidy 5: Super-insulating glazing for households

[83] http://www.sustainablecity.be/themas/sustainable-building
[84] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 26-30, www.medemip.eu

Despite their relatively small surface area compared to walls, windows are nevertheless a major source of heat loss. Compared to single glazing, efficient double-glazing reduces heat loss from glazed walls by more than two thirds. As the properties of the frame (in particular the material) also have a significant effect on the window's energy efficiency, the glazing and frame unit must be taken into account. There is a € 50 subsidy per m2 of double-glazing, with a € 2 500 ceiling per dwelling. At federal level, it is also possible to benefit from a 40% tax deduction for the cost of fitting double-glazing under certain conditions.

Subsidy 6: Mechanical ventilation with heat recovery for households
All houses must have adequate ventilation if you want the air inside to be healthy, to avoid the risk of condensation and, in certain cases, to have a sufficient quantity of air to ensure correct operation of combustion equipment. The subsidy is equivalent to 50% of the bill for supply and installation of the mechanical ventilation system, capped at € 3 000 per dwelling.

Subsidy 7: Passive/low energy housing (households)
The "passive house" concept applies to new dwellings in which the heat insulation is so effective that a conventional heating system becomes almost or even completely superfluous. The "passive house" does not exceed 15 kWh/m2 per year for heating the premises. The "passive house" concept also applies to renovation. However, in this case, as the existing situation does not allow for correction of building orientation and structure problems, the energy requirements will be less strict. In this case, we talk about "low energy house", where the performance level is set at 60 kWh/m2 per year of energy consumption for heating the premises. Generally speaking, there is a subsidy per dwelling of € 100 per m2 of floor area up to 150 m2 and of € 50 per m2 of floor area above 150 m2. This subsidy cannot be added to the 6 subsidies mentioned above.

Subsidy 8: External solar protection for households
Good protection against sunlight in summer, combined with appropriate ventilation, may avoid the need to fit air conditioning and increase comfort. The ideal solution is to install a solar protection system on the outside of glazing in the form of a blind or a shutter. The subsidy is 20% of the cost for supply and installation of the solar protection, capped at € 400 per dwelling.

Subsidy 9: Low-temperature (HR+)/condensation (HR TOP) gas boiler for households
A low temperature boiler is characterized by operation within water temperature ranges lower than for a traditional boiler, thus reducing energy losses and gas consumption. The condensation boiler, on the other hand, recovers a large proportion of the calories still available in the fumes, thus generating an even greater energy gain. The subsidy relates to boilers used for heating and mixed heating/hot water and amounts to 50% of the cost for supply and installation of the boiler, capped at € 150 per HR+ low temperature gas boiler and at € 500 per HR TOP condensation gas boiler. At federal level, it is also possible to benefit from a 40% tax deduction for the amount of the boiler installation under

certain conditions.

Subsidy 10: Instantaneous gas water heater for households
Savings are possible, in particular through the use of instantaneous bypass gas water heaters with no pilot light, in which the gas flow automatically adjusts to hot water demand. The subsidy is 50% of the cost for supply and installation of the water heater, capped at € 200 per installation.

Subsidy 11: Thermal control in households
Thermal control is a key component of a heating system. Thermal control ensures that a comfortable temperature is maintained as and when required in different rooms. Incorrect or inappropriate adjustment is a major source of loss of thermal comfort and energy waste. There are various equipment options for thermal control: air thermostat with clock, thermostatic valves and external sensor. The subsidy is equivalent to 50% of the cost of supplying and installing the control devices, capped at € 500 per dwelling. In addition to this subsidy, the Federal Government grants a 40% tax deduction of the cost of installing a control system (thermostatic valves, air thermostat, external sensor) under certain conditions.

Subsidy 12: Heat pump for domestic hot water in households
The heat pump is a machine that transfers the calorific energy of a cold environment to a warmer environment through the intervention of mechanical energy (compressor). Rather than producing heat by burning fossil fuels, the heat pump exploits the heat present in the environment: in the water, the ground and the air. Heat is most often distributed in the dwelling by a system of low temperature underground pipes (30-35 °C), which requires all walls to be well insulated. The subsidy is 50% of the cost for supply and fitting of the heat pump, with a cap of € 2 500 per dwelling for installation of a domestic hot water heat pump and € 5 000 per dwelling for heating of the premises. Alongside this subsidy, the State grants a tax deduction of 40% of the total for the installation of a heat pump under certain conditions.

Subsidy 13: Solar water heater for domestic hot water/for additional installation of central heating in households
Thermal solar collectors transform sunlight into heat. They are used with the solar water heaters to transfer the solar energy to the water. Combined systems are also available, which enable domestic hot water and some of the heating water to be produced with the solar collectors. This system does however need a larger surface area of panels. The radiators also need to have a larger emission surface area, because it is a low temperature system (55 °C). The subsidy amounts to 50% of the total cost for supply and installation of the solar water heater with a maximum of € 3 000 per dwelling for the installation of domestic hot water heating and a maximum of € 6 000 per dwelling for installation of domestic and additional water heating for central heating of the premises. In addition to the subsidy, the end user can not only benefit from a tax deduction of 40% of the total for installation of a solar water heater (without exceeding a ceiling and under

certain conditions), but also from a municipal subsidy.

Subsidy 14: Photovoltaic electricity production system for households
Photovoltaic solar collectors directly transform light into electricity. Given that the sun does not shine at all times, it is appropriate to either use a storage system or be connected to the grid to ensure a permanent supply. This second option is more appropriate to our urban environment: when electricity production is lower than consumption, current is taken from the grid and, conversely, the grid is supplied when demand is lower than production. To do this, the installation must meet certain technical conditions of compatibility and security. The subsidy is 50% of the cost for supply and installation of the photovoltaic system, capped at € 3 000 per dwelling. At federal level, there is also a tax deduction of 40% of the total for the installation of photovoltaic panels (up to a given ceiling). Moreover, for each MWh produced, a green certificate (CV) may be obtained. Green certificates are issued annually, by fraction and on a flat rate basis for panels less than 4 m2 according to the estimated electricity production.

Subsidy 15: A++ refrigerator (including combined) for households
Each household appliance is sold with a label or information sheet indicating the electricity consumption category (from A to G) to which the appliance belongs. Therefore, consumers are given objective, standardized information allowing them to choose equipment that has better energy efficiency. A category A household appliance is economical, while a category G appliance is not very economical. A "+" is added to category A to distinguish appliances that are even more economical. Category A++ designates a new generation of refrigeration equipment more economical than that in category A. This subsidy will partially cover the additional cost involved with buying an A++ appliance compared to category A. The subsidy is € 200 per A++ refrigerator.

Subsidy 16: A++ freezer for households
Category A++ designates a new generation of refrigeration equipment more economical than that in category A. This subsidy will partially cover the additional cost involved when buying an A++ appliance compared to category A. This subsidy is € 200 per A++ freezer.

Subsidy 17: Category A electric/gas tumble dryer for households
Drying laundry inside the home may cause humidity and hygiene problems. Heating the air and cooling it requires a lot of energy. It is not surprising therefore that tumble dryers are high energy- consuming machines. The vast majority of models have energy label C. Some more economical models are coming onto the market. Tumble dryers with label A are rather uncommon. The subsidy therefore seeks to make this more efficient category more accessible. Moreover, there are tumble dryers which operate on natural gas and which are much more efficient than electric tumble dryers. The amount of the subsidy will depend on the type of tumble dryer. Thus, € 200 will be granted for each category A electric tumble dryer and "400 for each gas tumble dryer.

In addition to the subsidies outlined above, under renovation subsidies arranged by the

Housing Department of the Territory and Housing Planning Administration, the Region offers subsidies, in the event of renovation of a building used for housing, for heat insulation, for work done to the building shell (rendering, cladding, frames and doors) and for installation of heating and hot water production systems. The content and amount of the subsidies are defined in Articles 8 to 10 of the ministerial decree relating to the conditions for application of the decree of the Government of the Brussels-Capital Region of 13 June 2002 on granting subsidies for housing renovation.

2.2.2 Collective Housing Subsidies[85]

Collective housing subsidies are available to the following stakeholders with an operating base, registered office, main establishment or management office in the Brussels-Capital Region: Public Service Real Estate Company (SISP), Communal Land Management Agency (RFC), CPAS (Public Social Action Centre), Social Real Estate Agency (AIS), and Joint Building Ownership with or without legal personality. Eligible buildings must have at least two dwellings. Eligible studies and investments must affect the whole of the building.

Subsidy 1: Energy audit for collective housing
The energy audit is a method that assesses the energy features of a building and its installations or those of a production process. The aim is, after creating a report of the energy consumptions of a building or a process taking into account its characteristics and its uses, to identify areas for energy efficiency improvement depending on technical and economic possibilities. The subsidy amounts to 50% of the cost of the study.

Subsidy 2: Feasibility study for collective housing
The feasibility study seeks to determine the design and the technical, energy and economic characteristics of a specific energy-saving investment without making any reference to a type or a specific brand relating to this investment. Specific investment is taken to mean any investment which does not correspond to equipment and installations currently in use and which requires a specific design study. Traditionally, this is a technical and economic study that assesses the benefit of installing a specific technology compared to a traditional or pre-existing technology. The subsidy amounts to 50% of the cost of the study.

Subsidy 3: Energy design study for a future collective housing building
An energy design study is an analysis of future energy consumptions of the building, prior to its construction, including any possible variations. It is carried out in particular by computer simulation. Its purpose is to optimize the characteristics of the building structure and the equipment installed as well as their suitability. It incorporates an assessment of future operating costs, so that the contracting authority may make choices based on overall costs (investment and operating costs). The subsidy amounts to 50% of the cost of the study.

[85] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 31-34, www.medemip.eu

Subsidy 4: Energy accounting for collective housing
Energy accounting enables energy consumption of a building to be monitored over time and clarification of the decisions to be made in terms of energy management of this building. It is an accounting system for energy fluxes, firstly to create a tool for making energy management decisions in particular through the collection, processing and communication of information relating to energy vectors consumed by each technical operation unit, by department or by use, secondly to establish consumption ratios and thirdly to raise the alarm where necessary and enable control of energy consumption deviations. The scale of the arrangements must be assessed according to the size of the building and its installations. The subsidy amounts to 50% of the cost for supply and installation of the equipment.

Subsidy 5: Cogeneration facility
The investments permitted are for high-quality cogeneration facilities, including the electrical connection required for the needs of a building or several neighbouring buildings. Trigeneration is not eligible. It is useful to consult the electricity distribution system operator on the technical connection and metering conditions applicable to private electricity generation facilities. All the equipment and implementation thereof must comply with applicable technical provisions that are available from Sibelga. The subsidy amounts to 20% of the total investment for high-quality cogeneration (including installation studies).

Subsidy 6: Relighting of collective housing communal areas
Relighting is a rational use of energy (RUE) technique to improve the lighting system of a room according to its use. Using this technique, users will have better lighting, will consume less energy, will need to use air conditioning less and will reduce their polluting gas emissions. In other words, their energy consumption will be improved.
The subsidy amounts to 30% of the invoice total.

Subsidy 7: ventilation/cooling for collective housing
All work involved with installing a speed regulator on ventilation compressors, pumps and systems benefits from this subsidy, which amounts to 20% of the cost for supplying and fitting the frequency regulator, with a cap of € 5 000 per substation.

Subsidy 8: Insulation of the building roof for collective housing
This subsidy works in the same way as Subsidy 1 for the residential sector. There is a € 12 subsidy per m2 of insulated surface, with a € 1 000 ceiling per dwelling.

Subsidy 9: Green roofing for collective housing
This subsidy works in the same way as Subsidy 2 for the residential sector. For extensive green roofing, the subsidy is € 7.5 per m2 of insulated surface, with a minimum of 10 m2 and a maximum of 100 m2 per dwelling. For intensive green roofing, the subsidy is € 15 per m2 of insulated surface, with a minimum of 10 m2 and a maximum of 100 m2 per

dwelling.

Subsidy 10: Insulation of external walls for collective housing
This subsidy works in the same way as Subsidy 3 for the residential sector. There is a € 25 subsidy per m2 of insulated surface, with a € 2 500 ceiling per dwelling.

Subsidy 11: Floor insulation for collective housing
This subsidy works in the same way as Subsidy 4 for the residential sector. There is a € 25 subsidy per m2 of insulated surface, with a € 2 500 ceiling per dwelling.

Subsidy 12: Super-insulating glazing for collective housing
This subsidy works in the same way as Subsidy 5 for the residential sector. There is a € 50 subsidy per m2 of double-glazing, with a € 2 500 ceiling per dwelling.

Subsidy 13: Mechanical ventilation with heat recovery for collective housing
This subsidy works in the same way as Subsidy 6 for the residential sector. The subsidy is equivalent to 50% of the cost for supply and installation of the mechanical ventilation system, capped at € 3 000 per dwelling.

Subsidy 14: Passive/Low energy collective housing construction
This subsidy works in the same way as Subsidy 7 for the residential sector. Per dwelling, there is a subsidy of € 100 per m2 of floor surface up to 150 m2 and € 50 per m2 of floor surface over 150 m2. There are various limitations to this subsidy.

Subsidy 15: External solar protection for collective housing
This subsidy works in the same way as Subsidy 8 for the residential sector. The subsidy is 20% of the cost for supply and installation of the solar protection, capped at € 400 per dwelling.

Subsidy 16: Pipe insulation for collective housing
There is a subsidy of up to 20% of the cost with a cap of € 5 000 per building.

Subsidy 17: Condensation boiler for collective housing
All work involved with installing a condensation gas boiler is eligible for the subsidy. The subsidy is € 10 per kW of rated power installed with a minimum of € 400 and a ceiling of € 10 000.

Subsidy 18: Instantaneous gas water heater for collective housing
This subsidy works in the same way as Subsidy 10 for the residential sector. The subsidy is 50% of the cost of supply and installation of the water heater, capped at € 200 per installation. The subsidy is aimed at the installation of individual instantaneous gas water heaters in collective housing. The subsidy is multiplied by the number of dwellings.

Subsidy 19: Thermal control for collective housing

This subsidy works in the same way as Subsidy 11 for the residential sector. The subsidy is equivalent to 50% of the cost of supply and installation of the control devices, capped at € 1 000 per boiler room.

Subsidy 20: Heat pump for collective housing
This subsidy works in the same way as Subsidy 12 for the residential sector. The subsidy is 50% of the cost of supplying and fitting the heat pump, with a cap of € 2 500 per dwelling for installation of a domestic hot water heat pump and € 5 000 per dwelling for heating of the premises.

Subsidy 21: Solar water heater for collective housing
This subsidy works in the same way as Subsidy 13 for the residential sector. The subsidy is 50% of the total costs for supply and installation of the solar water heater with a maximum of € 3 000 per dwelling for the installation of domestic hot water heating and a maximum of € 6 000 per dwelling for installation of domestic and additional water heating for central heating of the premises.

Subsidy 22: Photovoltaic collective electricity production system for collective housing
This subsidy works in the same way as Subsidy 14 for the residential sector. The subsidy is 50% of the cost of supply and installation of the photovoltaic system, capped at € 3 000 per dwelling.

2.2.3 Tertiary Sector Subsidies[86]

The subsidies for the tertiary sector and industry are available to the owners of public sector buildings in Brussels, non-commercial bodies, undertakings and the self-employed in the Brussels- Capital Region and federations representing a sector of activity.

Subsidy 1: Energy audit for the tertiary sector
This subsidy works in the same way as Subsidy 1 for collective housing. The subsidy amounts to 50% of the cost of the study.

Subsidy 2: Feasibility study for the tertiary sector
This subsidy works in the same way as Subsidy 2 for collective housing. The subsidy amounts to 50% of the cost of the study.

Subsidy 3: Energy design study for a future tertiary sector building
This subsidy works in the same way as Subsidy 3 for collective housing. The subsidy amounts to 50% of the cost of the study.

Subsidy 4: Energy accounting for the tertiary sector
This subsidy works in the same way as Subsidy 4 for collective housing. The subsidy

[86] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 38-40, www.medemip.eu

amounts to 50% of the cost for supply and installation of the equipment.

Subsidy 5: Cogeneration facility for the tertiary sector
This subsidy works in the same way as Subsidy 5 for collective housing. The subsidy amounts to 20% of the total investment for high-quality cogeneration (including installation studies).

Subsidy 6: Use of renewable energy tertiary sector
Investments eligible for the subsidy are for installations using energy from renewable sources and which are designed above all to meet the needs of the building. Renewable energies are understood to mean any energy source, other than fossil fuels and nuclear fission, the consumption of which does not limit its future use, in particular hydraulic energy, solar energy, geothermic energy, biogas, organic products and waste from agriculture and forestry arboriculture and the organic biodegradable fraction of the waste. This also includes the use of heat pumps insofar as there is a net gain in primary energy over the annual result of the installation. Before any private generation installation that can function in parallel, contact must be made with the electricity distribution network operator regarding the technical connection and metering conditions. The installation (equipment and implementation) must comply with applicable technical provisions (available from Sibelga). The subsidy is 40% (including studies) for the use of renewable energy sources.

Subsidy 7: Installation of a heat network for tertiary sector buildings
The subsidy is 30% of the cost of making an investment (including studies).

Subsidy 8: Heat insulation of tertiary sector building walls
This subsidy applies for all work carried out to achieve overall heat transmission coefficients for the walls lower than or equal to the reference threshold values. In addition, any investment in insulation must be accompanied by an analysis of the wall's future hygrothermal behaviour and information relating to the relative future humidity of the insulated premises (with potential suggestions for improving ventilation). The subsidy is 30% of the cost of making an investment (including studies).

Subsidy 9: Replacement or improvement of any tertiary building heating system
The system must fall within one of the following categories:

- Condensation boilers;
- Partitioning work on the heat distribution system (zone heating);
- Thermostatic valves suitable for the type of usage of the premises;
- Control systems;
- Any other work relating to heating installations that is designed so that the heating system (boiler, heat distribution and control) is particularly efficient, namely a system which, on the one hand, develops a higher level of energy efficiency than a traditional system and, on the other hand, enables heat distribution and control adapted to the principles of rational use of energy for the building's different uses.

The subsidy is 30% of the cost of making an investment (including studies).

Subsidy 10: Lighting systems for the tertiary sector
In order to benefit from the subsidy, replacement of the lighting system must meet certain conditions. On design, the choice of the lights and fittings to be fitted should be such that it cannot lead to an average level of lighting more than 20% higher than the requirements of Belgian standard NBN EN 12464-1 (NBN EN 12193 for sports facilities). The subsidy is 30% of the cost of making an investment (including studies).

Subsidy 11: Optimization of the lighting system operation in the tertiary sector
Investments eligible for the subsidy are those relating to timers, possible associated with sensors, in passageways, corridors and toilets; on-off or continuous control of the light level according to the natural lighting of the room; dual circuits for reduced lighting. The subsidy is 30% of the amount invested (including studies).

Subsidy 12: Rotating electrical equipment for the tertiary sector
This relates to any rotating electrical equipment (pumps, fans, compressors) with a motor fitted. As regards heating, ventilation or refrigeration installations, it must be fitted with automatic control suitable for the actual needs of the building and its occupants.
The subsidy is 30% of the amount invested (including studies).

Subsidy 13: Any ventilation and cooling equipment for the tertiary sector
The equipment must fall within a given category. The subsidy is 30% of the amount invested (including studies).

Subsidy 14: Any equipment or system for improving energy efficiency in the tertiary sector
The equipment must be particularly efficient, i.e. any equipment or system which develops a higher level of energy efficiency than normal and must fit with the principles of rational use of energy for the different uses of the building in question. The subsidy is 30% of the amount invested (including studies).

Subsidy 15: Energy efficiency actions in the tertiary sector
Any professional federation representing a particular Brussels sector may submit an application for a grant to cover 100% of any action that seeks to improve energy efficiency and the use of renewable energy sources for the benefit of a large number of institutions or stakeholders in their sector in Brussels. This may involve organization of a seminar or training session, conducting research, a support mission, creation of an information brochure, etc. The aim is to improve the energy efficiency, namely the reduction of primary non-renewable energy consumption to meet the final energy needs.

2.3 Evolution of the Subsidy System

In the past three years, the subsidy system has evolved, based on constant review and analysis of market adaptations and practices. For example, in 2010 Brussels regional authorities decided to reduce the subsidies for solar panels. The reasons for this decision were practical. On the one hand, 2009 saw a peak in applications for solar panel subsidies, yet the panels were often installed on badly isolated buildings, which significantly decreases performance. On the other hand, the cost of solar panels decreased with time. As a result, Brussels authorities decided to reduce (but not to eliminate) the solar panel subsidies. Instead, the idea is to place more emphasis on construction improvements, such as insulation subsidies.[87]

On July 19, 2012 the Brussels Regional government decided to augment some regional energy subsidies, effective immediately. The decision came in response to the abrupt move on behalf of the Federal Government to eliminate tax breaks for energy-efficient buildings.[88]

The policy change affects the following subsidies:[89]

- The exterior wall insulation subsidy was doubled, reaching 110 €/m2;
- The double glazing subsidy was tripled, reaching 130 €/m2;
- The condensing boiler subsidy was doubled, reaching 1 600 €;
- The heat pump subsidy was doubled, reaching 4 750 €;
- The solar water heater subsidy was increased by 50%, reaching 3 500 €.

The recent increase in energy subsidies, aimed at avoiding a crisis in passive construction, once again illustrates one of the key success factors in the Brussels model: a high-level commitment of the regional government.

2.4 Green Loans

Also part of the 2004 policy framework package, the green social loan (*prêt vert social*) is a zero-interest loan provided to individuals who wish to isolate their homes, thereby reducing energy consumption in line with the passive standard criteria. CREDAL, a credit cooperative based in Brussels, provides the funds, while Brussels Environment acts as an intermediary.

The loans are specifically targeted to low-income families, for whom the burden of increased renovation costs is the heaviest.[90] For low-income families, house renovations

[87] http://www.livios.be/fr/_build/_dozz/_build/_lowe/9681.asp?content=Bruxelles%20croit%20en%20la%20construction%20passive

[88] http://www.bruxellesenvironnement.be/Templates/news.aspx?id=31981&langtype=2060

[89] http://www.lalibre.be/actu/bruxelles/article/750948/de-nombreuses-primes-energies-vont-etre-doublees-a-bruxelles.html

[90] http://www.sustainablecity.be/themas/sustainable-building

to improve energy efficiency are not an attractive investment, because the initial costs are high, and the benefits (in the form of a lower energy bill) are slow to come. In this context, the green social loan aims to offset some of the initial insulation costs. Both homeowners and leaseholders can apply for loans in the range of 500 € to 20,000 €.

Green loans are granted for two types of house renovations:[91]

1) Insulation: roof, exterior walls, sun, super-isolating windows, and controlled mechanical ventilation;

2) Effective heating: gas-condensing boilers, gas instantaneous water heaters, and thermal regulation devices (thermostatic valves, room thermostats).

The specific conditions to apply for a green loan are as follows:[92]

1) To possess a net monthly income of 1.088 € for individual candidates / 1.484 € for couples; or brute annual income of 30.000 € for individual candidates / 60.000 € for couples;

2) To accept the granting conditions of Brussels Environment;

3) To repay the loan within the following periods, depending on the amount of the loan[93]:

- 500 € - 18 months
- From 501 € to 2.500 € - 24 months
- From 2.501 € to 3.700 € - 30 months
- From 3.701 € to 5.600 € - 36 months
- From 5.601 € to 7.500 € - 42 months
- From 7.501 € to 10.000 € - 48 months

As an instrument especially tailored to ensure buy-in from the most vulnerable social group, the green social loan is an integral element of the Brussels success model.

2.5 Federal Tax Reductions for Passive Construction

In 2009, the Federal Government offered tax breaks for efficient buildings. Thus, a building defined as “low-energy” obtained a tax reduction of € 420, a passive building - € 850, and a zero-energy building € 1.700. The tax breaks were valid for a period of 10

[91] See the green social loans flyer, available through http://www.bruxellesenvironnement.be/Templates/Particuliers/informer.aspx?id=3026
[92] See the green social loans flyer, available through http://www.bruxellesenvironnement.be/Templates/Particuliers/informer.aspx?id=3026
[93] http://www.credal.be/index.php?option=com_content&task=view&id=51&Itemid=64

years, and were renewable annually, provided that the building continued to adhere to passive construction guidelines.[94]

However, in November 2011 the Federal Government eliminated federal tax breaks for low energy buildings. Consequently, the probability for passive construction in the Brussels-Capital Region plummeted. By June 2012, the demand for energy subsidies was 50% lower, in comparison with the previous year.[95] Aiming to compensate for the loss of federal subsidies, the regional government of Brussels doubled certain energy subsidies (see **2.3 Evolution of the Subsidy System**).

3. KEY STAKEHOLDERS INVOLVED

3.1 Sustainable Building Facilitator Network

For those individuals, groups or businesses that wish to build or renovate in line with passive standards, the Region has provided a network of support specialists (facilitators) since 2008. Since 2011, this specialist network service has been centralized under Brussels Environment under a new name: Sustainable Building Facilitator Network (*Facilitateur Bâtiment durable*).[96]

All facilitators are renowned professionals with ample experience and an established expertise in the area of energy efficiency. Their mission is to offer impartial, independent consulting services on energy consumption management, rational use of energy (RUE) and promotion of renewable energy, at every stage of a project.[97] While they do not replace the architect, the design office or the installer, they provide free-of-charge guidance and recommendations in all areas related to management, renovation or construction of passive buildings.[98]

The facilitators are experts in the following areas:

- Tertiary building sector;
- Collective housing;
- Eco-construction;
- Renewable energy;

[94] http://www.questionscapitales.be/2011/que-vous-rapporte-fiscalement-une-maison-passive/
[95] http://www.7sur7.be/7s7/fr/3007/Bruxelles/article/detail/1473072/2012/07/20/Des-primes-energie-revues-a-la-hausse-a-Bruxelles.dhtml
[96] http://www.ceraa.be/index.php?rub=le-facilitateur-eco-construction-de-la-region-de-bruxelles-capitale
[97] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 15, www.medemip.eu
[98] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 12.

- Cogeneration;
- The legal framework for Energy Performance of Buildings (EPB);
- Passive building.

Facilitators offer the following services:[99]

- Technology and supplier information;
- Identification and assistance in compiling administrative files for financial aid;
- Top-level technical expertise with permanent telephone and e-mail support, critical review of specifications, supervision of research and specific guidance (namely closer monitoring of certain project sponsors);
- Information on energy-related tools;
- Guidance at the different stages of an "energy" strategy;
- Help with energy analysis of buildings;
- Supervision of construction and renovation projects;
- Comparison of commercial offers for any energy installation.

Facilitators are classified according to their mission and activities, as follows:[100]

- **Collective housing facilitators**: deal with managers of collective public housing, apartment blocks or co-ownerships. In addition to the services mentioned above, they provide: comparison of bids for lighting, heating and domestic hot water production systems, review of feasibility studies, and review of specifications.

- **Tertiary sector facilitators**: deal with private or public institutions (hospitals, rest homes, office buildings, swimming pools, schools, businesses, service companies, etc.)

- **Cogeneration facilitators**: deal with large buildings: offices, swimming pools, hotels, collective housing, etc. It provides methodological assistance in project management, cogeneration design and financial viability assessment. In Brussels, there is particularly cost-effective and underexploited potential.

- **Renewable energy facilitators**: provide assistance with renewable energy tools and services, especially for large projects (for instance, a thermal solar installation with more than 25 m! of panels). Smaller projects consult with the non-profit organisation APERE(*Association pour la Promotion des Énergies Renouvelables*).

- **Green building facilitators**: highly specialized experts that target the construction sector. Green building facilitators offer consulting in all areas of eco-construction.

[99] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 16, www.medemip.eu
[100] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 16, www.medemip.eu

Their mission is to promote the green building tools of Brussels Environment, to raise awareness of green building, and to push green building forward by identifying obstacles and proposing adequate solutions.

- **Eco-district facilitators:** offer consulting to a wide range of public and private actors (architects, designers, investors, as well as municipalities), on making their district sustainable.

For a list of past and future facilitator seminars and presentations, see: http://www.bruxellesenvironnement.be/templates/news.aspx?id=33400&langtype=2060&site=pr

3.2 The Employment-Environment Alliance

The Employment-Environment Alliance (*Alliance Emploi-Environnement,* or AEE) is an example of how the Brussels government stimulates the market from the top, yet all the way placing a premium on bottom-up solutions. The creation of AEE embodies the decision of the regional authorities to adopt a new working method. Instead of defining priorities and imposing respective solutions from the top, the government calls on key stakeholders to propose solutions.[101] The AEE comprises professional organizations, unions and other organizations working in the area of environmental protection. It operates on the basis of a participatory approach. The members draft open collaboration proposals while sharing information and best practices. [102]

AEE arose as a response to the exploding demand for eco-construction in the Brussels-Capital Region.[103] It acts on two levels: one intended to stimulate demand (in progress), the other intended to support the development of supply.[104]

To this end, AEE mobilizes and coordinates the activities of public, private, and non-governmental actors along a shared goal: the development of economic industries related to the environment. Sustainable construction is one of the three major work axes of the Alliance.[105] The overarching goal of AEE is to stimulate the most promising economic sectors in terms of growth and employment, and to support them in their transition towards more sustainability, thereby improving the competitiveness of companies and enhancing the employability of Brussels residents, including low-skilled workers.[106] Quality job creation in sustainable construction, mainly for masons, chapistes, façade

[101] See Evelyne Huytebroeck's speech from October 14, 2010, available at: www.evelyne.huytebroeck.be
[102] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 14.
[103] http://www.sustainablecity.be/themas/sustainable-economy
[104] http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Professionnels/Themes/Emploi_et_%C3%A9conomie/07_Alliance_Emploi_Environnement/ficheactions_fr.pdf pg. 13.
[105] http://www.brusselsgreentech.be/en/component/k2/item/136
[106] http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Professionnels/Themes/Emploi_et_%C3%A9conomie/07_Alliance_Emploi_Environnement/ficheactions_fr.pdf pg. 3.

builders, roofers, carpenters, glaziers, heating and sanitation specialists (installation and maintenance), electricians, architects, and technical engineers, is one of the organization's main goals. Specifically, the Alliance strives to generate 2.500 new jobs.[107]

The work of AEE can be divided into three different stages:[108]

- **Stage 1: Analysis.** At this first stage, the goal is to identify the potential total employment, on the basis of available studies, current projects and contacts with field operators.

- **Stage 2: Development.** During the development phase, joint public-private working groups will be established. They will focus on priority projects estimated in this sector.

- **Stage 3: Implementation.** During the implementation phase, planned actions will be carried through. The process includes a review by a monitoring committee.

AEE's Action Plan for 2012 outlines the main areas of action and working methodology of the organization, as follows:[109]

Professionalization: The first conversion propeller of the sector towards more sustainable construction is the acquisition by entrepreneurs, managers and workers alike, of a higher level of professionalization. In this area, the Employment-Environment Alliance is to take the following actions:

- Develop benchmarks of more environmentally friendly techniques, and materials for the construction sector;
- Create a "one-stop-shopping" webpage, making information on all aspects of sustainable construction available to all interested parties;
- Expand the professional development training offer, particularly for independent persons, very small enterprises, and other collaborators;
- Elaborate a training module on insulation-airtightness-ventilation, targeting sector professionals;
- Constitute a value chain of companies able to meet market demands;
- Establish and support clusters (vertical and horizontal) of companies able to meet the quality requirements of the market environment;
- Customize and make more more accessible the support services of Brussels Region Public Employment Organization (ACTIRIS) to companies, especially in matters of employment;

[107] http://www.bruxellesenvironnement.be/templates/news.aspx?id=28961&langtype=2060&site=pr

[108] http://www.res-sources.be/bruxellesallianceemploi-environnementaxed%C3%A9chetscestparti

[109] http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Professionnels/Themes/Emploi_et_%C3%A9conomie/07_Alliance_Emploi_Environnement/ficheactions_fr.pdf pg. 15-19.

- Strengthen and improve regional assistance for companies already active or engaging in sustainable construction;
- Mobilize Social Economy regarding promising niches of low-qualified work in the field of sustainable construction;
- Organize the improvement of services offered by social economy enterprises.

Employee training: To move towards sustainability, companies will have to adapt and improve the skills of their employees. This is because sustainable construction by itself does not automatically lead to the creation of new professions. Rather, existing professions have to adapt to new ways of working. To speed up the conversion of the sector, and to ensure a high level of technical quality, companies will need to resort to providing professional development opportunities to their workers. Thus, the Employment-Environment Alliance commits to:

- Study and create two instruments that facilitate access to business training, namely: a sustainable construction "Catalyst Fund," and "professional development cheques";
- Create a platform to identify the professional development needs of businesses, and stimulate companies to take advantage of training opportunities;
- Adapt training benchmarks to the challenges of sustainable construction;
- Create a network of training operators active in the field of sustainable construction;
- Establish a strategy to increase the number of trainers in sustainable construction (with priority: insulation, airtightness specialists), and ensure constant training of the trainers;
- Develop an insulation-airtightness training module for professionals;
- Extend the supply of professional development opportunities to independent persons, very small enterprises, and others.

Sales: The challenge for a company that already decided to engage in sustainable construction is to carry out its first project, which helps evaluate its mastery of the processes and techniques of implementation, establishes a network of suppliers, and identifies real risks and real sources of additional costs related to sustainable construction. Governments can support companies in their sales in several ways, for instance by introducing specific clauses in public procurement. The Employment-Environment Alliance commits to:

- Promote the Ecobuild Cluster among individuals;
- Constitute a value chain of companies able to meet market demands in Brussels;
- Establish and support clusters (vertical and horizontal) of companies able to meet the quality requirements of the market;
- Mobilize Social Economy regarding promising niches of low-qualified work in the field of sustainable construction;

- Create an "information packet" on all regional aids for sustainable construction;
- Analyze the implementation of systems for declaration of environmental performance of building materials (EPD);
- Have a tool to use environmental information, in line with the “life cycle” approach;
- Reinforce the “lead by example” approach of the regional authorities in introducing verifiable environmental performance requirements in public procurement;
- Introduce environmental clauses in the Contract documents for construction and renovation;
- Develop guidance tools (checklists, standard specifications and datasheets) for construction works most frequent among individuals (insulation, replacement boilers and chassis).

Honouring of Commitments: Once the sale is completed, the company will honor its commitments, which means ensuring a comfortable and fast access to the materials and instructions for implementation, as well as uncovering new techniques and new materials, with the efforts of research and innovation these actions imply. This, the Employment-Environment Alliance aims to:

- Stimulate innovation;
- Provide a platform for research in sustainable construction;
- Promote research and innovation in the renovation of existing buildings;
- Promote research and innovation in the field of materials for sustainable construction;
- Define and mobilize tools for research and innovation for small projects;
- Constitute a value chain of companies able to meet market demands in Brussels;
- Establish and support clusters (vertical and horizontal) of companies able to meet the quality requirements of the market;
- Mobilize Social Economy regarding promising niches of low-qualified work in the field of sustainable construction.

Gaining market recognition: Companies that have capitalized on their first experiments, and can be regarded as competent in the field of sustainable construction, must be recognized as such on the market. Here, the contribution of the Alliance is to set up a visible and recognized set of labels. The Employment-Environment Alliance will:

- Label the actors (companies and professions);
- Reinforce the “lead by example” approach of the regional authorities in introducing verifiable environmental performance requirements in public procurement.

Company growth: A company that has successfully moved towards sustainable construction should logically grow, given the increasing demand for sustainable goods and services. Managing growth is not easy, as many companies have encountered too many unexpected costs that grow too fast. The Employment-Environment Alliance will:

- Help companies manage their growth and transformation through promotion of existing support tools;
- Strengthen and improve regional assistance for companies already active or engaging in sustainable construction;
- Expedite a study of space access (installation, storage, etc.) for companies in sustainable construction

Investment: Companies must be able to finance their growth, and to access funding mechanisms and information. The Employment-Environment Alliance will:

- Create a permanent credit information mechanism for sustainable construction companies;
- Create an "information packet" of all regional aids for sustainable construction;
- Facilitate access to credit for businesses that initiate and or are active in sustainable construction;
- Foster the creation of social economy enterprises active in sustainable construction through financial incentives on startup

Recruitment: Through the training of job seekers but also of youth in secondary education system, companies must make sure that their future employees meet the new requirements of the construction sector. In this area, the Employment-Environment Alliance will:

- Organize pilot projects in education institutions in Brussels;
- Create a "week of sustainable construction professions";
- Organize a "launching the schools and sustainable construction initiative" roundtable;
- Deploy a strategy for teacher training;
- Organize visits of construction sites and businesses for students;
- Raise awareness of sustainable construction in schools and training centers;
- Adapt training benchmarks to sustainable construction;
- Establish a mapping of education stakeholders;
- Create a Joint Working Group, to discuss content material in educational institutions;
- Develop an insulation-airtightness training module for job-seekers;
- Establish a strategy to increase the number of trainers in sustainable construction;
- Improve the matching between supply and demand of the labor market in the area of sustainable construction.

In addition, the Employment-Environment Alliances engages in the following overarching activities:

- Establish an annual scoreboard of the construction sector (state of the market, employment, training, education, government financial aid) for actors involved in the development of sustainable construction;
- Constitute a technical committee to facilitate technical and pedagogical transfer of know-how;
- Build a common glossary for Brussels-Wallonia-Flanders.

3.3 Brussels Enterprise Agency (BEA)

The Brussels Enterprise Agency (BEA) is another initiative of the Brussels government authorities, created in 2003. Its purpose is to provide free, unbiased information and consulting services to individuals interested in starting a business in the Brussels-Capital Region.

In addition, the BEA collaborates closely with innovative businesses that show particular promise, and are deemed important for the Region. Green building and green technologies are considered areas of crucial importance, where BEA offers substantial project support.[110]

For instance, in November 2006 the BEA created the **Ecobuild Cluster** – an eco-construction cluster in Brussels that works as an interface for more than 50 businesses. The goal of the cluster is to serve as an umbrella organization for the complete range of Brussels-based sustainable construction actors.[111] The Cluster members are organized in the following seven categories:[112]

- Architecture firms;
- Engineering and building services and equipments firms;
- Contractors;
- Sustainable material and product producers or merchants;
- Property developers;
- Renewable energy companies;
- Partners (universities/research centres/non-profit associations).

Among the services provided by the Cluster are: strategic networking, information and best-practice sharing (through presentations and seminars), promotion of the enterprises, and opportunities to work with partners abroad.

[110] http://www.brussels.irisnet.be/about-the-region/regional-bodies/agence-bruxelloise-pour-lentreprise-abe
[111] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 14.
[112] http://ecobuild.b2b-match.com/index.php?page=cat_par&params[id]=132

3.4 Plateforme Maison Passive (PMP)/ Passiefhuis Platform (PHP)

Plateforme Maison Passive (PMP) and *Passiefhuis Platform* (PHP) are sister non-profit organizations, leaders in the promotion of energy-efficient construction.[113]

Plateforme Maison Passive **(PMP)** works in the francophone part of Belgium. 31 individual members and 22 enterprises, all concerned about energy efficiency, founded PMP in 2006. Its mission is to raise public awareness about the passive standard, to offer professional development opportunities and consulting services, to certify passive and zero-energy buildings, and to set standards related to energy in construction.[114]

One of PMP's main activities is to consult individuals and groups on passive building. In Brussels, the first session is free of charge, while the cost of any additional sessions depends on the type of construction project that the clients are interested in (tertiary or residential). In the Waloon region, PMP's services are free of charge. PMP also provides a wide variety of basic and advanced professional development opportunities related to the passive standard.

Currently, PMP offers professional development courses in the following areas:

- Summer internships (for professionals in the construction industry);
- Passive Building (beginner and advanced courses) for the residential and tertiary sectors;
- Use of WUFI software;
- Dynamic simulation;
- Use of PHPP software;
- Use of Therm software.

Passiefhuis Platform **(PHP)** was founded in 2002, and serves the Flemish part of Belgium. Its mission and activities closely mirror those of PMP. PHP's membership body includes leading actors in the building industry: individuals, firms and institutions committed to sustainable construction and energy-efficient technology development.

The goal of PHP is to stimulate the construction of buildings with very low energy requirements, based on the passive house concept. On the one hand, PHP acts as a hub of companies involved in the passive house concept. On the other hand, PMP provides as much information as possible to all parties interested in energy-efficient construction.[115]

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[113] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 8-13.

[114] http://www.maisonpassive.be/?-Presentation-de-la-PMP-

[115] Email correspondence with Irena Kondratenko, Research Projects Coordinator, Passiefhuis-Platform. August 23, 2012.

The principal activities of PHP include:[116]

- Promotion of the passive house standard: especially in the house-building and tertiary sectors. This includes granting quality certificates to recognize potential, as well as completed passive construction projects;
- Professional consulting on how to carry out passive housing projects;
- Documentation of passive houses, as well as publications on passive building;
- Funding of innovative passive construction ideas and technologies.

PHP's target audience is multi-disciplinary, and includes members of architects, builders, engineers, consultants, local governments, and companies building sector. Currently, PHP has 15 staff members: technical advisors, R&D experts, communication and events experts, and administrative support.

4. PLANNING AND DESIGN CAPACITY

4.1 Courses in higher education institutions: involvement of all stakeholders

Since the passive standard became a compulsory norm in the Brussels-Capital Region, there arose a need to train building sector professionals via universities, vocational schools, and various training centres. Nowadays, there are a few training initiatives for passive house and NZEB. Some are organized by Brussels Environment, some by PMP/PHP, and others at different training centres and educational facilities in the Brussels region. A broad-spectrum commitment is the only way to ensure that all the sector's stakeholders receive the necessary training. As part of the "standardisation" of the passive standard, it is essential to work via partnerships with all stakeholders concerned: federations, training centres, associations, universities, vocational schools, etc. What remains to be done is to extend the training program to secondary and primary schools.

In relation to the bulk of the project and the standardisation of the compulsory passive standard, the sector has already reacted by requesting the introduction of certification and quality insurance process.

The quantity and diversity related to know-how about the passive standard require the integration of the quality control processes that already exist for all public buildings (in Brussels Region) or on a voluntary basis in the private sector. Thus, current control bodies have assimilated the passive standard.

[116] "Passiefhuis-Platform vzw: The reflex for passive and low energy architecture." Flyer provided by Irena Kondratenko, Research Projects Coordinator, Passiefhuis-Platform. August 23, 2012.

There are European norms for training and execution of the work (NBN EN ISO/IEC 17020:2004 replacing EN 45004) and certification of persons (NBN EN ISO/IEC 17024). Launching the CoQual label (construction quality certification) has been a Belgian national initiative.

In 2009, Brussels Environment decided to develop a professional development program for conceptors, engineers, architects, and contracting authorities. A core premise of the training is a very good conception of a building. Thus, in the Brussels-Capital Region, PMP introduced training for designers in 2005, and for builders in 2007. Today, the training program involves the entire sector (developers, investors and promoters, building managers, property managers, notaries, maintenance companies, etc.) With the help of experts, Brussels Environment spends 18.000 training hours each year on topics of energy, material, water management, biodiversity, land use, and comfort, among others.[117] PMP's training program enables contractors to talk (train) other contractors, investors to talk (train) investors, etc.

PMP has also been very active in organizing a variety of training courses. Passivehouse training at PMP is tailored to the client: this is necessary because, for instance, tertiary sector clients have different needs from private individuals. For the tertiary sector, PMP has created specific guidelines. PMP officials consider that tailoring training programs is as important as it is appreciated. Awareness raising is also crucial, because many misconceptions persist about passive houses.

In PMP training, there are designer and construction cycles (standard), as well as advanced cycles, so as to suit participants who come into the trainings from different levels. There are also targeted training sessions, which cover very specific topics, as well as personalized guidance (personal sessions), and roundtables with a variety of stakeholders. But training clients alone is not enough. What is important is to foster exchanges between the different industries, to start a common dialogue between constructors, architects, clients, designers, etc.

The PMP designer cycles aims to foster sustainable passive building. It is a global vision: it requires providing a much more complex explanation than just the need to "build passive." People need to be able to situate the issue within a broader context (global climate, EU policy), as well as to have specific information on materials, mobility, etc. So it does not make sense to focus on passive building only. That's why the trainings speak of a global vision. The lectures are not very technical, but general vision is important: people should know exactly why they are asked to build passive, and why they are being asked to change their habits.[118]

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[117] http://www.ibgebim.be/Templates/Professionnels/niveau2.aspx?maintaxid=11674&taxid=12318

[118] Quevrin, Benoit, Salle, Sophie and Boyer, Charline. 2012. "Training the market: Lessons to learn." Speed talks about "top down" measures in Brussels. Presentation at the *PassREg 2nd International Workshop, Brussels* (October 5).

Figure 4 below illustrates the concept of the training, and the stakeholders involved. Figure 5 outlines the general framework of the global training strategy.

Figure 4: Professional Training Concept and Stakeholders

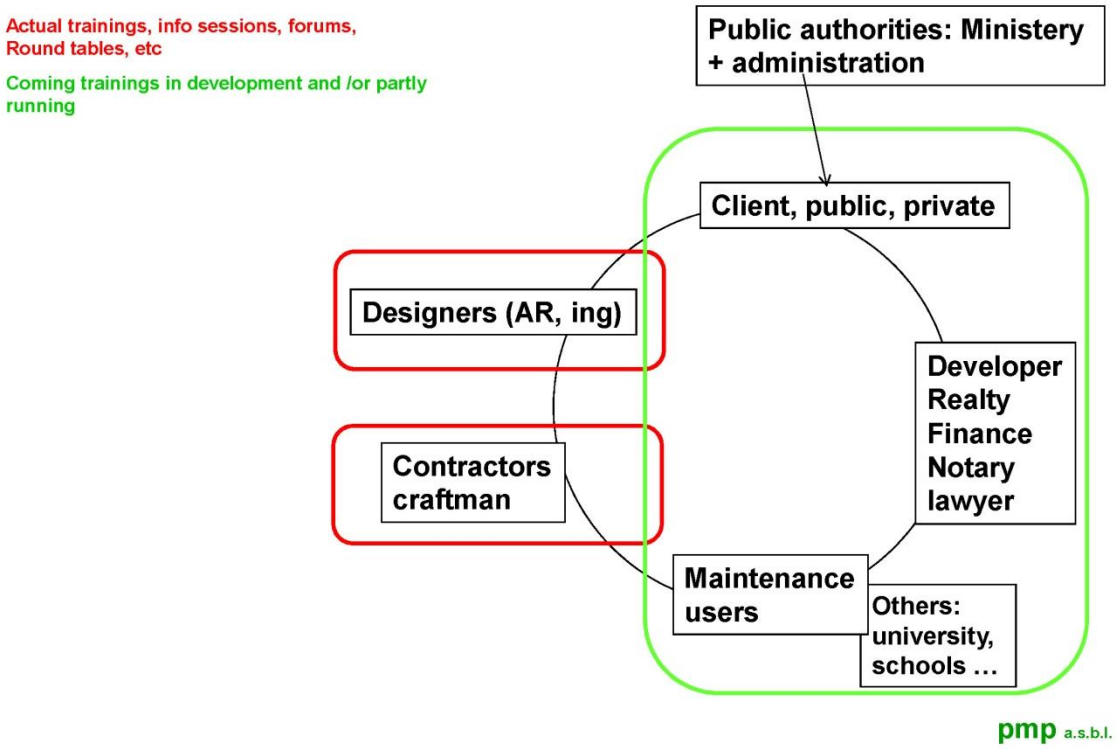
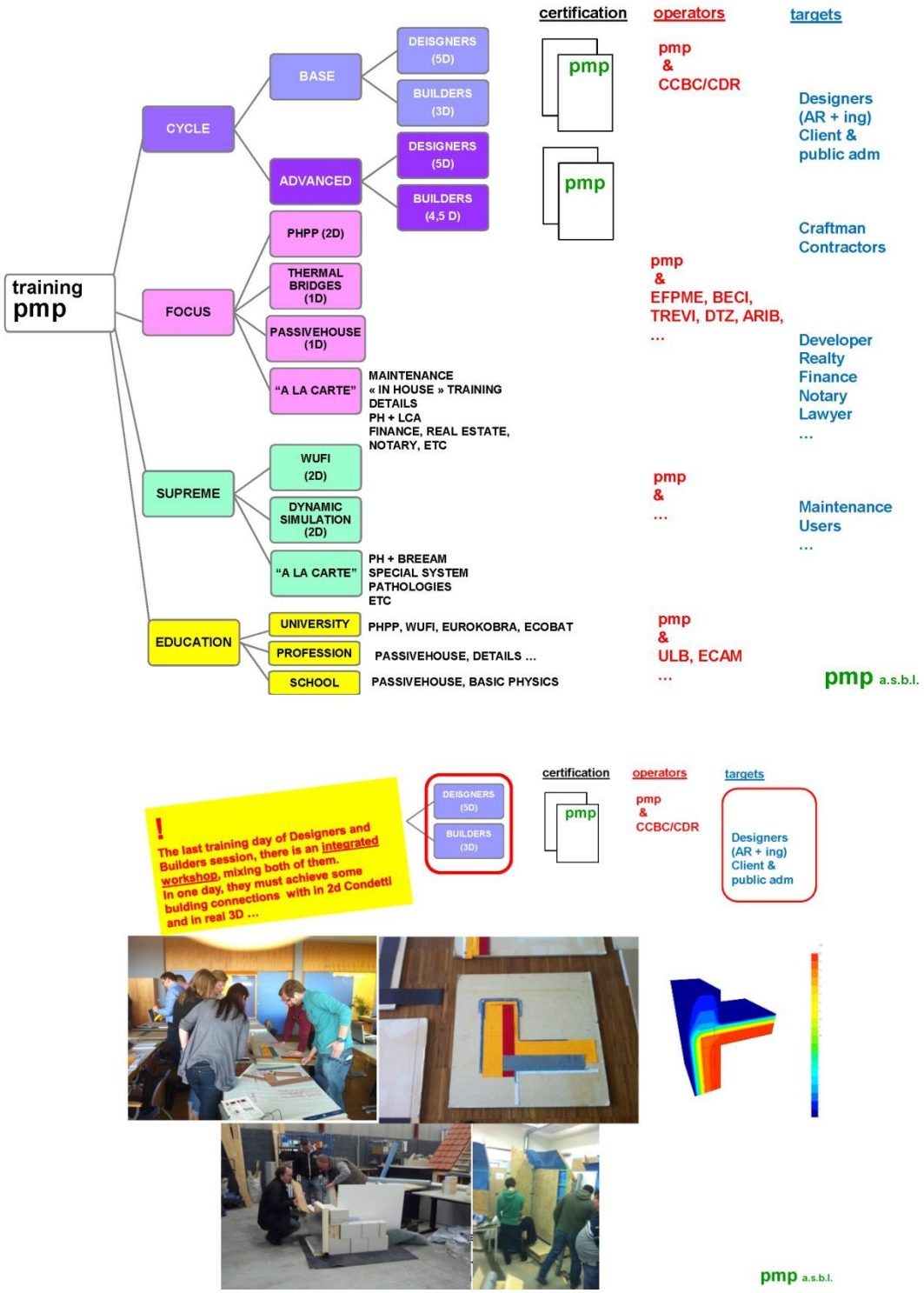


Figure 5: General Framework of the Global Training Strategy



For designers and builders, the concrete value added of the training lies in the opportunity to apply the learned concepts into practice. During the very last day of the training, participants spend a day together, collaborating on a project to build a typical "passive" construction.

As regards higher education courses, at the Department of Architecture of the Université Libre de Bruxelles, PMP has integrated passivehouse training, which is separated in different levels, as follows:

- Level BA2: All the basics required regarding thermics, techniques, etc.
- Level BA3: From "business as usual" towards a typical "passivehouse": Details and passivehouse construction site visits.
- Level MA1: Building Physics, including PHPP, Wufi, and thermal bridges.
- Level Ma1 and MA2: LCA, urban sustainable development, etc. and passivehouse construction site visits.

The higher education course program was an initiative of two professors: Bernard Deprez, member of PMP and BEPASSIVE magazine Board of Directors, and Sebastian Moreno-Vacca, also a PMP board member, and editor of BEPASSIVE magazine.

4.2 Brussels-Capital Region Construction Confederation

The Brussels-Capital Region Construction Confederation (*Confédération Construction Bruxelles-Capitale*) is the regional branch of the Construction Confederation. Its main mission is to defend the interests of companies in the construction sector, and to represent the sector vis-à-vis the Government of the Brussels-Capital Region.

Since 2008, the Confederation has been offering training for the construction sector. The Confederation maintains a Sustainable Construction Training Platform, which offers training in the passive standard for construction professionals, including the following services:

- Analysis of the needs of all workers: workers, employees and managers;
- Relevant orientation training modules;
- Implementation of customized training;
- Facilitation of requests for financial aid.[119]

Specifically, the Confederation has carried out the following sessions so far:

- Insulation (Air tightness): 7 training sessions for 27 contractors and 72 workers, amounting to 1.168 hours of training;
- Passive House Builder: 4 training sessions for 16 contractors and 42 workers, amounting to 1.008 hours of training;

[119] http://www.confederationconstruction.be/bruxellescapitale/frbe/serviceauxentreprises/plateformeformation.aspx

- Thermography training.

The results of these training sessions have been overwhelmingly positive. 98 % of the participants are satisfied with the insulation training, and 100% are satisfied with the Passive House Builder session. A positive effect of these endeavors is a snowball effect: participants become ambassadors, and they encourage other workers to participate. To sustain these achievements, good articulation and promotion of the training events are key. Thus, the next logical step is to create a global training plan for contractors, which would ideally be developed collaboratively by environmental, security and human resources managers.[120]

4.3 The Professional Reference Centre for Construction (CDR-Construction)

The Centre is part of the employment plan for Brussels residents, and the Contract for Economy and Employment (C2E). A collaboration initiative between the government authorities and the construction sector, its goal is to improve the employability of low-skilled workers in the construction sector. Specifically, the Centre evaluates educational needs and trains unqualified personnel in the areas of eco-building and renewable energy. Among the most highly demanded training areas are insulation, airtightness, eco-materials and photovoltaics. In collaboration with experts from the construction sector, the Centre launched a study of trades in transition. The study aims to shed light on the new skills that today's construction professionals need in order to work in the sustainable sector. One of the main goals of this research is to pinpoint the most urgent training needs in construction.[121]

CDR also is a platform, which offers a global view on construction. This is essential for a good approach. Heavy emphasis is placed on integration of all actors, and the creation of links between a variety of stakeholders. Capitalization on past experiences is also key for success.

There are four important obstacles in training that CDR aims to tackle. First, it is hard to see the concrete impact of the training in the sector. Second, there is resistance to change in the construction sector. Third, there is a lot of renovation work done in Belgium without a contractor and an architect, with which it is very difficult then to follow up. Fourth, educating youth about the advantages of passive building is crucial, yet drawing teenagers to teaching in passive and sustainable construction remains a significant challenge.

[120] Speed talks about "top down" measures in Brussels. Presentation at the *PassREg 2nd International Workshop*, *Brussels* (October 5).
[121] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 15.

Figure 6 shows the school kit elements of CDR's insulation/airtightness training:[122]

Figure 6: school kit elements of CDR's insulation/airtightness training

5. CONSTRUCTION AND TECHNOLOGIES

Identify and describe issues related to the building process itself, the building industry and the production of components and materials for PHs.

Below are some of the most prominent passive building projects in the Brussels-Capital Region:

5.1 Bruxelles Environnement Offices at the Tour & Taxi site

In an effort to lead by example, the Brussels regional authorities decided to move the headquarters of the Ministry of the Environment into a new building, designed by passive

[122] CDR-Construction. 2012. Speed talks about "top down" measures in Brussels. Presentation at the *PassREg 2nd International Workshop*, *Brussels* (October 5).

standards. Thus, the Tour & Taxi site in the downtown area became the new home for Brussels Environment. The new building is built on a "box within a box" principle, whereby the office floors in the middle have been broken up to allow natural light to come in through a large glass roof. External and internal sunscreens serve as overheating control.[123]

5.2 ELIA building

Elia is Belgium's high-voltage transmission system operator (30 kV to 380 kV). It operates more than 8,000 km of lines and underground cables throughout Belgium.[124] In 2012, the committee of the Belgian Energy and Environment Award (*Prix Belge de l'Energie et de l'Environnement*) awarded ELIA the Eco-Booster Award.[125] Eco-Booster awards are given to building projects that are not yet realized, but show promise in passive construction, and have proven to be feasible.

ELIA won the prize for its plan to build a new, passive office building in Schaerbeeck. The new ELIA offices will also meet the (Breeam) criteria. BREEAM is a British evaluation method for the environmental performance of buildings, which comprises all aspects of eco-construction: energy, water, waste management, biodiversity, the well-being of the people working in the building and transports.[126] The structure of the new ELIA building will be simple and compact, composed of columns and concrete slabs. The curtain wall façade will consist of an assembly of superposed side-by-side box sections, in touch with the triple-glazed window frames. Equipped with cellulose insulation, the framework of the box sections will be made of wooded joists, enclosed by an OSB panel on the inside and a wood fiber panel on the outside. To ensure proper cooling, the building will also have awnings, vertical sunshades, exposed concrete ceilings, and free and night cooling. The energy demands of the building are expected to be 328,000 kWh/year. Employees will have electric cars, rechargeable by the facility. The water from the roof of the building will be stored in three cisterns of 20,000 L. each, and used to supply the toilet flushes.[127]

5.3 L'Espoir Building

L'Espoir is a social housing project in Molenbeek –a municipality that takes part in the Local Action Plans for Energy Management (P.L.A.G.E.).[128] As the first social housing project in this municipality to comply with the passive standard, the L'Espoir building is a

[123] http://www.bepassive.be/intl/special01en/ pg. 48-49.
[124] http://www.elia.be/en/about-elia/who-are-we
[125] http://www.eeaward.be/
[126] http://www.polarfoundation.org/news/news_detail/gent_receives_ipf_prize_at_belgian_energy_awards/
[127] PassREg 2012. "Making frontrunners visible – Supporting future frontrunners." 2nd International Workshop, Study Tour, and 2nd Partner Meeting. Brussels: (October 2-4).
[128] http://www.bepassive.be/viewer/11/fr/ pg. 12-13.

prime example of best practices in the Brussels-Capital Region.[129] In response to the housing crisis in Brussels, Donatienne Hermesse, an eco-counselor at the Bonnevie Community Centre (*Maison de Quartier Bonnevie*) conceived the idea of providing affordable, energy-efficient housing to 14 low-income families (mostly unemployed immigrants). Social mortgages, provided by the Housing Fund (Fonds du Logement), covered 75 % of the cost, thus making the families owners of the project. Grants from the Brussels Regional government (sustainable buildings subsidies) and the Belgian Federal government (Big Cities Policy) covered the rest of the costs.[130]

The project consists of seven lower duplex apartments (floors 0 and 1), and seven upper duplex apartments (floors 2 and 3). Hence, all units have two floors and a double orientation (front and rear), much like maisonettes. The facades of the upper and lower duplex apartments are different from the front and from the back, and are painted in different colours. The use of eco-materials, such as solid wood stairs from Wallonia, blown cellulose, and certified timber and linoleum, is a principal feature of this project. As compact the building is, noise isolation is a major concern. The wooden skeleton was thus divided and spread throughout the length and height of the building. The units were equipped with partition walls, which were mounted on a U-shaped steel plate, attached to OSB panels. Ground floor apartments are accessible for persons with low mobility.[131]

From the start, the L'Espoir project aimed to be a participatory one. The families were closely involved in the realization and monitoring of the project. As a result, the building inhabitants managed to reduce their CO2 emissions by 25,000 kg in one year.[132] The project, which was completed in 2010, received an "Exemplary Building" award.[133]

5.4 P.L.A.G.E. hospitals

To date, at least 5 major hospitals in the Brussels-Capital Region have been renovated in the framework of the Local Action Plans for Energy Management (P.L.A.G.E.). These hospitals are: the Erasme hospital, Saint-Luc University Clinic, Brugmann University Hospital Centre (Victor Horta and Paul Brien sites), and the Iris Sud Hospitals (Joseph Bracops site). The results in terms of energy efficiency have been positive: the overall energy expenses saved amount to over 2 million years annually.[134]

5.5 Projet Bruyn

[129] http://experimentcity.net/en/best-practices/lespoir/
[130] http://experimentcity.net/en/best-practices/lespoir/
[131] PassREg 2012. "Making frontrunners visible – Supporting future frontrunners."
2nd International Workshop, Study Tour, and 2nd Partner Meeting. Brussels: (October 2-4).
[132] http://www.bepassive.be/viewer/11/fr/ pg. 12-13.
[133] http://experimentcity.net/en/best-practices/lespoir/
[134] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 11

Bruyn is a passive residential building project, part of a larger master plan to build 5000 residential units. It is subdivided into three parts: North Bruyn (200 units), West Bruyn, and East Bruyn (50 units and a kindergarten). Together, they comprise more than 300 new residential units.

The second phase of the project, West Bruyn, consists of 5 passive social housing buildings (a total of 79 passive apartments), 75 parking spaces, a multifunctional room, and a green area. The building materials are diverse: brick (regular and painted), whitewash, and concrete. Energy consumption of only 10 kWh/m2/yr is achieved due to high-quality insulation and heating solutions. In addition, the project boasts lateral ventilation and a free cooling system, 125 m2 of thermal panels and 110 m2 of photovoltaic panels.[135] West Bruyn is equipped with 125 m2 of thermal panels, and 110 m2 of photovoltaic panels. An open reservoir in the nearby park will be used for rainwater storage. Rainwater from the tanks will be directed into ground-level open ditches along the circulation paths, and feeding this draining/infiltration holding reservoir. As it builds into the reservoir, rainwater is slowly absorbed into the ground. Each apartment overlooks the green area, and is between G+1 and G+# in height.[136] Open swales, running alongside the roads, return rainwater from a 75 m3 cistern into the soil. A 2500 m2 extensive roof and public/semi-private green areas (vegetable gardens) are available for the building inhabitants. The West Bruyn project was one of the "Exemplary Building" winners.[137]

5.6 34-36 Saint François Street

34-36 Saint François Street is a multi-purpose, passive construction project that includes a 30-bed childcare centre and three residences for people with reduced mobility. The first three levels of the building constitute the childcare centre, while the upper three floors are residences.[138] A wooden façade and triple glazing ensure excellent insulation. Given the low heating needs, heating is provided via ventilation, resulting in a record consumption of 7 to 13 kWh/m2/yr. Solar panels and rainwater recovery further reduce the consumption of energy and water.[139] The project is an "Exemplary Building" winner.

5.7 Social housing in Anderlecht

The Anderlecht project is a 4-unit social housing building, built according to passive standards. The overall net heating consumption of the four apartments ranges between 8 and 13 kWh/m2/yr. The project was awarded an "Exemplary Building" award in 2009.

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[135] http://www.sustainablecity.be/exemplary-buildings/bruyn-ouest

[136] PassREg 2012. "Making frontrunners visible – Supporting future frontrunners." 2nd International Workshop, Study Tour, and 2nd Partner Meeting. Brussels: (October 2-4).

[137] http://www.sustainablecity.be/exemplary-buildings/bruyn-ouest

[138] http://www.bepassive.be/viewer/08/fr/ pg. 62-64.

[139] http://www.sustainablecity.be/exemplary-buildings/rue-st-francois-child-care-centre

5.8 Louvain-La-Neuve Childcare Centre

The passive childcare centre at Louvain-La-Neuve was inaugurated in 2010. It boasts a construction from eco-materials: a wooden frame, a heat pump, geothermal heating, and solar panels. A water recovery system redirects rainwater for use in the toilets, bathroom, and washing machine. Staff awareness of energy efficiency is high: the childcare employees claim to be using only green forms of transportation.[140]

5.9 Aeropolis II

The Aeropolis II building was a winner of the first round of "Exemplary Building" awards in 2007. To date, it is the largest passive commercial building in the Brussels-Capital Region. Originally, the building was not designed to be passive, but the architecture firm that won the project proposed a design change so as to reach passive standards. Thus, the brick outer layer of the building was replaced with glass: a layer of white glass enamel superimposed on a plate and framed by an anodized aluminum glazing bed. Vents were introduced on the sides of the glazing beds to ensure the desired thermal performance. Fr insulation, the architects combined the thin outer aluminum layer with a wooden support structure. Inside of this passive curtain wall, a perforated multiplex panel backed with 2 cm of rock wool resolves the acoustic balance. A membrane between the rock wool insulation panels further helps with airtightness. The offices of the building face mostly North, where the façade is glazed. The southern part of the building, which gets more sunlight, is partially occupied services blocks and vertical openings.

The thermal insulation and airtight curtain wall is very effective (n50 =0.49 vol/h). The net energy requirement for heating is thus 8 kWh/m2/yr, and heating is provided only by the sanitary ventilation. In winter, warm air is provided by a Canadian well. One 140 kW gas boiler is enough to maintain a temperature of 20 degrees inside. During the summer, the Canadian well dehumidifies and cools the air from 5-10 degrees, while and automatic sunlight control system maintains a comfortable temperature through the use of external blinds. A night cooling system is also in place: it cools the temperature by opening windows automatically, as well as by forcibly extracting air in the roof.[141]

5.10 Maison del L'Emploi et de L'Enterprise (M2E) Project

The House of Employment and Enterprise (Maison de l'Emploi et de l'Entreprise, or M2E) is a public, passive building in the Saint-Denis quarter, Municipality of Forest. The M2E project also contemplates building one passive childcare centre. The building uses solar panels, a rainwater redirection system, green roofs, and eco-friendly construction

[140] http://www.rtbf.be/info/regions/detail_une-eco-creche-a-louvain-la-neuve?id=6302053
[141] http://www.bepassive.be/intl/special01en/ pg. 34-40.

materials. Its net energy consumption for heating purposes is 9kWh/m2/yr.[142] The project also uses new cooling technologies, such as adiabatic cooling and over-ventilation.[143]

5.11 Molenbeek-Saint-Jean Channel

This building alongside the Charleroi channel in Molenbeek-Saint-Jean will be delivered in 2013. It includes one elementary school and 13 passive social housing units. The architectural design uses the southern orientation of the housing units to ensure proper light and heating. The design is appropriate for the very densely populated area, in the immediate proximity of downtown Brussels.[144]

5.12 42 Rue de la Loi Building

Another "Exemplary Building" winner, the 42 rue de la Loi project aims to renovate and extend 5 passive housing units, covering a total area of 1850/571 m2. The main goal of the project was to renovate profitably and confortably without installing an air conditioning system. To do so, the architects used an original combination of mixed steel and wood prefabrication. The passive housing units were constructed on the existing roof. With a net heating energy requirement of 27/12kWh/m2/yr, these housing units boast a heat exchanger, green roofs, and airtightness n50=0.60 vol/hr, as well as solar thermal and photovoltaic power. [145]

5.13 Biplan Participatory Housing – Haren

The Biplan project features an 810m2 passive apartment building on the border of the Brussels-Capital Region. Eco-construction, energy efficiency, reduced energy consumption and enhanced opportunities for social exchange among the residents are central to the project concept. In line with the passive standard, the net heating energy consumption of each one of the apartments is below 15 kWh/m2/yr. Such low consumption has been achieved by using eco-friendly construction materials: a wood frame and a 24 cm. cellulose insulation. The building has large green roofs, a rainwater tank, and a station for processing local greywater. The residents also enjoy a laundry room with a solar hot water washing machine, a community garden (for herbs and medicinal plants) on the green roof, a guest room shared by eight apartments, a meeting place located in the garden, and a common cellar for storing vegetable products.[146]

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[142] http://www.villedurable.be/batiments-exemplaires/md2e

[143] PassREg 2012. "Making frontrunners visible – Supporting future frontrunners." 2nd International Workshop, Study Tour, and 2nd Partner Meeting. Brussels: (October 2-4).

[144] http://www.wbarchitectures.be/fr/architects/TRAIT_norrenberg___somers/Ecole_fondamentale_et_logements_sociaux_a_Molenbeek-Saint-Jean/429/

[145] http://documentation.bruxellesenvironnement.be/documents/BxlVilleDurable_ANGL.PDF pg. 6.

[146] http://app.bruxellesenvironnement.be/batex_search/SearchEngineResults.aspx?language=FR

5.14 FSE (FBZ), Formelec and Tecnolec Headquarters

The Electricians Security Existence Fund (*Fonds de sécurité d'Existence du secteur des Electriciens*, or FSE), Formelec and Tecnolec are three leading organizations in the electricity sector, which have decided to build a shared, passive headquarters. The "H"-shaped design of the building ensures a common space while still maintaining the privacy of each organization's main offices. In terms of construction, the project features a mixed system: a metallic frame combined with concrete slabs fillings for the floors and concrete masonry for the walls. The metallic frame was chosen to lighten up the structure, which would have been too heavy if concrete had been used. Moreover, studies showed that the metallic frame does not run counter to the passive standard, provided that the thermal bridge between interior and exterior is well managed. Thus, the metal columns were filled with 30 cm. of polyurethane foam. The rest of the wall structure is classic: a concrete masonry covered with 30 cm. polystyrene coated graphite, and a 28 cm. fiberglass insulation. The roof is insulated with 21 cm. of PIR foam. The floor of the building is a concrete slab, insulated with 15 cm. of projected PUR. Upstairs, the building boasts a wooden frame and aluminum top triple glazing. Even though having a mixed metal/concrete frame posed challenges for airtightness, the problem was eventually solved by using EPDM rubber from the exterior on all four sides of the building chassis. In terms of ventilation, the system is also mixed. Most of the time, the building relies on natural ventilation, but there is also a helicoidal fan that forcibly extracts the air when the natural ventilation is insufficient. An automated opening and closing of windows, depending on the weather conditions, contributes to maintaining a comfortable temperature at all times. Overall, the net heating energy requirement of the building is 13 kWh/m2/yr.[147] Natural lighting comes in through large façade openings. Exterior shades and passive cooling devices (such as night cooling and an earth heat exchanger) control heat during the summer. To further reduce building overheating, which is a challenge particularly with office buildings, the project was equipped with a Canadian well. 318 m2 of photovoltaic panels will also be installed on the roof.[148]

5.15 Royale Sainte Marie Building

In the context of preserving the heritage of rue Royale, the Royale Sainte Marie building plans an extension of the high school, as well as the new gym. The construction will follow passive standards, using aerogel insulation.[149]

5.16 CPAS Building

[147] http://www.bepassive.be/viewer/09/fr/ pg. 38-46; 78.
[148] PassREg 2012. "Making frontrunners visible – Supporting future frontrunners." 2nd International Workshop, Study Tour, and 2nd Partner Meeting. Brussels: (October 2-4).
[149] http://www.bepassive.be/viewer/08/fr/ pg. 6.

After winning "Exemplary Building" funds in April 2011, the Public Center for Social Action (CPAS) in the municipality of Forest inaugurated its newly renovated headquarters.[150] CPAS aimed to renovate in line with passive standards while preserving the patrimonial heritage of the building. Built in the 1930s, the CPAS headquarters boasted an impressive Art-Deco style, but by 2007 the building was in a deplorable condition. The results of the renovation are impressive: while the net heating energy needs of the building in 1934 reached 335 kWh/m2 per year, by 2011 it was only 19 kWh/m2/yr.[151] Moreover, the original Art-Deco façade was preserved. The building was equipped with night cooling, a water management system, green roofs, and 30m² of photovoltaic panels.[152]

5.17 Gaucheret Childcare Centre

The Gaucheret childcare centre was among the first "Exemplary Building" winners in 2007. Conceived as a new construction project, the centre was finished in 2011, and welcomes 48 children. The net heating energy requirement of the building is 14 kWh/m2 annually. An air-ground heat exchanger system, installed on the first floor, ensures ventilation of 30 m3/h per person.

In addition to an F7-type air filter and battery heating, the ventilation unit also has an electric humidifier that ensures a minimum relative humidity of 40% during the winter. A heat recovery system has also been put in place, with a yield of 84%. In order to avoid unnecessary heating of fresh air during the summer months, a bypass circuit of the heat exchanger was also installed. The fresh air intake of the ventilation unit is connected to an air-sun heat exchanger. Before being sent into the building, the air first goes into the ground via a 40 m long hose. This solution has the advantage of slightly preheating the air during winter, thus saving energy.[153]

5.18 Urban/Large-Scale Recent Development

The SDRB (regional funds for development) has launched two large-scale projects in Brussels:

- **Tivoli**: 400 dwellings (commercial and social housing), 2 childcare centres and shops that must follow the passive standard. A third one of these must reach zero energy standards. It is a Design & Build & Finance development.
- **Gryson**: 50 social dwellings and 300 student apartments, all passive. It is a Design & Build & Finance development.

[150] http://archives.lesoir.be/un-batiment-eco-exemplaire-pour-le-cpas_t-20110427-01DAFP.html
[151] http://www.bepassive.be/viewer/08/fr/ pg. 68-74.
[152] https://www.educate-sustainability.eu/portal/content/passivhaus-standard-renovation-cpas-forest-brussels
[153] http://app.bruxellesenvironnement.be/batex_search/SearchEngineResults.aspx?language=FR

Furthermore, an initiative of the Municipality of Brussels is the Neo project. It consists of 750 dwellings, 20 000 m² of office space, and a Congress center (all in line with the passive standard), as well as a shopping mall of 100 000 m² (in line with very low energy standards). It is a "Design & Build & Finance & Operate" development.

As regards private initiatives, there are currently four private real estate skyscrapers, all operating according to the passive standard. The buildings, amounting to more than 200 000 m², contain mainly offices, and some dwelling. In addition, some large-scale "passive" renovation projects are in the works. One of them is the MT200 office building, a private development initiative of 100 dwellings. Another is Linne Plante: a regional development that comprises a renovation of a social housing tower and a childcare centre.

6. VISIBILITY AND PUBLIC SUPPORT

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.[154]

Furthermore, Brussels Environment has developed AlterClim, which is a software that helps determine whether rooms with a certain number of 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.[155]

Some other concrete initiatives of the Brussels-Capital Region to stimulate and increase the visibility of low-energy construction are described below.

6.1 Ecodynamic Company Label

Created in 1999, the Ecodynamic Company label is an initiative of Brussels Environment.[156] Its goal is to encourage companies and organizations to actively commit to improving their environmental performance (especially energy consumption, waste management, and the efficient use of raw materials). The target groups are all enterprises and organizations (large and small, private and public, regardless of their area of expertise).

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[154] www.housingeurope.eu/www.housingeurope.eu/uploads/file_/agenda.pdf pg. 1.

[155] See "2007 Energy Efficiency Action Plan for the Brussels-Capital Region," pg. 41, www.medemip.eu

[156] http://www.be-smarter.eu/en/best_practice_detail.html?liste=1&id=38

Specifically, the Ecodynamic Company label is a formal token of recognition of good environmental practices. It is awarded for a period of three years, and it gives companies one to three stars, depending on their performance. To receive a label, an organization must operate within the Brussels-Capital Region. The label also promotes setting up a system of environmental management in the context of the Eco-Management and Audit Scheme (EMAS) or ISO 14001.

Obtaining an Ecodynamic Company label requires going through the following steps:

- Formally announcing candidacy for a label by signing the "Eco-dynamic company charter." The signature obliges the company to commit to the 27 principles of eco-management, outlined in the charter.
- Receiving free guidance from a Brussels Environment consultant during the process of implementation of the 27 principles;
- Submitting a formal application for the label to Brussels Environment, no later than 2 years after having signed the charter. The application includes an environmental analysis, and an environmental program.
- Welcoming an on-site visit from the Brussels Environment jury, which will make a field assessment of the company before making a decision on whether to grant the label.

Companies that obtain the label are featured extensively in Brussels Environment publications, and on their website. In addition, the enterprise is allowed to affix an Ecodynamic Company label to all its communications and marketing materials. For those organizations that obtain the label, EMAS registration and ISO 14001 registration becomes easier.

6.2 "Be Passive" magazine[157]

Since November 2009, PMP and PHP have been issuing "Be Passive," a quarterly magazine dedicated entirely to low-energy building, and the passive standard in particular. The target audience is: architects, the public authorities, building societies, regional development agencies, engineers, construction manufacturers, real estate actors and all others involved in construction. The magazine aims to serve as a "one-stop shopping" centre for all that relates to energy-efficient building. The goal is to present the information in a clear, concise, and jargon-free way so as to be comprehensible to individuals without technical training. The website (free details and free issues) has more than 20 000 downloads. The magazine is distributed to all target audiences without exception (approximately 15 000).

[157] www.bepassive.be

Specifically, the magazine offers detailed accounts of prominent low-energy construction projects, as well as interviews with important individuals (public authorities, architects, construction sector leaders, building owners and residents). The "Exemplary Building" winners receive extensive coverage. In addition, the editors include updates on the current Belgian legislation related to low-energy building.

"Be Passive" is an initiative financed by PMP/PHP and a group of private stakeholders. 4 issues have been supported by Belgian *SPF environnement*.

6.3 The "Ice Challenge" Special Event[158]

The Ice Challenge event is organized by *Passiefhuis Platform* (PHP) in Brussels and Antwerp. It aims to sensitize the public and illustrate first-hand the benefits of good building insulation. The event consists of placing two 1,3 tone blocks of ice in two separate makeshift constructions – one very well insulated, the other one – not. The two constructions are placed side by side on a major downtown street for everyone to see. The goal is thus to illustrate how much faster 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 in just 11 days. But the main objective of the event is promotional: throughout the guessing competition, participants obtain useful tips energy saving and house insulation tips.

6.4 PMP/PHP Events

Passiefhuis-Platform (PHP) and *Plateforme Maison* Passive (PMP) jointly organize an annual **Passive House Fair**: a building technology forum that showcases the latest developments in energy-efficient construction. The Fair targets construction professionals and the general public alike. Among the activities of the happening are open houses, free readings, information and planning advice, and meetings with the professional members of PMP/ PHP.[159] In 2012, the Fair took place during the second weekend of September. 120 companies from the building sector participated.[160]

In addition, PHP and PMP also organize an annual **Passive House Symposium**, the next one of which will take place on October 5, 2012 at the Crowne Plaza Hotel in Brussels. A more specialized event than the Passive House Fair, the Symposium is targeted specifically to construction professionals. More than 30 prominent Belgian and international speakers give lectures on a variety of aspects concerning passive

[158] http://www.icechallenge.be

[159] "Passiefhuis-Platform vzw: The reflex for passive and low energy architecture." Flyer provided by Irena Kondratenko, Research Projects Coordinator, Passiefhuis-Platform. August 23, 2012.

[160] http://www.buildup.eu/events/24767

construction, and share their experiences with the audience. Participation in the Passive House Symposium is mandatory for all professionals who wish to stay abreast of the latest developments in passive construction.[161] The lead themes of the 2012 symposium are: 10 "passive" years, zero energy, neighbourhood developments, school renovations, energy-efficient cooling and heating, major renovations, dweller experiences, shared architecture, and passive schools.[162]

6.5 "Populist" Actions

Since the bulk of the project and the standardisation of the compulsory passive standard, it was time to communicate these advances widely to the public. One of the first public advertising initiatives is 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, a passive house is mainstream - the only thing special about it is the inhabitant.

6.6 Participation in International Projects

Active participation in international projects is a key contributor to the success of the Brussels-Capital Region. This way, the Region gains not only visibility, but also access to international funds to deepen and improve low-energy building policies and practices.

One such international funding mechanism is the **Intelligent Energy-Europe programme (IEE)**. An initiative of the European Commission, IEE is part of a broader EU policy to promote energy efficiency. It offers funding for organizations working to improve energy sustainability. Renewable energy, energy-efficient buildings, industry, consumer products, and transport are among the areas eligible for project funding. Each year, IEE disburses funds through calls for proposals. All EU Member States, as well as Norway, Iceland, Liechtenstein, Croatia and the Former Yugoslav Republic of Macedonia (FYROM) are eligible to apply. The IEE budget is € 730 million, running through 2013.[163]

In 2011, IEE funded the PassREg project, where the Brussels-Capital Region features prominently. Representatives of ten EU countries (both from municipalities and non-profit organizations), join forces in PassREg. In Belgium, the two key NGO partners that collaborate in the framework of RassREg are *Passiefhuis-Platform* (PHP) and *Plateforme Maison Passive* (PMP). The Passive House Institute Darmstadt, Germany acts as the overall project coordinator.

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[161] http://www.maisonpassive.be/?+5-octobre-2012-Symposium+

[162] http://www.bepassive.be/viewer/12/fr/ pg. 11.

[163] http://ec.europa.eu/energy/intelligent/about/index_en.htm

The overarching objective of PassREg is to spearhead energy-efficient construction throughout the EU. The promotion of passive standards (i.e. a maximum heating and cooling requirements of 15 kWh/(m²a) in all new buildings) is a core activity of the project.[164] To do so, PassREg employs a methodology of best practice sharing. Emphasis is placed on participants that are either front runner regions (having already surpassed the existing EU directives for efficient energy building), or aspiring regions (those striving to become front runners). The idea is to showcase the front runners' success, to collect and systematize lessons learned, and to apply the models in aspiring regions and beyond.[165]

The five specific objectives of the PassREg project are:[166]

- To increase awareness of the passive house standard, especially amongst key policy and industry actors;
- To identify the success factors that propelled some regions to a leading position in matters of energy-efficient construction. This includes deriving a list of "solutions," and analyzing whether they apply to other countries and regions;
- To build the capacity for high-quality professional development for construction professionals;
- To stimulate market demand for sustainable construction, products, and technologies;
- To increase the number of low-energy buildings in the partner regions.

The Brussels-Capital Region features as a front runner in the PassReg project. In May 2012, work started to analyze the key factors that facilitate Brussels' rapid progress in low-energy building. The second step in the analysis will be to determine if any of these conditions exist in other regions. If so, the positive experiences and lessons learned in Brussels will serve to stimulate energy-efficient construction in less-advanced regions. At the same time, the Brussels regional authorities will also benefit - participation in this project allows for careful process tracing, strategy evaluation and analysis of mistakes for future reference.

The Brussels-Capital Region is also a partner of the Seventh Framework Programme for Research and Technological Development (FP7). The FP7 is the main financing framework of the EU for Research & Development.[167] The FP7 runs from 2007 to 2013, and disburses funds through annual calls for proposals. Energy and the environment are among the 10 major themes financed by the calls for proposals. The specific subfields that are directly related to the passive construction standard and can be financed through FP7 are:[168]

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[164] http://www.passreg.eu/index.php?page_id=65
[165] http://www.passreg.eu/index.php?page_id=65
[166] http://www.passreg.eu/index.php?page_id=66
[167] http://www.brussels.irisnet.be/working-and-doing-business/doing-business-in-brussels/innovation-et-r-d/european-assistance-and-partnerships
[168] http://cordis.europa.eu/fp7/energy/home_en.html

- Renewable electricity generation
- Renewables for heating and cooling
- CO2 capture and storage technologies for zero emission power generation
- Energy efficiency and savings.

Independent researchers, university research centres and businesses are all eligible to apply for FP7 funds. Accepted applications are usually those filed by a consortium of different types of applicants from several EU member states (participation from third countries is also encouraged).

In this process, Brussels-Capital Region maintains a consulting role. The authorities offer assistance with FP7 applications to all potential candidates. The Brussels Enterprise Agency (BEA) is the designated National Contact Point for FP7. Each year, BEA organizes information seminars to help candidates make the most of their application. During the seminars, experts with detailed knowledge of FP7 projects share their experience, and advice candidates on how to improve their application. The last one of the information seminars (before the expiration of FP7 in 2013) was held on September 6, 2012 in Brussels.[169]

In addition to participation in EU-funded projects, the Brussels-Capital Region takes part in other international initiatives through the work of key NGOs. For instance, *Passiefhuis-Platform* (PHP) maintains active relations with the principal passive house organizations in Europe. PHP actively promotes Sustainable Energy-Europe 2005-2008, a campaign initiative of the European Commission to raise awareness of passive building.[170] PHP is also a member of *Informationsgemelnschaft Passivhaus*.[171]

[169] http://www.brusselsnetwork.be/eu-funding-m/71-events/1281-fp7-research-for-the-benefit-of-smes-seminar.html

[170] See http://www.managenergy.net/meta_informations/425

[171] "Passiefhuis-Platform vzw: The reflex for passive and low energy architecture." Flyer provided by Irena Kondratenko, Research Projects Coordinator, Passiefhuis-Platform. August 23, 2012.