

Energy retrofits for an administrative building

Bolzano, South Tyrol, Italy



The challenge of renovating an old, existing building: an Italian case study

Conversion of the former post office building situated close to the Bolzano train station was completed in 2006 for use by the South Tyrol state administration. The refurbishment and raising of the building, which is about 20,000 cubic meters, were designed in accordance with “CasaClima” requirements, an Italian energy certification for sustainable and passive buildings. It should be noted that the building is considered the first certified administration building in passive house standards worldwide, with a power consumption of about a liter (10 kWh/m²) of gas per year. This concretely demonstrates the role that local administration can assume in exemplifying the potential for energy-saving [1].

Country/ City Profile

Country		City	
Population (2014)	61.340 million [2]	Population (2015)	106,303 [4]
Land area (km ²)	301,340 [2]	Land area (km ²)	52.34 [4]
GDP per capita (2014, current international \$, at purchasing power parity)	34,706 [3]	GDP per capita / GDP per capita at purchasing power parity	n/a
Region	Europe	Region	South Tyrol, mountain
City's physical geography	Location	<ul style="list-style-type: none"> ✓ It is located at the northernmost point in Italy, latitude 46° 29' 28" N, longitude 11° 21' 15" E (weak air circulation, heat waves) ✓ Entirely located in the Alps, it is dominated by mountains ✓ The landscape itself is mostly cultivated with different types of shrubs and forests ✓ High altitude (min. 232, max. 1.616 m above sea level) 	
	Climate	<ul style="list-style-type: none"> ✓ Continental (average annual temperature: 13,9 C°); ✓ 1,064.9 mm/year annual rainfall [4] 	

Initiating context

75 percent of apartments in South Tyrol are older than 25 years and consume more than three times the energy of “C-class” buildings in the CasaClima-classification [5]. In general, more than 80 percent of Italian buildings were constructed between 1960 and 1990. During these years, energy efficacy was not considered an issue, neither insulation for the exterior walls, the roofs, nor the windows; fossil energy was used almost exclusively. These numbers put into evidence the high potential for energy and carbon savings which exists in the building sector. Energy retrofitting is an appropriate solution to reduce energy costs, especially at a time when property values reflect the energy efficiency of buildings. Employing the most advanced technology, energy used for heating in buildings can be reduced by up to 90 percent compared to standard buildings [5].

CasaClima is part of the CasaClima Agency, an independent public society born in 2002 from South Tyrol which operates as a certification body for energy efficiency in the construction sector. Among the goals of CasaClima is to integrate lower energy spending with comfort and lastingness. Each category provides an estimate of a building's energy consumption. There are three CasaClima classes: *Gold*, *A*, and *B*. *CasaClima Gold* exhibits the lowest energy consumption of the three classes, with a heating energy consumption of 10 kWh/m² annually; it is also called “one-litre” construction, as it requires one litre of oil (or a single cubic metre of gas) per square metre each year. Buildings with a heat consumption of less than 30 kWh/m² annually receive *CasaClima A* classification. In order to qualify as *CasaClima B*, a building's heating energy consumption must be under 50 kWh/m² annually [5]. The ex-post office building in Bolzano is qualified as *CasaClima Gold*.



Before



After

Source: [10]

Project description

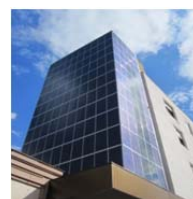
The building, originally constructed in the Fifties as a post office, was renovated in July 2004 according to the European Union's principles of energy efficiency for sustainable buildings. It is absolutely the first public building following PassivHaus standards, and at a global level, the first administrative building that has achieved these requirements [6]. It is a further expression of the local administration that decided to refurbish the building, which today hosts the Environmental Department of the local government, instead of building a new one. In this manner, the administration decided to invest into energy-savings, exemplifying how aims and objectives of climate protection, energy efficiency, and urban energy policies can be reached. In this sense, Bolzano's local government represents an example of good urban practices for creating policies to enhance its community's quality of life. It exemplifies how a local government can engage and use the local cultural heritage to move a step closer to achieving a sustainable community.

The roof and façade are highly insulated with EPS and XPS insulation panels, respectively. Thermal bridges are minimized. Glass areas allow for significant daylight and solar thermal gain. A central ventilation system with heat recovery extracts warmth and the damp air from the home, in order to replace stale moist air with filtered and fresh air from the outside. A condensing boiler (60 kW) uses the energy, which in older heating systems is lost in the atmosphere with the flue gases. A photovoltaic system meets energy demand inside the building. Heating energy consumption costs fell from 90,000 € per year to 5,000 € per year for the period before the refurbishment, despite of an increase in building volume from 12,000 m³ to 20,000 m³ [7]. So, the refurbishment of historic buildings to lower energy demand is both possible, and economically feasible.

Implementation process

Project implementation details

Process	<p>The building was renovated from 2004-2006 and has been in operation since May 2006.</p> <p>The steps of development included:</p> <ul style="list-style-type: none"> ✓ May 2003 - November 2004: project and design proposals by local architects and engineers ✓ June 2004: authorization of the executive project ✓ July 2004 - May 2006: start with executive project ✓ May 2006: staff moved into the building
Leadership	<p>Local administration decided to refurbish the building in accordance with "CasaClima" requirements instead of building a new one as a good practice in energy-saving</p>
Financing	<p>The total cost of the project was 7.6 million €</p>
Involved stakeholders	<p>The teamwork involved for the project was made by a various key players:</p> <ul style="list-style-type: none"> ✓ City of Bolzano/Local administration - as client of the project ✓ Specialists in the building sector (architects, engineers, technical area manager, project manager) - as responsible for project construction, for electrical and mechanical construction activities, as well as construction monitoring ✓ Various other consultants responsible for project construction ✓ CasaClima teamwork - responsible for energy efficiency certification of the building



Source: [10]

Results

Energy refurbishment benefits [6, 7, 8]

ANNUAL HEATING DEMAND	10 kWh/m ² per year
HEATING LOAD	13 w/M ²
PRIMARY ENERGY REQUIREMENT	118 kWh/m ² per year
COOLING DEMAND	4 kWh/m ² per year
AIR TIGHTNESS	N ₅₀ = 0.64/h



Source: [10]

Lessons learned

The efficient use of resources - such as energy savings, energy efficient technologies and measures as well as the use of renewable energy sources - is needed for the energetic refurbishment of a historic building. The low energy cost of CasaClima construction has quality of life advantages reflected in everyday city life.

In this sense, this project addresses local governments, exploring how they can address energy efficient historic building renovation in a strategic and effective manner, using these old buildings as vehicles for sustainable development at the local community level. Environmentally damaging gases such as carbon monoxide, nitrogen oxides, and hydrocarbons are reduced and, in this sense, the building represents a contribution to improving the environmental health of the city. According to the Intergovernmental Panel on Climate Change (IPCC), "over the whole building stock, the largest portion of carbon savings by 2030 is in retrofitting existing buildings" [9].

Renovation, retrofit and refurbishment of existing buildings represent an opportunity to upgrade the energy performance of building assets for their ongoing life. Retrofitting involves making modifications to existing buildings that may improve energy efficiency or decrease energy demand. Energy efficiency retrofits can reduce the operational costs, particularly in older buildings, as well as help to attract tenants and gain a market edge.

References

- [1] Bolzano administration webpage: <http://www.provincia.bz.it/edilizia/opere-ultimate/475.asp>
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- [4] City of Bolzano webpage: <http://www.comune.bolzano.it/>
- [5] CasaClima webpage: <http://www.agenziacasaclima.it/>
- [6] Building data: http://www.fierabolzano.it/klimahouse/mod_moduli_files/Landhaus11_Scheda%20tecnica.pdf
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- [8] Passive House Database: <http://www.passivhausprojekte.de/>
- [9] IPCC webpage: <http://www.ipcc.ch/>
- [10] Photos and images: <http://www.passivhausprojekte.de/> ; <http://ediliziainrete.it/referenze/ex-edificio-delle-poste-bolzano-bz> ; http://www.fierabolzano.it/klimahouse/mod_moduli_files/Landhaus11_Scheda%20tecnica.pdf

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