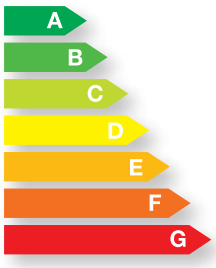
www.display-campaign.org



Displayers renovate from G to A!

Actions and costs for the renovation of public buildings in cities participating in the European Display® campaign

With the support of

Energy Cities, www.energy-cities.eu, November 2014
Graphic identity: www.tuttiquanti.net

With contributions from: the City of Bistrița, the City of Echirolles, the City of Freiburg, the City of Litoměřice, the City of Martigny, the City of Mendrisio, the Energy, Equipment and Environment Syndicate of cities of Nièvre (SIEEEN), the Regional Energy Agency of Kaunas (KREA), the Urban Community of Bordeaux.

Towards the deep renovation of public buildings at large scale

The European Energy Efficiency Directive, applicable in December 2012, requests Member States to renovate their buildings with a rate of 3% per year. The initial proposal of the European Commission targeted all public buildings, an objective that Energy Cities, coordinator of the European Display® Campaign, has always supported. Indeed, a 3% rate implies the renovation of the entire building stock by 2050.

Energy Cities continues to encourage local authorities and associations of local authorities in all European countries to commit to achieve this 3% goal, together with their governments. For this reason, Energy Cities joined the Renovate Europe Campaign, a European campaign for the renovation of buildings. Display® is one of the communication tools to publicly communicable the reduction of energy consumption thanks to renovation measures.

In this publication, be inspired by renovation best practices from European local authorities, including detailed measures and their cost. **They are showing the way towards deep renovation of public buildings at large scale!**

You too can tell us more about the renovation of public buildings in your local authority and join these Displayers who renovate from G to A!

The Energy Cities' Display® team

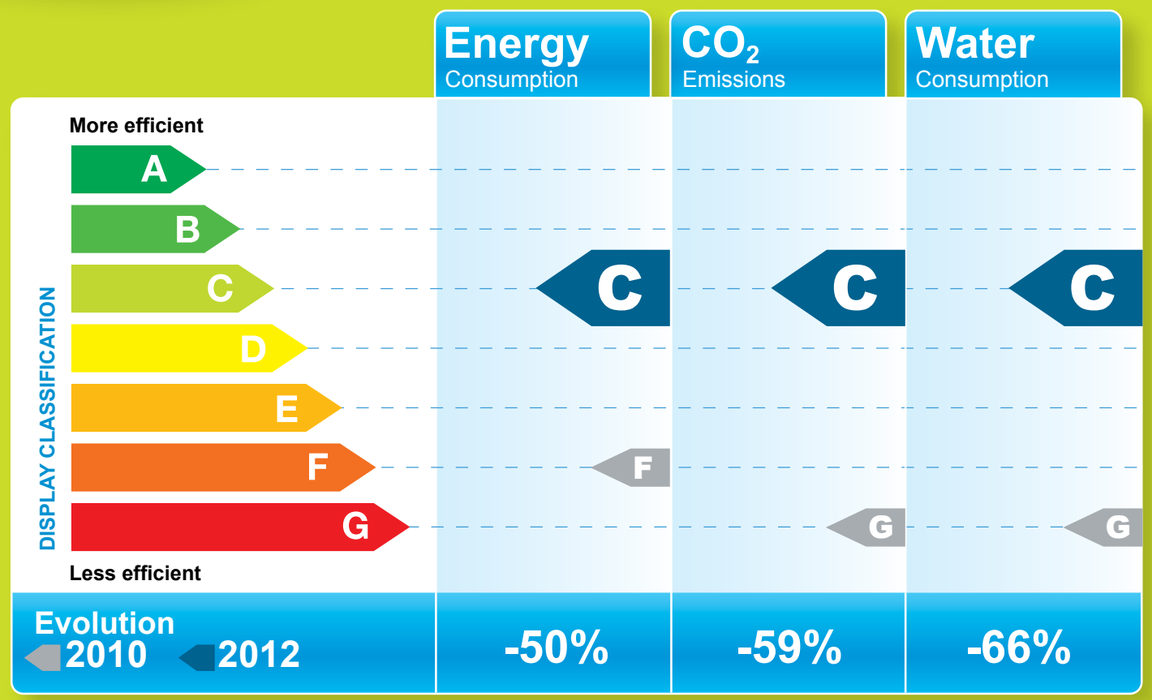
Displayers renovate from G to A!

Andrei Mureșanu secondary school

How does this building compare?

Category: General school
Operating hours: 3200h

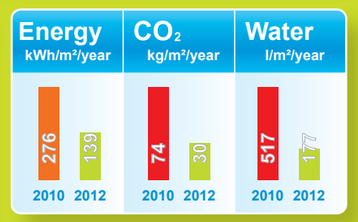
Area: 762m²
Year of construction: 1890

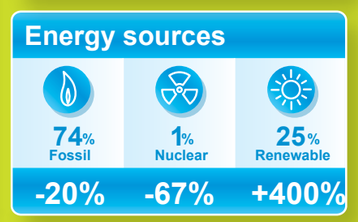


What solutions have been implemented?

Renovation actions to improve the building's energy performance:
- replacement of windows by double glazed windows
- renovation of the facade to allow the walls to breathe.
- insulation of the roof
- renovation of lighting
- replacement of the boiler

Renovation of the heating system: €10,500
Thermal insulation: €6,700
Replacement of windows: €17,900





PRIMĂRIA MUNICIPIULUI BISTRIŢA
COMPARTIMENT ENERGETIC
IOAN PAPOI
Tel +40756.122.068
papoi.ioan@primariabistrita.ro

www.display-campaign.org

City of Bistrița (Romania)

renovation 2010-2011

Building envelope

Roof	Insulation with a layer of 18cm of mineral wool.	€6,700
Facade	Replacement of the external finishing layer on the facades by a spongy plaster that allows the walls to breathe. Insulation with 10mm of cellular polystyrene.	
Windows	Replacement of existing windows by wooden double glazed windows.	€17,900

Technical installations

Heating	Renovation of the heating system, replacement of the boiler and installation of an automatised distribution heating system.	€10,500
Water	Renovation of the hot water systema and installation of a solar panel.	€1,900

Equipment

Renovation and automation by replacing the old bulbs with low energy light bulbs fixed on the ceiling and on the walls, fluorescent type FIA04-1x36 W, FIRA 03- 4x36W i FIRA04 - 2x36.	€16,200

Awareness-raising

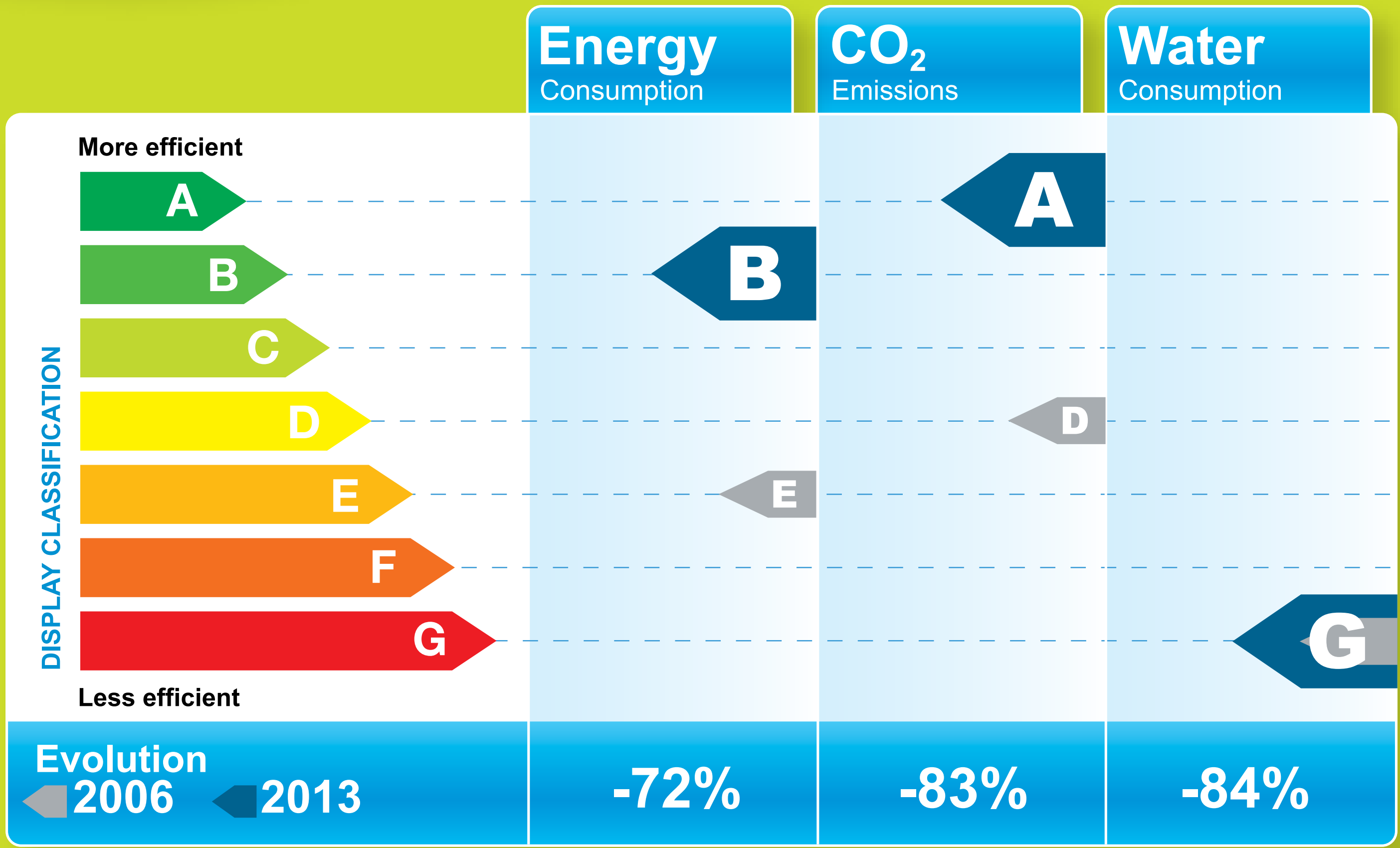
The Display® campaign has been launched in Bistriţa's schools, including the GEN I-IV "Andrei Muresanu" school, during the 2011 European Mobility Week and with the participation of the school management, the energy managers and student representatives. The "Eco-Energy" school teams have been created in 2012 and aim to present energy saving tips to students.

Jean Jaurès primary school

How does this building compare?

Category: General school
Operating hours: 2860h

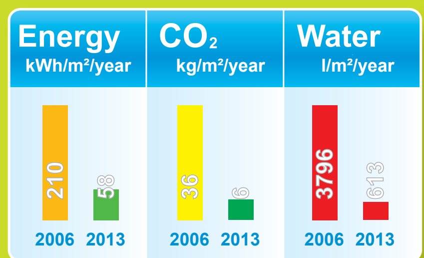
Area: 1841m²
Year of construction: 1960



What solutions have been implemented?

Renovation with "low energy" standard (BBC) from 2010 to 2012:
External insulation of walls, insulation of the roof, installation of double glazed windows, renovation of the heating system and insulation of pipes, installation of external sunscreens, internal lighting controlled by presence detectors, installation of a double flow ventilation.
Improvement of the energy management via individual meters and a connexion to a building management system.

from 2010 to 2012: 1,8 M€ (VAT inclusive)



Energy sources

Fossil	Nuclear	Renewable
26%	42%	32%
-66%	+180%	+256%

Ville d'Echirolles
Services Techniques
BERNARD François
Tel 0476206415
f.bernard@ville-echirolles.fr

energycities

www.display-campaign.org

City of Echirolles (France)

renovation 2010-2012

Summary

The municipality of Echirolles aims to reduce the energy consumption of its public buildings by 30% by 2014 (in the conditions of constant climate and building surface). Thanks to the energy monitoring of public buildings, the municipality has identified the 25 highest energy consuming buildings. The Jean Jaurès primary school is part of this list and also caused comfort problems to its users: overheating, direct lighting at certain times of the day, cold wall sensation, access to persons with reduced mobility, absence of canteen. All these issues led the municipal team to conduct a complete renovation of the primary school. The standard was the target, especially thanks to renovation including external insulation.

Envelope

Roof	Insulation of the roof with 14.5cm of mineral wool (U=0.27).
Facade	External insulation: 17.5cm of mineral wool. External sunscreen: solar gain < 0.15.
Windows	Double glazing with low emissivity.
Airthightness	Improvement of the airtightness (0.8 with 4 hp).
Other	A heat recovery ventilation has been installed, as well as light sensors and presence detectors to control lighting, and individual meters. Such works require the necessary project management and regular checks to achieve the objectives. The city of Echirolles has also required the involvement of all teams throughout the project duration and also tests such as dynamic thermal simulation, the analysis of lighting and airtightness tests (3 were conducted).

Technical installations

Heating	Renovation of the urban district heating substation. Insulation of pipes. Installation of low temperature steel radiators.
Cold/Hot water	Insulation of the networks. Installation of water savers.

Equipments

Replacement of the existing light bulbs by T5 ballasts. The lighting adapts to natural light.

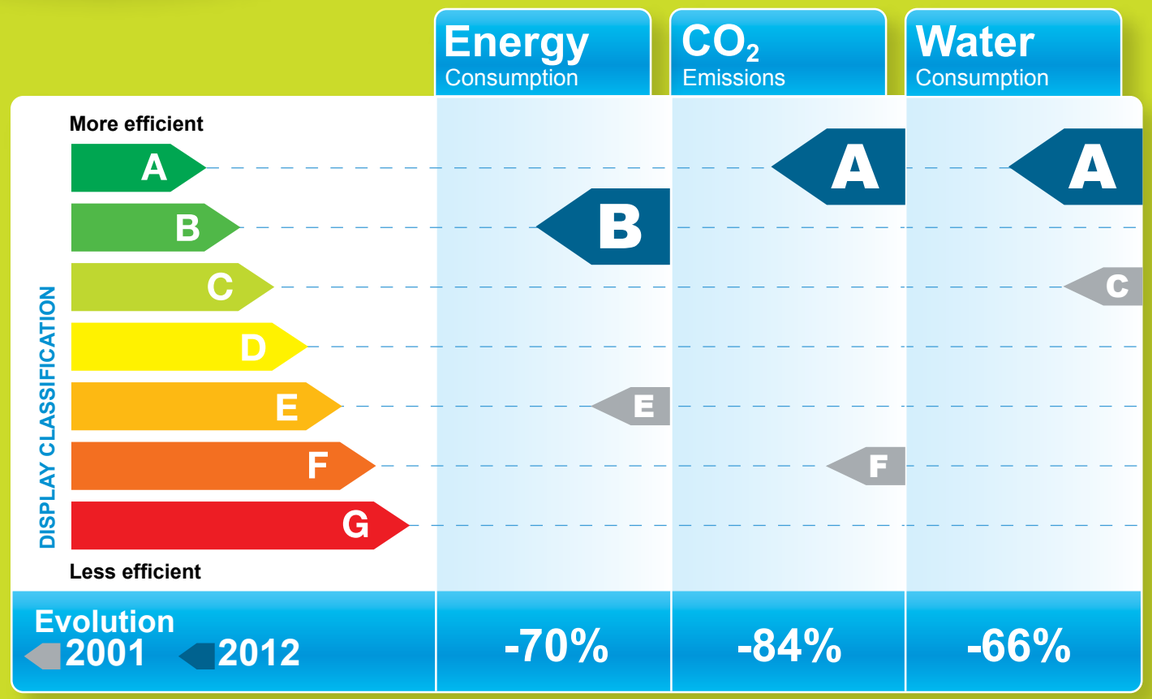
Awareness raising

Specific communication has been done for the building users, presenting the installations and how to use them.

Weiherhof school

How does this building compare?

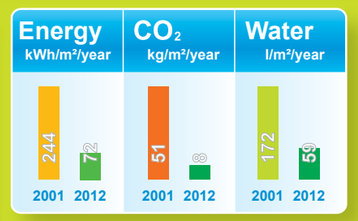
Category: General school **Area: 9755 m²**
Operating hours: 2860h

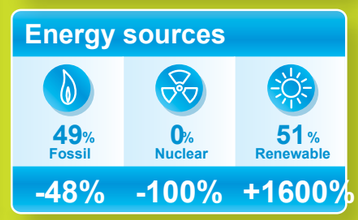


What solutions have been implemented?

Insulation of the roof and facades
Replacement of all windows
Installation of a wood boiler
Installation of PV panels on the roof
Replacement of the lighting system

The heating energy consumption has been reduced by 75% thanks to technical measures compared with 1998. The training of caretakers has also enabled another 5-10% reduction of the energy consumption.





Stadt Freiburg im Breisgau
Hochbauamt
Energiemanagement
Tel 0761/201-4559
bernhard.wiese@stadt.freiburg.de

www.display-campaign.org

City of Freiburg (Germany)

renovation 2001-2012

Summary

The need to renovate the Weiherhof school became urgent 20 year ago. Students and their families were complaining about unsafe buidlings. Therefore, the city council has increased the allocated budget to the renovation of old buildings. The Weiherhof school was the highest expenditure of this programme. The renovation was initially planned from 1997 to 2006 but has been extended to allow for additional measures. Works have been conducted in two phases: deep renovation of school buildings until 2004 (8.4 M€); renovation of other buildings such as the school hall and the sports hall from 2003.

Envelope

Roof	Insulation (14cm); U : 0.15 W/m²K.
Facade	External insulation of walls (12cm – 14cm); U : 0,25 W/m²K.
Windows	Replacement of all windows (U : 1,1 W/m²K).

Technical installations

Heating	Replacement of the boiler: installation of a wood boiler (supplied with wood chips) and a condensing boiler (gas); rehabilitation of a basement to stock wood chips.
PV installations	Installation of PV panels on the school roof. The city has rented the roof to the local energy company that has made the investment and carried out the installation.
Cold/hot water	Installation of water savers in showers and toilets.
Other	The excellent results can be explained not only thanks to the energy efficient measures implemented but also thanks to a new process: the traning of caretakers. The implied savings represent 5 to 10%. Therefore the high energy performance of the school has also been achieved thanks to the engagement of caretakers.

Equipment

Replacement of the lighting system in classrooms and corridors.
The building is supplied with green electricty (certified by TÜV), which means that it comes from RES installations (cofinanced thanks to a higher price).

Awareness-raising

Display of the before-after renovation Display® poster.

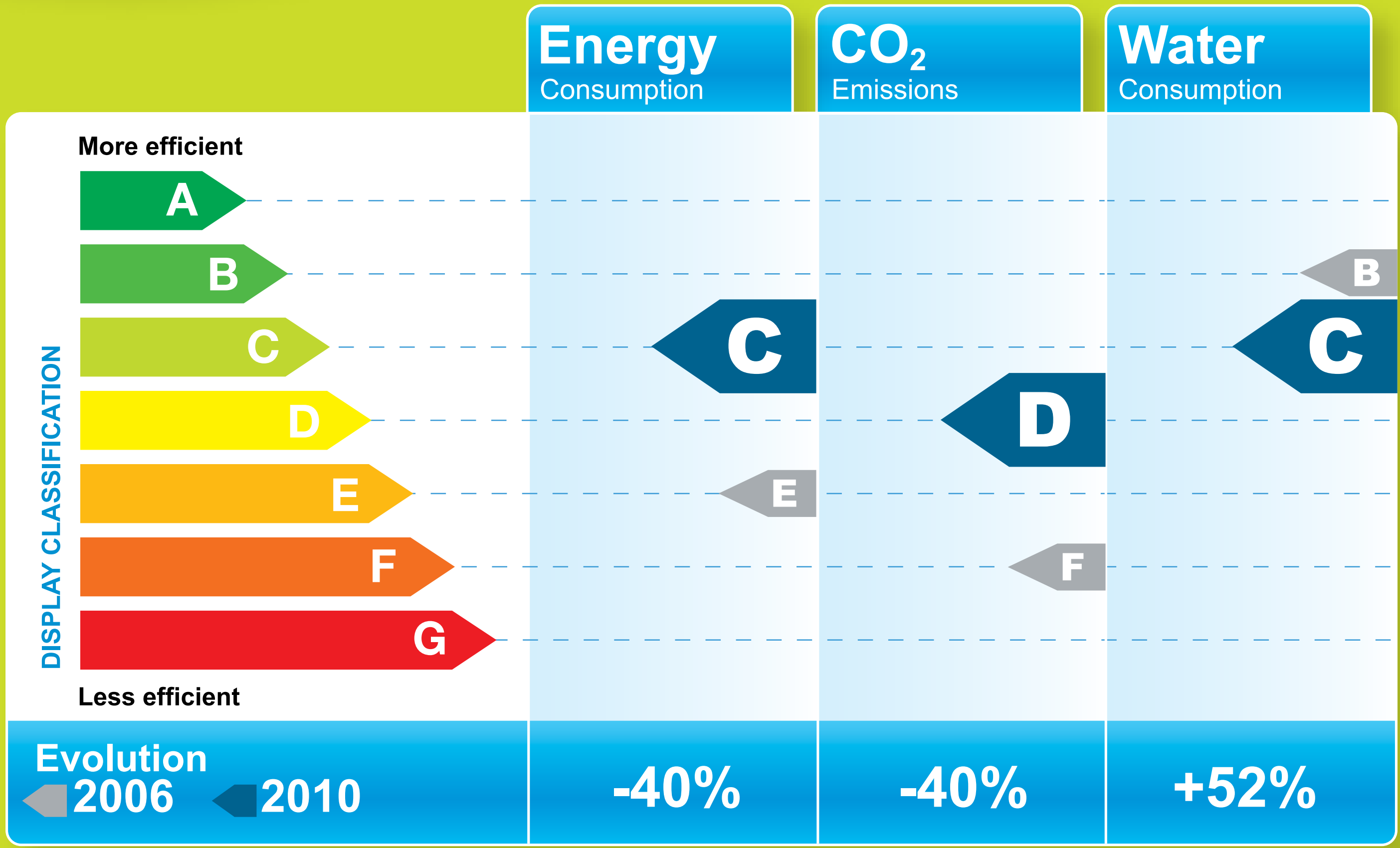
display®

Litoměřice, Ladova 5 primary school

How does this building compare?

Category: General school
Operating hours: 1800h

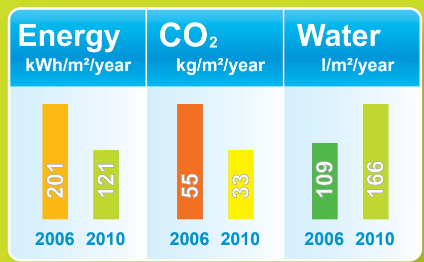
Area: 8040m²
Year of construction: 1989



What solutions have been implemented?

The objective of the renovation was to decrease the energy consumption of the building by 1.124 GJ/year and also avoid 117 tonnes of CO_2 emissions. These objectives were fulfilled by the insulation of the whole envelope of the building, the replacement of all windows and doors, roof insulation and the installation of the photovoltaic system.

The total budget of 24 million CZK (865,000 euros) was supported by the grant of the Environment Operational Programme to the amount of 20 million CZK (€721,000).



Energy sources

91% Fossil	7% Nuclear	2% Renewable
-2%	+40%	-+0%

Město Litoměřice
Oddělení projektů a strategií
Jaroslav Klusák
Tel 416916445
jaroslav.klusak@litomerice.cz

energycities

www.display-campaign.org

City of Litoměřice (Czech Republic)

renovation 2008-2009

Summary

The Ladova Primary School 5 is a complex of 6 inter-linked buildings (school buildings, canteen, sportshall). The total built-up area of the building is 4,503m². The heated area of all floors is 8,041m² and the average height of the floors is 3.9 m. The building is heated and the hot water is prepared by the coal CHP of the local energy company. Electricity is supplied by the central energy company and by the photovoltaic system installed on the roof of the building.

Envelope

Roof	Insulation of the whole roof (area: 3,231m²) with 5cm of polyurethane.	6.5 million CZK (€234,000)
Facade	Insulation of the whole envelope (area: 2,850m²) by 10cm of polystyrene.	7.2 million CZK (€259,000)
Windows	Replacement of all windows and doors (area: 1,611m²) by the new ones. U = 1.2 W/m²K for windows and U = 1.4 W/m²K for doors.	10.3 million CZK (€371,000)

Technical installations

PV installations	Installation of the photovoltaic system on the roof of the building with the power of 110 kWp.	4.5 million CZK (€162,000)

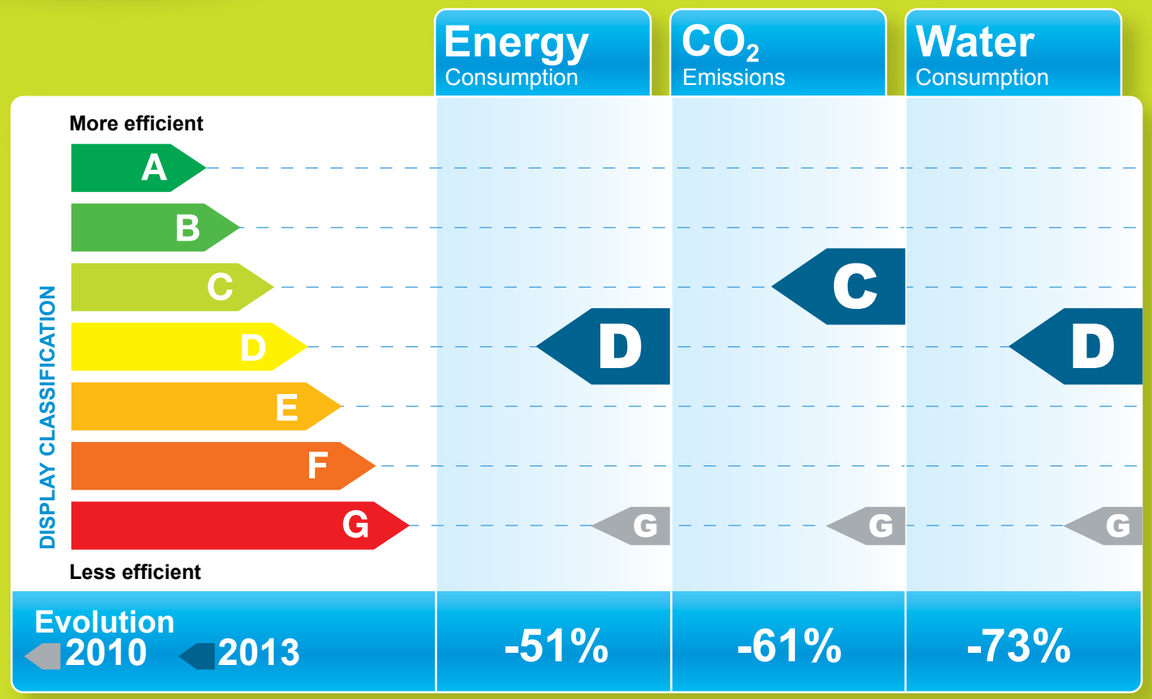
Awareness-raising

The poster was displayed after the renovation. A presentation focusing on energy savings, RES and energy friendly behaviour was made by the energy manager for the pupils of the primary school. Energy data monitoring and evaluation have been established after the renovation (monthly data for electricity and water, weekly data for heating).	About 20,000 CZK (€720)

Primary school

How does this building compare?

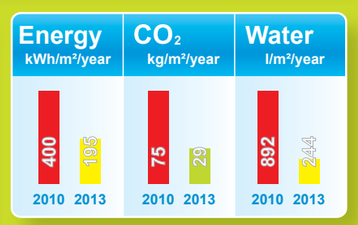
Category: General school **Area: 2566m²**

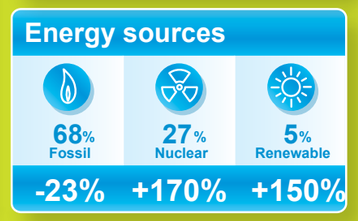


What solutions have been implemented?

Internal insulation of the existing building
External insulation of the building extensions
Replacement of windows
Replacement of the heating boiler

Global cost of the renovation: 10 million CHF (8,3 million euros)





Ville de Martigny
CREM
Tel 27 721 25 40
info@crem.ch

www.display-campaign.org

City of Martigny (Switzerland)

renovation 2011

Summary

A complete renovation of this building built in 1972 was conducted in 2010. An architects competition has been launched for the extensions of the school.

Envelope

Roof	Insulation of the roof of the vertical extension of the existing building: graphite expanded polystyrene (0.029 W/(m.K)), thickness: 20cm.
Facade	Internal insulation of the existing building: expanded polystyrene (0.038 W/(m.K)), thickness: 16cm. Perimeter inculation of the lateral extensions: graphite expanded polystyrene (0.031 W/(m.K)), thickness: 8cm.
Basement	Insulation under the concrete floor: expanded polystyrene (0.035 W/(m.K)), thickness: 10-14cm.
Windows	Replacement of windows of the existing building.
Airtigthness	Installation of a dural-flow ventilation.

Technical installations

Heating	Installation of a geothermal heat pump (heating and cooling) with a condensing gas boiler that replaces the existing gas boilers. Pre-heating of hot water by 8m² of solar panels.

Equipments

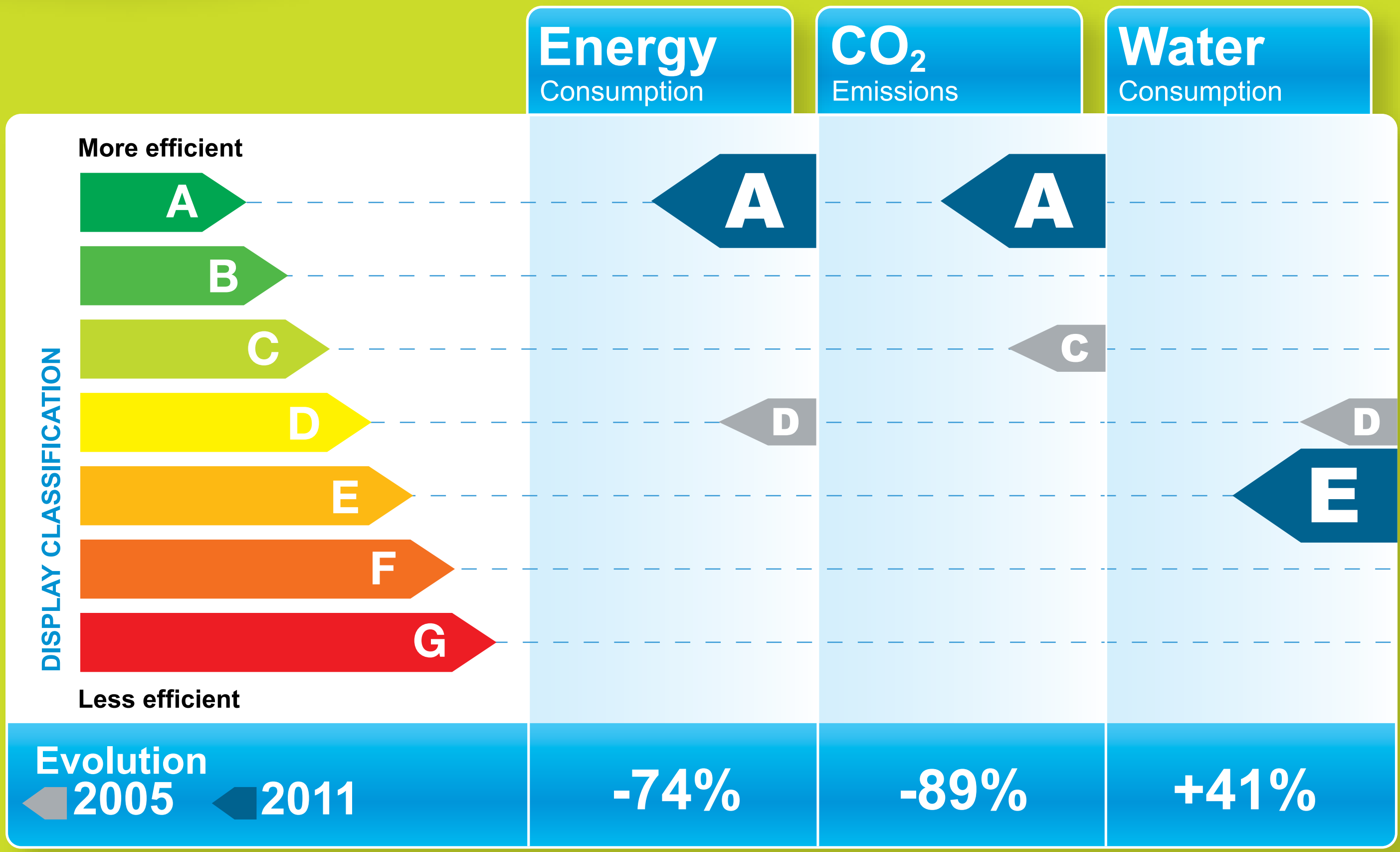
Installation of compact fluorescent lamps and LED.

Cutural centre and covered market

How does this building compare?

Category: Meeting places
Operating hours: 624h

Area: 1720m²
Year of construction: 1944



City of Mendrisio (Switzerland)

renovation 2009

Summary

The building designed by the architect Chiattone in the 1940s was an enclosed cattle market. The municipality of Mendrisio transformed it into a cultural centre. The renovation of the building included the installation of fibre ciment cladding on the roof, the replacement of roof windows and of pipes and the renovation of all flat roofs. Before the renovation, an EPIQR+ analysis (Energy Performance, Indoor environmental Quality and Retrofit) has been conducted which enabled the implementation of the planned works.

Envelope

Roof	Thermal insulation with corrugated aluminium sheets (area:1,100m²). Renovation of flat roofs (area: 510m²) and of pipes.
Facade	Establishment of buffer space (depot and services) between the internal surface and the external facades.
Windows	Replacement of roof windows (with more efficient glass).

Technical installations

Heating	Optimisation and new regulation of equiments.

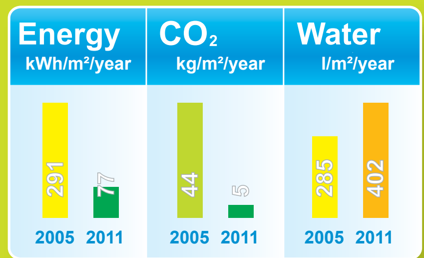
Equipment

Widening of the ventilation ducts.	32 000 CHF (€26 480)
Installation of new monitoring and control panels.	10 000 CHF (€8 275)

What solutions have been implemented?

2008: Launch of renovation works and thermal insulation of the roof; installation of new roof windows that are thermally insulated.
2009: end of renovation works; update oand re-programmation of the monitoring control panels.

1,120,000 CHF (€927,068)



Energy sources

32% Fossil	6 % Nuclear	62% Renewable
-51%	-60%	+210%

Città di Mendrisio
Ufficio tecnico
Arch. Mario Briccola
Tel 91 640 32 03
mario.briccola@mendrisio.ch

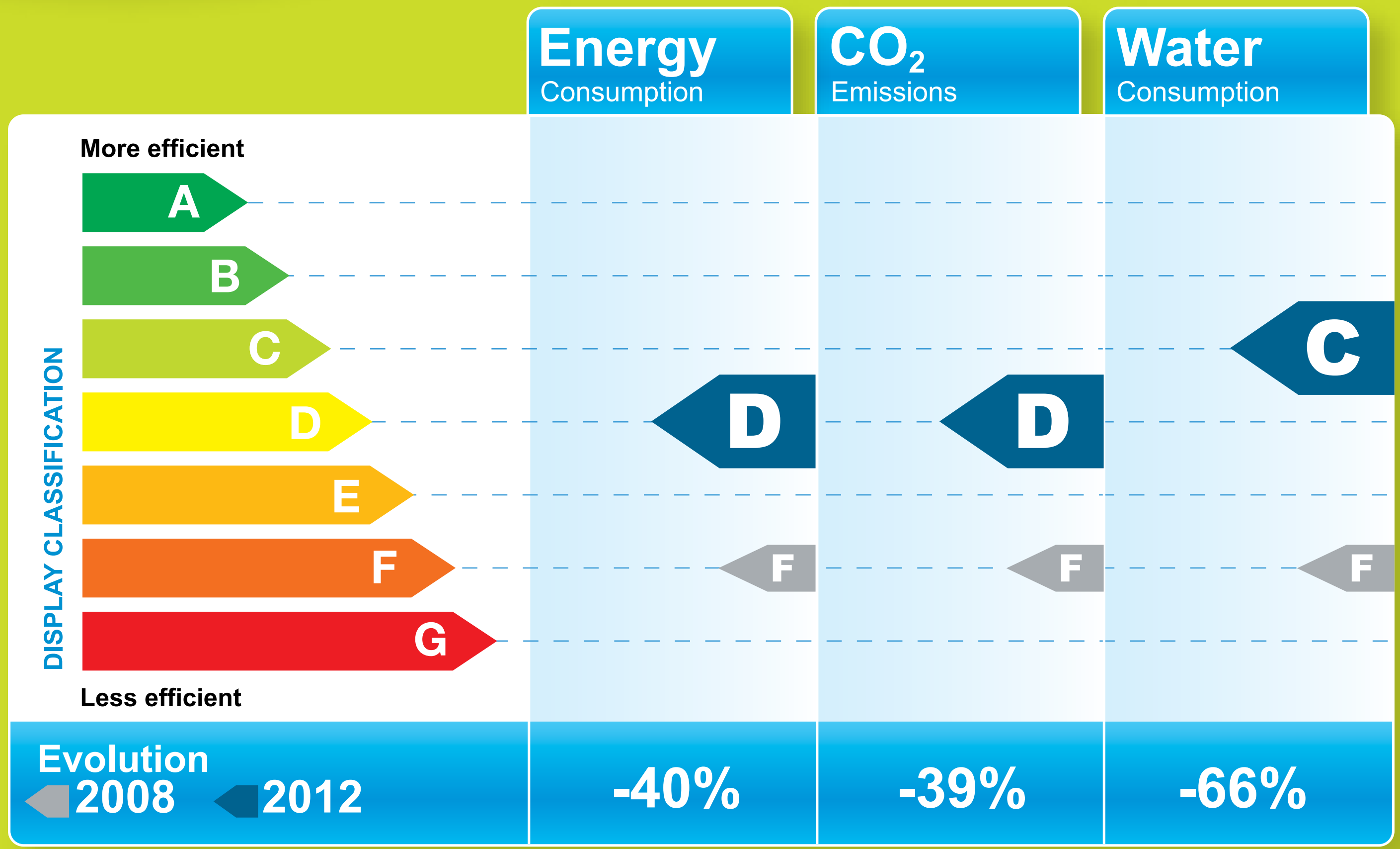
energycities

www.display-campaign.org

Community centre
City of Clamecy

How does this building compare?

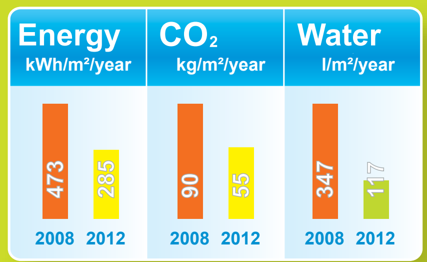
Category: Meeting places
Operating hours: 45h
Area: 1537m²



What solutions have been implemented?

The buiding attics have been insulated in 2009 by 2 crossed layers of 160mm each.
In 2010, a room thermostat has been installed to regulate the temperature from 21°C to 17°C depending on the building use.
The heating pipes have been insulated to reduce themal distribution losses.

The renovation costs are of €2,861 (tax excl.). These costs only include furniture, as renovation works have been conducted by public servants.
The energy savings enables the municipality to avoid the fuel expense of close to €57,000 (tax incl.) since 2009.



Energy sources

71% Fossil	25% Nuclear	4% Renewable
+1%	-4%	-+0%

Energy, Equipment and Environment Syndicate of cities of Nièvre (France)

renovation 2009-2010

Summary

The city of Clamecy benefits from energy advice support from the Energy, Equipment and Environment Syndicate of cities of Nièvre (SIEEEN). The energy pre-audit of city buildings shows that buildings occupied by associations are the least energy efficient. The city therefore decided to renovate the building in 2009. Since 2010, the fuel consumption has decreased by 40%. This important reduction has enabled the city to avoid a heating expense of €75,000 (VAT inclusive) (cumulated financial saving from 2009 to 2013).

Building envelope

Roof	Insulation of attic by 2 crossed layers of 160mm of glass wool (80h by public servants).	€2,196 (VAT exclusive)

Technical installations

Heating	Installation of an ambient thermostat to control the burner (reduction from 22h to 6h from 21°C to 17°C); cost: €90 (VAT exclusive). Insulation of heating pipes; cost: €395 (VAT exclusive); 70h by public servants.	€485 (VAT exclusive)

Awareness-raising

The municipality has developed a 2-day training entitled "Awareness raising actions for sustainable development". 83 public servants have been trained in 2010/2011. The objective was to present in details what is sustainability and what are the related concrete measures to be implemented by local authorities. The municipality displays energy certificates on all public buildings. In 2011, during the sustainable development week, the municipality has hosted an exhibition presenting environmental issues to schools. The aim is to present the energy chain from its creation to its use.
www.youtube.com/watch?v=BcYVybYQgyk

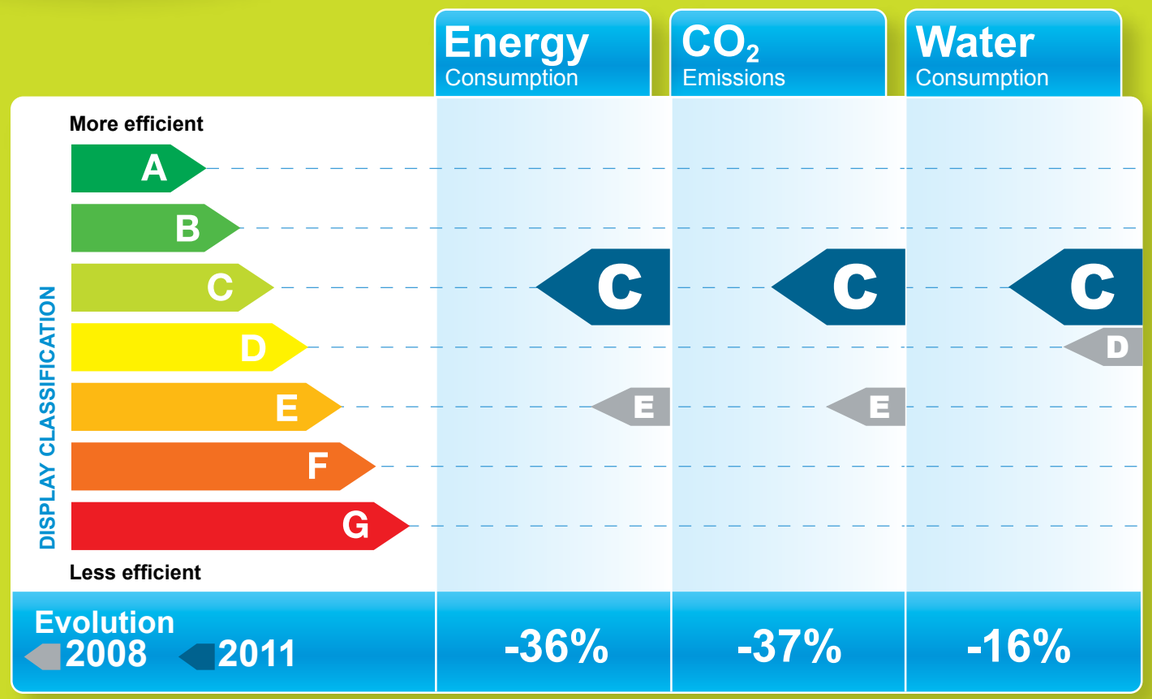
SIEEEN
Patrimoine & Energies
Conseil en énergie partagé
Tel 03 86 59 76 90
equipe-archi@sieeen.fr

Kaunas M.Mažvydo secondary school

How does this building compare?

Category: General school
Operating hours: 2160h

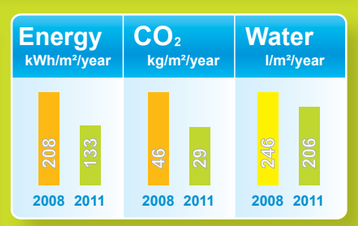
Area: 4813m²
Year of construction: 1978

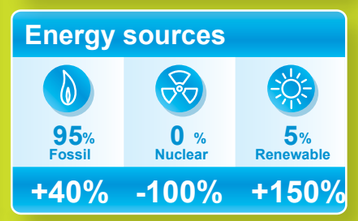


What solutions have been implemented?

- Insulation of external walls and the roof
- Replacement of windows and external doors
- Replacement of the heating system as well as the hot/cold water system
- Replacement of electrical installations (wiring and lighting)
- Replacement of part of the ventilation system
- Installation of a fire alarm system and access for disabled people

European Structural Funds – 3,665,930 Lt (€1,061,727)
City of Kaunas – 625,000 Lt (€181,013)
Lithuanian Ministry of Education and Science – 350,000 Lt (€101,367)





Kauno Regioninė Energetikos Agentūra
Tel 37 491043
krea@techpark.lt

www.display-campaign.org

Kaunas Regional Energy Agency - KREA (Lithuania)

renovation 2011

Envelope

Roof	Repair and additional insulation with expanded polystyrene foam (area 2883m²). After renovation U = 0.2 W/m²K.	491,959 Lt (€142,481)
Facade	Additional insulation of external walls and glass block elements (area 3392.16m²). Insulation of basement walls around the building's perimeter, to a depth of 80cm. After renovation U = 0.25 W/m²K.	849,238 Lt (€245,956)
Windows	Replacement of windows before the main renovation (area 733.98m²). After renovation U = 1.6 W/m²K. Replacement of external doors (area 32.86 m²). After renovation U = 1.6 W/m²K.	windows: 389,885 Lt (€112,910) doors: 17,454 Lt (€5,055)

Technical installations

Heating	Replacement of heating pipelines by new, multi-layered, balancing valves. Replacement of heating devices (radiators) and installations of thermo-static valves.	405,552 Lt (€117,456)
Water (cold/hot)	Replacement of cold water supply pipelines and water taps.	385,994 Lt (€112,081)

Equipment

Replacement of the electric installation (wiring and lighting).	1,509,448 Lt (€437,116)
Control of indoor temperature in every room is performed by thermostatic valves on heating devices. Ventilation system is renewed in gym premises and the conference hall.	

Sensibilisation

The progress and results of renovation were placed on various web pages including that of the school and shared with the other schools in Kaunas and the city administration.

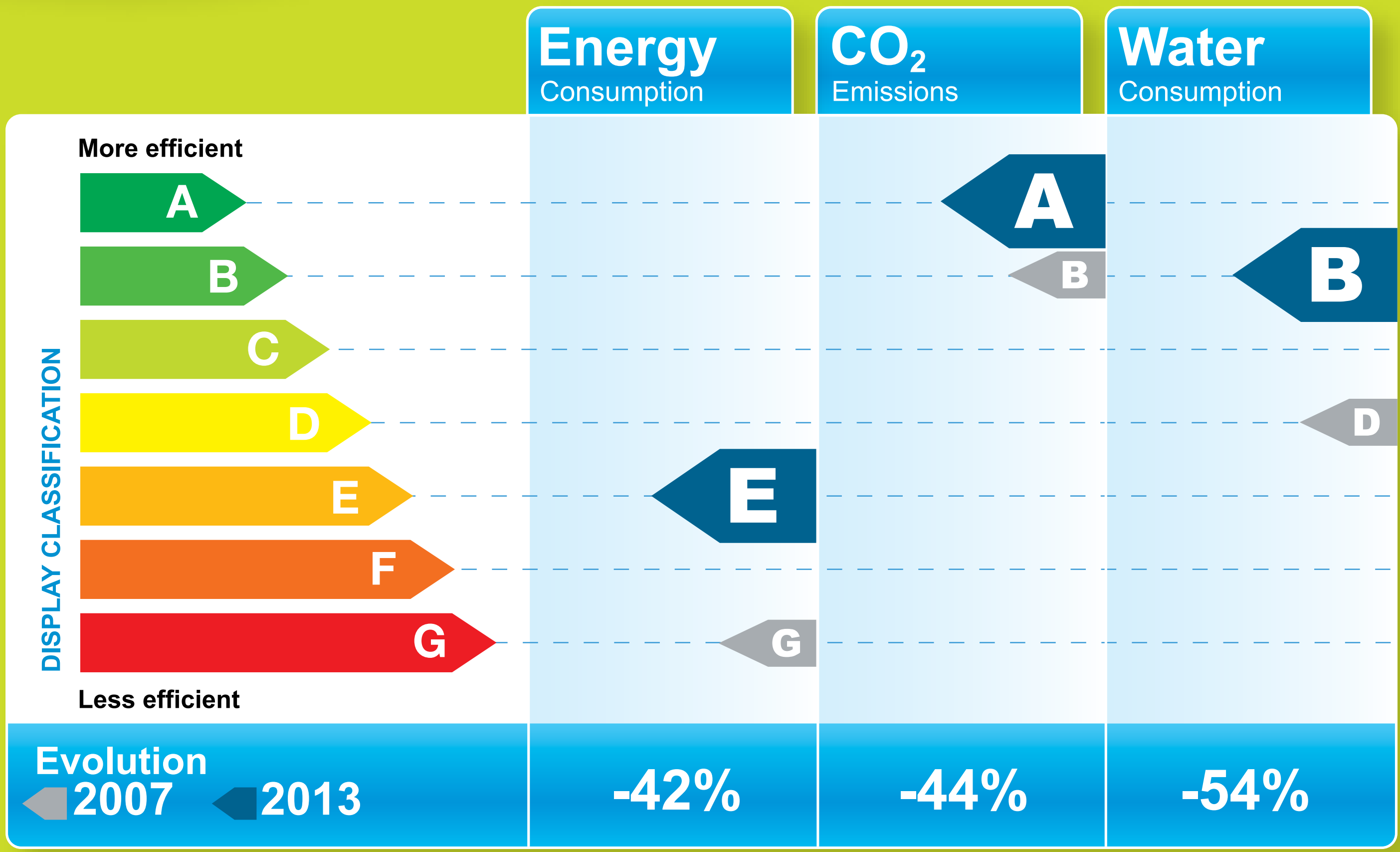
display®

City Hall of the Urban Community of Bordeaux

How does this building compare?

Category: Administrative
Operating hours: 3500h

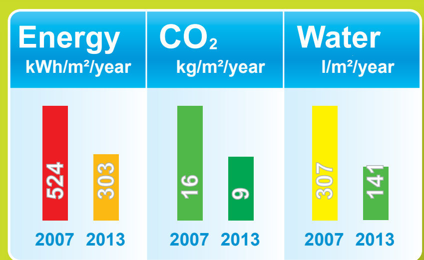
Area: 45600m²
Year of construction: 1979



What solutions have been implemented?

Replacement of exterior joinery by low emissivity double glazing.
Internal insulation of walls.
Installation of reversible radiant ceiling for heating and cooling.
Replacement of light bulbs by energy efficient bulbs that are fully automated.
Air handling units with energy recovery.
Heating and cooling provided by chillers connected to:
- energy recovery from waste water of a unitary manifold,
- geothermal energy from the district for extra heating.
Solar photovoltaic installation of 414m²: 177m² on glass roof (20.7 kWc) and 237m² of roof modules (38,9 kWc).
Building management system (BMS).

Total cost: 37 M€ (VAT exclusive).
Expected savings: €250,000 (VAT exclusive) per year.
Cost of energy recovery from wastewater: €1,248,000 (VAT exclusive).
onnection cost to the deep geothermal of the disctrict: €191,172 (VAT exclusive).



Energy sources

Fossil	Nuclear	Renewable
9%	79%	12%
-+0%	-+0%	-+0%

COMMUNAUTÉ URBAINE DE BORDEAUX
LaCUB
www.lacub.fr

Communauté Urbaine de Bordeaux
Direction des Bâtiments et Moyens
Service Bâtiment
Tel +33 (0)5 56 99 84 84
www.lacub.com

energycities

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Urban Community of Bordeaux (France)

renovation 2009-2013

Summary

The reorganisation of the City Hall of the Urban Community of Bordeaux provided an opportunity for energy performance and efficiency actions to be implemented. These actions are part of a larger strategy: the Sustainable Energy Action Plan. This global approach for a better management of the energy consumption has an impact on all CUB buildings through a multiannual investment plan dedicated to energy savings and the reduction of CO_2 emissions.

Envelope

Facade	Thermal insulation with extruded polystyrene (+ 10 cm compared to the initial insulation).
Windows	Installation of double or triple glazing depending on the facades. Use of high performance glass that enables a better solar control compared to common glass.
Airtightness	Improvement of the airtightness of the roofs.

Technical installations

Heating	Total replacement of the heating system. Production via 2 heat pumps, supplied with: - energy recovery from waste water; power recovery: 600 kW. - backup plan: connection to the local geothermal heat network. Emitters: reversible radiant ceilings in the offices and meeting rooms. Pre-heating of new air via heat recovery ventilation + batteries connected to the heat pump system.
PV installations	2 additional installations on the roof of the low building: - glass roof: integration of polycrystalline modules: 200m²; installed capacity: 20 kWc. - roof top: 144 polycrystalline modules: 200m²; installed capacity: 34 kWc. The unit is connected to 4 inverters positioned on the roof and electricity is fed back into the power grid of the building to ensure full consumption of production.
Hot/Cold Water	Production of part of the hot water by a thermodynamic water heater. Measures to reduce water consumption thanks to appropriate equipment such as pressure regulators.

Equipment

Complete replacement of lighting: led in bathrooms, corridors and underground car parks; T5 lights in offices and meeting rooms; lighting management system.
Complete replacement of air handling units.
Double ventilation energy recovery from exhaust air stream.

Awareness-raising

Communication upstream, during and after construction. Realisation of a guide for new users to raise awareness of energy conservation and inform them about the operation of the facilities.

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