Project n°: TREN/04/FP6EN/S07.31038/ 503135

Acronym: BRITA in PuBs

Title: Bringing Retrofit Innovation to Application in Public Buildings– BRITA in PuBs

Instrument: Integrated project

Thematic Priority: 6.1.3.2.1 ECO-BUILDINGS

Publishable Final Activity Report
Bringing Retrofit Innovation to Application in Public Buildings – BRITA in PuBs

Revision: **0**

Period covered:	**from 1/5/2004 to 30/4/2008**	Date of preparation:	**22/7/2008**
Start date of project:	**1/5/2004**	Duration:	**48 months**

Project Coordinator name:
Hans Erhorn
Fraunhofer Institute for Building Physics

Project coordinator organisation name:
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V.
as legal entity acting for its Institute
Fraunhofer Institute for Building Physics (IBP),
Fraunhofer-IBP

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	**X**
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

Publishable Final Activity Report
Bringing Retrofit Innovation to Application in Public Buildings – BRITA in PuBs

Authors:

Heike Erhorn-Kluttig and Hans Erhorn (Fraunhofer Institute for Building Physics, D)

Disclaimer:

Bringing Retrofit Innovation to Application in Public Buildings – BRITA in PuBs has received funding from the EU 6th Framework Programme under the contract:
TREN/04/FP6EN/S07.31038/503135

Content

1. Project Summary

The BRITA in PuBs project (Bringing Retrofit Innovation to Application in Public Buildings) aimed at increasing the market penetration of innovative and effective retrofit solutions to improve energy efficiency and implement renewables, with moderate additional costs.

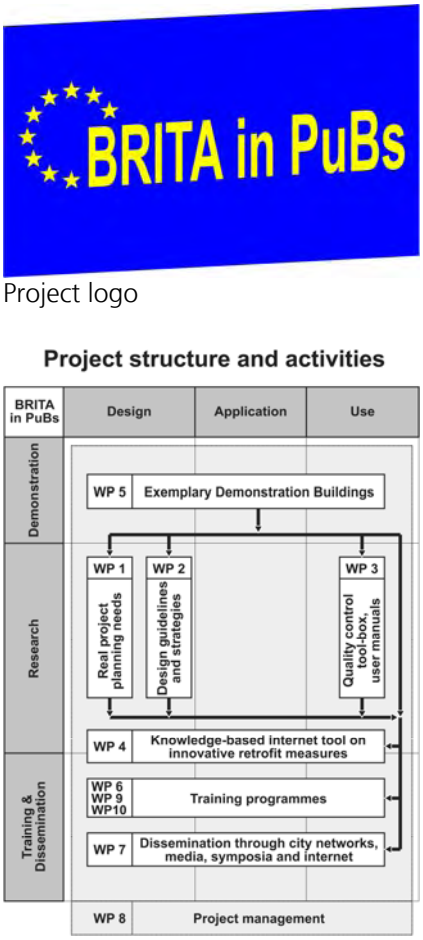
In the first place, this was realised by the exemplary retrofit of 8 public demonstration buildings in the four participating European regions (North, Central, South, East). By choosing public buildings of different types such as colleges, cultural centres, nursing homes, student houses, churches etc. for implementing the measures it should be easier to reach groups of differing age and social origin. Public buildings were used as engines to heighten awareness and sensitise society on energy conservation. The general aim of the retrofits at the demonstration buildings was to reduce the primary energy demand for heating, ventilation, cooling and domestic hot water by factor 2 and at the same time to improve the user satisfaction by also factor 2.

Secondly, the research work packages included socio-economic research such as the identification of real project-planning needs and financing strategies, the development of retrofit design guidelines, of an internet-based knowledge tool on retrofit measures and case studies and of a quality control toolbox to secure a good long-term performance of the building and the systems.

The third main pillar of the BRITA in PuBs project was dissemination. This was divided into two parts, the training of users, architectural students and maintenance personnel, and the publishing of the research and demonstration work to different target groups. The latter was done in a combination of targeted PR-campaigns and using local, national and international networks such as Energie Cités, the internet and other media, and arrangement and participation in symposia and conferences.

The project was organised geographically by region and vertically by incorporating the owners of the public buildings, the research team of architects and engineers and the project dissemination networks. The project was managed via biannual meetings, a steering committee and four subtasks on design, implementation, use and dissemination. A general assembly taking place at the meetings decided on finance and project alterations, which were prepared for discussion by the steering committee.

Project logo



Project structure

www.brita-in-pubs.eu
www.brita-in-pubs.com
www.brita-in-pubs.info
www.brita-in-pubs.de
Project website

2. Participant List

Parti-cipant. Role	Parti-cipant. Number	Participant name	Participant short name	Country	Date enter project	Date exit project
CO	1	Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. as legal entity acting for its Institute Fraunhofer Institute of Building Physics (IBP), Fraunhofer-IBP	Fraunhofer	Germany	1	48
CR	2	City of Stuttgart	City of Stuttgart	Germany	1	48
CR	3	IT Power	ITP	United Kingdom	1	48
CR	4	Plymouth College of Further Education (City College Plymouth)	PCFE	United Kingdom	1	48
CR	5	SINTEF Civil and Environmental Engineering	SINTEF	Norway	1	48
CR	6	Asker Municipality	Asker Municipality	Norway	1	48
CR	7	Hol kirkelige fellesråd (Hol Church Council)	Hol Church Council	Norway	1	48
CR	8	Norwegian Building Research Institute	NBI	Norway	1	48
CR	9	Architect Røstvik/SunLab	SunLab	Norway	1	48
CR	10	Cenergia Energy Consultants	Cenergia	Denmark	1	48
CR	11	København Kommune – Uddannelses-og Ungdomsforvaltningen	UUF	Denmark	1	48
CR	12	Statens Byggeforskningsinstitut, (Danish Building and Urban Research)	SBi	Denmark	1	48
CR	13	Valtion teknillinen tutkimuskeskus (VTT Technical Research Centre of Finland)	VTT	Finland	1	48
CR	14	Ente per le Nuove Tecnologie l'Energia e l'Ambiente	ENEA	Italy	1	48
CR	15	Politecnico di Milano	Politecnico di Milano	Italy	1	48
CR	16	Garboli Conicos S.p.A. Impresa General Costruzioni[1)]	Garboli Conicos	Italy	1	12
CR	17	Università degli Studi di Palermo (Dept. D.R.E.A.M)	UNIPA-DREAM	Italy	1	48
CR	18	National Technical University of Athens	NTUA	Greece	1	48
CR	19	EuDiti Ltd.	EuDiti	Greece	1	48
CR	20	Evonymos Ecological Library	Evonymos	Greece	1	48
CR	21	Brno University of Technology	BUT	Czech Republic	1	48
CR	22	Vilnius Gediminas Technical University	VGTU	Lithuania	1	48
CR	23	Forschungszentrum Jülich GmbH	FZJ	Germany	1	48

3. Co-ordinator Contact Details

The BRITA in PuBs project was coordinated by Hans Erhorn of the Fraunhofer Institute of Building Physics. To contact him, please use the coordinates on the right:

Hans Erhorn
Fraunhofer Institute of Building Physics
Nobelstr. 12
70569 Stuttgart
Germany

Tel: +49-711-9703380
Fax: +49-711-9703399
e-mail: hans.erhorn@ibp.fraunhofer.de

Co-ordinator's contact details

4. Project Organisation

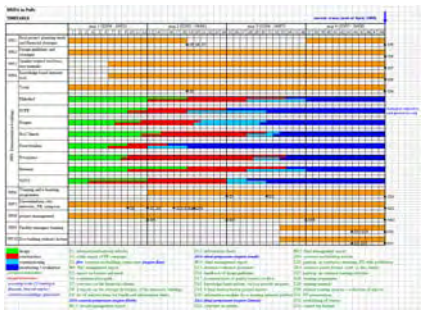
In total the group held nine meetings during the project phase (Helsinki in May 2004, Copenhagen in November/December 2004, Vilnius in April 2005, Berlin in November 2005, Asker/Hol in April 2006, Palermo in October 2006, Brno in March 2007, Athens in October 2007 and Stuttgart in April 2008) and organised two common Ecobuildings symposia in Berlin, November 2005 and Stuttgart, April 2008. After having concentrated on the design relevant work packages and the start of the dissemination in the first project year, the BRITA in PuBs team spent work in parallel on the demonstration, the dissemination and the research work packages. Within the third year there was focus on the realisation of the retrofit of the demonstration buildings, the further development of the research work packages on design guidelines, information tool and quality control toolbox and last but definitely not least on the training of users and other target groups and the dissemination of the project and the Ecobuildings initiative as a whole. Significant work had to be spent on the management of the project, mainly on an amendment to the Annex I and the extensive communication with the Commission. In year 4 all work packages, that were related with and influencing each other, were in the final phase and the concentration was on the analyses of the demonstration building monitorings and the completion of the project deliverables such as reports, design guidelines, tools, the training courses and the general project dissemination like the website, the newsletters and the presentations at conferences.

The BRITA in PuBs participants at the first meeting in Helsinki, May 2004…

…and during a visit at the demonstration building Filderhof at the final meeting in Stuttgart, April 2008.

5. The Demonstration Buildings

The inner core of the project was the realisation of the retrofit concepts and measures for the 8 different demonstration buildings. The experiences made there were used in many other work packages such as the BRITA in PuBs information tool, the quality control toolbox, the training of the facility managers, the courses for architectural students and mainly the dissemination work. The project summaries, the monitored results and lessons learned are quoted in the information tool and the checklists of the quality control toolbox have partly been applied at the demonstration buildings for a test. All buildings have been published in local and/or national newspapers and other dissemination means. For example the British demonstration building Plymouth City College was



Detailed time table showing the planned working phases of the different work packages. The demonstration buildings are divided into design, realisation, commissioning and monitoring phase.

Screenshot of the video made at two BRITA in PuBs demo buildings available on the project website.


The demonstration building Nursing Home Filderhof, Stuttgart.


"Our demonstration projects are well suited to serve as best practice examples both for our municipality and for external planners and facility managers in Stuttgart and throughout Germany. We also present these projects at congresses to disseminate our best practice with others."
Deputy Mayor Matthias Hahn, Urban Design and Environment of Stuttgart, in his speech on the 3rd EnSan-Symposium.

featured twice in British TV, and the demo buildings Borgen and Hol are part of an EU sponsored video project. However the main focus in WP5, the work package on design, realisation, monitoring and reporting of the demonstration buildings, was to complete the monitoring and to analyse the results of the project. The building diary on the project website was updated regularly and showed the progress of the retrofit work. The final deliverable of the demonstration building work package after the 4th project year was the report on the realisation and validation analysis including a comparison between concept and realisation which needed a big combined effort of all the demonstration partners and the work package leader. The demonstration buildings and the main included energy efficiency and renewable energy retrofit measures can be summarised as follows:

5.1 Nursing Home Filderhof, Stuttgart, Germany

The Filderhof demonstration project, a nursing home, was renovated and enlarged by an extension. Since the energy consumption of the building stock was very high in comparison to the public building stock of Stuttgart, the city decided to put emphasise on an energy retrofit. Besides a new heating plant the energy improvement of the building envelope was part of the retrofit. The windows were changed, the walls insulated, a new heating system with solar plant and combined heat and power unit was installed, the lighting system has been completely rebuilt and a PV plant was erected. Between the existing building and the extension an atrium was constructed. One of the challenges of the project was that the exterior façade has many historical elements (the balcony, the frame of the entrance door and the architrave block of the building) which were worth to be kept. Therefore the wall insulation couldn't be realised on the outside, but had to be moved to the inside.

Main retrofit measures:

- High efficient windows with 3-pane glazing and thermal spacers
- Internal insulation of the external walls with mineral fibre wool in aluminium construction frames, covered with gypsum boards incl. a vapour barrier
- Insulation of the roof between and below the rafters
- Insulation of the ceilings and around the new heated rooms in the cellar
- New energy efficient lighting system
- Ventilation systems with high heat recovery rate for the new bathrooms and the kitchen
- Combined heat and power unit, two condensing boilers, solar thermal plant for domestic hot water
- Photovoltaic panels on the roof
- Building energy management system

5.2 City College Plymouth, UK

The challenge of this project was to upgrade the external facades and remodel internally to modernise the building but adopting a whole range of energy saving technologies. The existing building dating from 1972 had only been partially refurbished since that time. As part of the overall refurbishment of the building the following low energy technologies were proposed: PV cladding, low-e windows, solar control, insulation of facades and roofs, heating and control improvements, natural ventilation, wind turbines, low energy lighting and controls, rainwater harvesting and tap replacements. A holistic retrofit concept was developed and the measures have been designed, but not yet realised besides the installation of two wind turbines adjacent to the tower block building.

Wind turbines at the building City College Plymouth.

"I find it inspiring to see the wind turbines turning when I arrive in the morning. Although they only make a small contribution to our energy needs, it was very much a 'pilot' project. As City College Plymouth designs it new buildings, we will be incorporating a lot more 'green' design principles and practices."
Viv Gillespie, Principal of the City College Plymouth.

Main retrofit measures:

- New thermally broken double glazed, reversible windows
- New cladding with significant increase in insulation values and partly integration of PV (south and west facades)
- Introduction of rain water harvesting
- 3 high efficient modulating boilers and high efficiency radiators served from a zone distribution system
- Combined heat and power unit
- Solar thermal unit to supplement the domestic hot water system
- Night ventilation through louvers
- Two 6 kW wind turbines
- High frequency electronic controlled gear and T5 lamps, controlled by occupancy and light levels
- Upgrade of the building energy management system

5.3 Community Centre Borgen, Norway

The Borgen demonstration project has proven that innovative energy solutions like a thermal heat pump, hybrid/natural ventilation and active use of daylight in combination with increased insulation and high quality windows have substantially reduced the energy consumption at a reasonable cost and payback time slightly over 10 years. The challenge was to implement a comprehensive renovation of a combined elementary/secondary school building built in 1971, transforming it into a secondary school incorporated in a local community centre. The overall goals were best possible quality classification for environment, resources and indoor climate, reduction of the total energy consumption for heating, ventilation and lighting by 50 % or better and utilisation of renewable energy sources.

"Borgen Community Centre stands as a very successful project, representing a major contribution to improve environment, resources and indoor climate.
I register with pleasure that our goal of reducing energy consumption by at least 50% has been achieved by a good margin. Our experience with the technical principles applied to the building represents a good foundation for future buildings in our municipality. The building has been awarded a prize for being an environmental friendly building, and the response from the users is very positive."
Stein Grimstad, Head of Project Department, Asker Municipality.

Main retrofit measures:

- Re-utilisation of all construction elements that satisfied Norwegian building requirements


The Community Centre Borgen.

- Replacement of roof elements including a lift of the central area to allow daylight into the building
- Roof insulation with average thickness of 300 mm
- Rebuilt walls with 200 mm insulation
- New windows with wooden frames and outside aluminium cladding, high quality double glazing and low emissive coating
- Insulation of floor slabs
- Geothermal heat pump with 44 energy wells
- Two oil boilers as back-up system (mandatory)
- Natural hybrid ventilation system incl. air culverts
- Improved daylight conditions through windows and skylights in the roof
- Adjustable electrical lights automatically controlled by light sensors
- Advanced building energy management system


The church in Hol, a listed building, now preheated by a solar air collector.


"If we are going to secure the future of coming generations, we must protect the environment. The church has a responsibility in this context and we will support work to stop negative environmental trends. We will show examples and shout, "it works". We will support all good forces and help provide politicians with courage to initiate necessary measures."
Laila Riksaasen Dahl, Bishop of Tunsberg in her New Year speech 2006.

5.4 Church in Hol, Norway

The Hol Church project has uncovered the big challenges to be met when dealing with a considerable part of protected buildings in Europe. As these buildings will be remained for decades and centuries, they appear to be crucial with regard to the energy need reduction in the building stock. The demonstration building in Hol showed that energy efficient solutions can be applied to a listed building under the authority of protective antiquarian wings, that meant in principle that not any structural change could be allowed. However steadfastness and endurance coupled with innovation led to success.

Main retrofit measures:

- Insulation of the floor from below through the crawl space
- Insulation of the ceiling from above after argumentation that the existing ceiling with a very dry sawdust covering was a fire risk
- Proper adjustment of the windows and doors and equipment with rubber gaskets
- Use of an air canon which 'shoots' unheated air upwards to replace the heated air under the high ceiling
- Installation of an air based solar thermal system. Connection of the solar collector to the church by an earth sheltered insulated duct. The air is moved by fans driven by a PV collector.
- Operation of the heating system through remote control by the care taker


The demonstration building Proevehallen, a sports and event centre.

5.5 Cultural Centre Proevehallen, Copenhagen, Denmark

The Proevehallen demonstration project proves that introducing the right concept of energy conservation measures and renewable energy integration into a renovation project can bring the resulting building up to an energy standard that is considerable better than current building regulations at reasonable costs and payback time. Energy efficient solutions

were used to turn an old factory building into a modern low energy and multifunctional cultural house.

Main retrofit measures:

- External insulation of the brick walls
- Natural ventilation of the upper floor. The windows are demand-controlled according to CO_2 and temperature.
- Mechanical ventilation of the lower floors including an efficient air-to-air heat exchanger controlled by CO_2 and temperature sensors.
- Solar PV on the gable wall
- Solar PV/thermal that delivers heat to a heat pump. The return flow of the heat pump is cooling the PV system which increases the efficiency of the system.

5.6 Evonymos Ecological Library, Athens, Greece

The challenge of this project was to renovate a listed building, constructed in 1895–1950 close to the central archeological spaces in Athens, using energy conservation and renewable energy systems. Besides it had to be converted into an ecological library devoted to demonstration, education, and dissemination of low energy and environmental friendly technologies in building construction and renovation. This included traditional and modern techniques of energy and water conservation, ecological building materials, renewable energy systems, and recycling of water, paper, etc. At the same time the energy refurbishment had to follow the norms and restrictions foreseen by the General Building Code for listed buildings of this type.

Main retrofit measures:

- Complete renovation of the building interior incl. the addition of new useful spaces such as a mezzanine between the ground floor and the 1st floor and the conversions of an existing veranda to an open reading area and of a terrace into a sitting area
- External insulation of a walls and roofs with 4 cm insulation thickness. The external architectural decorative elements were dismounted for the placement of insulation and then replaced or reconstructed
- Air-tight windows with low-e double glazing and night insulation (insulated aluminium rollers)
- Reduction of window stripping and tight window frames
- Intregration of two sunspaces on the verandas/terraces
- PV integration on the sunspace roofs as shading devices
- Solar thermal collectors for domestically heated water
- Efficient gas fired boiler system for heating with pumps with variable frequency drivers
- Hybrid ventilation: ceiling fans and earth pipes
- A centrifugal fan at the top of the main stairs to assist natural ventilation by rejecting used air
- Passive cooling strategies such as shading, night ventilation and use of the thermal building mass.

"Copenhagen is devoted to fighting the climate change and welcome the opportunity to use a prominent building as a lighthouse to demonstrate the importance of introducing energy efficient retrofit measures for a renovation project of a public building. Our vision for Copenhagen is to become the world's EcoMetropole by 2015. … I hope that the good experiences from Proevehallen will encourage and inspire other building owners, public as well as private, to look into the possibilities of increasing the use of energy efficiency savings and renewable energy in coming building renovation projects."

Klaus Bondam, Mayor of Technical and Environmental Administration of Copenhagen.

The Evonymos Library in Athens.

"We believe that a major step in reducing environmental pollution is the widespread use of low energy and ecological construction technologies, and especially in retrofitting of existing buildings. The renovation of Evonymos Ecological Library integrates energy conservation and renewable energy systems with traditional building techniques in a listed building, and as such it can serve as a pilot project for many similar buildings in Greece and in Europe."

Dimitrios Papadimoulis, Member of the European Parliament (Committee on the Environment, Public Health and Food Safety).


The social centre Brewery in Brno.


"Ancient Brewery was a part of historical monastery and its manor. Brewery was in 2005 enlisted as a national heritage and this made the retrofit very complicated, requiring a unique design and construction works. Advanced and energy saving technologies for heating and ventilation namely in boarding and lodging parts implemented into Brewery increased its value and as we expect, will reduce substantially operational costs. Brewery becomes a precious stone of a newly developed campus of the Faculty of information technologies of Brno University of Technology."
Zdenek Bouša, Vice Dean for Development, Faculty of Information Technologies, Brno University of Technology.


"Every Morning I look at the Main Building of VGTU on my way to work and a feeling of admiration sweeps me: it has become so beautiful after refurbishment. It's sad that we could not refurbish other buildings of VGTU yet."
Prof. Dr. habil. Romualdas Ginevicius, Rector of Vilnius Gediminas Technical University.

5.7 Students' Social Centre Brewery, Brno, Czech Republic

The Brewery is an old industrial-type building in a historical area of the city of Brno. The Brewery and some other buildings in the area have been retrofitted for the use of the faculty of information technologies of the Brno University of Technology (BUT). The name brewery refers to the purpose that the building was originally used for; however, it only served as a warehouse in the recent past. The retrofitting of the Brewery involved a complete change of use. The industrial-type building had to be transformed into a modern social and cultural centre for students and academics. Many building structures had to be rebuilt or reinforced during the retrofit and all the building systems had to be designed from scratch.

Main retrofit measures:

- New windows with glazing U-value of 1.1 W/m²K
- Insulation of some external walls with 100 mm of mineral wool, most walls are made of 1 m thick heavy brick construction
- Insulation of the floor to the ground with 60 mm of polystyrene and insulation of the ceilings under the unheated lofts with 160 mm of mineral wool
- Insulation of the roof with 160 mm of mineral wool
- Hydronic heating system with different types of radiators and convectors
- Efficient air-conditioning system (VRV)
- Ventilation system with heat recovery
- Photovoltaics
- Building energy management system

5.8 Main Building of the Vilnius Gediminas Technical University, Lithuania

The challenge of this project was to show how energy efficient solutions can be achieved in applying the methodology of multi-variant design and multiple criteria analysis of a building refurbishment by forming thousands of alternative versions. This methodology allowed determining the strongest and weakest points of each part of the refurbishment project of the main building of the Vilnius Gediminas Technical University. The building was in use for more than 30 years and the building envelope had untight sealings at joints and untight windows. The planned measures include a renovation of the facades, a replacement of the windows and entrance doors, a renovation of the roof, a slight optimisation of the renovated thermal unit and the control systems and a renovation of the heating system.

Main retrofit measures:

- Insulation of the facades to reduce the U-value from 1.07 W/m²K to 0.2 W/m²K
- New windows with a U-value of 1.16 W/m²K

- New entrance doors with a U-value of 1.5 W/m²K
- Insulation of the roof. The new U-value is 0.2 W/m²K
- New, fully automated heating system
- Partial renovation of the thermal unit incl. an electromagnetic indicator for heat and water quantity
- Replacement of the current ventilation system with a fully automated mechanical system with 50-70 % heat recovery and new ducts

The main building of the Vilnius Gediminas Technical University.

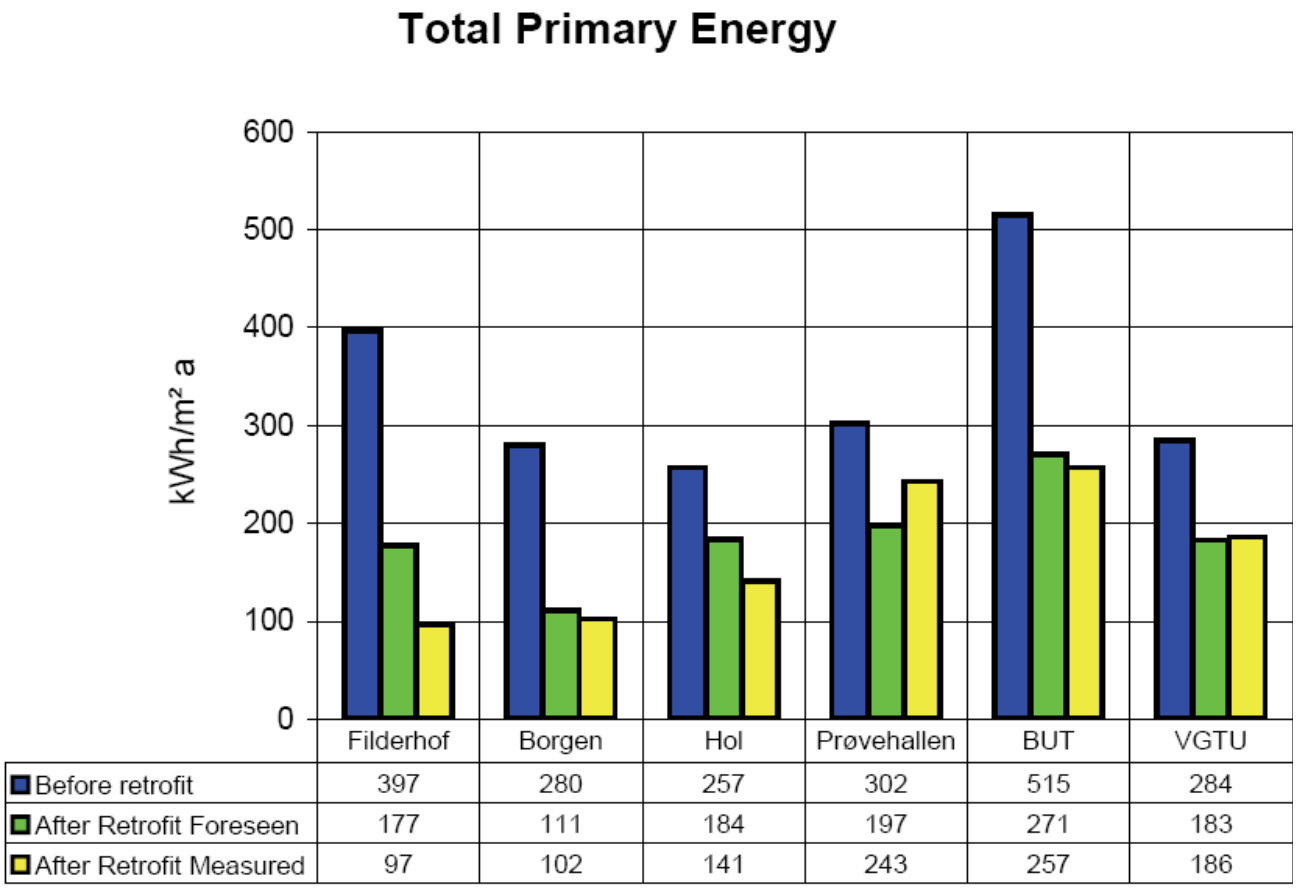
5.9 The Monitoring Results of the Demonstration Buildings

The BRITA in PuBs deliverable "8 reports on the realisation and validation analysis of the demonstration buildings in BRITA in PuBs" contains detailed descriptions of the design and realisation of the retrofit measures and the results of the monitoring periods.

The main goal for the retrofits was the reduction of the primary energy consumption by 50 % after the retrofit. The diagram below compares the primary energy consumption before and after the retrofit for each building. The reduction factors of the buildings range between 1.2 and 4.1 and the average is 2.2 and therefore meets the goal.

Main goals of the BRITA in PuBs demonstration buildings:

- Reduction of the primary energy demand for heating, ventilation, cooling and domestic hot water by factor 2.
- Improvement of the user satisfaction by factor 2.



Comparison of the total primary energy consumption before, calculated after and measured after the building retrofits. The results of the Evonymos building were not yet available at the time of the report.


Further reading:
Citterio, M. et ali: Report on the realisation and validation analysis of the demonstration buildings in BRITA in PuBs (2008). Report available at: www.brita-in-pubs.eu

Another aim for the demonstration buildings was the decrease of the users' dissatisfaction rate also by factor 2. Although this effect was not easy to prove, mainly because in some buildings the use and therefore also the users changed, the report shows that all buildings report an increase of the thermal comfort, sometimes by enquiries, sometimes by measured conditions.

The report contains additional interesting information such as details on the energy performance (heating and domestic hot water and electricity) and the costs of the retrofit measures.

5.10 Life Cycle Assessment of the Demonstration Buildings

The 8 demonstration buildings were not only evaluated regarding their final and primary energy consumptions, but were also assessed concerning their life cycle. The "life cycle" approach encompasses all the impacts occurring during the entire life-cycle of products and services from "cradle to grave". It assesses the environmental impact of materials, products and/or services throughout their entire life cycle, from the production of raw materials to the waste disposal. The study "Life Cycle Assessment of the BRITA demo building retrofits" applies the Life Cycle Assessment (LCA) methodology as regulated by the international standards of series ISO 14040.

The following elements have been included in the analysis:

- Construction materials and components employed during the retrofits;
- Main components of traditional and renewable energy based plants;
- Impacts induced from building construction.

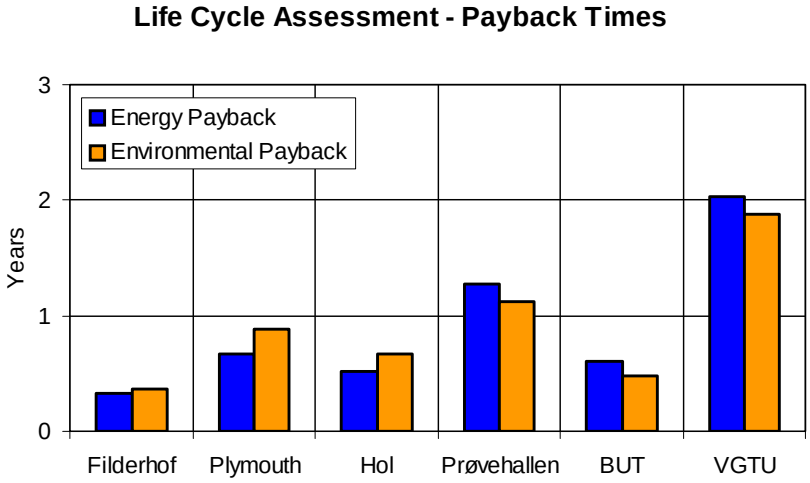
The main aim of the research was to assess the "environmental quality" of the engaged actions and, in particular:

- to highlight components and steps of the project that have the greatest impacts;
- to trace a balance of energy and environmental benefits and drawbacks concerning the retrofit actions.


Further reading:
Beccali, M. et ali: Life Cycle Assessment (LCA) of the BRITA demo building retrofits - Analysis of the environmental benefits and burdens related to demobuilding retrofit actions (2008). Study available as annex to the retrofit design guideline "LCA" at: www.brita-in-pubs.eu

The analysis showed significant energy and environmental convenience of the accomplished retrofits. In particular the energy and environmental payback times that resulted were very low, with values varying from 0.3 to 2 years. This means that in a relatively small time period the global energy and environmental investments are fully repaid by the obtained benefits. The relatively long useful time of the retrofits therefore produces large energy consumption savings and avoidance of emissions of large quantities of pollutants. It is interesting to note that the largest benefits are generally

related to the insulation of the buildings: high efficiency windows, mineral wool and glass wool sheets, in fact, insulation allows great energy savings over a long period with a relatively short life-cycle impact. Even renovation of heating plants and lighting systems produces large benefits. In contracts, the use of renewable energy had lower benefits due to the low productivity of the plants with outputs sometimes lower than expected at the design stage.



Results of the Life Cycle Assessment of the BRITA in PuBs demonstration buildings. The Borgen case study has been excluded because it was not possible to split the material for the retrofit from the material for the construction of new parts and the results would therefore be not comparable.

6. The Research Work

6.1 Real Project Planning Needs

The work package on real project planning needs (WP1) has performed a study on the barriers and needs at administrations concerning the energy efficient retrofit of public buildings. Based on a literature review, three main barriers have been found:

- Information barrier: Decision makers and others don't know enough about low energy innovative solutions so that they are not preferred in public building/refurbishment projects. The right information is not available/not present at the right time for the right people in the decision process.
- Economical barrier: The economy is a main barrier. The budgets don't to allow extra costs for energy friendly solutions. Financial and other incentives are not good enough or not well known. Building developers and building owners do not know enough about innovative solutions and energy saving potentials, and fear high extra costs.
- Organisational and institutional barriers: Building developers and building owners are not necessarily the

The 3 main obstructions for the realisation of energy efficient retrofits:

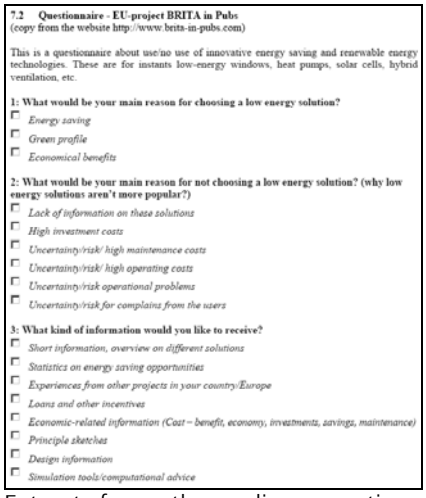
- Information barrier
- Economical barrier
- Organisational and institutional barriers

decision makers. The decision can be influenced from politicians or done by others like consultants. Who the decision maker is, depends on the organisation in the municipality and the project.

Based on this the project partners have developed an online questionnaire and made interviews with public administration staff. The main questions were:

- What would be your main reason for choosing a low energy solution?
- What would be your main reason for not choosing a low energy solution? Why aren't low energy solutions more popular?
- What kind of information would you like to receive?
- How can we best give you that information?
- In which language?
- Who should be the target for this information? To whom should we distribute this information?

The detailed results of the study are presented in the report "Socio-economic Analysis on Barriers and Needs". They gave also valuable input to many other project deliverables.



7.2 Questionnaire - EU-project BRITA in Pubs
(copy from the website http://www.brita-in-pubs.com)

This is a questionnaire about use/no use of innovative energy saving and renewable energy technologies. These are for instants low-energy windows, heat pumps, solar cells, hybrid ventilation, etc.

1: What would be your main reason for choosing a low energy solution?
- Energy saving
- Green profile
- Economical benefits

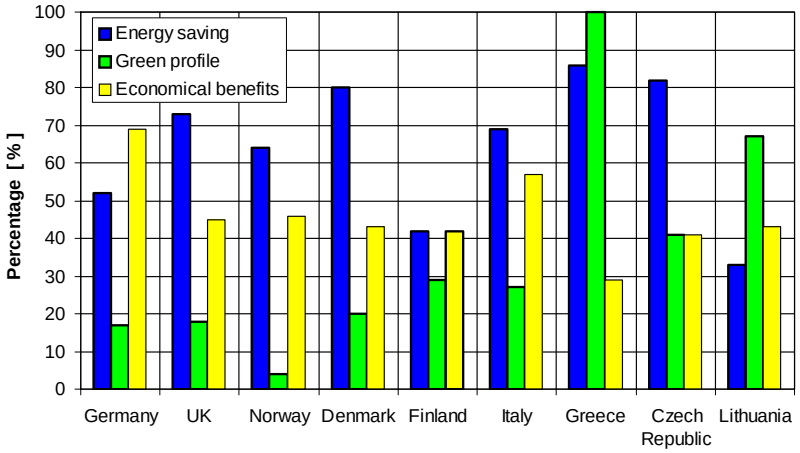
2: What would be your main reason for not choosing a low energy solution? (why low energy solutions aren't more popular?)
- Lack of information on these solutions
- High investment costs
- Uncertainty/risk/ high maintenance costs
- Uncertainty/risk/ high operating costs
- Uncertainty/risk operational problems
- Uncertainty/risk for complains from the users

3: What kind of information would you like to receive?
- Short information, overview on different solutions
- Statistics on energy saving opportunities
- Experiences from other projects in your country/Europe
- Loans and other incentives
- Economic-related information (Cost – benefit, economy, investments, savings, maintenance)
- Principle sketches
- Design information
- Simulation tools/computational advice

Extract from the online questionnaire on barriers and needs at the planning of energy efficient retrofit projects in public administrations.

Further reading:
Thunshelle, K. et ali: Socio-economic Analysis on Barriers and Needs (2005). Report available at: www.brita-in-pubs.eu

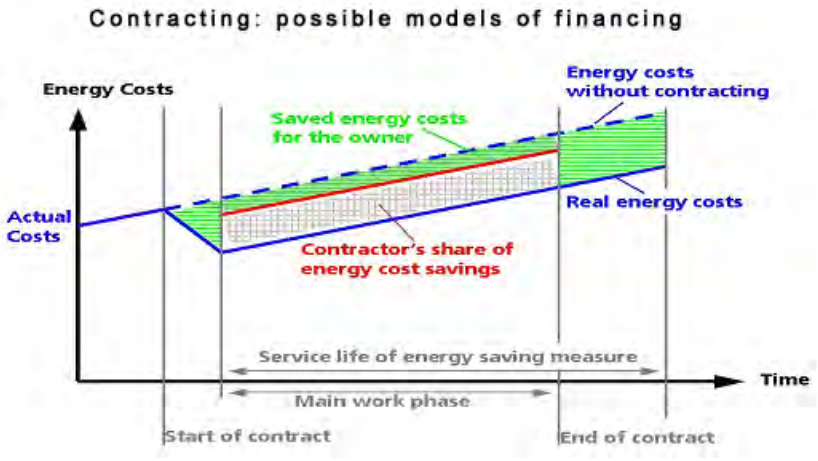
Main reason for choosing a low energy solution



National answers to the question "What would be your main reason for choosing a low energy solution for a building retrofit?"

The "Overview on Financial Schemes in the different participating countries" is another result of the socio-economic research work in BRITA in PuBs. Besides the national summaries on available financial schemes, tabular overviews and the assessment of the transferability of the schemes as well as used financial mechanisms at the demonstration buildings are included in the report. Innovative financial schemes for low energy public retrofits in the European Union complete the information in the report, namely the third party financing (so-called contracting) and a further development of this mechanism, the intracting. Intracting is the use of an own money pool dedicated to energy efficient retrofit projects that is paid back by the savings due to lower energy consumption and is then again used for the next retrofit project.

Further reading:
Triantis, E. et ali: Overview on Financial Schemes in the different participating countries (2005). Report available at: www.brita-in-pubs.eu



Scheme of the „contracting" model for financing energy efficient retrofits.

A "Communication guide" was also developed within the project. The communication guide is a reference document to be used for the dissemination of information on innovative retrofit energy saving measures for public buildings - for example by innovative manufacturers of building products and components, helping them to better target their marketing information. Specifically the guide was used for the dissemination of the results of the BRITA in PuBs project and for marketing the tools developed within the project. The guide was translated to all 9 national languages and ends with a list of national information channels such as newsletters, journals, magazines and special websites.

Further reading:
Mørck, O. et ali: Communication guide (2005). International and 9 national versions available at: www.brita-in-pubs.eu

BRITA in PuBs deliverables \ BRITA in PuBs target groups	technical personnel (planning + management)	technical maintenance staff	technical consultants	politicians	building owners	contractors	building users	general public
financial schemes report	■		□		□			
design guidelines	□		■					
quality control toolbox	□	■				■		
BIT: BRITA in PuBs information tool on innovative retrofit measures	■		□	□	□	■		
demonstration building report	■	□	■		□	■		□
BISHs: BRITA in PuBs blackboard information sheets		■					■	■
BRITA in PuBs e-learning module		■					□	■
website (www.brita-in-pubs.com)	□	□	□	■	■	□	■	■
electronic newsletter	■			□				
PR-campaign	□			■	□			
articles in journals + magazines	■		□	■	■			□
common eco-buildings symposium + alternative conferences	■		■					

■ specifically targeted to group □ offers valuable information to group

Extract from the BRITA in PuBs Communication Guide showing a matrix between the project results and the relevant target groups. At the time of the report, some deliverables were not yet fixed, such as the facility managers training material and the architectural student course and the 2nd Ecobuildings symposium.

The influence of the project experiences and results on the daily work of the related public authorities was the working theme of the last year and is summarised in an originally planned internal report called "Evaluation report on influences of results of WP1 on daily work of the public authorities". However this report was assumed to be interesting to a broader audience and was therefore changed to be publicly available. The report can be summarised like this:

- Both the consciousness on saving energy in retrofit projects and attitude to innovative low energy or renewable energy solutions among the demo partners have changed in a positive direction during the project period. This meets the main goals for the project.
- The project seems to have changed their every day work procedure in direction of having energy saving and sustainability on top of their agenda. Some report about closer collaboration with building managers and focus on day to day energy saving.

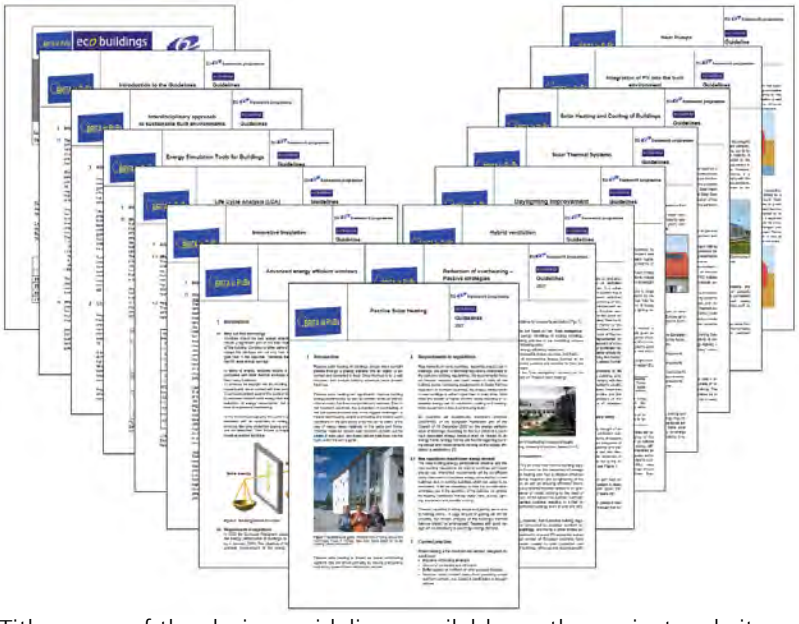
Further reading:
Thunshelle, K.: Internal evaluation report on influences of results of WP1 on daily work of the public authorities (2008). Report available at: www.brita-in-pubs.eu

6.2 Retrofit Design Guidelines

WP2 "Guidelines and tools for the right design strategies" worked on in total 13 different retrofit design guidelines, from innovative measures and technologies, including insulation, windows, hybrid ventilation, heat pumps over the use of passive solar, solar cooling, implementation of photovoltaic to design tools and Life Cycle Analysis. All guidelines are presented in a common format. Hearing persons gave feedback to the drafts in order to further develop the guidelines. The demonstration buildings are used as case studies in the different guidelines. After the third project year the first guidelines were available on the project website and with the end of the project all guidelines can be downloaded and printed from the internet as complete handbook and as separate guideline. The titles of the 6-8 pages documents are presented on the left.

The BRITA in PuBs Retrofit Design Guidelines:

0 Introduction chapter
1 Interdisciplinary approach to sustainable built environments
2 Energy simulation tools for buildings
3 LCA Guidelines in the building sector
4 Innovative insulation
5 Advanced energy efficient windows
6 Passive solar heating
7 Reduction of overheating – Passive strategies
8 Hybrid ventilation
9 Improved daylighting
10 Solar thermal systems
11 Solar heating and cooling of buildings
12 Integration of PV in the built environment
13 Heat pumps



Title pages of the design guidelines available on the project website.

Further reading:
Thunshelle, K.: Handbook of design guidelines, tools and strategies for low energy refurbishment of public buildings (2008). Report and separate guidelines available at: www.brita-in-pubs.eu

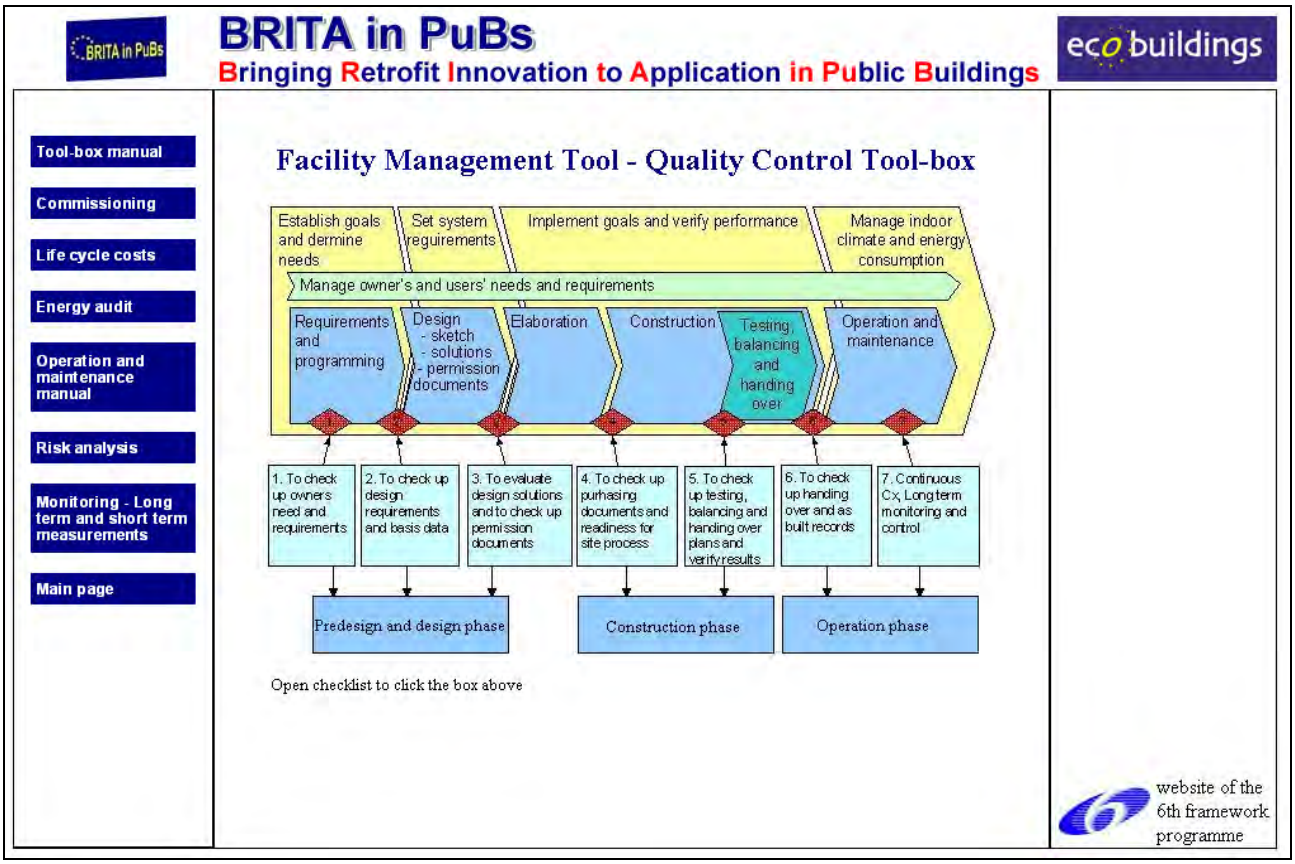
6.3 The Quality Control Toolbox

The partners of the work packages "Quality control toolbox" (WP3) have developed an electronic collection of checklists that enables the quality control of building projects from the programming over the design, construction, commissioning to the operation and maintenance phase. The toolbox and the collected national and international examples visualise the use of the various offered checklists. The tool and the documentation are available on the project website.

The tool-box includes:

- Risk-management and preliminary energy/life-cycle costs calculations for the design and planning stage commissioning
- Quality control procedure for the implementation stage including the analysis of the realisation phase of the demonstration buildings and in the stage of use
- Development of electronic display information panels and the involvement and acceptance of the users (a user and service manual model)
- A web-based energy and facility management monitoring system, which has feedback to the planning stage and can be used in benchmarking
- Energy audit model for ascertaining the performance of the building

Further reading:
Kauppinen, T. et ali: Documentation of the quality control toolbox (2008). Report available at: www.brita-in-pubs.eu



The different components and phases of the Quality Control Toolbox concept as screenshot from the tool available at the project website.

Title page of the BRITA in PuBs Information Tool (BIT) available on the project website.

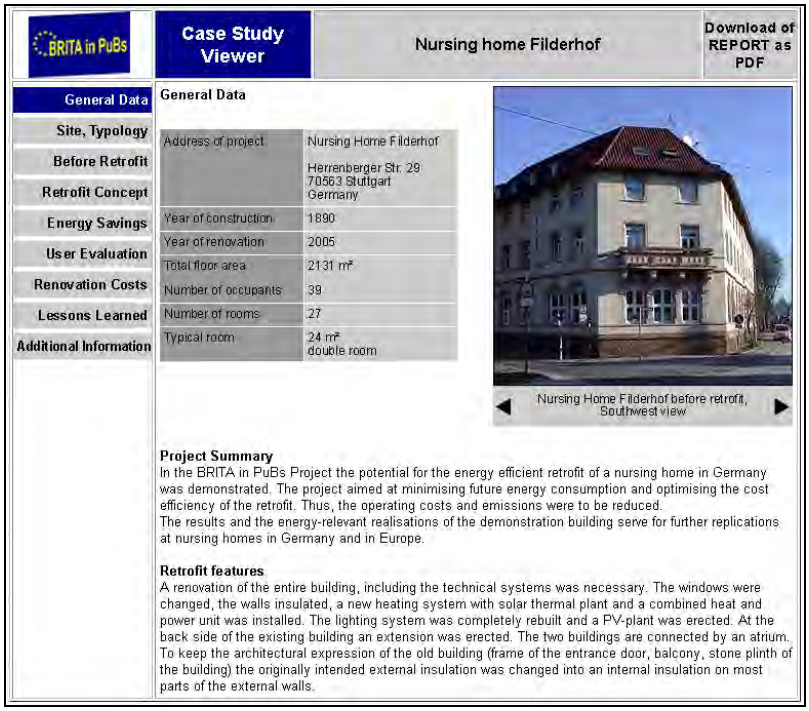
Matrix presenting the realised retrofit measures at the different case studies within the BIT.

Performance rating tool for comparing the energy and water consumption of specific buildings to the national average of buildings of the same type.

6.4 BRITA in PuBs Information Tool (BIT)

The BRITA in PuBs Internet Information Tool is an electronic database which offers many different types of information for decision makers at public retrofit projects. The tool presents in a clearly structured way all demonstration buildings from the project plus more than 30 educational case study buildings from a just finished IEA project (IEA ECBCS Annex 36 "Retrofitting of Educational Buildings"). In a matrix the buildings are opposed to different retrofit strategies starting with the building envelope, over heating and ventilation systems, solar control and cooling strategies, lighting systems to renewables and management methods.

The retrofit technologies and the case studies are described in detail in so-called viewers. For both the case studies and the retrofit measures, more detailed information is offered as pdf-downloads including the final reports of the demonstration buildings and the retrofit design guidelines.



Case Study Viewer: General data page of the demonstration building Nursing Home Filderhof.

An additional feature of the information tool is the performance rating tool. Here the user can visually compare the electricity, heating and water consumption of a specific (own) building with the national average for 19 different building types.

Retrofit Measure Viewer on lighting technologies as part of the BRITA in PuBs Information Tool.

The tool is available on the project website and includes the following parts:

- case study viewer
- retrofit measure viewer
- performance rating tool
- background information
- list of national contact points


Further reading:
Erhorn-Kluttig, H.: Documentation of the BRITA in PuBs Internet Information Tool (2008). Report available at: www.brita-in-pubs.eu

7. Training and Dissemination Work

The training and dissemination work of the project is comprised of various efforts and means. The following chapters try to summarise the main parts but can't give the whole overview. Besides the project dissemination, there was also a common Ecobuildings dissemination, mainly a cooperation between the four different Ecobuildings projects from the same call. On the other hand there was also a mostly national dissemination based on the demonstration buildings experiences which resulted in articles in journals and newspapers. The BRITA in PuBs Press Mirror includes a collection of articles and papers on the project.

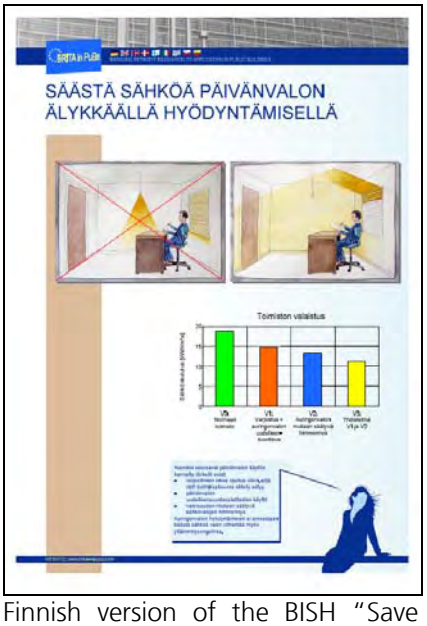

Further reading:
Mørck, O. and Erhorn-Kluttig, H.: BRITA in PuBs Press Mirror incl. overview of articles to professional journals and conference papers (2008). Report available at: www.brita-in-pubs.eu

7.1 Blackboard Information Sheets

The energy consumption of a building is strongly influenced by the user. The BRITA in PuBs demonstration projects concentrate on the improvement of the building envelope and the building systems' energy efficiency, but the idea of the blackboard information sheets was to show the users how they can reduce the energy consumption of a building and at the same time improve their comfort by learning the right behaviour or using the offered technologies in an optimum way. In total 8 different blackboard information sheets for

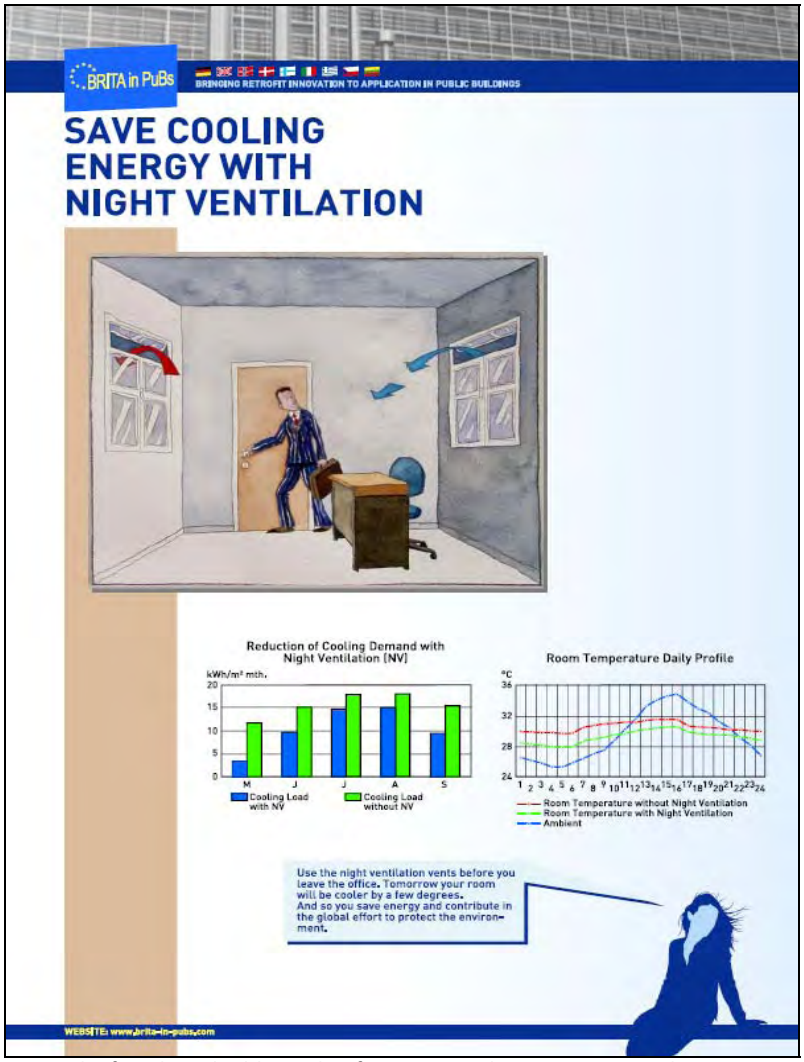
Topics of the Blackboard Information Sheets (BISHes):

1. Save cooling energy with night ventilation
2. Save electricity through the intelligent use of daylight
3. Save cooling energy with shading
4. Save energy and improve work efficiency using the thermostat right
5. Report defects to the maintenance personnel
6. Monitoring and targeting is basis for successful energy retrofitting
7. Save energy and improve thermal comfort by keeping windows closed when air-conditioning is on
8. Utilise instrumentation and controls in facility and energy management



Finnish version of the BISH "Save electricity through the intelligent use of daylight".

improving the user behaviour were developed within the project. They are available on the project website in English, but also in many of the national languages of the participants and some of them in Estonian. The sheets have been presented on blackboards of public buildings and feedback on the blackboard information sheets is also available.



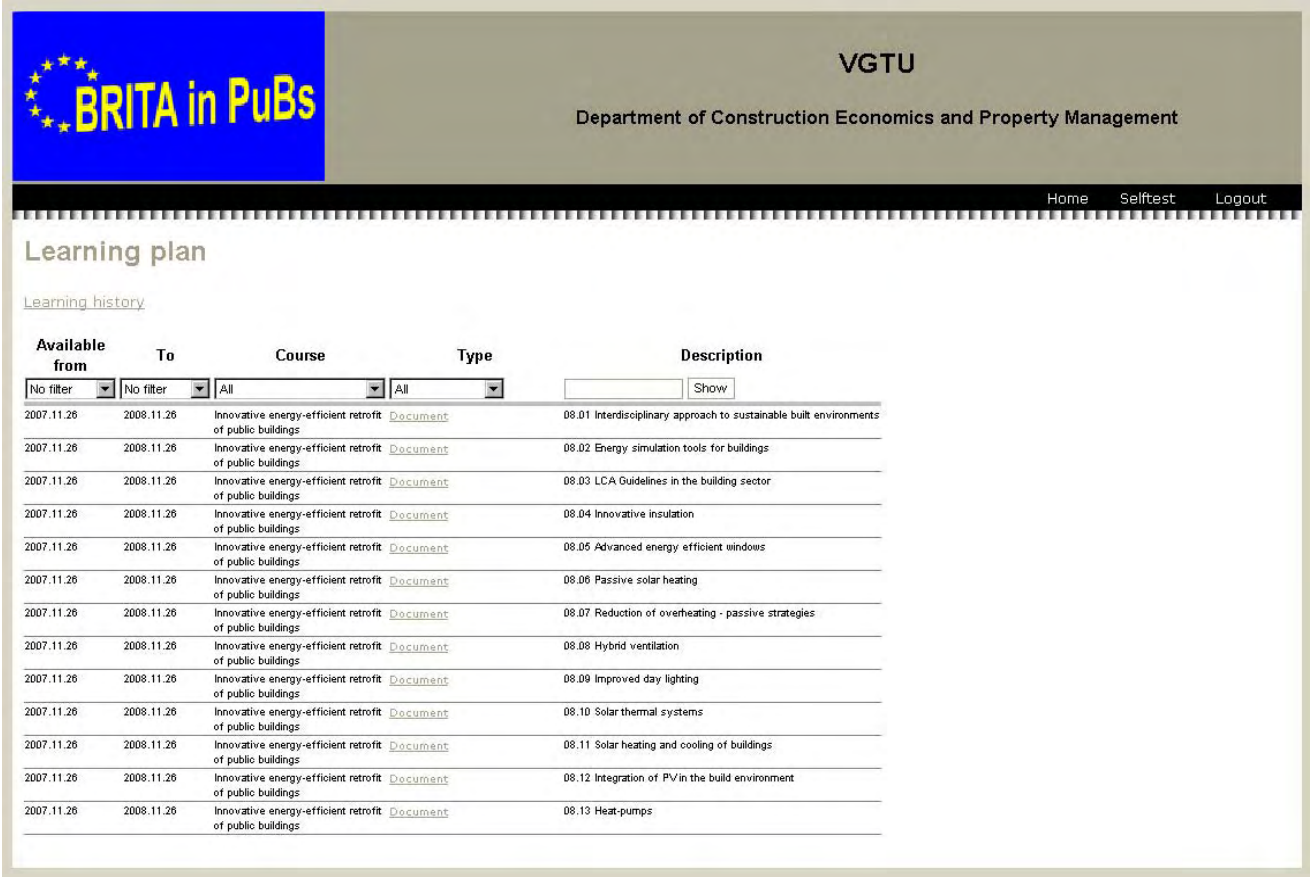
Example for the Blackboard Information Sheets: Save cooling energy with night ventilation.

7.2 Students' E-learning Module

The partners produced an electronic textbook with results from the project that is included in an intelligent computer learning system. The design guidelines were chosen as the main results to be presented in the E-learning tool. The users, mainly students at the Vilnius Gediminas Technical University, can test their gained knowledge by doing an exam. The E-learning module can be applied at other computer learning systems as well.

The module formulates questions of various difficulties, specifies sources for additional studies and helps to select literature and multimedia for further studies and a computer learning system to be used during studies. The results of the

testing process are given in a matrix and in a graphical form: information on correct and incorrect answers, time distribution to every question, number of times a student has changed an answer to each question of a test, the time required by the student to answer as well as the doubts of selection. The E-learning module has been included in the existing E-learning system at VGTU and can thus be accessed from anywhere in the world through a link on the BRITA in PuBs website.



Offered study objects within the E-learning module of BRITA in PuBs.

7.3 Facility Managers' Training

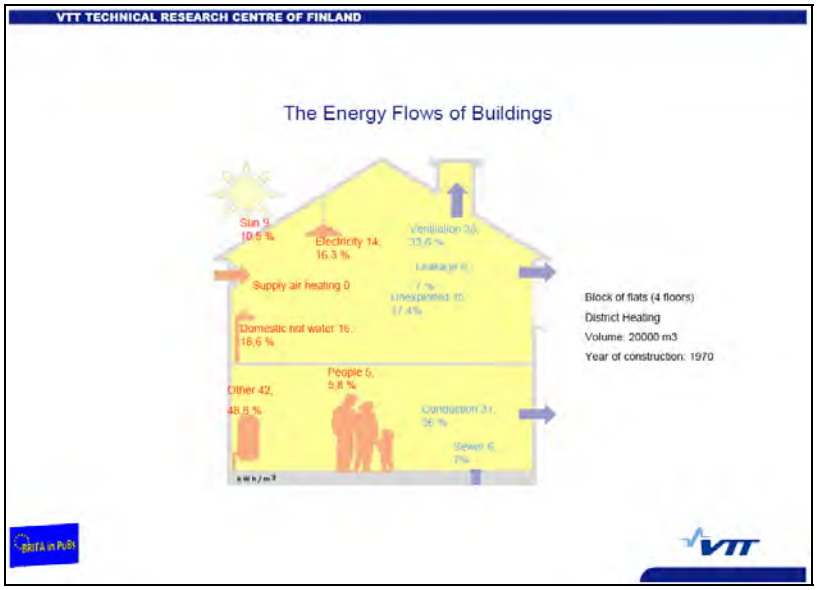
In WP9 "Facility managers' training" a training course for care takers etc. at the participating institutions and for other interested participants was organised based on the results of the demonstration buildings of BRITA in PuBs. The course was held at 6 different locations and the training material is available on the project website. The course was planned as a two-day training session.

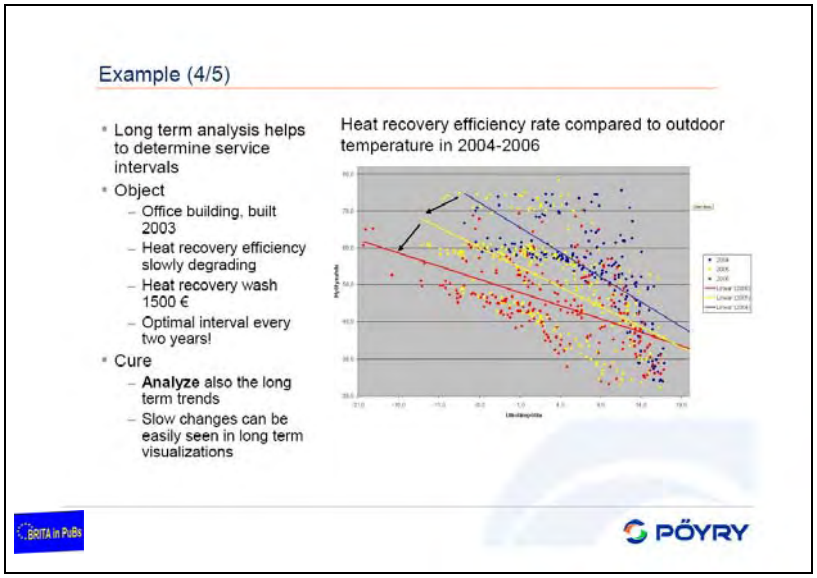
The aim of the training programme was to ensure proper handover procedures for retrofitted buildings and to assure efficient and optimal operation and maintenance, in particular, helping to achieve optimum energy performance. Besides general items, such as what is commissioning and how can quality control be realised, the second part of the course dealt with the best practice examples of the BRITA in PuBs demonstration buildings and with the experiences and information available in each country.


Audience of the facility managers' course in Brno, 25-26 April 2008.

Further reading:
Kauppinen, T. et ali.: Facility managers' training material. Pdf-version of presentations available at: www.brita-in-pubs.eu

According to the feedback, the receiving was positive, but proposals for the improvement and possible corrections for the content were accepted. One presentation was in narrated slides form, which proved to be an exquisite way to disseminate information.





Extracts from the material for training the facility managers.

"On behalf of the Special Scientific Committee on Environmental Management of Civil Works, Technical Chamber of Greece and on me personally, I would appreciate if you could accept my heartiest congratulations on the two-day seminar recently held by you and your brilliant collaborators.
BRITA in PuBs is an illustrative example on the track of the European Directive (EPBD) and the results from the application of the energy conservation as an economic conceptional framework for the protection of the environment, in the course of action we are all of us working."
D. Messaris, Hygienist Civil Engineer

Comment of an attendee at the Greek facility managers' course.

7.4 Architectural Student Lectures

Project partners with access to architectural schools set up and ran architectural courses to train students in the field covered by the Ecobuildings initiative: A European building stock with an energy efficiency that goes beyond national requirements.

Based on the results of the BRITA in PuBs and the other Ecobuildings projects course material in the format of power point presentations in English were developed. This includes a training part aimed at applying the lecture themes to practical case studies. The course methodology represents an integrated approach:

Further reading:
Røstvik, H. N. et ali.: Architectural students courses presentation material. Presentations available at: www.brita-in-pubs.eu

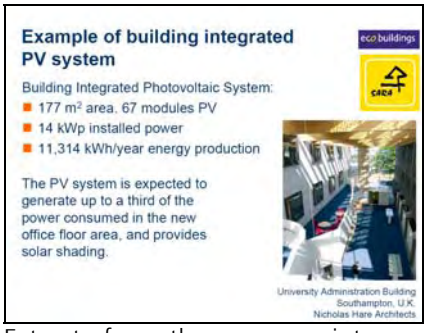
Part 1- Lectures as basis for Q&A and discussions:

- Lessons learned from the BRITA in PuBs and the other Eco-buildings projects
- Interdisciplinary approach to sustainable built environments
- Energy efficiency and energy supply from renewables
- Energy simulation tools
- Life cost analysis tools

Part 2- Learning to solve similar challenges through training:

- Selection of existing buildings that students can visit as case study
- Collection of existing information on each building
- Analysis of use patterns in the building
- Auditing conducted in selected parts of building (daylight, humidity, temperature measurements)
- Interviews of users on thermal and comfort issues
- Scenario of environmental retrofitting intervention
- Development of the best-integrated design solution for each building
- Final design and construction of components

The courses were realised at 5 different European architectural schools.



Extracts from the power point presentations for the architectural students courses.

7.5 Two Common Ecobuildings Symposia and other Conferences

In November 2005 and April 2008 the project organised two international symposia in Berlin and Stuttgart which did not only present the results of the project work of BRITA in PuBs, Demohouse, Eco-Culture and SARA to about 70 participants each, but also the initiative Ecobuildings.

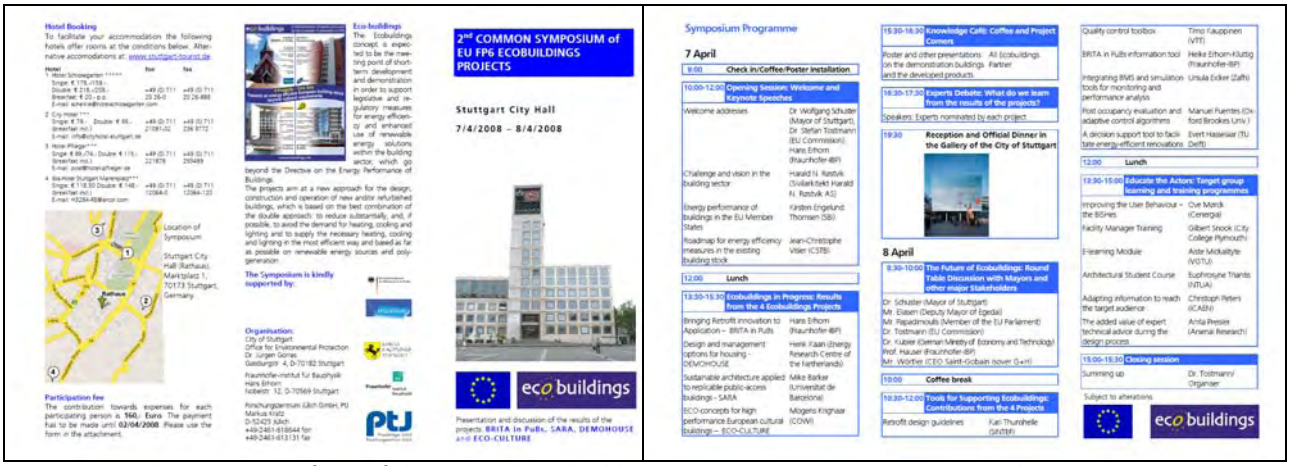
The locations were quite different but nevertheless both impressive: The low energy building "German Museum for Technology" in Berlin (a museum without air-conditioning) and the town hall of Stuttgart.

Further reading:

Erhorn, H. and Kratz, M.: EU FP6 Ecobuildings Symposium. Deutsches Technikmuseum Berlin, 22-23 November 2005. Proceedings available at: www.brita-in-pubs.eu

Görres, J. et ali: 2nd EU FP6 Ecobuildings Symposium – City Hall Stuttgart, April 2008. Proceedings available at: www.brita-in-pubs.eu

Invitation and programme flyer of the first Ecobuildings Symposium in Berlin, November 2005.



Invitation and programme flyer of the second Ecobuildings Symposium in Stuttgart, April 2008.

In connection with the symposia 17 oral presentations have been held by the project partners, for which papers were delivered and collected in proceedings that are available on the project website, but also on the EPBD buildings platform database. More than 20 posters on the demonstration buildings and other project results, the project as a whole and the Ecobuildings initiative were designed and presented at the symposia. Additionally an evaluation of the symposia organisation and content by the participants was organised and analysed.

One of more than 20 posters that were presented by the BRITA in PuBs project at the Symposia.

Impressions from the first and second Common Ecobuildings Symposia.

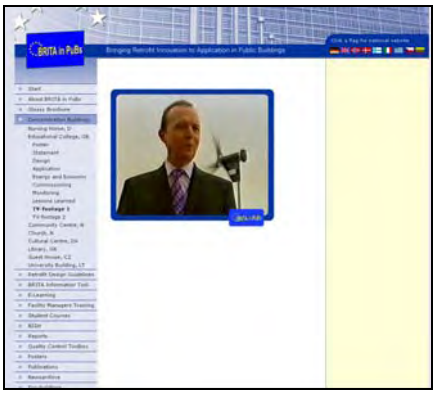
The project participants presented the BRITA in PuBs demonstration buildings and other project results at various national and international conferences. A list of the conferences is given in the BRITA in PuBs Press Mirror. Yet at some occasions the organisers valued the project as that important that they choose to place the presentation as key note speech or invited the speakers. One time the Ecobuildings projects even formed a special session at a conference:

- 2nd International Solar Cities Congress, Oxford, UK, 3-6 April 2006 (special session on Ecobuildings)
- Sustainable Energy Supply for Buildings – Ecological potential and socio-economic acceptance, Steyr, Austria, 17-18 May 2006 (invited speaker)
- PALENC/AIVC – Building low energy cooling and advanced ventilation technologies in the 21st century, Crete island, Greece, 27-29 September 2007 (key note speech)
- Ecobuildings Cluster Workshop, Brussels, Belgium, 28 May 2008 (key note speech)

7.6 TV Broadcasts and Videos on the Project

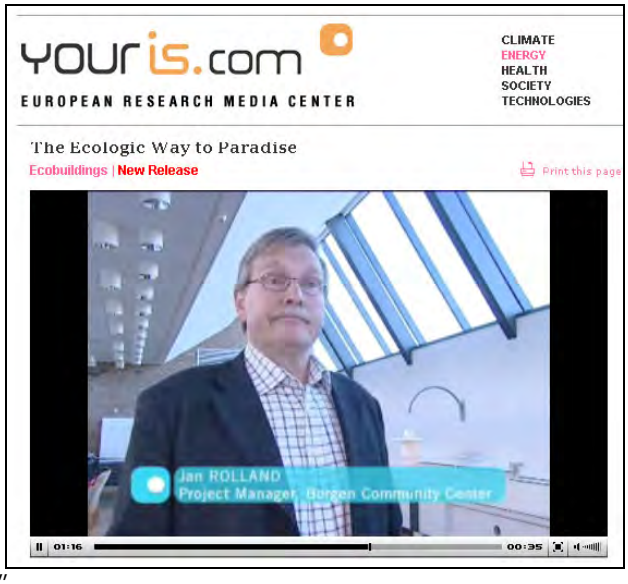
During the project phase the project was several times presented in TV footages or videos available on the internet. The focus of the films was mostly on demonstration buildings. A selection of films is listed below and is accompanied by screenshots of the films:

- BBC TV footage of the City College Plymouth wind turbines (1), available at the project website under demonstration building "educational college, GB"
- BBC TV footage of the City College Plymouth wind turbines (2), available at the project website under demonstration building "educational college, GB"
- Video by Youris European Research Media Centre: "The Ecologic way to paradise" on the two demonstration buildings Hol Church and Borgen Community Centre, available the project website and also at http://www.youris.com.
- The Youris video will also be part of a Euronews broadcast, on the European TV news channel. The high tech magazine programme report focuses on technical developments.
- The Canadian Broadcasting Corporation has asked for an interview regarding the report "Exemplary Retrofit Concepts in Europe" with respect to public buildings. The interview shall be transmitted in the radio show "Maritime Noon".



Screenshot from the BBC TV footage on the wind turbines at Plymouth City College (1).

Screenshot of the website of Youris (European Research Media Centre) presenting the video "The Ecologic Way to Paradise".



Screenshots from the video "The Ecologic Way to Paradise".

7.7 The Glossy Brochures: Ecobuildings and BRITA in PuBs

The project has contributed to the Common Ecobuildings Glossy Brochure which focuses on the demonstration buildings from the 4 different projects, but it has also produced an extended BRITA in PuBs glossy brochure which presents all project results. Both brochures were distributed at the 2nd Common Ecobuildings Symposium and are available on the project website for download.

Further reading:
Erhorn, H.: Bringing Retrofit Innovation to Application in Public Buildings. Public buildings as shining examples for a better energy efficiency in Europe. Glossy Brochure available at: www.brita-in-pubs.eu

Cover page and content list page of the BRITA in PuBs Glossy Brochure.

7.8 Two Information Papers on the EPBD Building Platform

The coordinators of the BRITA in PuBs project have written two information papers for the EPBD building platform (www.buildingsplatform.org). The platform is the official dissemination web-portal of the European Commission for actions related to the Energy Performance of Buildings Directive. The first information paper deals with the Ecobuildings Initiative and includes information on all 4 projects from the same call and the second one summarises the 2nd Ecobuildings Symposium in April 2008 in Stuttgart.

Further reading:
Erhorn-Kluttig, H. und Erhorn, H.: Ecobuildings – an EU demonstration initiative for building concepts that go beyond national energy performance requirements. Information paper available at: www.buildingsplatform.info

Erhorn-Kluttig, H. und Erhorn, H.: 2nd Common Symposium of FP6 Ecobuildings Projects, 7-8 April 2008, Stuttgart, Germany. Information paper available at: www.buildingsplatform.info

Title pages of the two information papers on Ecobuildings written by the BRITA in PuBs project.

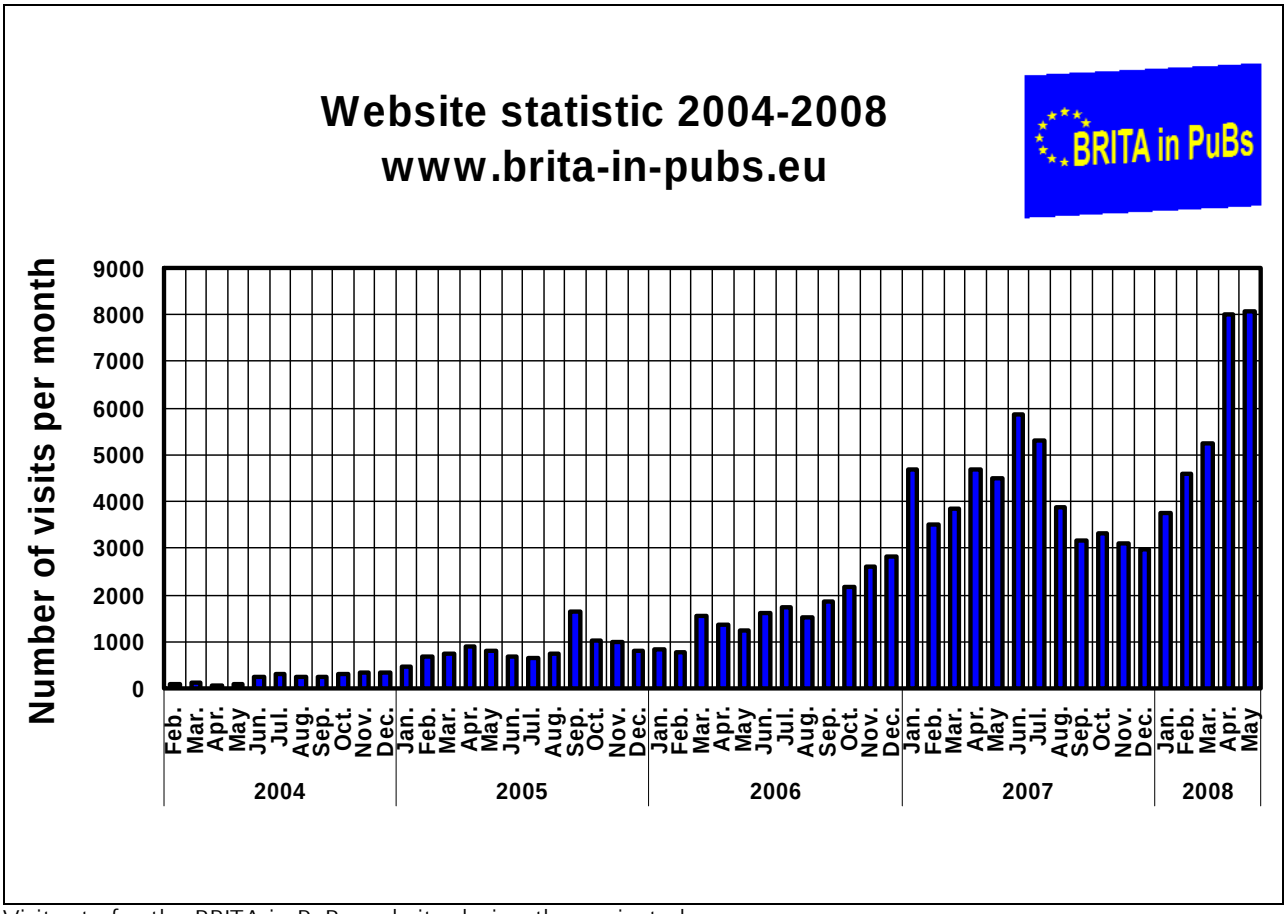
7.9 BRITA in PuBs Website

The project website www.brita-in-pubs.eu (also www.brita-in-pubs.com, www.brita-in-pubs.info and www.brita-in-pubs.de) offers a big number of project results, all reports, 17 newsletters and information on the demonstration buildings and the project in general. The website is not only very attractive in the layout including the changing demonstration projects in the centre; also the products are easy to access.

In order to facilitate the translation to the different languages it was developed in a so-called content management system (CMS). The big effort that was spent on the website by mostly Cenergia, FZ Juelich and Fraunhofer-IBP, but also by many of the other partners that were responsible for the national translations and the newsletter articles, the building diary and contributions to various reports and other products proved to be successful as the hit, visit and download rates show.

Screenshot of the BRITA in PuBs Website.

The visit rate increased over the project phase from about 200 visits per month at the start of the project, when the website could only present the planned work programme, up to more than 8000 visits per month at the end of the project. Also the pdf-downloads have grown from 200 up to 1800 per month. Especially the retrofit design guidelines have been downloaded up to 440 times in a month. Similar good rates have been reached for the blackboard information sheets (up to 470 times per month). The reports achieved total download rates of 1200 times per month. The BRITA in PuBs Information Tool (still as beta-version at that time) was visited up to 78 times per month. Compared to similar national and international project websites these figures can be assessed as quite impressive.



Visit rate for the BRITA in PuBs website during the project phase.

7.10 Common Ecobuilding Dissemination

All FP6 Ecobuildings coordinators of the same call met in Brussels at the Commission and were asked to overtake some parts of the Common Dissemination. The BRITA project was leading the part poster development. Two types of posters have been developed: at first a common template that has been used by all 4 projects during the first 2 project years and afterwards a common Ecobuildings poster that shows all four projects and visualises the common goal "Towards an energy

efficient European building stock beyond national requirements."

The common Ecobuildings website (www.ecobuildings.info) was several times updated with information and articles and the status of the demonstration buildings and other input was provided for the common Ecobuildings newsletter.

At the end of the project phase detailed input for the glossy brochure on all 6FP Ecobuildings demonstration buildings was delivered. The glossy brochure and a more detailed brochure including all results of the BRITA in PuBs project are available on the project website.

The 4 coordinators of the Ecobuildings project worked out a "Discussion Document from the EU-FP 6 Ecobuildings Projects for Use in the Preparation of Calls in the Seventh Framework Programme". The last big common Ecobuildings dissemination measure was the 2nd Symposium that was held in Stuttgart in April 2008 and presented the results of all 4 projects.

Common Ecobuildings poster.

Further reading:
Erhorn, H. et ali: What are Ecobuildings and are they needed in the Seventh Framework Programme? A Discussion Document from the EU-FP 6 Ecobuildings Projects. Document available at: www.brita-in-pubs.eu

7.11 Information Exchange with 3 European Commissioners

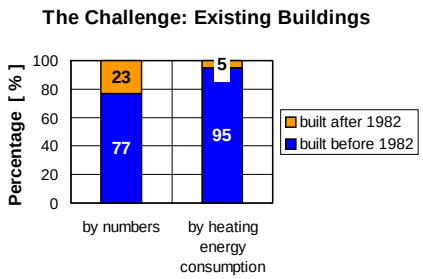
The BRITA in PuBs project had the opportunity to be presented to 3 different European Commissioners and make the highest level in the European administration aware of itself and the various project results, but also of the importance of the Ecobuildings demonstration initiative:

- EC Vice President Margot Wallström discussed with a BRITA member about the value of existing buildings in European energy supply as a vehicle to reduce the overall need for energy in Europe during an informal meeting in March 2007.
- EU Commissioner Günter Verheugen, the Vice-President of the European Commission and Commissioner of DG Enterprise and Industry visited the Fraunhofer Institute in Stuttgart in April 2007. The various presentations held for him and his delegation included also one on the Ecobuildings programme with focus on the BRITA in PuBs project.
- In preparation for the EU and G8 meeting 2007, the EU/G8 Energy Efficiency Conference "Shaping Tomorrow´s World" took place in Berlin in April 2007. EU Commissioner Piebalgs and German Ministers Tiefensee, Glos and Gabriel participated in the meeting. One of the conclusions of the conference was that energy efficiency is a task for everybody. There are existing technologies but none of these technologies can make a sufficient difference on their own; a portfolio of technologies is needed. Ecobuildings can offer the great potential that is needed.


Photos of the information exchanges with the 3 European Commissioners.

8. Community Added Value

The Ecobuildings projects of the 6th Framework Programme had their main focus on the demonstration. In the case of BRITA in PuBs it was the design, realisation and evaluation of 8 energy efficient retrofits of public buildings in Europe. The call demanded that the measures and technologies implemented should be close to the market, replicable and with limited additional costs. Therefore the impact of the project can be less on industry as there are limited new developments included. Instead the impact was mainly on the local, national and partly international policy sector and to some extent on the research sector.



Heating energy consumption in Germany by buildings of different age groups.

The BRITA in PuBs project emphasised in its work programme, but also in the dissemination work, that the big challenge of energy efficiency is the existing building stock. In all European Member States exist energy efficiency requirements for new buildings and mostly there are also demonstration projects for new buildings that show even better energy efficiency than the local requirements. Yet, the biggest ratio of energy is consumed in existing buildings. The rather small improvement that can be achieved due to somewhat better new buildings can't be compared to the energy efficient retrofit of the existing building stock. It has to be considered that besides some architectural developments like the big apartment blocks mainly built in the Easter European countries by using pre-fabricated concrete slabs, most existing buildings are diverse in the building material and building systems. Thus solutions have to be found that are transferable to different building types. Also the timing of renovations is usually building dependent. Solutions for whole communities, which are the aim of the Concerto initiative can seldomly be applied to existing buildings, at least not in inner city communities.

European-wide demonstration projects and as such also BRITA in PuBs offer the possibility to broaden the perspective not only of the project participants, but also of all those that can be reached by the training and dissemination efforts. In the case of BRITA in PuBs the project participants from Finland to Greece and from UK to Lithuania learnt a lot about problems with building retrofits in the other participating countries, whether they were similar to the own or very different from them. In case of similar problems the solutions can be mostly transferred to other countries. So far unfamiliar problems were still very instructive as they can either show the future of the energy efficiency evolution process or remind of problems that have been solved within the own country and encourage to go even further.

8.1 Impact of the Project on the Policy Sector

The successful realisation of the demonstration projects in Germany, UK (partly realisation), Norway, Denmark, Greece,

Czech Republic and Lithuania together with the strong dissemination and training efforts led to a better awareness of the need for energy improvement in the existing building stock, but also to the acceptance that energy efficient retrofits of public buildings beyond national requirements are possible and feasible at the local, national and international policy levels.

At the local level the projects proved that even with listed buildings there are technologies available that can halve the energy consumption. Information exchange with and dissemination to the local decision makers at the relevant public authorities fed not only to the project (e.g. to the work on real project planning needs, etc.), but also gave those decision makers more insight and believe in the available energy efficient retrofit technologies. The BRITA in PuBs "Report on influences of results on daily work of public authorities" presents the feedback of the involved authorities and shows that there is now an improved consciousness and attitude regarding energy efficiency and use of renewables in buildings, and as well a further developed understanding of the topic.

Of course the involved decision makers are only the starting point of project impact on policy. Presentations at national and international city networks as made for example by the representatives of the City of Stuttgart in the German "Städtetag" but also by other partners and the inclusion of the project in the city's/organisation's yearly report, such as the energy report of again City of Stuttgart, influenced not only the local authorities, but also other comparable authorities in the same, partly also in other countries. Having some of the leading national city authorities included in the project (e.g. Stuttgart, Asker/Oslo, Copenhagen) shows to other, sometimes smaller towns the future orientation of building retrofits. The demonstration projects received (e.g. Borgen community centre) or were proposed for awards (e.g. City College Plymouth) which extended the national publicity rate. The TV footages as summarised in chapter 7.6 contributed furthermore to the awareness level.

A very interesting experience was to have the church authority of Norway as partner in one demonstration project. The idea of using public buildings as locomotives can't be better realised as with a church showing to the people that energy savings and better indoor comfort can be achieved with at the same time limited costs. The church and mainly the involved bishop proved to be a very strong partner that even managed to convince the antiquarian authorities of realising energy efficiency despite having big worries concerning any changes. Of course all other included public buildings transferred the idea of energy efficiency and energy efficient retrofit of the building sector to the society as well.

The KfW banking group, the bank of the Federal Republic of Germany, has developed a financial funding programme for

Further reading:
Thunshelle, K.: Internal evaluation report on influences of results of WP1 on daily work of the public authorities (2008). Report available at: www.brita-in-pubs.eu

NYHETER

Satsar på solvarme

Hol kyrkje med i EU-prosjekt ■ Står og fell på Riksantikvaren

Hol kyrkje på Hagafoss er med i eit stort EU-prosjekt om energieffektivisering. Eitt av siktemåla er å dra nytte av solvarmen.

Sprengjer energitiltaksfondet i Hol

Flere rovdyr i Vats

Press article on the retrofit of the church in Hol including a solar air collector.

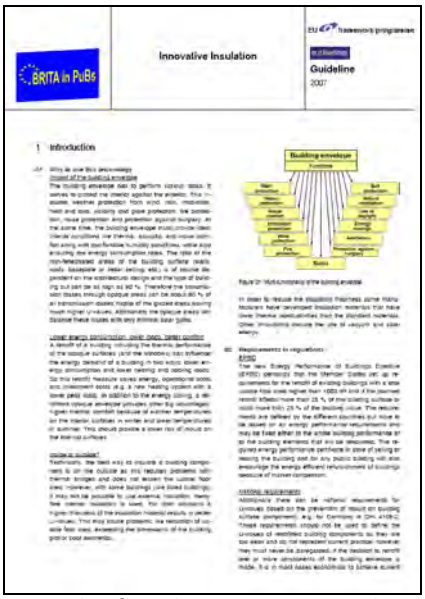
retrofit measures at public buildings and used results from BRITA in PuBs as basis.

The results of BRITA in PuBs and Eco-culture have also been proposed as input to a new programme in Copenhagen for 5000 "cheap" dwellings to be built over the next years.

The four Ecobuildings Coordinators have written a discussion document based on the experiences of the EU FP6 Ecobuildings projects for the use in the preparation for calls in the 7th Framework Programme. It was distributed widely on platforms like ECTP, Concerted Action and the project websites. 3 EU Commissioners (Piebalgs, Verheugen, Wallström) received information on BRITA in PuBs results and mentioned the importance of the Ecobuildings initiative for the EU building stock.

8.2 Impact of the Project on the Industry Sector

As the project's main parts were demonstration of retrofit technology that is already available on the market but not yet used enough, and not the research work for new products, the relation to the industry is naturally somewhat limited. However there has been cooperation with the industry concerning the retrofit design guidelines on innovative products, which were read by industry representatives that partly gave feedback to improve the content of the guidelines.



Example for the cooperation between the project and the industry: the retrofit design guidelines.

Within the demonstration projects there was also cooperation with the industry. The Borgen case study for example worked on two new developments, a new glass solar collector and a revolving window with a summer and winter side.

8.3 Impact of the Project on the Research Sector

According to the FP6 programme the research part of the project had to focus on socio-economic research mostly. Good examples for this work are the real project planning needs report and the overview on existing financial schemes for the retrofit of buildings. Both works started with the analysis of existing material, literature on the one hand and nationally available financial schemes on the other hand. The collection of national knowledge was the first step, followed by an evaluation of the possible transferability from one country to others. This was either done by questionnaires within the countries or by an assessment made by the participating national experts.

The design guidelines as well as the quality control toolbox and the BRITA information tool do not present in depth research, but the collection of nationally available research knowledge which was combined to guides and tools that contain in total significant research value presented in a attractive and commonly understandable way, not only for architects and engineers, but also for decision makers, technical staff and facility managers in public administrations.

The papers and presentations on conferences such as Solar Cities, PALENC, North Sun, Sustainable Buildings, etc. and the articles in professional journals, e.g. Energy and Buildings, disseminated the project results to the world-wide research community.


Further reading:
Mørck, O. and Erhorn-Kluttig, H.: BRITA in PuBs Press Mirror incl. overview of articles to professional journals and conference papers (2008). Report available at: www.brita-in-pubs.eu

8.4 Impact of the Project on the Standardisation Sector

Standardisation influences significantly the national market penetration of components or systems. If no suitable validation methods do exist, innovative components often can't compete with established products; their advantages will not be transparent for the user. The Directive 2002/91/EU of the European Communities on the energy performances of buildings helps to eliminate this discrimination. The Directive was passed at the end of 2002 to comply with the Kyoto protocol by promoting energy efficiency and renewables in the building sector.

The Directive points out that the energy performance of buildings should be calculated on the basis of a methodology which may be differentiated at regional level, that includes in addition to thermal insulation other factors that play an increasingly important role such as heating and air-conditioning installations, application of renewable energy sources, lighting appliances and design of the building.

BRITA in PuBs supported the standardisation process by reflecting the ongoing developments of calculation procedures in the design phases of the demonstration projects, by comparing the calculation results with the measured values in the validation period and by describing the potential of selected innovative measures, realised at the demonstration sites. Some of the participants are working in the relevant standardisation committees of CEN TC 89/156/169/228 and national application committees, so the transfer of results from the project is guaranteed.


Further reading:
Beccali, M. et ali: Life Cycle Assessment (LCA) of the BRITA demo building retrofits - Analysis of the environmental benefits and burdens related to demobuilding retrofit actions (2008). Study available as annex to the retrofit design guidelines at: www.brita-in-pubs.eu

The study "Life Cycle Assessment of the BRITA demo building retrofits" applied and tested the Life Cycle Assessment (LCA) methodology as regulated by the international standards of series ISO 14040.

9. Personal Added Value for the Partners

At the end of the project phase the Coordinators asked the participants for their impressions on the project.

- What was their personal gain from participating in the project?
- How will BRITA in PuBs influence their future work and perspective on the energy efficiency of buildings?

- What should be changed in future projects?

„By offering a high quality seminar (WP9) on energy efficiency through facility management we had the opportunity to approach a potential market with innovative products."

„Access to a broad range of expertise is secured and has been a great asset of the project participation, both as regards the project development and the personal development within an expanding field."

„The opportunity to participate in a project, involving so many participants from different countries of the EU, has been invaluable for my personal development …
It has encouraged me to put myself forward to go onto the national executive for the Environmental Association of Universities and Colleges….
We will also try to reach further to achieve a zero carbon college."

„This project was a further step of the city in retrofitting their buildings and thereby showing what is possible."

„… we will be using the Retrofit Design Guidelines and the BRITA Information Tool for our consultancies services in the UK and in Europe.
Another dimension of this project is that it brought new business relations and possible partnerships putting us more into the European contexts."

„Participating in different work packages has brought forward my understanding of sustainable building issues, making me a better adviser for planners and architects.
I can now refer to the BRITA project as a source of inspiration."

„Working with a group of highly professional planners and contractors has increased my knowledge and understanding on many aspects of the building process …
The active use of daylight has shown there is money to be saved and at the same time the quality of the internal space can be improved. I feel that this is a win/win situation…
Taking part in the BRITA project has been a most rewarding experience to me"

„Specific added value is the improved understanding of R&D and Demonstration activities on the field of rational energy use especially in the building sector within the EU-Framework and the participating countries"

„Access to project results and other people's experience has added value to the project and the development of personal skills."

„The BRITA in PuBs project has proven… that it is very useful to combine research, demonstration and training work at a European scale into one project… I have learned a lot from the many different aspects of the project covered by the many practical applications of different technologies and the lessons learned from that."

„The research part has been very productive as many guidelines concerning a lot of new technologies have been written. These guidelines can be used in our teaching at the university…
The information tool BIT can be used by the Danish decision makers and be a big help to them when making decisions concerning the public building stock."

„The BRITA in PuBs project gave a great opportunity to test, develop and exchange information about various methods and procedures created in the participating countries…
The delay due to decision making and handling in the Commission was a factor which caused problems in allocating the resources during the project.

„We mainly appreciated that not only the quality of scientific contribution is fundamental for obtaining good results in such kind of programmes but also one requires other kind of competences (administrative, management and organisational).

„It was very interesting to observe the differences in economic and technical approach [of the retrofit projects]…
The tools provided in this project Design Guidelines, Quality Control Toolbox, BIT and BISHes will definitely be a reference for my future work in this field."

„The coordination of 22 partners from 9 different countries proved to be a challenging but also mostly rewarding task. The project has shown that the combined and partly uncompensated effort of all partners can lead to impressive project results regarding demonstration and research, but mainly in dissemination of the project and its results.
The use of a multi-lingual information platform was an interesting experience for us that we plan to take advantage of in the future."

Annex: Summary Tables on Dissemination and Use

Section 1 – Exploitable knowledge and its use

Exploitable knowledge (description)	Exploitable product(s) or measure(s)	Sector(s) of application	Timetable for commercial use	Patents or other IPR protection	Owner & other partner(s) involved
not applicable, there is no plan for commercial use					

Section 2 – Dissemination of knowledge

Overview table

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
ongoing	*website*	*public*	*all*	*currently about 8000 visits/mth.*	*10 (Cenergia) / 1 (Fraunhofer) / 23 (FZ Juelich)*
17 issues over the 4 years	*newsletters*	*public*	*all partici-pating countries*	*more than 100 subscribers, in total 2810 downloads*	*10 (Cenergia)/ all*
05/04 – 04/08	*press releases*	*public*	*all*	*?*	*10 (Cenergia)/ 1 (Fraunhofer)*
05/04 - ongoing	*presentations at conferences*	*experts/ interested audience*	*all*	*depending on conference*	*all*
22-23 November 2005	*common Ecobuildings symposium*	*experts/ interested audience*	*Germany, Europe*	*67*	*23 (FZ Juelich)/ 1 (Fraunhofer)*
7-8 April 2008	*2nd common Ecobuildings symposium*	*experts/ interested audience*	*Germany, Europe*	*65 people from 16 different countries*	*1 (Fraunhofer)/ 2 (City of Stuttgart)/ 23 (FZ Juelich)*
ongoing	*articles in technical journals*	*experts/ interested audience*	*all partici-pating countries*	*?*	*all*
ongoing	*eco-buildings website*	*public*	*Europe*	*up to 700 visits/mth.*	*1 Fraunhofer/ COWI (ext.)*
ongoing	*Information distribution via Energie Cites*	*decision makers*	*Europe*	*?*	*1 Fraunhofer/ Energie Cites*
ongoing, available on the website	*BRITA in PuBs blackboard information sheets (BISHes)*	*building users*	*all*	*between 200 and 470 downloads per month;*	*Ongoing, available on the website*
ongoing, available on the website	*Retrofit Design Guidelines*	*Designers/ public*	*all*	*Between 200 and 450 down-loads per month; in total 2190 downloads so far*	*8 (NBI)/WP2 partners*

Section 2 – Dissemination of knowledge (cont.)

Planned/ actual dates	Type	Type of audience	Countries addressed	Size of audience	Partner responsible /involved
ongoing, available on the website	*glossy brochure of all 6FP Ecobuildings demo projects*	*designers/public*	*all*	*distributed to all participants of the 2nd Eco-buildings symposium, downloads so far unknown*	*1 (Fraunhofer / ECN (ext.)/ all demonstration partners (2,4,6,9,10,20, 21,22)*
ongoing, available on the website	*glossy brochure of the BRITA in PuBs project (demo buildings plus all other project results)*	*designers/public*	*all*	*distributed to all participants of the 2nd Ecobuildings symposium, in total 60 downloads so far*	*1 (Fraunhofer / all demonstration partners (2,4,6,9,10,20, 21,22)*
ongoing, available on the website	*BRITA in PuBs internet information tool*	*decision makers (designers/ public)*	*all*	*in total 500 visits for β-version so far*	*1 (Fraunhofer)*
ongoing, available on the website	*Quality control toolbox*	*Designers/ decision makers/ facility managers*	*all*	*in total 70 visits for β-version so far*	*13 (VTT)*
ongoing, available on the website	*project posters*	*public*	*all*	*in total 340 downloads so far*	*1 (Fraunhofer), all partners*
ongoing, available on the website	*reports*	*Designers/ decision makers/ facility managers/ public*	*all*	*in total 12440 downloads so far*	*10 (Cenergia)/ WP6 partners*

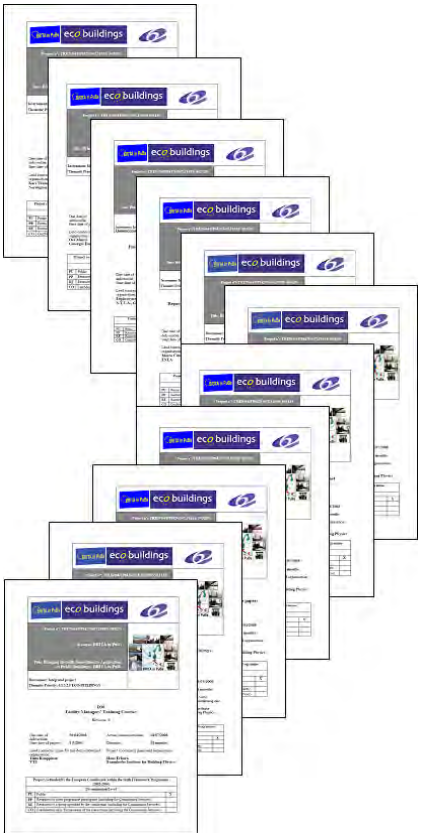
Section 3 – Publishable Results

Besides the poster that was designed at the project start, the press releases about the start, the website (D1), the news in the newsletter (D1), the papers at various conferences and the written articles on the project there are:

- D3: Proceedings of the common Ecobuildings Symposium
- Proceedings of the 2nd common Ecobuildings Symposium (additional to work programme)

and the following publicly available reports and other type of results:

- D5: Socio-economic report on barriers and needs
- D6: Communication guide in several languages
- D7: Overview on financial schemes
- D8: 8 reports on the concept development of the demonstration buildings
- D12: Blackboard information sheets in several languages
- D15: Evaluation document of changes in the planning process of public administrations due to the project
- D16: Retrofit design guidelines separately or as part of the handbook on design guidelines
- D17: Quality control toolbox, available on the project website incl. manual of the toolbox
- D18: BRITA in PuBs information tool available on the project website incl. documentation of the information tool
- D19: Final demonstration projects report
- D20: Information module for E-learning platforms
- D22: BRITA in PuBs press mirror incl. overview of articles to professional journals and conference papers
- M23: Publishable Final Activity Report
- D24: Common Ecobuildings website (www.ecobuildings.info)
- D26a: Common Ecobuildings poster (including a second version)
- D26b: Ecobuildings Glossy Brochure: Ecobuildings–Answer to an immense challenge. An important step towards sustainable innovation and security of energy supply of the EU.
- D28/D29: Facility training programme and manual
- D30: Facility managers' training courses summary
- D31: Architectural students lecture power-point presentations
- Revised poster on BRITA in PuBs and various posters of the demonstration buildings and the other project results (additional to work programme)
- BRITA in PuBs Glossy Brochure: Public Buildings as shining examples for a better energy efficiency in Europe



Covers of the reports written in BRITA in PuBs. All reports available at: www.brita-in-pubs.eu

Covers of the proceedings of the 2 Ecobuildings Symposia. Proceedings available at: www.brita-in-pubs.eu

Covers of the 2 glossy brochures on Ecobuildings and BRITA in PuBs. Brochures available at: www.brita-in-pubs.eu