

Boavista neighbourhood, Lisboa (Portugal)

Country: **Portugal**

Name of city/municipality: **Lisbon**

Title of case study: Boavista neighbourhood, Lisbon

Year and duration of the renovation: From 03/2013 to 09/2013

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Link(s) to further project related information / publications, etc.:

<http://lisboaenova.org/wp/eco-bairro-boavista-ambiente/>

http://www.cm-lisboa.pt/fileadmin/Noticias/ficheiros/Eco-District_Boavista_PT_.pdf

Schematic figure or aerial overview



Figure 1. Schematic view of the intervention areas after renovation. Source: "CML" from: http://www.lisboaenova.org/images/stories/EcoBairroBoavista/Eco_Bairro_Boavista_fevereiro_2012_BOOKv5_print.pdf.



Figure 2. 3D aerial view after renovation - Boavista neighbourhood. Source: "Google Maps".

Introduction and description of the situation before the renovation

Boavista neighbourhood is located in the western outskirts of the city of Lisbon and is surrounded by the Forest Park of Monsanto. City authorities in the '60s of the XX century built this neighbourhood to relocate low resources families, which lived clandestinely in central areas of the city.

The area has undergone successive phases of rehousing, and its current population is estimated at 6,000 inhabitants, with a total of 1,559 housing units. The majority of the units are public-owned. The municipal company Gebalis manages this neighbourhood that mainly consists of two different areas, which were occupied in different rehousing periods: Single Family Houses, designated as “Alvenarias” (1960/1970) from the first phase, and Multifamily Buildings and Services (1980/1990) that were built in different phases. Table 1 shows some key characteristics of this neighbourhood.

Table 1. Key characteristics of Boavista neighbourhood. Source: Gebalis (www.gebalis.pt).

Rehousing phases	1 st : 510 “Alvenarias” – 1960/1970 2 nd : 4 lots built between 1976 and 1977 3 rd : 9 lots built between 1981 and 1984 4 th : PIMP ¹ – 34 lots built between 1988 and 1996 5 th : PER ² – 14 lots built between 1997 and 1999
Socio-demographic characterization	About 6,000 residents. The majority of the population is Caucasian. There is about 20 families of gipsy ethnicity and 30/35 families of African origin.
Employment and jobs	Population presents a generalized low level of education. There is a significant percentage of retired people and individuals with temporary jobs, mainly related to the building construction sector, hospitality and housekeeping services.

Before the renovation, buildings presented a generalized state of advanced deterioration, including cracking of the plaster of the facades. From occupants’ surveys realized by Gebalis, some of the most frequent complaints of the residents were the cold indoor climate, the humidity and mould and the air infiltrations inside the houses, even in the most recent zones of the neighbourhood.

The Municipal Master Plan of Lisbon qualified this neighbourhood as a Priority Intervention District in 2011.

¹ PIMP – Programa de Intervenção a Médio Prazo (Mid-term Intervention Programme).

² PER – Programa Especial de Realojamento (Special Programme for Rehousing).

Description of the renovation goal

The intervention in the Boavista neighbourhood was realized under the framework of “Eco-Bairro” initiative, which comprised not only the questions regarding the existing built environment of the neighbourhood but also diverse comprehensive initiatives to motivate ecological and energy-saving behaviours in the residents.

The two areas referred in the Introduction and indicated in Figure 1 – “Alvenarias” and the “Multifamily buildings area” – had distinctive states of conservation and the strategy followed in each one was quite different. The “Alvenarias” area was considered uninhabitable and therefore it was decided to replace the existing single-family houses by new constructions. This project was concluded in 2018 and it had a completely different process than the one followed in the rest of the neighbourhood. For this reason, this operation is not addressed in this document.

On the other hand, the multifamily buildings presented a high level of physical deterioration at the façades and signs of deterioration in indoor comfort conditions, including large areas of mould inside dwellings. In consequence, these buildings were renovated with the main objective of improving their energy and thermal performance while considering the environmental performance of the materials used. For this purpose, thermal insulation (black cork agglomerate) was applied to the envelope of the buildings. At a later stage of the renovation process, the existing single glazed and aluminium frame windows were replaced by PVC frame window with double-glazing. In addition, solar thermal panels were implemented in the pool and sports complex.



Figure 3. Schematic view of the Boavista neighbourhood before renovation. Source: “Blog Bairro da Boavista – Lisboa” from <http://bairrodaboavista-lisboa.blogspot.com/p/fotografias.html>.

Description of the renovation concept

The Program of Action for the “Eco-Bairro” initiative had seven active fronts in its agenda:

- 1) Renovation of multifamily residential buildings;
- 2) Construction of new equipment in the neighbourhood as Eco-center and Eco-gardens;
- 3) Installation of renewable solar thermal;
- 4) "Net-Verde", wireless network of free access to the Internet in the neighbourhood;
- 5) "PediBus", pedestrian circuit in the neighbourhood;
- 6) Urban and architectural solution for "Alvenarias" zone;
- 7) Communication actions, for example, through the creation of the Eco-Bairro website and social networks, sports and recreational activities, and Energy-Environmental awareness actions and monitoring.

Regarding the renovation of residential buildings, to answer to the problems indicated in the previous section, support was requested from the Lisboa E-NOVA (Municipal Agency for Energy and Environment) and the National Civil Engineering Laboratory (LNEC). After a public tender, around 20,000 m² of an External Thermal Insulation Composite System (ETICS) using cork as an insulation material was applied. The selection criterion for the insulation material was related to its reduced environmental impact. In a second phase, about 3,000 windows covering 4,000 m² of the heated area were also replaced.

The energy demand was reduced in a 28% only due to the application of ETICS. This is the measure with the highest impact in terms of energy needs reduction.

Regarding renewable energy sources, 118 m² of solar thermal panels were installed in the roof of the existing municipal pool of the neighbourhood, allowing for the pre-heating of the water used in the facilities. Monitoring of the installed system registered a thermal efficiency of 65%. In July and August, solar heat was responsible for 95% of the heating needs in the pool, whereas, in the following months, the value dropped to around 80%.

Lighting in the streets and in the school serving the neighbourhood was changed to LED technology. Replacement in public lighting has generated a 70% reduction in electricity consumption. In the elementary school “Arquiteto Gonalo Ribeiro Telles” there are savings of around 13.8 MWh/year, which corresponds roughly to about 55% reduction in the electricity consumption regarding lighting in the facilities.

Involved stakeholders included: the Recreational Association of Bairro da Boavista Residents; Lisbon Municipality, Lisboa E-Nova – Municipal Energy Agency and Gebalis - Municipal company that ensures an integrated management policy, which aims at the administration of the neighbourhoods, the quality of life of the resident population and the conservation of the municipal real estate in Lisbon.



Figure 4. Solar thermal system installed in the pool roof. Source: Lisboa E-Nova.

Project Fact Box (I)

General information

Parameter	unit	before renovation	after renovation
Urban scale of area:	m ²	55,000	55,000
Population in the area:	-	6,000	6,000
Number of buildings in the area	-	28	28
Heated floor area of all buildings	m ²	80,000	80,000
Building mix in the area:			
Single family homes (SFH)	% of heated floor area of all buildings	-	-
Multi-family homes (MFH) - up to three stories and / or 8 flats			
Apartment blocks (AB) - more than 8 flats		80	80
Schools		5	5
Office buildings		-	-
Production hall, industrial building			
other - commercial and cultural		10+5	10+5
Consumer mix in the area:			
Small consumers: SFH + MFH – < 80 MWh/a	in % of annual heat demand	80	80
Medium consumers: AB, schools, etc. – 80-800 MWh/a		20	20
Large consumers: industrial consumers, hospitals, etc. > 800 MWh/a		0	0
Property situation of buildings:			
private	% of heated floor area	10	10
public		90	90
Property situation of energy supply system (district heating):			
private	% of heated floor area	n.a.	n.a.
public		n.a.	n.a.

Project Fact Box (II)

Specific information on energy demand and supply:

Parameter	unit	before renovation	after renovation
heating demand (calculated)	kWh/m ² a	60.5	48.2
domestic hot water demand (calculated)	kWh/m ² a	30	20
cooling demand (calculated)	kWh/m ² a	n.a.	n.a.
electricity demand (calculated)	kWh/m ² a	n.a.	n.a.
heating consumption (measured)	kWh/m ² a	n.a.	n.a.
domestic hot water consumption (calculated)	kWh/m ² a	included in the heating consumption	
cooling consumption (measured)	kWh/m ² a	n.a.	n.a.
electricity consumption (measured)	kWh/m ² a	n.a.	n.a.
(Thermal) energy supply technologies:		n.a.	n.a.
<i>decentralized</i> oil or gas boilers	% of heated floor area		
<i>decentralized</i> biomass boilers			
<i>decentralized</i> heat pumps			
<i>centralized (district heating)</i>			
<i>other (please specify)</i>			
renewable energy generation on-site:			
solar thermal collector area	m ²	0	118
photovoltaics	kWp	0	0
other (please specify)	kW	-	-

Financial issues:

Parameter	unit	before renovation	after renovation
total investment costs of the renovation	Euro/m ²	-	130
- building envelope renovation costs	Euro/m ²	-	n.a.
- heating/cooling supply costs	Euro/m ²	-	n.a.
- renewable energy production costs	Euro/m ²	-	n.a.
LCC available	yes / no	no	no

Description of the technical highlight(s) and innovative approach(es)

The Boavista neighbourhood case is an interesting intervention because it is part of the “Eco-Bairro” initiative, which has wider objectives and intends to improve the ecological behaviour and sustainability awareness in the neighbourhood residents. It is the first phase of a significant intervention area of 20 hectares where approximately 6'000 people live. The intervention took into consideration not only energy efficiency issues but also the health and the thermal comfort of the users. The intervention also showed sustainability concerns regarding the materials used (materials with low embodied energy) like the use of cork as the insulation material in the ETICS. The intervention also combined energy efficiency measures with renewable energy sources.

Frequently, residents of the Boavista neighbourhood complained about the cold indoor climate, humidity and mould and air infiltrations. It was also evident the cracking of the buildings' façade mortar. As a solution, it was proposed the application of experimental mortar based on lime and cork. The material was tested to guarantee the best application in an area of around 20.000 m² (Figure 5). In a second phase of the intervention, more than 3'000 windows were replaced by more energy-efficient windows.

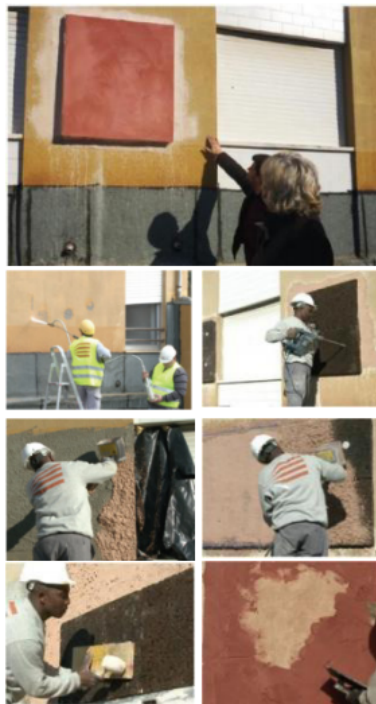


Figure 5. Experimental test of the mortar in existing building on Boavista neighbourhood.

Source: CM-Lisboa, from: http://www.cm-lisboa.pt/fileadmin/Noticias/ficheiros/Eco-District_Boavista_PT_.pdf

Decision and design process

General / organizational issues:

Besides the municipality, several stakeholders were involved:

- CML, Câmara Municipal de Lisboa (Lisbon municipality);
- EPAL, Empresa portuguesa de Águas Livres as (national water distribution company);
- GEBALIS, Gestão de Bairros Municipais de Lisboa EEM (municipality social housing company);
- ISCTE, Instituto Superior de Ciências do Trabalho e da Empresa (educational institution for work sciences and business);
- SCML, Santa Casa da Misericórdia de Lisboa (social solidarity private institution);
- APF, Associação para o Planeamento da Família (family planning Association);
- ABAE, Associação Bandeira Azul da Europa (European Blue Flag Association);
- APA, Agencia Portuguesa do Ambiente (national environmental agency);
- CARRIS, Companhia Carris de Ferro de Lisboa (Lisbon public transport company);
- EDP, Distribuição Energia SA (national energy company);
- EPUL, Empresa Pública de Urbanização de Lisboa (urban planning municipal company);
- Agrupamento de Escolas Pedro de Santarém (local schools cluster);
- Lisboa E-NOVA, Agencia Municipal de Energia e Ambiente de Lisboa (municipal energy company);
- Fábrica da Igreja Paroquial de S. José do Bairro da Boavista (local church);
- VALORSUL, Valorização e Tratamento de Resíduos Sólidos da Área Metropolitana de Lisboa (Norte) (municipal waste management company);
- IHRU, Instituto de Habitação e Reabilitação Urbana, IP (national housing and urban renovation company);
- PSP, Polícia de Segurança Pública (police);
- LNEC, Laboratório Nacional de Engenharia Civil (national laboratory of civil engineering);
- ARMABB, Associação Recreativa de Moradores e Amigos do Bairro da Boavista (Residents Association);
- Junta de Freguesia de Benfica (parish council);
- Centro de Saúde de Sete Rios (local healthcare centre)

The inclusion of Boavista neighbourhood into the letter BIP/ZIP (Neighbourhoods and Priority Intervention Areas in Lisbon), approved in 2011 by the municipal assembly, was an important institutional issue to support the project. Because of the comprehensive nature of the project, the involvement of a large number of project partners was considered essential for the success of all the associated actions. The role of the residents' association (ARMABB), must also be highlighted. The association was responsible for motivating residents to participate and facilitate all actions within the scope of the "Eco-Bairro" project.

Stakeholders' role and motivation:

Main stakeholder	Specify which organization(s) was (were) involved	Role (decision maker, influencer, technical advisor, delivery)	Driver/motivation
Policy actors (municipality department, government body, innovation agency, etc.)	GEBALIS (municipality social housing company) CML (Lisbon Municipality)	Owner/Decision maker	Need for corrective maintenance and poor energy-environmental performance of the neighbourhood, resulting in building pathologies
Users/ investors (individual owner, housing association, building managers, asset manager, project developer)	ARMABB (Residents Association)	influencer	Need for corrective maintenance and poor indoor conditions
District-related actors (Community/occupants organizations, etc.)	ARMABB (residents association)	influencer	Poor interior conditions with high levels of thermal discomfort and presence of mould areas Evidence of cracking of buildings' façade mortar
Energy network solution suppliers (Distributor system operator, energy supply company, energy agency, ESCO, renewable energy companies)	EDP -Energias de Portugal (national energy company)	Technical advisor/Partner	Social Responsibility /Research
Renovation solution suppliers (Planning and construction parties, urban planners, architects, design team general contractors, products suppliers, ESCO, contractor, energy monitoring, facility manager, installation provider, one-stop-shop, etc.)	Lisboa E-NOVA (municipal energy agency) LNEC (National Laboratory of Civil Engineering)	Delivery; technical advisor	Participation in relevant research project
Other intermediaries (public bodies, trade organizations, NGO's, consultancies, research institutes)	Santa Casa da Misericórdia (social solidarity private institution) CARRIS (Lisbon public transport company) VALORSUL (municipal waste management company)	Partner	Social Responsibility/ Participation in relevant research project

Design approach:

The program "Eco-Bairro Boavista Ambiente" had as principal objectives:

- Intervention in the façades and gables using eco-insulated cladding and the replacement of existing windows;
- the use of participatory methodology in urban and renovation architectural projects;
- to develop and apply concepts of energy efficiency and environmental behaviour and awareness under the programme "Eco-Bairro".

Technical issues:

Technically, the most challenging issue was to find the most adequate material to be used as an external wall insulation material with the ability to improve the indoor comfort condition, humidity and mould problems and the air infiltration issues expressed by the households before renovation, using sustainability criteria to support the decision.

Financing issues:

The "Eco-Bairro" project was financed within the framework of the "Política de Cidades – Parcerias para a Regeneração Urbana do QREN" (City Policy – Partnerships for the Urban Regeneration under QREN). The QREN – Quadro de Referência Estratégico Nacional – (National Strategic Reference Framework) was an instrument for the implementation of the common policy for economic and social cohesion amongst the European member states in the period 2007-2013. The availability of structural funding for this operation was key for the implementation of the project, since the municipality did not have the resources necessary for the intervention.

Management issues:

No particular challenges were found regarding the management of the project.

Policy framework conditions:

The social housing management company Gebalis led the renovation process and the intervention was conducted under a broad environmental programme, which can be framed in a kind of preaching policy. The use of sustainability criteria in intervention in existing buildings can also be considered as a demonstration for other social housing contexts. The obligation to comply with thermal regulations and energy standards, in particular, the requirements of Decree-Law 118/2013 was essential to obtaining energy reductions.

Lessons learned

One of the major success factors of the neighbourhood intervention is its integration in a broader environmental program that aimed at raising energy and environmental awareness in the residents.

There was a holistic perspective of the intervention, combining renewables and passive measures on the envelope, while considering sustainability concerns regarding the choice of the insulation material, which should have low embodied energy. Significant energy and carbon savings were achieved from the technical measures implemented. Heating demand was reduced by 20% when considering building envelope measures alone.

There is significant potential for transferability and replicability of the lessons learned in this project for other municipalities and governance structures, namely regarding the opportunity provided for EU structural and cohesion funds and the focus on the combination of social inclusion and improvement of energy efficiency (and renewable energy sources) measures.