EBC
Energy in Buildings and Communities Programme

Vila D'Este neighbourhood, Vila Nova de Gaia (Portugal)

Country: **Portugal**

Name of city/municipality: **Vila Nova de Gaia**

Title of case study: Vila D' Este

Year and duration of the renovation: 2009-2015

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Link(s) to further project related information / publications, etc.:
https://www.interregeurope.eu/policylearning/good-practices/item/677/vila-d-este-housing-refurbishment/
https://www.gaiurb-habitacao.pt/viladeste
http://www.cm-gaia.pt/fotos/editor2/a-nova-vila-deste.pdf

Schematic figure or aerial overview

Figure 1. Schematic view of Vila D'Este neighbourhood after renovation. Source: Google maps.

Introduction and description of the situation before the renovation

Vila D'Este is a densely populated neighbourhood, with approximately 17'000 inhabitants, located in Vilar de Andorinho, in the municipality of Vila Nova de Gaia, Portugal. The neighbourhood has a total of 109 buildings distributed over 18 blocks, with 2'085 dwellings and 76 commercial spaces. It was initially built between 1984 and 1986, through a funding program for Housing Developments. The neighbourhood is one of the most significant housing developments on the metropolitan area of Porto and in the municipality of Vila Nova de Gaia and is served by an elementary school (built in 1999), a sports and public pool facilities (built in 2001).

From the urban perspective, it was a closed, degraded and peripheral area, making it a challenge also in terms of social cohesion. The area was considered critical in terms of social problems and concentration of socially vulnerable minorities.

The buildings of Villa D'Este used a technique designated as "tunnel formwork", which is very common in social housing projects from the '80s of the XX century in Portugal. The stairwells are prefabricated and are supported on ledges in the walls of concrete of the adjacent "tunnels". The façades are of brick walls or blocks without insulation.

Before the renovation intervention, there was a general deterioration of the façade materials, mainly due to the absence of maintenance and repair measures. The anomalies consisted of low indoor thermal comfort, poor ventilation, presence of water infiltration and condensation, which have a negative impact on the durability of the building components and indoor air quality.

The renovation intervention represented a very high investment effort for the municipality of Vila Nova de Gaia. As the ownership of buildings in the neighbourhood is divided between the municipality and the private owners, no financial return from the intervention was expected.

At the urban level, the lack of an effective planning process guiding the disconnected interventions made in the last decades was also identified as a problem that had to be dealt in the scope of an overall neighbourhood intervention.

Description of the renovation goal

The renovation was integrated into a new strategic vision for the neighbourhood that included improving educational policies, sports, urbanism and public spaces, accessibility and road systems.

The physical intervention in the buildings was triggered by the state of degradation and the need to meet current energy and indoor air quality requirements, as well as to renovate the entire neighbourhood from an architectural and aesthetics perspective.

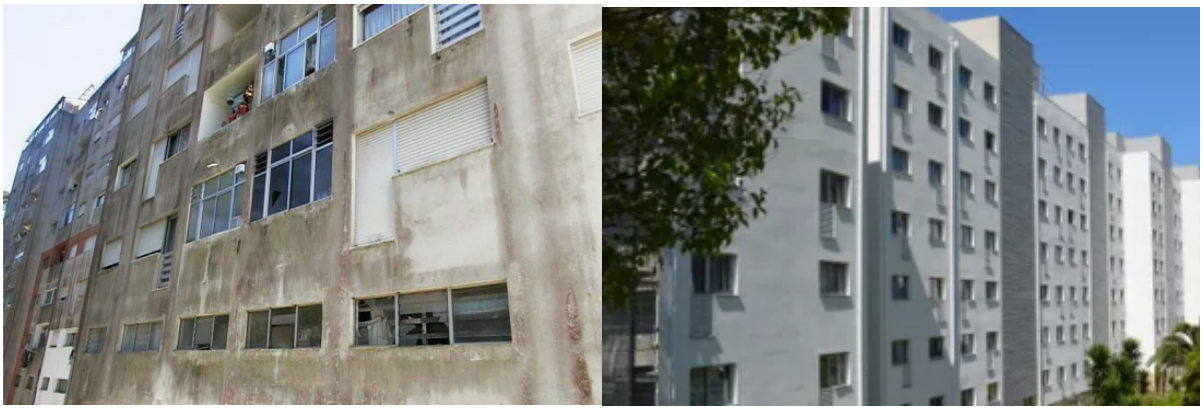

Figure 2. Façade in Vila D'Este district before renovation (left) and after renovation (right). Source: Gaiurb, from: http://www.cm-gaia.pt/fotos/editor2/a-nova-vila-deste.pdf.

Description of the renovation concept

The renovation of the neighbourhood was part of a dynamic action program created to involve all partners in the process. It was designed to ease the articulation between public and private organizations and to guarantee the success of the intervention, through complementarity and innovative solutions.

The neighbourhood renovation was carried out in two separate phases and using distinctive funding instruments. In both phases, the project was co-financed by the municipality and the EU structural funds. The first phase (2008) was financed through "ON.2 – North Regional Operational Programme (QREN)". The second phase (2011) was based on the "Cities Policy - Partnerships for Urban Regeneration" program.

The first phase concerned three different axes: Building Requalification, Public Space and Urban Environment Requalification, Social Inclusion and Socio-Economic and Professional Valorisation. Physically, this intervention focused on 6 blocks of the neighbourhood, besides reorganization of the road system, creation of green areas and new walking zones. Socially, the intervention was followed by several actions dedicated to promoting the qualification of minorities living in the neighbourhood. In addition, several actions were created to promote better conditions for young population to access the employment market.

The second phase in 2011 focused on two dimensions: Building Requalification and Social Inclusion and Socio-Economic and Professional Valorisation of the population. This phase intended to continue the work already initiated in the first phase and focused on the remaining 12 blocks.

At the building level, the renovation was primarily an extensive improvement of the buildings envelope. For that purpose, the municipality's energy agency – ENERGAIA – developed an energy analysis based on thermal regulations requirements and on the Portuguese Thermal Performance Building Code in force.

The following measures and materials were implemented:

Roof

- Execution of metallic coating type "Roofzip[1]";
- Introduction of 8 cm thick layer of rockwool insulation and windshield vapour barrier, heat transfer coefficients of 0.39 W/m^2 ºC and 0.38 W/m^2 ºC, for upward and downward airflow, respectively;
- Application of Aeolian[2] fans on top of the ventilation conducts of sanitary facilities.

Exterior Walls

- Application of a 5 cm thick layer of thermal insulation in external walls with expanded extruded polystyrene (ETICS), heat transfer coefficients of 0.59 W/m^2 ºC;
- Installation of panels and flaps in GRC (Glass Fibre Reinforced Cement);

[1] Waterproof metallic coating which is applied without the use of screws - www.roofzip.com.
[2] Fans driven by the action of wind.

- Replacement of window areas in buildings' entrance doors, stairwells and storerooms;
- Installation of shading elements in window areas.

Project Fact Box (I)

General information

Parameter	unit	before renovation	after renovation
Urban scale of area:	m²	170’000	170’000
Population in the area:	-	~17’000	~17’000
Number of buildings in the area	-	109	109
Heated floor area of all buildings	m²	126’000	126’000
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		85	85
Schools		5	5
other: sales and cultural		5	5
Consumer mix in the area:			
Small consumers: SFH + MFH – < 80 MWh/a	in % of annual heat demand	85	85
Medium consumers: AB, schools, etc. – 80-800 MWh/a		15	15
Large consumers: industrial consumers, hospitals, etc. > 800 MWh/a		-	-
Property situation of buildings:			
private	% of heated floor area	n.a.	n.a.
public		n.a.	n.a.
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/m²a	84	57
domestic hot water demand (calculated)	kWh/m²a	30	30
cooling demand (calculated)	kWh/m²a	n.a.	n.a.
electricity demand (calculated)	kWh/m²a	n.a.	n.a.
heating consumption (measured)	kWh/m²a	n.a.	n.a.
domestic hot water consumption (calculated)	kWh/m²a	n.a.	n.a.
cooling consumption (measured)	kWh/m²a	n.a.	n.a.
electricity consumption (measured)	kWh/m²a	n.a.	n.a.
(Thermal) energy supply technologies:		n.a.	n.a.
decentralized oil or gas boilers	% of heated floor area	-	-
decentralized biomass boilers		-	-
decentralized heat pumps		-	-
centralized (district heating)		-	-
other *(please specify)*		-	-
renewable energy generation on-site:			
solar thermal collector area	m²	0	~500
photovoltaics	kWp	0	0
other (please specify)	kW	0	0

Financial issues:

Parameter	unit	before renovation	after renovation
total investment costs of the renovation	Euro	~12 000.000,00	
- building envelope renovation costs	Euro/m^2	-	-
- heating/cooling supply costs	Euro/m^2	-	-
- renewable energy production costs	Euro/m^2	-	-
LCC available	yes / no	no	no

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

The combination of building envelope measures with the chosen systems led to considerable energy and carbon emissions reductions, which in the social housing context are quite significant. In terms of heating demand, a calculated reduction of 32% (27 kWh/m^{2}a) was achieved with the intervention. The Vila D´Este Housing renovation project led to the improvement of the buildings energy performance, allowing a potential annual saving of 3'800 ton CO_{2eq} and an estimated annual saving of 837'433.92 €/year, according to the information provided in the Interreg Europe website[3].

[3] https://www.interregeurope.eu/policylearning/good-practices/item/677/vila-d-este-housing-refurbishment/

Decision and design process

General / organizational issues:

The intervention was initiated because of a strategic decision by the municipality to improve the liveability of the neighbourhood. The buildings in the neighbourhood presented a high level of deterioration. There were complains through the residents' association of poor indoor conditions with high levels of thermal discomfort and the presence of extensive areas of mould.

The project was coordinated by the City of Gaia, and the following interested agents were involved:

- owners association;
- residents association;
- condominiums association;
- Junta de Freguesia de Vilar de Andorinho (Parish council of Vilar de Andorinho);
- Vilar de Andorinho Church;
- Gaiurb-Urbanismo e Habitação, EM (municipality social housing company);
- CONSTRUCT – Universidade do Porto (research centre from the University of Porto).

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.)	Gaiurb (municipality social housing company)	Owner/ Decision maker	Improved dwellings and surrounding conditions and increased quality of life of the residents
Users/ investors (individual owner, housing association, building managers, asset manager, project developer)	Owners association* Junta de freguesia de Vilar de Andorinho (Parish council of Vilar de Andorinho)	Influencers	Improved quality of life of the residents
District-related actors (Community/occupants organizations, etc.)	Residents association	Influencers	Improved quality of life of the residents
Energy network solution suppliers (Distributor system operator, energy supply company, energy agency, ESCO, renewable energy companies)	There weren't any of them involved	-	-
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.)	CONSTRUCT – University of Porto (Energy efficiency research centre	Technical advisor	Participation in relevant research and implementation project
Other intermediaries (public bodies, trade organizations, NGO's, consultancies, research institutes)	There weren't any of them involved	-	-

Design approach:

The renovation intervention was part of a broader plan of the municipality to improve the image of the neighbourhood and the quality of life of the residents. The project had two main objectives that had to be integrated: energy performance improvement and complete aesthetics reformulation of the neighbourhood.

The major challenges in the process were related to the relocation of families during the renovation works.

Technical issues:

No information available.

Financing issues:

The strategic intervention in Vila D´Este neighbourhood was financed by the municipality and through EU structural funds (Table 1). Although there are differences in the two phases, there was roughly 80% funding from the EU and 20% from the municipality for the operation.

Based on this investment and the energy savings achieved, the estimated payback time is of less than 12 years.

Table 1. Phases of the renovation process made in Vila D'Este district.

Phases	**Phase I**	**Phase II**
Year	2009	2013
EU structural funds	3'565'782.67	6'200'411.71
Gaiurb	1'091'139.70	1'247'632.80
Total Investment	**4'656'922.37**	**7'448'044.51**

Management issues:

No information available.

Policy framework conditions:

The obligation to comply with thermal regulations and energy standards, in particular, the requirements of Decree-Law 118/2013 was key to obtaining energy reductions.

Lessons learned

The implementation of the renovation of the neighbourhood constitutes a clear example of a successful intervention that can increase the quality of life of the residents, as well as address social inclusion and improve the sustainability of the built environment, with significant energy savings and carbon emissions reductions.

The project also demonstrates a good practice regarding the implementation of national thermal regulations in line with the Energy Performance of Buildings Directive (EPBD) objectives and nZEB target and EU policy framework related to energy poverty concerns.

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