

Lourdes Neighborhood, Tudela (Spain)

Country: **Spain**

Name of city/municipality: **Tudela (Navarra)**

Title of case study: **Lourdes Neighborhood**

Year and duration of the renovation: **2010-2012**

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

<http://www.tudela.es/docs/industria/lourdes-renove-presentacion.pdf>

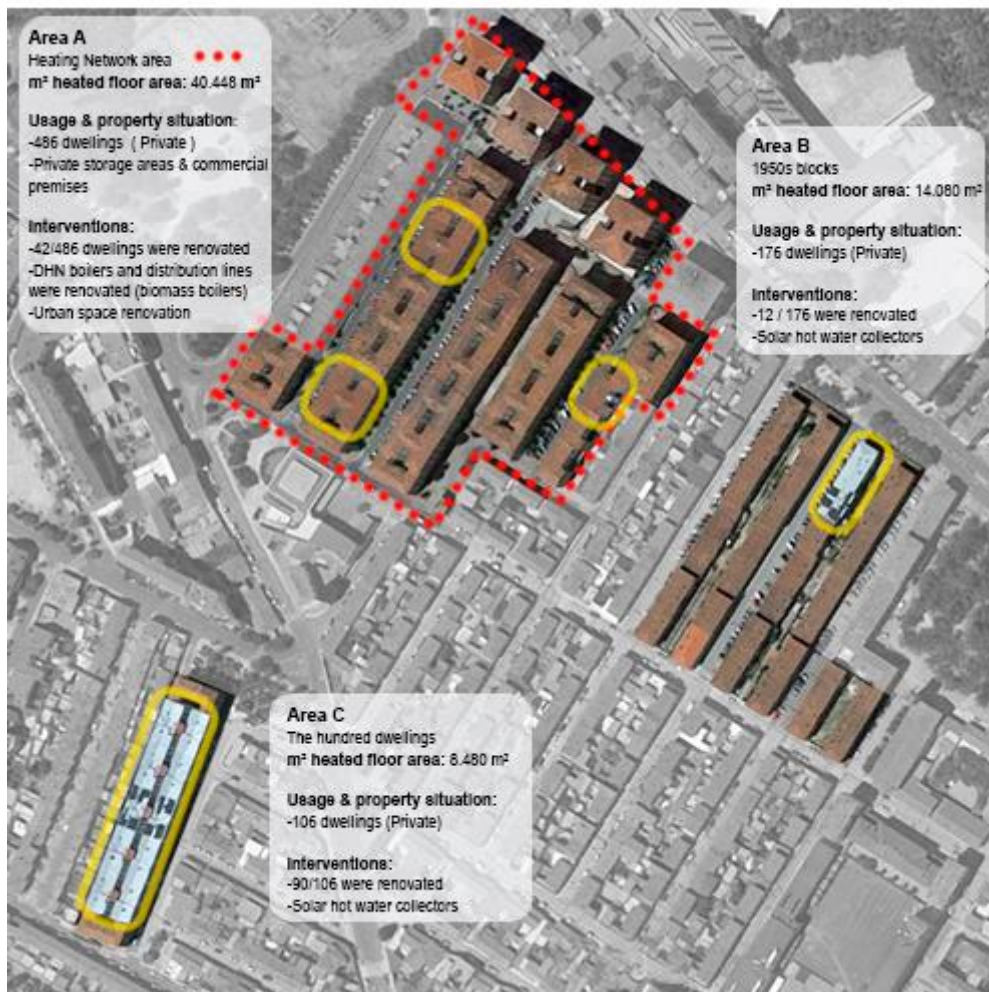
Domingo-Irigoyen, S., Sánchez-Ostiz, A., & Miguel-Bellod, J. S. (2015). Cost-effective renovation of a multi-residential building in Spain through the application of the IEA Annex 56 Methodology. Energy Procedia, 78, 2385-2390.

<https://www.sciencedirect.com/science/article/pii/S1876610215019268>

Schematic figure or aerial overview

LOURDES RENOVE PROJECT

Context:	Scope of project:
City: Tudela	District: Lourdes
Region: Navarra	Areas: Only coloured building blocks
Country: Spain	Building typology: Private Multifamiliar apartment blocks



Pilot Projects - Renovated buildings —————

Figure 1. Schematic/aerial view of Lourdes renovation area

Introduction and description of the situation before the renovation

The area selected for this Success Story is located in the Lourdes Neighborhood, in the outskirts of the city of Tudela (North of Spain). This district was built between 1954 and 1972 and was originally developed as a social housing area¹. As a result of a building and social degeneration process during the last decades, this district became one of the most economically-deprived districts in Tudela. For this reason, in 2009, the municipality of Tudela started a process of renovation in this area.

This Success Story presents the highlights of the Lourdes Renove Project that was defined as a first phase of an integral energy and urban rehabilitation strategy in this district. Three particular subareas (A, B, C) were included in the scope of action of this project. In this report, the data summarized in the Project Fact Box concerns area A - marked with red dot lines (Figure 1) - from which more information was available. Main strategies carried out in areas B and C are also described.

In terms of building characteristics, different multi-family building block typologies are found in these areas, all sharing similar low-quality construction. Envelopes lacked of any kind of insulation and the original wood-frame windows were nearly all replaced by residents during the last decades. Overall, buildings were highly energy inefficient and they didn't meet the current minimum requirements of the Spanish Building Code. Following, there is a description of the building and energy system features found in these areas and the number of dwellings and main morphology differences among them:

- **Area A** corresponds to the San Juan Bautista District Heating Network (DHN) which served a total amount of 486 dwellings (Total heated area: 40.448 m²). Before the renovation of this old facility, the heating distribution network had huge thermal losses and it was connected to old inefficient oil boilers. In terms of heating control, there were no individual controls or energy meters installed in the dwellings and the heating costs per dwelling were calculated dividing the total heating costs according to the dwelling's area.
Two main building typologies are found in this area: the "H-block" (due to the floor plane shape: Ground floor + 4 upperfloors) and the Tower block (Ground floor + 8 upperfloors). Ground floors in these typologies are occupied by some commercial premises and storage private areas.
- **Area B** corresponds to the oldest buildings in this district, known as the 1950s blocks. Each building block is comprised 6 dwellings following the linear block typology (groundfloor + 2 upperfloors) - two dwellings in the ground level floor, plus two additional floors with two dwellings per floor. This area accounts for a total amount of 176 dwellings (Total heated area: 14,080 m²)
- **Area C** accounts for a total amount of 106 dwellings, divided in 7 building blocks with 18 dwellings per block following the "H-block" typology - two dwellings in the ground

¹ Nowadays, most residents are owners and an elevated percentage of households are private rented properties.

level floor, plus four additional upperfloors with four dwellings per floor. (Total heated area: 8,480 m²)

In Area B and C, heating was provided in different ways. Most buildings had a central heating system per building but in some cases dwelling had individual heating systems. In all Areas A, B and C, - but mostly in the ones not included in the DHN (B and C) - there are reported cases that some dwellings used alternative heating systems such as butane stoves, electric heaters or even there were dwellings with no heating system due to their vulnerable situation.

Domestic hot water is provided by individual electrical or gas boilers installed at different times by occupants and some dwellings have installed individual air conditioning units for cooling in summer. No energy saving systems for lighting or other appliances existed.

Description of the renovation goal

The Lourdes Renove Project responded to the need to promote the integral renovation of this deprived social housing area. This project acted on three levels with very specific goals:

- a) **Environmental level.** To reduce energy consumption and CO₂ emissions by:
 - a.1 Improving the energy efficiency of the building envelopes
 - a.2 Improving district heating network efficiency (new and more efficient boilers; replacing old distribution lines).
 - a.3 Providing district heating with regulation and control systems. (Central regulation and individual smart meters in dwellings, radiator valves)
 - a.4 Increasing the share of renewals (Biomass boilers for the DHN, solar collectors for domestic hot water).
- b) **Economical level.** To improve the value of the dwellings and reduce the energy demand and derived cost for families in this area with medium-low purchasing power.
- c) **Social level.** To ensure the permanence of the families in the dwellings and the social cohesion in the area by improving the neighborhood quality and appealing.
 - c.1 Renovating the exterior appearance of facades and urban space.
 - c.2 Ensuring adequate accessibility (new elevators, elimination of accessibility barrier elements)
 - c.3 Reducing the risk of mold and condensation, increasing indoor comfort conditions.

Description of the renovation concept

The most relevant aspect of this renovation was the simplicity and effectiveness of all the measures performed to reduce the most urgent deficiencies in the urban space, the buildings and the energy systems. All the decisions were based on technical and economic criteria taking into consideration that occupants had to stay in their dwellings during the renovation works.

The renovation was carried out on three levels: urban space renovation (Area A), building renovation (Area A, B and C) and energy systems (DHN renovation in area A, and solar hot water collectors in Areas B and C).

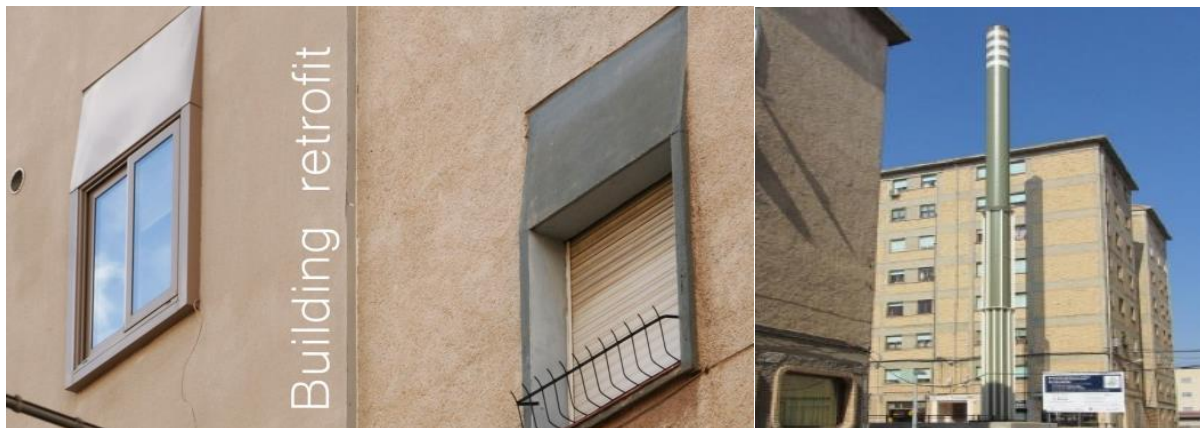


Figure 2. Area A. (Left) Building renovation. (Right) District Heating Network renovation.

Building renovation: envelope and facilities

Three different design (architecture) renovation projects were developed for the different areas. However, a similar renovation concept was applied in each of them:

- Old facilities were removed from the façade and new openings for the exhaust pipes of existing and future gas hot water boilers were arranged.
- A single layer of insulation (6-8 cm) was fixed to the wall and covered by an acrylic and elastic mortar.
- Additional sliding windows were installed as a double layer outside the existing windows. Slightly different aesthetically solutions were applied depending on the existing facade morphology.
- The original old pitched roofs were repaired and insulated.
- New telecommunication systems were updated and individual aerials were relocated from the façade to the roof.



Figure 3. New conservatories in Area B

- Terraces in the linear block (Area B) were extended and closed conforming new conservatories connected to the south facade.
- First floor ceiling in contact with non-heated spaces (Areas A and C) was insulated with 10 cm of mineral wool where it was possible.

In the construction details (Figure 4), it can be seen the solution for the "H-block" typology in Area A:

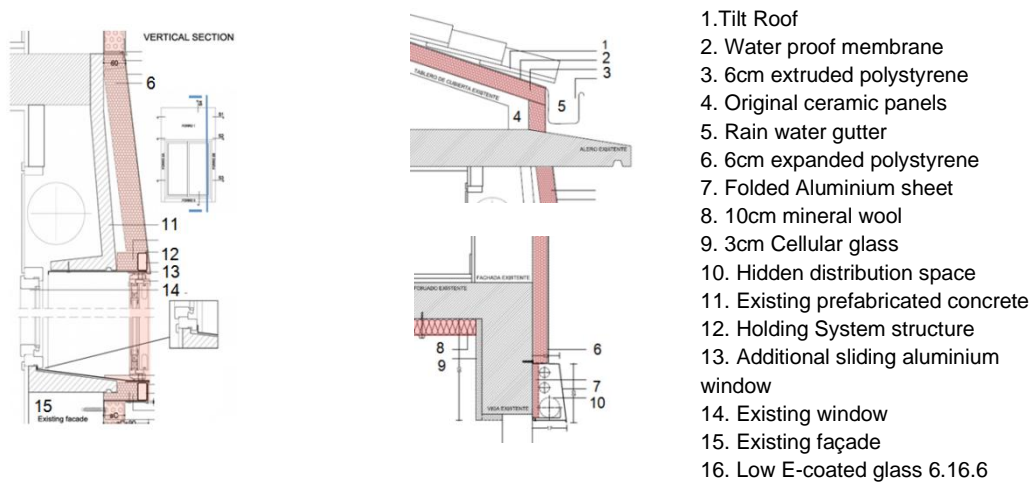


Figure 4. Construction details of renovation solution

Table 1 Average characteristics and U-values before and after renovation

	Before renovation	U-value (W/m ² °C)	After renovation	U-value (W/m ² °C)
Roof	Tilt roof, no insulation, unheated space under the roof	1.25	6 cm insulation (extruded polystyrene)	0.45
Facade	25 cm single brick wall, no insulation	1.89	6 cm (expanded polystyrene)	0.38
Window	Single glass/wood frame	5	Additional sliding aluminum frame. Old window maintained. Double Low E-coated glass 6.16.6/aluminum Ug1.6/Uw3.2	1.95
Floor	Concrete beam slab with ceramic hollow fillers,	1.47	12 cm insulation (mineral wool)	0.22

District heating network and other building systems

- In Area A, the DHN distribution system was replaced and insulated and new, more efficient, biomass and gas boilers were installed.
- Regarding hot water production, in Areas B and C, new domestic hot water solar collectors were placed on the roofs, but no particular measure was applied in the production facilities. Individual electrical boilers and few individual gas boilers installed during the last decades are the most common systems.
- Regarding heating control in the DHN Area (Area A), wireless thermostats were installed in every dwelling and old radiators were retrofitted with new regulation valves allowing occupants to regulate heating according to their preferences.

Project Fact Box (A area) (I)

General information

Parameter	unit	before renovation	after renovation
Urban scale of Area A:	m ²	-	-
Population in the area: Lourdes district	-	1200	1200
Number of buildings in the area	-	486 dwellings	42 ² /486 dwellings
Heated floor area of all buildings	m ²	40,448	(3,360 ¹ / 40,448)
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		100	8.31 ¹ / 100
Schools		-	-
Office buildings		-	-
Production hall, industrial building		-	-
storage areas and commercial premises		unheated	unknown
Consumer mix in the area:			
Small consumers: SFH + MFH – <80 MWh/a	in % of annual heat demand	(100)	(100)
Medium consumers: AB, schools, etc. – 80-800 MWh/a		-	-
Large consumers: industrial consumers, hospitals, etc. >800 MWh/a		-	-
Property situation of buildings:			
private	%of heated floor area	100	100
public		-	-
Property situation of energy supply system (district heating):			
private	%of heated floor area	100	100
public		-	-

² Share of buildings with renovated envelopes

Project Fact Box (A area) (II)

Specific information on energy demand and supply:

Parameter	unit	before renovation	after renovation
heating demand (calculated)	kWh/m ² a	-	-
domestic hot water demand (calculated)	kWh/m ² a	-	-
cooling demand (calculated)	kWh/m ² a	-	-
electricity demand (calculated)	kWh/m ² a	-	-
heating consumption (measured)	kWh/m ² a	89.57kWh/(m ² a) ³	46.38 kWh/(m ² a) ⁴ 45.25 kWh/(m ² a) ⁵ 23.93 kWh/(m ² a) ⁶
domestic hot water consumption (calculated)	kWh/m ² a	unknown	unknown
cooling consumption (measured)	kWh/m ² a	≈0	≈0
electricity consumption (measured)	kWh/m ² a	unknown	unknown
(Thermal) energy supply technologies:			
<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>		100	100
other (<i>please specify</i>)			
renewable energy generation on-site:			
solar thermal collector area	m ²	0	0
photovoltaics	kWp	0	0
other (please specify) (Biomass)	kW	0	1440

Financial issues:

Parameter	Unit	before renovation	after renovation
total investment costs of the renovation	Euro/m²	-	-
- building envelope renovation costs	Euro/m ²		283 ⁷
- heating/cooling supply costs	Euro/m ²	-	60.62 ⁸
- renewable energy production costs	Euro/m ²		-
LCC available	yes / no	-	no

³ Before District Heating renovation (2010-2011)

⁴ Total District Heating heating consumption (2012-2013)

⁵ Not renovated building heating consumption in the DHN (2012-2013)

⁶ Renovated buildings heating consumption in the DHN (2012-2013)

⁷ Total cost of the building envelope renovation of 42 dwellings (3360 m²) = 954,000 €

⁸ Total cost of the district heating system (40,448 m²) = 2,614,000 €

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

Key renovation facts

(1) Limited budget/ Less is more. This example highlights the simplicity and effectiveness of all the measures performed to solve particular necessities and overcome the financial constraints of this deprived area. Although sufficient subsidies and adequate financing were finally obtained (from European Framework Concerto Programme, regional government, etc.), the limited budget was always a concern that helped focus on the strategies for an effective energy consumption reduction.

(2) Holistic district approach. The main drivers of energy consumption were taken into account in the project - district heating network, building energy efficiency and users behavior - addressing cost-effective energy saving measures. Important factors behind this renovation included: leveraging already existing infrastructure, renewable energy use, energy consumption reduction and community empowerment in the use of energy.

(3) Public initiative, control and coordination between stakeholders during the renovation process. As crucial as the physical renovation strategies carried out, this example highlighted the importance of coordination between stakeholders: administration, neighbors and private entrepreneurs. The initiative of the public authorities and the public housing company (Nasuvinsa) was the essential support to promote, speed up and control the whole process. Nasuvinsa, as a public intermediary, assumed the role of being the meeting point for decision making during this process and the main coordination agent helping counterbalancing the different interests of the different agents involved.

(4) Community involvement. Personalized mentoring and agreement facilitator agent. Taking into account the fundamental barrier of community engagement in the renovation process, Nasuvinsa played also a fundamental role in the promotion and information dissemination, resident guiding and coordination in the participatory process involving all the community in the decision making. The following strategies were carried out:

- Door to door interviews providing adequate information about the pros and cons of the renovation and about possible financing strategies.
- A customer service and information office in the neighborhood.
- Coordination of events for collective participation and decision making.
- Coordination of visits to other similar renovation projects in the area.

(5) A pilot intervention. Monitoring for validation. The Lourdes Renove Project was conceived as a first stage that laid the groundwork for the full renovation of this deprived area in the future. As a trial, all the developed actions have been carefully evaluated during the last years in order to validate or modify the future interventions in this area. In order to evaluate these measures different monitoring actions were carried out. Thanks to the energy meters installed during the DHN renovation, all the heating data was centralized and supervised to control the heating performance and energy savings. Also, post-occupancy assessments were carried out after renovation evaluating the improvements in terms of comfort during winter and summer periods.

Decision and design process

General / organizational issues:

The Lourdes Renove Project responds to the need to promote the integral renovation of this deprived social housing area and the upgrade of the inefficient district heating. This project acted on three levels:

- Environmental level. By improving the energy efficiency of the building envelopes and district heating boilers and distribution pipes aimed to reduce the energy consumption and CO2 emissions.
- Economical level. By promoting new employment in the area and the reduction of the energy consumption and derived economic burden on families in this area with medium-low purchasing power.
- Social level. By renovating the exterior appearance of facades and urban space, ensuring adequate accessibility and energy efficiency aimed to improve the neighborhood quality and appealing to ensure the permanence of families in their dwellings and the social cohesion in the area.

Stakeholders involved

The success of this renovation initiative was the result of the implication of multiple stakeholders; the leadership of the Tudela city council and other public institutions (Navarra Government and Spanish Department of Economy, Finance, Industry and Employment), the support and participation of the neighborhood population, the construction and research sector (Zabala, Cener, Cenifer) and the coordination and management of a semi-public housing company, Nasuvinsa.

Main steps

Different actions and steps were followed to support this successful implementation.

- The project "Lourdes Renove" was framed within the scope of action of the CONCERTO Programme. It started in 2010 after the signing of the agreement between the Municipality of Tudela and the public company NASUVINSA.
- As a key strategy, in 2010, Nasuvinsa opened a neighbor service point, the Lourdes Renove Office, a meeting point for technicians and neighbors and a dynamizing agent of the process.
- A master plan was set up to prioritize three key intervention areas: (1) The thermal envelope, (2) the district heating network and (3) the improvement of energy use by families.
- At the same time, the Tudela city council promoted and developed a Social Activity and Involvement Plan boosted by a social worker to interact within the community. Neighborhood Associations and Neighbors' Association presidents were engaged in the process.
- Along 2010, the Tudela city council called four architectural ideas competitions for each of the different building typologies in the area. The winner proposals were implemented along 2011 and were practically finished at the end of the year.
- All building and facilities renovation projects had to be implemented in short timeframe (14 months). In this short period the following actions had to be done:

- ✓ Project definition.
- ✓ Seeking subsidies and financing: identification of possible money sources, dossier presentation and definition of the economic strategy.
- ✓ The call for tenders related to the works and services set out above.
- ✓ The adoption of the necessary agreements and resolution among the community.
- ✓ Process for licenses.
- ✓ Coordination with the urban redevelopment plan.
- ✓ Construction works (without interrupting the normal life of dwellers).

Resources available before the project

Very limited resources were available before the project as a result of the low purchasing power of this area. This project ended successfully thanks to the subsidies and the favorable financing opportunities.

Drivers and barriers (opponents)

This project was made possible thanks to the initiative of Tudela municipality and the extraordinary support and management of the public company Nasuvinsa. Both agents, along with the population of the area, made the interventions possible despite the opposition of a certain part of the residents. Nevertheless, if more people would have agreed to be part of the renovation process, possibly more buildings would have been renovated. Undoubtedly the second most important driver was the financial assistance of the European Union and the regional and local administrations.

Stakeholders' role and motivation:

Main stakeholder	Specify which organization (s) was (were) involved	Role (decision maker, influencer, technical advisor, delivery)	Driver/motivation
Policy actors	Tudela city council	Main driver Financial/ regulations facilitator	Neighborhood renovation
	Navarra and European Government	Direct subsidies	
Users/ investors	Building managers Neighbors	Influencer Community engagement	Dwelling improvement (comfort, energy savings, accessibility)
	Bank (Caja Navarra)	Financing	
District-related actors			
Energy network solution suppliers	Project developers: GIROA	Delivery & decision maker District heating Renovation	
Renovation solution suppliers	Project developers: Building renovation: Mar Arch.) Urban renovation: (Blasco Arch.)	Delivery & decision maker Project development Technical assessment	
Other intermediaries (public bodies, (NASUVINSA) trade organizations, NGO's, consultancies, research institutes)	Public bodies (NASUVINSA)	Communication Agreement facilitator Coordination Nexus between tenants, municipality and technicians.	Neighborhood renovation
	Research institutes (CENIFER, CENER)	Consultancy and Technical assessment	
	Consultancies (Zabala Innovation)	Consultancy (European Project Consultancy)	
	Research group (SAVIArquitectura, UNAV)	Post Occupancy Evaluation	

Design approach:

In 2010, Tudela municipality sets up four architectural ideas competitions for the different existing building typologies in Areas A, B and C. Design proposals must take into consideration the following requirements pursuing an integral energy retrofit and general upgrade:

- **Energy loss reduction through the envelope.** New thermal envelope standards were set from 2006 by the Spanish Building Code (CTE DB-HE). This building code has been already overridden by more demanding regulations.
- **Minimum impact during renovation works.** Construction works should be fundamentally carried out from the exterior of the buildings, thus allowing people living at home during this phase.
- **Keeping budgets in check.** Preliminary projects should be accompanied by an economic evaluation, broken by measures and types of action (accessibility, thermal envelope and general facilities) facilitating neighbors decision making. These budgets had to be ratified by construction companies.

Decision steps

- Call for architectural ideas competitions for the different existing building typologies. The proposals had to contemplate the integral energy retrofit of the buildings with high requirements of energy efficiency.
- Organization of a project launch day for the neighbors (October 2010) in which the winning projects and financing possibilities were displayed.
- Meetings with neighborhood communities for the adoption of agreements in every building block in the Lourdes Renove office and the final definition of the pilot projects.
- Meetings in the neighborhood civic center for informing about the renovation of the San Juan Bautista District Heating.

Main challenges in the design phase

The main challenges during the design phase were related to:

- **Aesthetics.** The final appearance of the renovated buildings shouldn't be disruptive or interfere with the surrounding buildings avoiding striking differences in the neighbor and facilitating social cohesion.
- **Limited time and budget.** Project, formalities and works had to be finished in a very short period of time (14 months). That's why, all the process had to be very coordinated and timely. The involvement of the municipality and regional administrations was fundamental for the streamlining of this process. In addition, measures had to be defined from a time and cost-effective approach. For that reason, the defined measures had to be easy to implement. The reduced budget was also a challenge. However, the solutions adopted configured in the end a feasible and adequate strategy for future renovations in this neighborhood.
- **People kept living at home during the works.** Measures applied had to take into account the minimization of nuisances and pollution caused by works in the interior of the dwellings during the renovation process.

Technical issues:

Major technical challenges/constraints regarding system design/implementation

As stated before, this project faced a fixed deadline (14 months) that obliged the managers to anticipate any unforeseen setback in the renovation phases. Thereupon, one of the most challenging works was the exterior and interior rearrangement and renovation of telecommunication lines, water and gas pipe lines and air conditioning units which varied from one building to the other. In order to meet the deadlines, all the construction work had to be carefully followed by the coordination agent (NASUVINSA) in order to meet with every unexpected modification of the project in the shortest time possible (as it happened with distribution lines). Every modification of the project had to be approved by the neighbors so regular meetings were held.

Financing issues:

This project was financed thanks to public grants and private loans. In particular, two loans were requested in the name of the owners' associations. Both loans covered the total cost of the interventions. The first loan was requested to cover the amount funded by grants, and the other one, the rest of the expenses. 59,5% of total expenses came from subsidies, and the rest was completely financed by private loans.

- For thermal envelope renovation costs, owners pay an amount of 40 €/month for the next 10 years; considering 20 €/month discount accounting the 50% of energy savings got after the intervention. In 15 years, it is expected the return of the initial investment.
- For district heating renovation, the monthly flat-rate fee for heating was increased from 51€/month (only heating) to 67€/month (including heating costs + works loan). Total expenses will be paid in around 12 years.

Subsidies or other financial incentives

Subsidies and financing were vital to drive the development of this project taking into account the average medium-low purchasing capacity in this area and the financial crisis.

Main challenges/constraints regarding financing

Among the main limitations for the financing of the Lourdes Renove Project we find three fundamentally as a consequence of the strong economic crisis that Spain suffered between 2008 and 2014.

Firstly, the situation of the banks was not very favorable and the interest on the loans was very high (5-7%) discouraging the participation of many neighbors. Also, the economic situation of the families in this neighborhood, already of low purchasing power, reached very critical levels during these years as a result of the crisis. And finally, as a consequence of the two previous causes, the total financing of the project had to depend on multiple sources of financing. Therefore, another relevant constraint was the complex management process carried out by Nasuvinsa dedicated to find and get, European, regional or state subsidies to reduce as possible the expenses covered by the neighbors with private loans.

Business model

No business model was defined for the amortization of the project beyond what it has been already described. The benefits obtained by the works performed in the envelopes or the

renovation of the district heating system went directly to the neighbors in the form of energy savings and the reduction of heating costs, among other benefits.

Management issues:

As it is the case in the vast majority of building renovation projects, especially at district scale, appropriate management and coordination was crucial to the success of the intervention throughout the different phases - decision making, subsidies and financing, coordination between the actors involved, development and evaluation. The Lourdes Renove project and, fundamentally, the principal agent in charge of the management faced the following challenges:

- Attaining the highest agreement possible on the decisions among the neighbors (>60%).
- A great economic vulnerability in the neighborhood that required a complex management of economic aid and financing.
- The short period, 14 months, in which the whole project had to be designed, approved, organized and developed.
- Coordination between multiple agents with different interests.



Figure 5. Decision process scheme

Policy framework conditions:

Regulations which stimulated / hindered the process

A relevant regulation in promoting this project was the Law 19/2009 of 23 November on measures to encourage the process of renting and energy efficiency of buildings. Based on this law, the works whose purpose is to improve the energy efficiency in buildings could have 3/5 (60%) of parties' agreement between neighbors obliging all owners in the event of surpassing this majority.

At local level, some funding ordinances were also important, such as the "Municipal Ordinance on aid for the execution of renovation works within the scope of the Lourdes Renove (Tudela) project". The Lourdes Renove project also benefited from different existing regulations at regional, state and European level for obtaining funding.

Police instruments that moved the district into action

The local regulations helped the neighbors and specially the most vulnerable ones to finance or subsidize the cost of the interventions. This activated the agreement among the unmotivated dwellers.

Lessons learned/interesting findings

Major success factors

Thermal envelope

- Thanks to the energy efficiency measures applied, between 40 to 45% of energy savings and emissions reduction was achieved. Total energy savings are around 649 MWh/year.
- Due to these measures another improvements and co-benefits were possible:
 - The reduction of the U-values and the improvement of air tightness of the envelope improved thermal comfort, acoustic insulation, and reduced the possibilities of surface condensations and mold formation.
 - It also reduced energy consumption and consequently CO₂ emissions.

Heating control

- (District Heating Network) Thermostats and energy meters allowed users individual control, thus improving comfort and energy savings.

District Heating renovation

- A total of 70-75% of energy savings was achieved due to the improvement of thermal envelope and district heating system renovation.
- The use of biomass reduced gas consumption by 88%, bringing down energy costs and dependency from fossil fuels.

Socio-economic benefits

- Thanks to the tight cost of these interventions, the subsidies gathered and the attractive financing opportunities, no money ahead was given by neighbors fostering the participation of most vulnerable groups in this renovation.
- Thanks to the multidimensional renovation approach of this intervention (urban space, building and energy systems); the general perception of this area has improved, reducing social and urban degeneration processes.
- Energy efficiency measures helped in reducing energy consumption and therefore, in reducing the energy cost impact on this vulnerable families.

Management

- Decision and agreement in district renovation projects are important barriers to eliminate. In this case, the role played by Nasuvinsa, the management team, making coordination possible between the three pillars of the process, represents a great example of successful management for future interventions.
- After 8 years, the success of these interventions has encouraged other renovations in the area.

Major bottlenecks

- The lack of sufficient agreement within the communities hampered the integral renovation of this district. However, based on the success of this initial development in the area and the benefits in terms of comfort and energy savings observed by neighbors in the pilot projects, a second redevelopment project in the district is currently under development, Lourdes Renove 2.

- Familiar economic constraints were also a major bottleneck. However, thanks to the efforts made by Nasuvinsa, 59% of the renovation costs were fully subsidized, and the rest was completely financed by suitable credits tailored to the particular situation of each family.

Major lessons learned

- Communication with neighbors at all stages of development is the essential vehicle for the development of these type of interventions.
- It is needed to promote global projects that consider all aspects of energy renovation (envelope, systems and user awareness).
- District renovations are very complex processes that need the support of regional and local authorities and management teams that should act as facilitators of the processes (coordination of all the agents involved, definition of proposals, funding, agreement, information and dissemination)
- Grants are effective resources to promote these interventions in vulnerable environments.
- The involvement of the potential beneficiaries of interventions from the beginning is essential.