



ZenN

Nearly Zero energy Neighborhoods

Economic and ownership structures

D.4.3 Report



**Publisher**

ZenN – Nearly Zero energy Neighborhoods

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ZenN website: <http://www.zenn-fp7.eu/>

Disclaimer

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Executive Summary

This report has been elaborated in the framework of Nearly Zero energy Neighbourhoods (ZenN) project. The project is being implemented in the 2013 – 2017 period and is funded through EU's Seventh Framework Programme (FP7). In total, 12 partners from five countries are involved in the project: Tecnalia (Spain), CEA (France), IVL Swedish Environmental Research Institute (Sweden), SINTEF (Norway), ASM (Poland), NTNU (Norway), The municipality of Oslo (Norway), Debegesa (Spain), City of Eibar (Spain), Ville de Grenoble (France) EJ-GV (Spain) and the City of Malmö (Sweden).¹ The aim of ZenN is to reduce energy use in existing residential buildings and neighbourhoods.

Four demonstration sites in Sweden, Norway, Spain and France had been chosen to take part in the ZenN project. A number of measures have been implemented in these demonstrators in order to perform deep energy-efficient retrofitting. The general objectives of the project are to demonstrate the feasibility (technical, financial and social) of innovative low energy renovation processes for buildings at the neighbourhood scale; identify and disseminate promising management and financial schemes to facilitate large scale replication and launch of ambitious replication plans at several scales (local, regional etc.) with the participation of local administrations.

The aim of the report is to give an overview of the **financial schemes applied in the ZenN demonstrations** in order to propose any cost-effective solutions to service the particular needs of investors, and to assess the efficiency and effectiveness of these solutions. The last chapter is dedicated to performing an evaluation of the transferability of the instruments applied in ZenN demos to other projects concerning renovation of energy infrastructures.

The **first chapter of this document is introductory**, focusing on short descriptions of the existing financial instruments used to fund the energy efficiency refurbishment in Europe. This part of the report also gives an overview of the financing available within the ZenN project.

The **second chapter is dedicated to the methodology** used within the study. This part of the research was implemented by the project partners with the coordination of ASM. Interview methodology was created in order to obtain information from the respondents develop this financial overview of the demo cases. The study involved participation of the stakeholders (owners, managers, residents representatives etc.) representing each of the properties engaged in the project and was delivered in the national languages. The results of the interviews were analysed and the findings have been included in the main body of this report.

The third chapter is the central part of the document, consisting of a **full overview of the study results and the analysis of the economic and ownership structures of each demo site**. There are four subchapters dedicated to deliver country specific information concerning the national cases in the following order:

¹ For more information on the ZenN-project, visit project website: <http://www.zenn-fp7.eu/>

- ✓ Norway Demonstrator: Oslo, Økern nursing home,
- ✓ France Demonstrator: Grenoble, Arlequin,
- ✓ Spain Demonstrator: Eibar, Mogel,
- ✓ Sweden Demonstrator: Malmö, Lindängen.

All of the cases have been described with respect to six thematic areas. Firstly, an **overview of the property** and the construction site has been given, providing information about the state of the buildings, the recent residents and other relevant characteristics. In the second subparagraph the **ownership of the building** has been analysed and presented, which is followed by an indication of the decision makers and explanation of the decision making process distinctive for the particular case. **Project financing**, which is the most important aspect of this analysis has been described in the fourth section of the report. Finally, the last two paragraphs relate to the **overall assessment** of the financing process and the **indication of the challenges** faced by the owners and decision makers. To put these analysis into context, all of these information is followed by a short description of other, relevant financing sources available locally on the national market where the refurbishment took place.

The fourth chapter is comprised of information concerning the transferability of the financing schemes used in ZenN, as well as examples of solutions that could improve the exploitation of energy efficient solutions on the housing market.

Finally, the summary of the main results is provided in the last chapter, giving an overview of the most important findings of each of the demo cases and the conclusions drawn from the analysis.

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List of abbreviations

ADEME - The French Environment and Energy Management Agency

ANRU - L'Agence nationale pour la rénovation urbaine

CDC - Caisse des dépôts

CITE - Crédit d'Impôt de la Transition Énergétique

CLTV - combined loan-to-value ratio

CO₂ - carbon dioxide

CODEVI - Compte pour le Développement Industriel

CSF - Confédération Syndicale des Familles

GDHIF - Green Deal Home Improvement Fund

EU – European Union

EPC - Energy Performance Contracting

ESCO - Energy Saving Company

ENOVA - Norwegian National Energy Agency

FAQs - Frequently Asked Questions

FEDER - European Fund of Regional Development

FHA - Federal Housing Administration

FHFA - Federal Housing Finance Agency

FIT - Feed-In Tariff

GHG - greenhouse gas

HVAC - Heating, Ventilation, Air Conditioning

ICO - Official Credit Institute

IDAE - Institute for Diversification and Saving of Energy

kWp - kilowatt-peak

LDD - Livret de Développement Durable

LPG - Liquefied Petroleum Gas

LVR - Loan to Value Ratio

MINEFI - Ministère de l'Économie, des Finances et de l'Industrie

MINETUR - Ministry of Industry, Energy and Tourism

MPE - Royal Norwegian Ministry of Petroleum and Energy

MWh - Megawatt-hours

NOK - Norwegian Krone

NPNRU - National Program of Urban Renewal

NZEB - Nearly Zero-Energy Buildings

NZEBR - Nearly Zero Energy Building Renovation

OBY - Omsorgsbygg Oslo KF

PACE - Property Assessed Clean Energy

PFER - Plan de Fomento de las Energías Renovables en España

PV- Photovoltaics

SDH - Société Dauphinoise pour l'Habitat

SEK - Swedish Krona

SME - Small and Medium Sized Enterprise

TPF - Third Party Financing

TPI – Third Party Investment

URP - Urban Renewal Project

U.S. - United States

VAT - Value Added Tax

ZenN – Nearly Zero Energy Neighbourhoods

1 Introduction

Apart from complex technical matters, the aspects of financing of energy-efficient retrofitting pose the biggest challenge to investors, owners and administrators. Nearly Zero Energy Building Renovations (NZEBR) are very resource intensive ventures, which are not usually set to bring large, short term profits. Most energy-efficient renovations need an estimated several years to reach the full pay-back time of the investment. In today's fast paced society, focused on obtaining immediate results, such a perspective often seems not attractive enough for investors to decide on financing large scaled retrofitting of properties without any additional support. There is also some perceived financial risk associated with taking credit for large scale retrofitting in the face of the recent financial crisis, thus many property owners are not willing to take loans. Some investors may assume that energy-efficient renovations will not bring predicted results, as many of used technologies are new and were not yet verified in real life and during long operating time.

However, there are certain financial schemes and mechanism that make the implementation of energy-efficient investments more attractive to both the investors and the financial institutions. Apart from information campaigns that are centered around the alteration of attitudes towards energy saving measures, there is a number of financial solutions that take upon the challenge of making retrofitting more accessible and viable to real estate owners across Europe. These instruments are variously used in different countries pending on the political context and administrative solutions.

This report examines financial mechanisms that have been applied in demonstration buildings renovated within the ZenN project, looking into all difficulties, attitudes, the cooperation between actors, as well as all advantages associated with the funding that emerged along the way. All owners of ZenN demonstration buildings applied different sources of financing in order to realize the intended energy-efficient refurbishment. The cases vary in complexity, from simple solutions with one main investor, to intricate multi-owner contracts with more difficult decision making roads. Nevertheless, all participating locations managed to successfully implement the planned renovations, using the available financial incentives and setting good examples for the surrounding communities and facilities. In some cases a domino effect has begun that will most certainly lead to larger scale replication of the energy efficient renovations that were initiated by the ZenN project.

The description of each demo case provided in the following sections of this report is intended to bring valuable insights and share the experiences of investors with all owners and organizations willing to engage in similar projects in the future. It is probable that some

of the recently encountered challenges, as well as many of the available solutions will be faced again in the future.

First, a short overview of the main financial instruments dedicated to energy-efficiency improvements is described in the next section.

Transferability of financing schemes applied in ZenN is analyzed near the end of the report. It gives information about the conclusions arising from the analysis of the studied material, examines the strongest features of the applied solutions and recommendations for future use. Additionally, some supplementary ideas are indicated in this chapter that emerged during the work phase of the project and could be used in similar projects in the future in order to streamline the work.

The last part of section 3 of this report (subchapter 3.6) provides a summary of results of the analyzed demo cases with the distinction of the main findings and a short comparison of the regularities observed in each case.

1.1 Financial instruments for energy efficiency improvements at national and regional levels

Most EU countries² offer a set of national incentive schemes for energy-efficient retrofitting, as well as some solutions at the local/regional level. It depends on the regionalization of each country, whether the national or regional funds are more widespread.

National government may provide the financial incentive **directly to the property owners or energy bill payers or indirectly through some intermediary bodies**, such as energy companies. There is no clear distinction between these two solutions in terms of their effectiveness, however it may be easier for governments to work with a few large companies, rather than all the individual recipients.

Grants/subsidies

Grants and subsidies usually constitute a partial backup and depend on public priorities, budgetary margins. Public subsidies often give only a partial answer to the needs of potential investors. Such needs often consist of technical and financial assistance for the project.

- **Grants and subsidies for obtaining advice or carrying out audits.**

² International Energy Agency, Policies and Measures Databases, <http://www.iea.org/policiesandmeasures/energyefficiency/>

Some countries³ provide not only financing associated to retrofitting itself, but also encourage the phase of gathering expert advice concerning the existing levels of energy use and the spectrum of solutions for improving energy-efficiency available for a particular, analyzed case.

- **Grants and subsidies for upgrading building fabric or systems.**

This type of financing is very common in EU-28⁴ although the range of subsidized technologies and elements, as well as the size of the grants varies across different countries.

- **Targeted subsidies for installation of renewable energy systems.**

Similarly, the targeted subsidies are also very widespread in EU⁵. Each country has its own arrangements concerning the types of technologies supported by these grants. This way different regions may encourage the use of solutions best fitting their climatic circumstances for e.g. solar panels are financed in regions with abundant sunshine. An example of usch targeted subsidy is the German Market Incentive Programme for Renewable Energies that supports the use of renewable energy sources in existing buildings (residential and non-residential buildings). The programme offers support for the use of renewable energy sources for heat: the installation of solar collector systems, small systems for solid biomass heat production, and photovoltaic systems at schools and universities, biogas systems, large biomass systems, hydro systems and deep geothermal systems.⁶

Feed-in-tariffs for renewable energy production

Feed-in tariffs (FITs) put a legal obligation on utilities and energy companies to purchase electricity from renewable energy producers at a favorable price per unit, and this price is usually guaranteed over a certain time period. The most effective schemes are guaranteed for a period of around 20 years.

Under a feed-in tariff, eligible renewable electricity generators, including homeowners, business owners, farmers and private investors, are paid a cost-based price for the renewable electricity they supply to the grid. This enables diverse technologies (wind, solar, biogas, etc.) to be developed and provides investors a reasonable return.

³ MURE energy efficiency indicators and data, <http://www.measures-odyssee-mure.eu/query-energy-efficiency-policy-household.asp>

⁴ International Energy Agency, Policies and Measures Databases, <http://www.iea.org/policiesandmeasures/energyefficiency/>

⁵ Ibidem.

⁶ MURE energy efficiency indicators and data, financial measures in Germany, <http://www.measures-odyssee-mure.eu/query-energy-efficiency-policy-household.asp>

It is another popular mean of financing, working as a revenue incentive with a diversified feed-in tariff that is intended to promote some solutions over others. There is no capital incentive in this case.

Soft loans

Soft loan schemes are mechanisms where public funding decreases the cost of loans which are usually distributed by private banks. Banks have access to low cost capital which is required by the investor. Those banks can distribute that capital to the end customer, and the government, as it has been successfully proved in case of Germany, can stand behind the banks and allow them to have access to certain poles of low cost capital that makes sense for the national interest.

Sponsored loans for improving energy efficiency

A reduced interest rate loan for the capital investment in energy-efficiency modifications is provided. These schemes are assessed as less expensive than subsidies and offer long repayment periods.

Tax/VAT incentives for energy efficient buildings

This solution is a direct form of support to the investor after the refurbishment has been made. The amount and duration of the tax benefit can be linked to the type and range of modification. These are directed at actors in the energy field such as manufacturers, generators, distributors etc. Fiscal measures include tax reductions (individual, corporate and on properties), tax credit and reduced Value Added Tax (VAT).

The main difference among tax credit and tax reduction is the direct or indirect incidence in the amount payable to the state. The tax reduction is an amount subtracted from the payable income tax that does not generate reimbursement to the taxpayer, i.e. if the payable income tax is less than the tax deduction the net value in favour of the taxpayer is not going to be reimbursed by the tax authority. The tax credit is an amount to be reimbursed to the taxpayer against the payable income tax. VAT is a general tax on consumption applied to commercial activities involving the production and distribution of goods and the provision of services.⁷

⁷ H.Bedford, S.Birchall, D.Bleicher, I. Wallis, E.Causee, Summary of policies and incentives relevant to retrofit in the EU-27, 2014

1.2 Financial schemes for energy efficiency improvements at national and regional levels

Energy Supplier Obligations (White certificates)

The system of white certificates is a tool, which uses market mechanisms, to promote energy efficiency. White certificates are documents that attest saving a certain amount of energy as a result of investments in improved energy efficiency. They have property rights and are traded on a commodity exchange of energy.

The essential element of White Certificates is imposing an obligation on a group of entities that operate in the energy market (e.g. energy companies selling electricity, heat, gas and operators of distribution, transmission system) in regard to attaining certain amount of energy savings as a result of measures taken to improve energy efficiency or payment of so-called substitute fee when the energy savings are not implemented/achieved. Fulfilment of the obligations to obtain a certain amount of energy savings is presented by redemption of particular amount of white certificates (which amount to the required energy savings).

Participation of third-party / Energy Performance Contracting

This other option is based on using the services offered by companies with technical and financial back up, prepared to invest in projects that reduce energy consumption and energy costs in return for a share in energy savings that will be ensured by this investment.

This investing company is the Energy Saving Company (ESCO). ESCO usually receives additional financial support from an external third party financial institution and this method is called Third Party Financing (TPF). Here several possible funding sources should be investigated: private banks and lending institutions; venture capital companies; equity funds; strategic partners (e.g., utilities and engineering companies); leasing companies and equipment manufacturers.

In the ESCO type project three parties are being involved: the owner/customer (his/her role is defining the goals of the project, identification of available financial resources and understanding of the various possibilities arising from the hidden potential of rational energy use), an expert who makes money on “energy costs reduction” service (in this case ESCO – it is responsible for project performance according to the previously signed agreement) and the financial institution that provides money for the investment.

Energy Performance Contracting (EPC) is a contract that guaranties to the customer achievement of savings declared by ESCO. An amount of the achieved savings in the energy costs is used for the reimbursement of the investment of the ESCO. After the end of the

contractual period, where the ESCO has achieved the amortization of its capital and earned the corresponding commercial profit, it backs away and the outcome of the refurbishment of the building is for the benefit of the building users. If the project does not provide returns on the investment, the ESCO is often responsible to pay the difference.

1.3 The ZenN project subsidy

The Nearly Zero Energy Neighbourhoods international project (<http://zenn-fp7.eu/>) is being implemented in the years 2013 – 2017 and is funded through the European Commission's 7th Framework Programme within the "Energy efficiency technologies and materials, On-site renewable energy sources, Very low energy buildings, Financing, socio-economics" theme.

The 7th Framework Programme itself lasted for seven years from 2007 until 2013 and had a total budget of over € 50 billion. It was the European Union's Research and Innovation funding programme with two main strategic objectives: to strengthen the scientific and technological base of European industry and to encourage international competitiveness while promoting research that supports EU policies.

ZenN-project consists of twelve partner organizations from five different countries throughout Europe. Grants received from European Commission for the implementation of the project and renovation of the demonstration buildings is irreclaimable. The mentioned funds are allocated on the basis of the project proposal, as well as the evaluation of the obtained renovation goals.

Although, the 7th Framework Programme has already ended there is another EU programme called Horizon 2020, which started in 2014 and is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (until 2020).

Within the above mentioned programme another energy related work programme is operating: Secure, Clean and Efficient Energy. This work programme is split into the following focus areas: Energy Efficiency, Low Carbon Technologies and Smart Cities & Communities. The Energy Challenge is designed to support the transition to a reliable, sustainable and competitive energy system. A budget of €5 931 million has been allocated to non-nuclear energy research for the period 2014-2020.

For all the required information, any interested investor or company, wanting to implement R&D projects, may visit the Participant Portal available at the European Commission's website :

<http://ec.europa.eu/research/participants/portal/desktop/en/home.html>.

Non-registered users can use this website in order to search for funding, read the H2020 Online Manual & download the legal documents, check if an organisation is already registered and contact support services or check FAQs. There are additional functions available for anyone who registers. Registering allows to submit proposals, sign grants and manage projects.

2 Methodology

The research methodology used in order to gather valuable insights concerning the financial aspects of the renovations performed within ZenN was twofold.

Firstly, respective project partners have provided in-depth information on applied financing schemes in each demonstration. The information related to the ownership structure, the decision making and the financing of the investment. Information gained allowed the identification of decision-makers whose input was required for the 2nd stage of the research.

The 2nd stage of research was based on a methodology using qualitative participatory techniques consisting of individual In-depth Interviews with key stakeholders (owners/investors, housing associations, developers, parties involved in the financing/co-financing of the investment, Institutions responsible for the fund raising).⁸ Questions included in the interview guides were related to: ownership structure, decision procedure, investment cost, applied financial schemes and business models, available financial support for building renovation on local and national scale, payback time of the investment, etc. The questions were quite extensive in order to guide the interviewer during the gathering of the information requested in particular questions. Interviewers were allowed to ask other questions or comment whenever necessary in order to stimulate the discussion. There were cases when questions had been addressed by the interviewees before the analyzed theme was mentioned during the dialogue. That was an indication of a good dynamic of the interviews and a proof that the respondents had extensive knowledge of the cases.

The interviews were performed in national languages by individual interviewers selected by the project partners representing each demo case. Each interviewer received specially adjusted interview guide that was developed with consideration for the specificity of the particular case.

⁸ In-depth interviewing is a qualitative research technique that involves conducting intensive individual interviews with a small number of respondents to explore their perspectives on a particular idea, program, or situation.

3 Financial and ownership structures

The following part of the report is dedicated to an in-depth analysis of the gathered research materials on the demo cases partaking in the ZenN project. Each renovation site had its own specificity and dynamics.

The overview provided in this part of the report focuses on the financial side of the endeavors and involves looking into the entire process of funding - from obtaining the funds, down to finalizing the investments and examining the financial benefits.

The purpose of this chapter is to provide valuable insights into the process of financing deep energy-efficient retrofitting of existing buildings. Future investors may draw inspiration and advice from the work performed by the partners involved in the ZenN project. Owing to a wide cross-section of the cases and the diversity of their contexts and developments, the provided source of information should be sufficiently comprehensive to provide information on various scenarios and answer variety of questions faced by building owners planning to get involved in refurbishment and funds allocation. Each demo case is also shortly evaluated by the engaged respondents, who provide a deep overview of the project work developments details.

Each case study is presented in relation to seven sub-sections: site description, ownership structure, decision making, project financing, overall assessment, encountered challenges and other financial incentives available to investors.

3.1 Norwegian Demonstration case: Oslo, Økern nursing home

3.1.1 Description of the site

Økern nursing home was built in 1975 and contains 140 dwellings for senior citizens. The retrofitting project has been completed and the tenants moved in in October 2014. The demonstration case is one out of four buildings that are connected to each other. The other buildings were renovated in 2000-2010. The buildings are inhabited by seniors and there is a senior activity centre connected to the complex. The nursing home is in operation 24 hours a day, 7 days a week and is a working environment of the staff and a home for 140 senior residents.



Table 1 Økern nursing home, Oslo, Norway

Among the major refurbishment activities performed in Økern are: mounting of additional insulation, minimizing of thermal bridges and the construction of a building with lower air infiltration rate. These measures have reduced the energy demand for heating by 80%. All energy for heating now comes from district heating rather than from direct electricity as previously. The Heating, Ventilation, Air Conditioning (HVAC) system has been altered and the variable-air-volume control has been introduced in relevant spaces, resulting in a heat recovery of 85% and a maximum SFP of 1,5 kW/(m³/s). This has reduced the energy demand for ventilation (except heating) by 70%. In addition to this, the lighting system was changed to a system with low energy consumption and motion sensors, reducing the energy demand for lighting by 38%. The total energy demand for Økern Sykehjem has thus been reduced by 66 % from 357 kWh/m² year to 120 kWh/m² year.

The techniques and products used to achieve the above mentioned modifications combine a series of known and well-tested measures within the same project. The innovative part has been the process and the manner in which the owner collaborated with research institutes during the design and execution of the work. This particularly applies to the roof PV plant that was installed, making it Oslo's largest plant. It is expected to produce 105 MWh annually and will cover 10% of the buildings energy demand.

3.1.2 Ownership structures

Økern nursing home which is being renovated within the ZenN project is owned by Omsorgsbygg Oslo KF (OBY), which in turn is owned by the city of Oslo. OBY is a municipal enterprise and one of Norway's largest property managers. OBY owns approximately 660 buildings in Oslo and aims to be a role model in terms of energy efficiency in its own building mass.

3.1.3 Decision making

Omsorgsbygg Oslo KF is a municipal enterprise, which falls under the office of the Department of Culture and Industry. It is one of the country's largest property managers with more than 900,000 square meters in the portfolio, which consist of kindergartens, nursing homes, fire stations, museums and other municipal purpose properties.

Omsorgsbygg main goal is to be a leader in the development, construction and management of environmentally friendly and energy-efficient health care buildings.

Omsorgsbygg is very ambitious when it comes to energy efficiency objectives and has a strategic main goal of being among the very best in this respect. Working in an international team, providing best expertise in the field was a very big motivation to participate in the project. Omsorgsbygg sets a goal of being an advocate for energy efficiency and take social responsibility very seriously. Being a big public property company is a great responsibility that translates into making choices that make the world become more sustainable. The access to the research expertise available in the ZenN project was also an important incentive in the case of Omsorgsbygg.

Both Omsorgsbygg and the city of Oslo were the decision makers on the retrofitting process performed within ZenN. The decision to rehabilitate Økern was made in advance, before the participation in the project. Only a slight increase of the previously set targets was needed in order to meet the requirements of the ZenN, so it was a fitting project and a good opportunity for this particular property.

Omsorgsbygg acted as the manager of the retrofitting initiative and the decisive body, however some other parties were consulted when the agreement concerning the project was made. Among those relevant entities were the residents, the workers, as well as the department for city preservation and the non-technical building operating department.

3.1.4 Project financing

There were three main sources of financing for this retrofitting. The investment was funded from the following sources: the municipality's budget, the ZenN project funds and the national fund for energy efficient buildings called ENOVA.

ENOVA SF is a Norwegian National Energy Agency owned by the Royal Norwegian Ministry of Petroleum and Energy (MPE), established in 2001 with headquarters in Trondheim and a total staff of 60 employees. Enova SF works with a broad network of players in all sectors of the economy, including decision makers in commerce and industry, end-users, municipalities and other public sector and regulatory bodies. Enova's role is to strengthen the links between the various groups of actors, to coordinate project development and to improve the effectiveness of public action in the energy area. Enova's vision is an energy-efficient and renewable Norway. Its primary objective is to promote environmentally friendly restructuring of energy end-use and energy production. The energy restructuring is a long-term initiative to develop the market for efficient and environmentally friendly energy solutions that contribute to strengthening the security of supply for energy and reduce the emissions of greenhouse gases

ENOVA contributed 450 NOK⁹ per square meter, that is 4,4 million NOK¹⁰. The payments per square meters were made accordingly to the surface stated in the application: 9357 meters . The investment support from Zen-N amounted to 50 euros per square meter. The total investment cost for the renovation was just under 215 million NOK¹¹ (approximately 18 000 000 €) .

The table below presents the overview of the budget used for retrofitting of the Omsorgsbygg demonstration site. Please note that the sums are in €.

OSLO demonstration site	
Total investment cost:	18 000 000 €
Cost for each financing party:	
City budget	16 971 000 €
ZENN project	468 000 €
ENOVA	561 000 €

Table 2 Budget summary of the Oslo demonstration site

⁹ Exchange Rates: 1 Euro = 9.3138 Norwegian Krone (04.11.2015; <http://themoneyconverter.com/>)

¹⁰ Ibidem

¹¹ Ibidem

The diagram presented below shows the proportion of funding from all three sources used in the case of Økern refurbishment project. As indicated in the graphic – the majority of funds were provided by the municipality (94% of the budget). ENOVA and the ZenN project funding were comparable in size – around 3% of the used financing.

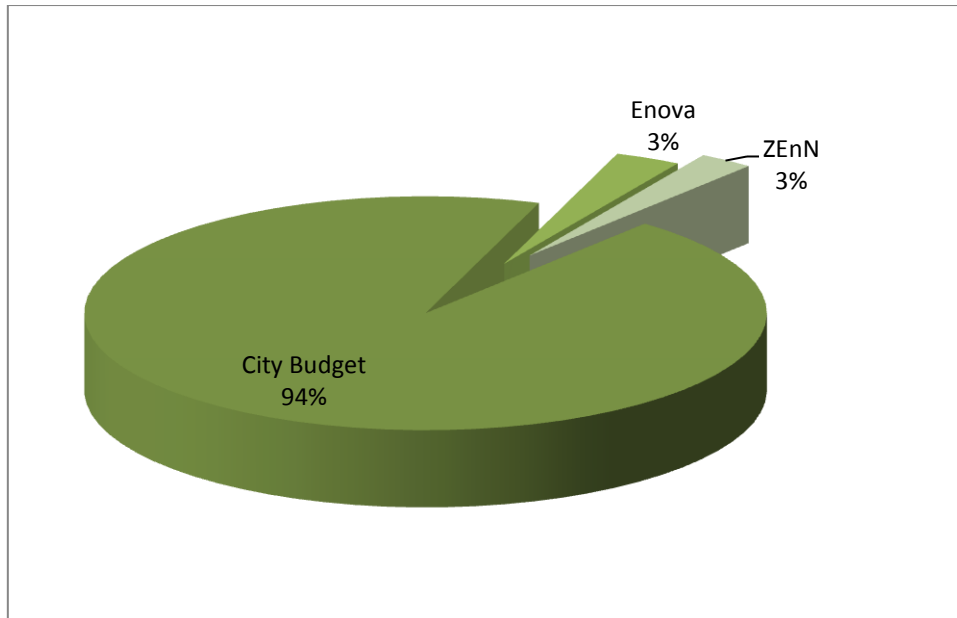


Figure 1 Share of the financing sources used in the case of the Økern demo site

A calculation of the resources required for achieving a NZEB renovation rather than usual TEK-10 renovation showed the need for additional funds for the investment that amounted to 17,7 million NOK.

TEK-10 are new regulations that entered into force on 1st July of 2010, developed by the The Norwegian Building Authority. The EU Directive 2010/31 on energy performance of buildings was the reason for tightening of the previous legislation. TEK-10 sets some minimum energy-efficiency requirements of particular building components, such as doors, windows or walls. The objective of the TEK-10 regulations is to ensure buildings will eventually obtain NZEB level. In 2015 and 2020 another tightening of the regulations is planned. All new constructions and renovations presently developed must take into consideration the TEK-10 requirements.¹²

¹² Byggregler TEK 10, http://www.paroc.no/knowhow/byggforskrifter/byggregler-tek10?sc_lang=nb-NO.

3.1.4.1 Subsidies acquiring

Depending on the ownership structure different institutions may be responsible for the obtaining of renovation financing. It may be either the building owner, or the consultancy agency working for the investor in order to streamline the process of application. In case of the Økern nursing home the Omsorgsbygg Oslo KF being the property manager, was solely responsible for raising the investment funds. It contacted both the municipality representatives as well as the ENOVA's staff and worked within the ZenN project to obtain the required budget.

3.1.4.2 Payback time

The payback time for the investment, with the help of ENOVA is 7.5 years. Without the ENOVA's funds it would have been 13 years.

Although the monitoring period has not finished yet and the exact figures on what the energy bill amounts to after the renovation are not available yet, it is certain that the retrofitting will result in at least a 68% reduction in energy expense. The final calculation will be available after the monitoring period.

There is also a warranty period continuing one year after the end of the renovation and the acquisition of the building in Økern. In the first phase after the handover of a building, there are always systems that are partially defective or do not perform as described or assumed. The warranty period intends to determine such shortcomings and correct them. Therefore, only after such amendments are made that the actual financial benefits can be calculated.

There were no comparisons of the NZEB renovation payback time with the Tek-10 standard of efficiency in renovation. In many cases the payback time is hard to establish, due to the fact that particular renovations concern diversified aspects of the property. They involve both the energy-efficient modifications as well other types of work.

3.1.4.3 Return on investment

The financial benefits for the building operators (Sykehjemsetaten) will result from experiencing lower energy bills, thus the owner of the building (Omsorgsbygg) has put up a green leasing contract ensuring a pay back from the investment in energy efficiency measures. The tenants will pay a slightly increased rent, however the final expenditure for the accommodation expenses will be lower than before the retrofitting due to much lower

energy bills. The additional rent money will be used in order to assure the return of the owner's investment.

Like a normal commercial lease, a green lease governs the relationship between the landlord and tenant, but through environmental lens. A green lease is either a new lease or a modification to an existing lease with additional set of schedules compared to a 'normal' lease contract, such as a contractual basis for monitoring and improving energy performance, mutual obligations for both tenants and owners to achieve resource efficiency targets (e.g. energy, water, waste) and to minimize the environmental impacts. This ensures that the rented space operates at an agreed level through regular monitoring and ensures issues can be addressed as they arise. Green leases help to ensure that leases are structured to create compulsion and to create incentive for both parties.

Among the main principles that should guide the use of green leases is:

- The landlord should operate the building and the tenant should operate its premises as efficiently as possible.
- For any given system, installation, or piece of equipment, the responsibility for the capital expense and the benefit of savings should reside with the same entity. Alternatively, all of the savings achieved by virtue of a system improvement should be available to pay for the improvement.
- To the extent feasible, both consumption and demand for resources throughout the building should be measurable and transparent to both the landlord and the tenants.¹³

3.1.5 Overall assessment

The financing model applied in the case of the Økern demonstration site has been assessed by the building owners as worth recommending to other developers.

The financing scheme used in case of the nursing home has been successful, because it made it possible to implement a pioneer project which has attracted a lot of attention from the local community, and thus it has paved the way for other energy efficient projects.

The financial results have not been perceived as the most important benefit of the investment, although the economic improvement, resulting from the changes in the functioning of the building, was substantial. This can be understood taking into account that Økern demonstration site is not a commercial property. The most important advantage

¹³ Energy Efficiency Lease Guidance, Center for Market Innovation, Natural Resources Defense Council (NRDC) November 2011, p. 2

obtained after the renovation (apart from the improvement in energy efficiency), mentioned by the building managers, were the positive reviews it has provided to Omsorgsbygg and Oslo. This has been a great promotion of energy efficient solutions in the regions and it has given an increased willingness (also politically) to invest in similar types of projects. Among other mentioned benefits of the project was the upgrade of skills of the owner's organization representatives that will enable more professional implementation of similar projects in the future, based on the expertise generated within ZenN.

3.1.6 Encountered challenges

The established budget posed a slight challenge during the retrofitting of the property. The intention was to minimize the costs, which resulted in a partial renovation that was implemented upon the previous refit done in 2009/2010 on the inside of the buildings. However, still in the end the investor managed to achieve a lot more than expected, but it has been difficult and required some extra funds.

During the process of retrofitting some parts of the property have been demolished and this led to discovering additional areas of the building that needed renovation. Due to the fact that the real estate is an old facility the level of costs had been rising during the progress of the refit.

Moreover, the modified area turned out to be larger than stated in the application form. There is an expanded technical room on the roof, due to the increased weight of the new ventilation system, to manage the increased load bearing on the building. Therefore, this area has not been included in the calculated subsidy.

In relation to the funding entities and their role in the refurbishment, the owner of the retrofitted facility in Norway suggested that a greater flexibility from the ENOVA's side concerning the energy-efficient technologies covered by the funding would greatly help. Currently this organization supports only heat pumps, and not, for example, the solar cells. Expanding the range of support provided by the ENOVA agency would be a good solution.

The financial support from ENOVA was essential for the development of works, however it would be beneficial for the building owners if the range of technologies and construction elements covered by the support was greater.

3.1.7 Other financial incentives available for investors in the Norway

Norwegian State Housing Bank's incentives for Low-energy Housing

The Norwegian State Housing Bank assists with achieving Norway's national environmental targets by encouraging the construction of more environment-friendly housing, for example by stimulating low energy consumption. The Housing Bank supports projects that contribute to capacity building; those with a high level of ambition and a high transfer value. The basis for the Housing Banks environmental work is the environmental action plan for 2009 - 2012, issued by the Ministry of Local Government and Regional Development. Almost half of all new homes with a loan through the Housing Bank have specific environmental qualities. Projects focusing on low-energy housing, "passive" houses and environmentally friendly renovations and modernizations are prioritized, and nearly half of these have implemented energy saving measures. In new buildings, the energy saving is 40 percent or more, and for renovated buildings 20 - 40 percent. The Norwegian State Housing Bank provides financing to both public and private sector.¹⁴

3.2 French Demonstration case: Grenoble, Arlequin

3.2.1 Description of the site

The neighbourhood of ARLEQUIN in Grenoble is a 1970's residential development of 1800 dwellings in a high-rise complex within a larger district called Villeneuve. The buildings range from 6 to 15 storeys and are concrete structures with two kinds of façades: light pre-fabricated concrete modules and heavy modules. The neighbourhood was born from an urban utopia, with an ambitious target of social mixture and an innovative architecture. The objective was to provide inhabitants with a huge park and several public facilities in close vicinity to their dwellings. But 40 years later, this location started to be perceived as a deprived area with low income residents comprised of more than 30 nationalities, a high unemployment rate, and confused public and private spaces.

3.2.2 Ownership structures

Arlequin is a large scale renovation with multiple owners. Numbers 30/40 are a joint-ownership owned mainly by the social housing association SDH.¹⁵ Of a total of 244 dwellings, only 17 are occupied by the owners while 5 are rented, representing 22 private dwellings. All private dwellings are located at the Arlequin number 30.

¹⁴ International Energy Agency, Norway -Incentives for Low-energy Housing, <http://www.iea.org/policiesandmeasures/pams/norway/name-24134-en.php?s>.

¹⁵ SDH - Société Dauphinoise pour l'Habitat; <http://www.sdh.fr/>.



Table 3 The neighborhood of ARLEQUIN in Grenoble

Consequently the Arlequin number 40 is 100% owned by SDH. However, numbers 50/120 are a joint-ownership of approximately 950 dwellings with 2 corridors totally made of private owned dwellings with 2 secondary owners unions.

Arlequin number 80 is made up of 37 dwellings, with 28 owners occupying their homes and 9 rented dwellings. Number 100 is made up of 153 dwellings, with 98 owners occupying their homes and 55 rented dwellings. Arlequin numbers 50, 60, 70, 90, 110 and 120 are made of social dwellings owned by the social housing association ACTIS.¹⁶ While numbers 130/170 are a mixed joint-ownership made of 421 dwellings. 162 dwellings are privates with 130 owner/occupiers and 32 rented dwellings.

A Housing for the Elderly is located at the Arlequin number 160 (*Les Gentianes*). It is made of 71 dwellings and is managed jointly by the social housing association SDH and by the "Centre Communal d'Action Sociale" of the City of Grenoble.

All the other dwellings are owned by the social housing association SDH (for example the Arlequin number 140).

¹⁶ ACTIS - Acteur de l'immobilier social - OPH de la Région Grenobloise; <https://www.actis.fr>.

3.2.3 Decision making

The ZenN project allowed the Grenoble demonstration site to go further in its energy use reduction strategy. The improvement of energy efficiency was the motivation and one of the priorities for the owners of the property.

Regarding the decision making process, the resolutions concerning participation in the ZenN project were made jointly. The decision of a more ambitious level of retrofitting was made by the Municipality of Grenoble and the building owners. The public establishments in charge of social housing – Société Dauphinoise pour l'Habitat (SDH) and Société de gestion d'habitations à loyer modéré (ACTIS) decided to perform retrofitting at the “low-energy house” retrofitting level. Therefore, the role of the Municipality was to convince both these organizations that the ZenN project funding was an opportunity to develop an exemplary renovation in social housing, not only in term of space management, but also in term of energy consumption.

Energy efficiency was always one of the main goals established by the SDH program. Nevertheless, the ZenN project allowed the SDH to go further than the primary objectives by reaching a new level of performance of 65kwh/m²/year, instead of 90kwh/m²/year that were foreseen at the early stage of the project development.

The inhabitants of the neighbourhood were also consulted and received a wide range of information in the framework of the Urban Renewal Project (URP).

SDH and the city integrated a segmentation of the dwellings into the project, in order to facilitate their management. Smaller managing units, comprising of 80 dwellings instead of 150, were organized.

3.2.4 Project financing

The renovation was a part of the national program of urban renewal for la Villeneuve. In consequences, the financing clauses were defined by the general and financial regulations of L'Agence nationale pour la rénovation urbaine (National Agency for Urban Renewal - ANRU).

ACTIS was in charge of the renovation of the East and West of the 50 Galerie de l'Arlequin (89 dwellings). The operating costs of ACTIS amounted to 75 281€ per dwelling. The renovation costs of the 89 dwellings in the East and West of the 50 Galerie de l'Arlequin amounted to a total of 6 700 000 €. The table below presents the investment costs and the financial scheme applied by ACTIS.

SDH was responsible for the renovation of the “40 Galerie de l’Arlequin” (154 dwellings). The operating costs amounted to 83 000€ per dwelling, reaching a total of 12 900 000€.

The next table presents the investment cost and the financial scheme applied by SDH for refurbishment of 40 Galerie de l’Arlequin (154 dwelling).

TOTAL OPERATION COSTS	12 859 878,00
FUNDING	AMOUNT
LOANS	4 693 326,00
AMALLIA Loan	1 500 000,00
CDC : certified eco-loans / "sustainable developement" tax credit	1 848 000,00
CDC : refurbishment loan	1 345 326,00
Subsidies	5 596 007,00
<i>Europe : smartcities ZenN</i>	<i>674 960,00</i>
<i>Urban Renewal Project (ANRU agreement)</i>	<i>4 228 047,00</i>
ANRU initial grant (2008)	1 257 155,00
ANRU supplementary grant (2012 amendment)	1 437 835,00
Métropole grant ANRU agreement (2008)	175 328,00
Métropole supplementary grant (2012 amendment)	463 150,00
Région supplementary grant (avenant 2012)	350 000,00
Ville de Grenoble grant ANRU agreement (2008)	81 429,00
Ville de Grenoble supplementary grant (2012 amendment)	463 150,00
<i>Métropole energy support</i>	<i>693 000,00</i>
SDH own funds	2 570 545,00
TOTAL	12 859 878,00

Table 4 Investment cost structure and financial scheme - SDH

The SDH has taken out three loans from two agencies: AMALLIA and the Caisse des Dépôts et Consignations (CDC)

- Urban Renewal AMALLIA loan:

- Amallia is a member of « Action Logement », an organization working in the field of social and solidarity economy, acting daily to facilitate access to housing or home maintenance support for employees, thereby supporting access to work.

Action Logement, is represented by employers and employees with a joint administration of the « Participation des Employeurs à l’Effort de Construction » (PEEC) (employers’ contribution to building and construction work, in favor of employees’ housing), with two main missions:

- To build and finance social and intermediary housing

- To accompany the workers' housing mobility and occupational mobility
 - Rate : 0,75%
 - Duration : 20 years
 - Amount : 1 500 000 €HT
- **Caisse des Dépôts et Consignations (CDC) loan :**
 - The CDC is a public group in the service of the general interest and of the economic development of the country. This group fulfills missions in the general interest and in support of the State's and local authorities' public policies, and can also engage in competitive activities.
It was created in 1816 and placed under the supervision and safeguards of the Parliament, the Caisse des Dépôts is the only financial institution in Europe to have the nation's protection, which confers it independence and autonomy. As a public group, it is made up of a public institution and subsidiaries.
 - ***CDC Social housing Eco-loan logement social :***
 - **General characteristics :**
 - **Object :** The social housing eco-loan is a measure resulting from the Grenelle Environnement Forum, which enables the refurbishment of the 800 000 social housing dwellings which use the most energy, by 2020.
It is a loan from 9 000 to 16 000 € per dwelling, accessible to social housing organisms.
Its amount can be increased of 2000 € per dwelling if the works provides evidence for a certification of energy performance.
 - **Eligibility :** For the "category D" dwellings (151 to 230 kWh/m²/year) the following conditions have to be met :
 - The conventional primary energy consumption of the building before the works, must be between 151 and 230 kWh/m²/year ;
 - The works must enable the realization of a gain of primary energy conventional consumption of 85 kWh/m²/year, knowing that this goal is to be modulated with respect to climatic zones and altitude, or must enable to reach a conventional primary energy consumption of 80 kWh/m²/year (also modulated with respect to climatic zones and altitude).
 - **Duration:** 5 to 25 years
 - **Rate :** Asset backed to the livret A, variable with respect to the duration of the works.(The **livret A** is a tax-exempt saving account regulated under French Law. It is the most frequent investment in France.)
 - **SDH loan characteristics :**

- Amount : 1848 000 € (or 12 000 €/dwelling)
 - Duration : 20 years
 - Rate : 2,90% (in 2011)
 - Growth rate : 0%
- **CDC PAM loan (refurbishment loan) :**
 - **General characteristics :**
 - **Objet** : social housing refurbishment loan
 - **Eligibility** : works :
 - Ongoing process of improving the cultural heritage ;
 - Improving the daily life of the residents, including works for to meet accessibility standards ;
 - Refurbishment and renewing components ;
 - Major renovation ;
 - Energy retrofit, as a complement to an eco-loan ;
 - Treatment of asbestos as a complement to anti-asbestos loan
 - **Duration** : 5 to 35 years.
 - **Rate (variable)**: livret A rate + 60 bp (0,60 %)
 - **SDH loan characteristics :**
 - Amount : 1 345 326 € (or 8 736 €/dwelling)
 - Duration : 20 years
 - Rate : 3,3 % (in 2011)
 - Growth rate : 0%

The diagram presented below shows the proportion of funding sources applied by SDH. As indicated in the graphic subsidies received and taken loans constitute the majority of acquired funds (respectively 43% and 37% of the budget). SDH provided 1/5 of the investment cost.

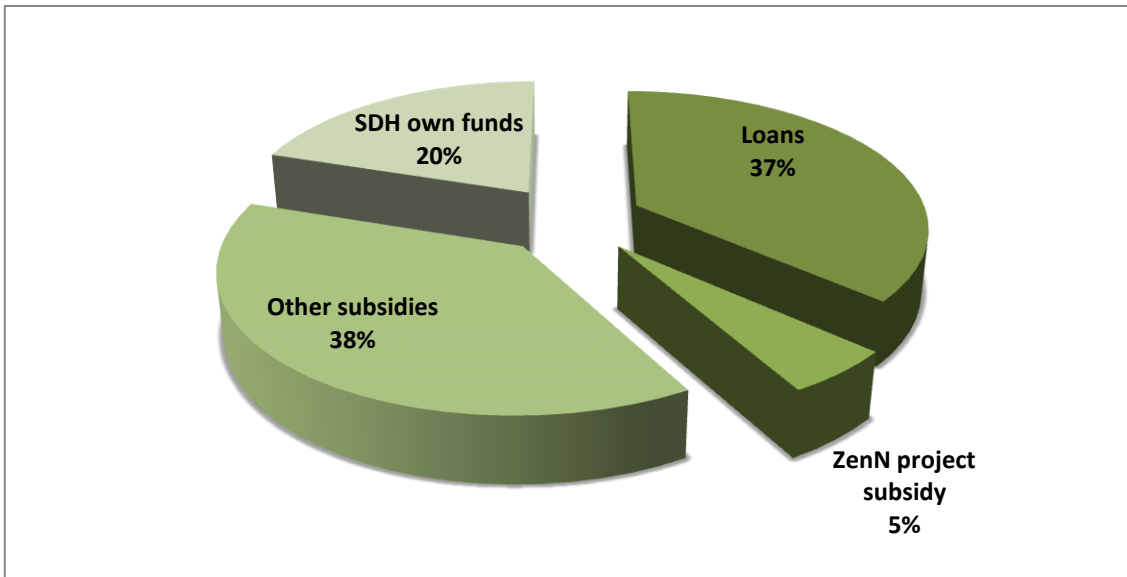


Figure 2 Share of SDH financing sources

The table below presents the investment cost and the financial scheme applied by ACTIS for the refurbishment of the 50 Arlequin (89 dwellings).

TOTAL OPERATION COSTS		8 063 604,32
FUNDING		
	Amount	
Loans	2 167 090,00	
CDC : certified eco-loans / "sustainable development" tax credit	1 424 000,00	
CDC : refurbishment loan	296 000,00	
CDC : asbestos removal	347 090,00	
Aliance : prêt 1%	100 000,00	
Subsidies	3 960 069,00	
<i>Europe : smartcities ZenN</i>	<i>410 627,00</i>	
<i>Urvan Renewal Projet (ANRU agreement - Urban Renewal Agency)</i>	<i>3 398 352,00</i>	
ANRU initial grant (2008)	650 000,00	
ANRU supplementary grant (2012 amendment)	907 500,00	
Métropole grant ANRU agreement (2008)	298 712,00	
Métropole supplementary grant (2012 amendment)	-	
Région grant ANRU agreement (2008)	1 147 502,00	
Région supplementary grant (2012 amendment)	-	
Département grant ANRU agreement(2008)	394 638,00	
Ville de Grenoble supplementary grant (2012 amendment)	-	
<i>Métropole energy support</i>	<i>151 090,00</i>	
ACTIS own funds	1 936 445,32	
TOTAL	8 063 604,32	

Table 5 Investment cost structure and financial scheme - ACTIS

ACTIS has taken out three loans from the CDC and Aliance 1% (Action logement):

- **CDC social housing eco-loan:**
 - *General characteristics* : see SDH
 - *Characteristics of the ACTIS loan:*
 - Amount : 1 424 000 € (or 16 000 € / dwelling)
 - Duration : 15 years
 - Rate : livret A – 75 bp, or 0% today

- **CDC PAM loan (refurbishment) :**
 - *General characteristics* : see SDH
 - *Characteristics of the ACTIS loan:*
 - Amount : 296 000 € (or 3 326 € / dwelling)
 - Duration : 25 years
 - Rate : livret A + 60 bp (Basis Point), or 1,35 % today

- **CDC anti-abestos loan :**
 - *General characteristics* :
 - **Eligibility** : Abestos removal operation (works and study) ; loan up to 10 000 € per dwelling.
 - **Duration** : 5 to 25 years
 - **Rate** : Asset backed to the livret A, variable with respect to the duration of the works

 - *Characteristics of the ACTIS loan:*
 - Amount : 347 000 € (or 3 899 € / dwelling)
 - Duration : 15 years
 - Rate : livret A – 75 bp (0,75 %) pb, or 0% today

The diagram presented below shows the proportion of funding sources gathered by ACTIS. As indicated in the graphic – subsidies received constitute the majority of funds (51% of the budget). ACTIS own funds covered almost 1/4 of the total investment cost.

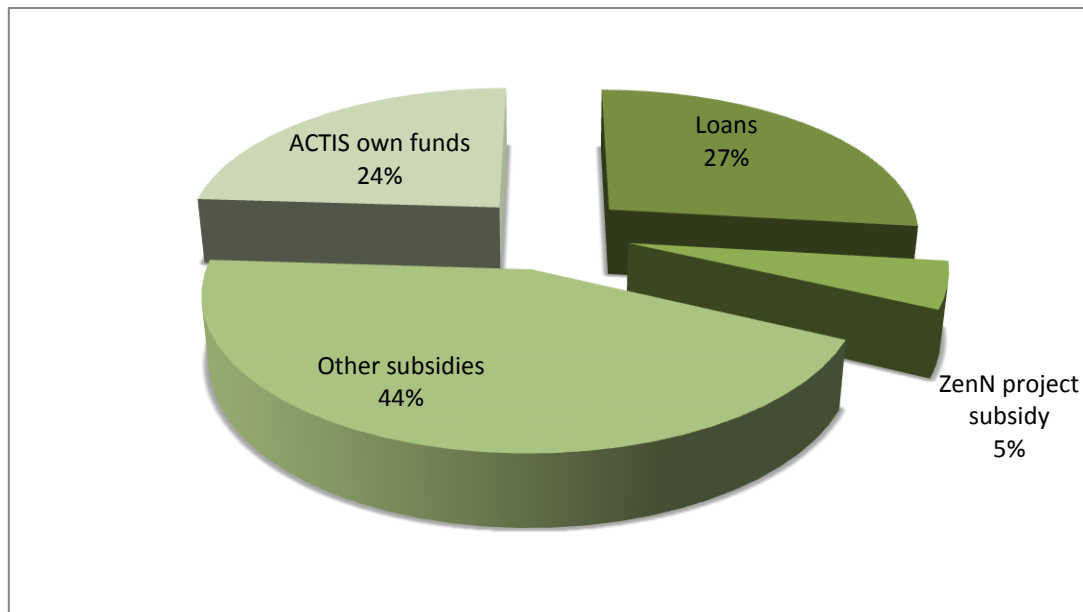


Figure 3 Share of ACTIS financing sources

3.2.4.1 Subsidies acquiring

The responsibility for raising the funds for the retrofitting laid on the building owners (SDH and ACTIS) and the city of Grenoble. The funds were mainly public, from both the national and local levels.

All the financing sources were essential to achieve the goals established in the project. ANRU's financing was naturally evaluated as very important simply because it was the largest, while the additional influence of the ZenN financing was related to the opportunity to conduct more intensive, deeper energy efficient renovation.

3.2.4.2 Return of investment

In accordance with the thermal renovation and the remodeling of the dwellings into smaller and more tailored sizes, the owners of the property considered:

- 1) A decrease of approximately 35% of energy consumption and 25% of the price of the subscription;
- 2) A 20% decrease of the cleaning costs;
- 3) A decrease of the renting charges between 18% and 25% (associated with the remodeling of the dwellings into smaller sizes).

The expected energy target is 65Kwh/m²/year. So the program should allow a 30% drop on heating consumption (the most widely impacted expense item). This will translate into lower energy bills for the residents.

Apart from the above mentioned changes, the owners will gain financial benefits from the opportunity to raise the rents (taking into consideration that the rent is in fact still smaller for the dwellers due to the decreased sizes of the apartments), however the prices increase will not exceed 10%. The subject of payment methods that concerns the building dwellers has been discussed with the CSF¹⁷, which is a neighborhood tenants association. It resulted in an agreement signed by both parties. A maximum 10% increase of rents (excluding the bill charges) has been established and planned not sooner than the time the refurbishment is complete.

3.2.5 Overall assessment

ACTIS representatives have been satisfied with the financial scheme for the renovation. They wish to reproduce the same scheme for the next renovation projects, especially in “la Villeneuve”. Considering that future projects will be implemented under a new urban renewal plan, there is a strong chance that the financial scheme will stay the same, excluding the unique ZenN financing.

The financing sources were all beneficial considering the level of investment necessary to finance the project.

3.2.6 Encountered challenges

A difficulty regarding the financial side of the energy efficient renovations that has been mentioned by the building owners was related to the lack of sustainability of the financing over the time. The ANRU convention was signed for a defined period of time. It is now finished and still the new National Program of Urban Renewal (NPNRU) is not yet operational and is also limited in time (such as the ZenN credits).

The financing of the project was enabled by the commitment of all the financial partners, but the cost for SDH was still perceived as relatively high. Furthermore, certain parameters influenced the investment level badly and became an unexpected cost. Among those was the increased VAT level from 1st January 2015 and the new regulations on asbestos complicating the intervention of the workers (included in the SDH costs).

¹⁷ CSF - Confédération Syndicale des Familles; <http://www.la-csf.org/>.

3.2.7 Other financial incentives available for investors in France

Planned Energy Efficiency Certificates (White Certificate Scheme)

As part of the French Energy Bill, the government (Ministere de LEconomie, des Finances et de lIndustrie - MINEFI) planned to put in place a system of tradable "white certificates" for energy efficiency. Suppliers of energy (electricity, gas, heating oil, Liquefied Petroleum Gas (LPG), heat, refrigeration) would be required to meet the government mandated targets for energy savings achieved through the suppliers residential and tertiary customers.

Under the French White Certificates Trading programme suppliers are free to select the actions to meet their objectives, such as informing customers how to reduce energy consumption, running promotional programmes, providing incentives to customers and so on. A list of ratified activities was ratified to help the various actors to facilitate the operations. Those exceeding and undercutting their objectives can trade energy savings certificates as required for common compliance.

Decrees and orders regarding the 3rd period of the White Certificate Scheme were published in 2014. The 3rd period started on the 1st January 2015, with an objective of 700 TWh cumac for the 2015-2017 period.¹⁸

Livret de Developpement Durable: Preferential loans for energy saving measures

On 5 October 2006 the French Government announced the creation of a EUR 10 billion fund for the funding of domestic energy conservation projects with low-interest loans. Available from 1 January 2007, the low-interest loans are based on a previous tax-free savings account known as the CODEVI (Compte pour le Développement Industriel). This savings product allowed banks to finance the development of small and medium sized enterprises (SMEs). The CODEVI as of 1 January 2007 has been renamed to the LDD (Livret de Développement Durable) and banks must use a portion of these funds to offer preferential loans for domestic energy conservation projects. While the CODEVI was capped at EUR 4600 per person, the LDD cap has been raised to EUR 6000 per person to raise additional funds for these loans. As of 2009 the account pays tax-free interest of 2.5% a year. In 2008, banks must dedicate 2% of the funds to energy conservation loans, rising to 5% in 2009 and 10% thereafter. Preferential loans can be awarded to individuals, co-properties and entrepreneurs for the purchase and installation of: energy efficient boilers; thermal

¹⁸ International Energy Agency, France – White Certificate scheme, <http://www.iea.org/policiesandmeasures/pams/france/name-22969-en.php?s> .

insulation (walls, windows, shutters); thermal regulation equipment; equipment producing energy from renewable sources; space and water heating equipment using wood or other biomass; heat pumps. Applicants must provide the bank with documents from the equipment installer, certifying that the equipment and installation meets the required energy efficiency criteria. This financial measure is complementary to the 2005 tax credit scheme. The acquisition of domestic energy efficient equipment entitles the buyer to a price reduction (tax credit scheme) and a low-interest loan at the same time (LDD measure).¹⁹

This economic instrument is still in force.

Tax credit in favour of high efficiency natural gas boilers

The finance law of 30 December 2003 has extended the tax credits, considered under article 200 of the general tax code, to investments towards individual high efficiency natural gas boilers.²⁰

Heat Fund

The Heat Fund was implemented in order to support the production of heat from renewable resources and recovered energy. This investment support system is one of the commitments of the Grenelle Environment Forum. The Heat Fund's goal is to support 5.5 Mtoe production of renewable heat between 2009 and 2020; this number represents more than a quarter of the renewable energy production target of 20 Mtoe by 2020 set by the Grenelle Environment Forum. The Heat Fund mainly supports the development of the use of biomass (forestry, agriculture, production and thermal recovery of biogas, etc.), geothermal energy, heat pumps and solar thermal. The targetted sectors are collective housing, tertiary, agriculture and industry. By encouraging the use of renewable energy by heating networks, the Heat Fund will also have an important social impact (reduction and stabilisation of social housing heating bills) and directly encourage overall diversification of the energy supply. The Heat Fund intervention methods are:

- for large scale biomass facilities (production of renewable heat greater than 1 000 toe/year) in the industrial, agricultural and tertiary sectors there is an annual national call for projects. Five calls for projects have been already launched (fifth one was launched in September 2012).

¹⁹ International Energy Agency, France - Preferential loans for energy saving measures, <http://www.iea.org/policiesandmeasures/pams/france/name-22968-en.php?s>.

²⁰ International Energy Agency, France - Tax credit in favor of high efficiency natural gas boilers <http://www.iea.org/policiesandmeasures/pams/france/name-21918-en.php?s>.

- for all other sectors (including residential), and for biomass facilities between 100 and 1000 toe/year, the Heat Fund is managed by the ADEME at regional level with regional calls for projects. It complements aid currently granted in the context of State-Region Project Contracts.²¹

Tax credit for energy transition (CITE)

Subsidy in the form of a 'tax credit', equivalent to a reduction in income tax to the percentage level of the credit. If the owner does not actually pay income tax it comes in the form of a grant. From 1st January 2015, the Crédit d'Impôt de la Transition Énergétique (CITE) will be subject to an eco-conditionality criterion: the work must be performed by installers that hold the quality sign "recognised Grenelle de l'environnement". Most forms of energy conservation works are eligible for the CITE, such as loft insulation, double glazing, wall insulation, central heating controls, condensing boiler, combined heat and power. However, the installation of solar panels is no longer considered eligible expenditure. There are maximum limits to the amount of the works for which the tax credit can be granted. The maximum for one person is €8,000, and €16,000 for a couple, which is increased by €400 for each additional person in the household. That makes a maximum tax credit of around €5,000.

Over 6 million of the 34 million primary residences in metropolitan France benefited from CITE at least once between 2005 and 2011.

Since September 2014, the tax credit was reinforced and simplified with a single 30% rate.²²

3.3 Spanish Demonstration case: Eibar, Mogel

3.3.1 Description of the site

The neighbourhood of Mogel is a 1950's residential development of 21 buildings on a sloped terrain. The neighbourhood is part of the Catalogue of Cultural Interest Items included in the Planning Regulations of Eibar. Almost all the buildings are five stories high. The construction consists of a mixed concrete framing and wooden beam floors. The ground floor walls are composed by a layer of load-bearing stone, and the rest of the facades are cavity brick walls. The roof is made of wood. The buildings have never been renewed, however, many owners

²¹ International Energy Agency, France - Heat Fund
<http://www.iea.org/policiesandmeasures/pams/france/name-30673-en.php?s>.

²² International Energy Agency, France - Tax credit for energy transition (CITE),
<http://www.iea.org/policiesandmeasures/pams/france/name-22732-en.php?s>

have installed double glazing windows. Most of the population has low-medium income, with a mix of long-term residents, such as the elderly dwellers, and young couples.



Table 6 Mogel neighborhood, Eibar, Spain

3.3.2 Ownership structure

The owners of the demo building in Eibar are mostly the residents. The property in Mogel reflects the typical situation of Spanish residential stock. Property is very fragmented, with individual owners occupying their dwellings, or renting it to tenants. There are ten dwellings in each portal and each of them has one or more owners. The integral renovation project of Mogel began in 2006, when the residents, represented by the Neighbourhood Committee proposed to improve the accessibility of the neighbourhood, as well as the accessibility of the residential buildings. The landscape in Eibar is very hilly as the city lies in a narrow valley in a mountainous area, the highest mountains are between 700 and 800 metres high. Therefore, facilitating access to the buildings is very important for citizens

3.3.3 Decision making

There are two decision-making levels in the Mogel neighbourhood, but only one of them takes precedence over the other and it is the community's decision (all of the residents in the blocks of flats). The community agreement (the apartment dwellers) in each hall was needed to decide on the participation in the ZenN project. The decision concerning the refurbishment was taken building by building by a simple majority. If the majority of the

building residents decided to do the refurbishment the other neighbours residing in this building were also obliged by law to participate.

At the same time there is a **Neighbourhood Committee** that represents some of the residents of the neighbourhood. This Committee initiated the work at the very beginning and contacted the City Council. It also acted as a go-between the residents and the architects who designed the retrofitting. The Committee held meetings with the architectural studio that was responsible for pointing out the possible building modifications. Although it does not have any legal personality, the Committee acted as a decision maker concerning the presented retrofitting measures. After evaluation five of the possible building modifications were presented to the entire neighbourhood and the other options were discarded. It is important to note that decisions made by the Committee were only generic. The official decision was in the hands of the residents of the apartment blocks, as stipulated in the law on horizontal ownership.

Debegesa the Local Development Agency of Lower Deba region (www.debegesa.com) has also participated in the decision process taking place in the Mogel neighbourhood. Created in 1985, it was one of the first local development agencies not only in Spain but also in Europe. Debegesa is a Public Limited Company but it is a non-profit-making company financed by public funds. Since 1998, Debegesa was established as an Urban Society of Rehabilitation of Lower Deba region. Since then, Debegesa has offered Housing rehabilitation service assisting individuals and neighbouring communities, developers of rehabilitation works, giving service to nearly 10,000 homes in the region. Debegesa develops and manages the sustainable Rehabilitation Program of Lower Deba region together with IHOBE (Environmental Management Public Society of the Basque Government). They focus on promoting the rehabilitation of buildings with criteria of sustainability and energy efficiency in all those agents related to them, such as neighbouring communities, community managers, companies and building associations, as well as professionals and technicians in the region. Debegesa's main goal is the sustainable development of the region in environmental, town planning and restoration, human capital, innovation and companies and Tourism fields. In recent years, Debegesa has taken part in ten European projects.

Taking into account that the residents were mostly concerned with installation of lifts in their halls, one of the arguments in favour of participating in the ZenN project was the fact that it would allow to bring an added value with the same costs. The lift would cost around 16,000€. With the same price, thanks to subsidies within ZenN project, the property would also have its façades and roof renovated. Moreover it would exhibit improvement in energy efficiency with the installation of solar panels and a centralized accumulator. This is why ZenN project was such a big opportunity for the residents.

In the end each block of flats had to sign a contract. The decision concerning the selection of a construction company responsible for the retrofitting was fully transparent and based on a public tender. The architects that were contracted to organize the competitive bid, while

Debegesa and the Neighbourhood Committee were responsible for the decision making. As far as the decisions on the materials used for retrofitting go, it was the assistance of the architects that helped the owners decide on proper insulation and other elements. After preparing certain measurements (e.g. heat loss), the architects proposed fitting solutions. However, they were advised that the economic factor was the key to making decisions and a limited price range had to be taken into account.

3.3.4 Project financing

3.3.4.1 Subsidies acquiring

The EU funding in the frame of the ZenN project was not discovered by the Eibar property owners independently. Instead it came as an opportunity that emerged from the City Council. The Mayor, a recent councillor of urban planning of the city, was familiar with the situation of the Eibar property and suggested it should take part in this endeavour. The Eibar City Council was responsible for searching and raising the funds.

There were four financing sources of the investment:

- The Basque Government,
- The Eibar City Council
- The European programme
- The residents' funds

All of them were direct grants. Apart from that, the Basque government provided a subsidized interest rate. Part of the investment was also financed by the residents. It is important to point out that the funds were not strictly and exclusively for energy efficiency reform. The Basque Government subsidy was dedicated for the lift installation as an accessibility complement and for the energetic reform. In order to access the funds three aspects of the property condition had to be taken into account during the retrofitting: the accessibility, energy efficiency and insulation. All of them were included in the budget. In the case of Eibar City Council, the grants were directed to the installation of the lift and to the renovation of the façades (without taking into account the energy improvements). The City Council contributed by repealing the site and rehabilitation fees.

The total cost of the retrofitting varied between dwellings, due to differences in size and necessary elements, however the overall costs varied between 32,000 and 36,000 €. The subsidy that the owners received amounted to about €19,000, which was financed by the Basque Government (14,213€), the Eibar City Council (800€) and the ZenN project (4,400€) Thus the financing amounted to an average of 50% to 60% of the entire costs. Taking into account the size of the financial aid, the Basque Government subsidy was considered the

main one, while the others were complementary. The help of the Basque Government functioned as the main lever for the investment, while the rest of the funds assured the operation was viable. There were no difficulties when it came to obtaining the funds from the Basque Government. Therefore, it is a recommended funding source for potential investors planning building renovations.

The table below presents the summary of the budget for the retrofitting of the Eibar demonstration site.

Eibar demonstration site		First Phase
Total investment cost:	7 004 000 €	4.109.067,10 € (without IVA)
Cost for each financing party:		
Neighbours	3 066 500 €	1.086.485,08 €
Eibar City Council	175 000 €	134.952,52 €
Basque Government	2 800 000 €	2.131.950,00 €
ZENN project	892 500 €	755.679,50 €
Other parties? Please indicate.	Basque Energy Agency (EVE) 70 000€	-

Table 7 Budget summary of the Eibar demonstration site

The following diagram presents the composition of the different financing sources utilized for the renovation of the Eibar demo site. As clearly visible in the picture, the owners' resources were the biggest contributor to the overall budget, followed by the Basque Government subsidy. The ZenN project contributed around 13% of the entire funds.

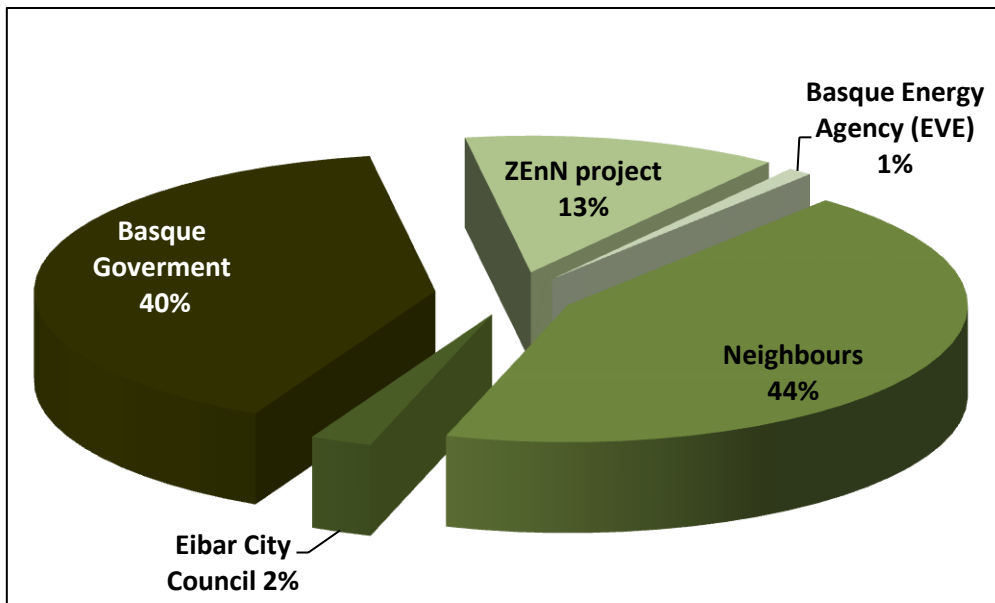


Figure 4 Share of the financing sources acquired in the case of the Eibar demo site

3.3.4.2 Payment methods

As mentioned before, the amount of payments necessary to fund the retrofitting of the particular buildings and apartments in the Mogel property varied a little due to differences in the number of elements that needed refurbishment. Some residents did not need to put new windows, while others did, which resulted in a 3000€ - 4000€ differences per flat owner in the final price.

There were a few payment methods used by the owners of the dwellings. Some of them chose to pay with cash, others asked for loans. There were a few cases where the financial situation was difficult due to unemployment. However, the chosen construction company mediated with the Caja Rural de Navarra bank and negotiated better financial terms that allowed for longer payment period (5 to 10 years) and resulted in lowering instalments to about 200€ – 300€ a month, which made it easier to participate for the owners with fewer resources, who were unable to take a loan due to their financial situation.

The model of payments defined that the payments were to be made jointly by the residents of each individual block of flats. All the payments were made accordingly to the conditions that the construction firm set out. The construction company facilitated the payment terms that allowed the project to run. These terms were attractive because they did not oblige the residents to pay any sums initially. The first payment needed to be done when the 20% of the refurbishment works were executed and certified, that was around the end of the third month. The payments were done block by block – once the building had 20% of the work completed and certified the owners made their first payments. What is more, the payment

had to involve only the part that was not subsidized, the rest could have been supplemented after the funds were transferred. In other case, some of the residents may have not been able to pay the price up front.

All the residents requested support with their payments. Debegesa worked to gather all the support in one package - from the Basque Government, the City Council and the European Commission. The residents of the buildings applied for all these resources combined together. Among the housing rehabilitation grants offered by that the Basque Government, one applies to helping subsidy beneficiaries with payments of their interest rates. Depending on the beneficiary's income the government offers additional funds used in order to lower the interest rates by a decimal point. The bank then adjusts the rates, taking into account the money received from this subsidy.

As for the subsidies, the money is transferred between the funding entities, the block owners (community owners and finally the contractors. In order to avoid a lack of control over the transferred money, each building community was obliged to prepare special separate accounts only for the retrofitting funds. This way there was no risk that some indebted account would consume all the resources.

3.3.4.3 Return on investment

The residents have benefited from the implementation of the renovations. The value of the property is now greater due to its integral rehabilitation and above all because of the installation of the lifts. The property is also far more energetically secured, which also translates into its value. This is why the residents are obliged to return the subsidies provided by the Basque Government in case they sell their properties in the following 20 years.

The circumstances varied among the dwellings and the return on investment may be different in each case. It depends on the level of investments, as well as on the energy consumption patterns. It is different in case of large families in comparison to individual dwellers. In all cases the direct return on investment (not understood as the property value) was foreseen to be very long term and linked to use of the utilities. It may be possible that the financial benefit will occur for future generations. Thus, it was not the finances, but rather the quality of living conditions and home comfort related to the accessibility measures (the lifts) that were the biggest improvements and encouragement for the participants. The energy efficiency measures were treated as an unexpected result that was appreciated only after the refurbishment was finished.

3.3.5 Overall assessment

The financial scheme was assessed by the representatives of the Neighbourhood Committee as an effective and transferable plan, which satisfied the owners of the buildings. It was also promoted in these terms by Debegesa. All the residents talked naturally about the changes they noticed during and after the renovation. They noticed improvements in living comfort and lower heat demand. They are very satisfied with the results.

It is worth noting that many of the dwellers were mostly interested in acquiring the lifts in their buildings. It was an important investment for them. Thus, it was the strategy promoted by Debegesa and the Basque Government to try to connect the energy efficient renovations with other previously requested installations and modifications of the buildings. It is advisable to use such a combined investment approach in order to encourage owners to involve energy efficiency measures in other types of projects. This way it is possible to achieve a good added value for a similar price of the work and omit additional construction works in the property. All refits are performed jointly at the same time, minimizing the impact and the inconvenience for the residents.

The payments structure that was possible with the contribution and help of the construction company was assessed as very convenient by the representatives of the community.

3.3.6 Encountered challenges

The project has been very successful. However, there were some barriers and challenges encountered in the process. Concerning the decision making process, some of the neighbourhood representatives were reluctant to decide on the participation in the refurbishment at first. However, due to a final majority decision in favour of the project all residents were obliged to involve themselves in the project.

Concerning the financing scheme, the need of registering a file at the property office in case the owners would like to sell their dwellings was quite problematic. However this is understandable, as the refurbishment greatly increased the value of the buildings.

Also, ownership issues arising in the case of some dwellings have been a challenge during the renovation. As already mentioned before, some dwellings owners had financial restraints due to unemployment. Therefore, it was very difficult for them to participate in the renovation process. Also, there were cases of multiple ownership due to inheritance (by the children of the owner) or death of the owner. Some ground floor apartments' owners were quite sceptic towards the renovation plans as one of the modifications was the

construction of elevators which they did not need as much as their neighbour living on higher floors.

In addition to the above mentioned man-made financial barriers, there has been little engagement in the project from the banks. Many of them did not provide competitive offers with low interest rates. At one point this posed as a barrier in the development of the project financial scheme. The banks viewed the project from a more traditional standpoint. Rather than looking at the market position and image incentive that came along with participation in such projects, they examined the clients from the perspective of the financial risk. In result there were some residents who did not manage to receive loans at all. The ones that had financial problems searched for different solutions, such as receiving support from their relatives or making individual agreements with the banks.

Another difficulty were the deadlines for the grant applications, which posed a challenge for the applicants. In case there was more time for dealing with the formalities there may have been a chance for another block of flats to take part in the project.

Moreover, a large proportion of owners have been doubtful about the disbursement of funds before the process of retrofitting ended. Many of them did not have a complete trust in the funding process and were worried whether they would actually receive the subsidies. This has also been a drawback when it came to obtaining support for the project.

3.3.7 Other financial incentives available for investors in Spain

National Energy Efficiency Fund – 2015

A multi-sectoral policy funded with 168 million EUR from Ministry of Industry, Energy and Tourism (MINETUR), European Fund of Regional Development (FEDER funds) and 207 million EUR from power companies. The fund is intended to address the energy goal made under the accomplishment of the EU Directive 2012/27/UE. Spain has provided the Commission with a goal of 15,320 ktoe of energy savings accumulated for the period 2014 to 2020, which was increased to 15,979 ktoe according to the latest revision of the methodology by the European Commission. The target for 2015 is 262 ktoe or 3.046,51GWh (67.916,58 Euro/GWh saved).²³

Financing for Renewables and Energy Efficiency (credit line)

²³ International Energy Agency, Spain - National Energy Efficiency Fund - 2015
<http://www.iea.org/policiesandmeasures/pams/spain/name-142618-en.php?s>.

Under the Plan for the Promotion of Renewable Energy in Spain (Plan de Fomento de las Energías Renovables en España, PFER) prepared by IDAE (Institute for Diversification and Saving of Energy) on the basis of Law 54/1997 on the Electricity Sector (Ley 54/1997, del Sector Eléctrico), the Official Credit Institute (ICO) and IDAE provided a credit line for investment in renewable energy and improving efficiency projects (saving and fuel switching in industry, energy efficiency in buildings, etc). Public finance would back up to 70% of the project investment by means of loans at low interest rates, between 2-5%. The programmes total budget is 30 million.

Among the financial incentives available for energy-efficient retrofitting in Spain, that are described in the 2014–2020 NATIONAL ENERGY EFFICIENCY ACTION PLAN are the programmes mentioned below.²⁴

PAREER: Aid Programme for the Energy Renovation of Existing Buildings

This programme promotes comprehensive actions favouring energy efficiency improvement and the use of renewable energies in the housing stock of existing buildings in the residential sector, and also to comply with article 4 of Directive 2012/27/EU, relating to energy efficiency.

The actions are to fit one or more of the following typologies:

Improvement of the thermal envelope energy efficiency.

Improvement of energy efficiency in thermal and lighting installations.

Replacement of conventional energy for biomass in thermal installations.

Replacement of conventional energy with geothermal energy in thermal installations.

It is used in the residential sector (housing and hotel use) approved by IDAE (Instituto para la Diversificación y Ahorro de la Energía) Resolution of 25 September 2013. Its goal is to encourage and promote the implementation of integral measures which favour energy saving, energy efficiency improvement and the use of renewable energies in existing buildings. Assistance is granted in the form of a monetary provision without compensation or repayable loan, depending on the type of measures (thermal envelope and heating and lighting installations). It has a budget of €125 million.²⁵

JESSICA-FIDAE Fund (Energy Saving and Diversification Investment Fund)

²⁴ International Energy Agency, Spain - Financing for Renewables and Energy Efficiency, <http://www.iea.org/policiesandmeasures/pams/spain/name-21610-en.php?s>.

²⁵ International Energy Agency, Spain - PAREER Programme (Aid Programme for Energy Rehabilitation in Buildings in the Household and Hotel Sectors), <http://www.iea.org/policiesandmeasures/pams/spain/name-142621-en.php?s>.

Fund for financing the renovation of non-residential buildings. The aim of this fund is to finance urban sustainable development projects to improve energy efficiency, use renewable energies and be developed by energy services companies (ESCOs) or other private enterprises. This fund is to finance all the investments directly bound to the issue of energy efficiency and the use of renewable energies in urban environments, and it is compatible with other public or private funding sources, as well as with subsidies either co-funded or not by the FEDER.

Priority issues:

Energy efficiency and energy management (existing and new buildings)

Renewable energy projects (solar thermal, solar PV, biomass)

Projects related to clean transport, contributing to improvement of energy efficiency and the use of renewable energies.²⁶

PIMA SOL

Promoted by the Ministry of Agriculture, Food and Environment. The Plan to promote environmentally friendly behaviour in the tourism sector is intended to reduce emissions of greenhouse gases from the Spanish tourism sector. In particular, it promotes the reduction of direct GHG emissions in hotel facilities through energy efficiency improvements. The beneficiaries of the Plan are hotels, which will implement measures leading to increased energy efficiency of their facilities based in Spain. The energy efficiency projects carried out by hotels, after meeting specific criteria, will generate carbon credits equal to the reduction of 1 tonne of CO₂. The government is obligated to buy them at the fixed price of EUR 7 per credit.²⁷

State plan for the promotion of rental housing, building restoration and urban regeneration and renovation, 2013–2016 (Royal Decree 233/2013) of the Ministry of Development²⁸

Aimed at promoting the energy renovation of residential buildings. Includes a residential building renovation programme aimed at improving energy efficiency. Measures eligible for subsidy include improving the thermal envelope of buildings to reduce energy demand for heating and cooling, installing heating, cooling, domestic hot water and ventilation systems

²⁶ International Energy Agency, Spain - JESSICA-F.I.D.A.E Fund (Energy Saving and Diversification Investment Fund), www.iea.org/policiesandmeasures/pams/spain/name-142620-en.php?s.

²⁷ International Energy Agency, Spain - PIMA SOL (Plan for promoting environmentally friendly behavior in the tourism sector), <http://www.iea.org/policiesandmeasures/pams/spain/name-43729-en.php?s>.

²⁸ MINISTRY OF INDUSTRY, ENERGY AND TOURISM, 2014–2020 NATIONAL ENERGY EFFICIENCY ACTION PLAN, https://ec.europa.eu/energy/sites/ener/files/documents/2014_neeap_en_spain.pdf, page.94.

and common building facilities such as lifts and lighting. To qualify for subsidies, the building's total annual energy demand in terms of heating and cooling must be reduced by at least 30% compared to the levels taken before implementation of the measures, as demonstrated by the energy certificate.²⁹

3.4 Swedish Demonstrator: Malmo, Lindängen

3.4.1 Description of the site

The Lindängen neighbourhood is located in the outskirts of southern Malmö. It has a population of just over 6.000 inhabitants; of which 1.000 live in the buildings that are included in this project. The dwellings in Lindängen site consist solely of rental apartments. The vast majority of the houses in the Lindängen area are apartment buildings built during the 1960's and 1970's. Approximately 45 percent consist of housing cooperatives and 55 percent of privately owned rental apartments.



Figure 5 Swedish Demonstrator: Malmo, Lindängen

3.4.2 Ownership structure

Three high-rise apartment buildings and one low-rise apartment building are included in the demonstrator. The buildings are within the category of “million program houses” - a large number of apartment buildings that were built in Sweden around 1965-1975. The sole

²⁹ Ibidem.

owner of the Lindängen demo site property is Trianon Vårsången AB, one of the subsidiary companies of Fastighets Aktiebolaget Trianon (referred to as „Trianon”). Trianon is a real estate company with strong local roots, which owns, manages and develops residential and commercial properties in central Malmo, Limhamn and in Lindängen. The property portfolio consists equally of residential and commercial premises. Trianon owns and currently manages 1,200 residential units, while the gross leasable area operated by the company is approximately 138,000 square meters.

3.4.3 Decision making

The Trianon company is the decision maker for Lindängen demonstration building in the retrofitting process performed within ZenN. Decisions were confirmed in retrospect by the Trianon company board. The decision making process covered calculation of the saving potential of a variety of renovation concepts with different saving ranges. The final option was in line, with only minor changes, with a measures package needed for the EU grant application. There was no life cycle cost analyses performed in advance to the investment, but Trianon has performed their own valuations.

Trianon made an agreement with the energy company E.ON. Through the agreement, E.ON had the overall responsibility for the renovation work that regarded the district heating system connection and heat pumps. E.ON was engaged/contracted by Trianon to perform the major work concerning district heating:

1. Installing new heat stations with improved heat exchangers in connection to each building instead of one common heat station in the area for all as it was before the project.
2. Installing of exhaust air heat pumps on the majority of the exhaust air flows and new efficient fans
3. Adjustment and optimisation of system pressure, temperatures and valves in heating circuit

E.ON was also responsible for installing photovoltaics on the roof.

The agreement was important for the implementation of the measures. E.ON has used subcontracting in order to fulfil their responsibilities, the different services covered by the agreement have been procured individually/separately with other service providers.

As previously explained, the banks have not been involved in the decision process.

3.4.4 Project financing

3.4.4.1 Subsidies acquiring

The main motivator behind the will to engage in extensive retrofitting of the buildings was the owner's business approach claiming that successful endeavours in retrofitting result in profits and "make good businesses". The financial benefit associated with cost saving was a decisive factor. Another aspect that pushed the owner towards investing in energy efficient solutions was the possibility of obtaining an EU grant. Although it constituted only 1/6 of the total investment in the project, it has been an important motivator.

The goal of the renovation of the Lindängen site was to reach a 50% reduction of energy use. The entire investment was funded by Trianon, followed by a bank loan and the EU funds provided within the ZenN project. The entirety of the required funds was accumulated by the owner.

The table below gives the summary of the budget used for retrofitting of the Lindängen demo site.

MALMO demonstration site	
Total investment cost:	6 400 000 €
Cost for each financing party:	
Building owner + bank loan	5 378 000 €
ZENN project	1 022 000 €

Table 8 Budget summary of the Malmo demonstration site

The diagram presented below indicates the share of the ZenN financing in the overall budget for the renovation of the Malmo demo site. The composition of the funds is very simple in this case. The majority of funds were provided by the owner of the building who has also acquired additional financing in the form of a bank loan for the amount of approximately € 1 600 000 from the Handelsbanken bank. However the ZenN financing was also an important contribution comprising of 16% of the budget.

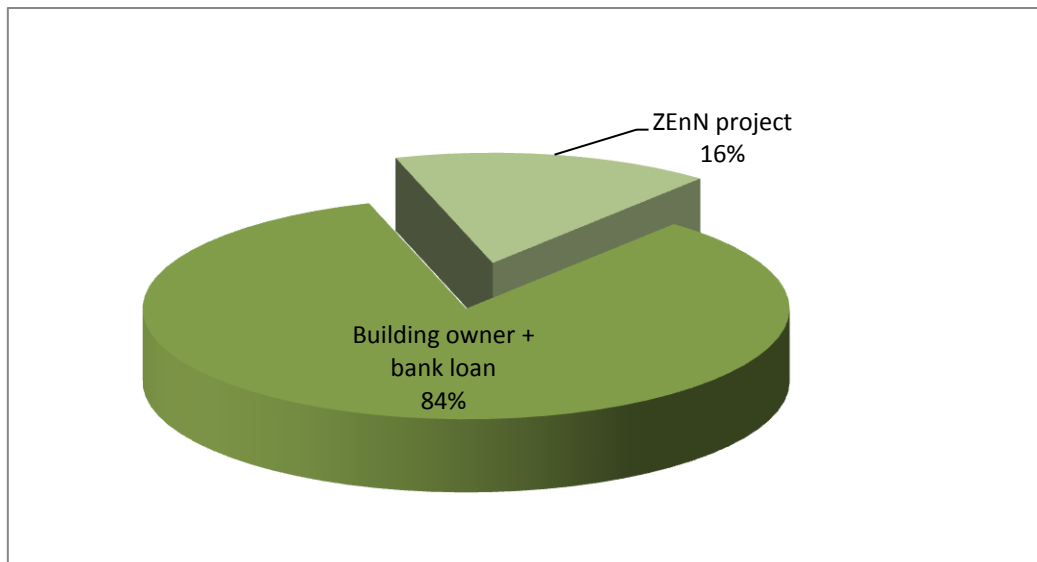


Figure 6 Share of the financing sources used in the case of the Malmo demo site

3.4.4.2 Payment methods

The company had no problems with financing the investment, however this was due to the availability of its own resources. Unfortunately such advantageous circumstances are not a common case. In order to receive funds from the bank in Sweden it is important to have a low LVR (Loan to Value Ratio). Banks do not finance uncertain investments with high risks and a low LVR means that the value of the entity's resources is high compared to the amount of money to be borrowed. The company had a LVR for the property of around 60%, which was lower than the maximum of around 75%. That made the situation less risky for the bank. The investment was financed within the financing possibilities that the company possessed and there was no need to provide calculations concerning this particular retrofitting investment to the bank. The interest rates for the loan did not exceed 1%, which was unusually beneficial. According to the building owner the investment is recouped purely by the market conditions and the rise of the property value.

3.4.4.3 Return on investment

In the owner's perspective the evaluation of the payback time of the investment has to take into consideration the property valuation. A higher net operating income will result in higher property assessment. This means that if the property valuation increases by more than 50

million SEK³⁰ (the amount invested in the retrofitting), there is no need to examine the payback time.

The company and its shareholders will be the sole financial beneficiary of the nZEB renovation. The increased net operating income has not been noticed yet, but due to the changes in the market situation the property has already generated 50 million SEK³¹ of revenue due to the rise of its value. When this effect coincides with the net operating income increase the company will earn more than it has invested. Taking into account that some of the renovations, such as the replacement of windows, were necessary either way (the technical life span of windows has been reached) the overall profit from the retrofitting in case of Trianon is significant.

What is more, as result of the energy efficiency improvements the bank might be willing to lend even larger sums of money to the company in the future. After the savings due to retrofitting (generated in the net operating income increase) are noticed, the bank will give a higher valuation of the property.

3.4.5 Overall assessment

Taking part in the project and investing in energy efficient measures was a good business in the owner's opinion. The ZenN grant was the main motivator to participate and grants were also the reason why the building owner became interested in energy efficiency. Taking into consideration that the investment is repaid soon after the renovation due to the increase of the property value, the owner believes strongly in his investment.

3.4.6 Encountered challenges

Preparing accurate technical measurements of the building before the renovation was a very big challenge. The financial aspect of the investment was not as challenging as proper planning of the modifications, which will influence the end results. Unfortunately consultants presented very different approaches and results. In the end the owners had to decide themselves on the best solutions. It was a big risk, considering that there is still not enough data to determine whether the investment was fruitful.

³⁰ Exchange Rates: 1 Euro = 9.3224 Swedish Krona (19.01.2015; <http://themoneyconverter.com/>)

³¹ Ibidem.

3.4.7 Other financial incentives available to investors in Sweden

Sustainable Municipalities Programme

The Sustainable Municipalities programme started in March 2001. During the first period, which ran five years from 2003-2008, six municipalities were selected by the Swedish Energy Agency to participate in the programme. During the next programme phase, 2008-2011, the programme included 62 Swedish municipalities, amounting to approximately 20% of all Swedish municipalities. In the phase running from 2011 to 2014, a total of 38 municipalities are participating. The reason for the reduction in participating municipalities is i.e. higher demands put on those participating. The programme builds on the municipality's ambitions to make society more sustainable.

The municipalities work towards integrating long-term energy and sustainability perspectives in their daily functioning, with the purpose to save both on costs and protect the environment. The responsibility of the municipalities is to decide an energy policy, engage in a continuous improvement process and carry out measures to improve energy efficiency and introduce renewable energy sources. The Swedish Energy Agency contributes with research grants, environmental scanning, basic data and method support, as well as participating in the municipalities efforts in the area of energy.³²

Among different financial support available for the building owners is the **Swedish Electricity Certificate System**. In this system, producers of renewable energy are granted one certificate for each MWh they produce, which then can be sold.

Another tool supporting energy efficiency are **the Guaranties of Origin**. It is an electronic document guaranteeing the origin/energy source of the electricity produced that can be sold. One guarantee is provided for every MWh produced. These guarantees are issued for all types of energy production.

There is also governmental support for photovoltaics available in Sweden. The level of support is calculated based on the base of the eligible costs for the installation of photovoltaics (max 30 % to companies and 20 % to others). Highest possible support is 1 200 000 SEK/PV plant, and the eligible costs may reach a maximum of 37 000 SEK plus VAT/installed kWp.

Also the **VINNOVA (Sweden's innovation agency)** funds projects related to energy-efficiency. VINNOVA promotes sustainable growth by improving the conditions for innovation, as well as provides funding for needs-driven research.

³² International Energy Agency, Sweden - Sustainable Municipalities Programme
<http://www.iea.org/policiesandmeasures/pams/sweden/name-21504-en.php?s>.

4 Transferability of financing schemes applied in ZenN

The following paragraphs describe the conclusions, as well as the respondents' suggestions, concerning the factors influencing the transferability of the financial solutions implemented within the ZenN project. Some of the described mechanisms are more specific and connected to the experiences gathered during the particular renovations performed within the project, however some descriptions (such as the Third Party Financing or the ESCO) are a general overview of the possible solutions that may be applied in other projects. These are the main and most popular approaches to financing NZEB renovations nowadays.

Chapters 4.3, 4.4 and 4.5 give additional advice and solutions concerning the ways of facilitating the process of NZEB refurbishment. The last of these sub-chapters relates to translating more innovative approaches into the spectrum of financing options used for deep energy-efficient retrofitting.

4.1 Third Party Financing and the Energy Savings Performance Contracting

One of the possibilities for financing deep energy efficient renovations is to use **TPF (Third Party Financing)**. This term refers only to the debt financing where the project financing comes from a third party, e.g. a financial institution, not from internal funds of the ESCO or the customer.

Third party financing means that neither the client (owner), nor the ESCO (construction company) is responsible for the provision of the funds. It is the third entity - financial institution that provides funding for the venture. The technical management of the energy efficient refurbishment can be outsourced to a private construction company or the ESCO.

Considering which of the interested parties (the ESCO or the owners) will take upon itself the responsibility of the loan the financing institution may either assume the rights to the energy savings or may take a security interest in the project equipment.

In case the ESCO takes upon itself the risk associated with the loan, the debt resides on the balance sheet of the ESCO or the financing institutions. Both public and private customers benefit from this type of external financial assistance since such debt service is treated as an **operational expense** and not a capital obligation. Thus, **the owners' debt ratings are not impacted**. For highly leveraged entities it is important that the obligation is not registered as a debt on their balance sheets because this means that their borrowing capacity is unaffected. However, parties seeking financing need to first inquire the country-specific

conditions for operational financing and meet the requirements that need to be fulfilled in order for the financing to be viewed as an operating lease and not a capital lease.

Both of the above mentioned approaches to Third Party Financing (the owner lending money or the ESCO) are associated with the **Energy Savings Performance Contracting (ESPC)**, which is a budget-neutral approach to making building improvements. Under an EPC arrangement ESCO implements a project to deliver energy efficiency, or a renewable energy project, and uses the stream of income from the cost savings, or the renewable energy produced, to cover the costs of the project, including the costs of the investment. This approach is based on the transfer of the technical risks from the client to the ESCO based on performance guarantees.

Considering the option which allows the users/owners to borrow the required funds, it is important that their efforts are backed by the mentioned **energy savings guarantee agreement by the ESCO**. In this way, the borrower is more credible and the energy savings guarantee reduces the risk perception of the bank. Such guarantees provide certainty for the financing institution that the energy savings produced by the investment will cover the amount of the debt and generate a positive cash flow. This also influences the proposed interest rates (apart from the size of the borrowing company and its credit history). However, it is worth noting that energy poverty is a barrier for this system. In climates which are not extreme but rather moderate residents with economic difficulties do not use heating systems in order to generate some savings. In this scenario the ESCO system is unfortunately not viable.

4.2 Cooperation with ESCO

Considering the above mentioned solutions, the general recommendation for any interested building owners, who need to gather additional funds for an envisaged energy efficient retrofitting, is to use the assistance from an energy service company (ESCO) who can give credibility for the project, as well facilitate the access to finance by providing an energy savings guarantee.

The ESCO often approaches a potential client with a proposal of an **energy savings project and a performance contract**. This ESCO is said to “drive” the project. Once the owner is aware of the possibility of an energy savings project, he or she may decide to place it out for bid, or just stick with the initial company. During the first phase of research and investigation, an energy auditor from the ESCO surveys the site and reviews the project's systems to determine the areas where cost savings are feasible. This is usually done free of charge to the client. This is the energy audit, and the phase is often referred to as the feasibility study. An overview of the potential project is developed by the client and the

auditor, and then the ESCO's engineering development team expands upon and compiles solutions.

The ESCO bears the costs of implementing energy-saving operations, which are then repaid, during the life span of the contract. This agreement allows sharing the benefits of these investments or modernization with the ESCO. In other words, the investor pays the upfront cost of the investment/modernization with the savings generated in the operating costs resulting from the implemented investment activities and modernizations. The ESCO will proceed to implement the work only if it is **guaranteed rate of return** of the funds involved in the whole project is satisfactory. If the income generated by the energy saving during the term of the contract would be less than all costs, the company bears the loss.

The scope of the ESCO services may include projects that increase energy efficiency, as well as maintenance and repair of equipment, the combined production of electricity and heat, new technologies, alternative electricity generation. All these solutions are feasible if the payment for those services comes from the achieved savings.

It is worth remembering **that ESCOs provide several important benefits when cooperating within project**, not only associated with the financial credibility. The involvement of an ESCO provides opportunity for the following services:

- ✓ technical consultancy,
- ✓ defining the contract,
- ✓ energy analysis,
- ✓ project management,
- ✓ project funding
- ✓ training,
- ✓ performance guarantees,
- ✓ monitoring of the results
- ✓ exploitation and taking care of the level of savings,
- ✓ risk management.

The ESCO also assumes almost all of the risks:

- ✓ the technological risk associated with the choice of energy-saving projects and savings achieved in practice,
- ✓ the technical risk associated with the choice of equipment and apparatus,
- ✓ the economic risk related to assessing the energy performance of the implemented solutions,
- ✓ the financial risk associated with the capacity of the customer to regularly pay the bills and meet the financial commitments (loans, leasing, etc.)
- ✓ risks related to the operation of the building and the maintenance, assuming responsibility for operating the equipment, durability and reliability, correct and error-free level of service, any damage caused to the customer or the residents due to a power outage, and even natural disasters (fires, floods, theft, etc.).

4.3 Generating the return on investment in residential rented apartments

One of the problems that may arise in case of energy efficient renovations of residential building stock is the fact that the owner is not the user of the building. In such cases the investment/expenses are made by the owner, however the incentives and utility upgrades are used by the dwellers of the building. This may seem as a discouraging factor for the investor. Still, there are solutions that make this kind of split incentive bearable for both parties.

As in the case of the renovation performed in France within the ZenN project, the landlord may use the rental costs in order to generate return of the made investment without affecting the level of costs experienced by the residents.

Considering that the cost of utilities drops significantly after the refurbishment, it is possible to use the existing financial gap to deliver additional income for the investors. The owner of the building has the right to increase the rental costs of the apartments located in the building taking into consideration the renovation and improvements that have been performed. These improvements translate into the aesthetics of the building and the comfort of living. At the same time, there is little to no risk of generating opposition to the increased rent among the dwellers due to the fact that **the overall costs of living will still be lower or exactly the same** considering the energy efficiency savings. The lower energy and utilities bills will compensate for the increase rent. Additionally, there is a chance of generating a non-financial incentive for the dwellers in the form of improved quality of life and better living conditions inside of the building (for example better insulation resulting in more comfortable temperatures inside).

4.4 Assuring the flexibility and continuity of financing

The respondents of the analysed study have provided their own opinions on the most important financial factors influencing the transferability and effectiveness of the financial solutions used in refurbishing projects. Taking into account their experiences, the following important factors were mentioned:

1. **Assuring that a small percentage of the available funds is kept aside in the case some additional, unforeseen expenses should come up (error margin).**

This means **the initial budget of the renovations should be slightly expanded** in order to give the financial security for the project implementers. Additional money would allow to omit any barriers related to unexpected expenses that would arise due to new, unforeseen

and necessary construction work. Taking into account the complexity of deep energy efficient renovation, the possibility of being faced with some unscheduled renovation work is quite significant. These additional funds would be used only in special circumstances and returned to the financing bodies in case there was no need to use them during the project.

2. The sustainability of the funds was mentioned as being very important by the project participants.

This means that there is a need for a different approach to financing NZEB renovations in terms of the duration of the subsidies. ZenN project Partners mention the importance of continuity of the financing programs/instruments. In the case of projects coordinated by public entities, such as municipalities, there is a strong need for a financing source that would go on for a longer period of time, without interrupting the continuity of financing options. This would pave the way for more extensive projects, involving a renovation of greater number of building. Such long-term financing options would allow to use the experiences gathered in an initial project and transfer them onto the future renovations. Considering that the financing source would stay the same, the formalities required to obtain the funds would also be identical. This would enable the investors to use the financing options more effectively and efficiently for future projects. Then the financing sources are fragmented and have a short life span, it is impossible to implement more widespread renovations using these options. The investors need to get accustomed with the procedures and formalities from scratch.

4.5 Innovative mechanisms for financing energy efficiency

It is worth mentioning that some innovative mechanisms for financing energy efficiency and renewable energy improvements have been applied in United Kingdom, United States of America and France.

However most of them have not yet been used in deep energy (NZEB) retrofitting. Nonetheless, it is worth mentioning that these solutions pose a great opportunity also for nZEB renovations. This may be a new trend for financing such deep retrofits in EU member countries. They have been tested and proven as effective in smaller project, which is a good forecast for their future use. In the following section a short overview of the promising new solutions is made.

Among the central ideas that could be introduced as new and promising ways of financing energy efficient retrofitting are: attaching the loans to the properties (not owners or residents) and making the loan flexible to the changing residents or property rights, including the loan instalments in the utility bills or deducting the loaned money from the

property tax bills. All of these ideas are examined on the basis of examples set in the following two cases.

4.5.1 Green Deal

The Green Deal is a financing method of energy efficient renovations that has been implemented in United Kingdom in January 2013.³³ The aim of it was to enable private firms to offer consumers energy efficiency improvements to their homes and businesses at no upfront cost, and where payments are returned through a **charge of instalments on their energy bills**. The program was intended to encourage house owners and owners of companies to use energy efficient technologies/solutions such as insulation of walls, exchange of windows, insulation of doors, installation of smart meters and installation of heat sources such solar collectors, heat pumps and biomass systems. Under the Green Deal, building owners and the tenants were able to order an energy efficient refurbishment of their property from a Green Deal Provider and fund it with a new type of loan. The difference between The Green Deal and a conventional loan is that the bill is **attached to the building where the savings come from, and not the payer of the bill**. In addition, when the resident moves out of the building, he stops paying the energy bill (in addition the loan).

The choice of the offer, thus the decision on the number and the type of implemented solutions, depends on the property owner who cooperates with a Green Deal Adviser in order to distinguish the most suitable solution for the building and estimate the payback time.

In this model the loan repayments are not made directly to the lender but will instead be added to the property's electricity bill as a separate item. The loan is therefore repaid by the person responsible for the energy bills, who will also benefit from the improved energy efficiency of the property. The energy supplier company then passes on the money to the Green Deal Provider. Because the loan runs with the property, not the person, the loan will continue to be paid even if the original owner or tenant who organized the refurbishment leaves the property. Of course, it is this mechanism which makes the scheme applicable to the rental sector (private or commercial) as it is the occupiers of the property (who of course could be tenants) who pay off the loan.

The Golden Rule of the Green Deal solution is a limitation that comes with the loan. Under this rule, the annual cost of any **loan repayments must not exceed the anticipated annual saving in energy costs**.

³³ Green Deal: energy saving for your home, <https://www.gov.uk/green-deal-energy-saving-measures/overview>.

Unfortunately the Green Deal Home Improvement Fund (GDHIF) in the United Kingdom is now closed to new applications. The government has stopped funding the programme due to its low take-up. However, considering that the new, conservative government in UK has blocked all of the main initiatives for sustainability and renewable energy it is not an indication of the ineffectiveness of this tool, but rather the overall policy of the new leaders.

The central idea of this solutions is very attractive both for the building owners and could be successfully utilized on different markets. One of the main advantages of this solution is that there are no upfront costs needed from the building owners. Secondly, the flexibility given by attaching the loan to the building opens up the market of rental houses for the opportunity of being included in the energy efficiency modifications. Additionally, the loan payments are not burdensome to the tenants, as the amount of the instalments is not to exceed the savings obtained due to the renovation. From the point of view of the end users this solutions is completely impact free – it does not affect their budgets. Overcoming the financial barriers without imposing a long-term commitment on the owners and residents to pay for the performed refurbishments gives the opportunity to perform widespread renovations without much trouble. The result is that the building stock becomes more energy efficient while the owners and users remain free to relocate and do not face the burden of a several years of debt – the Green Deal finances stay with the properties until paid off.

4.5.2 PACE – Property Assessed Clean Energy Program

Property Assessed Clean Energy (PACE) is a financing program aimed at decreasing energy consumption in buildings launched by United States of America.³⁴

The PACE programme is used by the local governments of individual states to finance renewable energy and energy efficiency projects on residential, commercial and industrial properties. PACE programs allow property owners to avoid the high upfront cost of clean energy installations, such as solar panels, and other energy-saving retrofits by paying for these improvements over time through an addition to their property taxes. In areas with PACE legislation in place municipal governments offer a specific bond to investors and then loan the money to consumers and businesses to put towards an energy retrofit. The loans are repaid over the assigned term (over the course of somewhere between 5 and 25 years) via an annual assessment, as a line item on the homeowner's property tax bill. PACE bonds can be issued by municipal financing districts, state agencies or finance companies and the proceeds can be used to retrofit both commercial and residential properties. Similarly to the

³⁴ Office of Energy Efficiency & Renewable Energy , PROPERTY-ASSESSED CLEAN ENERGY PROGRAMS, <http://energy.gov/eere/slsc/property-assessed-clean-energy-programs>

Green Deal solution, PACE allows for the loan to be attached to the building rather than the owner.

Recently some barriers to popularizing the program across the U.S. were cleared on August 24th 2015 at the National Clean Energy Summit in Las Vegas, Nevada. FHA (Federal Housing Administration) announced anticipated guidelines for a new initiative that will support borrowers seeking to make energy efficient improvements to their homes, including guidance that will allow borrowers to use Single Family FHA financing for properties with existing PACE loans that meet certain conditions. FHA is developing Single Family PACE guidance to overcome impediments in the purchase and sale of properties to which PACE loans are attached due to concerns that in the event of defaults this loan, as a tax assessment, may have super lien status and/or take precedence over the first lien mortgage. The Single Family FHA guidance will address the impact of PACE assessments on purchases, refinances and loan modification options available to borrowers experiencing distress and will require will require these liens to be subordinate to FHA single-family first-mortgage financing.

Considering the variety of types of residential PACE programs, FHA is preparing a guidance, that is also being informed by ongoing conversations with the Federal Housing Finance Agency (FHFA). A minimum will involve the following:

- Lien Position: Only PACE liens that preserve payment priority for first lien mortgages through subordination;
- PACE payment, structure, and term: PACE financing has to be a fixed-rate, fully amortizing loan;
- Eligible Properties: PACE assessments have to be attached to single family properties, as defined by FHA, which are 1- to 4-unit dwellings, including detached, semi-detached and town home properties;
- Equity Requirement: PACE liens that preserve payment priority for first lien mortgages will be eligible for financing that does not exceed FHA's maximum combined loan-to-value (CLTV) ratio;
- Record Keeping: PACE liens must be formally recorded and be identifiable to a mortgage lender through a title search;
- Additional Consumer Protections: PACE programs must comply with applicable federal and state consumer laws and should include disclosures to and training for homeowners participating in the program.³⁵

According to PACENow, a nonprofit organization that promotes the PACE model, about \$500 million in residential PACE projects for approximately 25,000 homes was generated in 2014 in the state of California. The commercial market has generated around \$100 million in

³⁵ Guidance for Use of FHA Financing on Homes with Existing PACE Liens and Flexible Underwriting through Energy Department's Home Energy Score, <http://portal.hud.gov/hudportal/documents/huddoc?id=FTDO.pdf>

completed projects and another \$400 million is planned. The approximately \$600 million in completed projects is a big change in comparison to the \$60 million generated in 2013.³⁶

Overall PACE legislation has been passed by 31 states, and nearly \$1 billion in projects has been financed using this solution, despite some opposition from mortgage holders. Many thousands of projects have been completed since 2008 and so far there is no evidence that PACE has caused defaults.³⁷

Considering the growing success of PACE on the U.S. market it is worth to consider this solutions to be adopted on European markets.

4.5.3 Public Third Party Investor public operators

TPI (Third Party Investor) is a translation of leasing mechanisms to the energy retrofit of buildings. In TPI the investment in the energy efficient retrofitting is not carried out by the building owner, thus relieving him of the burden of the debt. The third-party investor has a claim on the future energy savings, and may take on the risk of not achieving the expected savings, however he does not directly lend the money to the owner of the building but rather invests himself and has the rights to the future earnings related to the energy savings.

Considering the difficulty associated with managing large energy efficiency investments with low profitability in very long term commitments it is important to assure greater credibility of the project in the building owners' view. Trust in the operators is very important when it comes to encouraging uptake and dissemination of long term projects. Without it the owners will not be convinced that the investments are safe and worthwhile.

Taking the mentioned specificity of large projects into consideration, an innovative approach to third party investments has been introduced in the Ile-de-France region (France) with the support of Caisse des Dépôts et Consignations and Caisse d'Epargne. Energies POSIT'IF, a public-private company created in 2013, is a public ESCO made up of a small team which mainly negotiates the contracts and develops the financial engineering, while all technical aspects are subcontracted. It is designed to finance deep renovation projects with contracts between 15 and 30 years.

The solution targets deep renovation of residential and public buildings and the production of renewable energy. The company is responsible for the technical coordination of work when it comes to working with the private condominiums as well as small social landlords. It drives the process of implementing EPC with an energy efficiency commitment and a

³⁶ White House Announcement Means 'Today Is a Very Big Day for PACE,
<http://www.greentechmedia.com/articles/read/White-House-Announcement-Means-Today-is-a-Very-Big-Day-For-PACE>.

³⁷ Ibidem.

financing offer. In the case of public buildings Energies POSIT'IF provides consultancy during the EPC negotiations between the public entities and the private operators. Finally, during the projects considering renewable heating and green electricity production, initiated by local project promoters, the company provides consultancy, as well as engineering and financial participation.

Considering the residential sector, Energies POSIT'IF proposes a contract in which the building owner authorizes it to study the feasibility and the modalities for an energy retrofit operation in case the condominium association is ready to launch the process of energy refurbishment. Subsequently, the company presents to the neighbourhood association a comprehensive project, with all technical specifications and a financial engineering adapted to each individual situation. This may include:

- public support to co-owners or to the co-owners association: subsidies, tax rebates
- financing by co-owners: equity, soft loans (the transferability of the current 0 % loan for housing retrofit to Energies POSIT'IF is under discussion with the French authorities)
- financing directly provided by Energies POSIT'IF³⁸

The company's role is multiple – it facilitates the accessibility of different funding solutions, it subcontracts the implementation of the planned work to suitable companies (if the project is accepted by the residents) and also takes care of the maintenance of the installations, guaranteeing a planned level of energy consumption.

³⁸ A. Bullier, C. Milin, Alternative financing schemes for energy efficiency in buildings”, ECEEE SUMMER STUDY PROCEEDINGS, eceee 2013 Summer Study – “Rethink, renew, restart”; 3–8 June 2013, Belambra Les Criques, Toulon/Hyères, France p. 801

5 SUMMARY OF RESULTS

The diversity of the retrofitted demo sites gives a good opportunity for an extensive overview and analysis of the possible financial schemes and solutions. Taking into consideration all the various details and the context of each of the cases, it is clear that the work performed within the ZenN project is a rich source of information and experiences to examine. There are different aspects of the ownership structures that influence the work path from the point of investing up to the point of assessing the financial gain.

The first conclusion drawn from the analysis is that **the level of the owner's satisfaction with the applied financing scheme was quite high**. Majority of the respondents indicated they would either use the same financial model again in future projects or would be willing to recommend the solution to other building owners.

Although the model had been a great success also in the case of the Spanish demo site, the owners of the Eibar properties had certain doubts concerning the replicability of the investment. One of the reasons for this hesitation is the fact that the project was strongly dependent on public support – around 57%-60% of the work was funded by third parties. Moreover, the ownership structure was very fragmented in this case and required individual approach to some of the residents. However, it is natural for such large projects to encounter some obstacles. This did not influence the fact that the renovation performed in Eibar ended with a big success and had great impact on the local communities, which very strongly interested in the performed work. As far as the recent developments show, there are four additional buildings in Spain that will be modernized using the same financial model (excluding EU funding – ZenN project) that was used in Eibar. This domino effect is also visible in the case of the Oslo demo site, where also additional plans for future renovations have been made as a result of the ZenN project influence.

Three out of four demo cases used **subsidies from both the national and local sources** (apart from the EU funds, own resources and loans). The regional source was dominant in the case of Spain (Basque Government), the French demo site was financed both with the use of national, as well as regional funds in similar proportions, however the Norwegian investment was financed to a larger degree by the municipality's subsidy (local funds), rather than national. The only case that did not apply for any grant apart from the ZenN funds was the Swedish site. Therefore, there is a full spectrum of combinations available.

One of **the simplest financing schemes with no major difficulties in financing and good results was the Swedish demo site** in Malmo. With a sole owner of the property – The Trianon company, there were no incompatibilities in the decision processes concerning the retrofitting. All plans were made by the same investor. What is more Trianon company did not have difficulties in obtaining funds for this venture due to a low LVR and consequently

good loaning possibilities. Even though the subsidy amounted to only 1/6 of the total spending it was a big motivator for the owner and a means to carry out the project. The financial ease was due to a positive evaluation of the company by the supporting bank, which enabled the money transfer to finance the major part of the retrofitting. What is more, the company concluded that even at the initial step of the retrofitting, when the energy efficiency has not yet been visible in the bills, the property has already gained much value due to the refurbishment. The sole value increase has been considered enough to cover all the expenses, so any additional savings will be added benefits to this great outcome. Not to mention the improvement in the building components and indoor climate quality with the installation of, for e.g. new windows. In case of a very clear ownership structure, where only one owner is managing the buildings (as in the case of Malmo in Sweden) and has all the required funds for the renovation, the financial model is very simple and clear. Unfortunately, such situations are quite rare (especially in the case of residential building stock) and the owners need to search for additional financial opportunities in order to fund the projects.

One of the conclusions of the financial barriers analysis is the fact that banks treat finances in rigorous, traditional and unified way. The fact that the target use of funds is energy-efficient retrofitting on a large scale, does not change the approach of financial institutions. What is important in the case of banks is the risk associated with the transaction and the amount and collateral for the loan. That is why many banks are quite cautious **when it comes to financing investments with relatively high risk**, for example by lending money to owners who are not affluent enough and do not have good credit ratings. This may result in difficulties when some of the co-owners of a retrofitted property are denied financing and cannot participate in the works. Majority of banks are not willing to offer much lower interest rates for their clients when it is not in their best financial interest. The economic gain and credit security are the factors that drive their solutions, which is natural taking into consideration banks are also regular commercial companies.

In all ZenN demonstration cases the subsidies were assessed as **very important and necessary sources of funds** for the planned refurbishments. In most cases, the grants were a big element of motivation for engaging in such a venture. **NZEB renovations are highly ambitious processes, consuming huge amounts of resources.** Therefore, it is sometimes hard to encourage the building owners to invest in energy-efficient technologies. This phenomenon is well documented in the case of the Spanish demo site in Eibar. **Without the financial incentive, the environmental benefits alone are not enough** to convince an average user of a dwelling to invest in retrofitting, even if it arrives with an opportunity for a subsidy. The regional and local governments are aware of that, that is why they are placing their attention on providing financing for these types of projects and providing support tools that will enable the owners to approach energy efficient retrofitting more successfully.

Taking into account the specificity of the energy efficient renovations mentioned above, it is important to put an emphasis on awareness building, targeting end users, residents and owners. In order to reach a higher level of interest in energy-efficient retrofitting it is important to assure investors are aware of the benefits arising from such processes. Not only the financial gains, such as lower energy bills and heat consumption and higher property values, but also the improved quality of life and the long term benefits of the renovation such as achieving EU energy consumption and emission reduction targets. Without a good understanding of the importance of performing energy-efficient retrofitting many apartment owners will not uptake it.

From environmental awareness to financial benefits, all cases had slightly different motivations that led them to partake in the ZenN project. There is also a large difference in the specificity and motivation for retrofitting between commercial and municipal properties. **Apart from trying to generate financial and energy savings, the public entities are also interested in improving energy performance due to ideological causes.** Setting good examples and disseminating the idea of NZEB renovation may be more important in case of public buildings than any financial gain that may arise in the process. That is why it may be more relevant in their case to provide solutions that will financially help with enabling large scale refurbishment. **Commercial owners are often focused on good business opportunities** and in their case it is extremely important to exploit solutions that will directly lead to financial gains and lower the risk for loss of resources. Convincing and plausible financial schemes encourage commercial investors to implement energy efficient renovations..

Another important issue that came up during the analysis of the research materials is the need for **financial flexibility, as well as flexibility in supporting a vast variety of technologies** in the grant awarding. On one hand, the building owners pointed out it would be important to have a surplus of funds when performing ambitious energy-efficient renovation. Sometimes during the work phase of the project some additional needs arise when the contractor encounters difficulties along the way of the refit. There may be additional space or some hidden elements of the construction that the applicants may not be able to distinguish at the beginning. It may be hard to finance such additional expenses in some cases without support. Secondly, when the financing entity imposes restrictions and requirements concerning the types of technologies and materials that may be used during the refit, it makes the process more likely to neglect the needs and specificity of a particular property. Giving flexibility and freedom of choice to the investors will more likely result in more effective and tailored solutions, using full capabilities of the gathered resources.

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