SUPER-i

D2.5 Social housing EE investment projects augmented database

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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 101028220.

Technical references

Project Acronym	SUPER-i
Project Title	Extended Public-Private Partnership for Investment in Smart Energy Efficiency Projects in a Social Housing context
Project Duration	September 2022 - August 2024

Deliverable No.	D2.5
Dissemination level*	PU
Work Package	Work Package 2
Task	***Task 2.1: Mapping SUPER-i portal requirements and data.*** ***Sub-task 2.1.2 Financial schemes: variable identification and data collection*** ***Sub-task 2.1.3 Energy efficiency in social housing: variable identification and data collection***
Lead beneficiary	UoY
Contributing beneficiary/ies	ATER, BL, EGC and HFROS
Due date of deliverable	31/08/2024
Actual submission date	31/08/2024

* PU = Public

PP = Restricted to other programme participants (including the Commission Services)

RE = Restricted to a group specified by the consortium (including the Commission Services)

CO = Confidential, only for members of the consortium (including the Commission Services)

v	Date	Beneficiaries	Track changes
1.0	06/06/2024	UoY	First draft
1.1	14/06/2024	UoY	Second draft
1.2	19/07/2024	UoY	Third draft
1.3	02/08/2024	UoY	Fourth draft
1.4	30/08/2024	UoY	Final revision

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Executive Summary

The SUPER-i survey, part of the Social Housing EE Investment projects augmented Database, provides key insights into the state of social housing in several European countries, focusing on opportunities for energy-efficient renovations and their socio-economic impacts. Using comprehensive questionnaires, the survey gathers data on building details, financial considerations, and environmental and social factors, helping stakeholders prioritize interventions with the greatest impact. It underscores the importance of funding and equity in successful refurbishments and highlights technical improvements like upgrading insulation and integrating renewable energy. The survey also examines financial aspects, showing that energy savings can offset refurbishment costs over time. Environmental considerations include resource efficiency and local material sourcing, while socio-economic impacts focus on reducing energy poverty by lowering energy consumption and costs for residents.

This document provides a detailed analysis of energy efficiency (EE) renovation projects in social housing across several European countries including Denmark, Italy, Slovenia, Poland, Greece, and France. The analysis focuses on the numerical outcomes related to energy savings, financial aspects, energy poverty, and health and safety improvements.

Denmark: the energy efficiency renovations led to substantial energy savings. For example, the Olufsgade project resulted in a 35% reduction in energy consumption due to improvements such as enhanced insulation and window replacements. Financially, the projects were supported by a combination of equity and local funding, with a total investment of approximately €500,000. The energy savings are expected to pay back the investment within 15 years, offering long-term cost reductions for residents. The projects also aimed to address energy poverty by reducing residents' energy costs by 20%, though it was noted that better metrics are needed to fully understand the impact. Health and safety were improved by ensuring compliance with Danish building regulations, which included enhanced fire safety measures and the elimination of mould risks through improved ventilation.

Italy: the Italian projects yielded significant results in terms of energy efficiency and financial outcomes. The Giarizzole building in Trieste achieved energy savings of 45%, reducing the building's energy consumption by approximately 70 kWh/m² per year. The refurbishment also led to a 50% decrease in the building's carbon footprint. The financial impact was notable, with the building's market value increasing by 300% post-refurbishment. The total investment for these projects was around €2 million, primarily funded through national and EU grants, supplemented by private savings. The initiatives significantly addressed energy poverty, reducing the percentage of residents' income spent on energy from 40% to 15%. Health and safety improvements included the replacement of outdated electrical systems and the installation of new fire alarm systems, ensuring compliance with Italian safety regulations.

Slovenia: the energy efficiency upgrades in the Murkova Ulica and Dolinska Cesta projects led to energy savings of approximately 30%, equivalent to reducing energy consumption by 60 kWh/m² per year. The total refurbishment costs were estimated at €1.2 million, with funding challenges noted due to a lack of detailed financial planning. Despite this, the projects aimed to mitigate energy poverty by lowering residents' energy bills by an average of 25%. Health and safety were prioritized through the replacement of old windows and roof insulation, reducing the risk of moisture-related issues and improving indoor air quality.

Poland: the Rajszew project in Poland focused on refurbishing a 1949 building, leading to a 40% reduction in energy consumption. This was achieved through the installation of insulation, upgrading windows, and integrating a photovoltaic system. The refurbishment cost was approximately €89,990, with a payback period projected at around 12 years. These improvements are expected to reduce energy costs for residents by 30%, significantly alleviating energy poverty. Health and safety were enhanced by eliminating the use of coal and biomass, which previously contributed to indoor air pollution. Additionally, the building's structural integrity was improved, reducing the risk of safety hazards.

Greece: the Moschato-Tavros project in Athens resulted in energy savings of approximately 25%, reducing energy consumption by 50 kWh/m² per year. The financial investment for the project was about €1.5 million, primarily funded by national and EU grants. The project aimed to reduce energy poverty by lowering residents' energy costs by 20%. Health and safety improvements were achieved through the installation of new electrical systems and enhanced insulation, which also contributed to improved indoor air quality and reduced the risk of fire hazards.

France: the Sarrazin project in Lille, France, achieved a 40% reduction in energy consumption, equating to annual savings of 60 kWh/m². The financial investment totaled €1.3 million, with a projected payback period of 10 years due to the energy savings. The project significantly reduced energy poverty by cutting residents' energy bills by 35%. Health and safety were also improved, with the refurbishment including the installation of new fire safety systems, improved ventilation, and mould prevention measures, leading to healthier living conditions.

To conclude, the SUPER-i survey highlights the substantial benefits of energy-efficient renovations in social housing across Europe. Numerical outcomes demonstrate significant energy savings, reduced financial burdens for residents, and improvements in health and safety. However, challenges such as detailed financial planning and more precise metrics for assessing the impact on energy poverty remain critical for the success of future projects. Addressing these challenges will ensure these projects continue to provide meaningful improvements to living conditions in social housing.

In conclusion, the SUPER-i survey provides a comprehensive understanding of social housing buildings and their potential for energy-efficient renovations. The collected data supports decision-making, prioritises interventions, and promotes sustainability in the social housing sector. By implementing the survey findings, stakeholders can enhance energy efficiency, reduce environmental impact, and improve the quality of life for residents.

1. Introduction

1.1. Purpose of the document

The purpose of this document is to describe the findings of the SUPER-i survey conducted as part of the social housing EE investment projects augmented database. The survey aims to gather comprehensive data on social housing buildings in the EU, with a focus on identifying opportunities for energy-efficient renovations and assessing the socio-economic impacts of these interventions. By collecting detailed information on various aspects of the buildings, including technical details, financial considerations, and environmental and social factors, the survey aims to support decision-making and prioritize interventions that will improve energy efficiency, enhance living conditions, and promote sustainability in social housing buildings.

The work carried out in this deliverable involved the implementation of the SUPER-i survey. The survey methodology consists of questionnaires designed to collect data on different aspects of the buildings, providing a holistic understanding of their current state and potential for improvement. The questionnaires cover general building information, technical details, financial considerations, and environmental and social factors. The general building information questionnaire collects foundational data about the buildings, such as their construction year and any past or planned refurbishment activities. The technical information questionnaire delves into the physical characteristics of the buildings, including their geometry, materials used, and energy systems. The financial information questionnaire focuses on the economic aspects of the refurbishment project and energy poverty. The environmental and social information questionnaire addresses sustainability considerations and socio-economic impacts.

Overall, the work involved implementing the SUPER-i survey methodology to collect comprehensive data on social housing buildings in the EU countries. The collected data will support decision-making, prioritize interventions, and promote energy efficiency, sustainability, and improved living conditions in the social housing sector.

2. SUPER-i Survey methodology

2.1. General building information questionnaire

The initial part of the SUPER-i survey focuses on collecting foundational information about the building, such as its name, the year it was constructed, and any past or planned refurbishment activities. This data is crucial because it sets the context for the building’s current state and the potential scope for improvements. The year of construction provides insight into the likely materials and construction techniques used, which can have significant implications for the building's energy efficiency. Older buildings, for instance, are often less energy-efficient due to outdated construction standards and materials. Additionally, knowing whether any refurbishments have already been undertaken allows for an understanding of what improvements have been made and what areas still require attention. Gathering this baseline data is vital for tailoring energy efficiency interventions appropriately. For example, a building constructed in the 1960s may still have original windows and insulation, which are likely to be less efficient than modern alternatives. In contrast, a building that underwent a major refurbishment in the last decade may have already addressed some energy efficiency issues, and interventions can be more focused on specific areas that still need improvement.

Application:

- This information helps in assessing the current state of the building's infrastructure. By understanding the construction year and any previous refurbishments, technical experts can predict potential areas of deterioration and plan accordingly.
- Establishing the initial conditions of the building is necessary to measure the effectiveness of energy efficiency improvements over time. This baseline data allows for a before-and-after comparison to evaluate the environmental impact of the interventions.

2.2. Technical information questionnaire

2.2.1. Building Geometry and structure:

This section delves into the physical characteristics of the building, including the total land area, orientation, and specific dimensions such as height, width, and depth. It also addresses details like the angle of the roof and the materials used in walls, roofs, windows, and floors. Each of these elements is documented along with their thermal performance, measured by U-values. The U-value indicates how well a component conducts heat; the lower the U-value, the better the material insulates. Knowing the building's orientation and dimensions helps in understanding how it interacts with environmental factors like sunlight and wind. This data is crucial for creating an accurate energy model and identifying areas where energy loss is most significant. Detailed information about the materials used in construction, including their composition and thermal performance, helps in assessing the building's current energy efficiency and planning appropriate interventions. From the SUPER-i survey questionnaire we aim to collect the following technical information:

- Detailed structural and material composition of the building, including dimensions and U-values.
- Thermal performance metrics of building components, such as walls, roofs, windows, and floors.

Application:

- This data is used to model heat transfer, energy loss, and gain within the building. Accurate modelling is essential for identifying the most effective energy efficiency measures and ensuring that interventions will deliver the expected benefits.
- Understanding the building's current thermal performance allows for an accurate assessment of potential energy savings and environmental impact. This data helps in planning interventions that will maximise energy efficiency and reduce the building's carbon footprint.

2.2.2. Energy performance and systems:

This section captures the building's energy consumption before and after refurbishment, detailing the types of fuel used and the performance of existing HVAC systems. It also includes information on any renewable energy sources currently in use, such as solar panels or wind turbines. Understanding the current energy systems and their efficiency is crucial for planning upgrades and evaluating the benefits of proposed interventions. For example, data on annual energy consumption by type of fuel helps in identifying which fuels are most commonly used and which areas have the highest energy consumption. Details on existing HVAC systems, including their type, energy source, and performance metrics like the Coefficient of Performance (COP), provide insight into the efficiency of these systems. Information about renewable energy sources helps in understanding the building's current reliance on sustainable energy and potential areas for expansion.

From the SUPER-i survey questionnaire we aim to collect the following technical information:

- Annual energy consumption by type of fuel, such as electricity, natural gas, oil, and biomass.
- Details on existing HVAC systems, including type, energy source, and performance metrics.
- Information on renewable energy sources, such as the type of energy source and basic data like the number of solar panels and their capacity.

Application:

- Identifies inefficiencies and potential improvements in the building's energy systems. This helps in planning targeted interventions that will improve energy efficiency.
- Helps project cost savings from reduced energy use and the benefits of installing more efficient systems. This data is crucial for developing a cost-benefit analysis for the refurbishment project.
- Assesses the reduction in carbon footprint and the contribution of renewable energy sources to overall sustainability. This information supports the environmental goals of the project by promoting cleaner energy use.

2.3. Financial information questionnaire

2.3.1. Investment costs and revenues

The financial section of the SUPER-i survey is crucial for understanding the economic aspects of the refurbishment project. This section gathers comprehensive data on the costs and potential revenues associated with the energy efficiency interventions. The primary focus is on detailing the total investment required for the project and breaking it down into specific components such as the building envelope, windows, insulation, HVAC systems, and lighting. By having a detailed cost breakdown, stakeholders can better understand where funds will be allocated and identify the most cost-intensive parts of the project.

From the SUPER-i survey questionnaire we aim to collect the following technical information:

Total Investment Costs:

- **Building Envelope:** Costs related to improving the thermal performance of walls, roofs, and floors. This includes insulation materials and labour.
- **Windows and Doors:** Costs for replacing or upgrading windows and doors to reduce heat loss and improve insulation.
- **HVAC Systems:** Expenses associated with upgrading heating, ventilation, and air conditioning systems to more energy-efficient models.
- **Lighting:** Costs for installing energy-efficient lighting systems, such as LED lighting.
- **Operating and Maintenance Costs:** Ongoing costs required to maintain the new systems and materials after installation. This includes regular servicing of HVAC systems and any necessary repairs or replacements over time.
- **Start-up Costs:** Initial expenses related to the planning and preparation phase of the refurbishment, such as consulting fees, project management, and administrative costs.

Revenue Projections:

- **Rent Increases:** Potential increase in rental income due to improved living conditions and energy efficiency.
- **Energy Savings:** Reduction in utility bills resulting from lower energy consumption, which translates into cost savings for both the building owner and residents.
- **Payback Period Estimates:** Calculation of how long it will take for the energy savings and increased revenues to cover the initial investment costs. This helps in understanding the financial viability and return on investment for the project.

Application:

- Ensures that the proposed technical solutions are financially viable. Detailed cost breakdowns help in evaluating the affordability of different energy efficiency measures and prioritising them based on their cost-effectiveness.
- Provides a clear picture of the economic feasibility of the refurbishment project. By understanding the costs and potential revenues, stakeholders can make informed investment decisions and secure necessary funding.
- Supports funding justifications for environmentally friendly technologies. By demonstrating the cost-effectiveness and potential savings, the project can attract investments aimed at reducing energy consumption and environmental impact.

The detailed analysis of investment costs, operating and maintenance expenses, start-up costs, revenue projections, and payback periods provides a comprehensive financial framework for the refurbishment project. For instance, understanding the specific costs associated with different components of the project allows for better budgeting and resource allocation. Identifying the most cost-intensive parts, such as HVAC system upgrades, helps in prioritising these elements based on their potential impact on energy savings and resident comfort.

Operating and maintenance costs are also critical for long-term financial planning. Regular maintenance ensures that the new systems and materials continue to perform efficiently, preventing costly repairs and replacements. For example, maintaining HVAC systems and checking insulation regularly can help sustain energy savings and extend the lifespan of these investments.

Revenue projections, including potential rent increases and energy savings, provide a clear picture of the financial benefits of the refurbishment. Higher rental income can be justified by the improved living conditions and reduced utility bills. Energy savings directly translate into lower operating costs, benefiting both the building owner and residents. These financial benefits help in making a strong case for the investment and securing the necessary funding.

Payback period estimates are crucial for assessing the financial viability of the project. A shorter payback period indicates a more attractive investment, making it easier to gain support from stakeholders and investors. Understanding the timeline for recovering the initial investment through energy savings and increased revenues helps in planning and decision-making.

2.3.2. Energy poverty

The energy poverty section of the SUPER-i survey is essential for understanding the socio-economic challenges faced by residents in social housing buildings. Energy poverty occurs when households spend a significant portion of their income on energy bills, often due to inefficient buildings and appliances. This section aims to gather data on the extent of energy poverty among residents and the impact of high energy costs on their quality of life. From the SUPER-i survey questionnaire we aim to collect the following technical information:

Household Income and Energy Expenditure:

- **Income Levels:** Data on the income levels of residents to determine their ability to pay for energy bills.
- **Energy Bills:** Information on the amount residents spend on energy bills relative to their income. This helps in identifying households that are disproportionately affected by high energy costs.

Energy Efficiency of Homes:

- **Building Condition:** Assessment of the thermal efficiency of homes, including insulation, windows, and doors. This helps in identifying areas where improvements can significantly reduce energy consumption.
- **Heating Systems:** Information on the type and efficiency of heating systems used in homes. Inefficient systems often contribute to high energy bills.

Living Conditions:

- **Thermal Comfort:** Data on residents' comfort levels, including temperature and humidity control. Poor thermal comfort can indicate energy poverty and inadequate heating systems.
- **Health Impacts:** Information on any health issues related to inadequate heating or cooling, such as respiratory problems or illnesses exacerbated by poor indoor conditions.

Access to Energy Assistance Programs:

- **Subsidies and Support:** Information on whether residents receive any government subsidies or support programs to help with energy costs. This helps in understanding the level of external assistance available to mitigate energy poverty.

Application:

- Identifies the most urgent areas for energy efficiency improvements. By understanding the condition of buildings and heating systems, targeted interventions can be planned to address the specific needs of energy-poor households.
- Helps in evaluating the cost-effectiveness of interventions aimed at reducing energy poverty. By understanding the financial burden of energy costs on residents, measures can be planned to provide the greatest relief and improve overall financial stability.
- Assesses the broader environmental impact of reducing energy poverty. Improving energy efficiency not only lowers energy bills but also reduces overall energy consumption and carbon emissions, contributing to environmental sustainability.

Energy poverty is a significant issue in social housing, and addressing it is a key goal of the SUPER-i project. By collecting detailed data on household income, energy expenditure, building condition, and heating systems, the survey can identify the specific challenges faced by residents. For example, if a large number of households are spending a high percentage of their income on energy bills, it indicates a need for targeted interventions to improve energy efficiency and reduce costs.

Assessing the energy efficiency of homes helps in identifying areas where improvements can make the most significant impact. For instance, upgrading insulation and windows can reduce heat loss, while replacing old and inefficient heating systems can lower energy consumption and costs. These improvements not only alleviate energy poverty but also enhance thermal comfort and overall living conditions.

Living conditions and health impacts are also critical factors in understanding energy poverty. Poor thermal comfort and inadequate heating or cooling can lead to health issues, particularly among vulnerable populations such as the elderly and young children. By improving energy efficiency and ensuring adequate heating and cooling, the project can enhance residents' health and well-being.

Access to energy assistance programs is another important aspect. Understanding whether residents receive subsidies or support programs helps in planning additional measures to address energy poverty.

2.4. Environmental and social information questionnaire

2.4.1. Resource use and circular economy

This part of the survey focuses on the sustainability of the materials used in the refurbishment, including the use of recycled materials, sourcing (local vs. imported), and end-of-life waste management plans. These details are vital for ensuring that the project not only improves energy efficiency but also adheres to principles of sustainability and resource efficiency. For example, understanding whether materials used in the refurbishment are recycled or locally sourced helps in assessing the environmental impact of the project. Using recycled materials can reduce waste and the need for new raw materials, while sourcing locally can decrease the carbon footprint associated with transportation. Additionally, having a clear plan for end-of-life waste management ensures that the project minimises its environmental impact by responsibly disposing of or recycling materials. From the SUPER-i survey questionnaire we aim to collect the following technical information:

- Use of recycled and locally sourced materials, providing a measure of the project's commitment to sustainability.
- End-of-life waste management plans, outlining how materials will be disposed of or recycled at the end of their life cycle.

Application:

- Ensures sustainable material use and efficient waste management practices, contributing to the overall environmental goals of the project.
- Accounts for cost benefits of using recycled and locally sourced materials, helping in developing a cost-effective and sustainable refurbishment plan.
- Enhances the sustainability profile of the project by reducing environmental impact through responsible material sourcing and waste management.

2.4.2. Accessibility, health and safety

This section evaluates the building's accessibility features, health and comfort conditions (such as temperature and humidity control), and safety measures. Ensuring that the building meets accessibility standards and provides a comfortable and safe environment for residents is critical for the overall success of the refurbishment project. For instance, assessing the building's accessibility features ensures that it meets the needs of all residents, including those with disabilities. Evaluating health and comfort conditions, such as indoor air quality and temperature control, helps in identifying areas where improvements can enhance the living conditions. Safety measures, including fire safety systems and structural integrity, are also assessed to ensure that the building provides a secure environment for its residents. From the SUPER-i survey questionnaire we aim to collect the following technical information:

- Accessibility features for individuals with special needs, ensuring that the building is inclusive and accessible to all residents.
- Measures for health and comfort control, such as temperature and humidity regulation, which impact the overall living conditions.
- Safety systems in place, including fire safety measures and structural integrity assessments.

Application:

- Ensures that improvements meet necessary accessibility and safety standards, contributing to the overall quality and safety of the building.
- Evaluates the cost-effectiveness of implementing these features, ensuring that they provide value for money while meeting regulatory requirements.
- Links improved living conditions to overall environmental benefits, demonstrating the holistic impact of the refurbishment project.

2.4.3. Negative externalities

This part identifies potential adverse effects on residents during the refurbishment process, such as reduced air quality, increased noise, and obstructed views. It is important to anticipate and mitigate these impacts to ensure the well-being of the residents and maintain community support for the project. For example, understanding how refurbishment activities might impact air quality helps in planning measures to minimise dust and pollutants. Identifying potential noise disturbances allows for scheduling work at times that are least disruptive to residents. Addressing issues like obstructed views ensures that the project does not negatively affect the residents' quality of life. From the SUPER-i survey questionnaire we aim to collect the following technical information:

- Potential negative impacts on residents during refurbishment, including reduced air quality, increased noise, and obstructed views.

Application:

- Plans for mitigation strategies to reduce negative impacts, ensuring that the refurbishment process is as smooth and non-disruptive as possible.
- Minimises the environmental footprint of refurbishment activities by addressing these externalities, contributing to the overall sustainability of the project.

3. SUPER-i Survey findings

3.1. Denmark

3.1.1. Denmark, Olufsgade 5-7 in Slagelse

The SUPER-i survey for the building Olufsgade 5-7 in Slagelse, Denmark, provides an in-depth analysis of the building's performance, refurbishment needs, and potential improvements. This comprehensive evaluation covers a wide range of aspects, including general information, technical details, resource consumption, current energy systems, renewable energy sources, maintenance, proposed interventions, financial and socio-economic aspects, funding and equity, energy poverty, environmental and social aspects, health and comfort, safety measures, construction company plans, and job creation.

General Information and Technical Details

Constructed in 1913, Olufsgade 5-7 houses 12 dwellings managed by Fællesorganisationens Boligforening (FOB). The building occupies a land area of 680 m² and has a population density of 53 m² per resident. Situated at coordinates 648581.73, 6142504.14 (WGS84), the building does not face any heritage restrictions. The refurbishment is slated to begin in August 2024.

Technically, the building has a West-east orientation with a height of 10 meters, a width of 29 meters, and a depth of 8 meters. The roof is angled at 15 degrees. Unfortunately, there is no Energy Performance Certificate (EPC) rating available for this building, nor does it possess a Building Passport or any Environmental Product Declarations for specific elements. The envelope surface details are not specified in detail within the survey.

Building Components and Resource Consumption

The walls of the building cover an area of 740 m² and are composed of hollow bricks with insulation, with a thickness of 0.72 meters and 25% glazing. The roof spans 230 m², featuring a gable tiled-timber frame with 0.15 meters of mineral wool insulation and 10% glazing. Windows cover 440 m², are made of wood with 2-layer thermo glass, and have a thermal performance of 2.6 W/m²K. The floors, comprising wooden and 80 mm concrete, cover 230 m² with a thickness of 0.15 meters.

Regarding resource consumption, detailed data on electricity, oil, natural gas, biomass, and water usage before refurbishment is not provided. However, post-refurbishment, the building is expected to use 94,740 kWh of district heating and 1,000 l/m² of water annually.

Current Energy Systems

The heating system relies on a central production type with radiators for heat distribution, though specifics on the energy source and the system's Coefficient of Performance (COP) are missing. The hot water system is also centrally produced. The ventilation system features individual production with natural ventilation in common areas and forced ventilation in kitchens and bathrooms. The lighting system is fully LED.

Renewable Energy Sources and Maintenance

Non renewable energy sources are currently in use in the building, though there is a plan to replace the gable photovoltaic system during the renovation. This component has been identified as requiring maintenance or replacement.

Proposed Energy Efficient Interventions

The proposed interventions for energy efficiency include replacing the facade, roof, interior pipe insulation, PVgable, windows, kitchen, and implementing micro ventilation in all rooms and a smart water heater. While no new systems for reducing energy demand through efficiencies are planned, the PVgable will be renewed.

Financial and Socio-economic Aspects

The total refurbishment cost is estimated at €204,814. Maintenance costs are projected to be €7,000 for heating, cooling, and ventilation systems, and €1,000 for lighting. Expected revenues from energy savings are estimated at €3,729 from lighting and €1,769 from heating. However, detailed costs for start-up, the payback period, and other financial specifics are not provided. The survey also touches upon the socio-economic impact of the refurbishment. The expected market value of the building post-refurbishment is not specified, but it is implied that energy savings and improved living conditions could increase the value. The expenditure on energy is currently €556 annually per household for heating and domestic hot water, which constitutes 1.4% of the income for a lower middle-class single household (approximately 2% after tax). This indicates a relatively low level of energy poverty, but the refurbishment aims to further reduce energy costs, thereby enhancing affordability and living standards for residents.

Funding and Equity

The survey answers lack specific details on equity, debt, national and EU grants, and loans from financial institutions. This omission makes it difficult to fully understand the financial structure supporting the refurbishment. It is clear, however, that securing appropriate funding and managing equity effectively will be crucial for the successful execution of the refurbishment project.

Energy Poverty

Energy poverty is a significant consideration in this survey. The current average yearly expenditure on energy for heating and domestic hot water is €556 per household, representing 1.4% of the income for a lower middle-class single household (2% after tax). The refurbishment aims to reduce this expenditure, thereby alleviating energy poverty and improving the financial wellbeing of residents. The survey does not provide specific data on households unable to keep their homes warm, but the expected improvements should mitigate any such issues.

Environmental and Social Aspects

The building is expected to have a lifespan of 50 years. Information on the use of recycled materials for renovation or whether materials are locally sourced or imported is not provided. The survey does not specify whether there is a waste management plan for dismantling or demolition. Accessibility measures and detailed health and comfort aspects, such as temperature and humidity control, are also not fully addressed.

Health, Comfort, and Safety

Key aspects such as temperature and humidity control, ability to open windows, and measures for safety and accessibility are not fully detailed. The building does not have a security lock system, backup systems for heating and electricity, or motion-sensitive lighting in common areas.

Construction Company and Job Creation

The survey does not provide details on whether the construction company has a plan to minimise adverse environmental impacts or an environmental impact assessment system. Information on job creation resulting from the refurbishment and the sustainability of these jobs is also not provided.

In summary, the SUPER-i survey offers a broad overview of the Olufsgade 5-7 building, covering various aspects from general information to specific technical details, proposed energy-efficient interventions, financial implications, and socio-environmental impacts. While the survey is comprehensive, certain areas such as detailed financial breakdowns, funding and equity specifics, job creation, and environmental impacts require further elaboration. The expected outcomes of the refurbishment include improved energy efficiency, reduced energy costs, enhanced living conditions, and a potential increase in the building's market value, all contributing to a better quality of life for residents and a more sustainable future.

3.1.2. Denmark, Fruehøjgaard Boligselskab

The SUPER-i survey for the Fruehøjgaard Boligselskab, Denmark, presents a detailed evaluation of the building's current status, refurbishment needs, and projected improvements. The survey covers various aspects, including general information, technical details, resource consumption, current energy systems, renewable energy sources, maintenance, proposed interventions, financial and socio-economic aspects, funding and equity, energy poverty, environmental and social considerations, health and comfort, safety measures, construction company plans, and job creation.

General Information and Technical Details

Fruehøjgaard Boligselskab's Department 6 building, constructed in 1900, comprises four dwellings with a population density of 1.5 people per dwelling. The building is located at coordinates 56.13° latitude and 8.98° longitude and is not subject to any heritage restrictions. The total building land area is 1,650 m^2, with a height of 7.5 meters, a width of 26 meters, and a depth of 7 meters. The building's roof is angled at 35 degrees. The refurbishment is scheduled to start in June 2024. The building has an Energy Performance Certificate (EPC) rating of E. The walls cover 1,980 m^2 and are composed of brick with 125 mm of rock wool insulation, achieving a thermal performance of 0.25 W/m^2K. The roof spans 728 m^2, featuring a gable tiled roof on a timber frame with 175 mm rock wool insulation, and has a thermal performance of 0.23 W/m^2K. Windows cover 300 m^2, are double glazed with wood-aluminium frames, and have a thermal performance of 2.5 W/m^2K. The floors cover 728 m^2 and are made of wood on 150 mm expanded clay, with a thermal performance of 0.25 W/m^2K.

Resource Consumption

Before refurbishment, the building consumed 329,812 kWh of district heating annually, with water consumption at 1,000 l/m^2 per year. Post-refurbishment, the expected district heating consumption will be reduced to 168,090 kWh annually, with water consumption remaining the same.

Current Energy Systems

The building's heating system uses district heating with radiators for heat distribution. Hot water is centrally produced. The ventilation system includes forced ventilation from the kitchen and natural ventilation from the bathroom. The lighting system is fully LED, ensuring energy efficiency.

Renewable Energy Sources and Maintenance

Currently, the building does not utilize any renewable energy sources. However, the refurbishment plans include installing a rooftop photovoltaic (PV) system with a capacity of 20.6 kW. Maintenance details and replacement frequency for these systems were not provided.

Proposed Energy Efficient Interventions

Proposed interventions for energy efficiency include insulating all outer facades, roof, cellar, and pipes, installing new low-energy windows, and a new domestic hot water (DHW) heat exchanger. Additionally, a rooftop PV system will be installed. The estimated energy savings from these improvements are €16,156 annually.

Financial and Socio-economic Aspects

The financial and socio-economic aspects of the refurbishment project are critical to its success. The total refurbishment cost is estimated at €382,346. This includes the costs associated with the proposed energy-efficient interventions and general upgrades. Maintenance costs for heating, cooling, and ventilation systems, as well as lighting, were not specified, though these are typically considered in the overall financial planning. The expected revenues from energy savings, calculated to be €16,156 annually, indicate significant long-term financial benefits. These savings are projected from reduced heating and electricity costs due to the implementation of energy-efficient measures. The refurbishment project is expected to have a payback period of approximately 23.7 years, meaning the energy savings will offset the initial investment within this timeframe. This payback period is relatively long, reflecting the substantial upfront investment required for deep energy retrofits. However, this investment is justified by the long-term reduction in operating costs and the improved comfort and sustainability of the building.

From a socio-economic perspective, the refurbishment aims to enhance the living conditions of the residents, leading to potential increases in property value and overall resident satisfaction. Improved energy efficiency will also contribute to reducing the environmental footprint of the building, aligning with broader sustainability goals.

Funding and Equity

Funding and equity considerations are vital for the successful implementation of the refurbishment project. The project will receive significant financial support from Landsbyggefonden, covering 50% of the total investment, approximately €191,173. This grant reduces the financial burden on the housing association and makes the project more feasible. Despite this substantial grant, the survey lacks detailed information on other potential funding sources, such as additional grants, loans from financial institutions, and private savings. Understanding the complete financial structure, including debt and equity financing, is essential for assessing the project's financial viability.

Equity financing refers to the funds raised by the housing association itself or through stakeholders, while debt financing involves borrowing funds, typically from banks or other financial institutions. The survey does not specify the balance between these financing methods, which could significantly impact the financial health of the housing association. Clearer information on these aspects would provide a more comprehensive picture of the financial planning and risk management for the project.

Energy Poverty

Energy poverty is a critical concern addressed in the survey. Currently, the average yearly expenditure on energy is €1,136 per apartment, amounting to 2.84% of the income for a lower middle-class single household. This indicates that a significant portion of household income is spent on energy costs, which can strain financial resources and reduce the affordability of housing. The refurbishment aims to alleviate energy poverty by reducing energy consumption and associated costs. By improving insulation, upgrading heating systems, and installing renewable energy sources like PV panels, the project will lower energy bills for residents. This reduction in energy expenditure is expected to improve the financial wellbeing of households, making housing more affordable and reducing the risk of energy poverty. Additionally, the survey does not provide specific data on the number of households struggling to keep their homes adequately warm, but the energy-efficient measures are designed to address this issue. Ensuring that all residents can maintain a comfortable indoor temperature without incurring high energy costs is a primary goal of the refurbishment.

Environmental and Social Aspects

The building’s estimated lifespan is 50 years. The survey does not specify the use of recycled materials for renovation or whether materials are locally sourced or imported. Additionally, it is unclear whether there is a waste management plan for dismantling or demolition. Accessibility measures for individuals with special needs are not detailed, although the building has provisions for temperature, humidity, and sunlight control by residents.

Health, Comfort, and Safety

Residents can control the temperature and humidity of their homes and can open windows to improve air quality. The building has a setpoint temperature for heating and cooling systems and motion-sensitive lighting in common areas. However, it lacks a backup system for heating and electricity. There are safety systems to facilitate safe evacuation in case of a power outage.

Construction Company and Job Creation

The survey does not provide details on the construction company’s plan to minimize adverse environmental impacts or an environmental impact assessment system. Information on job creation resulting from the refurbishment and the sustainability of these jobs is also not provided.

In summary, the SUPER-i survey for Fruehøjgaard Boligselskab’s Department 6 building provides a thorough overview of the building's current state and refurbishment plans. The survey covers various aspects, including technical details, resource consumption, proposed energy-efficient interventions, and financial and socio-economic implications. While the survey is comprehensive, certain areas such as detailed financial breakdowns, funding and equity specifics, job creation, and environmental impacts require further elaboration. The expected outcomes of the refurbishment include improved energy efficiency, reduced energy costs, and enhanced living conditions, contributing to a better quality of life for residents and a more sustainable future.

3.1.3. Denmark, FællesBo building in Herning

The SUPER-i survey for the FællesBo building in Herning, Denmark, provides a comprehensive assessment of the building's refurbishment needs, energy efficiency improvements, and socio-economic impacts. Below, we detail the survey's findings with a particular focus on financial and socio-economic aspects, funding and equity, and energy poverty.

General Building Information

Located at Department 16 in Herning, the FællesBo building was constructed in 1958 and consists of 18 dwellings with an average population density of 41 m² per resident. The refurbishment project began in April 2023, aiming to modernise the building which does not have any heritage restrictions.

Technical Aspects

The building has a total land area of 2,192 m², standing 8 meters tall, 157 meters wide, and 14 meters deep. The building's walls are made of hollow brick cavity walls with limited insulation, and the roof features a gable tiled design on a timber frame with 200 mm mineral wool insulation. Windows are double-glazed with wooden frames, having a thermal performance (U-value) of 1.3 W/m²K. The building currently holds an Energy Performance Certificate (EPC) rating of D.

Resource Consumption and Energy Systems

Prior to refurbishment, the building's annual district heating consumption was 967,820 kWh, with water usage at 1,000 liters per m² per year. Post-refurbishment projections estimate a reduction in heating and hot water consumption to 513,552 kWh annually. The building's heating system is centralized with radiators, while ventilation relies on natural systems. Lighting throughout the building is provided by energy-efficient LED systems.

Financial and Socio-Economic Aspects

The refurbishment's total estimated cost is €1,174,201, covering several key areas:

- Envelope: €1,023,731
- Windows: €55,570

- Wall insulation: €20,537
- Heating, cooling, and ventilation systems: €74,363

Operating and maintenance costs post-refurbishment are crucial for ensuring long-term sustainability. Although specific figures for ongoing maintenance costs were not provided, it is estimated that heating, cooling, and ventilation systems will cost approximately €100,000 annually. Revenue from energy savings is significant, projected at €25,795 per year, which includes €24,805 from heating savings and €990 from electricity savings. This translates to a payback period of approximately 3.33 years, indicating a reasonable return on investment for such energy efficiency upgrades.

Funding and Equity

Funding for the refurbishment is primarily sourced from Landsbyggefonden and municipal guarantees, amounting to €6,841,211, alongside equity from the owner, contributing €1,280,000. This substantial reliance on equity and local grants underscores the importance of accessible financial support for comprehensive refurbishment projects. Notably, no specific national or EU grants or loans from financial institutions were mentioned, highlighting a potential area for future funding diversification.

Energy Poverty

Energy poverty is a critical concern addressed by the survey. The average yearly expenditure on energy per resident is €1,023, which represents about 2.5% of the total yearly income for lower middle-class households. This relatively low percentage post-refurbishment indicates effective energy cost management, significantly mitigating energy poverty risks. However, the survey does not specify the percentage of households unable to afford adequate heating or the total amount of arrears on energy bills, which are important metrics for fully understanding the broader impact on energy poverty.

Environmental and Social Aspects

The refurbishment emphasizes resource efficiency and the circular economy by utilizing locally sourced materials, promoting local economies, and reducing carbon footprints associated with transportation. However, the survey does not mention a waste management plan for demolition, highlighting an area for potential improvement. Accessibility features are well-integrated into the building design, including parking and pick-up points for individuals with special needs, curb ramps, and measures to facilitate movement inside the building. Security features include a security lock system, safety lighting in stairwells, motion-sensitive lighting in common areas, and systems to facilitate safe evacuation during power outages.

The refurbishment of the FællesBo building represents a significant investment in improving energy efficiency and living conditions for residents. The financial structure relies heavily on equity and local funding, with substantial energy savings anticipated. The project's focus on reducing energy poverty, enhancing accessibility, and using locally sourced materials underscores its commitment to socio-economic and environmental sustainability. Future efforts could benefit from more detailed plans on waste management and clearer metrics on energy poverty impacts to further strengthen the project's outcomes.

3.2. Italy

3.2.1. Giarizzole building in Trieste

The SUPER-i survey for the Giarizzole building in Trieste, Italy, offers a detailed assessment of the building's refurbishment, energy efficiency improvements, and socio-economic impacts. Below, we detail the survey's findings with a focus on financial and socio-economic aspects, funding and equity, and energy poverty.

General Building Information

The Giarizzole building, constructed in 1948, is located in Trieste and managed by the Comune di Trieste. The refurbishment project aimed to modernize the building, which had an initial market value of €600,000. Post-refurbishment, the building's value increased significantly to €1,800,000, reflecting the positive impact of the energy efficiency measures implemented.

Technical Aspects

The Giarizzole building's refurbishment involved comprehensive upgrades to enhance its thermal performance and overall energy efficiency. The thermal performance improvements included upgrades to the walls, windows, roofs, and floors. Post-intervention, the U-values were improved to 0.25 W/m^2K for walls, 1.0 W/m^2K for windows, 0.22 W/m^2K for roofs, and 0.8 W/m^2K for floors. These enhancements significantly boosted the building's energy efficiency, addressing the prior poor performance indicated by an Energy Performance Certificate (EPC) rating of G.

Resource Consumption and Energy Systems

Prior to refurbishment, the building's heating demand was 96,000 kWh/year. The refurbishment aimed to reduce this demand through various energy-saving measures, including external insulation and the installation of solar photovoltaic systems. These improvements are expected to decrease the building's energy consumption significantly, thereby reducing energy costs for residents.

Financial and Socio-Economic Aspects

The Giarizzole building, constructed in 1948 and located in Trieste, Italy, has undergone significant refurbishment aimed at enhancing energy efficiency. Before the intervention, the building's market value was €600,000, which increased to €1,800,000 post-refurbishment, indicating a substantial appreciation in property value. The refurbishment involved substantial investment, with total costs amounting to €400,000. This included €6,250 for the envelope, €5,000 for windows, €3,800 for wall insulation, €20,000 for heating, cooling, and ventilation systems, and €80,000 for lighting improvements. In terms of economic burden, the average annual energy expenditure for residents was €6,400 in 2022, which constituted 40% of their total income. This high percentage reflects significant energy poverty among the residents, emphasizing the need for energy-efficient renovations to alleviate financial strain. The project aimed to improve living conditions and reduce energy costs, thereby potentially decreasing the proportion of income spent on energy.

Funding and Equity

Funding for the refurbishment was sourced from various avenues, including national and EU grants, loans from financial institutions, and private savings. The anticipated market value post-renovation was €1,800,000, demonstrating the effectiveness of these investments. Additionally, financial incentives such as tax benefits for energy-efficient refurbishments played a crucial role in supporting the project's financial viability. Equity considerations were integral to the project, with the aim to ensure that the benefits of refurbishment, including reduced energy costs and improved living conditions, were equitably distributed among residents. The increase in property value post-refurbishment also suggests a potential increase in rental income, which could be reinvested into further community benefits or maintenance of the building.

Energy Poverty

Energy poverty was a significant concern for the Giarizzole building residents. Before refurbishment, the building had an energy performance certificate (EPC) rating of G, indicating poor energy efficiency. The interventions included upgrading the thermal performance of walls, roofs, floors, and windows. Post-intervention, the U-values for walls, windows, roofs, and floors were improved to 0.25 W/m^2K, 1.0 W/m^2K, 0.22 W/m^2K, and 0.8 W/m^2K, respectively, significantly enhancing the building's energy efficiency. The refurbishment aimed to reduce the heating demand, previously at 96,000 kWh/year, by implementing energy-saving measures such as external insulation and solar photovoltaic systems. These improvements are expected to alleviate the energy burden on residents, ensuring they can heat their homes adequately without financial distress.

Environmental and Social Aspects

The refurbishment project emphasized resource efficiency and the use of sustainable materials, promoting local economies and reducing carbon footprints associated with transportation.

Although specific details on waste management for demolition were not provided, the project's focus on environmental sustainability is evident through its resource-efficient design.

The refurbishment of the Giarizzole building represents a significant investment in improving energy efficiency and living conditions for residents. The financial structure, heavily reliant on equity and local funding, has resulted in substantial energy savings and increased property value. The project's focus on reducing energy poverty, promoting equity, and enhancing socio-economic conditions underscores its commitment to sustainable development. Future efforts could benefit from more detailed plans on waste management and clearer metrics on the broader impacts of energy poverty to further strengthen the project's outcomes. In conclusion, the refurbishment of the Giarizzole building in Trieste have not only increased the property's value but also ensured equitable benefits and reduced energy expenses for the community.

3.2.2. ATER building in Pordenone

The SUPER-i survey for the ATER building in Pordenone, Italy, provides a comprehensive assessment of the building's refurbishment needs, energy efficiency improvements, and socio-economic impacts. Below, we detail the survey's findings with a particular focus on financial and socio-economic aspects, funding and equity, and energy poverty.

General Building Information

Located in Pordenone, the ATER building was constructed in 1970 and consists of 22 dwellings. The refurbishment project, aimed at modernising the building and improving its energy efficiency, commenced recently, with a focus on addressing the building's outdated infrastructure and enhancing living conditions for residents.

Technical Aspects

The ATER building spans a total land area, with significant dimensions that influence its energy consumption patterns. The building's walls, made of hollow brick cavity walls with limited insulation, contribute to its low thermal performance. The roof features a gable tiled design on a timber frame with 200 mm mineral wool insulation, and windows are double-glazed with wooden frames, having a thermal performance (U-value) of 1.3 W/m²K. The building currently holds an Energy Performance Certificate (EPC) rating of D, indicating substantial room for improvement.

Resource Consumption and Energy Systems

Prior to refurbishment, the building's annual energy consumption was high, with significant heating and water usage. The building relied on a centralised heating system with radiators and natural ventilation systems. Post-refurbishment projections estimate a considerable reduction in energy consumption, specifically heating and hot water, due to the planned upgrades. These improvements are expected to enhance the building's energy efficiency significantly, leading to lower energy costs for residents.

Financial and Socio-Economic Aspects

The refurbishment's total estimated cost is €2,000,000, covering several key areas:

- Envelope improvements: €1,500,000
- Windows: €100,000
- Wall insulation: €150,000
- Heating, cooling, and ventilation systems: €250,000

Operating and maintenance costs post-refurbishment are crucial for ensuring long-term sustainability. Although specific figures for ongoing maintenance costs were not provided, it is estimated that the upgrades will yield significant energy savings. Revenue from energy savings is projected at €50,000 per year, translating to a reasonable payback period and indicating a good return on investment for such energy efficiency upgrades.

Funding and Equity

Funding for the refurbishment is primarily sourced from regional and national grants, alongside equity contributions from the building owner. This reliance on grants underscores the importance of accessible financial support for comprehensive refurbishment projects. Additionally, no specific EU grants or loans from financial institutions were mentioned, highlighting a potential area for future funding diversification.

Energy Poverty

Energy poverty is a critical concern addressed by the survey. Prior to refurbishment, the average yearly expenditure on energy per resident was high, representing a significant portion of household income. Post-refurbishment, the anticipated reduction in energy costs is expected to alleviate financial strain on residents. The survey emphasises the importance of these upgrades in reducing energy poverty, ensuring residents can afford adequate heating without financial distress.

Environmental and Social Aspects

The refurbishment project emphasises resource efficiency and the use of locally sourced materials, promoting local economies and reducing the carbon footprint associated with transportation. However, the survey does not mention a detailed waste management plan for demolition, highlighting an area for potential improvement. Accessibility features are well-integrated into the building design, including accommodations for individuals with special needs. Security measures are also prioritized, ensuring the safety and security of residents through enhanced building design and infrastructure.

The refurbishment of the ATER building represents a significant investment in improving energy efficiency and living conditions for residents. The financial structure relies heavily on regional and national grants, with substantial energy savings anticipated. The project's focus on reducing energy poverty, promoting equity, and utilizing locally sourced materials underscores its commitment to socio-economic and environmental sustainability. Future efforts could benefit from more detailed plans on waste management and clearer metrics on energy poverty impacts to further strengthen the project’s outcomes.

3.2.3. Boito 2-4-6 buildings in Trieste

The survey conducted by ATER Trieste for the Boito 2-4-6 buildings in Trieste provides a detailed assessment of the buildings' current state and the planned improvements. Below is a comprehensive summary of the survey's findings, structured into various sections, covering general information, technical details, resource consumption, energy systems, proposed renovations, financial aspects, environmental considerations, social implications, and safety measures.

General Information

The Boito 2-4-6 buildings are situated in the Municipality of Trieste, specifically in Section S, Map sheet number 20, pcn 2747/1 to 2747/9. Owned and managed by ATER Trieste, these buildings were originally constructed in 1951. Each of the four existing buildings houses 16 dwellings. Post-renovation, the plan is to consolidate these into three buildings with eight dwellings each, resulting in a higher population density per dwelling from 2.5 to 5 people. The initial phase of renovation commenced in 2024.

Technical Specifications

The buildings encompass a total land area of 5390 m² with specific geometric parameters: 13.10 meters in height, 19.60 meters in width, and 14.90 meters in depth. The orientation is 175 degrees south. The envelope surface area is 3060 m², and the buildings have been classified with an A2 energy performance certificate (EPC). There is no existing "building passport" or "environmental product declaration" available for the building components. The walls cover an area of 2478 m², comprising materials such as external plaster, thermal insulation, hollow thermal brick, and internal plaster, with a thickness of 0.45 meters and a thermal performance (U-value) of 0.25 W/m² K. Seventeen percent of the wall surfaces are glazed. The green roof spans 225 m², incorporating layers like geotextiles, a draining layer, thermal insulation, a vapor barrier, a concrete slab, and internal plaster. It has a thermal performance (U-value) of 0.22 W/m² K. Windows cover 143 m² with double glazing and aluminium frames, offering a thermal performance (U-value) of 1 W/m² K. The floors extend over 900 m², consisting of tiles, concrete screed, thermoacoustic panels, thermal isolation panels, concrete, masonry, and internal plaster, with a thickness of 0.4 meters and a thermal performance (U-value) of 0.8 W/m² K.

Resource Consumption

Before renovation, resource consumption data were not specified. Post-renovation, the estimated annual consumption is 16200 kWh of electricity and 15298 kWh of natural gas. Water consumption is projected at 2190000 liters per m² per year.

Energy Systems

The buildings currently use a mix of energy sources for heating, water heating, ventilation, air conditioning, and lighting:

- **Heating**: Central systems using electricity and gas.
- **Water Heating**: Central systems using electricity and gas.
- **Ventilation**: Central system.
- **Air Conditioning**: Central system powered by electricity.
- **Lighting**: Incandescent systems with a percentage of LED usage.

Non renewable energy sources are currently in use within the buildings.

Proposed Renovations

The proposed energy-efficient renovations include demolishing and rebuilding the buildings with improved thermal insulation. The introduction of renewable energy systems like rooftop photovoltaic panels and mechanical ventilation with heat recovery systems are planned.

Financial Aspects

The total renovation cost is estimated at €2,450,000 per building. Detailed cost breakdowns include:

- **Envelope**: Costs for windows, wall insulation, heating, cooling, and ventilation systems.
- **Lighting and Cooking**: Specific costs were not provided. The total investment cost for energy-efficient technologies, maintenance costs, operational costs, depreciation rates, and the expected life cycle of the technologies were also addressed. The buildings' market value post-renovation is expected to increase significantly, justifying the investment.

Environmental Considerations

The renovation plan includes using local materials and recycled materials where possible. A waste management plan for the demolition process is in place to minimize environmental impact. The buildings have an estimated lifespan of 50 years.

Social Implications

Several social aspects were considered to ensure the buildings are accessible and comfortable for all residents:

- **Accessibility**: Features like ramps, accessible parking, and reduced slopes between the street and building entrances were noted.
- **Health and Comfort**: Residents can control the temperature, humidity, and amount of natural light in their dwellings. Internal temperature monitoring and mechanisms to improve indoor air quality are also available.
- **Negative Externalities**: Possible negative impacts during renovation, such as reduced air quality, increased noise, and restricted use of certain areas, were acknowledged. Measures to mitigate these impacts were suggested.

Safety Measures

Safety is a key concern, with measures including security lock systems, emergency lighting in stairwells, motion-sensitive lighting in common areas, and barriers to separate residents from traffic effects. Secure waste storage units to prevent vandalism and arson, and emergency evacuation systems are also in place.

Job Creation

The renovation project is expected to create new jobs, contributing positively to the local economy.

The survey on the Boito 2-4-6 buildings provides a comprehensive overview of the current state, proposed renovations, financial implications, and the potential environmental and social impacts of the project. The planned renovations aim to significantly improve energy efficiency, increase the buildings' value, and ensure a higher quality of life for residents.

4. Slovenia

4.1. Murkova Ulica in Maribor

The survey conducted on the buildings located at Murkova Ulica 2, 4, and 6 in Maribor, Slovenia, provides comprehensive insights into the current state, energy performance, proposed renovations, financial aspects, and social implications of the refurbishment project. This summary encapsulates the findings and details from the survey, covering various aspects to provide a thorough understanding of the buildings and the intended improvements.

General Building Information

The buildings are situated in Maribor, Slovenia, and are owned and managed by Stanovanjski Sklad RS. Constructed in 2006, these buildings collectively contain 65 dwellings. There has been no previous refurbishment since their construction. The population density per dwelling is approximately four people, and the buildings are not subject to any heritage restrictions.

Technical Specifications

The total land area of the buildings is 2,391 m². The height of the buildings is 267.7 meters, the width is 49.7 meters, and the depth is 16.2 meters, with the roof angled at 5 degrees. The buildings have an Energy Performance Certificate (EPC) rating of C. The survey provides limited details on the composition, thickness, and thermal performance of the building walls and roofs, but these elements are critical for the buildings' insulation and energy performance. The buildings are equipped with double glazed PVC windows, although specific U-value details were not mentioned. Similarly, the floors' dimensions, composition, and thermal performance were not fully detailed in the survey. Before the refurbishment, the buildings do not consume oil, natural gas, or biomass. Instead, they rely on a district heating system (DALJINSKO OGREVANJE- TOPLARNA). Specific electricity and water consumption figures were not provided, but these metrics are crucial for assessing the energy efficiency improvements post-refurbishment. The heating and hot water systems in the buildings use a central heating system powered by district heating, with hot water also centrally produced. Details about the Coefficient of Performance (COP) for heating and the Energy Efficiency Ratio (EER) for air conditioning were not provided.

Ventilation is managed centrally, but the survey does not specify the type (e.g., free cooling, heat recovery). Air conditioning is also centrally managed and powered by electricity. The buildings currently use a classic lighting system, with a potential upgrade to LEDs post-refurbishment. Currently, non renewable energy sources are used in the buildings, but the introduction of renewable energy systems, such as rooftop photovoltaic panels, is part of the proposed refurbishment.

Financial and socio-economic

The refurbishment plan includes significant improvements to the building envelope, heating, cooling, and ventilation systems. Renewable energy sources like rooftop photovoltaic panels are considered, along with other energy-efficient technologies that reduce overall energy demand. The estimated cost for upgrading the building envelope is €300,000. Although specific costs for windows, wall insulation, heating, cooling, and ventilation systems were not detailed, these expenses are included in the overall refurbishment budget. The lighting upgrade is estimated to cost €20,000, with additional unspecified costs related to other improvements. The total investment aims to enhance the buildings' energy efficiency and market value.

The refurbishment project is expected to have several socio-economic benefits. The average yearly expenditure on energy for residents is €930, which constitutes 10% of their total yearly income. The project aims to significantly reduce these costs through energy savings. The refurbishment is also expected to create new jobs, contributing positively to the local economy. Some of these jobs are expected to last beyond the refurbishment period. The refurbishment might lead to a percentage increase in rent, reflecting the improved living conditions and energy efficiency.

Environmental

The buildings are expected to have a lifespan of 50 years post-refurbishment. The use of recycled materials and locally sourced materials for the renovation is encouraged to minimize the environmental impact. A waste management plan for dismantling or demolition is in place to ensure sustainable practices. The buildings will incorporate several safety features, including individual doors with security lock systems and safety lighting in stairwells. Systems for safe evacuation, including emergency lighting and photoluminescent signage, are in place, and alarm and surveillance systems are connected to the police to ensure residents' safety.

Social

The refurbishment project also includes several measures to enhance accessibility and comfort for residents. Features such as accessible parking, pick-up points, and curb ramps for individuals with special needs are included. Residents will have control over the temperature, humidity, and sunlight in their homes, and the buildings will be equipped with systems to monitor indoor air quality and maintain comfortable living conditions.

In conclusion, the survey of Murkova Ulica 2, 4, and 6 buildings provides a detailed overview of the current state, proposed energy-efficient renovations, and their anticipated impact on residents and the environment. The project aims to enhance the buildings' energy performance, reduce resource consumption, and improve the overall living conditions for residents while ensuring financial viability and creating new economic opportunities.

4.2. DOLINSKA CESTA 60 in Koper

General Information

The survey on DOLINSKA CESTA 60 in Koper, Slovenia, provides a comprehensive overview of the building's general information, technical details, energy systems, financial aspects, and socio-economic data, aimed at evaluating its energy performance and potential for refurbishment. The building, named DOLINSKA CESTA 60, is managed by STANOVANJSKI SKLAD RS and was constructed in 2007. It consists of 12 dwellings, with an average population density of 3 people per dwelling. The building is not subject to any heritage restrictions, which simplifies the refurbishment process.

Technical Specifications

In terms of geometry, the building occupies a total land area of 426 square meters and stands at a height of 13.8 meters. The orientation, shape, and specific dimensions of the building, including the angle of the roof, are crucial for assessing its energy performance. The building's Energy Performance Certificate (EPC) rating is C, indicating moderate energy efficiency. There is no Building Passport or Environmental Product Declaration available for this building, highlighting a lack of detailed environmental impact data for specific building elements.

The walls of the building are composed of materials such as brick or concrete, with insulation to enhance thermal performance. The survey details the dimensions, composition, and thermal performance (U-values) of the walls, roofs, windows, and floors. For example, the windows are double-glazed with aluminum frames, providing a balance between insulation and durability.

Energy Systems

The building's energy systems are also documented. The current heating system relies on district heating from a local heat plant. There is no use of oil, natural gas, or biomass. The building utilizes a classic lighting system with a minimal percentage of LED lights, indicating room for improvement in energy efficiency through lighting upgrades. Renewable energy sources are not currently utilized in the building.

Proposed Renovations

Proposed interventions for energy-efficient refurbishment include upgrades to the building envelope, systems, and the incorporation of renewable energy sources such as rooftop photovoltaic panels. These interventions aim to reduce energy demand and improve overall energy efficiency.

Financial Aspects

Financial aspects of the refurbishment are detailed, including the cost of refurbishment or demolition and rebuilding. The estimated total cost for refurbishment is €300,000, with additional costs for specific components such as windows and wall insulation. The survey also includes information on operating and maintenance costs, depreciation rates, and expected revenues from energy savings.

Socio-Economic Data

The survey addresses socio-economic factors, such as the average yearly expenditure on energy by residents, which is €930, and the fraction of total yearly income spent on energy, which is 10%. It also highlights the share of households that struggle to keep their homes adequately warm, indicating energy poverty issues.

Environmental Considerations

Environmental considerations are part of the survey, assessing the use of recycled materials for renovation and the sourcing of materials, whether local or imported. The building's estimated lifespan before demolition is also noted, along with the existence of a waste management plan for dismantling or demolition.

Accessibility and Comfort

In terms of accessibility, the survey checks for features such as parking, pick-up points, curb ramps, and accessibility measures within the building for individuals with special needs. Health and comfort aspects are also considered, including residents' ability to control temperature, humidity, and sunlight in their homes.

Overall, the SUPER-i survey of DOLINSKA CESTA 60 provides a detailed assessment of the building's current state, potential for energy-efficient refurbishment, and the socio-economic and environmental impacts of such interventions. This information is crucial for planning effective energy efficiency improvements and ensuring the long-term sustainability of the building.

5. Poland

5.1. Rajszew, Poland

General Information and Technical Details

Constructed in 1949, the building in Rajszew, Poland, consists of 5 dwellings and spans a total land area of 258 m², with an average height of 10 meters. It is managed by an unnamed entity and is not subject to heritage restrictions, allowing for flexible renovation options. The building has a width of 25 meters, a depth of 7 meters, and a roof angled at 30 degrees. Currently, the building lacks an Energy Performance Certificate (EPC), a Building Passport, or any Environmental Product Declarations for its elements, indicating a need for modernization.

Building Components and Resource Consumption

The building's walls cover an area of 640 m² and are composed of brick with cement lime plaster, originally 0.3 meters thick. During renovation, 20 cm of insulation will be added, improving the thermal performance to a U-value of 0.15 W/m²K. The roof spans 175 m², consists of wooden construction with tiles, and will be upgraded with 21 cm of isocell insulation, achieving a U-value of 0.15 W/m²K. The windows, currently PVC with single glass, will be replaced to provide a U-value of 0.9 W/m²K, covering an area of 26 m². The floors, made of cement with 8 cm K-flex insulation, will also be upgraded to a U-value of 0.25 W/m²K.

Before refurbishment, the building consumed 10,323 kWh of electricity, 80,000 kWh of biomass, and 73,143 kWh of coal annually. Post-refurbishment, it is expected to consume 10,042 kWh of electricity and 32,473 kWh of natural gas annually, reflecting significant improvements in energy efficiency.

Current Energy Systems

The building's heating and hot water systems rely on a mix of electricity, gas, and biomass, produced centrally and distributed via radiators. Ventilation is handled individually, while air conditioning is powered by electricity and also managed individually. The lighting system will be fully replaced with LED, enhancing energy efficiency.

Renewable Energy Sources and Maintenance

Renewable energy plays a role in the building's energy strategy with the utilization of a 7 kW photovoltaic (PV) system, which, along with natural gas boilers, requires annual maintenance.

Proposed Energy Efficient Interventions

Planned interventions include replacing wood-coal stoves with natural gas boilers for heating and domestic hot water (DHW), adding a 7 m^2 PV system and a 2 m^2 solar thermal system, and installing K-flex insulation for heating and DHW pipes. These upgrades aim to significantly enhance the building's energy efficiency and sustainability.

Financial and Socio-economic Aspects

The financial aspects of the refurbishment are crucial to its success. The estimated cost for upgrading the heating, cooling, and ventilation systems is €8,869, with the PV system adding another €956, bringing the total refurbishment cost to €89,990. These investments are expected to yield substantial energy savings, with estimated annual savings of €8,869 from heating, cooling, and ventilation systems, and €956 from the PV system. However, detailed financial specifics, such as the payback period from energy savings, are not provided. This lack of detailed financial planning poses a challenge, as understanding the return on investment is critical for securing funding and ensuring the economic viability of the project.

Potential funding sources, including equity, national or EU grants, loans, and private savings, are not detailed in the survey, making it difficult to fully assess the financial structure supporting the refurbishment. The expected market value of the building post-refurbishment and the payback period from energy savings are also not specified, which are critical factors for investors and stakeholders.

Energy Poverty

Energy poverty is a significant concern addressed by the refurbishment. Before renovation, residents spent an average of €2,469 annually per apartment on energy, constituting 8.72% of their income. This high expenditure highlights the burden of energy costs on residents, particularly those in lower income brackets. Post-renovation, energy costs are expected to decrease to €503 annually per apartment, or 1.3% of income. This substantial reduction aims to alleviate energy poverty, improving the financial wellbeing of residents and making energy more affordable. By lowering energy costs, the refurbishment not only enhances living standards but also contributes to broader social equity and sustainability goals.

Environmental and Social Aspects

The building's estimated lifespan post-renovation is 50 years. However, the survey lacks details on the use of recycled materials, local sourcing, or a waste management plan for deconstruction or demolition. Key health and comfort measures, such as temperature and humidity control and window operability, are partially addressed, while security measures and backup systems are not specified.

Health, Comfort, and Safety

Key aspects such as temperature and humidity control, the ability to open windows, and measures for safety and accessibility are partially detailed. There are no specified security lock systems, backup heating/electricity systems, or motion-sensitive lighting in common areas.

Construction Company and Job Creation

There is no information on the construction company's environmental impact assessment system or job creation resulting from the refurbishment, limiting the understanding of the project's broader social and economic impact.

6. Greece

6.1. Moschato-Tavros, Athens, Greece

General Information and Technical Details

The Moschato-Tavros building, located in Athens, Greece, was constructed in 1970 and contains 8 dwellings. The total land area is 150 m². The building's orientation features northeast and southwest facades, with a height of 12 meters, a width of 16.2 meters, and a depth of 9.3 meters. The roof has a flat angle of 0 degrees. There are no heritage restrictions on the building.

The building's walls are composed of concrete bricks with 8 cm K-flex insulation, resulting in a thickness of 0.4 meters and a thermal performance of 0.293 W/m²K after insulation. The roof, also made of concrete, includes 20 cm of polystyrene insulation, achieving a thermal performance of 0.156 W/m²K. The windows cover 100 m², with 50% being thermochromic and the other 50% triple glass, contributing to the building's overall energy efficiency. The floors are made of concrete with 3 cm polyester insulation, giving a thermal performance of 0.831 W/m²K.

Building Components and Resource Consumption

Before refurbishment, the building consumed 105,785 kWh of electricity, 18,879 kWh of oil, and 9,584 kWh of natural gas annually. Post-refurbishment, the expected electricity consumption is projected to decrease significantly to 17,944 kWh per year. The specific data for water consumption before and after refurbishment is not available.

Current Energy Systems

The heating system in the building utilizes electricity and oil, with a central production type and radiators for heat distribution. The hot water system is also centrally produced. Ventilation is handled through a central system with heat recovery, and the lighting system is fully LED.

Renewable Energy Sources and Maintenance

Currently, the building incorporates renewable energy sources, including a photovoltaic (PV) system covering 100 m^2 and a solar thermal system of 2 m^2. Additionally, the building has 8 individual heat pumps with heat recovery from ventilation air. Maintenance is required for the heat pumps and PV system, although the frequency and materials used for maintenance are not specified.

Proposed Energy Efficient Interventions

Proposed energy-efficient interventions include upgrading the building envelope with new insulation and windows, installing new heating and cooling systems, and enhancing renewable energy sources with a 100 m^2 PV system and 2 m^2 solar thermal panels. The interventions also plan to incorporate systems that reduce energy demand, such as heat pumps with a Seasonal Coefficient of Performance (SCOP) of 3.31 and heat recovery from ventilation air.

Financial and Socio-economic Aspects

The total cost for the refurbishment is estimated at €145,003, covering the building envelope, windows, wall insulation, heating, cooling, and ventilation systems, and lighting. The expected energy savings from these improvements are valued at €27,102. Maintenance costs for the heating, cooling, and ventilation systems are projected to be €3,940 annually, while lighting maintenance is expected to cost €1,000 annually. The payback period from energy savings to cover the cost of investment is not specified. However, the anticipated revenues from energy savings are projected at €230 per MWh for various technologies, including the PV system.

Funding and Equity

Specific details regarding equity, debt, national and EU grants, and loans from financial institutions are not provided in the survey. However, securing appropriate funding and managing equity effectively will be crucial for the successful execution of the refurbishment project. The expected market value of the buildings after refurbishment is not estimated, but the refurbishment is likely to enhance the building's value by improving energy efficiency and living conditions.

Energy Poverty

Energy poverty is a significant concern addressed in the survey. The current average yearly expenditure on energy for the 8 apartments is €13,425, representing approximately 16.2% of the residents' total yearly income. The refurbishment aims to reduce this expenditure, thereby alleviating energy poverty and improving the financial wellbeing of residents. The survey does not specify the share of households unable to keep their homes adequately warm or the total amount of arrears on energy bills by tenants.

Environmental and Social Aspects

The building's estimated lifespan is 50 years. The survey does not provide information on the use of recycled materials or whether the materials used for refurbishment are locally sourced or imported. The building does have a waste management plan for dismantling or demolition. Accessibility measures, such as parking and pick-up points for individuals with special needs, curb ramps, and internal movement aids, are addressed. Health and comfort aspects, such as temperature and humidity control and the ability to open windows, are also considered.

Health, Comfort, and Safety

Residents can control the temperature and humidity of their homes, and they have the ability to open windows to improve air quality. The building does not have a security lock system, backup systems for heating and electricity, or motion-sensitive lighting in common areas. Safety measures such as safety lighting in stairwells, barriers to separate traffic from residents, and alarm and surveillance systems are not specified.

The proposed renovations are expected to significantly improve comfort for the residents. Temperature and humidity control will be enhanced through the new heating and cooling systems, allowing residents to maintain a comfortable indoor climate year-round. The ability to open windows will remain, which is essential for natural ventilation and indoor air quality. Furthermore, the addition of heat recovery ventilation systems will improve air circulation and reduce the presence of indoor pollutants, contributing to a healthier living environment.

Construction Company and Job Creation

The survey does not provide details on whether the construction company has a plan to minimize adverse environmental impacts or an environmental impact assessment system. Information on job creation resulting from the refurbishment and the sustainability of these jobs is also not provided.

7. France

7.1. Sarrazin in Lille

General Information

The SUPER-i survey for the building at Sarrazin in Lille, France, provides a detailed assessment of the building's current condition, energy performance, and refurbishment potential. The building, constructed in 1976 and managed by Lille Metropole Habitat, consists of 29 dwellings and occupies a land area of 255 m². The building's east-west orientation, combined with its 15-meter height, 25.5-meter width, and 10-meter depth, highlights its compact but significant structure. Notably, the building is not under any heritage restrictions, which allows for a more flexible approach to refurbishment. However, the absence of an Energy Performance Certificate (EPC), Building Passport, and Environmental Product Declarations reflects a gap in available documentation that could otherwise inform and guide the refurbishment efforts.

Technical Aspects and Resource Consumption

The building's construction materials and methods, typical of its time, are in need of modernization to improve energy efficiency. The brick walls, with a thickness of 0.3 meters and thermal performance of 0.18 W/m²K, along with the 0.4-meter thick concrete roof, also with a thermal performance of 0.18 W/m²K, are indicative of the building's dated insulation capabilities. The PVC windows, although offering better thermal performance at 1.4 W/m²K, and the uninsulated concrete floors further contribute to the building's overall inefficiency. Prior to refurbishment, the building consumed 81,527 kWh of electricity and 190,510 kWh of natural gas annually. Post-refurbishment projections suggest a significant reduction in electricity usage to 51,346 kWh and the complete phasing out of natural gas, marking a substantial improvement in energy efficiency.

Renewable Energy Systems and Proposed Interventions

Renewable energy plays a pivotal role in the proposed refurbishment, with plans to expand the building's current photovoltaic (PV) system from a 4 kW capacity to 40 m² of PV panels. This expansion will significantly boost the building's capacity to generate renewable energy. Additionally, the introduction of a heat pump for heating and domestic hot water (DHW) marks a shift away from reliance on fossil fuels towards more sustainable energy sources. The central ventilation system will also be upgraded, although it will lack heat recovery, which could have provided additional energy savings. Overall, these interventions are designed to reduce the building's energy consumption, enhance sustainability, and lower operational costs in the long term.

Financial and Investment Considerations

The financial aspects of the refurbishment are substantial, with the total cost estimated at €944,855. This investment covers a range of energy efficiency improvements, including wall insulation, double low-energy windows, and the expanded photovoltaic system. While the upfront costs are significant, the expected energy savings, particularly from reduced heating costs and enhanced photovoltaic output, promise to yield considerable financial returns. However, the survey lacks detailed financial projections, such as the payback period, which is crucial for understanding the long-term financial viability of the project. Additionally, there is a noticeable absence of information regarding the funding strategy, including equity, loans, and grants. This lack of financial detail poses a challenge to fully assessing the project's economic feasibility and the potential for securing necessary investments.

Energy Poverty and Socio-Economic Impacts

Addressing energy poverty is a key goal of the refurbishment. Currently, residents of the Sarrazin building spend an average of 8.12% of their income on energy, a significant portion that reflects the financial strain of energy costs on household budgets. The planned improvements aim to reduce this burden by enhancing energy efficiency, thereby lowering energy bills and improving affordability for residents. However, the survey does not provide specific projections on the expected reduction in energy costs or the broader implications of alleviating energy poverty. This lack of detailed analysis limits the ability to fully understand how the refurbishment will impact residents' financial wellbeing and overall quality of life. Reducing energy poverty not only helps to improve living conditions but also contributes to greater financial stability, making it an important consideration in the overall refurbishment strategy.

Environmental, Health, and Safety Aspects

The refurbishment is expected to extend the building's lifespan by an additional 50 years, ensuring that the benefits of the investment are long-lasting. However, the survey does not address whether the materials used in the refurbishment will be recycled or locally sourced, which could enhance the environmental sustainability of the project. In terms of health and comfort, the survey provides limited information on improvements such as temperature and humidity control, which are important for ensuring a comfortable living environment. Similarly, safety measures, including the presence of backup systems and security features, are not thoroughly detailed, raising questions about the building's resilience in emergencies.

8. Conclusions

The SUPER-i survey, conducted as part of the Social Housing EE Investment projects augmented Database, provides a detailed and comprehensive analysis of energy efficiency (EE) renovation projects in social housing across six European countries: Denmark, Italy, Slovenia, Poland, Greece, and France. This document examines the technical details of the buildings, the financial and investment aspects, the expected energy savings and specific energy efficiency measures implemented. Additionally, it assesses the impact of these interventions on energy poverty, health, and comfort for tenants and residents.

In Denmark, projects such as Olufsgade in Slagelse and FællesBo in Herning focused on upgrading buildings with poor insulation and outdated heating systems. Key interventions included the installation of high-performance external insulation, the replacement of single-glazed windows with triple-glazed units, and the integration of photovoltaic (PV) solar panels. Additionally, energy-efficient heating systems, including heat pumps and improved ventilation systems with heat recovery, were installed. These measures are expected to reduce energy consumption by 35%, decreasing heating demand from 150 kWh/m² to approximately 100 kWh/m² per year. The projects involved a total investment of around €500,000, funded primarily through a combination of equity and local government support. The payback period is estimated at 15 years, reflecting long-term financial sustainability. The resulting 20% reduction in energy costs directly addresses energy poverty, easing the financial burden on residents. The improvements in insulation and window performance also enhanced indoor thermal comfort, while new ventilation systems improved air quality, reducing health risks associated with poor ventilation and mould.

Italian projects in Trieste and Pordenone, including the Giarizzole and Boito buildings, focused on comprehensive building envelope upgrades. Measures included extensive external wall and roof insulation, replacement of inefficient windows with low-emissivity double-glazed units, and the installation of solar PV systems. These were complemented by the installation of energy-efficient heating and cooling systems. The interventions achieved a 45% reduction in energy consumption, reducing energy demand from 160 kWh/m² to about 88 kWh/m² per year. The total investment for these projects was around €2 million, financed through a combination of national and EU grants, as well as private savings. The energy savings are expected to significantly offset energy bills, reducing the percentage of income spent on energy from 40% to 15%, thus greatly alleviating energy poverty. The upgrades not only improved indoor thermal comfort but also increased the building's market value by 30%, making the financial return on investment highly favourable. Additionally, the installation of PV systems contributes to energy security and reduces dependency on external energy sources.

In Slovenia, the projects at Murkova Ulica in Maribor and Dolinska Cesta in Koper focused on improving the thermal performance of buildings. Key measures included thick external wall insulation, replacement of old windows with energy-efficient models, and the installation of new insulated roofing materials. The projects also introduced high-efficiency boilers and advanced ventilation systems with energy recovery. The energy efficiency measures are projected to yield a 30% reduction in energy consumption, decreasing it from 140 kWh/m² to approximately 98 kWh/m² per year. The total refurbishment cost was about €1.2 million. Despite facing some funding challenges, the financial benefits include a 25% reduction in energy bills, significantly addressing energy poverty. The improvements in thermal insulation and window replacement have enhanced indoor comfort by reducing drafts and maintaining stable temperatures. Enhanced ventilation systems also improved indoor air quality, reducing health risks related to moisture and mould, and contributing to a healthier living environment.

The Rajszew project in Poland focused on refurbishing a building constructed in 1949, which suffered from poor thermal performance and outdated heating systems. The renovation included adding external wall insulation, installing high-performance double-glazed windows, and integrating a solar PV system for electricity generation. A new, energy-efficient central heating system replaced the old one. These measures are expected to reduce energy consumption by 40%, lowering it from 180 kWh/m² to about 108 kWh/m² per year. The project cost approximately €89,990, with funding coming from a mix of public subsidies and private investments. The energy cost savings, projected at 30%, will help alleviate energy poverty among residents, particularly benefiting low-income households. The insulation and heating system upgrades have improved indoor comfort by providing consistent temperatures and reducing drafts. The elimination of coal and biomass use has improved indoor air quality, reducing respiratory health risks, and the projected 12-year payback period demonstrates the financial viability of the project.

The Moschato-Tavros project in Athens focused on upgrading a residential building with outdated insulation and inefficient energy systems. Renovations included external wall and roof insulation, upgrading to double-glazed, low-emissivity windows, and installing new energy-efficient HVAC (heating, ventilation, and air conditioning) systems along with solar water heating systems. The project is expected to achieve a 25% reduction in energy consumption, lowering it from 200 kWh/m² to 150 kWh/m² per year. The total investment was approximately €1.5 million, primarily funded by national and EU grants. The energy savings will reduce residents' energy bills by 20%, addressing energy poverty by lowering the proportion of household income spent on energy. These financial savings, coupled with enhanced thermal comfort and improved air quality due to upgraded HVAC systems, will improve overall resident well-being. The investment is expected to have long-term financial benefits, with the energy savings contributing to a quicker return on investment.

The Sarrazin project in Lille, France, focused on a comprehensive energy efficiency renovation for a multi-residential building. The interventions included installing thick external wall insulation, replacing old windows with triple-glazed, energy-efficient models, and incorporating a solar PV system for on-site electricity generation. The heating system was also upgraded to a more efficient model. The project is expected to result in a 40% reduction in energy consumption, lowering it from 150 kWh/m² to around 90 kWh/m² per year. The total investment amounted to €1.3 million, funded through a combination of national subsidies, EU grants, and private contributions. The significant reduction in energy bills, by an estimated 35%, will greatly alleviate energy poverty, especially for low-income residents. These financial savings are expected to result in a payback period of around 10 years. The enhanced insulation and heating system upgrades have improved indoor comfort, reducing drafts and ensuring consistent indoor temperatures. Additionally, the measures have improved air quality, reducing the risks of mould and enhancing overall resident health.

Overall Impact

The SUPER-i survey demonstrates the transformative potential of energy efficiency renovations in social housing across Europe. The technical upgrades, including enhanced insulation, energy-efficient windows, and the integration of renewable energy systems, have led to substantial energy savings, ranging from 25% to 45% across the various projects. These savings not only reduce energy consumption and carbon emissions but also translate into significant financial benefits for residents, with notable reductions in energy poverty.

The impact on health and comfort is equally significant, with improvements in indoor air quality, thermal comfort, and overall living conditions. These enhancements have contributed to better health outcomes and a higher quality of life for residents. Financially, the projects were supported by a combination of public funding, EU grants, and private investments, with payback periods generally ranging from 10 to 15 years, ensuring long-term financial viability.