



# SUPERSHINE

## SUPERSHINE survey collection and descriptive statistics - Part 1

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# Technical references

Project Acronym	SUPERSHINE
Project Title	S=Smart U=Upgraded asset-values and quality of life P=Public Private Partnership E=Extended Energy Efficiency R=Renewables triggered by the project SH=Social Housing I=Investment N=Net Zero E=European
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## Abbreviations and Acronyms

Acronym	Description
BEM	Building Energy Modelling
WF	Window Replacement
CO	internal or external insulation of the envelope
HC	proposals for improvements in heating and ventilation systems
LG	enhancements in area lighting
RE	incorporation of renewable energy resources
EA	Energy Audits
IA	Information Awareness

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Acronym	Description
HVAC	Heating, Ventilation, and Air Conditioning
ECM	Energy Conservation Measure

# 1. Introduction and purpose of the document

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This report aims to provide insights based on how the customised surveys per country were designed. These surveys will collect raw data to validate and replicate the SUPERSHINE analysis. Here are the key aspects covered in the data collection:

- **Social Acceptance:** Understanding how communities perceive and accept low-carbon technologies and energy-efficient solutions.
- **Financial Aspects:** Investigating the financial implications of adopting sustainable practices in social housing.
- **Environmental Impact:** Assessing the environmental effects of implementing energy-efficient measures.
- **Economic Considerations:** Analysing the economic feasibility of low-carbon technologies.
- **Social Life Cycle Assessment (LCA):** Evaluating the overall social impact of these initiatives.
- **Low Carbon Technologies:** Identifying innovative technologies that contribute to sustainability.
- **Energy Efficiency in Social Housing:** Focusing on improving energy efficiency within social housing complexes.
- **Social Engagement:** Exploring community involvement and participation.
- **Social Innovation:** Recognizing novel approaches to address energy poverty and enhance quality of life.

By examining these variables, the SUPERSHINE project aims to alleviate energy poverty while advancing the European Green Deal's goal of achieving a zero-emission building stock by 2050.

The surveys have been divided in two categories, Districts and Buildings to allow users to complete only the data that is relevant for them. The links for the surveys are (Active on 31st of March 2024)

- SUPER-I SUPERSHINE Survey for Lighthouse Districts  
(<https://ec.europa.eu/eusurvey/runner/SUPER-i-SUPERSHINE-Surve-LIGHTHOUSE-DISTRICTS>)
- SUPER-I SUPERSHINE Survey for Lighthouse Buildings  
(<https://ec.europa.eu/eusurvey/runner/SUPER-i-SUPERSHINE-Survey-LIGHTHOUSE-BUILDINGS>)

## 2. SUPERSHINE survey (portal)

### 2.1. Buildings

#### 2.1.1. Financial questions

The Financial questions section of the SUPERSHINE survey aims to gather comprehensive details about the social housing building targeted for energy efficiency improvements. Following the collection of basic information such as the building's size, type (e.g., apartment complex, townhouse), and current condition. This initial data provides a foundational understanding of the project's scope and scale. Additionally, the financial questions seek to assess the potential scope of investments by inquiring about refurbishment or demolition costs. Understanding the current state of the building and the extent of required improvements is crucial for planning and budgeting purposes. Detailed information gathered in this section lays the groundwork for subsequent analyses related to investment costs, financial metrics, and socio-economic impacts.

**Investment costs:** The Investment Costs section of the survey delves into the financial aspects of energy efficiency projects in social housing buildings. It breaks down the investment costs into specific categories such as envelope, windows, insulation, heating, cooling, ventilation systems, lighting, cooking facilities, and other relevant components. By itemising these costs, stakeholders can identify areas of priority and allocate resources effectively. Moreover, the survey seeks to gather data on start-up costs and the allocation of capital over refurbishment years. Understanding the distribution of investment costs over time allows for better financial planning and resource management. Additionally, assessing the total investment costs provides a clear picture of the financial commitment required for implementing energy efficiency measures in social housing buildings.

Financial questions		Unit of measurement
Refurbishment cost or demolition and rebuilding costs		(€)
Cost per intervention	Envelope	(€)
	Windows	(€)
	Wall insulation	(€)
	Heating, cooling and ventilation systems	(€)
	Lighting	(€)

	Cooking (if applicable)	(€)
	Others (please specify)	(€)
<b>Investment cost</b>	Start-up and other costs	(€)
	Fraction of capital spent on each year of refurbishment	(%)
	Payback period from energy savings to cover the cost of investment.	Years
	Total investment costs	(€)

**Payback Period and Financial Metrics:** The Payback Period and Financial Metrics subsection of the survey focuses on evaluating the economic viability of energy efficiency projects. It seeks to determine the payback period from energy savings, which indicates the time it takes for the project's financial benefits to offset the initial investment costs. Understanding the payback period is essential for assessing the project's attractiveness to investors and stakeholders. Additionally, the survey gathers data on total operating expenses, including maintenance costs and depreciation rates for technologies. These financial metrics help stakeholders assess the long-term sustainability and profitability of energy efficiency initiatives. Moreover, understanding the interest rates on debt or mortgages and other associated financial aspects provides insights into the project's financing structure and potential risks.

**Expected Variable Costs:** In the Expected Variable Costs subsection of the survey, the focus is on estimating the ongoing expenses associated with maintaining the energy efficiency technologies implemented in the social housing building. These variable costs include maintenance expenses for various components such as the building envelope, windows, wall insulation, heating, cooling, ventilation systems, lighting, cooking facilities, and any other relevant technologies. By understanding the expected variable costs, stakeholders can anticipate the financial commitments required to keep the energy efficiency measures operating at optimal levels over time. This information is essential for budgeting purposes and ensuring the long-term sustainability of the energy efficiency interventions. Additionally, identifying potential variable costs allows stakeholders to develop maintenance plans and allocate resources effectively to ensure the continued performance of the energy efficiency technologies.

Financial questions	Unit of measurement
Refurbishment cost or demolition and rebuilding costs	(€)

<b>Operating costs and other costs</b>	Maintenance costs	(€)
	Operating costs	(€)
	Depreciation rate (for each energy efficient renovation technology)	(%)
	Life cycle of the technologies	Years
	Fixed expenses (annual expenditures to operate and maintain equipment)	(€)
	Interest rate on debt or mortgage	(%)
	Other costs	(€)
<b>Expected Variable costs for maintaining the Energy Efficiency technologies in optimal condition</b>	Envelope	(€)
	Windows	(€)
	Wall insulation	(€)
	Heating, cooling and ventilation systems	(€)
	Lighting	(€)
	Cooking (if applicable)	(€)
	Others (please specify)	(€)

**Revenues:** The Revenues subsection of the survey explores the potential sources of income generated by the energy efficiency improvements implemented in the social housing building. It begins by gathering data on operating revenues, which may include income from rent, leasing agreements, or other sources. Additionally, the survey seeks to estimate the revenues generated from energy savings resulting from the implemented technologies. Understanding the financial benefits derived from energy efficiency measures allows stakeholders to assess the project's return on investment and overall financial viability. Furthermore, the survey inquires about potential rent increases, tax rates, incentives, and other revenue streams associated with the project. By identifying and quantifying these revenue sources, stakeholders can develop strategies to maximise financial returns and ensure the project's sustainability.

Financial questions		Unit of measurement
Revenues	Operating revenues	(€)
	Percentage of rent increase per year	(%)
	Percentage of private owners and for which buildings	(%)
	Other revenues	(€)
	Interest income	(€)
	Other income (Please specify)	(€)
	Tax rate on rents collected on social housing buildings.	(%)
	<i>Tax incentives for carrying Energy Efficiency refurbishments. For example (tax breaks)</i>	<i>(free text)</i>
	Default rate on rents.	(%)
	Vacancy rate	(%)
Expected revenues from energy savings from the following technologies:	Envelope	(€/MwH)
	Windows	(€/MwH)
	Wall insulation	(€/MwH)
	Heating, cooling and ventilation systems	(€/MwH)
	Lighting	(€/MwH)
	Cooking (if applicable)	(€/MwH)
	Others (please specify)	(€/MwH)

**Energy Poverty Assessment:** The Energy Poverty Assessment subsection of the survey focuses on evaluating the socio-economic impacts of energy efficiency interventions on residents of social housing buildings. It begins by gathering data on residents' yearly expenditure on energy, providing insight into the financial burden associated with energy costs. Understanding the average expenditure helps identify households that may be

particularly vulnerable to energy poverty. Additionally, the survey seeks to determine the fraction of total yearly income spent by residents on energy, which provides a measure of affordability and financial strain. This information is crucial for identifying households at risk of energy poverty and designing targeted support programs. Furthermore, the survey assesses the share of households unable to afford adequate heating, highlighting the prevalence of energy poverty within the building. By quantifying the extent of energy poverty, stakeholders can prioritise interventions and allocate resources effectively to address the needs of vulnerable residents. In addition to the financial aspects, the Energy Poverty Assessment section of the survey also examines the social impacts of energy efficiency interventions. It seeks to quantify the total amount of arrears on energy bills by tenants, providing insight into the prevalence of payment difficulties within the community. Understanding the extent of arrears helps identify households at risk of financial hardship and develop targeted support measures to alleviate their burden. Moreover, the survey inquires about the percentage of private owners within the social housing buildings, as well as their demographic characteristics. By analysing ownership patterns, stakeholders can tailor interventions to meet the needs of both tenants and private owners, fostering community-wide engagement and collaboration. Overall, the Energy Poverty Assessment section of the survey provides a comprehensive understanding of the socio-economic dynamics within social housing buildings and informs strategies to address energy poverty effectively.

Financial questions		Unit of measurement
Energy poverty	For the current residents, what is the average yearly expenditure on energy? (please specify the year)	(€)
	What is the fraction of total yearly income spent by residents on energy? (please specify the year)	(%)
	What is the share of households that cannot afford to keep their homes adequately warm?	(%)
	If available, total amount of arrears on energy bills by tenants.	(€)

**Funding:** The Funding subsection of the survey focuses on understanding the financial sources and mechanisms used to finance energy efficiency projects in social housing buildings. It begins by gathering data on the equity and debt structure of the project,

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including the proportion of funding provided by the building owner and external financing sources such as mortgages or loans. Understanding the funding sources and mechanisms is essential for assessing the project's financial stability and risk exposure. Furthermore, the funding subsection of the survey also gathers data on potential sources of funding for energy efficiency projects in social housing buildings. It seeks to identify national and EU grants available for such initiatives, as well as loans from financial institutions, private savings, and other sources. Understanding the availability of funding sources helps stakeholders navigate the complex landscape of project financing and leverage available resources effectively. Moreover, the survey seeks to estimate the total amount of funding secured from each source, providing insights into the project's financial structure and sustainability. By analysing funding sources and amounts, stakeholders can identify gaps in financing and develop strategies to bridge them. Additionally, the survey inquires about any tax incentives or other financial mechanisms that incentivize energy efficiency refurbishments, further enhancing the attractiveness of such projects to investors and building owners.

Financial questions		Unit of measurement
Property value	Equity (The fraction of the building the owner has paid for from his own money.)	(€)
	Expected market value of the buildings after refurbishment (The estimated price at which the property would be sold on the open market under all conditions for a fair sale.)	(€)
	Debt (The fraction of the building the owner has paid for using external financing sources e.g mortgage.)	(€)
Funding Sources	National grants	(€)
	EU grants	(€)
	Loans from financial institutions	(€)
	Private savings	(€)
	Other sources of funding (please specify)	(€)

## 2.1.2. Technical questions

The technical questions section of the SUPERSHINE survey aims to gather comprehensive details about energy improvement and the reduction in energy demand by collecting data through questionnaires. By utilising surveys, we can gather information from different areas to create a complete district intervention starting point.<sup>1</sup>

In relation to technical questions in the SUPERSHINE survey, providing information to understand the starting energy level. Understanding this data is essential for selecting the main interventions and evaluating potential improvements. Therefore, technical data surveys could calculate improvements in energy efficiency, reductions in greenhouse gas emissions, enhancements of energy supply, and optimization of energy infrastructure. This analysis considers factors to provide action on energy demand, efficiency, and sources when energy intervention will be implemented.

Technical questions		Unit of measurement
Data technical group	Specific question	
<b>General information</b>	Land Cadastral Reference	(-)
	Owner	(-)
	Year of construction	(Year)
	Number of dwellings / building	(n°)
	Population density	(Hab/km <sup>2</sup> )
	Per building	
	Per m <sup>2</sup>	
	Building Passport	(-)
	Building´s estimated lifespan	(Year)

These measurements are carried out through Key Performance Indicators (KPIs) distributed across four different categories, designed to evaluate the implementation of the following actions: (WF) window replacement, (CO) internal or external insulation of the envelope, (HC) proposals for improvements in heating and ventilation systems, (LG) enhancements in area

<sup>1</sup> Kamel, E. (2022). A systematic literature review of physics-based urban building energy modelling (BEM) tools, data sources, and challenges for energy conservation. *Energies*, 15(22), 8649.

lighting, (RE) incorporation of renewable energy resources, (EA) Energy Audits, (IA) Information Awareness, as well as information on billing and user behaviour.

In order to obtain the data necessary to calculate these KPIs and for academic research exploitation, academic questionnaires based on the BEM (Building Energy Modelling) models have been conducted. These questionnaires present structured data across five categories: (1) geometry and location, (2) HVAC (Heating, Ventilation, and Air Conditioning) and hot water systems, (3) building envelope systems, (4) schedules, and (5) weather data, which will be described below.

In relation with categories 4 schedules and 5 modifications for the content to be included. In Section 4, the schedules will be updated to include specifications for the frequency of maintenance and replacement. In Section 5, concerning the relationship with climate data, we will provide information and data for other metrics such as Renewable Energy Sources, Interventions for Energy Efficient Refurbishment, and Indoor Air Quality. Both sets of data will be further developed in the next paragraph.

- (1) **Geometry and location:** This group reports data on the geometry and location of the various buildings within an intervention area. This dataset enables the importation of building inventory geometry and the association of thermophysical properties, thereby simplifying the data acquisition process.
- (2) **HVAC and hot water systems:** The data on HVAC systems has been collected using measurement equipment or reported from interviews or forms. These systems play a crucial role in determining energy performance and significantly affect the results of ECM analysis. The primary focus is on building energy usage, particularly in terms of thermal energy for heating and cooling, domestic hot water demand, electrical consumption, and, in some instances, natural lighting.
- (3) **Building envelope systems:** The data on HVAC systems has been collected using measurement equipment or reported from interviews or forms. These systems play a crucial role in determining energy performance and significantly affect the results of ECM analysis. The primary focus is on building energy usage, particularly in terms of thermal energy for heating and cooling, domestic hot water demand, electrical consumption, and, in some instances, natural lighting.
- (4) **Type of occupancy and maintenance\*** : This section presents data stemming from the building's usage patterns. Specifically, in our context, the buildings are primarily used for residential purposes. Moreover, it examines how district building maintenance contributes to enhancing energy efficiency.
- (5) **Other\*** : This paragraph includes information related to Renewable Energy Sources, interventions for energy-efficient refurbishment, and indoor air quality, aiming to improve best practices for achieving environmental sustainability. These groups are

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aligned with the UN Sustainable Development Goals<sup>2</sup> 7 (Affordable and Clean Energy), 11(Sustainable Cities and Communities), 12(Responsible Consumption and Production), 13(Climate Action) and 15 (Life on Land).

Technical questions		Unit of measurement
Data technical group	Specific question	
<b>Geometry and location</b>	Latitude and longitude of the building	(xx°xx'xx.xx" )
	Total building land area	(m <sup>2</sup> )
	Shape building	(-)
	Height	(m)
	Width	(m)
	Depth	(m)
	The angle of the roof	(m)
<b>HVAC System</b>	Energy Performance Certificate	(-)
	Annual energy consumption	(-)
	Electricity	(kWh)
	Oil	(kWh)
	Natural Gas	(kWh)
	Biomass	(kWh)
	Water consumption by square metre	(l/m <sup>2</sup> /year)
	Heating system	(-)
Energy source	(kW)	

<sup>2</sup> United Nations. (2015). Transforming our world: the 2030 Agenda for Sustainable Development. Sustainable Development Knowledge Platform. <https://sustainabledevelopment.un.org/post2015/transformingourworld>

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	Type of production	(-)
	Type of heat distribution units	(-)
	COP	(-)
	<b>Hot water system</b>	(-)
	Energy source	(kW)
	Type of production	(-)
	<b>Ventilation system</b>	(-)
	Type of production	(-)
	Distribution type	(-)
	<b>Air conditioning</b>	(-)
	Energy source	(kW)
	Type of production	(-)
	EER	(-)
	<b>Lighting</b>	
	Type of lighting system	(-)
	Percentage of LED	(%)
	<b>Orientation</b>	(°)
	<b>Envelope surface</b>	(m <sup>2</sup> )
	<b>Total buildings surface</b>	(m <sup>2</sup> )
	<b>Walls</b>	(-)

<b>Building Envelope</b>	Dimensions	(m <sup>2</sup> )
	Composition	(-)
	Thickness	(cm)
	Thermal performance	(W/Km <sup>2</sup> )
	Proportion of the N,S,E,and W	(%)
	<b>Roofs</b>	(-)
	Dimensions	(m <sup>2</sup> )
	Composition	(-)
	Thickness	(m)
	Thermal performance	(W/Km <sup>2</sup> )
	Proportion of the N,S,E,and W	(%)
	<b>Windows</b>	(-)
	Dimensions	(m <sup>2</sup> )
	Composition	(-)
	Thermal performance	(W/Km <sup>2</sup> )
	<b>Floors</b>	
	Dimensions	(m <sup>2</sup> )
	Composition	(-)
	Thickness	(m)
	Thermal performance	(W/Km <sup>2</sup> )

<b>Maintenance</b>	Specify the frequency of maintenance	(Years)
	Specify the frequency of replacement	(Time)
	Proposed interventions <sup>3</sup>	(-)
<b>Other metrics</b>	Renewable Energy Sources	(y/n)
	Type of energy source	(-)
	Basic Data	(-)
	Interventions for energy efficient refurbishment	(-)
	Envelope	(-)
	Systems	(-)
	Renewable energy sources	(-)
	Energy Demand reduction	(-)
	Indoor air quality	(CO <sub>2</sub> )

### 2.1.3. Environmental questions

#### Scope

It is necessary to know the useful life of buildings in order to be able to calculate the carbon footprint of the buildings throughout their lifespan.

Lifespan has been estimated before demolition in default 50 years.

We will assess the GHG emissions to the atmosphere that buildings can potentially generate over their lifespan.

For this reason, it is necessary to include this question in the surveys.

<sup>3</sup> The proposed interventions implemented in the districts include the necessary maintenance works.

**Resource efficient and circular material life cycles**

Resource efficient and circular material life cycles subsection of the survey focus on evaluating the circular economy improvement in residents of social housing buildings. It begins by gathering data to identify if the materials used for the refurbishment are from locally sourced or imported. These data are relevant in order to minimise the climate material impacts. Locally sourced materials have lower environmental impact as they have fewer GHG emissions. It is very important too, to identify the country where the materials could be imported just to calculate the carbon footprint. In addition, the survey seeks to determine how many recyclable materials will be used for renovation. Although surveys do not assess any data about some necessary consumptions like water, diesel or electricity consumption is crucial for doing district LCA.

**End of life**

End of life subsection is focused on identifying if the buildings have a waste management plan for dismantling or demolition and how much waste will be disposed of. It is crucial to collect data about several types of wastes and their quantities. The waste that has to be measured at the end of life of a building or a district in general are: plastic, paper, glass, metal, demolition waste, hazardous waste.

Environmental questions	Unit of measurement
<b>Scope</b>	
X The building’s estimated lifespan	(years)
<b>Resource efficient and circular material life cycles</b>	
x Recycled materials used for renovation	(kg)
x materials used for the refurbishment locally sourced	(kg)
x materials used for the refurbishment imported	(kg)
Heating systems	
Energy Source	(tipo)
Energy consumption	(kw)
Water consumption	(L)
Ventilation System	
Energy Source	(tipo)



Energy consumption	(kw)
Air conditioning	
Energy Source	(tipo)
Energy consumption	(kw)
Lighting	
Type of lightings system	(tipo)
Energy consumption	(kw)
Renewable Energy Sources	
Tipo	(tipo)
Quantity	(kw)
<b>End of life</b>	
Plastic waste	(kg)
Paper waste	(kg)
Glass waste	(kg)
Metal	(kg)
Demolition waste	(Tn)
Waste generation-construction waste	(Tn)
Hazardous waste	(kg)

### 2.1.4. Social

Buildings and construction practices play an imperative role in ensuring social sustainability considering the significant amount of time people spend in buildings for work, leisure and living. Interventions are created within the urban social context by which actions are induced by various social actors in the environment.

Social sustainability is closely linked to human well-being, quality of life, and inclusiveness and these are the pivotal factors in ensuring a healthy, safe and resilient built environment. The social pillar receives the least attention and is largely overlooked compared to the development of the environmental and economic pillars. It is also the most challenging sustainability pillar to assess due to the inability to determine the impacts to be considered and their quantification method.

Social sustainability is regarded as an important sustainability dimension that is linked to community development. Although there are various interpretations of social sustainability, it can be generally contextualised as the fulfilment of health and well-being, safety, accessibility, quality of life, community development, cultural heritage, stakeholder participation, welfare, and human equity or diversity. The purpose of delivering social sustainability is to offer a conducive, healthy, safe and comfortable environment to the involved project stakeholders.

In light of operating three diverse demo sites spanning various cultural backgrounds and climatic regions, the SUPERSHINE project prioritised several key areas: accessibility, health and comfort, safety, job creation and environmental impact. By focusing our attention to these crucial areas at the building level, the renovation works aim to enhance the holistic well-being of the residents while fostering sustainable development. In the following sections, we will delve into each key area of the social dimension of the questionnaire at the building level, providing detailed descriptions and insights of each area.

### **Accessibility**

The accessibility of spaces and places determines the extent to which everyone – including persons with disabilities, older persons and children – can live, work and learn independently and participate fully and equally in society. The accessibility continuum is a concept that describes the experience of children, adults with disabilities and older persons departing from their homes, using pathways, crossing roads and taking transportation to reach, enter and use services and facilities. Four steps ensure the accessibility continuum: reaching a facility; entering a facility; moving around a facility; and using specific features of a facility. The questions asked for the buildings in the demo areas are related to these four dimensions of accessibility. The yes/no questions asked for accessibility are looking for answers to these four steps of the accessibility continuum; parking availability for, pick up points. Curb ramps around the buildings and any measures within the building for individuals with special needs.

### **Health and comfort**

Health and well-being are critical concerns of social sustainability. Indoor environmental quality is crucial to provide users with a good quality of life. There are five aspects of health and well-being in the built environment: a) thermal comfort, b) acoustic comfort, c) daylighting, d) ventilation and e) indoor air quality.

The main reason for retrofitting projects is improving the sustainability and energy efficiency of a building. These measures not only reduce energy consumption and costs but also contribute to a healthier indoor environment by improving thermal comfort and reducing the humidity, artificial lighting and heating/cooling, which can carry health benefits.

**Thermal comfort** is defined by ISO7730:2005 Standard as the condition of mind which conveys satisfaction with the thermal environment. Temperature changes can significantly affect mood which in turn causes behavioural changes. While people tend to be aggressive at lower temperatures, higher temperatures can result in aggression and apathy. Thermal

comfort is therefore acknowledged as a key parameter ensuring users and occupants perform at their maximum capability in their workplace and home.

Questions chosen by SUPERSHINE under health and comfort are linked with thermal comfort and daylight like control over the temperature, humidity, the monitoring of the temperature in the building, control over the sunlight with use of window coverings or any other forms.

Improving indoor **air quality**, reducing the presence of harmful pollutants, and ensuring adequate ventilation can significantly impact the health of the occupants. Retrofitting projects that focus on these aspects can help reduce the incidence of respiratory problems, allergies, and other health issues related to poor indoor environmental quality. Within the survey the relevant question is the availability to open the windows.

The project also wants to understand the expectation about impacts during the works of the energy efficiency refurbishment; reduced air quality, increased noise, uncomfortable thermal conditions, obstructed views, reduced safety and usability of the areas of the buildings.

## **Safety**

Safety is a fundamental part in buildings and structure and various measures should be incorporated into construction practices to prevent against both natural and man-made accidents such as fire, flood and social crime. Appropriate design and effective use of building spaces make occupants feel secure and could reduce the occurrence of crime, subsequently improving the quality of life.

The questions in SUPERSHINE are designed to understand the safety measures of the buildings; the security lock system, safety lighting in stairwells, motion sensitive lights around the building, measures taken to separate traffic, waste management, alarm and surveillance system, back up for utility services, safe evacuation measures.

## **Construction company (if applicable)**

The purpose of a construction environmental management plan is to outline how a construction project will avoid, minimise or mitigate effects on the environment and surrounding area. Environment plans help construction companies and developers minimise the environmental impact of their activities, comply with relevant laws and regulations, engage with stakeholders, manage environmental risks, and promote sustainability. Air and water pollution, noise and dust emissions, waste management, and biodiversity loss are taken into account in environmental plans. The plans consider the needs and concerns of local communities and develop a plan to communicate with all relevant stakeholders throughout the process. The questions in this subsection help understand the companies' plan for the environment to adverse the impacts of construction work and an environmental impact assessment system.

**Job Creation**

Job creation is a crucial social aspect of retrofitting/construction projects, driving economic growth, fostering skill development, and promoting social equity. It creates employment opportunities for a diverse group of professionals. These projects can foster skill development and professional growth. Workers involved in retrofitting projects often need to learn about new materials, technologies, and techniques, contributing to a more skilled and adaptable workforce. The questions asked in this subsection are related to creation of new jobs, the refurbishment of the projects and the sustainability of this environment.

Below, the list of the questions in the social subsection can be found.

Social Questions	Unit of measurement
<b>Accessibility</b>	
Is there parking accessible for individuals with special needs?	y/n
Is there a pick up point for individuals with special needs?	y/n
Are there curb ramps between the road and the entrance to the building?	y/n
Are there any accessibility measures to allow access and movement inside the building for individuals with special needs?	y/n
Is there parking accessible for individuals with special needs?	y/n
<b>Health and comfort</b>	

Can residents control the temperature of their homes?	y/n
Can residents control the humidity of their homes?	y/n
Can residents open the windows to improve air quality inside their homes?	y/n
Which is the setpoint temperature for the heating/cooling systems?	degrees
Is the temperature monitored in the building as a whole or at individual level?	y/n
Can residents control the amount of sunlight in their homes? (e.g. through window blinds, awnings, drapes, etc.)	y/n
<b>Safety</b>	
Is there a security lock system?	please specify
Is safety lighting provided in the stairwells? (y/n)	y/n
Does the building have motion sensitive lighting in the common areas? (y/n)	y/n
Are there any barriers to separate traffic from residents (y/n)?	y/n
Is waste secured in a locked unit to minimise the risks of vandalism and arson? (y/n)	y/n

Are there any alarm and surveillance systems, preferably connected to the police? (y/n)	y/n
Is there a backup system for heating and electricity (e.g. non-electric standby stoves or heaters)?	If yes please specify
Does the building have systems to facilitate safe evacuation of the buildings in the event of a power outage? (if yes, please specify, e.g. emergency lighting, photoluminescent signage of the evacuation routes, railings, UPS (uninterruptible power source))	If yes please specify
<b>Construction company</b>	
Does the institution have a plan to minimise the adverse impacts of the building work on the environment?	y/n
Does the institution have an environmental impact assessment system?	y/n
<b>Job creation</b>	
Will the refurbishment create any new jobs?	y/n
Are any of these new jobs expected to last even after the refurbishment?	y/n

## 2.2. Districts

### 2.2.1. Financial questions

**Does the district team up with local businesses for the uptake of new technologies targeting social and affordable housing?**

This question delves into the collaborative efforts between the district and local businesses to integrate innovative technologies into social and affordable housing. By forging partnerships with local enterprises, the district can ensure that housing solutions are not only technologically advanced but also cost-effective and tailored to the needs of the community. Through strategic alliances, districts leverage the expertise of businesses to enhance sustainability and promote equitable access to housing solutions.

**Purpose:** This question aims to understand the collaboration between the district and local businesses to implement new technologies in social and affordable housing.

**Type of data:** Information on partnerships between the district and local businesses, types of technologies being adopted, and the extent of collaboration.

### **Does the district involve residents and tenants in the process of renovating social and affordable homes?**

Building upon community engagement, this question explores the active involvement of residents and tenants in the renovation process for social and affordable housing. By soliciting input and feedback from those directly impacted, districts ensure that renovation plans are inclusive and responsive to community needs. Residents become active participants in shaping their living environments, fostering a sense of ownership and community pride.

Programs/Initiatives:

- Community workshops and forums facilitate dialogue and collaboration.
- Resident-led design committees empower residents to contribute to renovation projects.
- Informational sessions promote transparency and provide opportunities for residents to engage with the renovation process.

**Purpose:** To gauge community involvement in the renovation process, which can contribute to the social sustainability of housing initiatives.

**Type of data:** Insights into community engagement strategies, level of participation, and the impact on renovation projects.

### **Does the public authority provide financial support in terms of grants to EE renovations at the district level?**

Transitioning to financial support, this question examines the role of the public authority in incentivizing energy efficiency (EE) renovations through grants at the district level. By offering financial assistance, the public authority encourages districts to adopt EE measures, thereby reducing environmental impact and enhancing energy resilience. Grants serve as catalysts for sustainable development, enabling districts to implement cost-saving initiatives that benefit both residents and the environment.

**Purpose:** To assess the financial assistance provided by the public authority for energy-efficient (EE) renovations, which can incentivize sustainable practices.

**Type of data:** Information on grant programs, eligibility criteria, funding amounts, and the impact on renovation activities.

### **What are the expenses for running ICT services and digital tools, including smart grids, smart living applications in the district?**

Shifting focus to operational expenses, this question investigates the financial requirements associated with maintaining ICT services and digital tools within the district. These expenses encompass a spectrum of costs, including infrastructure maintenance, software licensing, and cybersecurity measures. By understanding the financial implications of digital infrastructure, districts can allocate resources effectively to support technological advancements and enhance service delivery.

**Purpose:** To understand the financial implications of implementing ICT services and digital tools in the district, which are crucial for efficient management and sustainability.

**Type of data:** Breakdown of expenses related to ICT services, smart grids, and other digital tools, including installation, maintenance, and operational costs.

### **Does the district offer infrastructure management services to the tenants and residents for a monthly fee?**

Expanding on service provision, this question explores whether the district provides infrastructure management services to residents in exchange for a monthly fee. These services may encompass the maintenance of utilities, transportation systems, and public spaces. By offering comprehensive infrastructure management, districts enhance resident satisfaction and ensure the efficient operation of essential services.

**Purpose:** To assess whether infrastructure management services are provided to tenants and residents and if there are associated costs.

**Type of data:** Information on the availability of infrastructure management services, fee structures, and services offered.

### **At district level, are there any investments planned in the areas below, and what is the required investment for each area?**

Concluding with future investments, this question evaluates the district's planned initiatives across various sustainability-focused areas. From increasing energy efficiency to promoting smart city projects and improving mobility systems, these investments represent commitments to long-term sustainability and community well-being. Understanding the financial requirements for each area enables districts to prioritise initiatives and allocate resources effectively to achieve their sustainability goals.

D2.1 SUPERSHINE survey collection and descriptive statistics- Part 1

**Purpose:** To identify planned investments in various areas related to energy efficiency, smart city initiatives, and infrastructure improvements.

**Type of data:** Details on planned investments, including the areas targeted, investment amounts, and expected outcomes.

Overall, the SUPERSHINE financial survey questions at district level aim to collect data on financial and socio-economic aspects of district level initiatives targeting social and affordable housing, providing insights into collaboration, community engagement, financial support, expenses and planned investments. This will be applied to inform decision-making processes and facilitate the development of the SUPERSHINE project. The table below, provides the SUPERSHINE survey financial questions at district level.

Financial & Socio-economic questions (District)	Type
Does the district team up with local businesses for the uptake of new technologies targeting social and affordable housing	Text box
Does the district involve residents and tenants in the process of renovating social and affordable homes? If yes, what are the programmes/initiatives already in place?	Text box
Does the public authority provide financial support in terms of grants to EE renovations at the district level? (textbox)	Text box
What are the expenses for running ICT services and digital tools, including smart grids, smart living applications in the district?	Text box
Does the district offer infrastructure management services to the tenants and residents for a monthly fee?	Text box
At district level, are there any investments planned in the areas below, and what is the required investment for each area?	Increasing energy efficiency in public buildings (schools, hospitals, libraries...)
	Increasing energy efficiency of public lighting system
	Increasing energy efficiency of water network
	Creating smart city/community projects
	Creating energy communities
	Setting up shared energy production systems between buildings

	Installing heat and power cogeneration systems
	Installing renewable energy systems
	Improving the mobility system

### 2.2.2. Technical

The data analysis used in the STET model helps us understand how interventions can be put into action at the district level. It deals with concerns about technical feasibility and energy modelling studies that often don't consider the roles of people, the changing social and political situations, and how society and technology are connected.

We've identified three main things that STET models need, based on ideas from both energy modelling and socio-technical transitions theory. This paper introduces the idea of a 'socio-technical energy transition.' It suggests creating formal, number-based energy models that also think about social things like people and how policies, technology, and behaviour all affect each other.

In addition to considering the data presented in the general table of subsection 2.1.2, the data is structured into three main groups: Techno-economic detail, Explicit actor heterogeneity, and Transition pathway dynamics.

**Techno-economic detail:** When discussing techno-economic detail in STET models methodology, we are referring to the importance of having sufficient detailed information about how changes in energy usage are implemented. This assists us in designing more effective energy policies.

- In these steps, a disaggregated portfolio of technology options with different price and performance characteristics will be included as the principal action to be involved in the district area. The action are:
  - District Heating and Cooling generation
  - Lighting renovation
- Bounded systems with operational or resource constraints.
  - Renewable Energy sources renovations

**Transition pathway dynamics:** Finally, we need to understand how these transitions evolve over time. Are we moving towards a more sustainable energy system? What are our long-term goals and how can we achieve them? These are important questions that STET models help us answer by assessing different options and transition pathways.

- Time horizons sufficient for exploring long-term socio-technical change, path dependencies;
- Radical alternatives to incumbent status quo technology or behaviour options.
  - During the planning phase of the district's energy renovation, we are incorporating urban heating and cooling systems like District Heating and Cooling. This will efficiently distribute both heat and cold throughout the area via a centralised network. To maximise energy production efficiency, we're also looking into combined heat and power generation methods. Moreover, we're exploring shared energy production systems between buildings to encourage collaboration and optimise resources. We anticipate incorporating legislation and urban planning regulations to support these interventions. For instance, this could involve implementing zoning laws that incentivise the installation of renewable energy systems in new constructions.

**Explicit actor heterogeneity:** It is also crucial to consider the diversity of actors involved in this process. We are not only talking about energy companies and consumers but also politicians, regulators, and civil society groups. All these actors have different interests and motivations. Their decisions can influence how our energy policies are developed.

- Multiple explicit actors with differentiated selection criteria or behavioural parameters;
- Actors that possess agency to shape transitions.
  - The process of energy renovation in a district involves the collaboration of various stakeholders. In the specific case of SUPERSHINE, local and regional government authorities play a crucial role in establishing policies and regulations aimed at the rehabilitation and improvement of vulnerable areas within intervention districts. Real estate developers are responsible for carrying out building renovations, while property owners provide access and cooperate in various intervention measures. Energy service companies (ESCOs) offer specialised solutions, and energy consultants and experts assess the efficiency of buildings.

Technical questions		Unit of measurement
Data technical group	Specific question	
Tecno-economical detail	Services	(-)
	Available	(-)
	New services planned	(-)
	Services needed	(-)
	Public lighting system	(-)

	Water network	(-)
	Land strategy	(-)
	Renewable energy sources systems	(-)
	Infrastructures	(-)
	Information and Communication	(-)
	Daily mobility structure	(-)
	Public transport lines	(-)
<b>Transition pathway dynamics</b>	District Heating	(-)
	Co-generation of Heat and Power	(-)
	Energy production systems shared by buildings	(-)
	Energy community	(-)
	Investments planned	(-)
	Energy efficiency	(-)
	Creating smart city	(-)
	Creating energy communities	(-)
<b>Explicit actor heterogeneity</b>	Mobility action plan	(-)
	Climate or action plan	(-)

### 2.2.3. Environmental

Understanding the environmental impact of districts, beyond individual buildings, is crucial for sustainable urban development<sup>4</sup>. Let's explore the key aspects related to district LCA:

**Lifespan and Carbon Footprint:**

- Just as with individual buildings, it's essential to know the useful life of entire districts to calculate their carbon footprint.
- By estimating the lifespan (commonly assumed to be around 50 years), we can assess the potential greenhouse gas (GHG) emissions generated by district activities over time.
- Including questions about district lifespan in surveys helps us evaluate long-term sustainability.

**Resource-Efficient and Circular Material Life Cycles:**

- This subsection focuses on evaluating circular economy practices within social housing districts.
- Data collection begins by identifying whether refurbishment materials are locally sourced or imported.
- Locally sourced materials have lower environmental impact due to reduced GHG emissions.
- Calculating the carbon footprint involves considering the country of material origin.
- Additionally, we assess the use of recyclable materials during renovation.

**Consumption Considerations:**

- While surveys typically don't directly assess water, diesel, or electricity consumption, these factors are crucial for district LCA.
- Understanding resource usage helps us make informed decisions about sustainability and efficiency.

**End of Life:**

- The end-of-life phase focuses on waste management for district components.
- We identify whether districts have waste management plans for dismantling or demolition.
- Key waste types include plastic, paper, glass, metal, demolition waste, and hazardous materials.
- Collecting data on waste quantities ensures responsible disposal practices.

## 2.2.4. Social

The social section of the survey conducted at the district level serves a twofold purpose: first, to construct a comprehensive social profile of the community, capturing its unique dynamics, challenges, and strengths; and second, to gather insights into the potential social resources available at the community level. The social profiling and existing resources of the community resources will play a vital role in facilitating robust community engagement initiatives. After completing the profiling questions, the survey delves into capturing existing social resources at community level as well as into aspects of social engagement which are discussed below.

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<sup>4</sup> The units for each impact are measured as shown in the Environmental buildings table on poin 2.1.3

To effectively engage with residents, it is essential to draw from a diverse range of tools and channels. Hence, before initiating the development of new engagement tools and channels, it is important to gain an understanding of the existing ones used by the community in engagement initiatives. By conducting a comprehensive assessment of the current tools and channels employed by residents, we can identify successful approaches, preferences, and areas for improvement.

The subsequent focus of the survey revolves around gaining insights into the level of involvement of vulnerable groups; women, ethnic minorities, young people or elderly. This question seek to determine aims to see if the social engagement strategy is sufficiently inclusive enough to effectively engage vulnerable be able to attract the vulnerable groups.

The next set of questions are organised to understand if there is an entity at district level like a **residents' organisation, local housing association or networking initiatives**. They usually play a crucial role in representing the interests of community members and enhancing the quality of life in residential areas. They serve as a collective voice for the community, advocating for residents' needs and interests with local government bodies, utility companies, and other external organisations. These entities can initiate and manage projects aimed at enhancing the local environment and infrastructure. These organisations can also play a vital role to advocate for energy efficiency and sustainability within the community. They can coordinate or develop a plan for refurbishment projects. They can help engage citizens throughout the process and encourage participation. Even if there is no organisation involved in the demo areas they can have interactions with **other associations** or can be involved in activities that were offered to other areas which in return increases awareness, engagement.

A **networking initiative** can facilitate the exchange of ideas, strategies, and best practices in energy efficiency, allowing participants to learn from each other's experiences. Incorporating a human-centred approach ensures that these exchanges also consider the impact on community well-being and individual lifestyles creating opportunities for collaboration across sectors and disciplines.

The survey also takes into account the involvement of **local governments in sustainability** projects. Usually, **Local governments** have direct communication channels with the community and can facilitate engagement processes to ensure that sustainability projects are in line with the residents' needs and preferences. Community buy-in is critical for the success and longevity of these projects. **International Agents (utilities, contractors, etc.)** can offer technical expertise, financial resources, and experience in implementing sustainability projects. They can introduce innovative technologies and practices learned from global experiences by promoting the **circularity of resources**, local associations can contribute to environmental sustainability and also foster economic growth and community well-being. This approach helps build a more sustainable, resilient, and equitable society. Besides the economic and environmental benefits there are social contributions like increasing community engagement.

**Support and inclusion initiatives** are additionally emphasised. Such initiatives for low-income citizens can vary widely depending on the location and the specific context of the

support being provided. There are common types of support and initiatives that tend to be available in many regions, aimed at enhancing the quality of life for low-income individuals and families. These can vary from housing assistance to other basic needs like food, healthcare, education or transportation assistance. These initiatives reflect a comprehensive approach to supporting low-income citizens, addressing various aspects of life from basic needs to opportunities for advancement and inclusion in society.

**Social Engagement** is also a key aspect of the survey. Developing an effective social engagement strategy relies on a comprehensive understanding of both the community profile and the array of existing tools and channels available for communication. However, within the realm of social engagement, two critical aspects need deeper exploration: the specific objectives guiding our engagements and the identification of key stakeholders with whom our engagement efforts hold the highest ambition level. By defining the objectives of our engagements, whether they involve fostering community cohesion, gathering feedback on initiatives, or promoting civic participation, we can tailor our strategies to align with these overarching goals. Simultaneously, identifying key stakeholders—such as local residents, community organisations, governmental bodies, and advocacy groups—allows us to prioritise our engagement efforts effectively. Gathering this essential information serves as the foundation for designing a customised engagement strategy that not only resonates with the unique characteristics of the community but also fosters more efficient and meaningful interactions. Through targeted engagement initiatives tailored to specific objectives and key stakeholders, we can cultivate stronger relationships, foster collaboration, and ultimately, drive positive change within the community.

Social Questions	Unit of measurement
<b>Accessibility</b>	
Please specify the social profiling of average inhabitants of the district	<ul style="list-style-type: none"> <li>· Age group</li> <li>· Employment</li> <li>· Education</li> <li>· wage band</li> <li>· Ethnicity</li> <li>· Any other relevant information</li> </ul>

What are the existing tools and channels to engage with residents and tenants?	Textbox
Do the following groups participate in district initiatives and activities	<ul style="list-style-type: none"> <li>a. Women</li> <li>b. Ethnic minorities</li> <li>c. Young people</li> <li>d. Elders</li> </ul>
Is there any residents organisation or local housing association at district level? Please specify	Textbox
If yes, do they participate in any decision about the energy efficiency refurbishment of the district? Please specify	Textbox
Do the social housing residents interact with any other nearby association or social activity? Please specify	Textbox
Is there any networking initiative showcasing energy efficiency and human centred approach championed by the district? Please specify	Textbox
Are the local government and international agents (i.e. utilities, contractors, etc.) involved in any decision about the sustainability projects of the district? Please specify	Textbox
Are the local associations promoting circularity of resources (reducing, reusing and recycling)? Please specify	Textbox
Are there any special discounts and any other support and inclusion initiatives available for low income citizens? Please specify	Textbox

<p><b>Social Engagement</b></p>	
<p>What social objectives do you aim to achieve through the implementation of Supershine? What socio-economic needs are you addressing? Briefly comment. Please, try to be specific.</p>	
<p>What are the most relevant stakeholders that we need to engage with for the co-design activities in your district? Please select all that apply and make sure to include also all relevant users/beneficiaries:</p>	<p>Group 1: Segregated &amp; excluded/ vulnerable</p> <p>Group 2: Tenants, residents, citizens</p> <p>Group 3: Community (leaders)/local associations</p> <p>Group 4: Elderly</p> <p>Group 5: Handicap</p> <p>Group 6: Students/school-university, teachers</p> <p>Group 7: Artists</p> <p>Group 8: Municipality</p> <p>Group 9: Business/Start-ups-SMEs, local businesses, Industry associations</p> <p>Group 10: Designers / Architects / Engineers</p> <p>Group 11: Policymakers/ Experts</p> <p>Group 12: NGOs and voluntary</p> <p>Group 13: Investors</p> <p>Other: Please specify</p>

<p>Can you provide your perception of the digital literacy of the target stakeholders at your pilot site? Please, provide the information for each stakeholder group that applies to your district. A best effort indication is fine. Please use the following scale: Very Low (1), Below Average (2), Average (3), Above Average (4), Very High (5).</p>	<p>The same groups as above</p>
<p>How would you describe the environmental concerns/savviness of the stakeholders at your pilot site? Please, provide the information for each stakeholder group that applies to your site. A best effort indication is fine. Please use the following scale: Very Low (1), Below Average (2), Average (3), Above Average (4), Very High (5).</p>	<p>The same groups as above</p>
<p>How would you describe the energy literacy of the stakeholders to be engaged in your district? Please, provide the information for each stakeholder group that applies to your site. A best effort indication is fine. Please use the following scale: Very Low (1), Below Average (2), Average (3), Above Average (4), Very High (5).</p>	<p>The same groups as above</p>
<p>What are the key challenges that you expect to actively engage with the targeted stakeholders, and group 2 in particular?</p>	
<p>Please describe the available resources &amp; skills that you can leverage to support the implementation of Supershine engagement strategy and co-design activities.</p>	

### 3. Conclusions

In the context of social housing, energy poverty, and building and district retrofit, the financial questions outlined within the SUPERSHINE survey provide a comprehensive framework for understanding and addressing the complexities of energy efficiency projects in social housing buildings and districts. By delving into various aspects such as investment costs, payback periods, revenues, energy poverty assessments, funding sources, and planned investments, the survey aims to gather essential data for informed decision-making and project development. These financial inquiries serve multiple purposes, including assessing the economic viability of energy efficiency interventions, identifying sources of funding and revenue generation, evaluating the socio-economic impacts on residents, and fostering collaboration between stakeholders. Moreover, the survey highlights the importance of community engagement, technological advancements, and sustainable infrastructure management in achieving long-term sustainability and resilience within districts. By collecting and analysing data on financial and socio-economic aspects, the SUPERSHINE survey empowers decision-makers to prioritise initiatives, allocate resources effectively, and implement targeted strategies to address energy poverty, enhance energy efficiency, and promote inclusive and sustainable development within social housing buildings and districts. Ultimately, the insights gained from these financial questions will play a crucial role in guiding the development and implementation of the SUPERSHINE project, contributing to its success and impact in creating healthier, more resilient communities. Regarding the technical, environmental and social aspects the survey's goal is to collect data that is crucial for the required assessment of the project in terms of the innovative proposed interventions, these include Life Cycle Assessment (LCA), beyond financial aspects, the survey quantifies environmental impacts. It accounts for energy consumption, emissions, and resource use. By identifying hotspots, we optimise sustainability. The survey captures data related to the entire life cycle of district retrofit interventions. By evaluating environmental impacts across stages (from material sourcing to end-of-life), LCA informs decision-making and Social Life Cycle Analysis (SLCA). The survey directly addresses social aspects. It assesses how interventions impact residents' lives, safety, and quality of life. By considering social well-being, we create inclusive and resilient districts. Finally, Environmental impact extends to social dimensions. SLCA evaluates social aspects such as well-being, health, and community engagement. The survey ensures a comprehensive understanding of the project's effects on people.

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