



# Guideline to creating a Neighbourhood Refurbishment Concept



**Magistrate of the City  
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## About RenoWave



The project “One-Stop-Shop extended model to increase the multi-apartment building stock renovation in the BSR” (RenoWave) establishes cooperation among homeowners, construction companies, energy agencies, and public authorities to initiate more energy-efficiency renovations in multi-apartment buildings. The main result of the RenoWave project will be a One-Stop-Shop (OSS) model that includes traditional and additional OSS services that cover all the steps necessary to initiate and implement energy-efficiency renovation projects in multi-apartment buildings. The RenoWave project is implemented under the Interreg Baltic Sea Region Program 2021-2027 with the support of the European Regional Development Fund. Implementation time of the RenoWave project is January 2023 to December 2025.

### Project partners

1. County Board of Dalarna (Sweden)
2. City of Lappeenranta (Finland)
3. Vidzeme Planning Region (Latvia)
4. Association of Communes and Cities of Małopolska Region (Poland)
5. Magistrat of the City Bremerhaven (Germany)
6. Baltic Environmental Forum Latvia (Latvia)
7. Housing Initiative for Eastern Europe (Germany)
8. Let's renovate the city NGO (Lithuania)
9. Polish Foundation for Energy Efficiency (Poland)
10. North Sweden Energy Agency (Sweden)
11. Development Centre of Võru County (Estonia)

### Summary of Deliverable

In Germany a guideline for the implementation of a neighbourhood refurbishment management as a driver and advisor for an energetic refurbishment coordinated between house owners within a neighbourhood will be compiled. The principle is the neighbourly supply between buildings. Homeowners, tenants, financial advisors, construction experts, and legal advisors are networked for the legally compliant implementation of tenant electricity.



[www.interreg-baltic.eu/project/RenoWave](http://www.interreg-baltic.eu/project/RenoWave)

*The project RenoWave establishes cooperation among homeowners, construction companies, energy agencies, and public authorities to initiate more energy-efficiency renovations in multi-apartment buildings.*



## Contents

|   |    |
|---|----|
| 1. Introduction .....   | 4  |
| 2. Preparations and Assessments .....   | 5  |
| 2.1. Defining the project area .....  | 5  |
| 2.2. Assessing the building stock, infrastructure and social situation .....  | 6  |
| 2.3. Identifying development potentials .....                                 | 7  |
| 3. Developing measures .....  | 8  |
| 3.1. Action plan .....  | 8  |
| 3.2. Stakeholder participation and communication .....                        | 11 |
| 3.3. Calculating energy potentials on neighbourhood level .....               | 12 |
| 3.4. Developing a basic renovation scheme based on a “typical building” ..... | 13 |
| 3.5. Controlling Concept .....  | 14 |
| 3.6. Challenges .....   | 15 |

|   |    |
|---|----|
| Table 1: List of measures developed for the neighbourhood refurbishment concept of neighbourhood “Alte Bürger, Bremerhaven” ..... | 10 |
|---|----|

## Abbreviations

|                 |                                |
|-----------------|--------------------------------|
| CO <sub>2</sub> | Carbon dioxide                 |
| KfW             | Kreditanstalt für Wiederaufbau |
| OSS             | One-Stop-Shop                  |



## 1. Introduction

This guide to developing a neighbourhood refurbishment concept is based on the experience of the City of Bremerhaven (Partner 5). The municipality developed a neighbourhood refurbishment concept and prepared it for implementation in the 'Alte Bürger' district, prepared and applied for a similar project in the 'Goetheviertel' district, and was involved in the development of the neighbourhood refurbishment concept for the 'Erfinderviertel' district. The Housing Initiative for Eastern Europe (Partner 7) analysed neighbourhood refurbishment concepts in eight German cities. Their findings have been incorporated into this document. In addition, insights from the project partners Vidzeme Planning Region (Partner 3), the Polish Foundation for Energy Efficiency (Partner 9) and the Development Centre of Võru County (Partner 11), which are involved in improving the energy performance of multi-family buildings, have been added to the guide.

### What is a neighbourhood refurbishment concept and who uses it?

Neighbourhood renovation concepts are strategic instrument used by mostly German municipalities. In Germany, the neighbourhood approach involves the creation of integrated neighbourhood renovation roadmaps and the subsequent implementation through a renovation management. The federal German government, represented by the Kreditanstalt für Wiederaufbau (KfW), in a two-stage funding scheme, funded these projects. The programme was discontinued in January 2024, due to cuts of the national climate and transformation fund.

Neighbourhood renovation approach aims to “improve the social, environmental, and economic situation for residents in a district in terms of urban planning, development, and/or different regulatory frameworks and conditions. It describes the process of improving a defined territory by implementing different measures relating to: architecture, building structure, energy efficiency, energy sufficiency, climate adaptation and resilience, regulatory framework (e.g. building code or construction law), as well as demographics, socio-economics, and residents’ behaviour. The biggest potential for an improvement of the energy situation lies in energy efficient renovation of the buildings, including its heating and electricity systems and infrastructure and mobility.”<sup>1</sup>

### What can a neighbourhood refurbishment concept achieve?

A neighbourhood refurbishment concept should deal specifically and strategically with the energy and climate-friendly refurbishment of a neighbourhood and thus address national climate protection goals at neighbourhood level. Solutions are designed as to how energy savings and CO<sub>2</sub> reductions through to decarbonisation can be achieved for a neighbourhood in line with climate protection strategies, particularly in the building stock and heat supply, as well as a more sustainable infrastructure.

Objectives of the concept:

- Energy-efficient building refurbishment with the aim of achieving a climate-neutral building stock
- Socially responsible energy development of the neighbourhood
- Support for committed refurbishment projects
- Implementation of climate adaptation measures on buildings at neighbourhood level
- Climate-adapted or pedestrian and cycle-friendly refurbishment/modernisation of streets, including street greening and rainwater management
- Generation/use of renewable energies in the neighbourhood and open opportunities for energy sharing

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<sup>1</sup> ComActivate, Reute (2024). Report on Good Practices of Refurbishment Roadmaps, p. 8., [https://www.bpie.eu/wp-content/uploads/2024/11/ComActivate\\_D3.2\\_Collection-of-Good-Practices.pdf](https://www.bpie.eu/wp-content/uploads/2024/11/ComActivate_D3.2_Collection-of-Good-Practices.pdf)



- Heat planning and development of heat supply options
- Preparation of refurbishment management as a 'one-stop shop'

Ultimately, the neighbourhood should reach CO<sub>2</sub> neutrality in the process. Additionally, renovating districts and improving the urban climate can enhance a positive local image. In the social context, working together in a neighbourhood level project can bring owners and residents closer together and foster the mutual support. Additionally, it can activate local trade and the demand for local products and services, which in turn benefits the local economy and the reduction of CO<sub>2</sub> emissions.

### What are the benefits of the neighbourhood approach?

The proximity of the buildings makes it easier for an One-Stop-Shop (OSS) to provide outreach advice and, of course, improves accessibility. The proximity of the building sites also allows for more efficient use of local tradesmen for renovation work or group procurements. It is not uncommon for the refurbishment of old buildings to involve the conversion of space heating systems. The connection of such buildings to district heating networks or storage solutions, for example, can be better synchronised and may be more economically calculable for the supplier.

Experience has shown that communication within a neighbourhood is much more efficient and diverse. The mere visibility of a refurbishment project creates interest among neighbours and leads to demand. Of course, this requires successful refurbishments with smooth processes.

Finally, neighbourhood planning and construction activities and the formation of group procurement have stimulated interest in community renewable energy installations.

## 2. Preparations and Assessments

### 2.1. Defining the project area

Before starting any analysis or assessment, the project area needs to be defined. It is therefore necessary to identify the key determinant of the project. This is highly dependent on the project setting.

The term 'neighbourhood' is used here in the context of building refurbishment to define areas. The purpose of defining neighbourhoods is to keep both collective and individual refurbishment costs down and to create added value within the neighbourhood for the common good. For this reason, the decision to define an area is not only based on urban planning considerations, such as the clustering of buildings of the same type.

In addition, social and economic conditions, which can define a neighbourhood as the lowest common denominator, are just as decisive for its delimitation. Social and economic conditions are just as important in defining a district as the lowest common denominator.

In old neighbourhoods, for example, communities have grown over generations. Culturally and linguistically distinct neighbourhoods have developed, partly as a result of previous vacancies and unregulated settlement. Their redevelopment should not be neglected for social, energy and fiscal reasons, but requires an appropriate approach and incentives.

The offer of building refurbishment meets the economic limits of the owners, which could be overcome by joint solutions.

The neighbourhood approach therefore means identifying an area in advance where the interests and needs of the owners in terms of refurbishment are very similar. Ideally, standard solutions tailored to the



type of building can then be developed for this area and compiled in a neighbourhood refurbishment concept.

Consequently, the various factors need to be considered to define the neighbourhood that will serve as the project area:

- Political boundaries of a district
- Financial project restrictions: size of clusters based on number of buildings/ households/ residents
- Clusters of the same building type, e. g. areas with only art nouveau buildings
- Social cohesion or cultural networks
- Social and economic situation of residents and owners
- Economic units (as e.g. industry, companies, shops or trade areas as shopping streets, merchants, craftsmen, restaurants...)

Ideally, the communication that precedes this is based on contact with existing trusted parties within the communities. These neighbourhood refurbishment concepts look at the district as a whole. In other words, they look beyond the economic viability of an individual building and thus allow for the regulated development of synergies for the use of refurbishment resources between different owners.

## 2.2. Assessing the building stock, infrastructure and social situation

To assess the project area in more detail and build the basis for the identification of potentials for improving energy efficiency as well as general living conditions in the neighbourhood, aspects of urban planning, energy data and social structures need to be examined.

An **Urban planning** assessment may include statutes of urban planning, development structure (building stock), utilisation structure, traffic, open spaces or economic development concepts. The land-use plan and the current development plans provide the legal framework and give an initial indication of the heterogeneous utilisation and development typologies that prevail here. Specifically, the following aspects should be covered:

- Analysis of the settlement structure / development
  - Location in the city / in the region
  - Settlement structure, building typology, etc.
  - State of refurbishment / building fabric (visual assessment of the substandard quality of all buildings in the study area)
- Mobility analysis
  - Transport structure (incl. e-mobility), networking of neighbourhood and city as a whole
  - Public transport services in the neighbourhood
- Analysis of open spaces and traffic areas
  - Investigation of design options to improve the quality of stay
  - Unsealing and greening potential
  - Possibilities for sustainable rainwater management

The assessment of the actual **energy status** of the neighbourhood may include data on energy demand / consumption, electricity and heat, renewable energy production and potentials in the neighbourhood, energy balances of houses or inventory of buildings. Specifically, the following aspects should be covered:

- Summarising energy and CO<sub>2</sub> balancing for the current situation
  - Balancing energy consumption using a qualified balancing tool for residential neighbourhoods
  - CO<sub>2</sub> balancing with upstream chain (primary energy consumption)



- Presentation of the results by energy source and sector (residential, commercial, infrastructure, transport)
- Analysis of the use of renewable and CO<sub>2</sub>-reducing energies
  - Determination of the current use of renewable energies
  - Identification of any existing combined heat and power plants and local heating supply systems
- Analysis of energy consumption/demands
  - Determination of the energy consumption of the neighbourhood buildings using accessible data from energy suppliers, network operators and owners (grid-bound energy sources, if available), as well as calculation of consumption quantities of the remaining energy sources with the help of chimney sweep data, if necessary
  - complementing the data by conducting an energy survey

The **stakeholder analysis** needs to include not only data on income levels, but also education levels or cultural / migrant backgrounds to identify possible language barriers. The neighbourhood structure in relation to the city, internal stakeholders, multipliers and external stakeholders need to be identified. What makes the neighbourhood tick? What are the attitudes and views of residents and users, their economic and political potential and barriers? What are the preferred access points? This information can be used to create various summarised stakeholder profiles or 'personas'. This will later be useful in developing appropriate communication and socially responsible interventions.

Another important aspect is to identify the community gatekeepers. An example might be a neighbourhood manager who already works with local businesses and homeowners. Convincing and gaining the support of this person will build trust in the community and increase their willingness to participate in the project, including data collection for energy status assessment.

### 2.3. Identifying development potentials

Based on the data and information collected, the next step is to identify potentials in urban development and energy measures of single buildings. These potentials ultimately serve to improve the energy performance and living conditions of the neighbourhood as a whole.

Generally urban development potentials look at levers for decarbonisation, spaces for action and their levers, calculation of the neighbourhood-wide heat potential, calculation of the neighbourhood-wide electrical energy potential. Subsequently, energy potential of single buildings focusses on heat demand, calculation of a buildings heat potential, a buildings electrical demand and calculation of its energy potential, simulation of the energy production and supply of a building group. Additional aspects to be considered are:

- Structural and technical potential / obstacles
  - Reduction of energy requirements and identification of savings potential for energy consumption and CO<sub>2</sub> emissions in existing buildings and infrastructure
- Supply technology potential / obstacles
  - Increased efficiency through optimisation through non-investment and low-investment measures, renewal of plant technology, etc.
  - CO<sub>2</sub> savings potential through switching energy sources
  - Increasing the use of renewable energies in the grid
  - Potential of roof area management
  - Energy storage
- Mobility offers
  - Opportunities to strengthen walking and cycling, improve public transport services and e-charging infrastructure



- Urban development / infrastructure
  - Optimisation of urban land-use planning with special consideration of climate impact adaptation, e.g. in traffic and open space planning, unsealing / wastewater replacement, options for redensification, heat island formation/cooling, planning specifications, etc.
  - Strengthening urban development qualities, e.g. green infrastructure, uses
- Social-structural and market-psychological potentials
  - Examination of social structural effects, in particular social compatibility, identification of concrete motivation potentials and obstacles
  - Possibilities for pooling interests
  - Stabilisation of communication structures
  - Residents' and owners' expectations of a structured offer of support such as an One-Stop-Shop (OSS)

### 3. Developing measures

The overall goal when developing a neighbourhood level refurbishment concept is to foster carbon neutrality. This should include urban planning-functional contribution to neighbourhood, physical and technical options for carbon neutrality, objective and guiding principle of carbon neutrality. The neighbourhood approach also allows to for a high level of stakeholder and participation. The tailor-made measures will then be implemented by a renovation management and facilitated through a neighbourhood based One-Stop-Shop. Thereby, the action plan and basic renovation scheme can serve as a guideline to which type of OSS is appropriate of the neighbourhood, while the controlling concept can be used as self-assessment of the success of the renovation management and OSS.

#### 3.1. Action plan

Based on the analyses of the building stock, infrastructure, social structures as well as the potentials of improving energy efficiency, specific measures for further energy-related development of the neighbourhood are developed including:

- Development of a target scenario; assessment of social and economic feasibility
- Synthesis of the different areas of potential into the target scenarios, e.g. existing climate protection strategy
- Comparative economic feasibility assessments, with a balanced economic focus
- Development of the resulting transformation pathway
- Identification of the energy, urban planning and social models and objectives for the neighbourhood in accordance with the target scenario
- Creation of a concrete and implementation-oriented catalogue of measures for the entire neighbourhood, which provides all information for the most climate-friendly development of the neighbourhood (including prioritisation and financing/funding options)
- One-Stop-Shop and Monitoring concept
  - Framework conditions for accounting and controlling
  - Feasibility assessment for the neighbourhood, including funding opportunities
  - Proposal model OSS with rough concept as future renovation management



## Project example “Klimameile Alte Bürger” in Bremerhaven

For the "Klimameile Alte Bürger" project, a neighbourhood refurbishment concept was developed in 2021 and 2022. The neighbourhood is part of the city of Bremerhaven in Germany and consists of Art Nouveau multi-apartment buildings. The buildings usually have six floors with commercial use of the groups floor (e.g. for offices, restaurants, bars, arts/ culture) while the other floor are used as apartments. The project addressed a variety of stakeholder such as: private owners, commercial/ public owners, homeowner associations, residents, business owners and operators (shops, service providers, gastronomy), cultural professionals/ artists, different associations and initiatives, local energy agency, grid operator and energy suppliers, public transport provider, bike- and car-sharing providers, networks/ organisations advising on energy efficiency and renovation, financial institutions (e.g. Bremer Aufbaubank), craftsmen, energy experts, municipal politicians and commissions.

The project was funded by the Kreditanstalt für Wiederaufbau (KfW). The KfW-programme offered two funding stages: firstly, the concept development as described in this guideline. Secondly, the implementation of the developed concept and its measures over three to five years through setting up a renovation manager. Unfortunately, the funding programme was discontinued in January 2024. Nevertheless, the “Klimameile Alte Bürger” provided valuable insights into the neighbourhood's issues and potentials for improving energy performance and sustainable living conditions overall. The existing neighbourhood management proved to be an important gatekeeper and multiplier for the project success.



Picture 1: neighbourhood “Alte Bürger” ©Jens Rillke



Picture 2: unrenovated buildings ©KEEA

The following table highlights the measures developed in the project, which go beyond the classical refurbishment approach as they also consider the larger neighbourhood context and issues such as mobility, quality of environment or commerce and culture. In addition, a renovation scheme and exemplary scenario calculations have been made based on a typical building in the neighbourhood (see section 3.4).



Table 1: List of measures developed for the neighbourhood refurbishment concept of neighbourhood "Alte Bürger, Bremerhaven"

| Measure  | Description  |
|--|--|
| 1<br>Renovation management and OSS                                 | The development steps resulting from the neighbourhood concept and the general pressure to act towards a climate-neutral climate mile and a sustainable urban lifestyle are initiated, communicated and organisationally supported with sufficient personnel resources on site in the neighbourhood.   |
| 2<br>Short distance mobility concept                               | In order to link the existing approaches and to bring them into a concrete, resolvable form with the aim of prompt implementation, a local mobility concept is to be developed that focuses on the promotion of climate-friendly forms of mobility (walking and cycling, public transport, e-mobility, sharing offers) and the improvement of the quality of life at neighbourhood level.  |
| 3<br>Round Table "heat transition"                                 | The primary objective is to create a well-staffed committee made up of representatives from politics, the city administration and the housing and energy industries.<br><br>The ultimate goal is to establish a geophysically correct, almost climate-neutral heat supply so that buildings with the goal of 'climate neutrality' can be connected to the heating network. This allows the benefits of a municipal heat supply to be utilised.   |
| 4<br>"Climate-neutral house" advisory campaign for building owners | The aim of the measure is to support building owners on their way to becoming climate-neutral buildings. As decisions on the redesign and modernisation of buildings are usually made based on general information, owners are advised by a refurbishment management or energy consultant on the energy refurbishment of their buildings and financing options.  |
| 5<br>Energy-saving advice for tenants                              | The aim is to reduce energy consumption by providing low-threshold, personalised advice to households and small businesses. The main focus here is on user behaviour (including thermostat operation) and connected appliances such as lighting, televisions, kitchen appliances, their use and new purchases.   |
| 6<br>"Climate neutral pays off" financing advice                   | By combining comprehensive refurbishment advice in accordance with measure no. 5 with an optimised subsidy package and loan financing, the financial advice is intended to open up a path that allows owners willing to refurbish their buildings to take the right first steps towards climate neutrality, adapted to their respective budgets. The aim is to increase the number of refurbishment and subsidy programmes opened in the existing moderately funded environment.                   |
| 7<br>Mobility Lab  | The traffic laboratory measure is intended to temporarily test a needs-based reorganisation of Bürgermeister-Smidt-Straße as part of a traffic trial, which at the same time promotes climate-friendly forms of mobility and contributes to improving the urban climate.   |
| 8<br>Intensive treatment of problem properties                     | This social and energy-related grievance is to be remedied by identifying, approaching and intensively addressing and, if necessary, exhausting all available regulatory means, pursuing legal initiatives to persuade the owners to carry out proper maintenance/refurbishment and comprehensive use, otherwise to sell the disputed property or to obtain authorisation from the municipality.   |
| 9<br>Urban green networks  | The measure aims to establish resident networks as organisational structures that fruitfully combine the commitment of individuals and enable long-term self-organisation of the initiatives.<br><br>The ultimate aim of the measure is to make an evident contribution to increasing the habitat for flora and fauna in the street and to improve the microclimate, cityscape and quality of life together with intensively planted house gardens and balcony greening in private outdoor spaces. |



|   |  |
|---|--|
| <p>10<br/>Commerce and culture - climate-neutral!</p> | <p>Retailers and restaurateurs were won over to the idea of establishing a climate-friendly offer. In addition to CO<sub>2</sub> and energy savings, a neighbourhood identity and authenticity were created - there is a qualitative and conceptual differentiation from interchangeable 'mainstream' offers. The change has also attracted (supra-regional) attention. The increase in attractiveness has opened up new consumer groups and inspired other neighbourhoods and communities.</p>  |
| <p>11<br/>Network</p>                                 | <p>The target group has become aware of and willing to change its lifestyle and is taking the appropriate steps. The redevelopment management has both strengthened existing offers in the neighbourhood (e.g. from the retail trade) and created initiatives and networks (see also measures 4 and 9) that deal with aspects of a sustainable lifestyle. There is constant further development and training on the topic of 'sustainable and urban lifestyles in the neighbourhood' so that new impulses can be taken up at any time.</p> |

### 3.2. Stakeholder participation and communication

The project will initially focus on the energy-efficient refurbishment of buildings and efficient energy supply, a renewable energy supply based on this and individualised advice for tenants and owners, individual counselling of tenants and owners.

In addition to the quality of the neighbourhood concept in terms of content and expertise, however, the integration of the people and stakeholders into the overall context is also important: without their acceptance of the project, their constructive acceptance of the project, their constructive involvement and their willingness to utilise the subsequent energy measures accordingly, the project would fail. It is therefore important to ask: What do the stakeholders, the commercial operators and their customers, landlords and tenants want? How can the idea of a climate-neutral neighbourhood be communicated? How can it be further developed and organised in concrete terms and is it supported by a few very active people or a majority?

An essential part of the service to be provided will therefore be public relations work and the organisation of participation processes. The communication of objectives and results must be transparent; personal contact, on-site presence and more outreach counselling services are to be preferred. Suitable forms such as workshops, stakeholder forums or similar should be implemented for participation.

This should stimulate the willingness of individual property owners to invest, gain the acceptance of tenants and also generate a willingness for a cross-property, forward-looking concept. Another aspect will be the communication of the project in the urban community. For the example of Bremerhaven, the Klimameile-Project is a flagship that can have far-reaching knock-on effects if presented appropriately. The integration of the local catering focus into a corresponding communication strategy with playful and experience-oriented elements will presumably achieve a different reach than mere information campaigns.

In addition to digital, analogue offers such as print (flyers, posters, roll-ups, questionnaires) must also be developed and motivating activities and campaigns must be offered. For example, an evening tour of the neighbourhood on a winter evening with a thermographic camera could arouse interest in the topic and generate attention. Imparting knowledge about the technologies to be used, but also about energy-saving behaviour, the efficient operation of heating and technical systems and the issue of climate change is also part of raising awareness. Based on the actual analysis of the resident structure and the experience gained in the project, target group-orientated offers are to be developed.



### 3.3. Calculating energy potentials on neighbourhood level

The overall calculation of the neighbourhood is based on the survey data using the building typology method. The formal calculation of potential is derived from this. In addition, exemplary buildings can be individually inspected, recorded in detail and energetically modelled using software. On this basis, refurbishment variants can be calculated that underpin the necessary action paths to a climate-neutral neighbourhood.

The energy potentials determined here in the building sector are calculated from a current perspective, with current technologies and socio-economic conditions. The assumptions made for the potentials are based on current knowledge. This distinguishes the potential analyses presented from scenario-based model calculations, which are used to approximate future conditions.

The potentials presented in the report are based on the current state of the art and the current framework conditions of the material and impact analysis. For example, it is assumed that the buildings will be refurbished at the time the concept is drawn up using the technology available at that time. A key question is how final energy consumption, the impact on the greenhouse effect, primary energy demand and energy costs would then develop.

The calculation may consider consumption data and their potential for energy savings in terms of electricity. Final energy consumption, greenhouse gas emissions and primary energy consumption of:

- Total building stock
- Electricity
- Photovoltaic systems
- Solar thermal energy

In terms of heating and energy saving the calculations can consider

- Insulation of the space between the rafters
- Insulation of the exterior walls with a thick thermal insulation composite system
- the installation of thermal insulation glazing,
- Insulation of the cellar ceiling
- replacement of existing heating systems through heat pumps, district heating, pellet heating systems

#### Calculation example Bremerhaven „Alte Bürger“

|                                  | End energy   | CO <sub>2</sub> -emissions | Primary energy |
|----------------------------------|--------------|----------------------------|----------------|
| <b>Buildings</b>                 | 17.837 MWh/a | 5.031 t CO <sub>2</sub> /a | 21.543 MWh/a   |
| <b>Electricity</b>               | 1.021 MWh/a  | 421 t CO <sub>2</sub> /a   | 2.379 MWh/a    |
| <b>PV-Panels</b>                 |              | 490 t CO <sub>2</sub> /a   | 1.560 MWh/a    |
| <b>Solar thermal energy</b>      |              | 83 t CO <sub>2</sub> /a    | 22 MWh/a       |
| <b>Total</b>                     | 18.859 MWh/a | 6.025 t CO <sub>2</sub> /a | 25.504 MWh/a   |
| <b>Total annually until 2030</b> | 2.357 MWh/a  | 753 t CO <sub>2</sub> /a   | 3.188 MWh/a    |

The total reduction in final energy by 2030 is 18,859 MWh, the reduction per year is 2,357 MWh. Using the building typological methodology

- a moderate refurbishment of all buildings can reduce the demand for thermal energy by 40% and the demand for electricity by 14%,
- effective refurbishment of existing buildings would reduce demand for heat by 75% and for electricity by 24%.

The potential reduction in emissions of greenhouse gases results from the building typological potential for energy savings in heat and electricity and the expansion of renewable energies. This potential amounts to 6,025 tonnes per year by 2030 (based on 2021). The annual reduction rate is 753 t/a.



### 3.4. Developing a basic renovation scheme based on a “typical building”

Based on the neighbourhood typical calculations, a renovation scheme for a typical building can be developed, aiming for the highest energy efficiency improvements thus the highest CO<sub>2</sub> emission reductions. However, the measures need to be viable, realistic, and replicable and focus on the homeowners' needs.

Despite developing a suitable path to installing renewable energy sources like solar panels, heating related measures can include:

#### Building shell related measures:

- Thermic insulation improvement of front and back facades  
→ in front no exterior insulation possible due to ensemble protection (Jugendstil/ Art Deco facades)
- Insulation of roof / top ceiling
- Windows in front need higher heat transfer coefficient (U-value) than exterior wall to reduce risk for mould
- Windows & doors at the back: heat transfer coefficient can be lower, in accordance with insulating capacity of exterior wall
- Balconies and bay windows: reduce thermal bridges e.g. by replacing concrete balconies with steel / wood balconies

#### Heating system related measures:

- Subordinate to refurbishment of building shell
- Highly efficient system with high share of renewable energy sources
- Improved thermic shell leads to lower energy demand and flow temperatures (+ ultrafiltration system)
- Air heat pumps can be considered for high thermic performance of building shell, otherwise not efficient (high annual utilisation rate) → can lower final energy consumption up to 90%
- District heating: can lower final energy consumption up to 70%



Pictures 3 & 4: comparing a refurbished, energy optimised back of the building with an unrefurbished one in Bremerhaven © KEEA



### 3.5. Controlling Concept

The term 'controlling' refers to a comprehensive management and coordination concept for the targeted implementation of energy-related refurbishment measures, for example. Controlling is an instrument for monitoring the effectiveness of the measures implemented. This type of measure controlling serves to document, evaluate, present and monitor the successes achieved. Individual measures must be recorded and monitored for regular performance reviews. In addition, current developments in areas such as politics and technology must be recognised. The resulting possible new options for action must be assessed and incorporated into the framework for action to be updated. Such regular position descriptions should be categorised as a long-term task in remediation management. In this way, the use of the human and financial resources provided can also be reviewed in terms of effectiveness and efficiency for the overarching goal of 'climate protection'.

At the beginning of the implementation phase of the energy-efficient neighbourhood concept, the allocation of responsibilities is an important first step. The results should be collected and analysed by a central collection point (e.g. refurbishment management).

The measures listed in the catalogue of measures are thematically diverse, e.g. energy-related measures on individual residential buildings and urban development measures or public information events to support the implementation of the catalogue of measures. Ultimately, the implementation of these measures is aimed at various stakeholders, such as owners, the municipal administration or a redevelopment manager. The catalogue of measures aims to reduce energy demand and GHG emissions in the area under investigation. However, due to the complexity of a neighbourhood, this is not always easy to achieve and is only possible if there is a so-called caretaker who collects the information in the neighbourhood. This will only be possible if a refurbishment management team is appointed to collect and maintain the data.

#### Carbon dioxide emissions as the core indicator

The core indicator of controlling is the recording of carbon dioxide (CO<sub>2</sub>) emissions. The recording can be carried out by calculating the CO<sub>2</sub> emissions from energy consumption and energy sources before and after a measure has been implemented. The values for this must be provided by the measure organiser.

- Complete building refurbishment: Recording of energy consumption and energy sources before and after the refurbishment. Calculation of CO<sub>2</sub> savings.
- Heating replacement: Calculation of the efficiency gain of the heat generator and the change of energy source.
- Individual measures such as window replacement: Calculation of the reduced heat losses and their CO<sub>2</sub> reduction.
- Transport technology: Construction of facilities to promote local mobility. Estimation of the effect of shifting traffic and calculation of the CO<sub>2</sub> reduction.
- Events: Estimation of the CO<sub>2</sub>-reducing effect based on type and number of participants.

The overall impact of CO<sub>2</sub> savings is calculated from the individual measures implemented and their CO<sub>2</sub> reductions. Other impact indicators such as primary energy consumption are also derived from this. The establishment of a refurbishment management system in the neighbourhood makes it possible to document the measures implemented in the neighbourhood and assess their impact. This is done in the form of a periodic report.



### 3.6. Challenges

The neighbourhood renovation approach can be a very effective tool for municipalities to promote energy efficiency in buildings, living conditions at district level and CO<sub>2</sub> neutrality. However, it is also a very complex undertaking, which makes it more difficult to implement than a single building refurbishment. There are several challenges to the project management of this approach.

Firstly, the municipality must ensure that the project management has sufficient knowledge, experience and skills to deal with the complexity of the projects and the variety of stakeholders and their different needs. Identifying stakeholders, particularly owners, can be challenging as the ownership structures within a multi-apartment building can be complex or even unknown. It may therefore be necessary to carry out investigative work and allow time for this in the implementation schedule.

Secondly, contacting and involving owners and stakeholders can be challenging. Some stakeholders may be reluctant to participate or provide the necessary data. A lack of trust in the authority or possible language barriers can contribute to this problem. Building trust is a key task. In the worst case, legal assistance may be needed. Getting owners to agree among themselves to start the refurbishment process in the first place is another issue that needs to be addressed. The high initial investment or disagreement on and acceptance of the most valid solution may be factors to consider. At the same time, identifying community gatekeepers and good multipliers (e.g. neighbourhood managers) to support the project, as well as the most effective communication channels, is important to its success.

In addition, the support of local actors such as energy agencies, energy auditors, craftsmen or financial institutions needs to be secured by the renovation management and OSS, which adds to the complexity of the project. In particular, helping owners to find good and up-to-date financial support is essential. Helping owners navigate technical, legal and, in some cases, monument protection requirements is another issue to be addressed by the renovation management and OSS.

Finally, the project management needs to ensure that the services and advice offered are applicable to the whole neighbourhood and that the renovation scheme created is replicable for all buildings. In addition, the monitoring concept needs to be carefully designed to validly track the progress of the impact on CO<sub>2</sub> reduction.

