Interreg Baltic Sea Region

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ENERGY TRANSITION
Enercracy

Draft Model Catalogue of Measures for Energy Plans

Enercracy – energy plans and communities towards energy democracy for green transition

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Project website: https://interreg-baltic.eu/project/enercracy/

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Introduction

The Interreg Baltic Sea Region Programme project Enercracy brings together five Baltic Sea countries – Estonia, Latvia, Poland, Finland, and Sweden – to compile their knowledge in energy and climate planning towards climate neutrality, to scale up prosumerism, energy communities, and the use of sun and wind technologies.

The Enercracy project aims to first transnationally brainstorm and combine the knowledge of 5 countries to develop a Draft Model Catalogue of Measures for green transition and climate neutrality, or steps towards it, for any municipality/region, for free use. Afterwards, the Draft Model Catalogue of Measures is piloted together with five municipalities through the dedicated energy and climate plan development. The energy and climate plans are developed through collaboration among the projects' technical partners, pilot municipalities, public authorities, interest groups, SMEs, and infrastructure and service providers, represented through the National Work Groups.

This is a Draft version of the Catalogue (D1.3). The draft version will be published on the project website in March 2026. But the final version of the Model Catalogue of Measures will be available in 2027 for free use on the projects' and project partners' websites after testing and improvements.

Developers of the Draft Model Catalogue of Measures:

- Tartu Regional Energy Agency, Estonia
- Zemgale Regional Energy Agency, Latvia
- Rzeszów Regional Development Agency, Poland
- Dobele County Municipality, Latvia
- Green Net Finland, Finland
- Energy Agency Southern Sweden, Sweden
- Karlskrona Municipality, Sweden
- Tori Municipality, Estonia

NB: Some of the measures can be somewhat similar or have similar versions! Each user of the Catalogue can choose the measures that better suit their municipality's needs.

1 Energy efficiency

Energy efficiency is one of the most powerful tools for reducing emissions and energy costs. Inefficient buildings and systems waste resources and increase vulnerability to price fluctuations. Improving efficiency is often the fastest and most cost-effective way to cut emissions while enhancing comfort and competitiveness. With rising energy prices and ambitious climate targets, stakeholders have strong incentives to act now. This chapter presents measures that make homes, businesses, and public spaces more sustainable and affordable.

1.1 Capacity building and stakeholder engagement for energy efficiency

1.1.1 Informing and educating residents about:

- increasing the energy efficiency of residential buildings, including ventilation and recuperation systems, and the state support programmes
- energy saving measures, changing daily habits in the use of energy-consuming equipment.
- management and regulation of renovated buildings.
- opportunities to produce electricity for self-consumption as a prosumer (more for residents of private houses, the concept is relatively complex for multi-apartment buildings).
- Placing information on energy bills.

Description: This measure provides comprehensive information and training for residents on improving building energy efficiency, ventilation, and recuperation, available EU support programs, energy-saving habits, and management of renovated buildings. It also includes guidance on becoming prosumers (mainly for private house owners) and offering clear information via energy bills.
Implementation time: Short-to medium term, ongoing (2-5years).
Enabling conditions: Organization that is competent to do it - house management companies, energy agencies. Municipal communication channels.
Stakeholders: House management companies, energy agencies, municipality, and resident associations.
Indicators: Number of information measures implemented, number of informed residents, reach of communication materials.

1.1.2 Invite residents to discussions on energy efficiency

Description: Organize broad discussions with residents to identify possibilities for energy efficiency improvements, optimizations, and opportunities for

collaboration. These dialogues aim to raise awareness and generate actionable ideas for reducing energy use.
Implementation time: Short-term.
Enabling conditions: Communication strategy, resources for event organization, and willingness of residents to participate.
Stakeholders: Municipality, residents, local associations, NGOs.
Indicators: Resident energy efficiency dialogues held (count), participants (count), optimization proposals collected (count), share of proposals integrated (%).

1.1.3 Organizing cooperation forums to facilitate renovation activities

Description: As intermediaries and coordinators, municipalities can create dedicated forums to help establish initial contact between apartment owners and renovation coordinators, such as one-stop service points. For example, since 2023, Võru has organized a county-level forum for apartment associations to promote apartment building renovation. The forum provided an opportunity to share practical experiences and discuss renovation-related issues with experts.
Organizing cooperation forums to facilitate renovation means creating a structured and well-thought-out communication platform where different stakeholders involved in the renovation process can regularly meet, exchange information, and seek joint solutions. These forums bring together building owners and apartment associations, municipal representatives, designers, builders, energy experts, and organizations offering financing and support measures, enabling a comprehensive approach to renovation from technical, economic, and legal perspectives.
Forums share best practices, introduce new technologies and energy-efficient solutions, explain funding opportunities, and discuss common problems and their prevention. Regular and well-organized cooperation forums help increase awareness and trust among stakeholders, reduce uncertainty in decision-making, and improve the quality and success of renovation projects, creating conditions for smoother and more efficient renovation activities.
Implementation time: Can be implemented within one project cycle.
Stakeholders: Municipalities, resident associations, local communities, energy agencies, and one-stop service points.
More info: https://interreg-baltic.eu/wp-content/uploads/2025/05/Guideline-for-OSS-service-providers-RenoWave.pdf
Indicators: Number of participants on the cooperation forums.

1.1.4 Organizing training and campaigns for residents and SMEs on energy-saving practices and system optimization

Description: Training sessions and awareness campaigns for residents and SME owners to increase knowledge about energy-saving opportunities and help them understand their home or business energy systems as integrated systems. Topics include simple daily energy-saving practices—such as smart heating use, improved insulation, and avoiding peak-hour consumption—as well as more advanced solutions, such as adopting energy-efficient technologies and making informed investment decisions.

Special attention is given to analysing energy consumption to identify areas of unnecessary costs and opportunities for significant savings through small changes. SMEs are introduced to automated control systems and renewable energy integration options to improve cost efficiency and reduce carbon emissions.

The program also emphasizes when and where to seek professional advice. Participants are directed to qualified energy consultants and audit services and provided with information on available subsidies and national measures that can support investments. Public campaigns complement training by shaping habits that promote responsible energy use and reinforce their understanding that everyone can contribute to energy savings and sustainability through everyday choices.

Implementation time: Short-term but continuous activity.

Enabling conditions: Availability of responsible institutions and partner organizations (e.g., energy advisors, local energy agencies, NGOs), enough trained energy consultants and trainers, suitable facilities and technical resources for training, public readiness to adopt energy-saving behaviours, and accessible and clearly formulated informational materials (guides, recommendations, sample solutions).

Stakeholders: Local municipality, energy agencies, energy experts, and the community.

Indicators: Number of participants reached**.**

1.1.5 Raising awareness on energy efficiency

Description: The aim of this measure is to implement activities (training sessions) that increase awareness of energy efficiency, including renovation advice and general knowledge on heating, ventilation, smart consumption, energy-efficient appliances, etc. It is important to activate, motivate, and advise apartment associations and private homeowners on best practices for building renovations and funding opportunities, and to share market expertise.

Implementation time: Short-term but continuous activity.
Enabling conditions: Availability of experts, effective cooperation between municipalities and apartment associations, funding opportunities, good communication, community interest, and willingness to participate.
Stakeholders: Municipalities, apartment associations, and private homeowners, energy efficiency experts and advisors, and training companies.
Indicators: Number of training sessions (pcs), number of participants.

1.1.6 Informative and educational measures on the regulation and management of renovated buildings

Description: The measure anticipates information sessions, guides, and training for building users, especially building managers, to ensure efficient operation and proper management of renovated buildings. The focus is on maintaining achieved energy savings through the correct use of heating and ventilation.
Implementation time: Short-term (1-2 years, ongoing).
Enabling conditions: Will to improve energy efficiency, readiness to act.
Stakeholders: Municipality specialists, especially building managers.
Indicators: Number of trainings organized, number of participants, good level of energy efficiency in the building (kWh/m2).

1.1.7 Inform building permit applicants about energy efficiency options

Description: During the building permit process, inform applicants about how to construct more efficiently than current standards and the benefits of doing so, supported by guidance materials.
Implementation time: Short-term.
Enabling conditions: Availability of standardized guidance, cooperation with permitting authorities, and resources for applicant support.
Stakeholders: Municipality, building permit applicants, planning authorities.
Indicators: Applicants informed about efficiency options (count), share of permits including efficiency measures (%), applicant satisfaction score, standard guidance/checklist published (yes/no).

1.2 Possible measures in the municipality for the end consumer – municipality

1.2.1 Prepare infrastructure in plans to promote district heating

Description: Through the comprehensive and detailed plans, prepare infrastructure or locations in a way that promotes district heating, ensuring future developments can connect easily.

Implementation time: Medium-term.
Enabling conditions: Updated planning guidelines, cooperation with district heating providers, and integration of heat demand analysis into planning processes.
Stakeholders: Municipality, district heating companies, property developers, energy agencies.
Indicators: District heating-ready corridors/areas designated in plans (count), new developments connected to district heating (count), estimated heat demand aggregated in planned areas (MWh).

1.2.2 Align the comprehensive plan and the energy plan

Description: Ensure that the comprehensive plan and the municipal energy plan work in the same direction by embedding cross-references and conducting joint reviews.
Implementation time: Short-term.
Enabling conditions: Political commitment, coordination between planning and energy departments, and resources for joint review processes.
Stakeholders: Municipality, planning authorities, energy agencies.
Indicators: Formal alignment statement adopted (yes/no), number of cross-references embedded in plans, joint review meetings held per year (count).

1.2.3 Link energy plan measures to current regulations

Description: Clearly link the energy plan's measures to current regulations, such as the EPBD, to ensure compliance and facilitate implementation.
Implementation time: Short-term.
Enabling conditions: Access to regulatory frameworks, cooperation between planning and energy departments, and resources for compliance checks.
Stakeholders: Municipality, energy agencies, planning authorities.
Indicators: Measures mapped to EPBD and national regulations (yes/no), number of plan measures with explicit regulatory link, compliance checks completed (count).

1.2.4 Implement a standardized energy management system for the municipality

Description: Introduce and certify a standardized energy management system to monitor and improve energy performance across municipal operations.
Implementation time: Medium-term.
Enabling conditions: Availability of technical expertise, funding for system implementation, and staff training.
Stakeholders: Municipality, energy agencies, technology providers.

Indicators: Energy management system implemented and certified (yes/no), share of municipal operations covered (%), number of facilities with metering & monitoring active, annual energy performance report published (yes/no).

1.2.5 Maintenance, improvement, and automation of the municipal energy management system.

Description: The measure focuses on maintaining, upgrading, and automating the municipal energy management system to improve monitoring and efficiency: accounting and analysis of energy consumption in municipal buildings, municipal road transport, and street lighting. Expansion of the system, possibly including municipal commerce companies and/or municipal transport. The system enables data-driven decisions for energy savings and emission reduction.
Implementation time: Medium-term (1–3 years).
Enabling conditions: municipal data availability, national energy efficiency reporting rules, specialist capacity.
Stakeholders: municipality, municipally-owned companies, infrastructure, and public service providers.
Indicators: Number of buildings or systems connected to the energy management system, energy savings achieved (%).

1.2.6 Energy management systems – equipment performance and energy consumption optimisation

Description: Practical example – Utilising energy surplus from PV/RES or purchased on the secondary market during peak hours (when energy is cheaper/available) to heat water in a swimming pool, implementation of BMS (Building Management Systems), automation, consumption anomaly detection, smart energy counters, tariff and consumption profile optimisation, integration of renewable energy sources with energy storage facilities - Identification of the elements which can be automated, integrated with RES, taking the above aspects into account in public procurement to facilitate and enable implementation of systems.
Implementation time: about 1 year.
Enabling conditions: Exploitation of existing renewable energy infrastructure, support, and training for employees, ESCO companies providing comprehensive energy management services (the ministry maintains a list of such companies).
Stakeholders: Municipal organisational units, residents and building users, municipal enterprises, SMEs – maintenance services.

Indicators: Cost savings in EUR per year, number of facilities with an energy management system in place, reduction in heat energy consumption (%), reduction in electricity consumption for lighting (%), final energy savings (kWh), and number of facilities covered by the remote monitoring system.

1.2.7 Comprehensive and energy-efficient renovation of public buildings

Description: Comprehensive and energy-efficient renovation of public buildings is a systematic approach aimed at improving technical condition, reducing energy consumption, and enhancing user comfort and long-term building value. Renovation addresses the building, including structures, technical systems, functionality, and usability. The focus is not on replacing individual elements but on well-thought-out solutions that ensure energy efficiency, a healthy indoor climate, and lower maintenance costs throughout the building's lifecycle.

Energy savings are achieved by improving thermal insulation, upgrading heating systems, installing efficient ventilation with heat recovery, and using energy-efficient lighting and control solutions. Increasingly important is the use of renewable energy to reduce dependence on fossil fuels and greenhouse gas emissions. Attention is also paid to indoor climate, lighting, acoustics, and accessibility to ensure public buildings are comfortable and healthy for all users. Comprehensive renovation is based on prior analysis and planning, including energy audits and technical condition assessments. Energy-efficient renovation of public buildings significantly reduces public sector energy costs, extends building lifespan, and serves as an important example for sustainable development and achieving climate goals.

Implementation time: Long-term activity, 10–20 years (depending on the number of buildings, condition, and financial resources).

Enabling conditions: Clear political will and long-term vision, comprehensive overview of building stock, stable funding, competent project management, and administrative capacity.

Stakeholders: Local municipalities, energy agencies, and energy experts.

Indicators: Number of renovated buildings (pcs).

1.2.8 Ensure low energy demand in buildings

Description: Ensure low energy demand in both existing and newly constructed buildings, considering upcoming EU targets for energy performance.

Implementation time: Long-term.

Enabling conditions: Updated building standards, integration into municipal planning, and cooperation with developers and property owners.

Stakeholders: Municipality, property developers, energy agencies, housing cooperatives.
Indicators: Share of buildings meeting low energy demand thresholds (%), alignment with upcoming EU targets documented (yes/no), average specific energy use (kWh/m²).

1.2.9 Changing the use of public buildings to increase energy efficiency

Description: Building usage and management affect energy consumption as much as technical solutions. Improving energy efficiency in public buildings depends not only on technical measures but also on usage patterns. Changing usage means reorganizing spatial, temporal, and functional use to reduce energy consumption while maintaining service quality. Many public buildings are partially underutilized or have uneven occupancy, creating opportunities to consolidate activities into smaller spaces, temporarily close unused areas, and reduce heating, lighting, and ventilation in those zones.
Energy efficiency can also be improved by optimizing operating hours, e.g., shortening opening times or grouping fewer intensive activities into specific time slots. Shared use by multiple institutions allows more efficient use of space and reduces the need for separate buildings. For example, a school during the day and a hobby school or community centre in the evening, or consolidating several small institutions into one building. In some cases, changing or adapting building functions according to actual needs, demographic changes, or technical conditions are justified.
In addition to physical and organizational changes, user behaviour and internal management also play important roles. More conscious energy use, clear rules, and automated control systems help reduce energy consumption without major investments. Although changing usage may involve legal, social, and practical challenges, this approach can reduce public-sector costs and environmental impact, and improve the sustainability of existing buildings.
Enabling conditions: Clear political will and long-term vision, comprehensive overview of building stock, stable funding, competent project management, and administrative capacity.
Implementation time: Long-term activity.
Stakeholders: Public building owners and users.
Indicators: Number of buildings adapted (pcs).

1.2.10 Impose stricter energy efficiency requirements in construction and renovation

Description: Apply stricter energy efficiency requirements than current legislation for new construction and renovation projects where the municipality is the client or landowner.
Implementation time: Medium-term.
Enabling conditions: Updated procurement guidelines, legal framework for enhanced requirements, and cooperation with developers.
Stakeholders: Municipality, property developers, contractors, energy agencies.
Indicators: Municipal projects applying stricter efficiency criteria (count), average energy performance vs BBR (% improvement), share of land sales with enhanced energy requirements (%), compliance rate in completed projects (%).

1.2.11 Set higher energy efficiency targets for municipal buildings

Description: Increase energy efficiency targets for municipal buildings beyond the current 5%, aiming for more ambitious reductions in energy use.
Implementation time: Medium-term.
Enabling conditions: Political commitment, integration into municipal energy strategy, and funding for efficiency measures.
Stakeholders: Municipality, energy agencies, facility managers.
Indicators: New efficiency target adopted (yes/no), annual energy use reduction achieved (%), number of buildings meeting the higher target, deviation from target tracked and reported (yes/no).

1.2.12 Use of energy-efficient and smart room climate analysis, control, and management equipment (sensors, data processing tools, and automated control tools, etc.) to ensure the energy efficiency of municipal buildings. Renovation, energy efficiency together with ventilation

Description: The measure anticipates installation of smart climate control and building management systems in municipal facilities — including sensors, data processing tools, and automated control systems — to ensure optimal temperature, ventilation, and lighting performance. Combined with renovation measures, this helps achieve higher energy efficiency and comfort.
Implementation time: Medium-term (1–3 years).
Enabling conditions: National regulations on building automation, education of staff in the use of smart climate analysis, and municipal IT capacity.
Stakeholders: municipality, municipally-owned companies, infrastructure, and public service providers.

Indicators: Number of buildings equipped with smart management systems, reduction of heating and electricity consumption (%).

1.2.13 Increasing the energy efficiency of technological processes and systems (e.g. sewage pumping systems, etc.)

Description: The measure focuses on improving energy efficiency in municipal technological systems such as water and sewage pumping stations and systems, waste management facilities, and district heating systems. It includes modernization of equipment, automation, and optimization of operating schedules.
Implementation time: Medium-term (2–4 years).
Enabling conditions: EU funding for infrastructure modernization, technical expertise for system optimization, and cooperation of municipal utilities.
Stakeholders: Municipally-owned companies, municipality, infrastructure, and public service providers.
Indicators: Energy savings in technological systems (kWh/year), energy efficiency improvement (%) compared to baseline.

1.2.14 Automate heating and ventilation control systems

Description: Automate heating and ventilation systems using modern technology, including AI-assisted controls, to adjust based on actual needs and reduce energy consumption.
Implementation time: Medium-term.
Enabling conditions: Availability of smart control technologies, funding for upgrades, and technical integration with existing systems.
Stakeholders: Municipality, technology providers, facility managers, energy agencies.
Indicators: Buildings with automated HVAC controls (count), verified reduction in heating/ventilation energy (%), comfort complaints vs baseline (count), AI-assisted control deployments (count).

1.2.15 Replacing indoor lighting in buildings with energy-efficient LED bulbs

Description: The measure envisages replacing old inefficient lighting systems in municipal buildings with energy-efficient LED technologies. The investment provides immediate reductions in electricity consumption and maintenance costs.
Implementation time: Short-term (1-2 years).
Enabling conditions: Building inventories, available financing.
Stakeholders: Municipality, municipally-owned companies.

Indicators: Number of replaced light bulbs, reduction in electricity consumption (kWh/year).

1.2.16 Modernisation of lighting infrastructure

Description: Modernisation of existing lighting systems by replacing old equipment and implementing smart lighting, intelligent light intensity control, remote control and monitoring, motion sensors, and premium LED technology, which will reduce consumption and operating costs. Use of partial power supply from renewable energy sources, e.g., photovoltaic panels, which will further reduce energy consumption from the grid - identification of elements requiring modernisation or replacement.
Implementation time: 3 years.
Enabling conditions: Current external infrastructure, law, and subsidies.
Stakeholders: Infrastructure and public service providers, regional and national authorities, municipalities.
Indicators: Cost savings in EUR per year**, n**umber of light points replaced, reduction in energy consumption (%), average decrease in installed power (W/light point), total energy savings (MWh/year), number of luminaires equipped with intelligent control systems.

1.2.17 Behavioural energy savings in public buildings

Description: Behavioural energy savings in public buildings means reducing energy consumption through people's daily habits and actions without requiring major technical investments. This approach is based on the understanding that a significant portion of energy costs arises from unconscious or habitual choices, which can be relatively easily changed through awareness, clear guidelines, and motivating communication. In public buildings with many users and irregular consumption patterns, behavioural energy savings have particularly high potential.
Energy use is directly affected by everyday activities such as heating and ventilation, lighting, switching electrical devices on and off, and water consumption
The success of behavioural energy savings largely depends on human factors and organizational culture. Leadership example, staff and user involvement, and clear explanations of why energy saving matters help create a responsible and supportive environment. Energy saving should not be seen merely as an obligation but as a shared goal that reduces costs, protects the environment, and improves building efficiency.
Effective and positive communication plays a central role in behavioural energy savings. Simple visual reminders, regular feedback on energy consumption,

and making achieved results visible help keep the topic in focus and support the development of lasting habits

Implementation time: 6–12 months.

Enabling conditions: Support from management and decision-makers, awareness and understanding of energy consumption, easy access to consumption data and feedback, suitable organizational culture, logical and simple technical systems.

Stakeholders: Institution management, building manager, energy-saving coordinator, employees and daily users, energy advisors, and trainers.

Indicators: Reduction of energy consumption compared with the base year before behavioural measure implementation (MWh/year).

1.2.18 Developing a digital platform for monitoring energy efficiency in public buildings

Description: To facilitate the work of institutions supporting renovation activities (e.g., one-stop service points), interactive tools can be developed to reduce obstacles during initial data collection.

Developing a digital platform for monitoring energy efficiency in public buildings aims to create a unified and comprehensive solution for systematically collecting, analysing, and presenting data on public sector building energy use. The platform's goal is to improve energy consumption oversight, reduce energy costs and environmental impact, and support data-driven management at both institutional and national levels. It enables better assessment of building conditions, identification of inefficient energy use, and measurement of the actual impact of energy-saving measures.

The digital platform aggregates data from various sources, such as meters, building automation systems, smart devices, and weather information, and makes it understandable for users through visual dashboards and reports. The solution supports different user groups—building managers, institutional leaders, municipalities, and state authorities—by providing role-based information and tools for daily management and strategic decision-making. At the same time, the platform helps meet national and EU reporting requirements and increases transparency in managing public sector energy use.

Implementing such initiatives locally allows renovation-supporting institutions to create targeted measures in areas with the greatest energy needs and raises public awareness of building conditions. Additionally, it lays the foundation for systematic and sustainable building management, supporting energy savings, cost optimization, and climate goals while strengthening the public sector's role as a leader in energy efficiency and digital management.

Implementation time: 2 years.

Enabling conditions: Quality and standardization of building energy consumption data, institutional support, existing technical infrastructure, digital capability and experience, user readiness, and cooperation.
Stakeholders: Local municipalities, infrastructure and public service providers, regional and national authorities, energy agencies, and one-stop service points.
More info: https://interreg-baltic.eu/wp-content/uploads/2025/05/Guideline-for-OSS-service-providers-RenoWave.pdf
Indicators: Number of buildings in the digital platform.

1.2.19 Environmentally friendly and energy-efficient new buildings. Individual climate neutrality for each newly constructed building

Description: The measure envisages that all newly constructed municipal buildings meet high energy efficiency and climate neutrality standards. Each new building should integrate renewable energy technologies — such as solar panels for partial electricity coverage — and energy-efficient heating solutions, including heat pumps or connection to the district heating system where available.
Implementation time: Long-term (3–5 years).
Enabling conditions: EU funding, national support programmes for sustainable public infrastructure.
Stakeholders: Municipality, design and construction companies.
Indicators: Number of new energy-efficient buildings constructed, share of renewables in total energy of the building (%).

1.2.20 Increasing energy efficiency of infrastructure

Description: The aim of this measure is to implement activities related to making supporting infrastructure (heating pipelines, street lighting, etc.) more sustainable. Upgrading street lighting systems, including applying flexible control (automation, dimming sensors, etc.), provides significant savings. Solar energy solutions can be integrated into district heating systems, sewage, and water systems.
Implementation time: Duration depends on existing conditions and chosen solutions, and may become long-term.
Enabling conditions: Willingness to invest in innovative solutions, availability of support measures, and cross-sector cooperation.
Stakeholders: All infrastructure owners.
Indicators: Number of installed renewable energy solutions (pcs), share of LED lights in street lighting (%), reduction in energy consumption compared to previous levels (%).

Photo: Solar power plant at Sloka wastewater treatment plant. Source: Jūrmala Municipality (https://www.jurmala.lv/lv/jaunums/jurmalas-udens-strada-ka-klimatvieda-udenssaimnieciba)

1.2.21 Creating an energy specialist/energy manager position in municipalities

Description: Municipalities manage many buildings and facilities whose energy consumption represents a significant portion of fixed costs, but energy-related decisions are often fragmented across different roles. The lack of a clear responsible person leads to reactive problem-solving and missed opportunities for energy efficiency and funding.

The energy manager's role is to consolidate the municipality's energy management into a single system. Responsibilities include monitoring and analysing energy consumption, identifying inefficiencies, planning energy-saving measures, and assessing their economic feasibility. The energy manager also coordinates energy audits, renovation and renewable energy projects, and funding applications. Another key task is developing and implementing municipal climate and energy strategies and fostering cooperation with institutions, policymakers, and the community.

Creating this position brings multiple benefits: financially through lower energy costs and better-planned investments, managerially through clearer accountability and data-driven decision-making. In the long term, an energy manager helps improve energy security, enhance reputation, and prepare for future regulations and price changes. Although challenges may arise regarding funding and role clarity, long-term savings and strategic value clearly outweigh these issues. Therefore, the energy specialist position should be seen as an

investment rather than a cost and as an essential part of sustainable and smart municipal management.
Implementation time: 1 year (from defining responsibilities to full-time operation).
Enabling conditions: Clear and realistic role, management support, access to data and systems, budget allocation, and collaborative culture within the municipality.
Stakeholders: Local municipality.
Indicators: Assignment of a dedicated person (Yes/No).

1.2.22 Set higher energy and climate targets in land allocation competitions

Description: Establish stricter energy efficiency and climate targets than the national building code (BBR) in land allocation competitions for municipal land sales to promote sustainable development.
Implementation time: Medium-term.
Enabling conditions: Updated competition guidelines, legal framework for enhanced requirements, and transparent evaluation criteria.
Stakeholders: Municipality, property developers, energy agencies, and planning authorities.
Indicators: Land allocation competitions with higher energy/climate criteria (count), required performance level vs BBR (% stricter), winning projects meeting criteria (count).

1.2.23 Develop strategic energy plans before new supply

Description: Develop strategic energy plans that integrate energy efficiency in buildings, transport, and operations before planning new energy supply, ensuring demand reduction is prioritized.
Implementation time: Medium-term.
Enabling conditions: Political commitment, cross-sector collaboration, and access to energy demand data for integrated planning.
Stakeholders: Municipality, transport authorities, property developers, energy agencies.
Indicators: Strategic energy plan adopted (yes/no), cross-sector actions integrating buildings, transport, operations (count), energy demand reduction achieved before new supply (%).

1.2.24 Set energy efficiency requirements in procurement and renovations

Description: Ensure low energy demand in existing and new buildings by setting requirements for energy efficiency in public procurement and

renovations, including meeting the EU target of 3% annual renovation of public buildings.
Implementation time: Long-term.
Enabling conditions: Updated procurement guidelines, funding for renovations, and compliance with EU directives.
Stakeholders: Municipality, contractors, property managers, energy agencies.
Indicators: Public procurements with efficiency requirements (count), annual renovation rate of public buildings meeting ≥3% (yes/no), share of renovated floor area compliant (%), average post-renovation energy performance (kWh/m²).

1.2.25 Conduct energy audits and collaborate with private property owners

Description: Perform energy audits and follow-up in municipal properties and collaborate with private property owners to identify and implement energy-saving measures.
Implementation time: Medium-term.
Enabling conditions: Availability of qualified auditors, funding for audits and measures, and cooperation agreements with private property owners.
Stakeholders: Municipality, private property owners, energy agencies, consultants.
Indicators: Energy audits completed in municipal properties (count), identified measures implemented (count), verified savings (MWh), and number of private owners engaged in joint audits (count).

1.2.26 Energy audit of the municipality

Description: A municipal audit allows for significant energy savings of up to several dozen percent. A comprehensive audit of the entire heat management system of a municipality/city and building audits. It will help determine the direction of action, thereby reducing energy consumption in the municipality or town. To maximise the effect of this measure, it can be implemented by identifying the most energy-intensive buildings and auditing them first. Given that regulations are subject to change, audits should be carried out regularly – at least every 5-10 years – are there any regulations in place?
Implementation time: about 3-12 months.
Enabling conditions: Availability of technical documentation and energy consumption data, no complicated installation or audit scope, availability of auditors, organisational conditions, and funds for financing audits.
Stakeholders: Energy agencies and full-service points, municipalities, offices, companies (including SMEs), auditors, and designers.

Indicators: Number of audits conducted, number of energy consumption optimisation plans developed, reduction in CO^2 emissions (t/year).

1.2.27 Energy storage solutions for heat and electricity - municipality

Description: Innovative solutions to store heat include thermal technologies such as a sand battery. Such initiatives have already been built in Finland in some municipalities, and they have received great feedback from the inhabitants and public authorities.
Implementation time: Up to 10 years.
Enabling conditions: Finding an investor for building a storage system, collaboration with a local company that will operate the system, enhancing support from local authorities, and acceptability of inhabitants
Stakeholders: Investors, technology developers, local public authorities, energy companies, residents
Indicators: Decreasing use of fossil fuels for heat and energy production, stored MWh.

1.3 Measures for energy end consumers - residential buildings

1.3.1 Promotion of energy efficiency measures in multi-apartment buildings. Higher priority for buildings with higher energy consumption, for example, buildings with consumption above 150 kWh/m2 per year, or buildings with a higher number of residents exposed to energy poverty

Description: Bearing in mind the large number of buildings to be renovated, it would be recommended to have a permanent advisory hub. Actions include identifying priority buildings, improving data availability, setting annual renovation targets aligned with support programs, consulting residents, and motivating resident involvement. Providing project management for EE renovation projects in apartment buildings – a specialist in a house maintenance company.
Implementation time: Long-term (multi-year, depending on national support programs).
Enabling conditions: EU, national funding programmes for residential building renovation, access to energy data of the building, and active involvement of building managers and residents.
Stakeholders: Municipality, housing companies, resident associations, and local communities.
Indicators: Number of renovated buildings per year and in total energy savings achieved (kWh/m² or %).

1.3.2 Transition to collective and sustainable heating solutions in multi-apartment buildings

Description: This measure establishes a framework for the phased reorganization of apartment buildings currently relying on individual solid fuel stoves, outdated gas boilers, or unsafe chimney configurations. The municipality will adopt binding regulations and technical guidelines that prioritize the transition to centralized district heating or collective building-level renewable systems, such as shared heat pump cascades or biomass boilers. Crucially, these regulations focus on replacing inefficient combustion-based systems and removing hazardous exhaust outlets from facades and ventilation shafts. The measure does not prohibit the installation of modern, high-efficiency individual renewable solutions, such as heat pumps, provided they meet contemporary safety, noise, and aesthetic standards. The municipality will support this transition by providing technical assistance for feasibility studies and coordinating with building managers to implement building-wide heating upgrades.
Implementation time: Medium - to long-term (2–5 years).
Enabling conditions: Updated municipal binding regulations on heating and air quality, alignment with national fire safety and construction codes, and availability of financial support instruments for collective heating upgrades.
Stakeholders: Residents, building managers, municipality, district heating providers, and certified HVAC installers.
Indicators: Number of buildings reorganized.

1.3.3 Increasing the energy efficiency of residential buildings, including the installation of renewable energy technologies for self-consumption, if technically and economically feasible

Description: The measure supports improvements to residential buildings through insulation, window replacement, efficient heating systems, and installation of renewable energy technologies (solar PV, solar thermal, heat pumps) for self-consumption where feasible. These measures help reduce energy bills and enhance comfort. The best practice proven to work is the provision of project management from the beginning to the end of residential buildings. It could also be one-stop shops or home renovation services within municipalities, but it should be decided how to finance them.
Implementation time: Long-term (3–5 years).
Enabling conditions: National renovation and renewable energy support programs, technical assessments, and active residents.

Stakeholders: residents of multi-apartment buildings, housing companies, enterprises (including SMEs), and resident associations.
Indicators: Number of buildings renovated, installed renewable capacity (kW).

1.3.4 Improving energy efficiency of existing buildings

Description: The aim of this measure is to implement activities related to improving the energy efficiency of existing buildings, including residential houses, apartment buildings, public buildings, and private and third-sector buildings. A central focus is to optimize building energy consumption and automate energy management through the introduction of energy monitoring systems. Because the renovation of existing buildings plays an important role in creating opportunities for renewable energy use and storage solutions, the municipality will actively map suitable neighbourhood or quarter-level renovation projects to maximize regional impact.
Implementation is facilitated by the strategic use of national support programs and subsidies, such as KredEx or other grants for businesses and municipalities. To ensure high participation rates, the development department will communicate about grant opportunities and provide initial consultations to stakeholders to clarify eligibility and technical requirements. Furthermore, the municipality will provide project assistance to navigate the complexities of renovation, ensuring that project-by-project transitions lead to a comprehensive increase in the efficiency of the local building stock.
Implementation time: The duration depends on existing conditions and chosen solutions, and may become a long-term activity.
Enabling conditions: Availability of energy audits and subsidies.
Stakeholders: All building owners.
More info: https://urbact.eu/good-practices/solar-energy-public-buildings
Indicators: Number of buildings renovated for energy efficiency (pcs), share of buildings with at least energy class C.

1.3.5 Wider use of recuperation systems

Description: The measure promotes wider installation of mechanical ventilation systems with heat recovery - recuperation - in apartment and private houses. Recuperation reduces heating consumption, improves indoor air quality, and helps maintain a consistent indoor climate in renovated buildings. For instance, measures can include communication with inhabitants or municipal staff, or special requirements in financing rules to facilitate wider use of recuperation systems.
Implementation time: Medium to long term (3–10 years).

Enabling conditions: National support programmes for ventilation upgrades, technical expertise, and resident awareness.
Stakeholders: Municipality, building managers, inhabitants, and enterprises.
Indicators: Number of installed recuperation systems, reduction of heating demand (%).

1.3.6 Approaching the level of nearly zero-energy buildings in the building renovation sector

Description: The measure envisages achieving nearly zero-energy building levels during renovation of residential buildings, focusing on high-quality insulation, efficient heating and ventilation systems, and integration of renewables where feasible. This might entail larger investments but would provide long-term cost reductions for residents. For instance, measures can include searching for financing options, implementing the pilot projects, popularising the outputs of it, etc.
Implementation time: Long-term (5–10 years).
Enabling conditions: Building standards, available financing.
Stakeholders: Residents of buildings, building managers, municipality, energy agencies, and construction companies.
Indicators: Number of buildings achieving nZEB-level renovations, energy consumption after renovation (kWh/m²).

1.3.7 Designing and constructing energy-efficient buildings

Description: When planning new buildings, energy efficiency and other sustainability principles should be prioritized by using innovative and environmentally friendly technologies. For example, a municipality could foresee some relevant requirements in municipal regulations.
Implementation time: Long-term activity.
Enabling conditions: Awareness and readiness to implement sustainable solutions, support measures, and access to materials and technologies.
Stakeholders: All new building developers.
Indicators: Number of buildings constructed (pcs).

1.3.8 Identification of energy poverty level

Description: To address energy inequality, the municipality must identify households struggling to meet their basic energy needs. This process involves collecting and analysing data on energy expenditure, household income, and building efficiency. By establishing a clear definition and threshold for energy poverty, the municipality can create a database of vulnerable consumers. This data-driven approach allows for targeted support, such as prioritizing specific

buildings for renovation or directing grant schemes (see Measure 1.1) to those with the highest energy cost-to-income ratios.
Implementation time: 6–12 months
Enabling conditions: Access to social assistance databases, cooperation with energy suppliers for consumption data, data protection (GDPR) compliance, and a defined methodology for measuring energy poverty (e.g., the 10% rule or low-income-high-cost indicator).
Stakeholders: Municipality (Social Services and Energy Department), energy utilities, national statistical bureaus, and residents.
Indicators: Number of households identified as energy-poor, percentage of residents spending more than 10% of income on energy.

1.3.9 Reduction of energy poverty

Description: The measure includes targeted support for energy-poor households through energy audits, small-scale efficiency improvements, replacement of old appliances, improved insulation, and access to state/EU support programs. For example, measures can include the identification of people in energy poverty, municipalities can establish municipal support points, introduce new activities through municipal social services, etc.
Implementation time: Long-term, continuous (5-10 years).
Enabling conditions: Consultations, one-stop shops, State support for energy-poor households, cooperation with municipal social services, and data on energy-poor households.
Stakeholders: Municipality, municipal social services, energy agencies, and resident associations.
More information: Energy Poverty | EU Covenant of Mayors
Indicators: Number of supported energy-poor households, reduction in energy expenditure (%).

1.3.10 Strengthen energy and climate advisory services for households and businesses

Description: Offer and strengthen energy and climate advisory services for households, businesses, and organizations, focusing on practical measures and financing options. Inform residents about available advisory services and their benefits for energy efficiency.
Implementation time: Short-term.
Enabling conditions: Availability of trained advisors, funding for advisory programs, and cooperation with energy agencies.
Stakeholders: Municipality, residents, businesses, energy agencies.

Indicators: Advisory sessions delivered (count), residents/businesses supported (count), satisfaction score, number of financing applications facilitated (count).

1.3.11 Automation and demand response - residents

Description: Demand response and automation systems are possibilities for individual residents to manage their energy consumption more efficiently through home automation. For households, e.g., the Shelly Wall Display system is feasible to control lighting, heating, and air conditioning.
Sales of electric vehicles are around 50% of new-car sales. An opportunity for residents' demand flexibility is also provided by electric vehicles acting as battery storage when not operating. The vehicle charging can be delayed or shifted to off-peak hours, offering significant flexibility for the resident. (Sridhar 2025).
Implementation time: 1-3 years.
Enabling conditions: Suitable properties and technologies, e.g., which allow continuous monitoring, recording, and analysing the energy data.
Stakeholders: Technology solution providers in the market, households.
Indicators: Saving on energy consumption, savings on energy bills, and a decrease in energy demand during peak hours.

1.3.12 Thermal modernization

Description: Thermal modernization of residential (for residents) and public buildings (for municipalities) reduces the negative impact of buildings on the environment by reducing heat demand in winter and energy consumption for hot water preparation, resulting in lower fuel consumption and reduced greenhouse gas emissions and air pollution. Technical modernisation of buildings and their elements, like thermal installation, modernisation of heating and hot water systems, installation of renewable energy sources, in the most energetically inefficient elements.
Thermal modernization is a set of measures aimed at reducing heat loss in buildings and improving their energy efficiency. In the case of municipal buildings, the first step is to identify the most energy-intensive elements, such as poorly insulated walls, roofs, windows, doors, or outdated heating and hot water systems. Conducting energy audits in municipal buildings can establish a baseline and identify priority areas. Then, based on the results from the audits, municipalities can conduct modernization or replacement of hot water and heating systems in municipal buildings, insulation of external walls, roofs, and floors, upgrading heating and ventilation systems, including the installation of energy-efficient solutions or heat recovery systems, and replacing windows and

exterior doors with more energy-efficient ones. Municipal actions can also support residents by providing financial grants or loans for modernization measures in private homes through the development of financial programs and local policies that support building modernization. These can also be tailored to the buildings with the highest energy losses among residents.
Implementation time: 2-3 years.
Enabling conditions: Financial support programs, grants, tax relief, ESCO companies providing comprehensive energy management services (the ministry maintains a list of such companies).
Stakeholders: Municipal authorities, residents, contractors.
Indicators: Number of buildings thermally upgraded**, r**eduction in heat and electricity consumption (%), annual reduction in CO2 emissions (t/year), annual primary energy consumption in public buildings, annual primary energy consumption in residential buildings, amount of average annual final energy savings achieved, number of buildings modernised under the ESCO/EPC model.

1.4 Measures in industry

1.4.1 Increasing the energy efficiency of production buildings and improving the energy balance, including the use of renewable energy technologies (solar, heat pumps, etc.) for energy production for the building's own consumption, where technically and economically feasible

Description: The measure anticipates improvement of the energy performance of production and commercial buildings through insulation of buildings and the introduction of digital energy monitoring. Renewable energy technologies such as solar PV and heat pumps could be installed when technically and economically feasible to reduce operational costs and environmental impact. For example, measures could include joint sustainability agreements between the municipality and industry players, and the municipality can foresee basic conditions for the municipality in municipal regulations.
Implementation time: Medium- to long-term (2–5 years).
Enabling conditions: energy audits and technical expertise for evaluating renovation and options of RES usage.
Stakeholders: Enterprises, including SMEs.
Indicators: Energy consumption per m², installed renewable capacity (kW), and CO_2 emissions reduced.

1.4.2 Use of energy-efficient, environmentally friendly, climate-neutral technologies in production

Description: The measure supports the transition of industrial production processes to high-efficiency, low-emission technologies, aligning with climate neutrality goals. Examples include advanced electric machinery, high-efficiency motors, and clean manufacturing technologies that reduce fossil fuel dependence and pollution. For example, measures can include joint sustainability agreements between the municipality and industry players, and the municipality can foresee basic conditions for the municipality in municipal regulations.
Implementation time: Long-term (3–6 years).
Enabling conditions: Business motivation to reduce operational costs, availability of technology suppliers, and available financing.
Stakeholders: Enterprises, including SMEs, and technology providers.
Indicators: Share of climate-neutral technologies in production (%).

1.4.3 Transition to renewable energy sources in the industrial and service sectors

Description: The measure promotes switching to renewable energy for electricity and heat in the industrial and service sectors, such as installing on-site solar PV or heat pumps, or sourcing green electricity from suppliers. Municipalities can support dissemination by highlighting companies that have successfully implemented RES solutions, strengthening motivation within the business community. For example, joint sustainability agreements between the municipality and industry players, the municipality can foresee basic conditions for itself in the municipal regulations.
Implementation time: Medium to long term (3–10 years).
Enabling conditions: Enterprise-driven modernization decisions, availability of market-offered high-efficiency technologies, and available financing.
Stakeholders: Enterprises, including SMEs.
Indicators: Electricity generated from RES (kWh/year), number of companies using renewable energy.

1.4.4 Replacing production equipment with more energy-efficient

Description: The measure encourages enterprises to replace outdated or inefficient equipment with modern, high-efficiency machinery. This would reduce electricity consumption and would improve productivity. For example, joint sustainability agreements between the municipality and industry players,

the municipality can foresee basic conditions for the municipality in municipal regulations.
Implementation time: Medium-to long term (3–10 years).
Enabling conditions: Available financing.
Stakeholders: Enterprises, including SMEs, equipment suppliers.
Indicators: Energy savings in production processes (%).

1.4.5 Offer municipal support during energy project planning

Description: Provide support during the planning phase of energy projects, including technical advice, cooperative business models, and solar access assessments. This initiative aims to reduce complexity and enable successful implementation of local renewable energy projects.
Implementation time: Medium-term.
Enabling conditions: Availability of technical experts, cooperation with external advisory organizations, and funding for planning support services.
Stakeholders: Municipality, energy agencies, residents, businesses, housing cooperatives.
Indicators: Number of projects receiving technical advice, number of cooperative business models supported, number of solar access assessments completed, number of inquiries handled.

2 Scaling up prosumerism

The energy transition is not only about large-scale infrastructure—it is also about enabling individuals and businesses to produce and consume their own renewable energy, thereby becoming *prosumers*. Prosumerism reduces dependence on fossil fuels, lowers energy costs, and accelerates decarbonization. With technologies like solar panels and battery storage becoming more affordable, now is the moment to scale up these solutions. Supporting prosumer initiatives creates a more resilient, democratic energy system in which every stakeholder can contribute to climate goals.

2.1 Information and capacity building for prosumerism

2.1.1 Organizing training sessions

Description: This measure focuses on conducting training sessions and educational programs for different target groups (e.g., municipal employees, businesses, communities, students) to raise awareness on specific topics.
Implementation time: Short-term and recurring – can start immediately if trainers are available and continue regularly.
Enabling conditions: Funding, cooperation with educational institutions and experts, and participants' interest.
Stakeholders: Municipalities, educational institutions, businesses, trainers, national authorities, community.
Indicators: Number of training sessions organized, number of participants.

Photo: Training session "Biodiversity in Home Gardens". Author: Tori Municipal Government

2.1.2 Raising energy awareness among communities and residents

Description: Raising awareness about modern energy solutions, digitalization of energy management, virtual power plants, and energy behaviour. Prosumerism requires a conscious approach to energy use, technologies, and environmental impacts, and people's understanding of energy consumption, costs, and opportunities offered by modern renewable energy sources must be systematically increased.

The goal of energy awareness is to introduce both technical and economic arguments that support the "domestication" of renewable energy production. It also helps explain how the energy market works: how electricity pricing operates, the role of demand-side management, and how acting as a prosumer can reduce household costs and increase energy independence.

Awareness activities include practical workshops, digital information platforms, demonstration projects, community discussions, and public campaigns. It is especially important to provide simple and understandable explanations for people with no prior knowledge of energy topics—this reduces perceived technical complexity and encourages the adoption of active energy solutions.

Implementation time: Awareness campaigns and initial workshops can be implemented within one year; expanding programs and creating demonstration projects may take several years.

Enabling conditions: Supportive policies, funding mechanisms, clear and accessible information, available guidelines, and cooperation.

Stakeholders: National authorities, local municipalities, energy companies, NGOs and communities, educational institutions, and residents/prosumers.

Indicators: Number of participants in awareness activities, growth in the number of prosumers, number of joint initiatives launched, amount of co-investment secured, number of shared infrastructure projects implemented.

2.1.3 Organizing training for municipal employees on prosumerism and its benefits

Description: The goal of these training sessions is to develop municipal employees' knowledge and skills in prosumerism to strengthen local governments' capacity to implement new sustainable, community-based, and economically efficient solutions in energy systems and public services. Prosumerism is becoming an increasingly important part of municipalities' roles in advancing the green transition and community innovation.

Through training, municipal employees gain knowledge of prosumer principles, related technologies, legal frameworks, and economic and environmental

benefits, enabling them to make informed decisions and initiate practical development projects.
The training program supports municipalities in acting as active participants in the green transition, linking strategic goals with everyday administrative and development work. Practical examples and case studies improve employees' ability to assess municipal buildings and services as potential energy producers, plan prosumer solutions, and engage residents and partners. The result is a better-prepared municipal organization, with knowledge and skills that support long-term energy savings, community involvement, and local economic and environmental development.
Implementation time: Short-term.
Enabling conditions: Strategic and political readiness, awareness of changes in the energy sector, and motivation to support the process, willingness of management and key staff to learn, external drivers and opportunities (e.g., national or EU policies or projects).
Stakeholders: Local municipality, experts
Indicators: number of municipal employees trained, growing number of prosumer energy projects, participant satisfaction rate.

2.1.4 Organizing separate campaigns for residents and local SMEs to raise awareness of local prosumer potential and opportunities

Description: Targeted campaigns for residents and small and medium-sized enterprises (SMEs) to explain the benefits and opportunities of becoming prosumers. Campaigns can include information sessions, digital content, and practical examples of successful projects.
Implementation time: Short-term.
Enabling conditions: Funding, cooperation with local energy agencies and business associations, and clear communication materials.
Stakeholders: Municipalities, SMEs, residents, energy experts, NGOs.
Indicators: Number of campaigns organised, number of participants reached.

2.1.5 Promoting favourable conditions for more owners of private houses and business buildings to produce electricity for their own consumption - transition to partial local electricity production

Description: Facilitating the positive acceptance of solar and other RES on the municipal website and other communications.
Implementation time: Long-term (1–10 years).
Enabling conditions: support programmes - available financing, positive acceptance of solar and other RES.
Stakeholders: households, businesses.

Indicators: Electricity produced from renewable energy resources, MWh/year.

2.1.6 Promotion of self-production to cover energy self-consumption - microgenerators (solar technologies, etc.)

Description: The measure would promote households to adopt microgeneration technologies, primarily solar PVs, to produce electricity for their own use. Municipal information campaigns, workshops, and cooperation with energy agencies can help residents understand the benefits, processes, and available support from the national programmes.
Implementation time: Medium-term (2–5 years).
Enabling conditions: National support programmes for microgeneration technologies and clear information for residents.
Stakeholders: residents of private houses, the municipality, and resident associations.
Indicators: Installed microgeneration capacity (kW), number of new prosumers.

2.2 Identify appropriate land and roofs of municipal buildings where solar technologies can be installed.

Description: The measure involves mapping and assessing municipal properties (buildings and land) suitable for solar PV installations. The focus is on sites with high daytime electricity use during sunny periods, such as administrative buildings, schools (if not empty in summer), and public service centres. The assessment will consider roof orientation, shading, grid connection options, and technical feasibility.
Implementation time: Short-term.
Enabling conditions: Access to municipal building data, technical expertise.
Stakeholders: Municipality, municipality-owned companies, property and technical specialists, energy companies, designers, and builders.
Indicators: Number of assessed buildings/land plots, total identified suitable area (m^2), and addresses.

2.3 Increasing renewable energy capacity and share, and developing related infrastructure

Description: The aim of this measure is to implement activities related to increasing renewable energy capacity (green energy production from various sources, including solar, wind, biomass, hydrogen), expanding the use of renewable energy solutions (for households and organizations), and strengthening related infrastructure (reinforcing the electricity grid, developing charging infrastructure for electric vehicles, etc.).

Implementation time: Small-scale projects (home PV systems) can be implemented faster (1–3 years), large-scale solutions (wind farms, hydrogen production, grid reinforcement) require a longer perspective (5–15 years).
Enabling conditions: National strategies and legal framework (National energy and climate plans, renewable energy support measures), investment subsidies and the EU funds, favourable grid connection conditions, flexibility in municipal planning and development activities.
Stakeholders: Municipalities and their companies, infrastructure and public service providers, national authorities, businesses, community.
Indicators: Installed renewable energy capacity (kW), Annual energy production (kWh), CO_2 emissions reduced (t/year).

2.4 Developing procurement conditions allowing communities to use municipal roofs or land

Description: The goal is to develop legally compliant procurement conditions enabling municipalities to offer residents and communities the opportunity to use municipal-owned roofs or unused land. This approach supports local innovation, green transition, local energy production, community initiatives, and more purposeful use of public assets. Conditions may include requirements such as community ownership and control, non-profit operational models, mandatory community involvement in all project stages, production limits, obligation to produce for local consumption, higher weighting for community benefits in evaluation, and local contribution requirements.
Implementation time: 1.5 years, including drafting procurement conditions and conducting tenders up to contract signing and project implementation.
Enabling conditions: Presence of a responsible energy project coordinator in the municipality, clear strategic direction.
Stakeholders: local municipality.
Indicators: number of energy community parks on municipal buildings.

2.5 Installing solar panels on unused municipal land to cover the consumption of nearby local users

Description: This measure focuses on utilising unused municipal land for solar panel installations to generate renewable energy for nearby local consumers. Such projects help reduce dependence on centralized energy production, lower transmission losses, and support local energy autonomy.
Implementation time: Short-term.
Enabling conditions: Availability of suitable land, grid connection options, investment support, and cooperation with energy companies.

Stakeholders: Local municipality, energy companies, contractors, and the larger community.
Indicators: Installed capacity (kW/MW), share of local consumption covered by generated energy (%).

2.6 Develop a rent model of roofs of municipal buildings and degraded territories (brownfield sites) for prosumers and energy communities

Description: This measure establishes a comprehensive framework for leasing municipal assets—including rooftops of public buildings, brownfield sites, and vacant land—to energy communities and prosumers. By streamlining the legal and administrative process for using public property, the municipality lowers entry barriers for small-scale renewable projects (Solar PV, small-wind, or bioenergy). The model focuses on long-term, transparent lease agreements or cooperative investment schemes that prioritize local socio-economic benefits and align public land use with climate neutrality goals.
Implementation time: Medium-term, including model development and legal approval.
Enabling conditions: National legislation permitting the lease of public assets for energy production, updated local land-use plans, and a transparent "Selection Criteria" matrix for energy communities.
Stakeholders: Municipalities (as lessors), energy communities, residents, local SMEs, energy agencies, and grid operators.
Indicators: Number of contracts signed, installed capacity under lease agreements (kW), installed capacity (kW/MW), share of local consumption covered by generated energy (%).

2.7 Technical consultations for households on how to become prosumers

Description: The measure provides free or subsidised technical consultations for households interested in becoming electricity prosumers. Experts will advise on system design, costs, legal aspects, and connection procedures.
Implementation time: Short-term but continuous activity.
Enabling conditions: Availability of qualified consultants, cooperation with energy agencies or one-stop shops, available financing – how to finance these consultations.
Stakeholders: Energy agencies, one-stop shops, municipality, resident associations, enterprises (installers).
Indicators: Number of consultations provided, number of households that installed PV after consultation.

2.8 Technical support and advice provision by municipal contact points

Description: This measure establishes a central municipal "One-Stop-Shop" that combines advisory services with active asset management to accelerate local energy projects. The contact point provides technical, legal, and administrative guidance to residents, energy communities, and businesses, assisting with project planning, grid connection, and applications for national or EU subsidies. Crucially, the hub manages a registry of mapped municipal assets—including rooftops, vacant land, and brownfields—suitable for energy production. It facilitates the allocation of these areas for community use through a transparent procedure (both proactive public offers and request-based applications). By connecting stakeholders with available public sites and co-investment models, the municipality reduces bureaucratic burdens and directly enables shared renewable energy infrastructure.
Implementation time: Short-term for advisory setup, medium-term for mapping and implementing the asset allocation procedure.
Enabling conditions: Political support, availability of municipal land/rooftops, GIS/spatial data for mapping, technical expertise, and a clear legal framework for leasing public assets to third parties.
Stakeholders: Local municipality, residents, energy communities, energy experts/installers, and grid operators.
More info: Križevci Sunny Roofs https://www.zez.coop/en/projekt/krizevci-solar-roofs/
Indicators: Number of municipal sites (roofs/land) mapped and offered for community use, number of community energy production units successfully established on municipal assets, and increase in the number of prosumerism projects in the area.

Photo: Community solar park on a municipal building roof in Croatia, Source: Interreg Europe (https://www.interregeurope.eu/good-practices/res-crowd-investing-initiative-krizevci-solar-roofs)

2.9 Develop a checklist or strategy to speed up permit application

Description: The municipality develops a checklist or strategy for residents and SMEs to ensure all necessary information is included in applications from the start, reducing lead times and speeding up the permit process for renewable energy project development.
Implementation time: Short-term.
Enabling conditions: Availability of regulatory information, cooperation with permitting authorities, and resources for checklist development and dissemination.
Stakeholders: Municipality, SMEs, residents, and planning authorities.
Indicators: Checklist published (yes/no), number of applicants using the checklist, reduction in average permit processing time (%), and applicant satisfaction score.

2.10 Requiring real estate developers to create conditions that support prosumerism

Description: This measure involves requiring real estate developers seeking building permits, detailed plans, or design conditions within a municipality's territory to create conditions that support energy prosumerism. Municipalities can require developers to design and build areas in a way that promotes renewable energy production, energy sharing, and prosumerism.
All new developments must be designed with solar energy use in mind, ensuring sufficient load-bearing capacity, appropriate tilt angles, and unshaded

placement for solar panels. Developers can be required to install a minimum solar production capacity (e.g., X kW per apartment, at least Y kW per square meter of gross floor area, or at least 50% of the roof area must be covered).
Requirements may also include building technical infrastructure that enables energy sharing between buildings, including cables, pipelines, distribution equipment, control systems, smart meters, and integration with grid operators or local energy community systems. Municipalities can require developers to submit an energy system concept during planning or permit application, describing planned production capacities, consumption forecasts, storage solutions, system balance, and impact on energy efficiency.
Implementation time: 2–5 years (~6–12 months for setting requirements + developer implementation).
Enabling conditions: Clear and stable regulatory framework providing certainty for developers, technical guidelines, standardized solution templates, and a clear coordination process to speed up planning and grid integration.
Stakeholders: Local municipalities, real estate developers.
Indicators: Number of requirements set for real estate developers.

2.11 Creating solar cadastres – public GIS map showing roof solar potential and guiding residents on next steps

Description: The goal of this measure is to create a public solar cadastre—a web-based GIS map that assesses the solar potential of all building roofs and supports informed investment decisions by residents, businesses, and municipalities. The solar cadastre displays radiation data and translates it into practical information: suitable roof areas, potential solar plant size, expected output, and profitability. The service guides users through the next steps, including requesting quotes and preparing for project implementation.
Clear communication is emphasized—the solar cadastre is a decision-support tool, not a technical guarantee. Verification of specific solutions remains the responsibility of designers and installers, but the municipality provides residents with reliable, free, and neutral baseline information.
French cities (e.g., Lyon, Grenoble) use solar cadastres. For example, Bordeaux launched its solar cadastre in the mid-2010s as part of its broader climate and energy plan to increase renewable energy use and make solar energy understandable and accessible to residents. The city wanted a public digital service enabling property owners to assess roof suitability for solar panels and make informed investment decisions. The technical and methodological solution was developed by Cythelia, a French renewable energy consultancy, in collaboration with Geomap-Imagis for GIS data processing and map application development.

Implementation time: 1 year (policy level agreements were achieved before)
Enabling conditions: Clear political and strategic mandate, strong municipal leadership, access to high-quality spatial data, experienced specialized contractor.
Stakeholders: Local municipality, service providers (solar cadastre developers, GIS specialists).
Indicators: Share of buildings with assessed solar potential (%).
More info: https://www.cythelia.fr/en/renewable-energies/expertise/solar-cadastre/

Photo: Fragment of the Bordeaux city sun cadastre. Source: Cythelia Energy (https://www.cythelia.fr/en/2015/10/01/cadastre-solaire-sur-le-perimetre-de-la-ville-en-cours/)

2.12 Organizing public grant schemes for residents interested in producing electricity/heat for themselves and neighbors

Description: The aim of this measure is to promote decentralized and community-based energy production, reduce household energy costs, and support the transition to more environmentally friendly energy use.
The grants target homeowners, apartment associations, and community groups where project benefits extend beyond a single household. Supported solutions include solar PV and solar thermal systems, heat pumps, biomass-based systems, small wind turbines, and energy storage systems. Grants may also cover design and grid connection costs and the creation of community energy systems for shared energy use.

Support can be provided as non-repayable grants or partial co-financing, with amounts depending on project size, impact, and technology used. Priority is given to technically and economically feasible projects with clear environmental and community benefits and long-term value. Transparent grant administration, clear evaluation criteria, and consistent monitoring ensure that supported projects effectively increase renewable energy share, reduce energy costs, and strengthen community resilience.
A best practice is to use revenue from local wind farms or other energy facilities (e.g., land lease fees) as grant funding. This approach is logical, well-justified in the community, and politically sound, directly linking large energy projects to local benefits. Similar practices have been implemented in Scotland.
Implementation time: 1–2 years + 1 year for follow-up evaluation.
Enabling conditions: Active role of municipalities and communities, availability of co-financing and financial instruments, existing technical and infrastructure readiness, clear and stable legal framework.
Stakeholders: Local municipalities, residents and communities, grid operators and district heating providers, energy experts.
Indicators: Growth in the number of prosumers

2.13 Offer project development support and partnerships for local energy investments

Description: The municipality provides technical advisory services for planning and implementing small-scale renewable energy projects, including site assessments, supplier offer reviews, and regulatory guidance. Partnerships with external organizations such as Coompanion enable cooperative ownership models and extended support.
Implementation time: Short-term.
Enabling conditions: Availability of trained advisors, cooperation with external support organizations, and funding for advisory programs.
Stakeholders: Municipality, energy agencies, residents, businesses, associations, and external advisory organizations.
Indicators: Number of advisory sessions provided, number of partnerships established, number of projects supported through technical guidance.

2.14 Facilitating the installation of renewable energy systems in municipal and private buildings

Description: Increasing the number of prosumers requires a friendly regulatory and administrative framework. Legal regulations should be simplified and rules clear, transparent, and stable so that residents, communities, and SMEs can easily understand and apply them. Administrative procedures for issuing

permits and connecting to the grid could be simplified and digitalised, reducing the time taken to process applications and lowering the costs involved.
Implementation time: 5 years
Enabling conditions: Access to national and EU funds, securing the necessary permits, obtaining financial resources for the implementation of the action, and support from authorities
Stakeholders: local government, municipal companies, SMEs, municipalities
Indicators: Number of installed renewable installations, average time needed to get permits and grid connection (days), number of new prosumers in the municipality, growth in installed renewable power capacity (MW).

2.15 Collaborate with property owners to utilize large rooftops for solar panels

Description: The municipality collaborates with property owners, preferably in commercial or industrial areas, to utilize large rooftops for solar panel installations, increasing renewable energy production and promoting local partnerships.
Implementation time: Medium-term.
Enabling conditions: Availability of legal agreements for rooftop use, financial incentives or co-investment models, and technical feasibility for solar installations.
Stakeholders: Municipality, property owners, businesses, energy agencies, and solar installation companies.
Indicators: Number of rooftop collaboration agreements signed, total rooftop area utilized (m^2), installed solar capacity on large rooftops (kW/MW), number of property owners participating.

2.16 Maximizing the use of apartment building roofs for energy production and encouraging on-site consumption (transition to collective purchase)

Description: More efficient use of apartment building roofs for renewable energy production is a key step toward energy independence and lower consumption costs. Many apartment buildings have large, underutilized roofs ideal for solar panel installation. Maximizing these surfaces significantly increases locally produced renewable energy and reduces reliance on external electricity markets.
The core idea is to use rooftop solar energy as much as possible within the same building. This means aligning production and consumption so that electricity is not sold cheaply to the grid and bought back at a higher price. Transitioning to collective purchase—where the entire building, including

apartments and common areas, consumes solar energy under a single electricity contract—creates clear economic benefits.
Daytime solar energy can power apartments and common systems such as ventilation, heat recovery, pumping stations, lighting, or EV charging points. Future storage solutions (e.g., batteries or thermal storage) will allow surplus energy to be used during evening peak hours.
Collective purchase reduces administrative complexity for residents, as all consumption is managed under one system. It also improves bargaining power with electricity providers, ensuring better prices and flexibility. Shared energy infrastructure fosters a sense of community and motivates decisions that increase building value, reduce costs, and support the green transition.
Implementation time: 1–2 years, considering negotiations with apartment associations and installation of energy production units**.**
Stakeholders: Local municipality, apartment associations.
More info: https://www.cleanenergywire.org/news/rooftop-solar-housing-blocks-could-cover-over-quarter-new-capacity-2030-researchers
Indicators: % of roofs of apartment buildings used for energy generation.

2.17 Installing solar PV panels on the roofs of municipal buildings and batteries to cover buildings' electricity consumption

Description: The measure proposes installing solar PV panels and battery storage systems on municipal buildings to cover part of their electricity consumption and improve energy resilience.
Implementation time: Medium-term.
Enabling conditions: Availability of municipal budget or external funding, legal framework for renewable installations, and grid connection approval.
Stakeholders: Municipality, municipally owned companies, energy agencies, PV and battery suppliers.
Indicators: Installed kWp, yearly energy production.

2.18 Map regulatory barriers and develop support mechanisms for local renewable energy

Description: The municipality conducts a structured assessment of permits, costs, and administrative complexity for small-scale solar, wind, and bioenergy systems. Findings will guide targeted support measures to enable residents, associations, and businesses to invest in local energy production and promote prosumers.
Implementation time: Long-term.
Enabling conditions: Access to regulatory data, cooperation with permitting authorities, and funding for analysis and support programs.

Stakeholders: Municipality, energy agencies, local businesses, and resident associations.
Indicators: Completion of regulatory barrier mapping (yes/no), number of barriers addressed, number of new support mechanisms introduced, increase in installed local renewable capacity (kW or MW).

3 Scaling up the number of energy communities

Energy communities bring people and organisations together to jointly produce, share, and manage energy, creating social, economic, and environmental benefits. They strengthen local resilience, reduce energy poverty, and keep financial gains within the community. Despite strong policy support, their development remains limited in many regions. Expanding energy communities is crucial now to meet climate targets and ensure fair access to clean energy. These measures help stakeholders collaborate effectively and unlock the full potential of collective action.

3.1 Technical assistance, training, and demonstration of energy sharing

3.1.1 Build municipal knowledge on energy sharing

Description: Ensure the municipality has knowledge on how and when energy sharing can be implemented, including technical, regulatory, and financial aspects, to provide guidance and resources for interested stakeholders.
Implementation time: Short-term.
Enabling conditions: Training for municipal staff, access to best practices, and cooperation with energy agencies.
Stakeholders: Municipality, energy agencies, consultants.
Indicators: Guidance toolkit published (yes/no), number of staff trained, number of advisory sessions delivered.

3.1.2 Involve residents through training seminars (workshop and manual) and pilot energy communities

Description: The measure encourages residents to take part in the energy transition via workshops, manuals, and active participation in pilot energy communities.
Implementation time: Short-term (1-2 years, ongoing thereafter).
Enabling conditions: Active municipal coordination, interested residents.
Stakeholders: municipalities, resident associations, energy communities, and local communities.
Indicators: number of participants, number of residents engaged in community projects.

3.1.3 Introducing energy communities and related opportunities to local communities

Description: This measure involves organizing regular awareness campaigns for residents. Information can be shared at community events, through thematic workshops, seminars, or dedicated information days. Awareness can also be raised via local media by publishing expert articles, opinions from active community members, or hosting Q&A discussions between interested residents and experts. In addition to theoretical knowledge, it is important to invite representatives of existing energy communities to share their experiences.
Implementation time: Ongoing activity.
Enabling conditions: Presence of active community members, knowledgeable municipal officials, and mapping of local energy challenges.
Stakeholders: Local municipality, local community (including businesses).
More info: URBACT good practice from Spain on local energy communities: https://urbact.eu/good-practices/local-energy-community
Indicators: Number of campaigns organized.

3.1.4 Use of digital platforms and social networks to popularize the experience of pilot energy communities

Description: The measure aims to disseminate the experience and results of pilot energy communities through municipal (and other) websites, social media, and digital platforms to inspire replication and strengthen community engagement in renewable energy initiatives.
Implementation time: Short-term (1-2 years).
Enabling conditions: Municipal communication resources and coordination among project partners.
Stakeholders: municipalities, local communities, energy agencies.
Indicators: number of communication materials/posts published, audience reach (views, shares).

3.1.5 Summarize information about financial support for energy communities

Description: Compile and publish a summary of available financial support options for energy communities to help stakeholders access funding and reduce barriers to implementation.
Implementation time: Short-term.
Enabling conditions: Access to up-to-date funding information, cooperation with funding agencies, and resources for publication.

Stakeholders: Municipality, energy agencies, residents, businesses, and associations.
Indicators: Financial support summary published (yes/no), number of downloads or views, number of inquiries received, number of projects applying for support.

3.1.6 Implement pilot energy communities - starting with lower-cost, high-visibility initiatives - in kindergartens, libraries

Description: Small-scale renewable energy pilot projects could be implemented in public buildings (e.g., kindergartens, libraries, etc.) to demonstrate local generation models and build public trust in community energy solutions.
Implementation time: Medium-term (1–3 years).
Enabling conditions: EU funding support, support from the municipality.
Stakeholders: municipality, municipally-owned companies, local communities.
Indicators: Number of pilot energy communities established, installed renewable capacity (kW), and CO_2 emissions reduced.

3.1.7 Conduct a pilot project for the energy community and energy sharing

Description: Implement a pilot project on municipal property to establish an energy community and share electricity with neighbouring properties, demonstrating the feasibility and benefits of local energy production and collaboration.
Implementation time: Medium-term.
Enabling conditions: Suitable municipal property, legal framework for energy sharing, and funding for pilot implementation.
Stakeholders: Municipality, residents, businesses, energy agencies, grid operators.
Indicators: Pilot initiated (yes/no), number of connected properties, share of on-site generation shared (%).

3.1.8 Highlight successful energy communities to inspire others

Description: Share success stories of energy communities through communication campaigns and events to inspire residents, businesses, and organizations to adopt renewable energy and collaborative models.
Implementation time: Short-term.
Enabling conditions: Communication resources, cooperation with successful communities, and funding for campaigns.
Stakeholders: Municipality, energy communities, residents, businesses, NGOs.

Indicators: Number of success stories published, number of communication campaigns, engagement rate on digital channels, and number of inspiration events organized.

3.1.9 Establishing demonstration areas

Description: This measure focuses on pilot projects that create demonstration areas where different solutions can be practically showcased (e.g., nature-based stormwater solutions, community gardens, energy-efficient buildings). These areas allow testing new solutions and provide learning opportunities for schools, communities, businesses, municipalities, and other stakeholders.
Implementation time: Depends on resource availability and investments. Larger areas require planning; small interventions can be implemented in the short term.
Enabling conditions: Cooperation among different stakeholders (e.g., companies offering specialised solutions and municipalities), and support measures.
Stakeholders: Municipalities, community, businesses, educational and research institutions.
More info: Pernova Education Centre “SMARTPARK” climate education demonstration area https://www.pernova.ee/smartpark/; Viimsi municipality nature-based sustainable stormwater system demonstration areas https://urbanstorm.viimsivald.ee/naidisalad/
Indicators: Number of demonstration areas established.

Photos: UrbanStorm project demonstration area in Viimsi. Author: Tori Municipal Government

3.1.9.1 "Smart Village" energy demonstration points in municipality - implements 1–2 pilot projects with RES solutions, for which data is open for everybody – costs, benefits, etc.

Description: The measure proposes establishing a "Smart Village" demonstration site within the municipality and implementing 1–2 pilot renewable energy projects, such as solar PV, heat pumps, or battery systems. All operational data: costs, production, savings would be publicly available to showcase benefits and build trust among residents.
Implementation time: Medium-term.
Enabling conditions: Access to funding and technical expertise, commitment from local government, and acceptance from the community.
Stakeholders: Municipality, local communities.
Indicators: Number of pilot projects implemented, energy produced (kWh), number of visitors, or data downloads.

3.1.10 Train municipal employees, business representatives, and active residents on how to establish and manage an energy community

Description: The measure provides targeted training for municipal employees, business representatives, and active residents on how to establish, manage, and operate energy communities. Training would cover governance models, legal requirements, financing, and technical aspects of renewable energy projects.
Implementation time: Short term (1-2 years).
Enabling conditions: Availability of lecturers, a clear legal framework, support from EU funds or national programmes, and interest from local stakeholders.
Stakeholders: Municipalities, enterprises (including SMEs), resident associations, local communities, energy agencies.

Indicators: Number of participants trained, number of new energy communities established.

3.2 Legal and operational framework for local energy communities and initiatives

Description: This measure involves the development of a formal regulatory framework and operational guidelines that define how the municipality supports local energy communities. Instead of general consultations, the municipality adopts a structured "Community Energy Roadmap" that provides templates for legal agreements (e.g., statutes for energy cooperatives), defines criteria for accessing municipal technical support, and establishes a clear mechanism for residents and SMEs to use public infrastructure for shared energy projects. This framework serves as the official "rulebook" to lower entry barriers and provide legal certainty for community-led renewable energy investments.
Implementation time: Medium-term.
Enabling conditions: Political commitment to community energy, legal expertise in energy regulations, and active engagement with existing citizen groups or NGOs.
Stakeholders: Municipality, residents, energy cooperatives, SMEs, energy agencies, and NGOs.
Indicators: Number of energy communities or cooperatives established, number of local projects utilizing the municipal legal templates/framework.

3.3 Use municipal planning tools to promote local energy production and energy communities

Description: The municipality integrates renewable energy considerations into planning instruments, prioritizing sites for local energy production, and offering favourable conditions to actors committed to sustainability, enabling both individual prosumers and energy communities.
Implementation time: Long-term.
Enabling conditions: Updated planning instruments, cooperation between planning and energy departments, and access to spatial data for site allocation.
Stakeholders: Municipality, planning authorities, energy agencies, residents, businesses, and associations.
Indicators: Number of planning instruments updated, number of sites allocated for local energy production, total renewable energy potential of allocated sites (MW).

3.4 Identify suitable roofs and land for the installation of solar and wind technologies for the municipality for energy communities (both the ones suitable for the first pilot projects and more potential places)

Description: The measure comprises identifying municipal properties suitable for solar PV or small wind installations for use by energy communities. The mapping will highlight the most feasible sites for initial pilot projects with local participation.
Implementation time: Short-term (1-2 years).
Enabling conditions: Access to spatial and technical data and cooperation among the municipality, landowners, and energy experts.
Stakeholders: municipality, municipality-owned companies, energy communities.
Indicators: number of suitable sites identified, total potential installed capacity, kW.

3.5 Creating transparent procedures for municipality-initiated energy communities

Description: This measure involves developing clear principles and procedures for municipalities to initiate and organize energy communities. It provides guidelines for municipal officials involved in energy community processes.
Implementation time: Short-term activity.
Enabling conditions: Municipal motivation to actively participate in developing energy communities in the region.
Stakeholders: Local municipality.
Indicators: Number of municipality-initiated energy communities

3.6 Create inclusive processes for resident dialogue and fair ownership in energy projects

Description: Establish inclusive processes for resident dialogue and ensure fair ownership models in energy projects to promote participation and equity, including underrepresented groups.
Implementation time: Medium-term.
Enabling conditions: Clear inclusion framework, legal models for shared ownership, and resources for stakeholder engagement.
Stakeholders: Municipality, residents, NGOs, energy agencies, businesses.
Indicators: Inclusion framework adopted (yes/no), projects with fair ownership models (count), participation of underrepresented groups (%).

3.7 Involving energy experts at community or municipality-initiated public events

Description: Energy experts participate in community and municipal public events to share information on energy issues, answer residents' questions, and present energy efficiency and renewable energy solutions. They collect feedback, provide advice, and help ensure transparency and trust in energy-related decisions. Their role is to support collaboration between residents, municipalities, and businesses.
Implementation time: short term
Enabling conditions: Availability of qualified experts and agreements with the local municipality.
Stakeholders: local municipality, energy experts, and the community.
Indicators: number of community members reached.

3.8 Conducting a study among residents and companies regarding their needs

Description: The study aims to determine residents' actual energy needs. Future actions should be tailored to the survey results, which can be conducted as a contest with prizes or end with a prize to encourage resident participation.
Implementation time: Short-term.
Enabling conditions: Social and regional programmes, availability of digital tools (online surveys).
Stakeholders: Universities, schools, NGOs, energy cooperatives, energy clusters, SMEs, municipalities.
Indicators: Expenditure on research per resident, Number of survey responses collected (in relation to the number of residents), Number of new energy cooperatives at the end of the year, once a year for 5 years, Readiness to participate in the community (% of declarations).

3.9 Technical support and advice provision by municipal contact points for energy communities and cooperatives

Description: This measure establishes a central municipal "One-Stop-Shop" or support centre dedicated to providing technical, legal, and financial guidance to energy community activists and housing cooperatives. The centre serves as an incubator for local energy projects, assisting with legal compliance (statutes and contracts), project preparation, and identifying third-party funding opportunities. A key function of the centre is the promotion of "best practices" by showcasing successful local and regional examples to build trust among residents. By specifically targeting housing cooperatives and resident

associations, the centre lowers the administrative barriers to shared renewable energy adoption and strengthens community engagement.
Implementation time: Medium-term.
Enabling conditions: National legal provisions for energy communities, political support, and access to best-practice materials and financial advisory expertise.
Stakeholders: Municipalities, energy agencies, housing cooperatives, resident associations, and energy experts.
Indicators: Number of consultations provided to community activists and cooperatives, number of energy communities or cooperatives successfully established, number of best-practice workshops or guides distributed to housing associations, satisfaction score from participating cooperatives and resident groups.

3.10 Hold energy dialogues with rural and remote communities

Description: Organize regular energy dialogues with residents in rural and remote areas, such as archipelagos, to engage them in energy issues and provide a platform for initiating energy communities.
Implementation time: Short-term.
Enabling conditions: Communication strategy, logistical resources for remote engagement, and cooperation with local associations.
Stakeholders: Municipality, rural residents, local associations, NGOs.
Indicators: Number of dialogue sessions, participation rate (%), number of energy community initiatives started, feedback score from participants.

3.11 Enabling residents to participate in municipal renewable energy production through innovative schemes

Description: Example from Vienna, Austria: The city-owned energy company Wien Energie launched a resident solar panel purchase program in 2012. Interest was immediate: for the first two solar plants where the model was tested, panels sold out within a week, for the third plant, it took only about 24 hours.
The innovative model works as follows: residents buy panels from solar plants built and operated by Wien Energie and lease them back to the utility. Wien Energie pays annual returns directly to participants' accounts or as vouchers for purchases (in partnership with supermarket chain Spar), electricity, or gas. Annual interest rates ranged from 1.75% to 3.1% for five-year contracts. When the panels reach the end of their lifespan (about 25 years), Wien Energie buys them back and refunds the full amount.
By 2017, 30 plants with a total capacity of 19 MW had been installed under this model, with approximately 10,000 residents investing €35 million. Panels were

installed in diverse locations, including railway stations, shopping centres, public schools, cemeteries, and social housing.
This solution allowed Vienna residents—most of whom live in apartment buildings with complex ownership structures or unsuitable roofs—to invest in solar energy and benefit from it.
Implementation time: Medium-term activity (approx. 3 years), as it involves planning and community engagement.
Enabling conditions: Existence of a municipal energy company, motivated and engaged residents.
Stakeholders: Municipality and its energy company, local residents.
More info: www.renewables-networking.eu/documents/AT-Vienna.pdf
Indicators: number of residents involved.

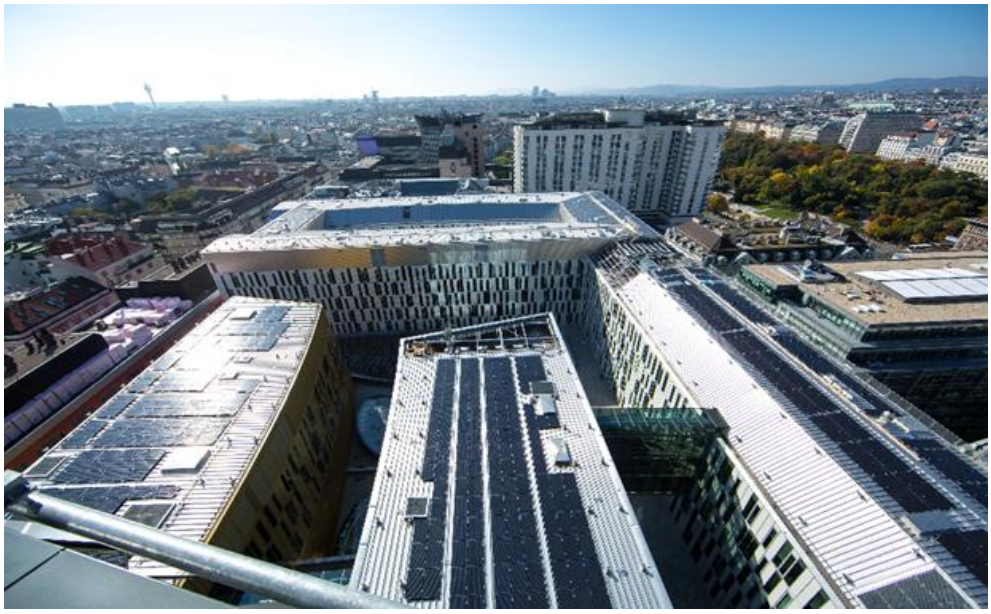


Photo: Solar rooftops on residential buildings in Vienna. Source: Smart City Wien (https://smartcity.wien.gv.at/en/residents-power-plants)

3.12 Encouraging collaboration between local businesses and residents to create community energy production (e.g., solar installations on large industrial roofs)

Description: This is an innovative cooperation model that unites the local community and industrial companies around a shared goal—producing clean and affordable energy.
The model centres on unused industrial rooftop space, where a solar power plant is installed. The plant is owned or co-financed by the community, meaning residents, small businesses, and the municipality can invest in the project. This

creates an economically and socially binding partnership where all parties contribute and benefit.

The renewable energy produced is purchased directly by the industrial company for its daily operations—such as powering production lines, ventilation systems, or cooling equipment. Electricity is bought at a fixed long-term price, ensuring cost predictability and reducing exposure to market fluctuations. At the same time, the company lowers its carbon footprint and improves its environmental reputation, which is increasingly important to employees, customers, and partners.

Community members who invest in the project benefit from revenue generated by energy sales. This income can be distributed in various ways—such as profit-sharing, dividends, or refunds to cooperative members. Beyond financial benefits, the project strengthens community cohesion, as residents see how their collective effort creates a greener, more independent, and modern living environment.

Implementation time: 1-3 years

Enabling conditions: local businesses' readiness to cooperate with the local community

Stakeholders: local SMEs, local municipality, local community

Indicators: number of energy projects between communities and SMEs

3.13 Signing preliminary agreements with existing and future industrial companies for community energy parks

Description: The municipality promotes cooperation between community energy plants and industrial companies by acting early—before companies establish operations in the area or build new production facilities. The municipality can request consent to use rooftop space for community solar installations or obtain a commitment to consider purchasing energy from community sources or prioritizing renewable energy solutions.

Negotiations can result in cooperation agreements between the municipality and the company. These agreements do not need to be binding, but send a clear signal to both the company and the community that the municipality supports development aligned with the green transition.

In parallel, the municipality can require or recommend solar potential analysis for new industrial buildings during planning and simplify permitting for solar installations, making the process fast and transparent.

Implementation time: short-term.

Enabling conditions: companies’ readiness to cooperate, local municipality's activeness toward community energy parks development.

Stakeholders: Local municipality, companies.

Indicators: number of community energy parks.

3.14 A local cooperative (for example, agricultural) jointly invests in PV capacity

Description: The measure promotes cooperative investment models, where local agricultural or business cooperatives jointly invest in solar PV systems to cover their electricity consumption and share benefits. Such projects strengthen local self-sufficiency and keep energy-related income in the region.
Implementation time: Medium-term (1–3 years).
Enabling conditions: clear rules/legislation.
Stakeholders: enterprises (including SMEs), energy communities.
Indicators: number of cooperatives established, installed PV capacity, kW.

3.15 Solar PV parks in rural areas

Description: Based on the Swedish Austerland Energi model, Gotland, Sweden, the measure envisions the creation of local energy cooperative(s) that develop solar parks in rural areas. Residents and businesses become shareholders in a cooperative that produces local renewable electricity, supports local jobs, and strengthens energy independence.
Implementation time: Medium-term (2–4 years).
Enabling conditions: clear legislation enabling energy communities and cooperative investment needed, support programs for community energy.
Stakeholders: energy communities, local communities, enterprises (including SMEs), resident associations.
Indicators: installed capacity, kW, number of cooperatives, annual renewable electricity generation, kWh.

3.16 Adjusting public procurement conditions to encourage energy community participation

Description: Example from Belgium: In organizing tenders for new renewable energy capacities, the city of Ghent has tested a system where price is not the sole evaluation criterion. If price accounted for 60 points, the qualitative criterion “participatory financing according to the International Cooperative Alliance principle” accounted for 40 points.
To qualify under this criterion, projects must aim for at least 30% resident participation. This minimum threshold was introduced in response to large utilities adding marginal cooperative elements to their projects to gain market share.
Implementation time: Short-term activity, involving legal analysis and updating procurement conditions for certain tenders.

Enabling conditions: Municipal commitment to fostering energy communities and resident participation.
Stakeholders: Local municipality, local communities.
More info: https://energy-cities.eu/wp-content/uploads/2024/07/How-cities-can-back-RECs.pdf?utm_source=chatgpt.com
Indicators: number of energy community projects.

3.17 Steering new neighborhood developments toward community energy solutions

Description: As land-use planners, municipalities can leverage urban planning for new eco-friendly neighbourhoods to guide developers toward community energy solutions, including collective self-consumption. Plans for district heating networks transitioning to 100% renewable energy can also include goals to enhance resident participation in energy systems—for example, when concession agreements are signed with resident energy cooperatives.
Example from Belgium: In 2016, the city of Eeklo signed a concession agreement for a district heating network powered by waste heat (including from a local waste incineration plant and hospital) and renewable sources, with ambitious criteria:
- Renewable heat price must not exceed the cost of individual gas heating (including purchase, installation, consumption, and maintenance).
- At least 30% of the network must be owned by residents.
- The developer must implement measures to address fuel poverty in the city.

Implementation time: Long-term activity, as it involves planning processes.
Enabling conditions: Municipal commitment to fostering energy communities, renewable energy use, and resident participation.
Stakeholders: Local municipality, real estate developers, district heating network developers.
More info:
https://www.rescoop.eu/uploads/rescoop/downloads/REScoopeu_procurement_guide.pdf?utm_source=chatgpt.com
Indicators: number of households involved.

3.18 Support existing energy communities in further development

Description: Identify and assist existing energy communities in upgrading operations, such as adding batteries, replacing generators, or managing generational transitions, through technical and financial support.
Implementation time: Medium-term.
Enabling conditions: Funding for upgrades, technical expertise, and cooperation agreements with energy communities.

Stakeholders: Municipality, existing energy communities, energy agencies, and technology providers.
Indicators: Number of existing communities supported, number of technical upgrades implemented, installed battery capacity (kWh), and number of financial support packages provided.

3.19 Organizing a competition for energy communities in the region with recognition and (financial) support for winners

Description: The competition aims to encourage municipalities, apartment associations, businesses, and communities to create initial or exemplary energy communities that contribute to regional energy independence, green transition, and resident well-being. The competition seeks diverse solutions—from shared solar parks to local energy storage and energy-sharing platforms—demonstrating how communities can actively create energy solutions.
An expert jury selects winners based on innovation, feasibility, and actual community involvement. Winners receive public recognition and, where possible, financial start-up support to accelerate or expand project implementation. Additional mentoring and technical advice may also be offered to ensure that ideas are realised in practice.
The broader goal is to establish the first practical and visible energy community examples in the region, inspiring others to launch similar initiatives and creating a knowledge and experience network that drives the green transition from the bottom up.
Implementation time: 1 year.
Enabling conditions: Free advisory support and accessible information, low participation barriers, community-friendly projects, strong communication, and visibility.
Stakeholders: Local municipality, regional energy agency, thematic organizations.
Indicators: number of energy communities participating.

3.20 Include energy sharing in new developments

Description: Incorporate energy sharing initiatives when planning new developments, inspired by projects like Tamarinden in Örebro Municipality, Sweden, to optimize local energy use and promote sustainability.
Implementation time: Long-term.
Enabling conditions: Updated planning guidelines, cooperation with developers, and technical standards for energy sharing.
Stakeholders: Municipality, property developers, energy agencies, residents, businesses.

Indicators: Number of new developments with energy sharing requirements, installed local generation capacity (kW/MW), share of demand met by shared energy (%).

3.21 Include a dedicated chapter on energy communities in the municipal energy plan

Description: Add a dedicated chapter in the municipal energy plan outlining benefits, guidance, and support measures for energy communities to promote their development and enhance local resilience.
Implementation time: Medium-term.
Enabling conditions: Political commitment, cross-department collaboration, and integration into municipal planning processes.
Stakeholders: Municipality, energy agencies, residents, businesses, NGOs.
Indicators: Dedicated chapter adopted (yes/no), number of support measures included, cross-department alignment confirmed (yes/no).

3.22 Developing community-based wind and solar power plants

Description: The community creates a renewable energy-based electricity and heating network powered by its own wind turbines, solar parks, and biogas plants. Small-scale battery storage is used if necessary. Electricity and heat are produced locally, and revenue remains within the community.
Implementation time: 2–6 years (planning, financing, construction, commissioning).
Enabling conditions: Strong cooperation between the municipality and residents.
Stakeholders: Local municipality, energy cooperative, farmers, developers, grid operators, and financiers.
More info: https://nef-feldheim.info/the-energy-self-sufficient-village/?lang=en; https://www.dw.com/en/feldheim-germanys-renewable-village/a-18466800

Indicators: number of households participating in community renewable energy initiatives

Photo: Energy self-sufficient village of Feldheim with local wind and solar infrastructure. Source: Energiequelle (https://www.energiequelle.de/en/projects/lighthouse-projects)

3.23 Organizing public grant schemes for communities interested in producing electricity/heat for themselves and neighbours

Description: Organizing public grant schemes by municipalities gives local communities the opportunity to develop their energy consumption and security by supporting projects that produce electricity or heat for themselves and neighbouring households. Through these schemes, village associations, apartment cooperatives, NGOs, or community groups can apply for funding to build solar or wind energy solutions, upgrade boiler houses, adopt bioenergy, or improve energy infrastructure.

The municipality sets the objectives, budget, and conditions for the grant scheme, announces it publicly, and organizes application evaluation. Project selection considers community benefits, technical feasibility, energy efficiency, and environmental impact. In addition to funding, municipalities can provide advisory support, template documents, and assistance with permitting to simplify the implementation of community energy initiatives.

Implementation time: 6–12 months.

Enabling conditions: Clear strategic framework (e.g., climate and energy plan, resilience, and energy security plan), political support from the municipal

council, sufficient budget and funding sources, administrative and technical capacity, readiness, and interest of potential applicants.
Stakeholders: Local municipality.
Indicators: Number of community energy projects funded and implemented, total installed capacity of renewable energy (kW), and number of households benefiting from community energy schemes.

3.24 Creating energy communities with municipal participation

Description: Municipalities can set an active example by becoming members of energy communities themselves. This strengthens the project's credibility, legitimacy, and practical benefits, which are harder to achieve without municipal involvement. Considering municipalities' responsibility to ensure local development and energy security, participation demonstrates strategic engagement rather than passive observation.
Municipalities own strategic resources (land, roofs, buildings) and can benefit from cheaper and more stable energy (reducing electricity costs for public buildings, stabilizing budgets against market fluctuations). Municipal involvement also simplifies access to grants and financing—many EU and national support schemes prefer or require municipal participation, community ownership, or proof of local benefit. Banks and investors view municipal involvement as risk mitigation and a guarantee of project stability.
Additionally, municipal participation can help avoid conflicts and increase social acceptance, as the project becomes public and transparent, reducing opposition and protests.
Implementation time: 1–3 years from preparation to operational energy community.
Enabling conditions: Clear and supportive political will, suitable municipal land or roof areas, sufficient grid capacity, community readiness and interest, and municipal resources for project management.
Stakeholders: Municipality, local community.
Indicators: Number of energy communities with direct municipal participation, total municipal roof or land area leased to energy communities (m^2), energy cost savings for public buildings through community participation (%).

3.25 Establishing community district heating networks

Description: A community district heating network is a local heat supply system owned or managed by the community, producing and distributing heat to multiple buildings through a shared pipeline. Its uniqueness lies in ownership and decision-making by residents, businesses, or municipalities—not large

energy corporations. Typically, such systems operate as energy cooperatives or local companies.
Small, flexible networks allow the use of local energy sources—wood chips, heat pumps, solar thermal, and waste heat—and offer more stable prices compared to individual heating or fossil-fuel-based systems. Economically, the model benefits the region: money stays in the local economy, jobs are created, and heat prices become more predictable. Socially, community ownership builds trust and can help reduce energy poverty in rural areas.
Establishing a community heating network requires thorough preliminary studies (heat demand, feasibility, technical solutions) and active cooperation between municipalities and residents. Successful implementation depends on diverse financing options: national grants, EU funds, favorable loans, and community co-financing. Legal and administrative frameworks for energy cooperatives and small networks should be simplified to reduce bureaucracy and support flexible business models. Infrastructure should prioritize low-temperature, highly efficient solutions that integrate various renewable heat sources.
Implementation time: 2–4 years.
Enabling conditions: Sufficient and concentrated heat demand, availability of local renewable sources, strong cooperation with the municipality, and access to grants and financing.
Stakeholders: Local municipality, community, technical experts and designers, potential heat source owners, financiers, and grant providers.
Indicators: Number of members.

3.26 Creating energy communities in new urban development projects

Description: In some large urban development projects in Sweden, energy community frameworks are actively integrated during the planning phase. This enables the development of infrastructure for energy communities before residents move in. However, resident interest in participating in planning meetings was low because the community did not yet exist.
Implementation time: Long-term activity linked to large-scale urban development.
Enabling conditions: Observed only in municipalities where the local energy company and distribution network operator were municipally owned, reducing conflicts.
Stakeholders: Municipalities, municipally owned energy companies, infrastructure and public service providers, developers.
More info: https://doi.org/10.1016/j.erss.2025.103921

Indicators: Number of new-builds with integrated elements of energy sharing.

3.27 Creating energy communities in parking structures

Description: To promote sustainable mobility, parking structures can be organized as fully functioning energy communities, focusing on EV charging infrastructure supported by solar power plants and battery storage systems. The initiative is led by the municipality and its parking company, ensuring municipal ownership of energy infrastructure and sharing benefits with residents, in line with the definition of a municipal energy community.
The most notable example is Sege Park in Malmö, with a PV capacity of 255 kWp and battery storage of 220 kW.
Implementation time: Can be implemented within one project cycle.
Enabling conditions: Requires cooperation or ownership of parking structures or parking service organizations.
Stakeholders: Municipalities, municipally owned parking companies, infrastructure, and public service providers.
More info: https://leadinglocalenergy.systems/wp-content/uploads/2023/04/Malmo-230426.pdf; https://www.instagram.com/reel/DMM1866SgSf/
Indicators: Installed renewable energy capacity on the parking premises (kW)

3.28 Energy communities in the municipality's rental apartments

Description: This measure establishes pilot energy communities within municipally-owned rental apartment buildings to demonstrate the feasibility of shared self-consumption models. The municipality, acting as the building owner, installs solar PV systems and implements a tenant electricity billing model, allowing residents to purchase locally produced green energy at a lower rate than the grid. The project involves developing standardized internal sharing agreements, installing smart metering infrastructure to track individual consumption, and creating a transparent billing system. These pilots serve as a Living Lab to overcome legal and technical hurdles, providing a scalable blueprint for private multi-apartment buildings and housing cooperatives.
Implementation time: 1-5 years.
Enabling conditions: National legislation allowing for peer-to-peer energy sharing or collective self-consumption, funding for smart meter deployment, and tenant willingness to participate in a communal energy model.
Stakeholders: Municipality, local energy company, solar PV installation company.
Indicators: Number of formed energy communities, savings in energy (kWh), and billing.

3.29 Connect energy communities to safety points

Description: Define energy communities as shared infrastructure and integrate them with safety points to enhance energy security and resilience. Safety points benefit from locally produced renewable energy and storage, reducing dependence on external sources during outages.
Implementation time: Medium-term.
Enabling conditions: Legal framework for energy sharing, technical feasibility for integration, and cooperation with local actors.
Stakeholders: Municipality, energy communities, safety point operators, grid operators, technology providers.
Indicators: Definition for shared infrastructure adopted (yes/no), MWh of electricity shared, and number of participating actors per site.

3.30 Resident dialogue on energy planning

Description: Organize resident dialogue events to gather input for the municipality's energy planning process, fostering transparency and community engagement in decision-making.
Implementation time: Short-term.
Enabling conditions: Communication strategy, resources for event organization, and willingness of residents to participate.
Stakeholders: Municipality, residents, NGOs, and local associations.
Indicators: Number of resident dialogue events, participation rate (%), number of proposals integrated into plans.

3.31 Utilize land allocation competitions to raise energy and climate standards

Description: Leverage land allocation competitions to set higher standards for energy use and climate impact. Prioritize energy communities to better utilize local energy resources and promote sustainable practices, encouraging innovative solutions and rewarding projects that contribute to energy efficiency and climate mitigation.
Implementation time: Medium-term.
Enabling conditions: Updated competition guidelines, political commitment, and transparent evaluation criteria for energy and climate performance.
Stakeholders: Municipality, property developers, energy agencies, residents, businesses.
Indicators: Competitions held with energy/climate criteria (count), weighting for energy community criteria (%), winning proposals with energy sharing (count).

3.32 Implement a systems perspective for energy optimization

Description: This measure involves the transition from individual building management to an integrated urban energy network approach. The municipality will perform a cross-sectoral analysis to identify opportunities for energy coupling and sharing between different urban functions. This includes mapping waste heat sources from industrial zones or data centres to link them with residential heating needs, as well as optimizing local electricity grids by balancing the production peaks of energy communities with the consumption patterns of municipal infrastructure. The approach focuses on creating circular energy flows where surplus energy is not lost but shared across sectors. Strategically, this involves aligning municipal spatial planning with grid capacity assessments to ensure that new renewable energy clusters are located where they can most efficiently serve local demand.
Implementation time: Long-term.
Enabling conditions: Access to energy data, analytical tools, and cooperation across municipal departments and with external stakeholders.
Stakeholders: Municipality, grid operators, energy agencies, consultants.
Indicators: Systems analysis completed (yes/no), identified optimization potential (%), cross-department actions initiated (count).

3.33 Advocate for open protocols in energy community technologies

Description: Promote the use of open protocols in energy community technology choices to avoid lock-in to single platforms and enable interoperability between multiple communities. The municipality advocates for this in projects and informs stakeholders about the benefits.
Implementation time: Medium-term.
Enabling conditions: Policy framework supporting open standards, cooperation with technology providers, and stakeholder awareness campaigns.
Stakeholders: Municipality, energy communities, technology providers, energy agencies.
Indicators: Policy on open protocols adopted (yes/no), projects requiring open standards (count), interoperability tests conducted (count).

3.34 Develop strategic energy plans, including local initiatives and grid collaboration

Description: Create strategic energy plans that integrate local renewable initiatives and collaboration with grid operators to ensure efficient energy distribution and resilience.
Implementation time: Medium-term.

Enabling conditions: Political commitment, cooperation agreements with grid operators, and integration into municipal planning processes.
Stakeholders: Municipality, grid operators, energy agencies, residents, businesses.
Indicators: Collaboration agreement with grid operator (yes/no), joint initiatives (count), grid impact assessments completed (count).

3.35 Train supervisory staff to support energy sharing and energy communities

Description: Train supervisory staff to advise environmentally hazardous operations on how they can share energy and join energy communities. By providing relevant training and resources, supervisory staff can help these operations reduce environmental impact and increase energy efficiency, promoting sustainability and collaboration within the municipality.
Implementation time: Short-term.
Enabling conditions: Availability of training programs, cooperation with environmental and energy agencies, and resources for advisory services.
Stakeholders: Municipality, supervisory staff, businesses with environmental permits, and energy agencies.
Indicators: Number of staff trained, number of advisory sessions delivered, satisfaction score from businesses, and number of energy sharing initiatives supported.

4 Renewable energy production and storage

Renewable energy is central to achieving climate neutrality and energy security. While technologies have advanced rapidly, deployment and storage solutions still lag in many areas. Expanding local renewable generation and integrating storage ensures a stable supply and reduces dependence on fossil fuels. With costs falling and policy support increasing, now is the time to accelerate this shift. These measures enable stakeholders to harness local resources and build resilient, low-carbon energy systems.

4.1 Promotion and demonstration of RES and flexibility technologies

4.1.1 Organizing Community Energy Days focused on energy topics (including prosumerism, energy communities, electricity demand management, etc.)

Description: Community Energy Days provide an opportunity to bring residents, businesses, and local organizations together to learn and discuss modern energy solutions and their practical impact on everyday life. The events focus on topics such as prosumerism, creating and operating energy communities, smart electricity demand management, and renewable energy adoption.

The program can include practical workshops where participants gain hands-on experience with solar panels, small wind turbines, or energy meters and learn how to manage household energy consumption more efficiently. Training sessions can cover technical topics (e.g., how to join an energy community or become a prosumer) as well as broader energy system concepts, making complex ideas easy to understand.

To engage children and youth, drawing competitions and creative activities can be organized, helping them explore energy topics through play—for example, designing a future energy city or creating a renewable energy superhero. These activities foster awareness from an early age and create a friendly, inclusive atmosphere for family events.

Community Energy Days strengthen the sense of collective action, increase awareness, and support the development of local energy solutions. They also provide a platform for sharing experiences, collaboration, and generating new initiatives that contribute to building a more sustainable and energy-efficient community.

Implementation time: 6 months – short-term activity

Enabling conditions: Community readiness and interest, supportive municipality and local institutions, partners and experts, suitable venues and infrastructure, sufficient funding and resources.
Stakeholders: Local municipality, community, experts.
Indicators: Number of participants reached.

4.1.2 Introducing alternative energy supply solutions

Description: Promote the use of energy-efficient renewable energy solutions and hybrid energy supply systems that combine electricity and heat production and storage for buildings located outside district heating networks or where connection is not feasible. Support the transition from fossil fuel heating to wood-based fuels, heat pumps, solar heating systems, or other solutions. Raising awareness among residents and businesses is also crucial for this measure.
Implementation time: Depends on existing solutions and investment scale, and may become long-term.
Enabling conditions: Support measures, awareness, and economic feasibility.
Stakeholders: All building owners.
Indicators: Number of installed renewable energy solutions (pcs).

4.1.3 Communicate the benefits of local energy production to inspire investment

Description: The municipality actively communicates the environmental, economic, and social benefits of producing renewable energy at the local level through tailored campaigns and success stories to inspire new investments and stimulate prosumer growth.
Implementation time: Short-term.
Enabling conditions: Communication strategy, funding for campaigns, and cooperation with local media and stakeholders.
Stakeholders: Municipality, residents, businesses, associations, NGOs.
Indicators: Number of communication campaigns conducted annually, number of stakeholders reached, engagement rate on communication channels.

4.1.4 Promote flexibility, market participation, and battery integration

Description: As part of the communication strategy, the municipality informs stakeholders about opportunities to participate in flexibility markets and the added value of integrating battery storage for load shifting and market responsiveness.
Implementation time: Short-term.

Enabling conditions: Availability of flexibility market mechanisms, cooperation with grid operators, and technical guidance for battery integration.
Stakeholders: Municipality, residents, businesses, energy agencies, grid operators.
Indicators: Number of communication materials or campaigns highlighting flexibility market opportunities, number of stakeholders informed or engaged.

4.1.5 Raising awareness on renewable energy

Description: The aim of this measure is to implement activities (e.g., training sessions) that increase awareness of renewable energy production and storage options.
Implementation time: Short-term but continuous activity.
Enabling conditions: Supportive policies and funding (grants, favourable financing conditions), community interest, and readiness.
Stakeholders: National authorities, local municipalities, energy companies, training institutions, communities, and residents.
Indicators: Number of training sessions (pcs), number of participants.

4.1.6 Installing and showcasing small-scale renewable energy solutions

Description: Small-scale renewable energy solutions are practical, locally applicable systems that enable the use of clean energy without large and complex infrastructure. Their main purpose is not only energy production but also raising awareness, promoting an environmentally friendly mindset, and engaging communities in sustainable development. Pernova exemplifies this approach, where technical solutions are linked to education, visibility, and hands-on experience.
Typical small-scale solutions include solar panels with energy storage, solar-powered outdoor lighting, small wind-solar hybrid systems, and solar-powered charging stations for mobile devices and, where possible, electric vehicles. These solutions are well-suited for households, schools, community buildings, and public spaces because they are relatively easy to install, modular, and expandable. While their production capacity is smaller than large power plants, their value lies in local use and direct impact on daily life.
Visibility and explainability are key for small-scale solutions. When solar panels, solar lights, or wind turbines are placed in public spaces and equipped with information boards or digital tools, they help people understand where energy comes from and how it can be used sustainably. This turns renewable energy from an abstract concept into a tangible experience—especially for children and young people. Combined with nature-based solutions like rainwater harvesting and greenery, they create a holistic, sustainable environment.

Implementation time: 1–1.5 years.
Enabling conditions: Cooperation between municipalities, businesses, and specialists, existing infrastructure (e.g., electrical grid for grid-connected solutions, installation surfaces), suitable natural potential, and funding sources.
Stakeholders: Renewable energy companies, technology providers, state and municipal authorities, public institutions
More info: https://www.pernova.ee/smartpark/
Indicators: Number of visits to the small-scale renewable solutions, installed capacity (kW), and number of solutions.

Photos: Pernova wind turbines (https://www.flowerturbines.com/) and solar-powered resting area with phone and scooter charging. Author: Tori Municipal Government

4.2 Development of the district heating system(s) (DHS):

4.2.1 Use of renewable energy sources for the preparation of heat energy and hot water in heating and cooling. Transition to 80-100% renewable energy in district heating

Description: Use of renewable energy resources in the heat supply of municipal and capital company buildings. Consider the installation of RES technologies or connection to DHS in those capital company buildings that provide heating with individual natural gas boilers. By 2030, …% of buildings of municipal commercial companies will switch to RES technologies for heat energy production or will connect to district heating. RES growth in DHS – heat pumps in small boiler houses. Promoting installations that generate both heat and electricity – cogeneration. In case the energy company is not a municipal company, ensure cooperation between the municipality and the energy company.

Implementation time: Medium-term (1–3 years).
Enabling conditions: For instance, availability of wood biomass, availability of finances, and space for installation of heat pumps.
Stakeholders: Municipally-owned heating companies, heating companies.
Indicators: % of heat energy produced by renewable energy sources.

4.2.2 Renovation of DHS by replacing outdated boilers with new emission-free technologies, increasing the efficiency of thermal energy production

Description: replacement of gas boilers, coal-fired boilers with low-emission heat sources, such as wood chip boilers, etc.
Implementation time: Medium-term (2–5 years).
Enabling conditions: available financing.
Stakeholders: Municipally-owned heating companies, heating companies.
Indicators: Number of modernised heat sources, % of heat energy produced by renewable energy sources.

4.2.3 Collaborative modernization of district heating networks

Description: The municipality and local heating companies work jointly to implement a strategic infrastructure upgrade program focused on minimizing distribution losses. This partnership involves identifying critical segments of the network for the replacement of outdated pipes with modern, pre-insulated alternatives and integrating advanced leak detection systems.
Implementation time: Long-term (1–10 years).
Enabling conditions: Available financing.
Stakeholders involved: Municipally-owned heating companies, heating companies.
Indicators: % of heat loss in heat supply.

4.2.4 Optimization of DHS management, operation, and maintenance processes and cost review

Description: various, heat production & supply company-specific measures proposed when reviewing the process of heat supply. This could be month-to-month decisions - purchase and use of different fuels depending on which is cheaper at that moment, and which kind of fuels could be used in the boiler houses of the heating company. It could be considerations of switching in - using one or another boiler house. Considerations and decisions of installing or using a heat reservoir or starting to use cellulose-based waste, etc.
Implementation time: Long-term (1–10 years).
Enabling conditions: review practices of the company**,** available financing.
Stakeholders: Municipally-owned heating companies, heating companies.

Indicators: competitive heat tariff.

4.2.5 Expansion of DHS with the aim of adding new consumers to the system

Description: Attracting new thermal energy consumers to DHS to compensate for the load reduction caused by energy efficiency measures in houses. Extension of DHS to new blocks of houses, where it is near the existing heat supply system, and the potentially added heat load compensates the investment into the extended heat supply pipeline.
Implementation time: Long-term (1–10 years).
Enabling conditions: available financing, review of DHS, and existence of nearby heat consumers.
Stakeholders: Municipally-owned heating companies, heating companies.
Indicators: Added consumers/heat loads per year.

4.2.6 Align building permits with district heating objectives

Description: Ensure building permit policies are aligned with the municipality's goal of increasing district heating connections, making new developments ready or mandated for DH integration, which could be called district heating zones. **Implementation time:** Short-term.
Enabling conditions: Updated building permit guidelines, cooperation with planning authorities, and technical standards for DH readiness.
Stakeholders: Municipality, planning authorities, district heating companies, property developers.
Indicators: Building permit policy aligned with district heating objectives (yes/no), new developments mandated or prepped for DH connection (count), share of eligible buildings connected to DH (%), average DH connection lead time (days).

4.2.7 Waste-to-energy production

Description: Copenhagen operates a modern waste-to-energy cogeneration plant that simultaneously produces electricity and heat for the district heating network. The plant uses municipal and industrial waste, converting it into electricity and heat through controlled combustion, reducing the amount of waste sent to landfills. The focus is on energy efficiency and minimizing CO_2 emissions using advanced flue gas cleaning technologies. A similar solution is suitable for larger cities with sufficient waste streams and an operational district heating network.
Waste-to-energy production is a measure that converts non-recyclable municipal and certain industrial waste into useful energy in the form of electricity

and/or heat. Through controlled combustion or similar thermal treatment technologies, residual waste is used as a fuel, reducing the amount of waste sent to landfills and lowering methane emissions. Modern facilities are often designed as combined heat and power plants, supplying electricity to the grid and heat to district heating networks. Advanced flue gas cleaning systems help minimize air pollutants and reduce environmental and health impacts.

Municipalities can implement this measure in line with the waste hierarchy, ensuring that prevention, reuse, and recycling remain priorities and that only non-recyclable waste is directed to energy recovery. Large municipalities with sufficient waste volumes and established district heating systems can develop and operate their own plants. Smaller municipalities can participate through inter-municipal cooperation, joint regional facilities, or long-term supply agreements with existing plants. They can also support the measure by improving separate waste collection systems and developing or connecting to district heating networks that utilize recovered heat.

Copenhagen provides an example of this approach, operating a modern waste-to-energy cogeneration plant that simultaneously produces electricity and heat for the district heating network. The plant uses municipal and industrial waste with a strong focus on energy efficiency and CO_2 emission reduction through advanced flue gas cleaning technologies.

Implementation time: 3–5 years (planning, obtaining environmental permits, construction).

Enabling conditions: Sufficient waste flow and functioning waste management system, district heating network, and public-private cooperation.

Stakeholders: Local municipality, waste management companies, district heating operators, and environmental authorities.

More info: https://parametric-architecture.com/copenhill-a-waste-to-energy-plant-with-a-ski-slope/; https://www.ieabioenergy.com/wp-content/uploads/2021/03/T36_WtE-and-Social-Acceptance_Copnehhill-WtE-plant-in-Copenhagen.pdf; https://www.cewep.eu/what-is-waste-to-energy/

Indicators: Amount of waste used in waste-to-energy plants (tonnes), waste-to-energy cogeneration capacity (MW electricity/MW heat)

Photo: CopenHill waste-to-energy plant with an urban ski slope in Copenhagen. Source: Parametric Architecture (https://parametric-architecture.com/copenhill-a-waste-to-energy-plant-with-a-ski-slope/)

4.2.8 Using geothermal energy in district heating

Description: Geothermal energy use in district heating is becoming increasingly feasible in Estonia. For example, the Roosna-Alliku geothermal plant in Järvamaa is one of the first pilot projects, producing about 400 kW of heat using energy stored in the earth. This solution can be applied in smaller towns and settlements with existing district heating systems, replacing fossil fuels (e.g., gas) with geothermal heat.

Geothermal energy use in district heating is a measure that utilizes heat stored in the earth to provide a stable and renewable source of thermal energy. Through geothermal boreholes and heat pump systems, underground heat is extracted and upgraded to temperatures suitable for district heating networks. This solution reduces dependence on fossil fuels such as natural gas and lowers greenhouse gas emissions from heat production. Geothermal energy provides a reliable base-load heat source with low operating emissions and relatively stable long-term costs.

Municipalities can assess local geothermal potential through geological surveys and feasibility studies before implementation. Larger municipalities with extensive district heating systems can integrate geothermal plants as part of a diversified renewable heat portfolio. Smaller towns and settlements with existing district heating networks can also adopt this solution, particularly where heat demand is concentrated and stable. Municipalities may implement projects

independently, through public–private partnerships, or in cooperation with local energy companies.

In Estonia, the Roosna-Alliku geothermal plant in Järvamaa serves as a pilot example, producing approximately 400 kW of heat using energy stored in the ground. This case demonstrates that geothermal district heating can be successfully applied in smaller communities to replace fossil-based heat production and support local climate and energy goals.

Implementation time: Pilot projects take 1–3 years to implement; wider adoption across Estonia is realistic within a decade, depending on geological conditions and drilling costs.

Enabling conditions: Estonia has competent studies and geological data to assess geothermal potential. District heating networks and heat pump technology are already in use. Development is supported by green transition funding and targeted use of CO_2 quota revenues.

Stakeholders: Estonian Geological Survey, Ministry of Climate, local energy centres, district heating companies, research institutions (e.g., TalTech), developers, and investment funds.

More info: https://www.egt.ee/uudised/jarvamaal-roosna-allikul-avati-maasoojusenergia-katsejaam

Indicators: using geothermal energy (yes/no), % of geothermal heating in heating balance.

Photo: Roosna-Alliku geothermal pilot plant. Source: Kesk-Eesti Tre Raadio (https://keskeesti.treraadio.ee/uudised/48316/fotod-roosna-allikul-avati-maasoojusenergia-katsejaam)

4.2.9 Using seawater heat in district heating

Description: Esbjerg, on Denmark's west coast, hosts the world's largest CO_2-based seawater heat pump, completed in 2024. The system uses seawater and wind energy as renewable sources and supplies climate-neutral heat to the district heating network. Its thermal capacity is 70 MW, producing about 280,000 MWh annually - enough for approximately 25,000 households. The project aims to help Esbjerg and nearby Varde achieve carbon neutrality by 2030.

Using seawater heat in district heating is a measure that captures thermal energy stored in seawater and upgrades it through large-scale heat pumps for use in district heating networks. The technology relies on stable water temperatures and renewable electricity, enabling low-carbon and highly efficient heat production. By replacing fossil fuel–based boilers, seawater heat systems significantly reduce greenhouse gas emissions and support climate neutrality targets. This solution is particularly suitable for coastal municipalities with access to seawater and established district heating infrastructure.

Municipalities can assess technical feasibility by analyzing local sea conditions, grid capacity, and heat demand profiles. Larger coastal cities can develop and operate large-scale seawater heat pump plants integrated into existing district heating systems. Smaller coastal towns can implement scaled-down systems or cooperate regionally to share infrastructure and investment costs. Municipalities may also establish public–private partnerships.

Esbjerg, on Denmark's west coast, provides a leading example with the world's largest CO_2-based seawater heat pump, completed in 2024. The 70 MW system produces approximately 280,000 MWh of climate-neutral heat annually—enough to supply around 25,000 households and supports Esbjerg and nearby Varde in their goal of achieving carbon neutrality by 2030.

Implementation time: Feasibility study and permits: 1–2 years, construction and connection works: 2–3 years. Total: 3–5 years.

Enabling conditions: Coastal city with seawater access, existing district heating system, availability of electricity (e.g., from wind or solar), subsidies and political commitment to reduce CO_2 emissions.

Stakeholders: Local district heating company, technology supplier and investors, municipality and environmental authority, potential energy producers and grid operators.

More info: https://dbdh.org/seawater-heat-pump-first-operational-experience-from-a-megaproject-in-esbjerg-dk/; https://www.pv-magazine.com/2024/11/29/worlds-largest-co2-based-seawater-heat-pump-goes-online/; https://www.man-es.com/company/press-releases/press-details/2024/11/28/mega-heat-pump-delivers-first-heat-in-esbjerg

Indicators: using seawater heat in energy (yes/no), % of seawater heat in heating balance.

Photo: Heat pump system in Denmark. Source: MAN Energy Solutions (https://www.man-es.com/discover/esbjerg-heat-pump)

4.2.10 Investigate opportunities for waste heat reuse

Description: Identify organizations located near municipal infrastructure and explore opportunities for waste heat reuse, for example, redirecting heat to space heating or supplying excess heat to district heating networks. It reduces overall energy demand and lowers emissions while improving operational efficiency.
Implementation time: Medium-term.
Enabling conditions: Access to spatial and industrial data, cooperation with local businesses, and technical feasibility for heat recovery systems.
Stakeholders: Municipality, industrial companies, district heating providers, energy agencies.
Indicators: Potential waste-heat sources mapped (count), recoverable heat potential identified (MWh), waste-heat integration projects initiated (count), agreements/MoUs with nearby organizations (count).

4.2.11 Promote the use of RES and district heating in local and individual heating

Description: The measure promotes switching from fossil fuels or inefficient local heating systems to renewable energy technologies (biomass, heat pumps, solar) or district heating where available. Municipal information campaigns and cooperation with district heating providers can accelerate the transition.
Implementation time: Medium to long term (3–10 years).
Enabling conditions: State support for heating system replacements, availability of district heating, and engagement of residents.
Stakeholders: Municipality, district heating companies, resident associations, energy agencies.
Indicators: Number of households installed RES-based heating or connected to district heating systems.

4.3 Production of local renewable heat energy

4.3.1 Using a sand battery for heat storage

Description: A sand battery is an innovative energy storage system that uses sand to store heat. The stored heat can be produced from renewable energy sources, such as electricity from solar or wind converted into thermal energy. This system enables flexible energy consumption, reduces fossil fuel use, and integrates renewable energy locally into the power grid or district heating system. A well-known example is Polar Night Energy's sand battery in Pornainen, Finland, which stores 100 MWh of heat and provides 1 MW thermal output, meeting local district heating needs and reducing CO_2 emissions.

Using a sand battery for heat storage is a measure that enables large-scale thermal energy storage by using sand or similar granular materials to retain heat at high temperatures. Electricity from renewable sources such as wind or solar power is converted into thermal energy and stored in the sand, which can later be discharged to supply district heating networks. This approach supports flexible energy consumption by storing excess renewable electricity during periods of high production and releasing heat when demand is higher. As a result, it reduces reliance on fossil fuel–based peak-load boilers and enhances local energy security.

Municipalities can integrate sand batteries into existing district heating systems to balance heat supply and demand and increase the share of renewable energy in heat production. Larger municipalities can implement utility-scale systems as part of broader renewable energy and storage strategies. Smaller towns with district heating networks can also adopt this solution, particularly where variable renewable electricity is available locally. Municipalities may develop projects independently, in cooperation with local energy utilities, or through public–private partnerships.

A well-known example is Polar Night Energy's sand battery in Pornainen, Finland, which stores approximately 100 MWh of heat and provides 1 MW of thermal output. The system meets local district heating needs, improves renewable energy integration, and contributes to significant CO_2 emission reductions.

Implementation time: Planning and technical solution selection: 1–2 years, Permits and infrastructure preparation (in cooperation with municipalities and district heating networks): 1 year, Construction and system installation: 1–2 years. Total process: approx. 3–5 years.

Enabling conditions: Existing district heating networks and electrical infrastructure for integration, local interest in renewable energy and storage solutions, technology suitability for Estonia's climate, potential to reduce CO_2 emissions and fossil fuel use under green energy policies.

Stakeholders: Local municipalities, district heating and grid operators, renewable energy developers, investors, and technology suppliers.

More info: https://polarnightenergy.com/news/worlds-largest-sand-battery-now-in-operation

Indicators: Sand battery installed storage (MWh).

Photo: Sand battery. Source: TechCrunch (https://techcrunch.com/2025/06/16/finland-warms-up-the-worlds-largest-sand-battery-and-the-economics-look-appealing)

4.3.2 Using biofuels for heat production

Description: The aim of this measure is to increase the use of biofuels in heat production, replacing fossil fuels and reducing greenhouse gas emissions. Biofuels such as sustainably sourced wood chips, pellets, and other biomass can be used in municipal and industrial district heating systems, apartment buildings, and small businesses. When sourced responsibly, biofuels can contribute to local energy security, reduce dependence on imported fossil fuels, and support regional value chains while lowering the carbon intensity of heat production.

Municipalities can promote this transition by converting municipally owned heating plants and boiler houses from fossil fuels to biofuels and by integrating biofuel solutions into renovation projects of public buildings and district heating systems. Long-term heat supply contracts and municipal energy strategies can prioritise renewable heat sources and provide investment certainty. Through spatial planning, permitting, and cooperation with district heating operators, municipalities can support the development or expansion of biofuel-based district heating networks. In addition, local governments can set sustainability criteria for biomass sourcing and ensure that air quality standards are maintained, thereby aligning renewable heat deployment with both climate and environmental objectives.

Implementation time: Depending on technical readiness, it can be short- or long-term.

Enabling conditions: Stable and local biofuel supply, subsidies, and technical readiness.
Stakeholders: District heating and heat energy companies, biofuel producers and suppliers, municipalities, national energy and environmental authorities, and financiers.
Indicators: Volume of biofuel consumption (tons or MWh), share of fossil fuels replaced (%) in heat production.

4.3.3 Community-based procurement of heat pumps

Description: In small municipalities (e.g., Middelfart, Denmark), households were dependent on fossil-fuel-based individual heating systems. The municipality addressed this issue by organizing information campaigns and jointly procuring heat pumps for households, thereby reducing investment costs for replacing heating systems. In Middelfart, Denmark, more than 200 households participated in the joint purchase of heat pumps. A similar approach of collective procurement can be replicated by other municipalities, particularly smaller municipalities.
Implementation time: Can be implemented within one project cycle.
Enabling conditions: Requires the capacity to conduct large-scale engagement campaigns.
Stakeholders: Municipalities, municipal energy companies, infrastructure and public service providers, resident associations, local communities, and regional and national authorities.
More info: https://co2mmunity.eu/pilots/denmark
Indicators: Number of households participating in community-based heat pump procurement.

Photo: Community and municipal meeting in Brenderup discussing joint heat pump purchase. Source: CO2mmunity (https://co2mmunity.eu/pilots/denmark)

4.3.4 Align municipal permit regulations with renewable energy goals

Description: Ensure that municipal regulations for environmental and building permits are aligned with the municipality's ambition to increase renewable energy deployment, enabling smoother approval processes for renewable projects.
Implementation time: Medium-term.
Enabling conditions: Updated permit guidelines, cooperation between planning and energy departments, and training for permit officers on renewable energy criteria.
Stakeholders: Municipality, planning authorities, energy agencies, and property developers.
Indicators: Alignment guidance for permits adopted (yes/no), share of permit decisions referencing renewable-friendly criteria (%), average processing time for renewable heat permits (days), approved renewable heat projects (count).

4.4 Production of local renewable electricity

4.4.1 Increasing use of renewable energy resources with local production units and developing storage capacity

Description: Increasing the use of local renewable energy resources means moving toward an energy production model where energy is generated as close as possible to the point of consumption. This reduces dependence on centralized energy production, minimises transmission losses, and helps municipalities and communities improve energy security. The more diverse the

range of renewable energy sources, the more stable the overall energy supply becomes, as different technologies complement each other seasonally and daily.

Developing storage capacity is an integral part of this transition. Renewable energy production is variable so effective solutions are needed to store surplus energy when production exceeds consumption. Energy can be stored in various ways: battery banks and advanced battery technologies are suitable for short-term balancing, while hydrogen production or thermal energy storage can address longer-term fluctuations.

Local energy production can not only reduce environmental impact but also create new economic opportunities, such as jobs in equipment maintenance and development or selling surplus energy to neighbouring regions in the future.

Implementation time: Depends on ambition and local readiness. Short-term: 1–3 years (resource studies, analyses, and pilot projects with small-scale production units), long-term: 7–15 years (developing fully autonomous energy solutions for regions).

Enabling conditions: National and local targets for increasing renewable energy share, simplified permitting for small production and storage units, investment support for both individual consumers and community energy projects, community interest and support, municipal buildings serving as examples of renewable energy use.

Stakeholders: Local municipalities, communities.

Indicators: Growth in the number of prosumers.

4.4.2 Facilitate transition of private houses to renewable energy resources

Description: The measure would support private house owners in transferring to renewable energy solutions, such as heat pumps, solar PV, or solar thermal systems. Although the support programs are national, municipalities can promote these opportunities through information campaigns, consultations, and cooperation with installers.

Implementation time: Medium- to long term (3–10 years).

Enabling conditions: National support programmes for households to install renewable energy technologies, effective municipal communication.

Stakeholders involved: Owners of private houses, municipalities, resident associations, energy agencies.

Indicators: Number of private houses switching to RES-based heating or electricity.

4.4.3 Installing storage solutions for existing renewable energy parks

Description: Adding storage solutions alongside existing renewable energy systems, such as solar and wind parks, helps stabilise energy production, reduce grid load, and improve the overall efficiency and flexibility of renewable energy use. Battery banks and other storage technologies enable surplus electricity to be stored and supplied to the grid or consumers during periods of low production or high demand, thereby supporting grid stability, increasing self-consumption, and improving the economic viability of renewable energy projects.

Municipalities can facilitate the deployment of storage solutions by integrating them into municipally owned renewable energy parks and assessing the technical and economic feasibility of adding storage to existing installations. In spatial planning and permitting processes, municipalities can enable and encourage the co-location of storage facilities with renewable energy parks and simplify administrative procedures for such upgrades. Through development agreements, energy strategies, or public–private partnerships, local governments can promote storage investments that strengthen local energy resilience, reduce peak load pressures, and enhance the reliability of renewable energy supply within the municipality.

Implementation time: Short-term activities include analyzing suitable technologies and locations, and designing solutions; construction and integration with existing parks may take longer.

Enabling conditions: Technical readiness, investment support, producers' interest in improving park profitability and flexibility, and rapidly developing and increasingly affordable energy storage technologies.

Stakeholders: Renewable energy companies, grid operators, technology providers, state and municipal authorities, financiers, and investors.

More info: https://sunly.ee/uudised/miks-on-pikkori-paikesepark-nii-innovaatiline; https://parnu.postimees.ee/8325115/galerii-eesti-suuruselt-teise-paikesepargi-juurde-kerkib-uuel-aastal-akupark

Indicators: Total capacity of completed storage solutions (MW/MWh).

Photo: Battery bank in container at Sunly Pikkori solar park. Author: Tori Municipal Government.

4.4.4 Installing solar panel carports for private homes and public areas

Description: Carports with integrated solar panels allow on-site clean energy production, provide shade for vehicles, and reduce energy consumption for buildings and public spaces. This solution is suitable for private homes as well as parking areas of shopping centres, schools, hospitals, and other public buildings.
Implementation time: Short- to long-term, depending on readiness and technical possibilities.
Enabling conditions: Sufficient parking area and sun exposure, subsidies, and technical readiness.
Stakeholders: Homeowners, businesses and shopping centres, municipal authorities, designers, construction companies, and energy companies.
More info: Example from Spain: https://sunpark.es/en/home/. Product made in Estonia: https://puiduvennad.ee/auto_varjualused/solar-ralf-375-m2/; https://www.solitek.eu/en/solutions/solar-carport-carport-integrated-solar-panels
Indicators: Number and capacity of installed solar carports (kW).

Photo: Example of solar carport in Spain. Source: Sun park (https://sunpark.es/en/what-is-sunpark/)

4.4.5 Installing small wind turbines

Description: Small wind turbines enable decentralized renewable energy production for homes, farms, and small businesses. They are suitable for areas with good wind conditions where solar energy may not be sufficient year-round. Small turbines help increase energy independence and reduce electricity purchased from the grid. For example, especially in rural areas, a municipality can consider installing a small wind turbine at some municipal building or, for example, at a wastewater treatment facility to cover its electricity consumption.
Implementation time: Depending on location and conditions, it can be implemented within a few years.
Enabling conditions: Mapping suitable areas and assessing wind potential, subsidies or favourable financing conditions, and availability of standard solutions.
Stakeholders: Households, farmers, small producers, technology and installation companies, and local municipalities.
More info: https://sustainablehomemag.com/residential-wind-turbines-in-australia/;https://freen.com/small-wind-turbines/; https://www.brighthub.com/environment/renewable-energy/articles/93146/
Indicators: Number and total capacity of installed small wind turbines, amount of renewable energy produced (kW/year).

4.4.6 Using vertical wind turbines in urban areas

Description: In 2013, a 1 kW innovative vertical-axis wind turbine was installed at the Barcelona International Convention Centre (CCIB) as part of the city's broader renewable energy pilot program. Unlike traditional horizontal turbines,

this device operates efficiently in low and variable wind conditions, is quiet, and well-suited for urban environments. The turbine generates electricity for building lighting and equipment, reducing energy costs and carbon footprint.
Similar small turbines could be implemented in Estonian cities and towns, for example, on public building rooftops, in industrial parks, or new developments aiming to combine local energy production with a green image.
Implementation time: Planning and technical feasibility study: 6–12 months, Permits and test installations: 1 year, Installation and commissioning: 6–12 months. Total: approx. 2–3 years.
Enabling conditions: Wind potential at low heights (e.g., coastal cities and tall buildings); municipal support for integrating renewable energy into construction projects; subsidies or tax incentives for small wind turbine installations.
Stakeholders: Municipalities and building owners; green technology companies and wind turbine manufacturers; research institutions and universities assessing system performance and impact.
More info: https://www.construible.es/2013/02/21/el-centro-de-convenciones-de-barcelona-instala-un; https://www.traveldailynews.com/regional-news/ccib-generates-its-own-energy-by-installing-a-wind-turbine/; https://vortexbladeless.com/
Indicators: Installed vertical turbine capacity (kW), total annual electricity generation (MWh).

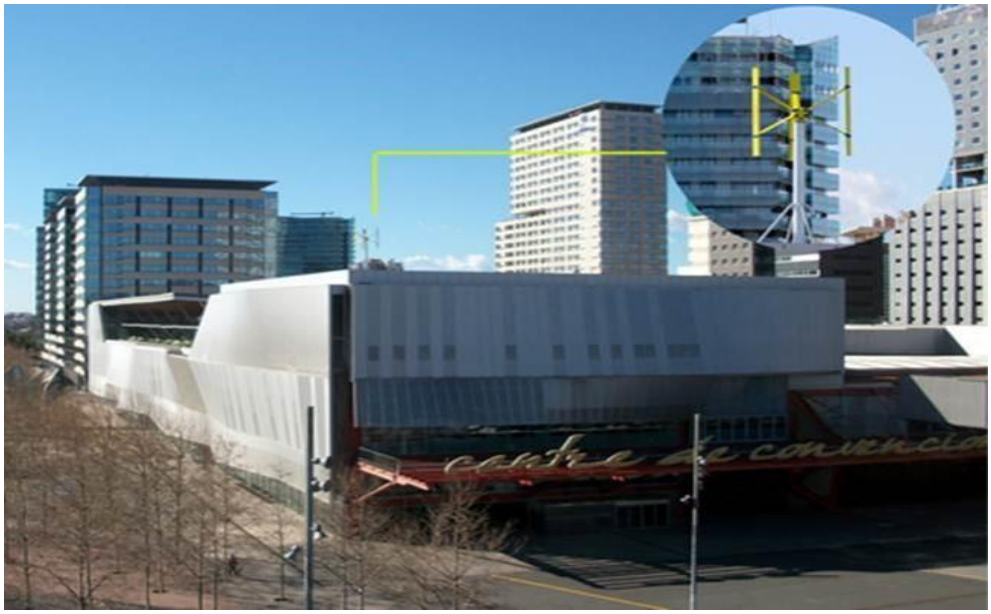


Photo: Vertical wind turbine in Barcelona. Source: Construible (https://www.construible.es/2013/02/21/el-centro-de-convenciones-de-barcelona-instala-un)

4.4.7 Installing solar roofs

Description: Solar roofs are integrated solar panels that replace part or all of a building's roofing material, enabling on-site renewable electricity generation while serving as a functional roof covering. They allow buildings to produce electricity for their own consumption, reduce energy costs, and contribute to greenhouse gas emission reductions. Compared to conventional rooftop solar installations, integrated solar roofs can provide a more aesthetically cohesive solution and are suitable for residential, public, and commercial buildings. In the Estonian context, solar roofs support national renewable energy targets and strengthen local energy resilience. Municipalities can promote solar roofs by systematically integrating them into new and renovated municipal buildings, particularly during roof replacement cycles. Schools, administrative buildings, sports facilities, and social housing projects can serve as demonstration sites that combine renewable energy production with educational and awareness-raising functions. Municipalities can also assess the solar potential of their building stock and develop phased investment plans aligned with budget cycles. Integrating solar roofs with energy efficiency upgrades and energy storage solutions further enhances their impact and supports long-term municipal energy cost savings.

Through planning and regulatory instruments, municipalities can encourage or require the installation of solar roofs in new developments and major renovations, especially in large residential, commercial, and industrial projects. Detailed spatial plans and building permit conditions may include renewable energy requirements or minimum on-site energy production targets.

Implementation time: Requires design, installation, and integration with the building's electrical system, making it a long-term activity depending on existing conditions.

Enabling conditions: Adequate solar potential and suitable building structure, subsidies, financing options, and standardized and easy-to-install roofing systems.

Stakeholders: Homeowners and property owners, developers, designers, installation companies, energy companies, and local municipalities.

More info: https://ennogie.com/en/ – includes dimensions, costs, production details under references https://solarstone.com/et

Indicators: Number and total capacity of installed solar roofs (kW).

Photo: Solarstone solar roof. Source: Solarstone (https://solarstone.com/et/tehtud-tood)

4.4.8 Developing offshore wind farms – planned projects in Estonia

Description: Building offshore wind farms in Estonia's coastal waters is one of the most promising solutions for large-scale renewable energy production. These projects involve large marine areas where turbines generate significant and stable electricity, leveraging offshore wind potential, which is stronger and more consistent than on land. In Estonia, several major projects are planned, such as the Tuul Energy project in western Saaremaa and the Liivi Bay offshore wind farm near Häädemeeste and Kihnu. Both projects aim for approximately 1 GW capacity, significantly increasing Estonia's renewable energy share and supporting national climate neutrality goals. In the future, production can be combined with energy storage or used for hydrogen generation, ensuring a 24/7 energy supply and flexible production.

Implementation time: Planning, studies, and environmental impact assessment: 2–4 years, permits and regulatory processes: 1–2 years, construction and turbine installation: 3–5 years. Total process: approx. 6–10 years.

Enabling conditions: Favourable wind and geographic conditions for offshore wind farms, legislation for marine area use and grid connection, EU Green Deal programs and national climate neutrality goals, support and interest from local municipalities.

Stakeholders: Local municipalities, electricity companies and grid operators, environmental and planning authorities, international developers and investors.

More info: https://liivimeretuulepark.ee/et/avaleht; https://www.toostusuudised.ee/uudised/2025/04/14/sunly-liitub-saaremaa-avamere-tuulepargi-arendusega; https://www.maritime-executive.com/article/estonia-grants-its-first-permit-for-an-offshore-wind-farm
Indicators: Installed capacity (GW), total electricity production (TWh)

Photo: Offshore wind farm. Source: Liivi Offshore Wind Farm (https://liivimeretuulepark.ee/et/avaleht)

4.4.9 Creating a simplified regulatory process for small-scale renewable energy producers

Description: In Estonia, electricity producers with a net capacity below 200 kW are exempt from several regulations and administrative processes. Such producers do not need to register as legal entities and are exempt from minimum capital requirements applicable to other electricity market producers and sellers. Additionally, grid operators cannot require connection documents for even smaller projects with a net capacity of up to 15 kW. For example, rooftop solar installations only require a building permit. A simplified regulatory and administrative framework significantly reduces the bureaucratic burden associated with obtaining small energy producer status.
Implementation time: Legislative changes require a long-term implementation schedule.
Enabling conditions: Long-term political will
Stakeholders: Energy agencies and one-stop service points, infrastructure and public service providers, resident associations, local communities, energy cooperatives, regional and national authorities.

More info:
https://clean-energy-islands.ec.europa.eu/countries/estonia/legal/community-energy-policies/prosumers
Indicators: Number of legislative changes

4.4.10 Purchasing and developing remote solar power plants

Description: Lithuania developed a framework for remotely managed solar power plants in 2019, following the 2018 National Energy Independence Strategy. Through an online platform, users can buy or rent renewable energy power plants regardless of location. This framework was particularly important for apartment residents and enables individuals to become energy prosumers. Additional incentive systems include subsidies for developing remote solar plants between 2022–2025 at €323 per kW of installed capacity. The municipality can enable the action by engaging investors for the creation of the physical energy infrastructure, as well as participating in the conceptualisation of the operational frameworks. In the later stages, municipalities themselves can act as participants in such initiatives.
Implementation time: Long-term activity, as it requires mobilizing various stakeholders.
Enabling conditions: Suitable legislative frameworks
Stakeholders: Municipalities, energy agencies and one-stop service points, infrastructure and public service providers, local communities, energy cooperatives, regional and national authorities, SMEs.
More info: https://www.interregeurope.eu/good-practices/remote-renewable-energy-power-plants-for-prosumers
Indicators: Number of participants, number of remotely managed solar power plants

4.4.11 Developing agrivoltaics (Agri-Solar)

Description: Agrivoltaics is a solution where the same land is used simultaneously for agriculture and solar energy production. In North and East Europa, this is realistic and promising but requires a different approach than in Southern Europe. Our climate, crops, and machine-based farming favour a design where solar panels are installed sparsely and at sufficient height, allowing normal cultivation and livestock movement.
Estonia's solar potential is moderate, and the sun is at a low angle for much of the year. Therefore, agrivoltaic systems must be higher, with greater tilt angles and row spacing to ensure even light distribution in spring and autumn. Snow and ice loads must also be considered, requiring strong steel structures and

panel placement at least 2.5 - 4.5 meters above ground. This design reduces shading and allows tractors, combines, and other machinery to operate.
Agriculturally, agrivoltaics suits crops that tolerate or prefer partial shade—such as potatoes, peas, field beans, brassicas, leafy greens, berries, and pastures. Panel shading helps reduce heat stress and maintain soil moisture, which is a key advantage under changing climate conditions. Yield reduction is usually small or negligible, while cereals (especially wheat) require very careful design or may not be suitable at all.
From an energy perspective, agrivoltaics is primarily intended for local use. Electricity can power farm buildings, dryers, cold storage, and pumps or be shared through energy communities. This reduces dependence on the grid and price fluctuations, making solar energy part of agricultural operations rather than a separate industrial facility. Capacity per hectare is lower than in conventional solar parks, but overall land productivity increases because the same area produces both food and energy. Currently, agrivoltaics is not legally defined in Estonia, and converting farmland for energy production is strictly regulated.
The municipalities can enable the development of the agrivoltaics industry by fostering collaborations between the technology installers and developers, together with local farmers or agricultural enterprises.
Implementation time: Up to 3 years (if the legal definition and separate procedure are clear), ~5 years with piloting.
Enabling conditions: Clear legal status, planning process distinct from conventional solar parks, sufficient financing (costlier than standard PV), local expertise (designers familiar with both PV systems and agricultural cycles), and early community engagement.
Stakeholders: Landowners/farmers, local municipalities, grid operators, energy partners, policymakers, local community, and neighbours.
More info: https://agrisolareurope.org/map/;
https://www.pv-magazine-australia.com/2025/04/08/agrivoltaic-partnership-to-drive-social-licence-for-landholders-hosting-solar/
Indicators: Installed capacity (MW) and total annual electricity production (GWh)

Photo: Agrivoltaic system combining solar energy generation with livestock grazing. Source: PV Magazine Australia (https://www.pv-magazine-australia.com/2025/04/08/agrivoltaic-partnership-to-drive-social-licence-for-landholders-hosting-solar/)

4.4.12 Identification of local renewable energy resources and areas where they can be used

Description: Assessment of the availability and potential of local renewable energy sources, such as solar, wind, biomass, geothermal, and small hydropower, and their suitability for specific areas and residents' needs. Considering technical, environmental, economic, and social factors - energy grid availability, environmental restrictions, and distance to energy consumption points. Implementing solutions that support local energy use among energy communities and prosumers.
Implementation time: 2 years.
Enabling conditions: Financial resources for the implementation of the action, support from authorities, and availability of necessary data and information technical capabilities of the municipality.
Stakeholders: local authorities, utilities, and research institutions, municipal enterprises, network operators, infrastructure and public service providers, and enterprises (including SMEs).
Indicators: Estimated renewable energy potential by source (MW), number of areas identified for each renewable energy source.

4.4.13 Identify suitable locations for solar parks and address grid bottlenecks

Description: Ensure the municipal comprehensive plan identifies suitable locations for solar parks and maps grid bottlenecks to optimize renewable energy deployment and improve grid efficiency.
Implementation time: Medium-term.
Enabling conditions: Access to spatial and grid data, cooperation with grid operators, and updated planning instruments.
Stakeholders: Municipality, grid operators, energy agencies, property owners.
Indicators: Suitable solar park areas identified (count), total potential capacity (MW), grid bottlenecks mapped (count).

4.4.14 Promote the use of renewable energy sources (biomass, solar, wind, etc.) for electricity production for the needs of the municipality (green renewable electricity for municipal infrastructure)

Description: Consider various options in municipal infrastructure, where it is possible to generate the necessary electricity from RES.
Implementation time: Long-term (1–10 years).
Enabling conditions: Review of infrastructure, available financing.
Stakeholders: municipal institutions on the roofs of which solar panels can be installed, and others.
Indicators: Electricity produced from renewable energy resources in municipal infrastructure, MWh/year.

4.4.15 Promote the installation of solar panels to cover the self-consumption of electricity in municipal buildings

Description: The first step is to evaluate the potential of solar panels depending on the building's electricity consumption, roof area, and characteristics. Database of priority projects: often in municipal buildings, where there are offices, electricity consumption is during the day, which allows solar energy to be used for self-consumption. Database of priority projects:

- should include municipal buildings, where there are offices – which have electricity consumption in summer
- social care centres
- data centres
- Besides solar PV panels, they should also include a battery.

Implementation time: Long-term (1–10 years).
Enabling conditions: knowledge of solar technologies, available financing.

Stakeholders: all municipal bodies that have electricity consumption in the sunny part of the year.
Indicators: Electricity produced from renewable energy resources, MWh/year.

4.4.16 Use of solar energy to cover the part of self-consumption of water management (PV panels and battery to cover the electricity consumed by pumping systems, etc.)

Description: Water management usually involves large electricity consumption due to pumping systems. Therefore, it is advisable to install solar systems in the places where the electricity consumption is the largest.
Implementation time: Long-term (1–10 years).
Enabling conditions: review practices of water supply efficiency, available financing.
Stakeholders: Municipal water companies.
Indicators: Electricity produced for self-consumption MWh/year, % of self-consumption covered with solar energy.

4.4.17 Collective procurement and group purchasing of renewable energy equipment

Description: The municipality coordinates or facilitates group purchasing schemes for residents, housing cooperatives, and multi-apartment buildings. By aggregating local demand for equipment such as solar PV panels, heat pumps, and energy storage solutions, the municipality enables residents to benefit from significant bulk-purchase discounts, standardized high-quality technical specifications, and simplified installation processes. The municipality (or a designated municipally owned company) manages the transparent tendering process, pre-qualifies reliable installers, and ensures better warranty terms. This reduces the financial and administrative burden on individual households, ensuring a more secure and cost-effective transition to renewable energy.
Implementation time: Short-to-medium term (1–2 years for mapping demand and conducting the procurement process).
Enabling conditions: Legal framework for collective procurement, political commitment, and a communication strategy to aggregate a sufficient volume of interested residents.
Stakeholders: Local municipality, municipally-owned maintenance companies, resident associations, housing cooperatives, and certified equipment installers.
More info: https://www.london.gov.uk/programmes-and-strategies/environment-and-climate-change/energy/solar-together-london, https://renewablesnow.com/news/north-holland-province-launches-group-purchase-of-solar-panels-388374/

Indicators: Number of households participating in group purchase schemes, total installed capacity of PV systems, and heat pumps (kW).

4.4.18 Provide financial support to non-profit organizations for renewable energy investments

Description: The municipality allocates funding to support non-profit organizations that wish to install renewable energy systems such as solar, wind, or bioenergy, lowering financial barriers and promoting local energy production.
Implementation time: Medium-term.
Enabling conditions: Availability of municipal or external funding, clear eligibility criteria, and a transparent application process.
Stakeholders: Municipality, non-profit organizations, energy agencies.
Indicators: Total funding allocated, number of non-profit organizations receiving support, installed renewable capacity through funded projects (kW/MW), share of supported projects completed successfully (%).

4.4.19 Offer municipal support during energy project planning

Description: Provide support during the planning phase of energy projects, including technical advice, cooperative business models, and solar access assessments. This initiative aims to reduce complexity and enable the successful implementation of local renewable energy projects.
Implementation time: Medium-term.
Enabling conditions: Availability of technical experts, cooperation with external advisory organizations, and funding for planning support services.
Stakeholders: Municipality, energy agencies, residents, businesses, housing cooperatives.
Indicators: Number of projects receiving technical advice, number of cooperative business models supported, number of solar access assessments completed, number of inquiries handled.

4.4.20 Dual function of local electricity supply

Description: Ensure local electricity production can serve dual purposes: regular supply and off-grid capability during crises, while improving resilience to climate change. To make this possible, the right technical installations, including a hybrid or off-grid inverter, will need to be in place at the site.
Implementation time: Medium-term.
Enabling conditions: Grid infrastructure prepared for islanding operation, technical systems enabling safe separation and reconnection to the main grid, availability of storage or backup generation, coordination with grid operators, and compliance with regulatory requirements for local resilience solutions.

Stakeholders: Municipality, local electricity producers, distribution system operators (DSOs), emergency management agencies, equipment suppliers, and regulatory authorities.
Indicators: Local production sites with islanding/off-grid capability (count), backup supply duration enabled (hours), resilience criteria included in procurement/standards (yes/no).

4.4.21 Resolve grid capacity and military restriction conflicts

Description: Collaborate with power grid companies and the Armed Forces to address conflicts related to grid capacity and military restrictions on energy projects.
Implementation time: Medium-term.
Enabling conditions: Structured dialogue platforms between municipality, grid operators, and Armed Forces, clear procedures for assessing military impact zones, transparent capacity data from grid companies, and coordinated planning processes to identify technically and strategically feasible solutions.
Stakeholders: Municipality, distribution and transmission system operators (DSOs/TSOs), Armed Forces, regional authorities, and permitting bodies.
Indicators: Formal collaboration agreements with grid companies and Armed Forces (yes/no), grid capacity constraints resolved (count), lead time reductions for connection (days), projects enabled in restricted areas (count).

4.4.22 Identify local renewable resources and create incentives for efficient utilization

Description: The municipality maps local resources such as wind potential, solar radiation, and biomass and introduces incentives to promote their efficient utilization for renewable energy production.
Implementation time: Medium-term.
Enabling conditions: Access to resource data, funding for mapping and incentive programs, and cooperation with local stakeholders.
Stakeholders: Municipality, energy agencies, residents, businesses, and associations.
Indicators: Completion of resource mapping, number of incentives introduced, and increase in utilization of local renewable resources.

4.4.23 Develop a Municipal Power Map

Description: Create a geographical power map for the municipality to identify areas suitable for new production and prioritize energy optimization measures.
Implementation time: Medium-term.

Enabling conditions: Access to geospatial and grid capacity data, coordination with grid operators, analytical tools for mapping energy demand and production potential, cross departmental municipal collaboration, and methodologies for identifying priority zones and optimization needs.
Stakeholders: Municipality (planning, environmental, and energy departments), distribution and transmission system operators (DSOs/TSOs), local energy companies, regional authorities, and GIS/data specialists.
Indicators: Municipal power map produced and published (yes/no), priority zones identified (count), new production capacity sited using the map (MW), energy optimization measures initiated in flagged areas (count).

4.4.24 Secure critical infrastructure with fossil-free backup power and storage

Description: The measure aims to secure essential infrastructure, such as water supply, by providing independent fossil-free power sources and energy storage to ensure resilience during outages.
Implementation time: Long-term.
Enabling conditions: Clear resilience strategy, access to funding for backup systems, and technical feasibility for integrating renewable energy and storage.
Stakeholders: Municipality, infrastructure operators, energy agencies, technology providers.
Indicators: Percentage of crucial infrastructure that can run in a power outage.

4.4.25 Set targets for renewable energy deployment on municipal buildings

Description: The municipality establishes clear and measurable targets for installing solar and/or wind energy systems on municipally owned buildings to guide investment planning and demonstrate leadership in the energy transition.
Implementation time: Long-term.
Enabling conditions: Political commitment, integration into municipal energy strategy, and access to funding for installations.
Stakeholders: Municipality, municipally owned companies, energy agencies.
Indicators: Achievement of renewable energy targets for municipal buildings (kW or MW installed).

4.5 Comprehensive approach to the development of wind energy in the territory

Description: Municipalities plan in which territory wind power plants are allowed. The steps necessary, the main considerations for wind parks, and how to create the necessary preconditions.

Implementation time: Long-term (1–10 years).
Enabling conditions: building trust in technology, available financing.
Stakeholders: municipality, wind park developers, energy communities.
Indicators: % of municipality territory identified to be suitable for wind power generation, wind park installations in MW.

4.5.1 Evaluate which territories of the concrete municipality are suitable for the establishment of wind power plants, and create preconditions for wind energy development

4.5.1.1 Mapping and assessment of potential sites for wind park development

Develop a detailed wind potential map and map all areas where:
• technical possibilities exist (wind speeds, distance to 110 kV lines),
• spatial planning allows for the deployment of wind parks,
• there are no significant conflicts with natural areas, cultural heritage, and military infrastructure.
Result: list of candidate areas and map of priority projects.

4.5.1.2 Technically - economic preliminary assessment

For each potential site, initially carry out an approximate capacity, electricity transmission connection options, investment costs, and local benefit potential calculations.

4.5.1.3 Procedure "roadmap" for investors

The municipality prepares a clear description of the processes (planning, process of environmental impact assessment, public consultations, deadlines). This speeds up the work of investors and reduces disagreements.

4.5.1.4 Public engagement model - implement a structured engagement:

• early dialogue phase with communities,
• information meetings,
• transparent information on turbines' locations, noise, and benefits.
Municipality can use the good practices from Scandinavia and Germany.

4.5.1.5 Implementation of a local benefit mechanism

Creating a procedure that determines how wind farm revenues reach communities:
• fixed payment for the turbine,
• infrastructure improvement (roads, community centres, park),

• support for social programs in specific parish territories.

4.5.1.6 Inclusion of wind energy in the territorial plan

Precisely determine permitted and restricted territories, supplement with the creation of industrial centres that would facilitate the consumption of green energy, and, if they require wind or solar parks in the immediate vicinity, promote their accelerated implementation.

4.5.2 Small-capacity wind turbines for private homes and farms

Promote the use of small turbines of 1–30 kW:
• especially in rural areas,
• on farms with high electricity consumption.
The municipality provides information, technical advice, and good practices.

4.5.3 Community wind turbines (within energy communities)

One of the realistically implementable models:
• 1–2 community turbines (200–500 kW),
• partial participation of residents with the “share” principle,
• the generated energy is directed to communal buildings.

4.5.4 Hybrid wind and solar parks in the rural areas of the municipality

Wind parks can work in combination with solar parks and batteries to balance the power:
• suitable for the flat terrain,
• well compatible with the use of brownfield (degraded territories) sites.

4.5.5 Installation of wind measurement stations

Conduct 2–3 years of meteorological measurements at potential locations:
• measurement towers,
• LIDAR stations.
This gives credibility to projects and attracts investors.

4.5.6 Integration of wind energy into municipal infrastructure

Although the municipality does not build the park itself, it can:
• conclude PPA (Power Purchase Agreement) with wind parks,
• fix cheaper electricity for heat pumps, water management, and street lighting.
This helps to achieve the municipal RES goal.

4.5.7 Support mechanism for investor search

The municipality develops:
• investor information package (map, rules, opportunities),
• contact point.
This significantly accelerates the progress of projects.

4.5.8 Strengthen network infrastructure and cooperation with the Distribution Network

Agree with network operators on:
• capacity availability,
• necessary transformer and 110 kV line reinforcements,
• possible joint projects.
This is a critically important point without which large wind farms cannot develop.

4.5.9 Compensation and regulation of the buffer zone

Develop clear criteria (to improve public acceptance):
• minimum distance from populated areas,
• visual impact,
• compensation amount for residents and landowners.

4.5.10 Wind energy education in schools and communities

• interactive seminars,
• excursions to existing wind farms.

4.5.11 Pilot project – one municipal low-capacity wind turbine

Demonstration pilot - small (100–200 kW) turbine:
• near a water management facility,
• near an industrial area,
• near landfill.

4.5.12 Wind measures for special types of territories:

4.5.12.1 Large wind farms (50–150 MW)

• suitable for areas with less population, where planning allows;
• higher contribution to the county budget (taxes, land rent);
• creates opportunities for PPA agreements.

4.5.12.2 Medium-sized farms (10–30 MW)

• can be included in industrial zones,

• especially where there are power lines nearby.

4.5.12.3 Small community wind farms (0.2–1 MW)

• suitable for villages and energy communities,
• lower noise and visual impact.

4.5.12.4 Individual turbines (1–30 kW)

• for private homes, farms, and small businesses.

4.6 Effective use of waste heat generated by industrial production processes and electricity production processes

Description: Individual solutions if some waste heat is available – adding more consumers or other solutions.
Implementation time: Long-term (1–10 years).
Enabling conditions: review of the processes, detection of waste heat, and financing available for installing solutions.
Stakeholders: industry.
Indicators: Used waste heat MWh/year.

4.7 Use of sewage sludge for biogas/energy production

Description: Use of sewage sludge for biogas/energy production. For example, a municipality can organize a procurement, which a company can use sludge for the production of biogas.
Implementation time: Long-term (5–10 years).
Enabling conditions: review of water management, available financing.
Stakeholders: municipal water companies.
Indicators: Biogas, electricity produced from RES MWh/year.

4.8 Coordinate electricity network plans with the comprehensive plan

Description: Establish coordination between electricity network plans and the comprehensive plan so that grid and infrastructure needs can be met through activities and investments in the physical environment. For example, in areas with grid constraints, solutions such as energy storage, carpooling, or island mode operation can be implemented.
Implementation time: Medium-term.
Enabling conditions: Formal cooperation framework with network owners, updated planning guidelines, and resources for integrated projects.
Stakeholders: Municipality, network owners, grid operators, energy agencies, and property developers.

Indicators: Formal coordination framework adopted (yes/no), joint plan updates or MoUs executed (count), integrated projects launched (count), reduction in local grid constraints or peak load (% or MW).

4.9 Plan redundant electricity and heat supply for essential operations

Description: The measure proposes planning redundant electricity and heat supply for essential operations such as healthcare, elderly care, public kitchens, and security facilities, using green energy and storage solutions.
Implementation time: Long-term.
Enabling conditions: Availability of financing, legal framework for decentralized energy solutions, and cooperation with grid and heat suppliers.
Stakeholders: Municipality, healthcare and social service providers, energy agencies, and technology suppliers.
Indicators: Percentage of crucial infrastructure that can run in a power outage

4.10 Future planning: designating areas for renewable energy installations in planning processes for unused land (closed landfills, brownfields)

Description: This measure requires a comprehensive and well-thought-out approach combining spatial planning, environmental assessment, technical feasibility, and community engagement. Utilizing such areas is attractive because they are often heavily impacted by human activity and do not compete with valuable agricultural or natural land. However, they require careful analysis to ensure safety, environmental sustainability, and economic viability.
The planning process begins with mapping unused or end-of-life land areas. For closed landfills and brownfields, stability and load-bearing capacity must be assessed, especially for landfills where fill material may settle. Accessibility (roads, maintenance logistics), proximity to the grid (affecting connection costs), and spatial restrictions (protected areas, easements, distance from settlements, aviation limits for wind turbines) must also be considered.
Environmental and safety aspects must be evaluated, such as soil and groundwater conditions (gas emissions, contamination risks), ecological impacts (e.g., whether the brownfield has become a semi-natural habitat), and visual/noise impacts on nearby communities.
Implementation time: 1.5 - 3 years.
Enabling conditions: Availability of suitable land, absence of environmental restrictions, existing or easily adaptable infrastructure (e.g., grid, substations), documented technical conditions (e.g., landfill cover, soil stability).
Stakeholders: Local municipality, technical and environmental experts.
More info: Jõelähtme municipality in Estonia has included the possibility of using a closed landfill for solar energy in its master plan. Several former

industrial areas in Ida-Virumaa (Aidu, Kohtla-Nõmme) are open for renewable energy projects.
Indicators: increasing resident participation in energy projects

5 Measures in transport

Transport remains a major source of emissions and air pollution, affecting health, mobility, and quality of life. Current systems often prioritize private cars and fossil fuels, creating congestion and environmental harm. Transitioning to cleaner, smarter transport solutions is urgent as cities grow and climate targets tighten. Measures in this chapter promote public transport, active mobility, and low-emission vehicles, offering benefits for everyone—residents, enterprises, and municipalities—through improved accessibility, cleaner air, and reduced costs.

5.1 Information and promotion of sustainable mobility habits

5.1.1 Promote sustainable commuting options for employers

Description: Inform companies about the benefits of offering workplaces that are easily accessible by sustainable transport modes such as biking, walking, and public transport to attract employees.
Implementation time: Short-term.
Enabling conditions: Communication campaigns, collaboration with business networks, and accessible planning data.
Stakeholders: Employers, municipal planning and communication teams, business associations.
Indicators: Number of companies informed about sustainable commuting benefits, number of companies adopting measures, increase in sustainable commuting options offered (%).

5.1.2 Campaigns to change mobility habits

Description: Awareness campaigns and behavioural change programs that encourage people to choose walking, cycling, or public transport. It can be linked to schools, employers, and communities to make daily mobility choices more environmentally friendly.
Implementation time: Short-term – campaigns and programs can be launched within 1 year.
Enabling conditions: Funding, cooperation with educational institutions and employers, and community involvement.
Stakeholders: Municipalities, community, educational institutions, businesses (employers).
More info: EU Mobility Week: https://mobilityweek.eu/home/; Tartu Mobility Week: https://tartu.ee/et/liikuvusnadal
Indicators: Number of campaign participants, number of campaigns organized.

5.1.3 Promotion of the inverted mobility pyramid

Description: Promoting a transport system that resembles an inverted pyramid, with walking at the top. At the next level down is another form of active mobility – cycling. Only at the lower levels are mechanised forms such as public transport, with car transport having an even lower priority. Organising promotional events can encourage people to change their habits, for example, cycling competitions or rallies, promoting active mobility in schools.
Implementation time: 1 year.
Enabling conditions: Support from local and regional authorities, good infrastructure for pedestrians and cyclists, and well-developed public transport.
Stakeholders: Residents, municipalities, schools, universities, infrastructure, and public service providers.
Indicators: Number of cars, e.g., at selected points in the city – reduction in the number of car journeys in the city, length of new cycle paths (km), annual number of users of pedestrian infrastructure, annual number of users of cycling infrastructure as part of non-urban public transport.

5.1.4 Encourage remote meetings, carpooling, and cycling

Description: Implement information campaigns and behavioural initiatives to promote remote meetings, carpooling, and cycling as sustainable alternatives to car travel.
Implementation time: Short-term.
Enabling conditions: Communication resources, employer engagement, and clear messaging on benefits.
Stakeholders: Municipal communication teams, employers, community organizations, transport authorities.
Indicators: Information campaigns launched (count), engagement rate (%), increase in remote meetings and carpooling adoption (%).

5.1.5 Promotion of public transport – especially in cities

Description: Increasing the attractiveness and use of public transport through information, education, and promotional campaigns aimed at residents of cities and municipalities. This can be achieved by increasing the frequency of services or introducing apps that facilitate journey planning. Promoting solutions such as joint bus and train tickets. To encourage people to use public transport, free travel can be introduced as part of a promotional campaign addressed to residents of municipalities and cities.
Implementation time: 1 year.
Enabling conditions: Current external infrastructure, attractive transport offer.

Stakeholders: Infrastructure and public service providers, authorities.
Indicators: Number of public transport passengers (monthly average, annual average – comparison), reduction in transport-related CO_2 emissions – expressed in CO_2e equivalent.

5.2 Improving the users' experience in public transport

Description: Improving the user experience in routes, apps, and schedules of public transportation to increase passenger numbers. In regions with active cross-border commuters, a ticket that is valid long enough and allows changing the means of different transport modes is necessary, for instance, in the Helsinki Metropolitan area.
Implementation time: 1-3 years.
Enabling conditions: Service and app designers, infrastructure, incentives, e.g., fair pricing in tickets.
Stakeholders: Inhabitants, Infrastructure, public service providers, and enterprises.
Indicators: Less private car use, less emitted CO2, and use of public transportation services.

5.3 Construction/optimisation of connections: roads, stops, etc.

Description: The construction and optimisation of connections include the construction or modernisation of transport infrastructure – public roads, access roads, intersections, public transport stops, etc. This measure will improve traffic flow and reduce traffic jams, thereby reducing transport-related emissions. To facilitate changes and there should be promotion and information about planning changes and modernisations – communicating to residents the benefits that will result from the changes.
Implementation time: 5 years.
Enabling conditions: Subsidies, support from authorities, and residents.
Stakeholders: Municipalities, Infrastructure and public service providers, Regional and national authorities, Road administrators - General Directorate for National Roads and Motorways.
Indicators: Travel time during rush hour – expressed, for example, in minutes – monthly/annual average, reduction in transport-related CO2 emissions – expressed in CO2e equivalent, number of modernised stops and road sections (number).

5.3.1 Adjusting public transport flows between different modes of transport

Description: Bus times adjusted to plane/train arrivals.

Implementation time: Medium-term (1–5 years).
Enabling conditions: bus flow planning.
Stakeholders: municipal bus companies, bus companies.

5.4 Further development of the Public Transport System

Description: The goal of this measure is to improve public transport stops and infrastructure, densify and update route networks according to local needs, and create secure bicycle storage facilities to enable bike-and-ride combinations. Important actions include better marking and publishing of timetables and stops, modernizing stops and bays, and installing electronic information boards. This measure is necessary to reduce car use and expand sustainable mobility options.
Implementation time: Small-scale works (e.g., info boards) can be implemented quickly and continuously, but infrastructure upgrades may take several years.
Enabling conditions: Climate-responsible planning at the municipal level, along with sufficient financing.
Stakeholders: Public transport organizers (municipalities, companies).
More info: Bus Rapid Transit (BRT) systems with improved stop infrastructure, timetables, info boards, and route networks to make public transport faster and more attractive: https://stateofgreen.com/en/solutions/bus-rapid-transit-brt-system/
Indicators: Number of upgraded public transport stops (pcs.)

5.4.1 Making public transport more affordable

Description: This measure focuses on increasing the attractiveness and affordability of public transport by offering ticket discounts or free rides for different target groups. It includes employer or municipal subsidies for ticket costs, free rides for certain groups (e.g., students, pensioners, people with disabilities), and needs-based discounts for low-income residents, including those in remote areas and islands. The goal is to reduce transport poverty and increase public transport use. A unified system should be established covering all public transport modes (train, bus, ferry) and allowing existing discounts to be supplemented based on socio-economic criteria.
Implementation time: Short-term – can start within 1–2 years, given political decisions and budget availability.
Enabling conditions: Municipal or national funding, a functioning public transport system, a flexible ticketing system, and public awareness.
Stakeholders: Municipalities, municipal companies (public transport operators), national authorities, community, businesses (employers).

More info: Example from Estonia: Several counties have implemented free public transport, resulting in increased ridership and reduced car traffic. Tallinn case: https://ruralsharedmobility.eu/wp-content/uploads/2019/08/SMARTA-GP-Fare-free-Public-Transport-in-Tallinn.pdf
Indicators: Increase in public transport users (%), number of users receiving discounts, reduction in CO_2 emissions in the transport sector (t/year).

5.4.2 Introducing climate-friendly fuels in public transport

Description: This measure focuses on replacing fossil fuels in public transport with more climate-friendly alternatives such as electricity, biogas, or hydrogen. The aim is to reduce greenhouse gas emissions in the transport sector and improve urban air quality. The measure also includes building necessary infrastructure (e.g., charging stations, fuelling points) and developing maintenance and service capacity.
Implementation time: Pilot projects and partial adoption are possible within a few years; full transition is a long-term process (5–10+ years).
Enabling conditions: Existing infrastructure, funding, and technological readiness.
Stakeholders: Municipalities, companies, infrastructure and public service providers, and national authorities.
More info: Movia (Denmark): 50% electric buses by 2024 and nearly 94% by 2030, City of Copenhagen: Goal for all city bus lines to be “zero emission” by 2025, currently ~43–57% electric buses.
https://stateofgreen.com/en/solutions/the-zero-emission-public-transport-of-the-future/; https://stateofgreen.com/en/solutions/electric-buses/
Indicators: Share of buses using climate-friendly fuels (electricity/hydrogen/biogas) (%).

5.5 Developing Logical and Connected Bicycle and Pedestrian Corridors (Network)

Description: The goal of this measure is to build and develop a coherent network of bicycle and pedestrian paths connecting residential areas, schools, workplaces, service points, and public transport hubs. Creating a network based on the needs of pedestrians and cyclists promotes safe and convenient walking and cycling, expands sustainable mobility options, reduces car use, and improves air quality. This principle can also be applied to creating a bicycle-only network.
Implementation time: Gradual and phased implementation, full network development may take decades.
Enabling conditions: Spatial plans, support measures.

Stakeholders: Municipalities, infrastructure and public service providers, local community.
More info: Example from Denmark: *The Concept for Cycle Superhighways* https://supercykelstier.dk/concept/
Indicators: Total length of constructed bicycle and pedestrian paths (km).

Photo: Cycle superhighway in Copenhagen promoting sustainable urban mobility. Source: Supercykelstier (https://supercykelstier.dk/english/press/)

5.5.1 Building park-and-ride facilities near public transport stops

Description: This measure involves building or upgrading parking facilities near city outskirts and public transport stops (train, bus, tram) to encourage leaving cars behind when traveling toward city centres. This helps reduce congestion and air pollution while promoting public transport use.
Implementation time: Can be implemented quickly under suitable conditions, but may require long-term planning.
Enabling conditions: Suitable land near public transport hubs, funding (municipal, national, and EU funds).
Stakeholders: Municipalities and their companies (transport/parking), infrastructure and public service providers (companies), local community.
More info: Example from Estonia: “Park and Ride” facilities on the outskirts of Tallinn have increased public transport use and reduced car traffic in the city centre.
Indicators: Number of parking spaces built (pcs).

5.5.2 Building parking facilities for light mobility vehicles

Description: This measure focuses on promoting the use of light mobility vehicles (e.g., electric bicycles, scooters) by providing convenient and secure parking facilities near service buildings, public transport stops, and public spaces. Effective parking requires good accessibility (visibility, signage), security (frame locks, camera surveillance), and weather protection (shelters). Added value comes from maintenance points where users can repair bikes or inflate tires.
Implementation time: Short-term activity if space and planning allow (e.g., near existing buildings or in new developments).
Enabling conditions: Spatial plans, subsidies.
Stakeholders: Municipalities, infrastructure and public service providers, community, businesses.
More info: Example: https://stateofgreen.com/en/solutions/bicycle-parking-facility-lyngby-station/ (extreme example: huge bicycle parking facility).
Indicators: Number of parking spaces built (pcs).

Photos: Left – repair stand in Paldiski central square, right – bike shelter in Tartu (built from recycled materials). Author: Tori Municipal Government

5.5.3 Developing charging infrastructure for electric cars and light mobility vehicles

Description: The goal of this measure is to build sufficient and easily accessible charging infrastructure for electric cars and light mobility vehicles (bikes, scooters, etc.), including in public spaces, suburbs, residential areas, and businesses. This includes installing fast and standard chargers on streets,

parking lots, near shops, office buildings, and indoors, as well as upgrading chargers to ensure adequate capacity and real user accessibility.
Implementation time: Short- to medium-term: initial chargers and necessary electrical connections can be installed within 1–2 years, broader infrastructure and fast chargers for high-volume use will take 3–5 years.
Enabling conditions: Availability of an electricity grid capable of handling loads and sufficient space, subsidies.
Stakeholders: Municipalities, businesses, national authorities, community.
More info: Electric car charging projects: https://ubitricity.com/en/case-studies/, Light mobility charging stations: https://jcharge.eu/rzeszows-innovative-jcharge-station-a-sustainable-mobility-solution-for-a-modern-city
Indicators: Number of charging points installed (pcs).

Photo: Shared micromobility station featuring electric scooters and bicycles..
Source: Lyft (https://images.ctfassets.net/vz6nkkbc6q75/2aFLGIZExXaUvxaIUHWZC1/f86e5d2bc7e962a82ac16773fb3f827b/20221117_Lyft_TBS_Hardware-0154-Edit.jpg?h=1000)

Photo: Electric vehicle charging station integrated into a street lamp post in Berlin. Source: Ubitricity (https://ubitricity.com/en/200-lamp-post-chargers-in-berlin/)

5.5.3.1 Deploy charging infrastructure in apartment-dense areas using municipal land and funding

Description: The municipality allocates funding and/or municipally owned parking areas to establish charging infrastructure in residential zones with a high concentration of apartment buildings. As many residents in these areas lack access to private charging options, this measure ensures equitable access to electric vehicle charging and supports the transition to low-emission transport.
Implementation time: Medium.
Enabling conditions: Funding availability, partnerships with charging providers, and suitable locations identified.
Stakeholders: Municipal planning and finance departments, energy providers, property owners, and charging infrastructure companies.
Indicators: Charging stations installed in apartment-dense areas (count), share of residents with access to public charging (%), utilization rate of installed chargers (%).

5.5.4 Development of infrastructure for environmentally friendly modes of transport

Description: Promoting the construction of bicycle infrastructure and other micromobility tools, including creating connections with the endpoints of public transport routes. Increase the number of electric bicycles, racks for all bicycles, scaling up cycling: bicycle parking near each municipal building, development

of bicycle infrastructure, solutions for safe bicycle storage in or near apartment buildings, organization of information campaigns to change the habits of residents

Implementation time: Long-term (1–10 years).

Enabling conditions: inclusion of environmentally friendly modes of transport in each new or reconstruction project of the municipality, and available financing.

Stakeholders: development departments of municipalities, city maintenance companies.

Indicators: length of bicycle paths (km), number of bicycle parking spaces.

5.6 Infrastructure development – park and ride areas

Description: Investing in a car park located near public transport stops for people using public transport, by creating:

- connections with public transport,
- parking lots,
- access roads,
- pavements,
- bicycle stands and parks

Drivers leave their vehicles in designated areas, transfer to public transport, and continue their journey to the city centre.

Implementation time: 2-3 years.

Enabling conditions: Availability of subsidies, funds, parking spaces, and cooperation with transport operators.

Stakeholders: Infrastructure and public service providers, Businesses (including SMEs), Local communities, Regional and national authorities.

Indicators: number of parking facilities built, number of people using the parking facility, number of parking spaces, number of vehicles using parking spaces in newly built, rebuilt, or retrofitted park-and-ride facilities.

5.7 Designing street space with priority for pedestrian and cyclist safety

Description: This measure focuses on redesigning street space to prioritize pedestrians and cyclists. It includes wider sidewalks, separated bike lanes, safe crossings, traffic-calming measures (e.g., raised intersections, speed limits), and pedestrian-friendly lighting solutions. Safety can be enhanced by clearly separating movement areas for pedestrians, cyclists, and cars using markings, greenery, or surface materials (e.g., green buffers or parked cars). Additionally, sufficient seating areas should be provided, creating pocket parks or multifunctional small structures suitable for all ages (8–80 years). This approach makes urban space safer and more attractive, encouraging sustainable mobility.

Implementation time: Short-term changes (e.g., traffic management adjustments) can be implemented quickly, but full street redesigns require longer (3–10 years).
Enabling conditions: Spatial plans, funding, clear procurement guidelines with climate and safety criteria, and coordination between authorities and energy providers.
Stakeholders: Municipalities, infrastructure and public service providers (companies), local community.
More info: Examples: Barcelona "superblocks." https://www.citiesforum.org/news/superblock-superilla-barcelona-a-city-redefined/; Copenhagen car-free solutions https://stateofgreen.com/en/solutions/copenhagen-car-freedom/
Indicators: Reduction in pedestrian and cyclist traffic accidents (%), total length of redesigned street sections (km), safe cycling routes built (km), e-bike charging stations installed (count), share of infrastructure procured with climate criteria (%).

Photos: Example of inclusive street design in Oslo. Author: Tori Municipal Government

5.8 Use of environmentally friendly energy in municipal transport, gradual movement towards low-emission/zero-emission vehicles in the municipality, municipal commercial companies

Description: In possible support programmes or when changing vehicles, purchasing electric buses or electric/hybrid cars for the municipality.
Implementation time: Long-term (1–10 years).
Enabling conditions: green thinking at the municipal level, available financing.
Stakeholders: municipal bus companies, municipal companies, and institutions.
Indicators: % of municipal fleet using green fuel.

5.9 Development of e-services

Description: Municipal e-services, so that residents do not have to go to the municipality physically.
Implementation time: Medium-term (1–5 years).
Enabling conditions: availability of IT programmers and a relevant legal setup for creating e-services.
Stakeholders: municipality administrations and services.
More information: Rīgas pašvaldības pakalpojumu portāls; Sociālā palīdzība - Jelgava; Aprūpe mājās pakalpojums | Dobeles novada pašvaldība
Indicators: Number of e-services offered.

5.10 Remote work

Description: Partial remote work, where possible, to reduce the number of travellers, the travel-associated CO2 emissions, and save travel time for the employees.
Implementation time: Short-term (1–3 years).
Enabling conditions: work specifics, the attitude of management towards remote work.
Stakeholders: all organizations where work specifics allow remote work.
Indicators: % of employees' time working remotely.

5.11 Development of filling infrastructure for alternative, environmentally friendly fuels

Description: Filling stations for gas vehicles, electric vehicles, and hydrogen vehicles. Municipality can create favourable conditions, maybe designate areas where such filling stations can be installed, procure the operators of filling stations for particular plots of municipal land, or speak with entrepreneurs, encouraging them to add such filling possibilities to existing filling stations.
Implementation time: Long-term (5–10 years).
Enabling conditions: increased numbers of vehicles using gas, electricity, or hydrogen.
Stakeholders: private fuel suppliers.
Indicators: Number of filling stations for alternative, environmentally friendly fuels.

5.12 Use of biogas for transportation

Description: The municipality could build its own biogas plant or collaborate with a cross-border municipality that has the existing plant. Rural municipalities usually have agriculture (farms and forests) and therefore produce lots of

biowaste, which may not be put to use. Finnish example: Increased use of biofuels in logistics, transportation. Finnish biogas production has been around 1 TWh for several years. Finland also has a target of 4 TWh of biogas production in 2030. Approximately 60 % of the gas produced was utilized in heat production. The use of biogas in transport has still been small, but in recent years it has been growing rapidly.
Implementation time: 3-10 years.
Enabling conditions: Raw materials available, logistics, production plant, and its capacity.
Stakeholders: Residents - through separate biowaste collection, waste management companies, local farm and forest owners, wastewater company.
More info: https://biokierto.fi/biokaasu/biokaasu2030/
Indicators: Decreased amount of mixed waste (kg), added renewable fertilizers.

5.12.1 Decentralized production of biogas

Description: The rural area can become a resource for decentralized production of biogas, for example, in energy communities.
Implementation time: Long.
Enabling conditions: Policy framework for decentralized renewable energy, financial incentives and funding, technical support and partnerships, grid and infrastructure integration, engagement with rural stakeholders, streamlined permitting and compliance.
Stakeholders: Municipal energy and sustainability departments, rural landowners and farmers, energy community cooperatives, biogas technology providers, local transport operators, regional authorities, environmental NGOs, and community groups.
Indicators: Rural biogas production sites established (count), biogas output integrated in energy communities (MWh or Nm^3), number of rural stakeholders engaged (count), share of local transport fuel demand met by biogas (%).

5.13 Developing Rental and Sharing Services for Various Vehicles

Description: This measure promotes the sharing and rental of different vehicles (bicycles, e-bikes, scooters, cars) to reduce the need for private car ownership and improve mobility options, especially in areas with limited public transport. Services are based on digital platforms that enable convenient access and use.
Implementation time: Existing solutions can be implemented in the short term, and developing and introducing new services is a longer-term process.
Enabling conditions: Public-private cooperation, legal framework, subsidies, and availability of digital platforms.
Stakeholders: Municipalities, businesses, community.

More info: Tartu Smart Bike Share: https://tartu.ee/et/tartu-rattarent; https://ratas.tartu.ee/; Car-sharing services: Bolt Drive, CityBee; Albania: Ecovolis bike-sharing https://ruralsharedmobility.eu/wp-content/uploads/2019/08/SMARTA-GP-Ecovolis.pdf; Wales: Community car-sharing https://ruralsharedmobility.eu/wp-content/uploads/2019/08/SMARTA-GP-Talybont-Energy.pdf
Indicators: Number of vehicles available in sharing services (pcs).

Photo: Electric bike-share system integrated into urban public transport in Tartu. Author: Ketlin Lääts. Source: City of Tartu (https://tartu.ee/et/uudised/rattaringluse-elektrirattad-tuuakse-tagasi-ringlusesse)

5.13.1 Enable carpooling and public transport in rural areas

Description: Create conditions for rural areas to access car-sharing infrastructure and attractive public transport options, reducing car dependency and improving mobility.
Implementation time: Medium.
Enabling conditions: Funding for infrastructure, partnerships with car-sharing providers, and improved rural transport planning.
Stakeholders: Municipal and regional governments, public transport operators, car-sharing companies, rural communities.
Indicators: Carpool infrastructure established (count), number of rural car-sharing users, public transport coverage in rural areas (%).

5.14 Restructuring parking policy

Description: This measure involves restructuring parking policy to reduce the attractiveness of driving into city centres and encourage alternative mobility options. Measures include higher parking fees in city centres and cheaper or free parking spaces in suburbs linked to public transport stops ("Park and Ride" solution). This approach helps reduce congestion, improve air quality, and increase public transport use.
Implementation time: Medium-term – implementation takes 2 – 4 years, depending on legislative changes, infrastructure availability, and resident engagement.
Enabling conditions: National and local legal frameworks for setting parking fees, existing suburban parking areas, attractive public transport alternatives, and public awareness campaigns.
Stakeholders: Municipalities, municipal companies (parking management), infrastructure and public service providers, community, businesses (including retail and services).
More info: Examples: Stockholm and Oslo have successfully implemented parking policy changes alongside measures to improve urban air quality.
Indicators: Increase in public transport users, reduction in CO_2 emissions in the transport sector (t/year).

5.15 Promotion and implementation of SMART solutions – apps (free parking spaces)

Description: SMART solutions that reduce the time needed to find a parking space or use intelligent traffic lights. This will lead, among other things, to a reduction in transport-related emissions. Implementation of SMART solutions can be achieved through:
- information and training campaigns for app users,
- workshops and educational materials promoting the use of the system,
- modernisation of existing infrastructure to support SMART systems (sensors, cameras)

Implementation time: 1-2 years.
Enabling conditions: Funds, financing programmes, possibility of integration with existing infrastructure, cooperation with transport operators.
Stakeholders: Residents, technology providers, infrastructure providers, and public service providers.
Indicators: number of app users (in the case of parking apps), number of car parks, traffic lights, etc. in each city, number of SMART solutions implemented, number of people using new or modernised digital urban transport systems.

5.16 Developing and offering demand-responsive transport

Description: This measure focuses on developing flexible, demand-responsive transport services, which are particularly important in rural areas where traditional public transport does not sufficiently meet local needs. Demand-responsive transport combines bus and taxi services, using technology to optimize routes and schedules based on user requests. The service must be convenient and flexible for different user groups, including the elderly and people with special needs.

Implementation time: Medium-term – pilot projects can be implemented within 1–2 years, wider rollout takes longer (3–5 years).

Enabling conditions: Public-private cooperation, digital platforms and technological readiness, funding, and legal framework for flexible transport services.

Stakeholders: Municipalities, national authorities, community, businesses, infrastructure, and public service providers.

More info: Example from Portugal's Tejo region: taxis integrated into the public transport system https://ec.europa.eu/regional_policy/en/projects/europe/flexible-and-affordable-passenger-transport-in-medio-tejo-portugal, Estonia pilot: Saaremaa RESPONSE project https://response-project.eu/pilots/pilot-in-saaremaa-estonia, Other pilots: https://response-project.eu/pilots, Netherlands https://ruralsharedmobility.eu/wp-content/uploads/2019/08/SMARTA-GP-REGIOTAXI.pdf, Slovenia https://ruralsharedmobility.eu/wp-content/uploads/2019/08/SMARTA-GP-Sopotniki.pdf .

Indicators: Number of users of demand-responsive transport services, number of service requests per month/year, regional coverage of service (%).

Photo: Demand-responsive transport pilot project for rural connectivity in Saaremaa. Source: RESPONSE Project (https://response-project.eu/news/estonian-biggest-island-saaremaa-testing-on-demand-transportation-solutions)

5.17 Replacement/purchase of low-emission vehicles and zero-emission vehicles

Description: This measure focuses on promoting the purchase of low- or zero-emission vehicles (e.g., electric cars, hydrogen cars, electric vans, and cargo bikes) through subsidies. The goal is to reduce greenhouse gas emissions in the transport sector and accelerate the adoption of sustainable mobility options.
Implementation time: Short-term if subsidy programs are available and funded, long-term impact requires consistent support and infrastructure development.
Enabling conditions: Subsidy programs. Availability of infrastructure for zero-emission rolling stock – charging stations, existing support programmes.
Stakeholders: National authorities, municipalities, businesses, community.
More info: Example from Estonia: zero-emission vehicle purchase subsidy, where individuals and companies received up to €4,000 for buying new or used electric cars.
Indicators: Number of low-emission and zero-emission vehicles purchased, reduction in CO_2 emissions in the transport sector (tons/year), number of low/zero-emission vehicles share (%) in the total number of public transport vehicles.

5.18 Collecting and analyzing mobility data

Description: Collect and analyse mobility data (e.g., mobility flows, vehicle movement patterns, public transport usage) to make better decisions on transport network development, route optimization, and achieving climate goals. Data also helps assess the impact of measures on CO_2 emissions and accessibility of mobility options.
Implementation time: Short-term – data collection and analysis can start within 1–2 years if technical capacity and partners are available.
Enabling conditions: Digital platforms, compliance with data protection regulations, cooperation with transport companies, and the IT sector.
Stakeholders: Municipalities, national authorities, companies (including IT and mobility firms), infrastructure, and public service providers.
More info: Example: mobility studies in Estonian municipalities, e.g., Kambja https://www.sei.org/projects/kambja-liikuvusuuring/ and Kambja mobility report PDF.
Indicators: Number of travellers analysed.

5.19 Improving energy efficiency of transport infrastructure

Description: Reduce energy consumption in transport infrastructure by using LED lighting at bus stops and bike paths, energy-efficient traffic signs, and smart management systems (e.g., traffic flow optimization). This helps reduce energy use and CO_2 emissions.
Implementation time: Medium-term – depends on the need to upgrade existing infrastructure (2–4 years).
Enabling conditions: Support measures, technological readiness.
Stakeholders: Municipalities, infrastructure and public service providers, companies (including construction and energy service providers).
Indicators: Emissions reduced in transport infrastructure (tonnes CO_2-eq/a).

5.20 Green logistics and sustainable freight transport

Description: Promote sustainable freight solutions, including electric vans, urban consolidation centres, and cargo bike deliveries. The goal is to reduce fossil-fuel-based urban logistics and improve air quality.
Implementation time: Medium-term – depends on infrastructure and service provider readiness (2–5 years).
Enabling conditions: Support measures, business interest, and collaborative logistics platforms.
Stakeholders: Municipalities, businesses, community.

Indicators: Number of electric freight vehicles, reduction in CO_2 emissions from freight transport.

5.21 Measures for end user – municipality

5.21.1 Comprehensive plan/master plan

Description: Through the comprehensive plan/master plan, reduce the need for transportation – for example, where schools, shops, etc., are located in relation to residential areas for shorter commuting. Integrate transport efficiency into urban planning by prioritizing walking, cycling, and public transport in new developments.
Implementation time: Medium.
Enabling conditions: Clear policies for mixed-use, walkability, and public transport, investment in safe walking/cycling infrastructure, land-use strategy ensuring proximity to schools and services, data and monitoring tools, financing mechanisms and developer contributions, strong interdepartmental coordination, communication campaigns, streamlined permitting, design standards for active ground floors and green infrastructure.
Stakeholders: Municipal urban planning department, transport & infrastructure department, regional public transport authority, education department, economic development office, real estate developers, major employers, local retailers, environmental & sustainability unit, data & analytics team, residents and community groups, cycling NGOs, regional authorities, utilities & public works.
Indicators: Share of new developments with mixed-use and proximity to services (%), mode share for walking, cycling, public transport (%), average commuting distance (km), comprehensive plan policies adopted (yes/no).

5.21.2 Reclaim central streets for green space and active mobility

Description: The municipality closes one or more central streets to motorized traffic in order to repurpose public space for greenery, walking, and cycling. This measure enhances urban quality, reduces emissions, and promotes sustainable mobility in the city centre.
Implementation time: Medium.
Enabling conditions: Policy for street closures and pedestrianisation, traffic rerouting plan, funding for greenery and active mobility infrastructure, stakeholder engagement and communication, coordination with public transport, regulatory approvals, and safety standards.
Stakeholders: Municipal urban planning and transport departments, parks and green space management, local businesses and retailers, residents and

community groups, cycling NGOs, environmental units, and public transport authority.
Indicators: Central streets pedestrianised (count), area repurposed for green and active mobility (m²), footfall change in pedestrianised zones (%), traffic-related emissions reduction in zone (%).

5.21.3 Promote cycling among municipal employees through incentives and infrastructure

Description: The municipality offers bicycle benefit schemes to employees, including access to subsidized or leased bicycles. To support active commuting, weather-protected and secure bicycle parking is provided near municipal workplaces. Additional incentives may be introduced to encourage walking and cycling as preferred modes of transport. Behavioural issues.
Implementation time: Short.
Enabling conditions: Policy for employee cycling incentives, budget for subsidies and infrastructure, secure, weather-protected bike parking, communication and engagement with staff, partnerships with bike suppliers and leasing providers.
Stakeholders: Municipal HR and administration, transport and mobility department, finance department, facility management, employees and staff unions, cycling NGOs, and local bike shops.
Indicators: Employees enrolled in bicycle benefit schemes (count), secure and weather-protected bike parking spaces installed (count), share of staff commuting by bike/walk/public transport (%), employee satisfaction with incentives (score).

5.21.4 Ensure sustainability in municipal vehicle procurement with dedicated funding and charging infrastructure

Description: The municipality enforces clear guidelines for purchasers and decision-makers to prioritize sustainability in all new vehicle acquisitions. All procurement must, at a minimum, comply with existing policies and climate targets. To enable a successful transition, financial resources are allocated for the purchase of low-emission vehicles as well as for the installation of charging infrastructure at relevant municipal sites. By leading by example and ensuring that charging capacity is not a limiting factor, the municipality demonstrates its commitment to low-emission transport and sets a standard for other actors.
Implementation time: Medium.
Enabling conditions: Clear procurement guidelines aligned with climate targets, dedicated budget for low-emission vehicles and charging stations, availability of reliable charging infrastructure, supplier partnerships for

sustainable vehicle options, monitoring and reporting systems, and coordination between procurement, sustainability, and facility teams.
Stakeholders: Municipal procurement and finance departments, fleet management and logistics teams, sustainability and environmental units, facility management, vehicle suppliers and leasing companies, energy providers and charging infrastructure contractors, municipal leadership and decision-makers.
Indicators: Share of municipal fleet that is low-emission (%), charging points installed at municipal sites (count), procurement compliance with sustainability guidelines (yes/no), fleet emissions per vehicle (g CO_2e/km).

5.21.5 Attractive infrastructure

Description: Creating attractive and user-friendly cycling infrastructure is key to encouraging more people to choose the bicycle as a daily transport option. Well-designed facilities—such as secure, weather-protected and conveniently located bike parking - lower barriers to cycling and support a more sustainable transport system.
Appealing cycling environments improve comfort, safety, and convenience, helping shift trips from car to bicycle. Strategically placed infrastructure near workplaces, schools, public transport hubs, and service centres makes cycling a practical choice, while visible and well-integrated amenities strengthen the municipality's image as modern and climate-smart.
Implementation time: Short.
Enabling conditions: Design standards for secure and weather-protected bike parking, budget allocation for infrastructure development, strategic placement near workplaces, schools, and public transport hubs, engagement with users and cycling organizations, streamlined permitting and coordination with property owners.
Stakeholders: Municipal transport and mobility department, facility management, urban planning department, local businesses and property owners, cycling NGOs and user groups, residents and commuters.
Indicators: Attractive bicycle parking built (count), utilization rate of bike parking (%), user satisfaction with infrastructure (score), coverage near key destinations (sites with facilities, count).

5.21.6 Dual functions in transport infrastructure

Description: Identify opportunities where existing or planned transport infrastructure can serve more than one purpose. This involves assessing current public transport services, cycling infrastructure, and logistics flows to determine where dual functions can be introduced—such as using public transport vehicles for both passenger mobility and small-parcel deliveries, or

designing bike paths that support commuting while also encouraging physical activity.

Once potential dual-use opportunities have been identified, the next step is to evaluate feasibility, engage relevant stakeholders, and implement pilot projects that test combined functions. This may include adapting infrastructure, integrating digital booking or loading systems, adjusting service schedules, or coordinating with health agencies to track and promote physical activity benefits. After implementation, the dual-function solution should be monitored, refined, and scaled based on user feedback, operational data, and environmental impact.

Implementation time: Medium.

Enabling conditions: Policy framework for dual-use transport solutions, partnerships between public transport operators and logistics providers, investment in infrastructure and technology for combined services, health promotion programs linked to cycling infrastructure, stakeholder engagement and pilot project funding, data collection and monitoring for usage and impact.

Stakeholders: Municipal transport and mobility department, public transport authority, logistics and delivery companies, health and wellness agencies, urban planning department, cycling NGOs and user groups, local businesses and retailers.

Indicators: Public transport services with dual-use (people + goods) piloted (count), bike paths with documented health and commuting usage (%), reduction in delivery vehicle-km via PT logistics (%), stakeholder participation in dual-function projects (count).

5.21.7 Municipality as an attractive employer through sustainable commute access

Description: Make the municipality a more attractive employer by offering a workplace that is easy to commute to by sustainable transports such as biking, walking, and public transport.

Implementation time: Medium.

Enabling conditions: Workplace travel plans, strategic location planning, investment in bike parking and transit connections, communication campaigns, and collaboration with public transport providers.

Stakeholders: Municipal HR and administration, transport and mobility department, urban planning department, public transport authority, facility management, employees and staff unions, cycling NGOs.

Indicators: Share of municipal workplaces with excellent access to sustainable transport (%), employee sustainable commute mode share (%), travel plan

adoption per site (yes/no), staff recruitment/retention linked to accessibility (qualitative/score).

5.21.8 Sustainable commuting

Description: Research if there are national or European initiatives that support sustainable commuting that the municipalities can join to get further support to reach companies.
Implementation time: Short.
Enabling conditions: Access to program information, dedicated staff for application, partnerships with companies, communication strategy for participation.
Stakeholders: Municipal sustainability and mobility departments, HR and administration, regional authorities, national/EU program coordinators, and local businesses.
Indicators: National/EU initiatives identified (yes/no), initiatives joined (count), funding or support secured (SEK/€), number of companies reached through programs (count).

5.21.9 Coordinated goods distribution

Description: The municipality initiates coordinated goods distribution that enables optimized fill rates and the ability to refuel or charge sustainable fuels. This could be used for transportation in municipal operations as well as industry.
Implementation time: Medium.
Enabling conditions: Logistics coordination platform, partnerships with industry, investment in sustainable fuel infrastructure, policy support for shared logistics.
Stakeholders: Municipal logistics and procurement departments, local industries, transport operators, energy providers, and regional authorities.
Indicators: Coordinated goods distribution program established (yes/no), average fill rate in municipal/partner logistics (%), share of deliveries using sustainable fuels or EVs (%), vehicle-km reduced in municipal operations (%).

5.21.10 Mobility agreements and parking management

Description: Introduce mobility agreements and parking management to reduce car dependency and support more sustainable travel. Mobility agreements encourage employers, developers, and property owners to promote alternatives such as public transport, cycling, and shared mobility—often in exchange for reduced parking demands or other incentives.
Parking management complements this by adjusting pricing, limiting long-stay parking, reallocating spaces, and using digital tools to ensure that parking

supply aligns with sustainability goals. Together, these measures make sustainable modes more attractive while discouraging unnecessary car use.
Implementation time: Medium.
Enabling conditions: Policy framework for mobility agreements, parking pricing and restrictions, communication campaigns, monitoring and enforcement systems.
Stakeholders: Municipal HR and administration, transport and mobility department, facility management, employees and unions, and local businesses.
Indicators: Mobility agreements adopted (yes/no), parking management policies implemented (sites, count), reduction in solo car trips (%), increase in sustainable mode share (%).

5.22 Measures for end users – inhabitants

5.22.1 Implementation of walking school buses to promote sustainable school transport

Description: The municipality implements walking school buses to and from primary schools. A walking school bus consists of a group of children walking to school together along a designated route and schedule, accompanied by an adult—such as a parent or school staff member. The concept combines safety and structure with physical activity and reduced car traffic around schools.
Implementation time: Short.
Enabling conditions: Support from schools and parents, safe walking routes, and coordination with local authorities.
Stakeholders: Schools, parents, municipal transport and safety departments, and community organizations.
Indicators: Walking school bus routes established (count), number of participating children, reduction in car trips to school (%).

5.22.2 Mobility structure in which walking, cycling, and public transport are prioritized

Description: The municipality should, through its spatial planning and transport strategy, actively promote a mobility structure in which walking, cycling, and public transport are prioritized in the traffic environment. This includes the development of coherent and attractive routes for active travel modes, as well as ensuring good accessibility and efficiency for bus services.
Furthermore, the municipality should strive to implement the concept of the 15-minute city, where residents can access essential services, workplaces, education, commerce, and recreational areas within 15 minutes - preferably by walking or cycling. This strategy contributes to reduced car dependency,

improved public health, enhanced social cohesion, and lower greenhouse gas emissions.
Implementation time: Long-term.
Enabling conditions: Updated urban planning guidelines, political commitment, and collaboration between planning and transport authorities.
Stakeholders: Municipal planning departments, transport authorities, developers, and community groups.
Indicators: Share of new developments prioritizing walking, cycling, and public transport (%), coherent active travel routes completed (km), adoption of 15-minute city principles in planning documents (yes/no).

5.22.3 Redirect parking revenue to subsidize public transport passes

Description: The municipality reallocates income from parking fees to finance subsidies for public transport passes. This measure supports a shift from private car use to more sustainable modes of transport while ensuring that financial instruments align with climate and mobility objectives.
Implementation time: Medium.
Enabling conditions: Legal framework for revenue allocation, agreement on subsidy scheme, and communication strategy.
Stakeholders: Municipal finance department, public transport operators, local government decision-makers.
Indicators: Parking revenue redirected (SEK/year), number of subsidized public transport passes issued, increase in public transport ridership (%).

5.22.4 Collaborate with the regional authority to develop more attractive public transport offers

Description: The municipality collaborates with the regional transport authority to design and promote more appealing public transport packages. This includes coordinated pricing models, improved service accessibility, and targeted campaigns to increase ridership and reduce car dependency.
Implementation time: Medium.
Enabling conditions: Strong inter-agency collaboration, shared objectives, and marketing resources.
Stakeholders: Regional transport authority, municipal government, public transport operators, and communication teams.
Indicators: Collaboration agreements with regional authority (count), new public transport packages launched (count), ridership increase (%).

5.22.5 Develop biogas infrastructure in rural areas

Description: Establish prerequisites for rural areas to develop biogas infrastructure, supporting sustainable fuel use in transport.
Implementation time: Long.
Enabling conditions: Investment incentives, technical expertise, and collaboration with energy providers.
Stakeholders: Municipal governments, energy companies, the agricultural sector, and regional authorities.
Indicators: Biogas infrastructure projects initiated (count), biogas production capacity installed (Nm^3/year), share of rural transport demand met by biogas (%).

5.22.6 Install public boat chargers and sustainable fuel options

Description: Boats are typically not kept at private residences, which means that residents rely on external investments in infrastructure to support the transition to electric or fossil-free fuels. Develop a strategy to install public boat chargers and enhance existing boat gas stations with sustainable fuel options.
Implementation time: Medium.
Enabling conditions: Funding availability, marina partnerships, technical standards for chargers and fuel systems.
Stakeholders: Municipal government, marina operators, energy providers, and boating associations.
Indicators: Public boat chargers installed (count), marinas offering fossil-free fuels (% of sites), utilization rate of chargers and sustainable fuel pumps (%), number of boat owners using electric or fossil-free fuels (count).

5.22.7 Expand charging infrastructure and fossil-free vehicle support

Description: Develop a public charging and fossil-free fuel infrastructure strategy to expand charging points and support fossil-free vehicles in municipal operations and for residents.
Implementation time: Medium-term.
Enabling conditions: Funding and land allocation, partnerships with energy providers, and technical standards for infrastructure.
Stakeholders: Municipal planning and finance departments, energy providers, charging infrastructure companies, and vehicle fleet managers.
Indicators: Public charging points installed (count), fossil-free fuel stations established (count), municipal fleet electrification rate (%).

5.23 Measures in industry

5.23.1 Investigate Loading Centres for optimized fill rates and sustainable fuels

Description: Explore the feasibility of establishing a loading centre that enables optimized fill rates and provides refuelling or charging options for sustainable fuels in industrial and municipal transport operations.
Implementation time: Medium-term.
Enabling conditions: Feasibility study funding, collaboration with logistics operators, and technical standards for sustainable fuels.
Stakeholders: Municipal government, logistics companies, energy providers, and regional authorities.
Indicators: Loading centre feasibility study completed (yes/no), loading centre established (count), average fill rate achieved (%).

5.23.2 Increase load factor in truck transport

Description: Encourage higher truck load factors by supporting coordination between local transport operators and businesses. Municipalities can help by sharing freight-flow data, promoting digital load-matching tools, adjusting delivery zones or schedules to ease consolidation, and facilitating shared loading spaces that multiple operators can use.
Implementation time: Medium-term.
Enabling conditions: Agreements with transport operators, digital tools for load optimization, and industry engagement.
Stakeholders: Transport companies, municipal logistics coordinators, industry associations.
Indicators: Agreements with transporters to increase load factor (count), average load factor improvement (%), reduction in empty truck trips (%).

5.23.3 Launch green travel plans for businesses

Description: Promote sustainable commuting by encouraging the development of green travel plans and policies. Municipalities can support this either by integrating green travel actions into their own travel plans and policies or by motivating and guiding external actors—such as local enterprises, business parks, and major employers—to adopt similar plans. Green travel plans typically include measures such as encouraging public transport use, cycling, walking, carpooling, and remote work, helping reduce car trips among employees while improving overall mobility.
Implementation time: Short-term.

Enabling conditions: Employer engagement, clear guidelines for travel plans, and communication resources.
Stakeholders: Businesses, municipal sustainability teams, and employer associations.
Indicators: Green travel plans launched for businesses (count), number of employees covered, reduction in car trips (%).

6 Measures for adaptation to climate change

Reducing greenhouse gas emissions and enhancing carbon sequestration are fundamental to limiting global warming. Without decisive mitigation, climate impacts will escalate beyond the capacity of adaptation measures. While previous chapters address sector-specific actions, this chapter focuses on complementary solutions - such as carbon sinks, sustainable land use, and circular economy practices - that are critical for achieving net-zero goals. Acting now not only prevents severe climate consequences but also creates opportunities for innovation, cleaner environments, and long-term prosperity.

6.1 Information measures for climate resilience and emergency response

6.1.1 Training of municipal staff on adaptation to climate change

Description: Training on measures against high water levels, strong winds, extreme heat, large-grain hail, and drought fires.
Implementation time: Short-term (1–2 years).
Enabling conditions: will and responsibility to adapt to climate change, availability of financing.
Stakeholders: all municipal organizations, especially the ones responsible for civil protection.
Indicators: % of municipal staff trained for adaptation to climate change.

6.1.2 Educational campaign on action in climate emergency situations - how to recognize heat stroke, etc.

Description: Seminars for a wider audience, municipal staff, company staff, and the public are provided by civil protection specialists.
Implementation time: Short-term (1–3 years).
Enabling conditions: will and responsibility to adapt to climate change, and some financing.
Stakeholders: municipal staff, company staff, public
Indicators: Educational campaign(s) organized.

6.1.3 Compile and share essential climate adaptation information

Description: Gather and publish essential climate adaptation information for residents, including emergency phone numbers, warning systems, and preparedness guidelines.
Implementation time: Short-term.

Enabling conditions: Access to emergency and climate data, communication resources, and cooperation with emergency services.
Stakeholders: Municipality, emergency services, residents, NGOs.
Indicators: Essential climate adaptation information compiled and published (yes/no), number of downloads/views, number of residents engaged through campaigns.

6.1.4 Disseminating knowledge about climate change adaptation in rural areas and supporting the implementation of adaptation practices in agriculture

Description: Agriculture is a sector that is particularly sensitive to climate change. Losses caused by extreme events in the agricultural sector account for over 50% of estimated losses across all sectors of the economy. The action consists of supporting and disseminating knowledge about the effects of climate change and solutions that support adaptation to these changes in rural areas. The solutions promoted should include the organisation of educational events, the operation of local information points, workshops, conferences, and lessons/demonstration meetings in schools
Implementation time: 3 years.
Enabling conditions: Government educational programmes aimed at farmers and the rural population. Information campaigns in the media and mass media.
Stakeholders: agricultural advisors and farmers, universities involved in agriculture, climate, and ecology. agricultural organisations and farmers' associations. Companies supplying technologies and equipment supporting adaptation to climate change.
Indicators: number of events organised, number of recipients of educational activities per year (persons/year), establishment of a local information point (yes/no), number of educational materials developed and distributed (brochures, guides, educational films), number of study visits or field workshops organised on farms, number of farms where specific adaptation practices have been introduced (e.g. change of irrigation system, cultivation of more resistant varieties).

6.2 Mapping climate-related risk areas

6.2.1 Flood-prone areas

Description: This measure focuses on identifying and mapping flood-prone areas to support risk-based planning and climate adaptation. Mapping uses data on precipitation, landforms, water bodies, and buildings to define areas with

increased flood risk. The results can be used in spatial planning, setting construction restrictions, and planning adaptation measures.
Implementation time: Short-term activity.
Enabling conditions: National climate monitoring data, previous studies, and analyses.
Stakeholders: Municipalities, national authorities.
Indicators: Identified flood-prone areas (ha/km^2).

6.2.2 Landslide-prone areas

Description: This measure involves analysing landscape and geological conditions to identify areas at risk of landslides. This is especially important in regions with steep slopes, clay soils, or high rainfall. Mapping helps prevent damage, guide construction activities, and plan adaptation measures.
Implementation time: Short-term activity.
Enabling conditions: Existing studies and analyses.
Stakeholders: Municipalities, national authorities
Indicators: Identified landslide-prone areas (ha/km^2).

6.2.3 Urban heat islands

Description: This measure focuses on identifying urban areas affected by the heat island effect, where temperatures are significantly higher than in surrounding environments. Mapping helps locate heat-risk areas with little greenery, lots of concrete and asphalt, and dense building patterns. The results can be used for planning green spaces, implementing cooling solutions, and reducing health risks.
Implementation time: Short-term activity.
Enabling conditions: Availability of climate data and satellite imagery, cooperation with universities and urban planners, and funding for green infrastructure projects.
Stakeholders: Municipality, planning authorities, environmental agencies, and property developers.
Indicators: Heat mapping completed (yes/no), number of cooling measures implemented, share of new developments limiting hard surfaces (%), identified areas with the biggest impacts of heat islands (ha/km^2)

6.3 Flood risk management plan

Description: Map with areas at risk of flooding and possible drainage solutions in place, as well as planned necessary drainage solutions.
Implementation time: Long-term (5–10 years).

Enabling conditions: will and responsibility to adapt to climate change, available financing.
Stakeholders: municipal maintenance companies
Indicators: Existence of a flood risk management plan.

6.4 Developing climate-resilient infrastructure

Description: This measure focuses on building and upgrading climate-resilient infrastructure to prevent risks associated with climate change. It includes developing drainage systems, shoreline protections, separate sewer systems, and storm-resistant structures. It is especially important to identify vulnerable sections where freeze-thaw cycles damage road surfaces or where increasing storms require more durable infrastructure and faster maintenance. Increasing the storm resistance of tall greenery through proper maintenance practices is also essential.
Implementation time: Mostly long-term activity, as it requires planning and design.
Enabling conditions: Availability of problem area mapping, support measures.
Stakeholders: Municipalities, national authorities, infrastructure and public service providers, businesses.
Indicators: Number of reconstructed infrastructure units (pcs or km)

6.5 Using nature-based solutions

Nature-based solutions increase urban resilience to climate change. Examples include green roofs and walls, rain gardens, and green squares, restoring wetlands on city outskirts to prevent flooding, planting trees to reduce heat islands, and enhancing biodiversity around water bodies. Heavy rain-induced flooding can be reduced by introducing green roofs and vertical greenery, which also mitigate urban heat islands and support biodiversity. For example, Copenhagen has integrated nature-based solutions into stormwater management to prevent flooding. These solutions simultaneously improve biodiversity, provide cooling, regulate rainwater runoff, and enhance residents' well-being.

6.5.1 Increasing green space in public areas

Description: This measure focuses on increasing the proportion of green spaces in urban environments to mitigate the heat island effect and improve living conditions. Green areas help cool the air during heatwaves, improve air quality, and reduce public health risks. Adding tall greenery (trees) in densely populated areas is particularly important.

Implementation time: Depending on location, both short- and long-term activities
Enabling conditions: Spatial plans, support measures.
Stakeholders: Municipalities, national authorities, infrastructure and public service providers, businesses.
More info: Various examples: https://www.sei.org/perspectives/kuumalained-eesti-linnades/ ; Ireland example of converting brownfield to green space https://urbact.eu/good-practices/sustainable-community-suburban-greenspaces .
Indicators: Area of newly created green spaces (m²), number of trees planted (pcs), reduction in temperature differences in areas (°C).

Photo: Pollinator Highway in Tallinn. Author: Tori Municipal Government

6.5.2 Green roofs

Description: Installing green roofs helps reduce the urban heat island effect, improve rainwater drainage, and increase biodiversity. Vegetation on roofs provides cooling, absorbs part of the rainfall, and extends the roof's lifespan. In addition to environmental benefits, green roofs contribute to climate adaptation by reducing peak stormwater runoff and lowering building energy demand for cooling. In dense urban areas, they create additional green surfaces without requiring extra land and can be combined with solar panels to maximize roof functionality.
Municipalities can promote green roofs both through their own investments and through regulatory and planning instruments. In municipal projects, green roofs can be systematically integrated into the design of new public buildings such as

schools, kindergartens, sports facilities, and administrative buildings, and added to existing buildings during renovation or roof replacement. Green roofs can also be attached to the smaller roofs, such as bicycle stands, etc. Municipalities can also adopt design standards requiring green roofs in suitable cases and implement pilot projects to demonstrate technical feasibility under certain climate conditions. In parallel, local governments can require or incentivise green roofs in private developments through detailed spatial plans, building permit conditions, green infrastructure coefficients, and stormwater management regulations. Incentives such as reduced stormwater fees, density bonuses, or accelerated permitting procedures can further encourage developers to incorporate green roofs in larger commercial and residential projects.

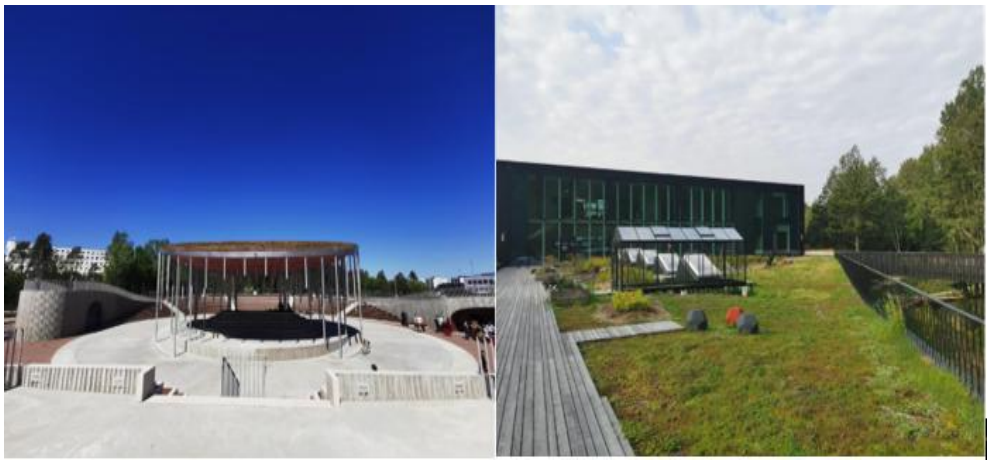
Implementation time: Short-term – can be implemented in new buildings or during the renovation of existing ones.

Enabling conditions: Technical readiness, support measures

Stakeholders: Municipalities, national authorities, businesses (building owners)

More info: The Keila Song Festival building has a green roof that serves as both an aesthetic and environmentally conscious solution.

Indicators: Number of green roofs installed (pcs), total area of green roofs (m^2).



Photos: Left – green roof at Keila Song Festival building (stonecrop mat), right – Viimsi Artium. Author: Tori Municipal Government

6.5.3 Green walls

Description: Green walls, or vertical greenery, help cool buildings, improve air quality, and increase biodiversity in urban environments. Vegetation on façades absorbs solar radiation, reduces heat gain, and contributes to lower building energy consumption. Vertical greenery also supports urban biodiversity by providing habitats for insects and birds, while improving the visual quality of built

environments. This solution is particularly suitable in densely developed areas where horizontal green space is limited or unavailable.
Municipalities can integrate green walls into new municipal buildings and into renovation projects, especially in dense urban centres where facade surfaces are exposed to high levels of solar radiation. Retrofitting blank facades of public buildings, parking structures, and noise barriers with climbing plants or modular systems can serve as demonstration projects. Green walls can also be incorporated into broader energy efficiency upgrades and urban regeneration initiatives. Through planning and regulatory tools, municipalities may require facade greening in specific development areas or include vertical greenery in green infrastructure and biodiversity requirements within detailed plans. Incentive schemes, co-financing mechanisms, or development bonuses can support uptake in private projects. Clear technical guidelines and maintenance standards are essential to ensure long-term functionality and resilience under local climatic conditions
Implementation time: Short-term – can be applied to both new buildings and existing ones.
Enabling conditions: Technical readiness, architectural compatibility.
Stakeholders: Municipalities, national authorities, businesses (building owners).
Indicators: Area of green walls installed (m^2).

Photos: Green wall in Budapest. Author: Tori Municipal Government

6.5.4 Green parking lots

Description: Green parking lots combine functional parking areas with green infrastructure elements to regulate stormwater runoff, reduce surface temperatures, and improve the overall quality of urban space. By using permeable pavements, grass pavers, and integrated planting areas, these

solutions enhance water infiltration and decrease pressure on drainage systems. Additional tree planting provides shading, reduces heat accumulation, and improves user comfort, while also contributing to biodiversity and air quality.

Municipalities can lead by example by applying green parking design principles in all new and renovated municipal parking areas. This includes replacing impermeable surfaces with permeable materials, integrating rain gardens or bioswales, and increasing tree canopy coverage. Parking areas can also be redesigned to reduce excessive paved surfaces and create multifunctional spaces that combine mobility and green infrastructure. In regulating private development, municipalities can introduce requirements for permeable pavements, minimum tree coverage, and sustainable urban drainage systems in large parking facilities through detailed plans and building permits. Setting limits on impervious surface ratios and linking parking design to stormwater management standards ensures that new developments contribute to climate mitigation and adaptation objectives while maintaining functional accessibility.

Implementation time: Medium-term – depends on planning and the need to upgrade existing infrastructure.

Enabling conditions: Spatial plans, support measures.

Stakeholders: Municipalities, national authorities, businesses.

More info: https://urbanstorm.viimsivald.ee/karulaugu-tee-parkla/; https://eu.goerie.com/story/news/education/2016/05/03/green-parking-lots-improve-water/25108372007/

Indicators: Number and area of green parking lots built (pcs, m²).

Photos: Green parking lot in Viimsi. Author: Tori Municipal Government

Photo: Green parking lot with permeable pavement to improve stormwater management. Source: GoErie (https://eu.goerie.com/story/news/education/2016/05/03/green-parking-lots-improve-water/25108372007/)

6.5.5 Nature-based stormwater systems

Description: Nature-based stormwater systems (e.g., infiltration at source, preserving/restoring ditches, permeable surfaces in parking lots, green roofs and walls, retention areas such as ponds, infiltration fields, rain gardens, buffer strips, swales, etc.) help manage and purify stormwater, reduce flood risk, and increase biodiversity. These systems mimic natural water movement and filtration processes. Using nature-based solutions reduces peak flow to sewers and water pollution (including downstream contamination).
Implementation time: Smaller solutions (e.g., rain gardens, street trees) can be implemented within 1–3 years, larger systemic solutions (wetland restoration, integrated urban green networks) require 5–15 years.
Enabling conditions: Spatial plans, support measures.
Stakeholders: Municipalities and their companies, infrastructure and public service providers, community, national authorities, and businesses.
More info: https://www.geoplastglobal.com/en/blog/interesting-green-roof-research-articles/; https://eu.goerie.com/story/news/education/2016/05/03/green-parking-lots-improve-water/25108372007/; https://baltijaskrasti.lv/blog/projekti/life-latestadapt/nature-based-solutions-cost-efficiency-tool/
Indicators: Number and area of nature-based solutions implemented (ha), number of trees planted.

Photo: Implementation of nature-based solutions to manage stormwater and increase urban biodiversity. Source: Copenhagen City Government

6.6 Adapting public spaces and buildings for heatwaves

Description: Public spaces and buildings are equipped with shading options, cooling systems, and cooling points (e.g., shelters, misting stations, air-conditioned indoor spaces) to provide relief during heatwaves. The goal is to reduce health impacts and prevent risks for vulnerable groups (the elderly, children). Measures also include shading large glass surfaces (e.g., canopies, façade curtains or blinds) to block solar radiation indoors, or using solar-control glass as the outer pane of glazing. As a non-invasive solution, glass surfaces can be covered with solar film, which also reduces winter heat loss.
Implementation time: Can be implemented within one project cycle, depending on existing conditions.
Enabling conditions: Availability of space and necessary connections
Stakeholders: Municipalities, infrastructure and public service providers, service institutions, etc.
More info: https://www.adaptaville.fr/les-ilots-de-fraicheur-une-reponse-efficace-contre-les-canicules; Https://www.toronto.ca/community-people/health-wellness-care/health-programs-advice/hot-weather/cool-spaces-near-you/; https://welovebudapest.com/en/article/2019/08/30/budapest-s-coolest-fountains-and-sprinkler-gates/; https://www.themayor.eu/en/a/view/vienna-s-cooling-concept-is-wrapped-up-in-one-convenient-app-10582
Indicators: Number of solutions installed or adapted (pcs).

Photo: Public space cooling station (misting gate) providing relief during heatwaves. Source: Daily News Hungary (https://dailynewshungary.com/hungary-issues-2nd-degree-heat-warning)

6.7 Installing public drinking water fountains

Description: Drinking water fountains are installed in public spaces to ensure free access to clean water. The goal is to reduce health impacts during heatwaves and prevent risks for vulnerable groups (elderly, children). Public fountains also help ensure water availability in exceptional cases (e.g., well-water shortages during drought).
Implementation time: Can be implemented within one project cycle, depending on existing conditions.
Enabling conditions: Availability of space and necessary connections
Stakeholders: Municipalities, infrastructure, and public service providers
Indicators: Number of drinking water fountains installed (pcs).

Photos: Public drinking water fountains in Tori (left), Budapest (centre), Viljandi (right). Author: Tori Municipal Government

6.8 Establishing and renovating community gardens

Description: Creating and improving community gardens supports diverse use of urban green spaces and offers residents the opportunity to grow their own food, thereby increasing food security and reducing emissions from transportation. Additionally, community gardens provide meeting places, strengthen social cohesion, raise environmental awareness, and contribute to mental well-being. Gardens also help with climate adaptation—for example, by improving rainwater infiltration and mitigating the urban heat island effect. In Tallinn and Tartu, community gardens are already in use and managed by active local associations.

Implementation time: A new community garden can be established or an existing one renovated within 1–2 years, and a larger city-wide network develops over 5–10 years.

Enabling conditions: Suitable vacant land (e.g., unused plots), municipal support and participatory planning, resident interest and involvement, supporting programs (EU Green Funds, urban green space development measures).

Stakeholders: Municipalities, local community.

More info: Tallinn community gardens https://www.tallinn.ee/et/tallinna-kogukonnaaiad

Indicators: Number of community gardens established or renovated, number of users, total garden area (m²).

Photos: Pelgu community garden. Author: Tori Municipal Government

6.9 Urban beekeeping

Description: Urban beekeeping supports biodiversity and pollinator populations, which are essential for climate adaptation. Pollinators ensure food production stability and contribute to the ecological resilience of urban green spaces. Additionally, urban beekeeping raises environmental awareness, provides educational opportunities for schools and communities, and strengthens local food production. Beehives placed in parks, rooftops, or community gardens have become popular in many European cities. For example, in Paris, hives have been installed on municipal and cultural building rooftops, increasing pollinator numbers and local honey production.

Implementation time: Short-term measure—individual hives or pilot projects can be set up within 1 year, and a large-scale urban beekeeping network develops over 3–5 years.

Enabling conditions: Suitable locations for hives (e.g., parks, rooftop gardens, community gardens), municipal support and regulations, raising public awareness, cooperation with beekeeping associations and educational institutions.

Stakeholders: Municipalities, community, infrastructure, and public service providers (e.g., parks, landscaping), businesses (including beekeeping companies), national authorities.

More info: Urban beekeeping in Paris https://www.alveole.buzz/cities/france/urban-beekeeping-paris/ , LHV project in Estonia https://www.lhv.ee/et/blogi/lhv-mesilased-andsid-oma-esimese-meesaagi

Indicators: Number of beehives installed.

Photo: Urban beekeeping installation on a rooftop to support pollinator populations and local food production. Source: Alveole (https://myhive.alveole.buzz/confederation-nationale-credit-mutuel)

6.10 Rainwater harvesting and reuse

Description: This measure focuses on collecting and reusing rainwater to reduce drinking water consumption. Collected rainwater can be used for irrigation, which is especially important in areas where groundwater is used for watering.
Implementation time: Simple solutions can be implemented in the short term, and larger projects require long-term action.
Enabling conditions: Awareness, support measures.
Stakeholders: Municipalities, businesses, community.
More info: Household solution https://gardenculturemagazine.com/build-your-own-rainwater-collecting-system/, Keila Song Festival grounds, and Pernova Smartpark also collect rainwater for irrigation; https://www.lugobiodinamico.eu/catalogo/en/proyectos/ag02-water-collection-and-storage-in-buildings/
Indicators: Volume of rainwater collected and reused (m^3/year), number of buildings/developments with rainwater reuse systems, reduction in drinking water consumption (%).

Photos: Left - rainwater collection at a private house in Sindi, right - Pernova Education Center in Pärnu. Author: Tori Municipal Government

6.11 Establishing and renovating firefighting water points

Description: This measure focuses on creating and renovating firefighting water points to ensure water supply meets fire safety requirements. Water points may be connected to public water systems, natural water bodies, or artificial reservoirs. Year-round access, sufficient flow, and proper signage are essential. This measure is particularly relevant due to extreme weather conditions, especially prolonged droughts that increase fire risk.
Implementation time: Renovating existing points is short-term, and establishing new ones is a long-term process requiring planning and design.
Enabling conditions: Cooperation with the Rescue Board, availability of land, and support measures.
Stakeholders: Municipalities, national authorities, infrastructure, and public service providers.
Indicators: Number of water points established or renovated, compliance with requirements (%), availability in critical areas.

6.11.1 Development of a sustainable urban planning statute

Description: The development and adoption of a sustainable urban planning statute enable municipalities to systematically integrate climate mitigation, climate adaptation, resource efficiency, and biodiversity objectives into spatial planning processes. A dedicated statute establishes clear principles for compact and mixed-use development, prioritises brownfield redevelopment over urban sprawl, and strengthens the link between land-use decisions and long-term climate neutrality goals. By embedding requirements for green space connectivity, sustainable mobility, energy efficiency, and stormwater

management into a formal regulatory framework, municipalities ensure that sustainability becomes a structural and legally supported component of all planning activities rather than a case-by-case consideration.
Municipalities can develop such a statute as a binding local regulation that guides the preparation of comprehensive and detailed spatial plans, municipal investments, and development agreements. The statute may define minimum standards for green infrastructure, impervious surface limits, density and mixed-use principles, sustainable urban drainage systems, and climate impact assessments for new developments. It can also establish requirements for proximity-based planning that reduce transport demand and support walking, cycling, and public transport use. In parallel, municipalities can align their own infrastructure investments, public building locations, and land disposal practices with the principles set out in the statute.
Implementation time: Comprehensive planning is long-term, and smaller changes are short-term.
Enabling conditions: Support measures.
Stakeholders: Municipalities, national authorities, businesses, community
More info: *Transforming cities' relationship with nature* https://urbact.eu/sites/default/files/2024-05/BiodiverCity_Baseline_Study_FINAL_0.pdf ; *Guide for planning a biodiverse city* https://www.sei.org/wp-content/uploads/2017/12/juhend-elurikka-linna-planeerimiseks-sei-tallinn.pdf
Indicators: Sustainable urban planning statute developed (yes/no).

6.12 Preserving the integrity of natural environments and ecosystems

The aim of this measure is to maintain and restore the integrity of natural habitats, preserve and improve the condition of water bodies (water quality, sediments, reed beds, etc.), and control invasive species.

6.12.1 Invasive species control

Description: This measure focuses on controlling invasive alien species (e.g., giant hogweed, Himalayan balsam, goldenrod) and raising awareness. Control includes physical, chemical, and biological methods, as well as preventive actions.
Implementation time: Short-term and recurring – depends on the extent of spread and control methods.
Enabling conditions: Guidelines, support measures
Stakeholders: Landowners, municipalities, national authorities.
Indicators: Area cleared of invasive species (ha).

6.12.2 Ensuring green network integrity

Description: This measure focuses on maintaining the connectivity and functionality of the green network, ensuring ecosystem linkages and biodiversity. The green network consists of core areas and green corridors, which must be clearly defined in spatial plans.
Implementation time: Medium- to long-term – linked to comprehensive and county-level planning.
Enabling conditions: Understanding of the municipal ecosystems, collaboration with the national environmental and transport agencies.
Stakeholders: Municipalities, national authorities.
Indicators: Share of connected green network areas (%), number and area of core areas and corridors.

6.12.3 Preserving and improving water body conditions

Description: This measure focuses on maintaining and improving the ecological status of water bodies, including improving water quality, removing sediments, restoring reed beds, and managing shore zones. Comprehensive water body maintenance helps preserve biodiversity, improve ecosystem functioning, and reduce eutrophication. Activities may also include awareness-raising, monitoring, and cooperation with local communities.
Implementation time: Medium-term – depends on the condition of the water body and the scope of planned activities (2–5 years).
Enabling conditions: Monitoring data, support measures.
Stakeholders: Municipalities, national authorities, community.
Indicators: Number of restored water bodies.

6.13 Developing and implementing biodiversity-friendly maintenance principles for green areas

Description: This measure focuses on adapting green area maintenance to preserve and enhance biodiversity. It includes timing mowing to favour species diversity, using native plants, reducing mowing intensity, and diversifying habitats.
Implementation time: Short-term – can be applied immediately to existing green areas.
Enabling conditions: Willingness to change current maintenance practices, community support and awareness, and cooperation with research institutions.
Stakeholders: Municipalities, communities, landowners, research institutions, businesses (maintenance providers).

More info: Example from Hungary https://urbact.eu/good-practices/wildflower-cities
Indicators: Number of green areas maintained under biodiversity-friendly principles.

Photo: Biodiversity conservation area in Tori municipality (Jõesuu). Author: Tori Municipal Government

6.14 Converting brownfields into green spaces

Description: This measure focuses on transforming unused or underutilized land (brownfields) into multifunctional green spaces that increase urban resilience to climate change. Green spaces help mitigate the heat island effect, improve rainwater infiltration, enhance biodiversity, and provide recreational opportunities for communities.
Implementation time: Depends on planning, community involvement, and investment capacity.
Enabling conditions: Spatial plans, support measures, and community interest.
Stakeholders: Municipalities, community, and landowners.
More info: Example from the URBACT program: In France, a participatory process created a community park combining green infrastructure and social inclusion https://urbact.eu/good-practices/participatory-urban-park-project
Indicators: Area of green spaces created from brownfields (m^2), number of participants in the engagement process, biodiversity indicators (e.g., number of plant species, insect habitats)

Photo: Conversion of an underutilized brownfield into a multifunctional community park. Source: URBACT (https://urbact.eu/good-practices/participatory-urban-park-project)

6.15 Provision and adaptation of engineering communication systems and infrastructure to extreme climate events

Description: Improve rain sewer systems and culverts in populated areas, defining their required capacity in advance, considering climate change, as well as promote sustainable rainwater management and the use of rainwater in places where water of drinking water quality is not required. For instance, rainwater reservoirs for fountains, toilets, etc.
Implementation time: Long-term (5–10 years).
Enabling conditions: will and responsibility to adapt to climate change, available financing.
Stakeholders: city maintenance departments/organizations, municipal water companies, etc.

6.16 Maintenance and development of land reclamation (drainage) systems, in accordance with the increased risk of flooding from storms due to climate change

Description: Regular cleaning of drainage systems, development of new drainage systems.
Implementation time: Long-term (5–10 years).
Enabling conditions: will and responsibility to adapt to climate change, available financing.
Stakeholders: municipal maintenance companies

Indicators: % drainage systems adapted to climate change.

6.17 Continue to separate the rainwater system from the domestic wastewater sewer system, promote the renovation and expansion of the rainwater system

Description: Separate piping systems for domestic sewage and rain sewage.
Implementation time: Long-term (5–10 years).
Enabling conditions: available financing.
Stakeholders: municipal maintenance companies, municipal water companies.
Indicators: % of separated systems for domestic sewage and rain sewage.

6.18 Creation of ditches, valleys, and other types of water reservoirs for heavy rainfalls

Description: Plan rainwater collection in specially designed lower points for cases of heavy rainfalls, if rainwater cannot be collected/drained away through the rainwater piping system.
Implementation time: Long-term (5–10 years).
Enabling conditions: will and responsibility to adapt to climate change, available financing.
Stakeholders: municipal maintenance companies, municipal water companies.
Indicators: % of city territory provided with rain drainage solutions.

6.19 Warnings and safety measures for visitors in areas at risk of potential landslides, flooding, by installing posters. Identify dangerous areas after storms and heavy rains

Description: Warnings after extreme climate events.
Implementation time: Short-term (1–2 years).
Enabling conditions: will and responsibility to adapt to climate change.
Stakeholders involved: municipal maintenance companies

6.20 Adaptation of structures and buildings to the effects of climate change (extreme weather conditions) and loads:

6.20.1 Identification of the most sensitive municipal buildings that would require adaptation to climate change and its associated risks

Description: List of buildings envisaging necessary measures, such as shading, cooling, building higher, measures against increased humidity, etc.
Implementation time: Short-term (1–2 years).
Enabling conditions: awareness of climate change, responsibility to prepare for extreme climate events.

Stakeholders: maintenance companies of municipal buildings, the development department of the municipality.
Indicators: List of buildings prepared.

6.20.2 Adaptation of structures and buildings to the effects of climate change (extreme weather conditions) and loads

Description: Improvements to the structures of existing buildings to mitigate the risks of climate change, including extremes.
Implementation time: Long-term (5–10 years).
Enabling conditions: awareness of climate change, responsibility to prepare for extreme climate events, and available financing.
Stakeholders: maintenance companies of municipal buildings, the development department of the municipality.
Indicators: % of municipal buildings prepared for extreme weather events.

6.21 Improving ventilation systems in the municipal buildings to reduce humidity

Description: Recuperation systems, improvement of existing ventilation systems, and mobile moisture collectors.
Implementation time: Short to long-term (1–10 years).
Enabling conditions: Will to adapt to climate change, climate events causing extra humidity, and availability of financing.
Stakeholders: maintenance companies of municipal buildings, the development department of the municipality.
Indicators: % of municipal buildings prepared for extra humidity.

6.22 Adaptation to the possible rise of water levels

Description: Construction of new buildings should be higher, where possible, to reduce the risk of flooding. Where necessary - increasing the diameter of rainwater drainage pipes, building culverts of larger diameter, etc.
Implementation time: Long-term (5–10 years).
Enabling conditions: National building norms, will and responsibility to adapt to climate change, and availability of financing.
Stakeholders: maintenance companies of municipal buildings, the development department of the municipality, and municipal water companies.
Indicators: % of municipal building stock adapted for higher water levels.

6.23 Measures against the heat risk

Description: Green zones, shading, etc. In urban planning and municipal territorial planning, municipalities should plan measures and zones that can reduce heat risk, such as more green zones with shading at a regular distance throughout the city, where possible. Also, when ordering/planning/building new municipal buildings or renewing the existing buildings, it should be planned how to cool the building in the case of more extreme heat: window shading, conditioning systems, cooling systems, etc.
Implementation time: Long-term (5–10 years).
Enabling conditions: Will and responsibility to adapt to climate change, availability of financing.
Stakeholders involved: maintenance companies of municipal buildings, the development department of the municipality.
Indicators: implemented measures against the heat risk.

6.24 Planting plants to reduce the amount of dust

Description: parks, green zones, lawns where possible.
Implementation time: Long-term (5–10 years).
Enabling conditions: Will and responsibility to adapt to climate change, availability of financing.
Stakeholders: city maintenance companies, development departments of municipalities.
Indicators: number of measures to reduce dust.

6.25 Development of a local climate risk monitoring and warning system

Description: The activity aims to support the local climate risk monitoring and warning system to prevent the effects of threats and respond to them when they occur. The action involves considering the potential risks to human health in local monitoring and warning systems for the effects of climate-related hazards, primarily extreme climate-related events that may have a measurable impact on the health and lives of residents in exposed areas (heat waves and cold spells, torrential rains, and strong winds (hurricanes, storms)). This is particularly important for the most vulnerable groups in the city (the elderly, children, and people with chronic illnesses). To develop a local climate risk monitoring and warning system, it's necessary to identify key areas requiring monitoring – installing/building sensors, monitoring systems, measuring points, etc.
Implementation time: 1 year.
Enabling conditions: Project entitled 'Knowledge base on climate change and adaptation to its effects, and channels for its dissemination in the context of

increasing the resilience of the economy, environment and society to climate change, and counteracting and minimising the effects of extraordinary threats', co-financed by EU funds.
Stakeholders: residents and users of the local government unit
Indicators: area covered by the climate-related hazard monitoring and warning system (km^2), inclusion of the risk of climate-related disease epidemics in the local warning system (yes/no), number of warnings/alerts sent, number of warnings/notifications sent, number of information and education campaigns carried out for the local community, number of training courses for local services and administration on responding to climate risks.

6.26 Optimisation of consumption and increased efficiency of water use in the municipality

Description: The action involves implementing solutions that promote water conservation and secure access to drinking water. Water conservation solutions lead to significant water and energy savings and reduce wastewater production. They reduce the risk of drinking water shortages during dry periods and minimise the negative effects of drought by retaining rainwater, and their proper management within the area of the rainfall will reduce the risk of urban flooding and inundation (relieving the burden on the stormwater drainage system). To facilitate implementation, the following actions can be taken:
- campaigns,
- training courses and workshops for residents on water management,
- modernisation of the water supply network,
- water meters and installation of monitoring and loss systems

Implementation time: 5 years.
Enabling conditions: securing the necessary permits (building law, water law, etc.), obtaining financial resources for the implementation of the action
Stakeholders: local government, municipal companies, and residents. Schools and kindergartens (environmental education, pilot implementation of tanks, rain gardens), universities and research institutes (development and evaluation of water-saving technologies).
Indicators: number of rainwater tanks located at public facilities, number of public buildings where water-saving solutions have been installed, reduction in drinking water (clean water) consumption in public buildings where water-saving solutions have been installed (m3/year), number of residents covered by the water conservation education programme, number of educational and information campaigns on water conservation, number of participants in educational activities (residents, students).

6.27 Measures for end user - municipality

6.27.1 Identify and address climate-related threats to electricity supply

Description: Identify climate-related threats that could jeopardize the municipality's electricity supply and transform these threats into resilience opportunities through strategic actions.
Implementation time: Medium-term.
Enabling conditions: Access to climate risk data, cooperation with grid operators, and resources for mitigation planning.
Stakeholders: Municipality, grid operators, energy agencies, and emergency services.
Indicators: Climate-related threats identified and documented (yes/no), number of mitigation actions implemented, share of threats converted into resilience opportunities (%).

6.27.2 Protect electricity infrastructure from natural disasters

Description: Protect electricity infrastructure from natural disasters through strategic planning and physical safeguards to minimize outage risks during extreme events.
Implementation time: Medium-term.
Enabling conditions: Risk assessment completed, funding for physical safeguards, and cooperation with infrastructure owners.
Stakeholders: Municipality, grid operators, emergency services, energy agencies.
Indicators: Electricity infrastructure with physical safeguards installed (%), risk assessment completed (yes/no), reduction in outage duration during extreme events (hours).

6.27.3 Strengthen infrastructure resilience for climate adaptability

Description: Assess roads, electricity, and district heating networks for climate adaptability and implement necessary upgrades to strengthen resilience against future climate impacts.
Implementation time: Long-term.
Enabling conditions: Access to climate projections, funding for upgrades, and cross-sector collaboration.
Stakeholders: Municipality, transport authorities, grid operators, district heating companies.
Indicators: Roads, electricity, and district heating networks assessed for climate adaptability (yes/no), number of resilience upgrades implemented, share of critical infrastructure climate-proofed (%).

6.27.4 Integrate energy considerations into operational development

Description: Ensure energy considerations are integrated into all operational development plans, enabling electricity systems to serve dual purposes and meet climate adaptation standards.
Implementation time: Medium-term.
Enabling conditions: Updated planning guidelines, cooperation between departments, and resources for dual-purpose energy solutions.
Stakeholders: Municipality, planning authorities, energy agencies.
Indicators: Energy considerations integrated into operational development plans (yes/no), number of projects applying dual-purpose energy solutions, compliance with climate adaptation standards (%).

6.27.5 Promote local energy systems with islanding capability

Description: Encourage the establishment of local energy systems that can operate independently during major disruptions to enhance resilience and energy security.
Implementation time: Medium-term.
Enabling conditions: Legal framework for islanding, technical feasibility for local systems, and funding for implementation.
Stakeholders: Municipality, grid operators, energy agencies, technology providers.
Indicators: Local energy systems with islanding capability (count), share of municipal energy demand covered during disruptions (%), backup duration enabled (hours).

6.27.6 Consider dual functions of electricity supply in development

Description: Incorporate dual functions of electricity supply in operational development, ensuring systems are both efficient and climate-adapted to meet future challenges.
Implementation time: Medium-term.
Enabling conditions: Updated design standards, cooperation with technology providers, and resources for climate-adapted solutions.
Stakeholders: Municipality, energy agencies, developers, technology providers.
Indicators: Dual-function electricity solutions adopted in operational plans (yes/no), number of projects implementing climate-adapted energy systems, share of new developments meeting resilience criteria (%).

6.27.7 Establish maximum limit on impervious surfaces in new developments

Description: Set a maximum limit on impervious surfaces in new development areas to allow proper drainage and reduce flood risks.
Implementation time: Short-term.
Enabling conditions: Updated planning regulations, cooperation with developers, and enforcement mechanisms.
Stakeholders: Municipality, planning authorities, property developers.
Indicators: Maximum impervious surface limit adopted in planning regulations (yes/no), share of new developments complying with drainage standards (%), reduction in flood risk in urban areas (%).

6.27.8 Promote decentralized energy systems for resilience

Description: Encourage the establishment of small, local, and decentralized energy systems that can operate during major disruptions to improve energy security.
Implementation time: Medium-term.
Enabling conditions: Legal framework for decentralized systems, funding for implementation, and cooperation with technology providers.
Stakeholders: Municipality, energy agencies, residents, businesses.
Indicators: Number of decentralized energy systems established, share of local energy demand met by decentralized systems (%), operational continuity during major disruptions (hours).

6.27.9 Integrate climate plans into spatial planning

Description: Ensure climate adaptation plans are integrated during the spatial planning phase to strengthen resilience and align development with climate goals.
Implementation time: Short-term.
Enabling conditions: Updated planning guidelines, cooperation between climate and spatial planning departments, and access to climate risk data.
Stakeholders: Municipality, planning authorities, environmental agencies, energy agencies.
Indicators: Climate adaptation integrated into spatial planning documents (yes/no), number of plans reviewed for climate resilience, compliance rate with adaptation guidelines (%).

6.28 Measures for end user – inhabitants

6.28.1 Empower civil society for climate adaptation and fossil-free energy

Description: Support civil society initiatives that promote climate adaptation and decentralized, fossil-free energy production through funding, partnerships, and capacity-building activities.
Implementation time: Medium-term.
Enabling conditions: Availability of funding programs, cooperation with NGOs and community groups, and clear guidelines for participation.
Stakeholders: Municipality, civil society organizations, energy agencies, and residents.
Indicators: Number of civil society initiatives supported, share of local energy projects involving community actors (%), funding allocated to community-led adaptation.

6.28.2 Establish crisis shelters with energy support

Description: Set up crisis shelters, including in rural areas, equipped with backup energy systems to provide safe refuge for residents during emergencies.
Implementation time: Medium-term.
Enabling conditions: Funding for shelter construction and energy systems, cooperation with emergency services, and identification of suitable locations.
Stakeholders: Municipality, emergency services, energy agencies, community organizations.
Indicators: Crisis shelters established (count), share of shelters equipped with backup energy (%), shelter capacity for residents (count).

6.28.3 Establish rural crisis shelters for emergency refuge

Description: Create crisis shelters in rural areas where residents can seek refuge during emergencies, ensuring shelters have renewable backup energy for resilience.
Implementation time: Medium-term.
Enabling conditions: Availability of rural sites, funding for construction and energy systems, and cooperation with emergency services.
Stakeholders: Municipality, emergency services, rural community organizations, energy agencies.
Indicators: Crisis shelters established in rural areas (count), share of shelters with renewable backup energy (%), and emergency readiness score.

6.28.4 Develop action plans for residents in climate crises

Description: Create and implement action plans for residents to follow during climate-related crises such as flooding, storms, or forest fires, including drills and simulations.
Implementation time: Short-term.
Enabling conditions: Access to risk data, cooperation with emergency services, and resources for communication and training.
Stakeholders: Municipality, emergency services, residents, NGOs.
Indicators: Action plan for climate crises adopted (yes/no), number of residents reached, number of drills or simulations conducted.

6.29 Measures in industry

6.29.1 Minimize excavation and preserve greenery in new developments

Description: Ensure excavation is minimized during new land development and preserve existing land, trees, and other greenery as much as possible to maintain natural ecosystems and reduce environmental impact.
Implementation time: Medium-term.
Enabling conditions: Updated planning guidelines, cooperation with developers, and enforcement of excavation and greenery preservation standards.
Stakeholders: Municipality, planning authorities, property developers, and environmental agencies.
Indicators: Share of new developments minimizing excavation (%), number of projects preserving existing greenery, compliance with excavation reduction guidelines (%).

6.29.2 Preserve geological elevation differences for natural drainage

Description: Ensure that elevation differences are preserved in areas of new development to promote natural drainage and reduce stormwater runoff risks.
Implementation time: Medium-term.
Enabling conditions: Access to topographical data, updated planning regulations, and cooperation with developers.
Stakeholders: Municipality, planning authorities, property developers, and environmental agencies.
Indicators: Elevation differences preserved in new developments (yes/no), number of projects applying natural drainage solutions, reduction in stormwater runoff (%).

6.29.3 Implement dual-function solutions in development projects

Description: Promote dual-function solutions such as trees providing shade, south-facing roofs generating solar power, waste heat reducing heating costs, and proximity to public transport lowering transportation costs. These measures optimize resource use and reduce environmental impact.
Implementation time: Medium-term.
Enabling conditions: Updated design standards, cooperation with developers, and technical feasibility for integrated solutions.
Stakeholders: Municipality, property developers, energy agencies, transport authorities.
Indicators: Number of projects implementing dual-function solutions, share of industrial sites with integrated energy/resource efficiency (%), documented cost savings from symbiosis measures (SEK/year).

6.29.4 Protect district heating infrastructure from natural disasters

Description: Implement strategic planning and physical safeguards to protect critical district heating infrastructure from natural disasters, ensuring continuity of heat supply during extreme events.
Implementation time: Medium-term.
Enabling conditions: Risk assessment completed, funding for resilience measures, and cooperation with district heating providers and emergency services.
Stakeholders: Municipality, district heating companies, emergency services, energy agencies.
Indicators: Critical district heating assets with resilience measures implemented (%), outage duration from extreme events (hours/year), redundant loops or backup heat sources added (count), risk and continuity plan updated (yes/no).

6.29.5 Protect electricity infrastructure from natural disasters

Description: Implement strategic planning to safeguard electricity infrastructure against natural disasters and extreme weather events.
Implementation time: Medium-term.
Enabling conditions: Risk and vulnerability assessments for critical electricity assets, access to climate risk data, coordination with grid operators, technical standards for climate-resilient design, and investment in protective measures such as undergrounding, physical barriers, and system redundancy.

Stakeholders: Municipality, distribution system operators (DSOs), transmission operators, emergency management agencies, infrastructure owners, and regulatory authorities.
Indicators: Electricity infrastructure with climate resilience measures implemented (%), outage frequency during extreme events (SAIFI), outage duration (SAIDI), risk assessments completed (count).

7 Measures for climate change mitigation

Reducing greenhouse gas emissions and enhancing carbon sequestration are fundamental to limiting global warming. Without decisive mitigation, climate impacts will escalate beyond the capacity of adaptation measures. While previous chapters address sector-specific actions, this chapter focuses on complementary solutions—such as carbon sinks, sustainable land use, and circular economy practices—that are critical for achieving net-zero goals. Acting now not only prevents severe climate consequences but also creates opportunities for innovation, cleaner environments, and long-term prosperity.

7.1 Public education and climate mitigation campaigns

7.1.1 Conducting awareness and behavioural change campaigns

Description: This measure focuses on organizing public campaigns to encourage residents and businesses to adopt specific changes (e.g., more climate-friendly choices). Campaigns can use various channels: social media, printed materials, events, and outdoor media.
Implementation time: Short-term but continuous activity.
Enabling conditions: Communication capacity, funding.
Stakeholders: Municipalities, national authorities, community, businesses.
More info: Example: Danish campaign inviting people to experience life near a wind farm https://stateofgreen.com/en/solutions/windy-retreats-from-nimby-to-yimby/
Indicators: Number of campaigns organized.

7.1.2 Education of residents and children

Description: To increase residents' involvement, it is necessary to communicate in terms of benefits: savings, financial resources, new workplaces, better air quality, better living conditions, a healthier environment, etc. Residents mostly ask, ‘what's in it for me?’ and "do I have to do anything about it?".
Educating children through practical activities - educating them using real-life examples, showing them how things work, involving children in educational activities using practical models (e.g. turning a hand crank/turbine and demonstrating that this causes a light bulb to light up): workshops, conferences, lessons/demonstration meetings in schools, interactive centre, pilot projects with summarised and clear information about energy communities, legal and organizational consulting (legal support, assistance with profitability analyses, moderating initiative group meetings, templates for statutes, regulations,

documents, identification of possible operating models (e.g., cooperative, cluster, renewable energy community).
Implementation time: 2-3 years, educational and survey activities are part of a long-term process, and the effects (new communities) may appear after 3-6 years.
Enabling conditions: Social and regional programmes, e.g., LIFE, school cooperation, and access to educational materials.
Stakeholders: universities, schools, NGOs, energy cooperatives, energy clusters, SMEs, municipalities.
Indicators: Education expenditure per inhabitant, number of children covered by educational programmes, number of workshops/demonstration lessons conducted, number of people participating in information meetings, number of new energy cooperatives – list of registered cooperatives in KOWR (National Support Centre for Agriculture), URE (Energy Regulatory Office) (registered clusters), agreements (unregistered clusters).

7.2 Developing a circular economy

The aim of this measure is to implement activities that support the development of waste management, sharing, refurbishing, and reusing existing materials, products, equipment, etc.

7.2.1 Repair centre

Description: Repair centres offer opportunities to extend the lifespan of products, thereby reducing waste generation and the use of new resources. Workshops are organized in these centres to teach how to repair clothes, furniture, electronics, and more.
Implementation time: Short-term – pilot projects can start immediately if space and other necessities are available, long-term if a building or space is lacking.
Enabling conditions: Support measures, community interest
Stakeholders: Municipalities, community, businesses.
More info: https://paranda.ee/ .
https://www.tallinn.ee/et/ringmajanduskeskus/kopli-93-parandustookoda
Indicators: Number of repair centres, number of workshops organized, number of participants.

7.2.2 Material reuse bank

Description: A material reuse bank enables the collection and distribution of construction materials, furniture, and other resources that would otherwise become waste.

Implementation time: Medium-term – requires space, logistics, and a cooperation network (2–4 years).
Enabling conditions: Interest from the construction sector, public-private cooperation.
Stakeholders: Municipalities, businesses, community.
More info: Oslo https://www.ressurssentral.no/, Tartu reuse bank https://tartu.ee/et/ringkasutuspank
Indicators: Quantity of collected and distributed materials (tons/year), number of participating companies.

Photos: Oslo reuse bank. Author: Tori Municipal Government

7.2.3 Reuse point

Description: Reuse points are places where used items (e.g., clothes, books, household goods) can be brought for reuse or sharing.
Implementation time: Short-term - can be established in existing community centres or waste stations. Long-term – building a new and larger circular economy centre for the region, which requires planning and design.
Enabling conditions: Support measures, community interest
Stakeholders: Municipalities, community, businesses.
More info: https://www.tallinn.ee/et/ringmajanduskeskus
Indicators: Number of reuse points, quantity of reused items (pcs or kg), number of visitors.

Photos: Tõdva community reuse point. Author: Tori Municipal Government

7.3 Creating sharing systems

7.3.1 Sharing items

Description: This measure focuses on creating sharing systems where community members can jointly use tools, household appliances, sports equipment, etc. Such an approach reduces consumption, extends product lifespan, and promotes community cooperation.
Implementation time: Short-term – can be launched as a pilot project within 1 year.
Enabling conditions: Community interest, suitable space, and management system.
Stakeholders: Municipalities, community, NGOs, and community centres.
More info: Examples of tool libraries can be found across Europe, including in community centres and libraries. Example from Canada: https://torontotoollibrary.com/,
in Estonia: tools https://keskraamatukogu.ee/kojulaenutus-2-2/tooriistalaegas/ , sports equipment https://keskraamatukogu.ee/kojulaenutus-2-2/spordivahendid/
Indicators: Number of users of sharing systems, number of items borrowed/lent.

7.3.2 Food Sharing

Description: Food sharing enables the distribution of surplus food within the community, reducing food waste and supporting those in need. Solutions may include community fridges, food-sharing points, or digital platforms.
Implementation time: Short-term – can be implemented in existing community centres or in cooperation with stores. Creating a network of food-sharing cabinets is a long-term activity.

Enabling conditions: Interest from the community and retail/food service companies, support measures.
Stakeholders: Municipalities, community, grocery stores, and catering companies.
More info: https://rohevald.ee/toiduringlus/
Indicators: Quantity of food redistributed (kg/year), number of food-sharing opportunities created.

Photo: Food-sharing cabinet in Paldiski. Author: Tori Municipal Government

7.4 Organizing sustainable events

Description: This measure focuses on applying environmentally friendly principles in organizing public and private events. It includes reducing waste, using reusable materials, offering local and plant-based food, and implementing transport-efficient solutions. Sustainable events help raise awareness and reduce the environmental footprint of events. Implementation is facilitated by the availability of relevant guidelines.
Implementation time: Short-term – can be implemented immediately in cooperation with organizers.
Enabling conditions: Availability of guidelines, awareness.
Stakeholders: Municipalities, businesses, the community, and all event organizers.
More info: National guideline https://kliimaministeerium.ee/rohereform-kliima/rohereform/keskkonnahoidlike-urituste-korraldamise-riiklik-juhis
Indicators: Number of sustainably organized events, amount of waste reduced at events.

Photo: waste sorting at an event. Author: Tori Municipal Government

7.5 Organizing green public procurement

Description: This measure focuses on implementing environmentally friendly public procurement, prioritizing energy-efficient, recyclable, and low-impact products and services. Tenders consider life-cycle costs, carbon footprint, and environmental impact. This helps steer the market toward sustainability and reduces the public sector's footprint.
Implementation time: Short-term – can be applied immediately within existing procurement frameworks.
Enabling conditions: Guidelines, legal framework.
Stakeholders: Municipalities, national authorities, businesses.
More info: https://green-forum.ec.europa.eu/green-business/green-public-procurement_en
Indicators: Share of green procurements (%).

7.6 Implementing carbon sequestration opportunities

Description: This measure focuses on increasing carbon sequestration through natural and technological solutions. It includes preserving and restoring forests, expanding green areas (e.g., green corridors), using carbon-sequestering building materials (e.g., wood, carbon concrete), and improving soil and wetland conditions. Carbon sequestration helps balance emissions and supports achieving climate neutrality.
Implementation time: Medium- to long-term – depends on land use and investments (3–10 years).
Enabling conditions: Planning, strategies, and regulations.

Stakeholders: Municipalities, national authorities, businesses, and research institutions.
Indicators: Area of carbon-sequestering land (ha), amount of CO_2 sequestered (tons/year).

7.7 Developing climate-friendly entrepreneurship

Description: This measure supports the development of climate-friendly business models and green technologies, including circular economy, blue economy, ICT, and sustainable logistics. The goal is to create an internationally competitive and diverse economy that contributes to achieving climate goals. Innovation, cooperation with research institutions, and the growth of green businesses are encouraged.
Implementation time: Medium-term – depends on support measures and business environment (2–5 years).
Enabling conditions: Business support schemes.
Stakeholders: National authorities, businesses.
Indicators: Number of climate-friendly companies, number of green technology projects, reduced emissions in the business sector (tons/year).

7.8 Promoting local food and short supply chains

Description: This measure focuses on encouraging local food production and consumption to reduce the carbon footprint from transportation and support regional economic resilience. Short supply chains reduce the need for storage, packaging, and logistics and contribute to food security. Activities may include developing community farmers' markets and direct sales platforms, as well as cooperation with local producers.
Implementation time: Short- to medium-term – pilot projects can start within 1–3 years.
Enabling conditions: Community interest, network of local producers, and support measures.
Stakeholders: Municipalities, community, producers.
More info: https://urbact.eu/good-practices/local-food-network-strategy
Indicators: Number of participating local producers.

7.9 Reduction of the amount of waste deposited in landfills by promoting waste sorting, recycling, and use as a resource in energy production

Description: Information campaigns, use of burnable fraction in cogeneration stations, waste incinerators.
Implementation time: Long-term (5–10 years).
Enabling conditions: Information campaigns, available financing.

Stakeholders: Municipal waste management companies.
Indicators: reduced % of waste buried in landfills.