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INFIRE

INnovative FInancing solutions for climate planning of REsilient and carbon neutral living areas

WP1 Innovative green financing for resilient and carbon-neutral Euro-MED living areas

D.1.2.1 Methodology for socio-economic evaluation of carbon neutrality and climate adaptation projects

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List of Abbreviations

- B/C - benefit/cost
- BAU - business as usual
- CACN - climate adaptation and carbon neutrality
- CAPEX - capital expenditures
- CBA - cost-benefit analysis
- CEA - cost-effectiveness analysis
- CF - conversion factor
- CO_2e - carbon dioxide equivalent
- CPR - common provisions regulation
- DCF - discounted cash flow
- DPP - discounted payback period
- EA - economic appraisal
- EE - energy efficiency
- EIB - European Investment Bank
- ENPV - economic net present value
- ERR - economic rate of return
- FDR - financial discount rate
- FRR - financial rate of return
- FRR(C) - financial rate of return of the investment
- FRR(K) - financial rate of return on national capital
- FNPV - financial net present value
- GDP - Gross Domestic Product
- GHG - greenhouse gas
- JASPERS - Joint Assistance to Support Projects in European Regions
- LCA - least-cost analysis
- MCA - multi-criteria analysis
- MFF - multiannual financial framework
- O&M - operation and maintenance
- OPEX - operating expenses
- RES - renewable energy sources
- SCBA - simplified cost-benefit analysis
- SDR - social discount rate
- SE - stakeholder engagement
- SPP - simple payback period

- SRTP - social rate of time preference
- WACC - weighted average capital cost
- WTP - willingness-to-pay

Introduction

The Mediterranean region faces an uneven energy transition due to unbalanced economic development, technology distribution, and finance flows. Energy efficiency and reducing greenhouse gas emissions are particular challenges for the Mediterranean, as average energy consumption is still considerably higher than the EU average, and the utilization of renewable energy is not progressing as expected. Investments in adaptation and carbon neutrality solutions and projects must double to achieve the EU's new climate and energy targets.

The escalating impacts of climate change necessitate urgent action across sectors, particularly in energy and climate adaptation. Energy systems are central to reducing greenhouse gas emissions and are crucial for enabling communities to adapt to a changing climate. As nations and regions implement projects to enhance energy resilience and promote climate adaptation, assessing their socioeconomic dimensions becomes increasingly important. A socioeconomic assessment evaluates the broader impacts of these projects on communities, economies, and social structures, ensuring that adaptation measures not only address environmental challenges but also promote equitable development and reduce vulnerabilities. While the financial analysis looks at the financial performances and long-term sustainability of the implementing body, the economic analysis tries to answer whether the project is beneficial for society as a whole.

Energy and climate adaptation projects—whether focused on renewable energy deployment, energy efficiency improvements, or climate-resilient infrastructure can have profound implications for local economies, employment, social inclusion, and public health. By systematically evaluating these factors, a socioeconomic assessment helps identify both the benefits and potential trade-offs of proposed projects, guiding policymakers, planners, and investors toward both environmentally sustainable and socially and economically beneficial solutions.

This assessment often considers various factors, including the project's long-term financial sustainability. It provides valuable insights into how adaptation interventions can contribute to poverty reduction, resilience building, and the equitable distribution of resources, particularly for vulnerable populations. Ultimately, the socioeconomic assessment of energy and climate adaptation projects is critical for fostering climate justice and ensuring that adaptation efforts lead to more inclusive and sustainable outcomes.

The methodology for the socio-economic evaluation of carbon neutrality and climate adaptation projects used within the INFIRE project draws the main principles from the European Commission and JASPERS' *Guide to Cost-Benefit Analysis of Investment Projects* published in 2014 and the later *Economic Appraisal Vademecum for the 2021-2027* period. Both documents present voluntary guides based on good practices

at the EU and national levels and are consistent with the approach to economic analysis followed by the EIB and other international financing institutions.

The primary purpose of the deliverable is to serve as a guidance and methodological foundation for several key outputs of the INFIRE project:

- Financial and Economic Evaluation Tool for carbon neutrality and climate adaptation projects (D.1.2.2)
- Feasibility studies for innovative CACN solutions piloted within the project (D.3.1a)
- Transnational monitoring and evaluation framework for CACN solution (D.3.4.1)

The document is structured to explain the main principles under which the socio-economic analyses of different types of CACN projects will be conducted, including the list of KPIs that will be used to evaluate and monitor the results of CACN pilot projects.

1 Socioeconomic evaluation methodology

1.1 General principles

The socioeconomic analysis plays a crucial role in project development, strengthening the economic rationale for EU funding and approval. It benefits both project promoters and evaluators by supplying valuable insights to decision-makers at critical stages of the project development cycle by identifying and narrowing down strategic and technical options during the initial programming and project development phases. The socioeconomic evaluation will also help to prioritize and rank CACN projects to achieve intended objectives within limited (public funding) resources and promote transparency and accountability in project selection through a standardized approach that enables testing of assumptions. Socioeconomic evaluation is not restricted to the project preparation (ex-ante) phase, during which it will be used to identify the best CACN option for reaching intended objectives and as a decision-making tool for deciding whether to proceed with this specific investment. All pilot CACN investments will also be tested in the ex-post phase to check the actual performances and causes of possible deviations from the ex-ante estimations.

The socioeconomic assessment of CACN projects is based on the standard set of principles, which include:

- Long-term perspective – a long-term reference period for the assessment of the costs and benefits of the project is applied, typically spanning from at least 10 years to 30 years or more, depending on the intervention sector. The CPR for 2021–2027 no longer includes binding reference periods per sector. The reference period corresponds to the project's economic life - or the expected time during which it remains functional, to allow its likely long-term impacts to be captured.
- Calculation of economic performance indicators expressed in monetary terms - a CBA tries to monetize all the project's positive impacts (benefits) and negative effects (costs). These values are discounted and then totalled to calculate a net total benefit. The project's overall performance is assessed using indicators expressed in monetary terms, enabling comparability and ranking among competing projects or alternatives.
- Microeconomic approach - The economic key performance indicators that result from the analysis are used to evaluate the project's overall impact on society and already calculate the broader effect on the economy (indirect effects). Adding these broader effects to calculations would result in double-counting social benefits.
- Opportunity costs – refer to the benefit of using a resource in its next best alternative use. Opportunity cost represents the financial gain or other benefit lost by pursuing one option over another or by taking no action.
- Incremental approach – the CBA compares a scenario "with the project" with a counterfactual baseline scenario which assumes what would happen without the project ever happening.

1.2 Socioeconomic assessment tools

Different kinds of tools can be used for conducting a socioeconomic assessment, depending on the type of CACN investment. The standardized EU practice has identified the following tools:

- Comprehensive Cost-Benefit Analysis is a full-scale analytical framework for assessing the socioeconomic impacts of investments of high social interest. The EU recommends that this complex and resource-intensive assessment tool be used proportionately to the investment's size, importance, and risk profile. Typically, this means that projects with investment costs above EUR 50 million must undergo such a full-scale assessment, although this threshold can be set much lower, depending on national regulations.
- Simplified Cost-Benefit Analysis (SCBA) is a method of assessing (usually) small-scale projects for which applying a full CBA methodology would be too resource-intensive compared to the project size. The simplified CBA can be based on either financial costs (based on market prices) or economic costs (based on shadow prices), depending on the availability of national conversion factors and cost structures (prices without taxes). As in comprehensive CBA, identified economic benefits are included in the simplified CBA, as the methodology used to estimate these benefits is well documented, and the data needed to produce robust estimates are generally available.
- Cost-effectiveness analysis (CEA) is a method for determining which investment option provides the highest effect at the lowest cost. CEA does not use the shadow price method but monetizes environmental externalities for energy projects.
- Least Cost Analysis (LCA) is a method in which different investment options achieve the same results/effects and only differ in their overall costs. The least expensive option is selected in LCA.
- Multi-Criteria Analysis (MCA) - Unlike CBA, which focuses on a sole criterion (the maximum benefit for society), MCA selects alternatives according to a set of different criteria and their relative ‘weights’. This tool is more used as a complementary tool to others, especially on the single project (investment) level, since it considers achieving more than one policy objective.

INFIRE’s Financial and Economic Evaluation Tool for carbon neutrality and climate adaptation projects will primarily be based on the simplified CBA methodology for economic assessments. However, its application to some pilot CACN actions within the project will not be possible. Therefore, the decision on which exact EA tool to use (CBA, SCBA CEA, or LCA) will depend on the specific attributes of CACN investments.

2 Financial analysis

A financial analysis is an integral part of the socioeconomic analysis and the overall CBA methodology. It assesses a project's financial feasibility, profitability, and risks before making investment decisions. Evaluating costs, revenues, and financial returns helps determine whether a project is worth pursuing from a monetary standpoint. Financial and economic analyses, although both parts of the CBA differ in scope, are the basis for the valuation of the costs and benefits (e.g. financial analysis does not consider non-cash flow items such as externalities) and the discount rates used.

Key components of a financial analysis include:

- Initial Investment (Capital Expenditure - CAPEX) includes costs for preparation activities, equipment, infrastructure, technology, and other required assets (e.g., licenses, fees).
- Operating Costs (OPEX) include recurring expenses such as energy, utilities, maintenance, salaries, insurance, etc.
- Revenues which can result from financial savings (e.g. lower energy consumption and maintenance and operation costs) or revenues generated from the production of energy or other services provided on the market
- Cash flow analysis, which evaluates inflows (revenues) and outflows (expenses) to ensure liquidity

2.1 Key parameters and assumptions

When conducting a financial analysis, several key assumptions must be made to ensure accurate and meaningful projections. These assumptions provide the foundation for forecasting future financial performance and evaluating investment decisions. Here are the most important ones:

- Reference period (time horizon) - Defines the period the financial analysis will cover (e.g., 5, 10, 20 years). It should align with the project's economic life, investment horizon, or expected repayment period. The reference period used in the CBA depends on the type of the project, but Article 2(14) of the EPBD defines the life cycle of new non-residential buildings as 20 years (30 for residential buildings). Therefore, the chosen reference period for evaluating INFIRE CACN projects will generally be 20 years.
- Financial discount rate (FDR) - Represents the required rate of return, often based on the Weighted Average Cost of Capital. A higher discount rate reflects greater risk and can vary depending on the specific sector, market conditions, risk premiums, and cost of financing. The WACC values should be those officially set at the national level by the regulating authority for those (sub)sectors where this is available. A 4% financial discount rate, which was used as a standard in the CBA 2014-2021 period, will also be used to evaluate CACN pilot projects, although a different rate can also be applied if needed.
- Residual Value - is the estimated value of an asset, project, or investment at the end of its useful life or reference period. It represents the remaining worth after depreciation or after a project

has been completed. In cases when the reference period is set equal to the project's economic life, the residual value is usually zero. However, in cases where, at the end of the reference period, some assets are still economically useful or there is a market for their resale, a residual value benefit can be included in the last year of analysis as a form of the project's revenue.

- Risk and sensitivity assumptions – to determine how changes in key assumptions affect core financial metrics (KPIs), variables with the highest risk and impact have to be pre-determined. In CACN projects, these commonly include CAPEX variations and expected energy savings or revenues.
- Value Added Tax (VAT) – The treatment of Value-Added Tax in financial analysis depends on the context and purpose of the analysis. Whether VAT is considered an eligible cost depends on whether it is a recoverable/refundable cost or not. Public sector or non-profit organizations do not reclaim VAT meaning that CACN projects should include VAT as CAPEX and OPEX in their financial analyses.

2.2 Core metrics – Key performance indicators

The financial analysis' key performance indicators or profitability metrics for CACN projects are:

- Financial Net Present Value (FNPV) is a financial metric that calculates the present value of future cash flows, discounted at a required rate of return, and subtracts the initial investment. It helps determine whether a project or investment is financially viable.
- Financial Internal Rate of Return (FRR) represents the discount rate that makes the Financial Net Present Value (FNPV) of a project equal to zero. It represents the expected annual rate of return on an investment or project. In simpler terms, IRR is the rate at which the present value of cash inflows equals the present value of cash outflows. It helps investors and businesses determine whether a project is financially worthwhile.
- Simple Payback Period (SPP) represents the time it takes for an investment to be fully recovered from its cash inflows, without considering the time value of money. It is a quick way to evaluate how long a project takes to break even.
- Discounted Payback Period (DPP) is the time required to recover an investment, considering the time value of money. Unlike the regular payback period, DPP discounts future cash flows to their present value before summing them up.
- The financial sustainability analysis at the project level aims to assess whether the project can balance out its positive and negative cash flows during the reference period.

2.3 Additional Key Performance Indicators

The financial analysis also recognises several additional key performance indicators or profitability metrics that can also be used for the assessment of projects in specific cases:

- Financial Net Present Value (FNPV(C)) and the financial rate of return of the investment (FRR(C)) are no different than the standard FNPV and FRR KPIs. However, '(C)' is added when the assessment of the investment is done in the context of EU or national funding. FNPV(C) and FRR(C) compare the investment costs to net revenues and measure the extent to which the project net revenues can repay the investment, regardless of the sources or methods of financing, while FNPV(K) and FRR(K) take into account the amount of EU or national financial contribution.
- Financial Rate of Return on National capital (FRR(K)), where K represents the discount rate, is a metric used in financial analysis to measure the return on capital invested from a national perspective, considering factors like government investments, subsidies, and public infrastructure projects. Instead of looking at private financial returns, FRR(K) considers the broader financial impact on a country's economy. The objective of the return on national capital calculation is to examine the project performance from the perspective of the assisted public and possibly private entities in the Member States ('after the EU grant').
- Debt Service Coverage Ratio (DSCR) is a financial metric used to assess an entity's or project's ability to cover its debt obligations with its operating income or savings. A DSCR lower than "1" means that the entity or project does not generate enough income or savings to cover its debt obligations, which could signal financial distress.

3 Economic analysis

An economic assessment of a project evaluates its overall impact on society by analyzing economic efficiency, social benefits, and costs beyond direct financial returns. Unlike financial analysis, which focuses on profitability for investors, economic assessment considers broader societal impacts, including environmental, social, and long-term economic effects. The key concept of the economic analysis is the use of shadow prices to reflect the social opportunity cost of goods and services instead of prices observed in the market, which may be distorted due to fiscal requirements, subsidies and non-monetized externalities. To properly assess the true impact of CACN projects on society, a move from the financial to economic analysis has to be made by:

- Making fiscal corrections by removing VAT, other taxes and subsidies from all prices used in the analysis (even if taxes are not recoverable)
- Converting market to shadow prices by using conversion factors for non-tradable goods or border prices for imported goods (prices excluding domestic taxes and subsidies but including international transportation costs and trade tariffs)
- Assessing non-market impacts and correcting for externalities

Future costs and benefits must be discounted once market prices are adjusted and non-market impacts are estimated. In investment project evaluations, the Social Discount Rate (SDR) reflects how society values future costs and benefits against present ones. However, only fiscal corrections and assessing non-market impacts and externalities can be conducted if a simplified CBA analysis is chosen.

3.1 Key parameters and assumptions

While the financial analysis primarily considers the project owner's perspective, the economic cost-benefit analysis (CBA) assesses the broader socioeconomic impact of CACN investments on society as a whole. In the scope of the EA, with a simplified CBA methodology the following key parameters and assumptions will be used:

- Social Discount Rate – The EU Member States can use their country-specific SDRs, although, in the absence of specified national values, 3% SDR can be taken as a reference point for EU-funded projects in the 2021–2027 period
- Direct project benefits:
    - Extension of the economic life of the building (elements) or equipment - represents a deferred cost benefit, i.e. the financial advantage gained by postponing a significant capital expenditure, such as replacing or rebuilding a building, infrastructure, or equipment. By extending the economic life of an asset, the need for costly replacements or major renovations is delayed, leading to savings in present value terms. The related annual value is estimated as the constant annuity over the operational phase of the reference period whose NPV equals the NPV of the project investment cost net of the residual value of the equipment replaced by the project

- Reduction in building maintenance costs - The possible reduction in costs relates to both preventive maintenance activities and estimated corrective maintenance
- Improved thermal comfort – a benefit which can be calculated with a "willingness to pay" methodology by interviewing users of the facility or based on the value of hypothetical additional energy savings associated with a hypothetical higher energy consumption in the without-project scenario that would have been needed to reach the same new temperature in the with-project scenario.
- Increase in property values – the expected increase after the CACN intervention. The economic CBA should only include the difference between the expected increase in property value and the NPV of the energy cost savings as quantified in the financial analysis to avoid the double-counting of benefits.

- Environmental and energy-related externalities:
  - Avoided energy (heat/electricity/cooling) generation, operating, and fuel costs. Data on local energy production should be used in the analysis where it is available. Fuel costs should ideally be expressed at the border price plus transportation cost, net of taxation.
  - Avoided emissions or sequestered CO_2 - The shadow price used for the monetisation of the estimated reduction in CO_2 emissions can be taken from the values published by the EIB and EC DG CLIMA in the Economic Appraisal Vademecum 2021-2027
  - Sequestered or avoided emissions of air pollutants – According to the methodologies for monetization of key air pollutants developed within the NEEDS[1] and ExternEE[2] projects the following values per air pollutant (damage values) can be used in the economic analysis:
    - Particulate matter - PM2.5:
      - Dense urban areas: EUR 100.000 – 250.000 per ton
      - Medium-sized cities and suburban areas: EUR 50.000 – 100.000 per ton
      - Rural areas: EUR 15.000 – 50.000 per ton
    - Particulate matter - PM10:
      - Dense urban areas: EUR 50.000 – 100.000 per ton
      - Medium-sized cities and suburban areas: EUR 30.000 – 50.000 per ton
      - Rural areas: EUR 5.000 – 30.000 per kg
    - Sulphur oxides (SOx):
      - Dense urban areas: EUR 30.000 – 50.000 per ton
      - Medium-sized cities and suburban areas: EUR 10.000 – 30.000 per ton
      - Rural areas: EUR 2.000 – 10.000 per ton
    - Nitric oxides (NOx):

[1] Valuation of Weighting Methods for Measuring the EU-27 Overall Environmental Impact, 2011, European Commission Joint Research Centre Institute for Environment and Sustainability

[2] Externalities of Energy. Volume 2, Methodology, 1995, DG Research and Innovation

- Dense urban areas: EUR 30.000 – 80.000 per ton
- Medium-sized cities and suburban areas: EUR 10.000 – 30.000 per ton
- Rural areas: EUR 5.000 – 10.000 per ton

  - Enhanced security of supply - in cases where the primary energy saved comes from imported fossil fuels, a standardized (EIB) value of EUR 10/MWh is used for the calculation of this benefit

In cases where monetization is not possible, the environmental impacts of CACN projects should at least be identified in physical terms for a qualitative appraisal, giving decision-makers more elements to make a considered decision.

3.2 Core metrics – Key Performance Indicators

The economic analysis' key performance indicators or metrics for CACN projects are:

- Economic Net Present Value (ENPV) is an indicator used to evaluate the economic feasibility of a project, policy, or investment by considering both financial and socio-economic costs and benefits over time. It is a variation of the Net Present Value (NPV) approach but includes broader economic and social impacts beyond direct financial returns. If ENPV > 0, the project is economically viable and creates net economic value. In cases where ENPV < 0, the society is better off without the project.
- Economic Rate of Return (ERR) is a measure used in the economic analysis of projects to evaluate their overall benefit to society. It is the discount rate at which the Economic Net Present Value (ENPV) becomes zero. ERR differs from the FRR because it includes non-market benefits and costs (e.g., environmental and social factors).
- The Benefit-Cost (B/C) Ratio is an economic indicator used in cost-benefit analysis (CBA) to assess the feasibility of a project or investment. It compares the total economic benefits of a project to its total economic costs. If the B/C Ratio > 1, the project is economically viable (Benefits exceed Costs), and if the B/C Ratio < 1, the project is not viable (Costs exceed Benefits), and society is better off without the project.

3.3 Additional Key Performance Indicators

Green surface areas are essential for sustainability, biodiversity, and climate resilience in urban and rural environments. Applying nature-based solutions or greening an area through trees, plants, and green infrastructure can have significant positive effects, which can also be assessed and monitored as part of the economic analysis. Two key types of green surface areas which can be evaluated within the INFIRE project include:

- Urban green spaces with several types:
  - Public parks and gardens – Designed for recreation and ecological benefits, improving air quality and mental well-being

    - Urban forests and street trees – trees planted along roads and public spaces to provide shade, reduce heat islands, and absorb pollutants
    - Community gardens – Shared spaces where people grow plants, vegetables, and flowers, fostering sustainability and local food production
- Green infrastructure with the following types:
    - Green roofs – vegetated roofs that insulate buildings, absorb rainwater and reduce urban heat
    - Green walls and living facades – vertical plant systems on building exteriors that improve insulation and air quality
    - Rain gardens and bioswales – planted depressions that manage stormwater runoff and filter pollutants
    - Permeable green spaces – grass-covered parking lots, pathways, or play areas that allow water infiltration to reduce flooding

These can be evaluated with the following KPIs, which can potentially be monetized as well:

- Green surface areas – the creation of new green surfaces or changes in the size of existing green surfaces. This indicator measures the increase/decrease of the total area (m^2) of urban green spaces or areas under green infrastructure
- Reduction of surface temperatures and the heat island effect – the difference in the average or peak surface temperatures
- Rainwater management: reducing runoff, enhancing infiltration, and improving water quality. These effects help in flood prevention, groundwater recharge, and pollution reduction.
- Biodiversity index - a numerical measure that reflects the variety (diversity) of living species in a particular area or ecosystem. This KPI should consider both the richness and evenness of species (Shannon Index – H)
- Polination capacity - reflects the ability of different ecosystems to support wild pollinators, using an estimate of likely visitation by pollinators

4 Key performance indicators of pilot actions and selection of socioeconomic evaluation tools

A set of key performance indicators and an evaluation tool have been chosen for each pilot action (except for pilot 8, which is not comparable to other pilots). However, due to the specific nature and scope of the pilot actions, different KPIs and the overall assessment methodology could be applied. The key performance indicators for evaluating and monitoring the pilot investment are presented in Annex 1.

4.1 Pilot 1 – Bio-Solar Roof in Karlovac

The bio-solar roof pilot investment in the City of Karlovac foresees climate neutrality and climate adaptation elements, meaning the project will have financial and economic effects. Therefore, a simplified CBA will be used for the socioeconomic assessment of this pilot.

4.2 Pilot 2 – Nature-Based Solutions in Arrábida

The pilot investments in implementing nature-based solutions and urban green spaces in three municipalities foresee climate adaptation elements, meaning the project will primarily have economic effects. Therefore, a least-cost analysis will determine the optimal NBS and green urban space solutions.

4.3 Pilot 3 – Nature-Based Solutions in Belleville

The pilot investments in implementing nature-based solutions foresee climate adaptation elements, meaning the project will primarily have economic effects. Therefore, a least-cost analysis will determine the optimal NBS solutions.

4.4 Pilot 4 – Decarbonization of District Heating and Cooling in Trieste

The pilot action foresees a detailed technical and financial simulation for the deep decarbonisation of the district heating and cooling system (DHC) in the AREA Science Park building complex. This climate neutrality measure will result in both financial and economic benefits, and therefore, a simplified CBA will be used for the socioeconomic assessment of this pilot.

4.5 Pilot 5 – Energy Efficiency in Public Buildings in Sarajevo

The improvement of energy efficiency levels of two public buildings in the City of Sarajevo is an investment in climate-neutral measures which will result in both financial and economic benefits. Therefore, a simplified CBA will be used for the socioeconomic assessment of this pilot.

4.6 Pilot 6 – Energy Help Desk in Peshtera

The pilot investment foresees the establishment of an energy help desk for energy-poor citizens in the town of Peshtera. Considering the nature of the pilot investment, a least-cost analysis will be performed to determine the optimal solution for the energy help desk.

4.7 Pilot 7 – Mobility Hub in Kalamata

The pilot investment foresees the development of a mobility hub consisting of e-charging stations powered by a solar power plant and applying an on-the-spot nature-based solution. Considering that this climate neutrality and climate adaptation pilot investment will have both financial and economic effects, a simplified CBA will be used to assess this pilot's socioeconomic performance.

4.8 Pilot 8 – Integrated Air and Climate Energy Planning Approach in Lyon Metropolitan

The pilot investment foresees the development of a decision-support tool for the Lyon metropolitan area to calculate the socioeconomic and environmental impacts of different RES/EE interventions. The development of the tool cannot be evaluated from a financial and economic standpoint, but the key performance indicators through which the pilot investment will be evaluated and monitored (Annex 1).

Annex 1 – Pilot action KPIs

Table 1 – Pilot action 1 – Bio-Solar Roof in Karlovac

Energy, Environmental, Financial and Social KPIs	Units	Thematic	Monitoring	Baseline (before implementation)	Target (from feasibility Study)	Tools
The energy produced by RES	kWh/year	Energy	Can be metered on the spot			Report presenting relevant data
Increased productivity of RES power plant due to NBS	% / kWh/year	Energy	Estimated			Report presenting relevant data
Share of RES in the overall energy consumption of the building	%	Energy	Can be calculated			Report presenting relevant data
Enhanced security of energy supply	EUR/MWh produced	Energy	Can be calculated			Report presenting relevant data
Financial savings (energy)	EUR/year	Financial	Metered and calculated			Report presenting relevant data
Financial savings (maintenance)	EUR	Financial	Estimated			Report presenting relevant data
Avoided emissions of CO_2 with RES	ton/year	Environmental	Calculated based on produced RES			Report presenting relevant data
Sequestered CO_2 by GI/NBS	ton/year	Environmental	Calculated based on type and size of NBS			Report presenting relevant data
Avoided emissions of air pollutants (PM 2,5/10, NOx, SOx) with RES	kg/year	Environmental	Calculated based on produced RES			Report presenting relevant data
Sequestered air pollutants (PM 2,5/10, NOx, SOx) by GI/NBS	kg/year	Environmental	Calculated or measured with equipment			Report presenting relevant data
Reduction of roof temperature-heat island effect and thermal comfort around the building (temperature difference)	Celsius	Environmental	Measuring equipment needed			Report presenting relevant data
Increase of green urban areas	m^2	Environmental	Can be calculated			Report presenting relevant data
Stakeholder engagement	no. of citizens	Social	Participation in decision-making activities			Report presenting relevant data

Financial and economic analysis KPIs	Units	Tools
Financial Net Present Value (FNPV)	EUR	Financial and Economic Evaluation Tool
Financial Rate of Return (FRR)	%	Financial and Economic Evaluation Tool
Financial Rate of Return on the Investment (FRR(C))	%	Financial and Economic Evaluation Tool
Financial Rate of Return of National Capital (FRR(K))	%	Financial and Economic Evaluation Tool
Simple Financial Payback Period (SFPP)	years	Financial and Economic Evaluation Tool
Discounted Financial Payback Period (DFPP)	years	Financial and Economic Evaluation Tool
Economic Net Present Value (ENPV)	EUR	Financial and Economic Evaluation Tool
Economic Rate of Return (ERR)	%	Financial and Economic Evaluation Tool
Benefit/cost Ratio (B/C)	<1>	Financial and Economic Evaluation Tool

Table 2 – Pilot action 2 - Nature-Based Solutions in Arrábida

KPIs	Units	Thematic	Monitoring	Baseline (before implementation)	Target (from feasibility study)	Tools
Urban green spaces surface	m^2	Environmental	Can be metered on the spot			
Quality of green urban spaces		Environmental				
Spatial distribution and accessibility of green urban area						
The potential of green urban areas to store water	m^3 of water per m^2 of green urban area	Environmental				
Sequestered CO_2 by GI/NBS	ton/year	Environmental	Calculation of CO_2 emissions sequestered			
Pollination capacity of the urban green area ecosystem						
Capacity to maintain the soil's biological activity		Environmental				
The capacity of green urban spaces to provide recreation		Social				
Number of municipal workers trained	Number of municipal workers trained	Social	Number of participants in training sessions			Attendance lists, photographs of the training sessions

Table 3 – Pilot action 3 - Nature-Based Solutions in Belleville

KPIs	Units	Thematic	Monitoring	Baseline (before implementation)	Target (from feasibility study)	Tools
Urban green spaces surface	m^2	Environmental	Can be metered on the spot			Report presenting relevant data
Quality of green urban spaces		Environmental				Report presenting relevant data
Spatial distribution and accessibility of green urban area						Report presenting relevant data
The potential of green urban areas to store water	m^3 of water per m^2 of green urban area	Environmental				Report presenting relevant data
Sequestered CO_2 by GI/NBS	ton/year	Environmental	Calculation of CO_2 emissions sequestered			Report presenting relevant data
Pollination capacity of the urban green area ecosystem						Report presenting relevant data
Capacity to maintain the soil's biological activity		Environmental				Report presenting relevant data
The capacity of green urban spaces to provide recreation		Social				Report presenting relevant data

Table 4 – Pilot action 4 – Decarbonization of District Heating and Cooling in Trieste

Energy, Environmental, Financial and Social KPIs	Units	Thematic	Monitoring	Baseline (before implementation)	Target (from feasibility Study)	Tools
The energy produced by RES	kWh/year	Energy	Can be metered on the spot			Report presenting relevant data
Share of RES in the overall energy consumption of the building	%	Energy	Can be calculated			Report presenting relevant data
Enhanced security of energy supply	EUR/MWh produced	Energy	Can be calculated			Report presenting relevant data
Financial savings (energy)	EUR/year	Financial	Metered and calculated			Report presenting relevant data
Financial savings (maintenance)	EUR	Financial	Estimated			Report presenting relevant data
Avoided emissions of CO_2	ton/year	Environmental	Calculated based on the increase of EE			Report presenting relevant data
Avoided emissions of air pollutants (PM 2,5/10, NOx, SOx) with RES	kg/year	Environmental	Calculated based on produced RES			Report presenting relevant data
Replicability	no. of replicators (buildings)	Energy	Number of other buildings (private or public) adopting pilot guidelines			Report presenting relevant data

Financial and economic analysis KPIs	Units	Tools
Financial Net Present Value (FNPV)	EUR	Financial and Economic Evaluation Tool
Financial Rate of Return (FRR)	%	Financial and Economic Evaluation Tool
Financial Rate of Return on the Investment (FRR(C))	%	Financial and Economic Evaluation Tool
Financial Rate of Return of National Capital (FRR(K))	%	Financial and Economic Evaluation Tool
Simple Financial Payback Period (SFPP)	years	Financial and Economic Evaluation Tool
Discounted Financial Payback Period (DFPP)	years	Financial and Economic Evaluation Tool
Economic Net Present Value (ENPV)	EUR	Financial and Economic Evaluation Tool
Economic Rate of Return (ERR)	%	Financial and Economic Evaluation Tool
Benefit/cost Ratio (B/C)	<1>	Financial and Economic Evaluation Tool

Table 5 – Pilot action 5 – Energy Efficiency in Public Buildings in Sarajevo

Energy, Environmental, Financial and Social KPIs	Units	Thematic	Monitoring	Baseline (before implementation)	Target (from feasibility Study)	Tools
Reduction of energy consumption	kWh/year	Energy	Can be metered on the spot			Report presenting relevant data
Enhanced security of energy supply	EUR/MWh produced	Energy	Can be calculated			Report presenting relevant data
Financial savings (energy)	EUR/year	Financial	Metered and calculated			Report presenting relevant data
Financial savings (maintenance)	EUR	Financial	Estimated			Report presenting relevant data
Avoided emissions of CO_2	ton/year	Environmental	Calculated based on the increase of EE			Report presenting relevant data
Avoided emissions of air pollutants (PM 2,5/10, NOx, SOx) with RES	kg/year	Environmental	Calculated based on reduction of energy consumption			Report presenting relevant data

Financial and economic analysis KPIs	Units	Tools
Financial Net Present Value (FNPV)	EUR	Financial and Economic Evaluation Tool
Financial Rate of Return (FRR)	%	Financial and Economic Evaluation Tool
Financial Rate of Return on the Investment (FRR(C))	%	Financial and Economic Evaluation Tool
Financial Rate of Return of National Capital (FRR(K))	%	Financial and Economic Evaluation Tool
Simple Financial Payback Period (SFPP)	years	Financial and Economic Evaluation Tool
Discounted Financial Payback Period (DFPP)	years	Financial and Economic Evaluation Tool
Economic Net Present Value (ENPV)	EUR	Financial and Economic Evaluation Tool
Economic Rate of Return (ERR)	%	Financial and Economic Evaluation Tool
Benefit/cost Ratio (B/C)	<1>	Financial and Economic Evaluation Tool

Table 6 – Pilot action 6 – Energy Help Desk in Peshtera

Units	Thematic	Monitoring	Baseline (before implementation)	Target (from feasibility study)	Tools
Number of municipal officers trained	Social	can be monitored on the spot			Attendance lists, photos of the training sessions held
Number of citizens consulted	Social	can be monitored on the spot			Attendance lists at meetings held with citizens, photographs of the session
Number of responses to the survey	Social	questionnaire			Report on the results of the questionnaires

Table 7 – Pilot action 7 – Mobility Hub in Kalamata

Energy, Environmental, Financial and Social KPIs	Units	Thematic	Monitoring	Baseline (before implementation)	Target (from feasibility Study)	Tools
The energy produced by RES	kWh/year	Energy	Can be metered on the spot			Report presenting relevant data
Enhanced security of energy supply	EUR/MWh produced	Energy	Can be calculated			Report presenting relevant data
Financial savings (energy)	EUR/year	Financial	Metered and calculated			Report presenting relevant data
Avoided emissions of CO_2 with RES	ton/year	Environmental	Calculated based on produced RES			Report presenting relevant data
Sequestered CO_2 by GI/NBS	ton/year	Environmental	Calculated based on type and size of NBS			Report presenting relevant data
Avoided emissions of air pollutants (PM 2,5/10, NOx, SOx) with RES	kg/year	Environmental	Calculated based on produced RES			Report presenting relevant data
Sequestered air pollutants (PM 2,5/10, NOx, SOx) by GI/NBS	kg/year	Environmental	Calculated or measured with equipment			Report presenting relevant data

Reduction of roof temperature-heat island effect and thermal comfort around the hub (temperature difference)	Celsius	Environmental	Measuring equipment needed			Report presenting relevant data
Increased Use of Sustainable Mobility	m^2	Environmental	Number of electric vehicles and bikes/scooters using the charging stations and parking facilities.			Report on the demand for charging stations and equipment in the car parks.
Stakeholder engagement	no. of citizens	Social	Surveys or feedback from users regarding the convenience and impact of the mobility hub and bike parking facility			Report presenting relevant data
Increased Access to Sustainable Transport Modes	no. of users	Social	The number of public servants and citizens shifting to electric vehicles and bicycles for transportation			Report presenting relevant data

Financial and economic analysis KPIs	Units	Tools
Financial Net Present Value (FNPV)	EUR	Financial and Economic Evaluation Tool
Financial Rate of Return (FRR)	%	Financial and Economic Evaluation Tool
Financial Rate of Return on the Investment (FRR(C))	%	Financial and Economic Evaluation Tool
Financial Rate of Return of National Capital (FRR(K))	%	Financial and Economic Evaluation Tool
Simple Financial Payback Period (SFPP)	years	Financial and Economic Evaluation Tool
Discounted Financial Payback Period (DFPP)	years	Financial and Economic Evaluation Tool
Economic Net Present Value (ENPV)	EUR	Financial and Economic Evaluation Tool
Economic Rate of Return (ERR)	%	Financial and Economic Evaluation Tool
Benefit/cost Ratio (B/C)	<1>	Financial and Economic Evaluation Tool

Table 8 – Pilot action 8 – Integrated Air and Climate Energy Planning Approach in Lyon Metropolitan

KPIs	Units	Thematic	Monitoring	Baseline (before implementation)	Target (from feasibility study)	Tools
Urban green spaces surface	m^2	Environmental	Can be metered on the spot			Report presenting relevant data
Quality of green urban spaces		Environmental				Report presenting relevant data
Spatial distribution and accessibility of green urban area						Report presenting relevant data
The potential of green urban areas to store water	m^3 of water per m^2 of green urban area	Environmental				Report presenting relevant data
Sequestered CO_2 by GI/NBS	ton/year	Environmental	Calculation of CO_2 emissions sequestered			Report presenting relevant data
Pollination capacity of the urban green area ecosystem	Score (1-100)					Report presenting relevant data
Capacity to maintain the soil's biological activity		Environmental				Report presenting relevant data
The capacity of green urban spaces to provide recreation		Social				Report presenting relevant data