

The CADS Tool: Turning Climate Targets into Actionable Decisions

Interreg
Baltic Sea Region



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ENERGY TRANSITION



Climate-4-CAST

The Climate-4-CAST project is co-funded by the Interreg Baltic Sea Region Programme to drive the transition towards climate neutrality.

What Is the CADS Tool?

The **Climate Action Decision Support (CADS) Tool** is an open-source tool developed to help municipalities plan, assess and prioritise their climate actions in a transparent and evidence-based way. It allows for emissions and financial impact assessments, thereby supporting the principles of **climate budgeting**.

The CADS Tool helps cities move from isolated workflows and calculations to a cohesive model of how different actions contribute to long-term climate goals. The results are presented with detailed and clear visualisations that can be used not only by climate experts, but also by high-level officials and decision-makers.

Tool users can combine available data and estimations about the city climate strategy and action plan in one place:

- **Compare and prioritise actions**
 - Emission reductions
 - Costs, savings, return on investment
 - Other monetisable impacts and benefits
- **Visualise emission and action scenarios**
 - Baseline trends
 - Target emissions pathway
 - Scenario alternatives

Climate budgeting integrates a city's climate targets with its annual budget planning, linking investments and actions to emission reductions

The CADS Tool is aligned with climate budgeting principles, but the adoption of a formal climate budgeting process is not a prerequisite for using the tool. Any city can experiment with the tool as a learning process to better understand the connections between climate and financial impacts



Why Do Cities Need Climate Decision-Making Support?

Better climate decisions require clear, transparent and comparable information

The CADS Tool addresses these gaps by turning climate data into clear, comparable and actionable insights that directly support municipal decision-making

Cities play a central role in achieving climate neutrality and meeting national and European climate targets. But they also face economic challenges and financial limitations on what they can do. Local decision-makers must make increasingly complex choices about investments, policies and priorities, often under time pressure.

In many cities, climate decision-making is constrained by fragmented data, uncertainty about the real impacts of climate actions and difficulties in comparing policy options.

Emission inventories, forecasts, cost estimates and action plans are often produced separately, making it hard to see the full picture or to communicate it clearly to political leadership and other stakeholders.

Cities frequently struggle to answer key questions:

- How are city-level emissions developing?
- What do climate actions actually achieve?
- What costs, savings and wider benefits do climate actions generate?
- Which climate actions bring the city closest to its emissions targets?



Key Benefits for Cities and Decision-Makers

For decision-makers, the key value of the CADS Tool lies in its ability to make complex climate information understandable and comparable. Instead of relying on separate spreadsheets, reports or assumptions made with different methodologies, cities can use one shared framework to explore options, assess trade-offs and justify choices.

The tool supports both long-term strategic planning and short-term operational decisions, making climate considerations a natural part of everyday municipal governance.



Helps identify the **most impactful and cost-effective** climate actions.



Helps track progress toward **climate neutrality targets**.



Brings climate and financial data together in **one integrated framework**.



Creates **transparency** and improves **communication** with decision-makers.



Supports **annual climate budgeting** and prioritisation.



Supports **cross-departmental collaboration** (climate, energy, transportation, finance).

The CADS Tool strengthens political decisions by providing a clear and transparent analytical basis

The CADS Tool helps cities use limited resources more efficiently

Core Feature 1

Climate Action Impact Modelling:

Assessment of individual climate actions by comparing their emission reduction impacts and economic implications, such as costs, savings and cost-effectiveness.

Core Feature 2

City-Level Emission Scenario Visualisation:

Development of city-level emission scenarios over time, integrating baseline trends, implemented measures and climate targets.

“The CADS tool enables us to compare different scenarios, making the remaining emissions gap transparent and highlighting which additional actions and changes are still needed. The model allows us to quickly adjust key parameters and immediately see how these changes affect the results, making it easy to explore different development pathways. The aim is to support decision-makers by presenting alternative options and their implications in a transparent and data-driven way.”

**Tampere Climate-4-CAST
project team**



“The CADS Tool provides an underlying analysis, which helps us to structure discussions and preparatory work with municipal companies. These analytical foundations are beneficial in supporting public debate on emission-reduction targets.”

**Bytom Climate-4-CAST
project team**



BYTOM

“The CADS Tool is supporting our journey towards climate neutrality. By clearly demonstrating the climate impact of proposed measures, the tool helps us identify and prioritise actions that deliver the highest emission reductions relative to their cost and thus supports budget negotiations. In the long term, it will contribute to the more effective implementation of climate strategies and help the city track progress towards its climate neutrality targets for 2030 and 2050.”

Riga Climate-4-CAST project team



How the CADS Tool Works

At its foundation, the tool uses a city's emission inventory and baseline development as a reference point. It is possible to start with just one emissions sector or strategic emissions focus area, if desired. Climate actions are then added to the model, each with the associated data or estimations of their impact, timing and scope. These actions can be combined into scenarios, allowing users to explore alternative pathways toward climate targets.

When assumptions or inputs are changed, the tool updates dynamically. This makes it possible to test “what-if” questions, compare alternatives and understand the implications of different choices.

The building blocks of the tool can be visualised separately or combined:

- **Baseline emission data:**
Current emissions and expected development without new actions
- **Data about climate actions:**
Measures with estimated emission and cost impacts
- **Scenarios and targets:**
Combinations of actions and developments compared against climate goals

Add in baseline data

Add action impacts, costs and benefits

Create action and input catalogues as scenarios

Generate visualisations of return on investment, progress towards emissions goals, and more.



Five Steps to Operationalise the CADS Tool

1 Define the tool's purpose:
What decisions will the tool support, and who will use it?

2 Set up the tool and data:
Baseline emissions, action data, targets and modelling level.

3 Assign roles and responsibilities:
Who updates data, who uses results, who ensures quality?

4 Integrate into decision-making:
Climate budgeting, planning, reporting and political discussions.

5 Maintain and improve:
Annual updates, scenario testing and learning over time.

The CADS Tool is designed to be flexible and scalable, allowing cities to start with available data and gradually deepen the level of analysis. The focus is on building a shared understanding of emission development and the role of climate actions in achieving city targets.

Typical starting use cases for cities:

- Prioritisation of individual investments and measures
- Climate action plan or roadmap update
- Climate budget preparation
- Scenario discussions with political leadership

Getting started with the CADS Tool does not require perfect data or complex modelling

What a city needs to get started:

- ✓ A recent city-level emission inventory
- ✓ A defined emissions reduction target
- ✓ Planned or existing climate actions
- Basic information on actions' emissions impacts, costs or benefits.
- If available, additional details on contributing factors to action impacts such as energy price or interest rates, etc.
- ✓ A responsible team or coordinator

Core Feature 1:

Climate Action Impact Modelling

Understanding the Impacts of Individual Climate Actions

Each action is described using data and estimations of scope, timing and emission impacts, as well as costs and savings, where available. Users can explore trade-offs, test assumptions and understand how selected actions contribute to overall climate targets.

Even with incomplete data, the tool makes assumptions visible and adaptable using parameter sliders. For example, a user can alter the input value of energy costs, energy mix or interest rates to show how such changes would affect the calculated impacts.

All calculations can be tracked to demonstrate the methodology behind the model and any interdependent aspects, such as actions influencing an input value. By applying the same modelling logic to all actions, the CADS Tool allows cities to compare measures across sectors using a common framework. This supports prioritisation and helps identify actions that deliver the greatest impact.

Visualised outputs of the action impact modelling include:

- **Action lists:**
Measures sorted by impact, cost or emission sector
- **Marginal Abatement Cost curve:**
Which actions are most cost-effective?
- **Return on Investment:**
How much benefit do the investments generate relative to their costs? When is the break even point?
- **Cost and benefit graphs:**
What are the economic implications of climate measures?
- **Action-specific node graphs:**
How are costs and benefits broken down to different dimensions?



Add tailored calculations to refine the model further, e.g.

Discounting costs
and savings

Annuity-based calculations
for cost-effectiveness

Parameter sliders

Modelled Outputs

Cost-effectiveness

Return on Investment

Cost-benefit Analysis

Model Elements

Example inputs

**Emission Reduction
CO₂e**

- Emission factors
- Activity data (e.g. reduced energy use, mileage)

**Actual Costs and
Benefits**

- Costs & savings from investments, operations, maintenance and energy

**Other Monetizable
Values**

- Price of reduced emissions
- Health impacts
- Regional economic impacts

**Climate Action
Impacts**

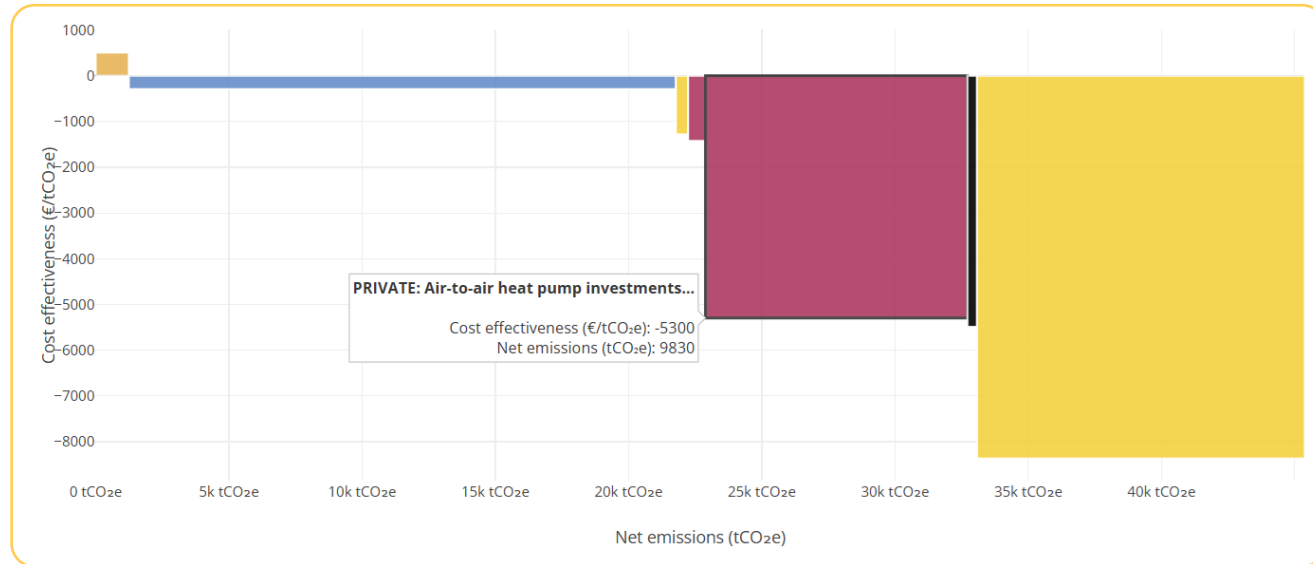
Emission Reduction

Net cost

Other Benefits

Examples of visualisations

Cost-efficiency (2024–2030)



Marginal abatement cost curve

Climate measures visualised by cost-efficiency and total emission reduction impact.

- The taller the bar, the more expensive the measure is per ton of emissions reduced.
- The deeper the bar, the greater the benefits generated by each ton of emissions it reduces.
- The wider the bar, the greater the emission reduction potential of the measure.

Actions listed by their cost-efficiency to reduce emissions

All listed measures have a negative cost-effectiveness value, meaning that the measure generates more cost savings than costs over the assessment period. All measures are thus economically beneficial.

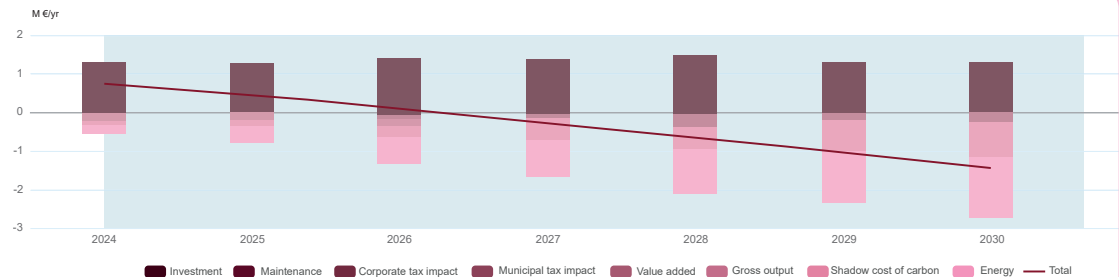
Climate Actions in a Sortable List View

Type	Name	Included in scenario	Total impact 2010-2030	Annual impact 2030	Net cost 2010-2030	Cost efficiency ↑
Electricity consumption	PRIVATE: Building renewable electricity production (PV)	✓	-12.3 ktCO ₂ e	-2.53 ktCO ₂ e/ yr	-103,000,000 €	-8,370 €/tCO ₂ e
Electricity consumption	CITY: Reolacing street lighting with LEDs	✓	-0.36 ktCO ₂ e	-0.045 ktCO ₂ e/ yr	-1,970,000€	-5,490 €/tCO ₂ e
Building Heating	PRIVATE: Air-to-air heating pump investment across the municipal building stock	✓	-9.83 ktCO ₂ e	-1.96 ktCO ₂ e/ yr	-52,100,000€	
Building Heating	CITY: Energy efficiency renovations in city's building stock	✓	-0.526 ktCO ₂ e	-0.092 ktCO ₂ e/ yr	-928,000€	-1,770 €/tCO ₂ e

Action-specific node graph

Costs and benefits are broken down by cost type for each individual climate measure. Benefits, such as energy savings, value added and tax impacts, are shown on the negative (below-zero) side, while actual costs are shown on the positive side. The red line represents the net balance of total costs and benefits.

Node Graph: Replacing oil heating across the municipal building stock



Core Feature 2:

Emission Scenario Visualisation

Understanding the Development of City-Level Emissions Over Time

The CADS Tool uses the city's emission inventory as a baseline and shows how emissions are expected to develop if no new actions are taken. This provides a clear reference against which the effects of climate actions can be assessed. By visualising emission development over time, the tool helps cities see whether they are moving in the right direction and how far they are from their climate targets.

The approach is designed to be transparent and easy to interpret, making emission trends understandable also for non-technical audiences.

The tool shows:

- Historical and current emission levels
- Baseline emission scenario
- Sector-level emission contributions
- Target year and emission reduction goal
- Climate action plan and tailored scenarios

Emission scenario visualisation turns long term climate targets into concrete, visible pathways

Key Scenario Elements

- 1 Baseline inventory**
Emission development in previous years
- 2 Baseline scenario**
Emission development in future without climate actions
- 3 Target overlay**
City's official climate neutrality target
- 4 Climate action plan scenario**
Development with all climate actions ON
- 5 Tailored scenarios**
Scenario building with certain action ON/OFF

Exploring Scenarios and Climate Targets

Building on the baseline, the CADS Tool allows cities to create and compare alternative emission scenarios. Scenarios combine multiple climate actions and show how these affect total city level emissions over time.

This makes it possible to explore key “what if” questions: Are current actions sufficient? What happens if implementation is delayed? How much additional action is needed to reach climate neutrality?

By presenting scenarios side by side, the tool helps decision makers understand trade offs, identify gaps and discuss options using a shared visual reference.

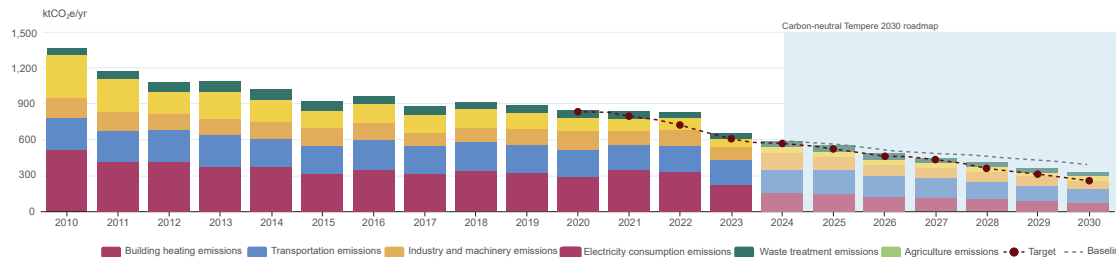
Climate Neutral Tampere Roadmap Scenario

Net emissions

Scenario Forecast 2030

334 ktCO₂e/yr

-76% (2010-2030)



Subsectors (2030)

Building Heating emissions

Scenario Forecast 2030

76.3 ktCO₂e/yr

-85% (2010-2030)

Transportation emissions

Scenario Forecast 2030

113 ktCO₂e/yr

-58% (2010-2030)

Industry and machinery emissions

Scenario Forecast 2030

75.4 ktCO₂e/yr

-55% (2010-2030)

Electricity consumption emissions

Scenario Forecast 2030

31.5 ktCO₂e/yr

-95% (2010-2030)

Waste treatment emissions

Scenario Forecast 2030

31.6 ktCO₂e/yr

-95% (2010-2030)

Agriculture emissions

Scenario Forecast 2030

6.2 ktCO₂e/yr

-16% (2010-2030)

Example of Scenario Visualisation

The figure illustrates the projected emission development for the City of Tampere. Under the current settings, where all climate measures included in the Climate Neutral Tampere Roadmap are implemented, the CADS Tool estimates a 76% reduction in city-level emissions by 2030. This indicates a 4% gap compared to Tampere’s climate target of an 80% emission reduction by 2030.

Scenario visualisations support:

- Comparing baseline and action-based scenarios
- Assessing progress towards climate targets
- Identifying the emission gap of targets
- Supporting strategic discussions and decisions

“The CADS Tool enables us to create a level playing field in terms of access to climate related knowledge. What would otherwise be gathered through different means can now be obtainable for all participants through the CADS Tool, empowering a more data driven climate discussion.”

**Aarhus Climate-4-CAST
project team**



“We had the opportunity to explore the CADS tool’s potential in terms of monitoring the local authority’s climate targets. The CADS Tool provides us a clear overview of the monitoring results in relation to the budgetary targets.”

**Norderstedt Climate-4-CAST
project team**



“The CADS Tool helps us in visualizing and analyzing paths towards our climate and energy objectives. For example, the tailored scenario function of the CADS Tool enables us to envision different development paths and scenarios for emissions development in the transportation sector. By combining baseline variables with electrification scenarios of the transport sector, we can identify three distinct pathways of emissions development.”

**Östersund Climate-4-CAST
project team**



Photo: Göran Strand / Östersund municipality

The CADS Tool

Co-designed by Climate-4-CAST Project Partnership



The CADS Tool was co-developed, tested and validated in the **Climate-4-CAST project**, in close collaboration with cities, researchers and technical experts. The tool was piloted in six cities around the Baltic Sea: **Aarhus (DK)**, **Bytom (PL)**, **Norderstedt (DE)**, **Östersund (SE)**, **Riga (LV)** and **Tampere (FI)**.

The technical development of the tool was led by **Kausal Ltd (FI)**. The piloting was supported by **HafenCity University Hamburg (DE)**, the **Union of the Baltic Cities Sustainable Cities Commission (FI)**, and **Uppsala University (SE)**, who provided the pilots with coordination, assessment and facilitation of exchange and communication.



Photo: HCU Communication

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 interreg-baltic.eu/project/climate-4-cast

 linkedin.com/company/climate-4-cast

The CADS Tool: Open-Source Solution for Cities of All Sizes

The CADS Tool helps cities integrate climate ambitions into everyday decision-making. By bringing climate and economic perspectives together, the tool helps cities move beyond isolated analyses toward a more strategic and transparent approach.

Detailed, step-by-step guidance on how to set-up and use the tool in decision-making is available in Output 2.4: Final tool code package and operationalisation guidelines of the Climate Action Decision Support Tool.



interreg-baltic.eu/project/climate-4-cast/#output-0

Scan the code for tool access options and quick set-up info

kausal.gitbook.io/climate-4-cast-tool



The CADS Tool is open-source and freely available. The tool can be used online with no download required, deployed locally on a single computer or self-hosted on city servers or deployed as a supported service:

- 1. Browser based online tool:** A ready-to-use web version
- 2. Self-hosted open-source tool code-package (GitHub under AGPL-3.0 licence):** Full access to the source code package for cities or organisations wishing to deploy and/or customise the tool.
- 3. Supported deployment via service providers (SaaS solution):** Users may also opt to contract external support for implementation, maintenance and further development of the tool through specialised service providers.

