Interreg Baltic Sea Region

Co-funded by the European Union

ENERGY TRANSITION
Climate-4-CAST

Analysing costs and benefits with the CADS tool

Examples of the City of Norderstedt

Climate budget training course, 07. May 2026

Dr. Toya Engel
City of Norderstedt, Department of Sustainability
interreg-baltic.eu/project/climate-4-cast/

Norderstedt’s measures

How we have tested the tool with 18 measures in total:

4 Measures, which are finished (valid data)

- ✓ Change Traffic Lights to LED (First Half)
- ✓ Change Traffic Lights to LED (Total)
- ✓ Change Street Lights to LED (Moorkamp Street)
- ✓ Tree Donations

6 Measures as assumptions / scenarios

- ✓ Assumption New-Build Nursery GEG-30
- ✓ Assumption New-Build Nursery Passive House Components
- ✓ Assumption New-Build Nursery Nearly Zero-Energy
- ✓ Assumption Change Street Lights to LED by 2029
- ✓ Reforestation "Am wilden Moor"
- ✓ Tree Planting at the School "Wittmoor"

4 Measures, which are ongoing (relatively valid data)

- ✓ Roof Refurbishment of Public Building
- ✓ Subsidy Program for Energy Refurbishment
- ✓ Energy Refurbishment of Kindergarten (Tannenhofstraße)
- ✓ Change Street Lights to LED by 2035

4 Measures as external trends

- ✓ Decarbonisation of District Heating (Municipal)
- ✓ Decarbonisation of District Heating (Customers of Local Energy Provider)
- ✓ Decarbonisation of Electricity (Municipal)
- ✓ Decarbonisation of Electricity (Customers of Local Energy Provider)

Figure 1: Norderstedt’s measures for testing the Climate-4-CAST tool
Source: City of Norderstedt, Department of Sustainability(2026)

Cost-Benefit Analysis for 3 scenarios

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Norderstedt use case from the Department of Traffic Infrastructure: Change streetlights to LED

Scenario 1: Business as usual

- Same interval as before, nearly the same budget as before
- Purpose: determine when the change is complete and how high savings and ROI would be; break-even point?

Scenario 2: budget target approach

- Change of all streetlights to LED by target year 2029 (city administration defined internal target year 2029)
- Purpose: How much more would we need to invest annually to reach the goal? How many additional lamps would need to be replaced annually? Does achieving the target offer advantages for payback time and ROI??

Scenario 3: Pause the change due to budget limitations

- Pause the change for 2 years due to budget limitations
- Purpose: demonstrate the financial impact (lost savings effects) a pause would cause.

Cost-Benefit Analysis

Relevant data for all three scenarios

Energy data

- Annual energy consumption for baseline (kWh)
- Minor annual energy consumption compared to the baseline energy consumption (kWh per year)
- Cumulative annual energy consumption compared to the baseline energy consumption (cumulative kWh savings)

Costs and saving data

- Energy price and median energy price (€ per kWh)
- Costs per unit and annual investment costs (€ per unit and capex per year)
- Cumulative annual energy cost savings (€ per year)

Emission data

- Greenhouse gas emission factor for electricity (standard electricity mix for Germany) (kg CO_2e per year)
- Greenhouse gas savings per year (kg CO_2e per year)

Cost-Benefit Analysis: BAU-Scenario

BAU scenario modelling – change streetlights to LED (finished by 2035)

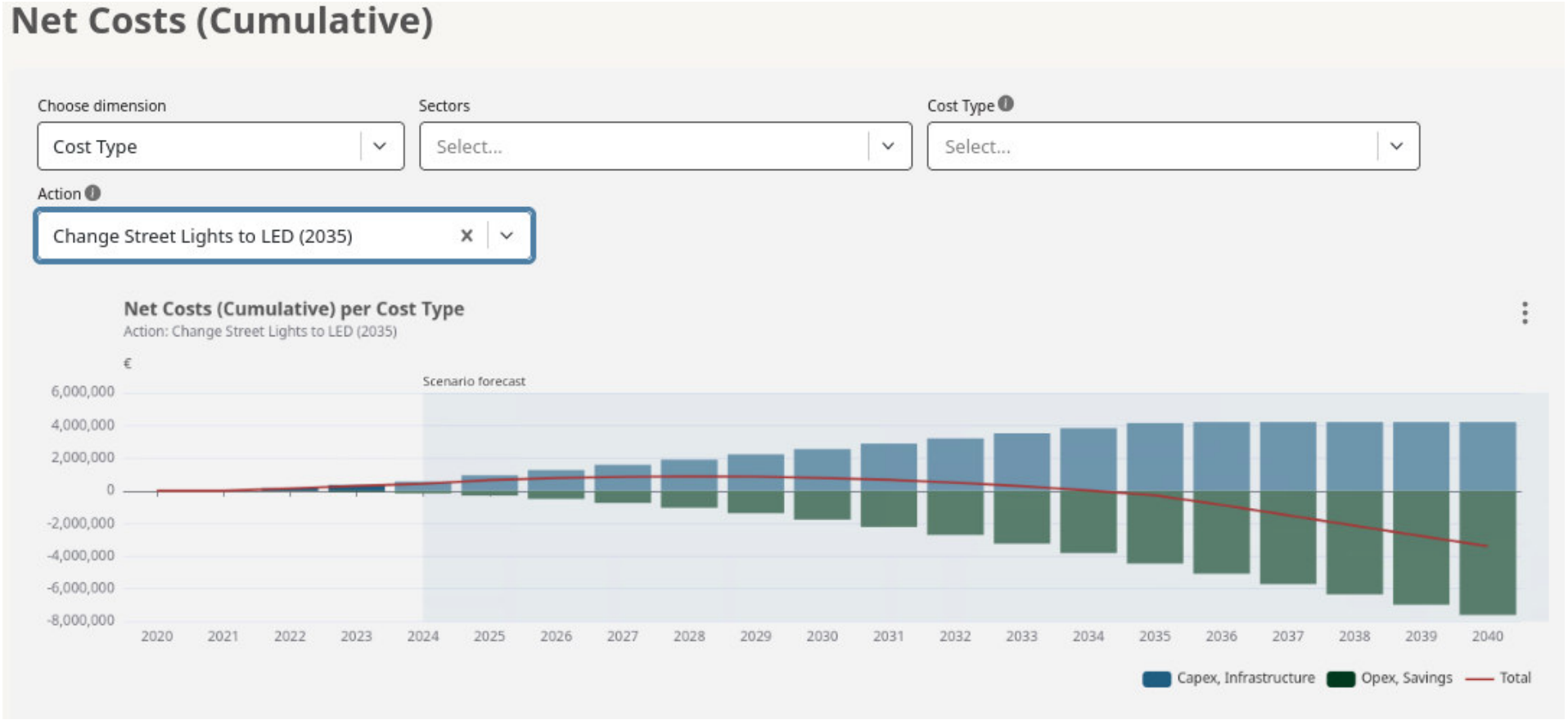

Figure 2: Climate-4-CAST Tool, City of Norderstedt — Cost-Benefit analysis for the measure "BAU-Scenario: Change streetlights to LED by 2035"
Source: City of Norderstedt, Department of Sustainability, Kausal (2025)

Cost-Benefit Analysis: BAU-Scenario

BAU scenario modelling – change streetlights to LED (finished by 2035)

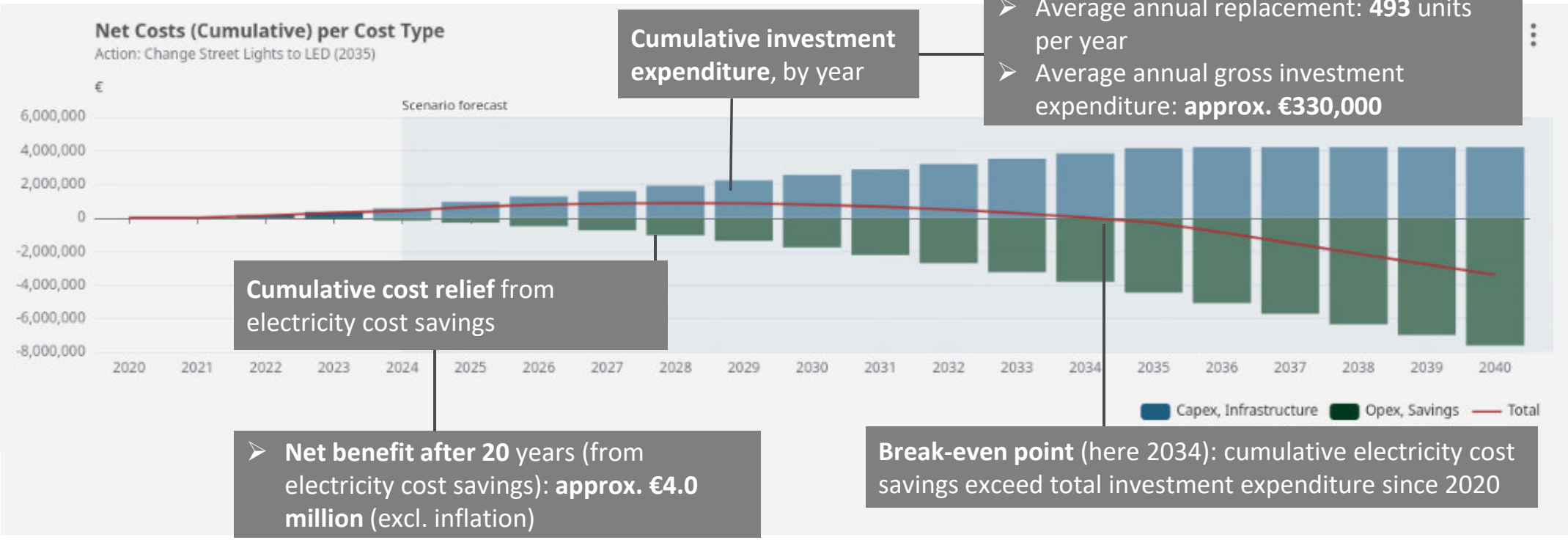

Figure 3: Climate-4-CAST Tool, City of Norderstedt — Cost-Benefit analysis for the measure "BAU-Scenario: Change streetlights to LED by 2035"
Source: City of Norderstedt, Department of Sustainability, Kausal (2025)

Cost-Benefit Analysis: Target scenario

Budget target scenario modelling – change streetlights to LED by 2029

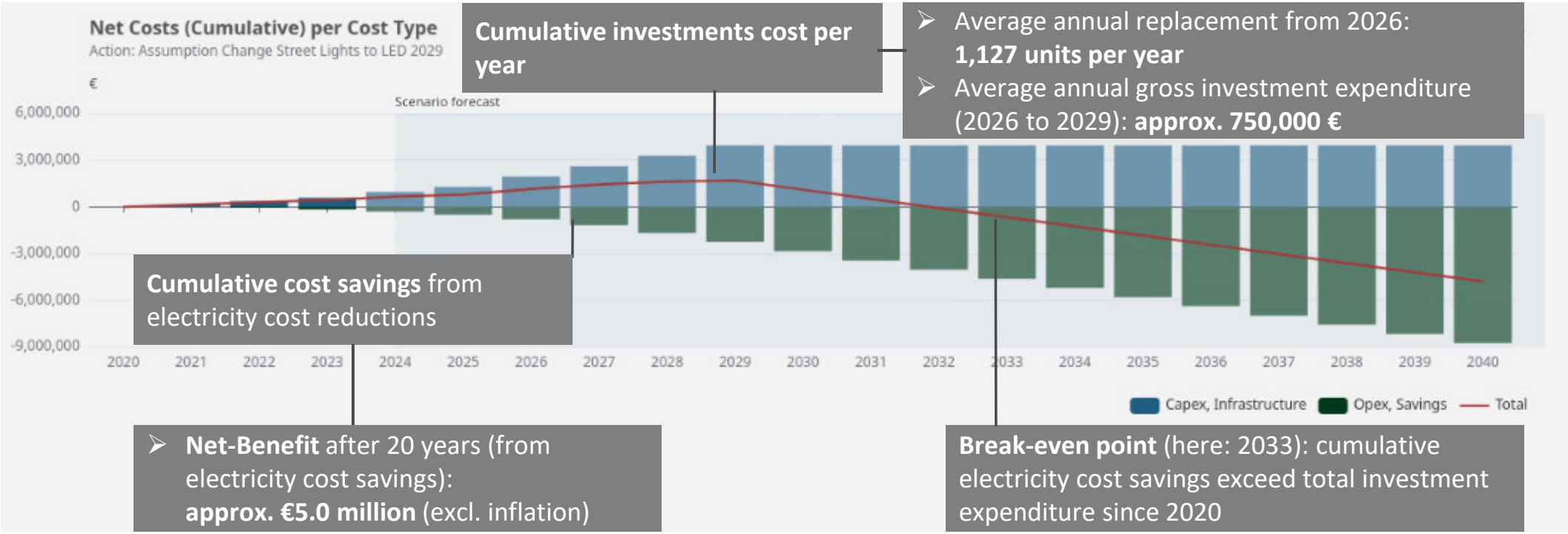

Figure 4: Climate-4-CAST Tool, City of Norderstedt — Net cost analysis for the measure "Scenario: conversion of street lighting to LED by 2029"
Source: City of Norderstedt, Department of Sustainability, Kausal (2025)

Summary of the cost-benefit analysis

Norderstedt use case from the Department of Traffic Infrastructure: Change streetlights to LED

Scenario	Investment cost per year / Number per year	Cost-Benefit (Net-Benefit) (2020 – 2040)	Year of amortisation
Scenario 1: Business as usual (done by 2035)	Approx. 330,000 € Approx. 493 units per year	Approx. 4.0 € million (excl. inflation)	2034
Scenario 2: Budget target approach	Approx. 750,000 € Approx. 1.127 units per year	Approx. 5.0 € million (excl. inflation)	2033
Scenario 3: Pause the change for 2 years due to budget limitations	Approx. 230,000 - 330,000 € Approx. 350 - 493 units per year (2 years pause, 2 years ramp-up)	Approx. 3.9 million (excl. inflation)	2037

Table 1: Summary of the three cost-benefit scenarios about changing streetlights to LED
Source: City of Norderstedt, Department of Sustainability (2025)

Cost-Benefit Approach for buildings

1. **Reference values from Frankfurt (German frontrunner in energy management) for** Assumption new-build nursery
   - 1,000 m² net floor area, 50-year lifecycle, hypothetical completion in 2025, operation from 2026
   - Comparison of new-build variants: according to statutory standard, −30 %, with passive house components, nearly zero-energy building

2. **Relevant data for nursery scenarios**
   - **Cost** for new build to current GEG standard
   - **Additional costs for higher energy efficiency** than current GEG standard (= difference between standard construction costs and incremental costs for efficiency measures above the current GEG standard => climate protection share)
   - **Reduced electricity and heating energy consumption** through higher energy standard (kWh per annum)
   - **Reduced electricity and heating energy costs (operating costs)** (€ per kWh and € total per annum)

Application in the building sector

Examples from Frankfurt a.M.: case study – new nursery building (comparison to current GEG standard)

Assumptions for new build: 1,000 m² net floor area, 50-year lifecycle, hypothetical completion in 2025, operation from 2026

	Total impact 2020–2040	Annual impact 2040	Net cost 2020–2040 *	Cost efficiency **	Payback times for additional costs vs. GEG standard:
Assumption New-Build Nursery GEG-30	-27.4 tCO_2e	-1.83 tCO_2e/yr	12,700 €	464 €/tCO_2e	17.4 years
Assumption New-Build Nursery Passive House Components	-27.4 tCO_2e	-1.83 tCO_2e/yr	-7,630 €	-278 €/tCO_2e	13.5 years
Assumption New-Build Nursery Nearly Zero-Energy	-93.1 tCO_2e	-5.82 tCO_2e/yr	-57,400 €	-616 €/tCO_2e	10.2 years

Figure 5: Climate-4-CAST Tool, City of Norderstedt — list overview for thee assumption measures (new-build nursery)
Source: Data from the city of Frankfurt am Main; calculations & presentation: City of Norderstedt, Department of Sustainability, Kausal (2025)

* **Net cost** = total investment costs minus total energy cost savings over 20 years

** **Cost efficiency** = cost per tonne of CO_2e saved over 20 years; double benefit in these examples: **CO_2e reduction AND cost savings**

Thank you for your attention!

Contact

Dr. Toya Engel
City of Norderstedt | Department of Sustainability
toya.engel@norderstedt.de

Website (English): https://interreg-baltic.eu/project/climate-4-cast/

Website (German): https://www.norderstedt.de/Climate-4-CAST

Climate-4-CAST is co-financed by the Interreg Baltic Sea Region Programme 2021-2027