Pilot Case Factsheet — Implementing EE1st in Transport Planning — Greece

September 2026

Background and objectives

The main objective of the 2nd Greek pilot case was the identification of the **most effective strategies and policies for promoting sustainable and energy-efficient transport to combat transport poverty and transport vulnerability** across all administrative levels (national, regional, municipal) through the systematic application of the **Energy Efficiency First (EE1st)** principle.

The pilot case could directly support compliance with **Article 3 of Directive 1791/2023/EU**, which requires that planning, policy, and major investment decisions in the transport sector be assessed under the EE1st principle. It aimed at the identification of the most **sustainable and beneficial transport alternatives** for society, **avoiding stranded assets** and ensuring that **new investments** are justified from both financial and economic perspectives.

The pilot case focused on the application of the EE1st principle in the transport sector across all administrative levels in Greece, including national, regional and municipal authorities. More specifically, the scope of analysis covers the transport strategies and policies selected within the framework of the **Greek Social Climate Plan,** as adopted in August 2026, to combat transport poverty and transport vulnerability due to the imposition of ETS2.

The pilot case can contribute to national planning processes, including:

- The **preparation of the National Energy and Climate Plan (NECP)** for the period 2031-2040, under Regulation (EU) 2018/1999.
- The **design and/or revision of Operational/Sectoral funding Programmes** related to transport.
- The **implementation of the Social Climate Plan.**
- The long-term modelling of the transport sector through integration into the **TIMES model**, to support **long-term transport sector modelling and least-cost investment planning** via a more expanded framework of analysis.

The pilot case is an example of the EE1st principle implementation considering that it:

- compares transport options (e.g. electromobility vs. conventional fuels) with a medium or long term perspective towards decarbonisation,
- avoids **stranded assets** by evaluating whether conventional fuel infrastructure is cost-effective,
- applies a **transparent methodology** based on the evaluation of different cost-effective indicators to ensure that the most energy-efficient transport solutions are prioritized and
- integrates **positive and negative externalities into the analysis**.

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Methodology

The methodological approach, which was applied within the framework of the Greek pilot case, is based on the comparison of different cost-effectiveness indicators in order to identify the most beneficial and effective transport alternative.

The main steps of the developed methodological approach include:

- **Step I**: Specification of the **geographical and system boundaries** (e.g. national, regional, local/municipal levels) and other parameters of the analysis (e.g. timeline).
- **Step II**: Identification of **different transport alternatives** to be assessed through the application of the EE1st principle, including both different types of vehicles for passenger and freight transport and public means of transportation. Determination of required technical parameters (e.g. investment cost, operating and maintenance cost, energy consumption and GHG emissions).
- **Step III**: Selection of the **conventional/baseline option** for each transport alternative separately according to the current trend/practice (e.g. operating and maintenance cost, energy consumption and GHG emissions).
- **Step IV**: **Quantification and monetization of private costs and benefits** for purchasing, operating and maintaining the examined transport alternatives.
- **Step V**: **Quantification and monetization of external costs and benefits,** according to the Handbook on the external costs of transport (Version 2019 – 1.1), as published by the EC, including the following categories of impacts resulting from the examined transport alternatives**:** habitat damage, well-to-tank emissions, noise, accidents, climate change, air pollution and congestion.
- **Step VI**: Calculation of different **cost effectiveness indicators** (e.g. final energy savings to public aid, GHG emission savings to public aid, net external benefits to public aid, cost savings to public aid, and net total benefits -adding net external benefits and cost savings- to public aid).
- **Step VII**: Conduction of a **sensitivity analysis** to explore robustness of the results and the extent to which the conclusions remain valid under different assumptions.
- **Step VIII**: **Ranking of the examined transport alternatives** based on the cost-effectiveness indicators **and identification of the most beneficial and effective transport alternatives** as resulted by the comparative analysis of the estimated cost-effectiveness indicators.

The EE1st principle also implies **broader discussion and cooperation** (e.g. for data collection, agreeing on key assumptions). The involved stakeholders include officials from Ministry of Environment & Energy, Ministry of Infrastructure & Transport, CRES, Regulatory Authority for Energy, Waste and Water, Social Climate Fund (SCF) Coordinating Authority, Regional Authorities, public transport operators and NGOs.

Main results

The analysis was carried out at national level in order to assess **16 measures in the transport sector**, selected within the framework of Greece's Social Climate Plan to address transport poverty and transport vulnerability.

The analysis led to the conclusion that:

- All the examined energy-efficiency options in the transport sector **generated positive overall benefits**.
- The **ranking** of the examined energy-efficiency options **varies depending on the cost-effectiveness indicator applied**.
- The **promotion of public transport generates higher societal benefits** than the promotion of energy-efficient vehicles.
- The **promotion of energy-efficient vehicles among microenterprises** appears to be more beneficial than the promotion of energy-efficient vehicles among households.

The ranking of the examined measures shows that performance varies considerably across the different cost-effectiveness indicators. **Athens Metro Rolling Stock**[1] emerges as the strongest overall measure, ranking first for net economic benefits/public aid and net total benefits/public aid, while also achieving very high rankings for final energy and GHG emission savings. **Modernization of public transport with zero-emission buses** also performs consistently well, ranking among the top measures across all indicators. **Financial incentives for zero-emission taxis** achieve the highest ranking for both final energy and GHG emission savings per unit of public aid, although their ranking is lower when broader economic and total benefits are considered.

The results also indicate that some measures perform particularly well from specific perspectives. **Vehicle occupancy measures** rank first in terms of net benefits/public aid and second in terms of net total benefits/public aid, despite their relatively weaker ranking for energy and GHG savings. Similarly, **ATHENS MOVE+**[2] performs relatively well across the indicators, particularly for net economic benefits/public aid. In contrast, **School mobility for students with special needs** consistently ranks near the bottom, particularly for energy and GHG savings, while several individual vehicle incentive measures show mixed performance across indicators. For example, incentives for heavy-duty vehicles rank poorly for energy and GHG savings per euro of public aid, but achieve a very high ranking for net benefits/public aid.

Overall, **no single measure is consistently optimal across all indicators**. Measures focused on public transport and system-level interventions tend to show stronger and more balanced performance, whereas technology-specific vehicle incentives can perform very differently depending on whether the assessment focuses on energy savings, emissions, economic benefits or total benefits. The results therefore support the use of a **multi-dimensional assessment** when prioritizing measures, rather than relying on a single cost-effectiveness indicator.

Table 1 presents the **estimated cost-effectiveness indicators** on annual basis. It should be noted that the main objective is to maximize the performance of each cost-effectiveness indicator.

Table 2 outlines the **ranking of the examined transport alternatives** based on the resulted cost-effectiveness indicators.

[1] This measure foresees both the upgrade of 10 trains in Metro Line 1 and the procurement and deployment of 12 new trains for Metro Lines 2 and 3.
[2] The measure of ATHENS MOVE+ foresees the delivery of 17 electric buses, the supply and installation of 9 charging stations, the development of two maintenance and parking facilities (depots) for the electric bus fleet and the construction and adaptation of municipal bus stops and Local Multimodal Mobility Hubs in targeted energy vulnerable areas within municipality of Athens.

Table 1: Resulted cost-effectiveness indicators.

Indicators	Final energy savings / Public aid (kWh/€)	GHG emission savings / Public aid (kg CO2/€)	Net external benefits / Public aid (€/€)	Cost savings / Public aid (€/€)	Net total benefits / Public aid (€/€)
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (LCVs - N1)	0.938	0.218	0.027	0.021	0.048
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Cars - M1)	0.568	0.130	-0.009	0.011	0.002
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Motorcycles)	0.407	0.100	0.015	0.022	0.037
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Passenger Vehicles - M2)	0.553	0.127	-0.008	0.010	0.002
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Medium-duty Trucks - N2)	0.391	0.072	0.021	-0.016	0.005
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Passenger Vehicles - M3)	0.387	0.089	0.000	0.014	0.014
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Heavy-duty Trucks - N3)	0.516	0.083	0.253	-0.037	0.216
Financial incentives for purchasing/leasing zero emission taxis (M1 category EV & M1 category EV 6-9 seat Minivans)	1.804	0.408	-0.001	0.026	0.025
Social Leasing	0.618	0.142	0.000	0.022	0.022
Modernization of public transport in urban areas with zero-emission buses	0.997	0.247	0.224	0.058	0.282
ATHENS MOVE+: Municipal Electric Urban Transport Network	0.846	0.217	0.181	0.058	0.239
School mobility for students with special needs	0.055	0.013	0.012	0.002	0.014

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Indicators	Final energy savings / Public aid (kWh/€)	GHG emission savings / Public aid (kg CO2/€)	Net external benefits / Public aid (€/€)	Cost savings / Public aid (€/€)	Net total benefits / Public aid (€/€)
Athens Metro Rolling Stock	0.944	0.249	0.254	0.073	0.327
Railway & Metro stations	0.114	0.030	0.031	0.009	0.039
DRT Regional	0.084	0.022	0.056	0.001	0.057
Vehicle occupancy (1 passenger) - Car use by potential future DRT users scenario	0.713	0.188	0.274	0.009	0.283

Table 2: Ranking based on the resulted cost-effectiveness indicators.

Indicators	Ranking based on the indicator Final energy savings / Public aid	Ranking based on the indicator GHG emission savings / Public aid	Ranking based on the indicator Net external benefits / Public aid	Ranking based on the indicator Cost savings / Public aid	Ranking based on the indicator Net total benefits / Public aid
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (LCVs - N1)	4	4	8	7	7
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Cars - M1)	8	8	16	9	15
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Motorcycles)	11	10	10	6	9
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Passenger Vehicles - M2)	9	9	15	10	16
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Medium-duty Trucks - N2)	12	13	9	15	14
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Passenger Vehicles - M3)	13	11	12	8	13

Indicators	Ranking based on the indicator Final energy savings / Public aid	Ranking based on the indicator GHG emission savings / Public aid	Ranking based on the indicator Net external benefits / Public aid	Ranking based on the indicator Cost savings / Public aid	Ranking based on the indicator Net total benefits / Public aid
Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Heavy-duty Trucks - N3)	10	12	3	16	5
Financial incentives for purchasing/leasing zero emission taxis (M1 category EV & M1 category EV 6-9 seat Minivans)	1	1	14	4	10
Social Leasing	7	7	13	5	11
Modernization of public transport in urban areas with zero-emission buses	2	3	4	3	3
ATHENS MOVE+: Municipal Electric Urban Transport Network	5	5	5	2	4
School mobility for students with special needs	16	16	11	13	12
Athens Metro Rolling Stock	3	2	2	1	1
Railway & Metro stations	14	14	7	11	8
DRT Regional	15	15	6	14	6
Vehicle occupancy (1 passenger) - Car use by potential future DRT users scenario	6	6	1	12	2

Where/how implementing EE1st makes a difference

An important difference lies in the **broader scope of impacts assessed**. A classical CBA generally focuses on the examination of direct investment, operation, and energy costs or savings. By contrast, EE1st stresses the inclusion of externalities and co-benefits, such as reductions in greenhouse gas emissions, improvements in air quality and related health benefits, enhanced energy security, and even macroeconomic impacts like GDP growth or job creation. These additional dimensions allow decision-makers to see the full value of efficiency-oriented strategies rather than focusing narrowly on financial flows.

Broader range of solutions

The application of the EE1st principle encourages the assessment of a wider range of energy-efficiency and demand-side options in the transport sector. This means that policy and investment decisions should not be limited to improving the efficiency of existing vehicles or replacing conventional vehicles with more efficient technologies. Alternatives such as public transport improvements, modal shift, shared mobility and other measures that reduce energy demand can also contribute to achieving transport and energy-policy objectives. Assessing these options within a common analytical framework makes it possible to identify solutions that may provide greater energy and societal benefits than those obtained through a technology-focused approach alone. This broader perspective is particularly relevant for the EE1st principle, as it allows reductions in energy demand to be considered as an alternative to, or in combination with, investments in additional energy supply and transport infrastructure.

Broader impacts

The assessment also demonstrates the importance of considering a comprehensive range of externalities when evaluating transport alternatives. In addition to the investment, operating and energy costs, the analysis incorporates impacts such as habitat costs, well-to-tank emissions, noise, accidents, climate-change impacts and congestion. These externalities can be substantial and may significantly influence the overall societal value of a transport measure.

An option that appears less attractive when assessed only on the basis of its direct financial or energy costs may become more beneficial when its wider environmental and social impacts are considered (e.g. such as in the case of Financial incentives to vulnerable microenterprises for buying zero or low emission vehicles (Heavy-duty Trucks - N3)). Conversely, measures with relatively high direct cost savings may have limited overall benefits if the net environmental and social benefits will be taken into account (e.g. such as in the case of Social Leasing for transport vulnerable households). This broader assessment is consistent with the EE1st principle since it evaluates alternatives based on their contribution to overall system efficiency and societal welfare rather than considering energy savings as an isolated outcome.

Different perspectives

A further important finding is that the ranking of the examined measures can vary depending on the cost-effectiveness indicator applied. The use of different indicators —such as the cost per unit of energy saved, cost per unit of GHG emissions avoided, cost per unit of external impacts avoided, cost per unit of cost savings, or cost per unit of total benefits— provides different perspectives on the relative performance of the alternatives. This is particularly important for applying the EE1st principle because there is no single indicator that can fully capture the multiple objectives of transport and energy policy especially in the case that it is not feasible to monetize all of them in order to conduct a CBA. An option may perform particularly well in terms of energy savings but less well when broader environmental or

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societal impacts are considered. Similarly, an alternative with higher initial costs may achieve substantially greater overall benefits. Consequently, the analysis should not rely on a single ranking but should examine the results across complementary indicators and identify options that remain attractive under different assessment perspectives. It should be noted that the conduction of multicriteria analysis can combine different indicators overcoming limitations related to monetization.

Better and more informed decisions

The combined assessment of energy performance, costs and wider environmental and societal impacts provides a stronger basis for decision-making. By identifying measures that are socially viable and beneficial, the analysis can support the design of more effective and appropriately targeted policy measures. The EE1st principle therefore provides a framework for moving beyond the question of which technology is the most efficient and addresses the broader question of which combination of transport measures can deliver the greatest overall benefits to society. This can assist policymakers in prioritizing measures according to their actual contribution to energy savings, emissions reduction, environmental improvement, accessibility and social welfare, while also taking account of their economic feasibility.

The EE1st principle embeds **procedural and governance differences**. It requires public authorities to adopt methodologies that make external benefits transparent and integrate stakeholders in co-designing processes, as shown in the Greek pilot case. A classical cost benefit analysis tends to be a more technical, isolated exercise, while the EE1st principle transforms it into a **participatory and policy-aligned** tool that better supports integrated energy planning and the achievement of the energy and climate targets.

The implementation of the developed methodological approach within the framework of the Greek pilot case will ensure that all the relevant policy documents (e.g. NECP and SCP) will be **consistent and streamlined,** leading to the effective achievement of the specified energy and environmental targets. The application of the EE1st principle will also facilitate the identification of the most beneficial transport alternatives for society, so that they can be included in future policy documents.

Overall, the assessment illustrates that applying the EE1st principle to the transport sector requires a **system-oriented and multi-dimensional approach**. Energy efficiency should be considered alongside modal choice, demand reduction, environmental impacts, social benefits and economic costs. The results also indicate that the preferred solution may depend on the objective and indicator used for the assessment.

Therefore, rather than establishing a universal ranking of transport alternatives, the EE1st principle can be used to identify a **portfolio of measures that provides the most favourable combination of energy, environmental, economic and social outcomes**. This approach can improve the robustness of transport policy decisions and help ensure that public support and investment are directed towards measures with the highest overall societal value.

About Enefirst Plus

Enefirst Plus is a 3-year project (November 2023 – October 2026) co-funded by the EU LIFE programme. Building on the previous Horizon 2020 Enefirst project, the aim of Enefirst Plus is to provide key stakeholders in all Member States with the technical support needed to effectively implement Energy Efficiency First across various sectors, particularly focusing on key decision-making processes.

Energy Efficiency First (EE1st) is an overarching principle for planning, policies and major investments having an impact on energy consumption. EE1st is about considering **energy efficiency and demand-response as energy resources** in the energy system, just as supply-side resources (e.g. generation capacities, network infrastructures). Implementing EE1st means that in planning exercises, policy design or decision-making about investments, the options considered include energy efficiency and demand-response, and that these options are compared with supply-side options on a **fair basis**, considering **multiple impacts and a long-term perspective**.

Implementing EE1st is easier said than done. Therefore, the general approach of Enefirst Plus is to complement existing resources to **plug EE1st in the decision making** for investments in energy infrastructure, energy planning, and designing incentives and policies.

Enefirst Plus is testing this approach in four countries (Croatia, Italy, Greece and Poland) and scrutinize the implementation of EE1st with **pilot cases** in each country. Two cycles, with four pilot cases each, will provide a diversity of **real-life examples** addressing typical situations where EE1st should be implemented. The new resources and pilot cases produced by the project, as well as experiences from other countries, serve as foundational elements for capacity building and experience sharing activities, and for the development of a community of practice.

Enefirst Plus' partners

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