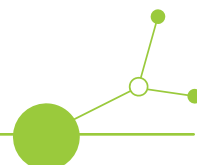


Collection of best practices - first edition

D.1.2.2



Version 2
10 2024





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Dissemination level	<i>Public</i>
Activity	<i>A.1.1 Assessment of needs and existing solutions</i>
Deliverable	<i>D.1.1.3 Updated catalogue of best practices</i>
Coordinating partner	<i>University of Maribor</i>
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Due date of deliverable	<i>15. 10. 2024</i>
Actual date of deliverable	<i>15. 10. 2024</i>
Status (F: final, D: draft)	<i>F</i>
File name	<i>REDU-CE-D_D.1.2.2 CollectionOfBestPractices_edition1</i>



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Deliverable revision			
Version	Date	Changes	Author (Organization)
1	15/09/2024	First version	Katja Hanžič, Klemen Sredenšek (UM)
2	15/10/2024	Second version	Katja Hanžič, Nina Pavletič, Domen Kuhar (UM)



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1. Introduction

The REDU-CE-D project, short for "customized Environmental Management System (EMS) to increase energy efficiency and reduce energy consumption of different transport modes in Central Europe," aims to enhance energy efficiency across various transportation sectors in Central Europe. This project addresses the requirements of the EU's Energy Efficiency Directive (EED), which mandates member states to achieve specific energy efficiency targets.

The primary goal of REDU-CE-D is to transpose the EED into air transport, urban transport, waterway transport, and rail transport sectors by developing and implementing customized EMS packages. These systems will be tailored to meet EU requirements and will be tested, developed, and disseminated through a collaborative, transnational approach.

The project adopts a cooperative strategy, involving assessment, mapping, and evaluation of best practices in monitoring energy consumption within the transport sector at the Central European level. A Transnational Working Group will assess the adaptability of selected practices and provide strategic inputs for their implementation. The findings will be showcased at the REDU-CE-D Conference.

Four pilot actions will be conducted in Croatia (air transport), Poland (urban transport), Hungary (waterway transport), and Italy (rail transport), involving two partners per sector. These pilots will test the EMS packages' effectiveness and involve key stakeholders from the respective sectors. The results will inform the further validation and finalization of EMS packages at the Transnational Advisory Forum.



2. Vocabulary

Majority of categories used for description of best practice cases and solutions are self-explanatory. Regardless, this section provides explanations to avoid any misunderstandings.

AREA OF INTERVENTION

For purposes of REDU-CE-D following areas of interventions were used:

- **Energy consumption**
- **Environmental impact**
- **Management systems**
- **Combination**

If the best practice relates to more than one type of area, the area is defined as Combination and further explained which areas are addressed.

TYPE

For purposes of REDU-CE-D following types of interventions were used for classification of best practices:

- **Electrical energy:** efficient use of electrical energy such as ventilation, lightning, air conditioning, IT services, transportation etc.
- **Fossil fuels:** efficient use of gasoline, diesel fuel and natural gas.
- **Renewable energy sources:** solar, wind, geothermal, biomass, biofuels, biogas solutions.
- **Noise and vibrations:** reduction and or suppression of noise and/or vibrations).
- **Air quality and GHG:** solutions for improving/maintaining air quality and/or reduction or greenhouse gasses (GHG) emissions.
- **Solid waste:** management and reduction of solid waste.
- **Circular economy:** recycling, digitalization, reuse and management of hazardous waste).
- **Habitat and biodiversity:** water, soil and land management, wild life corridors and monitoring systems, and other interventions related to habitat.
- **Spills or incidents:** prevention and management of fuel/oil/other harmful liquid spills, warning systems, training and scenarios for spillage incidents.
- **Training, policies, education:** internal policies/regulations, employee training and education programmes etc.
- **Information sharing:** knowledge exchange platforms or data sharing.
- **Other:**



TRANSPORTATION FACILITY

States transportation facilities where solution is (or can be) used. Solution can be used in one or several transportation facilities:

- **Airport**
- **Sea port**
- **Inland waterways port**
- **Railway terminal**
- **Urban transport - bus terminal**
- **Urban transport - rail terminal**
- **Urban transport - combined terminal**

TRANSPORT MODE

States transport modes where solutions is (or can be) used. Solution can be used in one or several modes of transport:

- **Railway**
- **Road transport** (bus, taxi, etc.)
- **Air transport** (airport, airplane)
- **Inland waterways** (river transport, lakes...)
- **Sea transport** (seaports, sea cruisers...)

STANDARDS USED

Provides information if any of the international standards were used (e.g. ISO, EN or other standard). If the information on standards used was available, standards and the reasoning behind it (why the particular standard was implemented and what are the benefits) is explained in additional notes.



3. Best practices

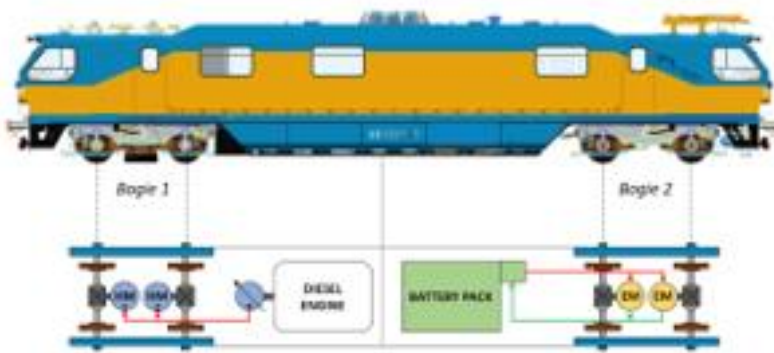
3.1. Energy consumption

Title	Application of LED lights in airport			
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Hungary	Electrical energy	Airport	Air	on-going (2024)
Description	One of the main usage of the electricity is the lighting both in office environment but mainly for technical purposes (e.g. runway, taxiway , etc). Changing the systems into LED lights dramatically decreases the cost of the electricity as well as decreases maintenance costs due to longer life-time. The installation of LED lights is within the sustainability strategy of the airport for years. A design principle was made informing our contracted partners on the technological, functional requirements, for example, we design for reduced light, therefore the LED lights can be used for a longer period. According the BUD standard during the planning of refurbishments of office or rented building or project which have connection with lighting it is mandatory to use LED application mainly with DALI system. DALI: communication BUS network allowing individual control of each light based on signals from sensors and switches, also motion sensors can be installed. In case of indoor lighting DALI is only installed in new or refurbished buildings and only where is it needed (in warehouses it would not be meaningful). Also in our passenger areas DALI is only installed if brightness control is needed. In case of outdoor lighting only at locations where possible we have a night reduced mode.			
Picture				



Estimated costs	N/A	
Standards used	Yes	
Additional notes	/	
Implemented by	Budapest Airport	
Information and contact	N/A	Emese Varga emese.varga@bud.hu



Title				
Rail Regenerative Braking Systems: Regenerative Braking System for freight locomotives				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Germany	Electrical energy	Railway terminal	Rail	ongoing
Description	Regenerative braking systems capture the energy generated during braking and feed it back into the electrical grid or onboard energy storage. This reduces fuel consumption and emissions. For example, all modern electric trains at Deutsche Bahn are equipped with a brake energy recovery function. When they brake, their motors act as generators, converting the kinetic energy into electricity, which then flows back into the overhead line. This electricity can then be used again by other trains. In 2023, this generated a total of around 1,440 gigawatt hours of electricity. This saves trains such as the ICE as much electricity in one year as around 350,000 four-person households consume annually.			
Picture				
Estimated costs	N/A			
Standards used	No information			
Additional notes	/			
Implemented by	Deutsche Bahn			
Information and contact	https://connectorsupplier.com/regenerative-braking-systems-rail-applications/			



Title				
Deploying E-chargers (partially financed by EU): Strategic goal - NET Zero Airport by 2035.				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Germany	Electrical energy	Airport	Air	Ongoing (2024)
Description At the airport there are several companies e.g. ground handlers who use many vehicles. Budapest Airport encourage them to change their fleet running with electricity. For this purpose it is necessary to increase the numbers of the e-chargers in the whole territory of the Airport. The airport operator aims to increase the number of electric vehicles in use at the airport, in its fleet and by its partners, including passenger cars, special service vehicles and other vehicles for airport-specific tasks. With the development of e-mobility at the airport carried out by the end of 2022, annual savings have reached 412,000 liters of fuel and, correspondingly, approximately 1,080 tons of CO₂. Budapest Airport applied for the European Union's "CEF 2 Transport - Alternative Fuels Infrastructure Facility" funding program in 2022 with its Net Zero Airport project. In the framework of this program, a grant agreement for the installation of 83 charging stations and 102 charging points was signed. In addition, the Hungarian government included the airport operator in the list of projects to be implemented by the Connecting Europe Facility at the end of 2021 to significantly improve the airport's electric charging infrastructure, with a total budget of nearly 3.2 million EUR, to install new e-charging stations at the airport. The development, which will be implemented in 3 phases until 31 August 2025, will be partly financed by Budapest Airport and partly by European Union funds (50%-50%). The EU contribution amounts to nearly 1,594,250 EUR. As of today the number of e-chargers installed by Budapest Airport (BUD) 79 locations, used by BUD group 74 chargers, used by public: 43 chargers. There are locations where the connection point is provided by BUD but the chargers are installed and operated by partners: 29 locations 170 chargers. By the end of 2023, BUD had 33 fully electric and 39 hybrid vehicles in its fleet, and its ground handling partners have already replaced more than 130 pieces of ground service equipment with new, electric ones. Thanks to, among other things, e-mobility developments at the airport in recent years, nearly 245,000 fewer liters of fuel were needed in 2023 than in 2019. The installed chargers provide the information on the electrical energy consumption peaks. The chargers record 15-minute period data and we have the same 15-minute period data on the feed. For this reason, it is visible when the daily ramp up peak is and information is received about the value of the electrical energy fed to the chargers of a period of 15 minutes. That allows				



	us to control the timing of charging or regulate the distribution in the peak hours. The T curve determines the usage profile at different locations therefore restrictions can be introduced if needed; ie: at certain locations peak charging is not allowed or the distributed energy can be regulated or information that the vehicle is charged can be sent to user via the mobile app (this is currently in use), and if is not moved, penalty can be imposed.	
Picture		
Estimated costs	N/A	
Standards used	Yes	
Additional notes	IEC 61851-1:2017 and ISO 17409:2020	
Implemented by	Budapest airport	
Information and contact	https://www.bud.hu/en/budapest_airport/media/news/actual_press_releases/budapest_airports_e_charger_infrastructure_expanding_with_eu_support.html https://www.bud.hu/en/budapest_airport/responsibility/important_documents/sustainability_report	Emese Varga emese.varga@bud.hu



Title				
Dynamic apron lighting (OLGA)				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
France	Electrical energy	Airport	Air	ongoing
Description	So called Dynamic apron lightning aims to optimize the control of apron lightning based on the presence of aircraft, leveraging both tower data and sensor technologies. The primary objectives of this project are: 1) Energy savings: reduce energy consumption by optimizing the periods of full illuminance when aircraft are present on the aprons. 2) Enhanced safety and security: Ensure that lightning levels meet regulatory standards, maintaining safety and security for passengers, operators, aircraft and overall operations. 3) Development and dissemination: Create a comprehensive guide of apron lightning to share optimized lighting strategies with other airports. 4) Energy Savings: Initial implementation of LED lighting resulted in energy savings of approximately 40% for the LED, 10 to 20% for the current optimization system. On the remaining total consumption optimizations through dynamic lighting controls are expected to yield an additional 10% -20%.			
Picture				
Estimated costs	34,000,000,00 EUR			
Standards used	No information.			
Additional notes	/			
Implemented by	Air France			
Information and contact	https://www.olga-project.eu/olympics-innovations/dynamic-apron-lighting		contact@olga-project.eu	



Title				
Geothermal project: Replacing natural gas heating with geothermal energy				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Hungary	Renewable energy sources	Airport	Air	on-going (2024)
Description	Budapest Airport aims to reach zero carbon operation till 2035, and as part of this the current natural gas based heating is to be replaced with a sustainable solution. It is a well known fact that Hungary and Budapest has a great geothermal potential, thus it is an obvious choice to investigate this solution. With the increasing energy & CO2 quota prices the project undoubtedly can have a positive business case. Deploying such a system will also increase our energy supply security. With on-site generation the risk related to gas supply from the national grid can drop to zero. Project started in 2019. The geology of Budapest area was unknown therefore a feasibility study was made. In 2020 it was realized that the project was worth to start. First it was investigated if transition to the geothermic or heat pumps is a better option. Geothermic was stated as financially more favourable. In 2022 an overall feasibility study made, investigating locations for wells also exploring the possibility for power generation, checking if it is possible to increase and at what capacity, drilling of new wells - including costs. Additionally, the seismic exploration of the area, a final geological study was completed in 2023. The expected temperature is 100-120 degrees Celsius. Our district heating system operates at 110 degrees which can be lowered with modifications to 90 degrees. With these parameters the total switch of the current usage of 25MW, 180 GJ/year of gas to geothermal power can be carried out, resulting in 10000 tons of CO2 reduction. The permit for exploration was handed in 2023. Problem: permitting procedure. The authority responsible is currently investigating whether there is any conflict of the project with the thermal baths in the area of Budapest. After permitting next step will be exploratory drilling, then design and construction tender can start.			
Estimated costs	N/A			
Standards used	No information			



REDU-CE-D

Additional notes	/	
Implemented by	Budapest Airport	
Information and contact	N/A	Emese Varga emese.varga@bud.hu

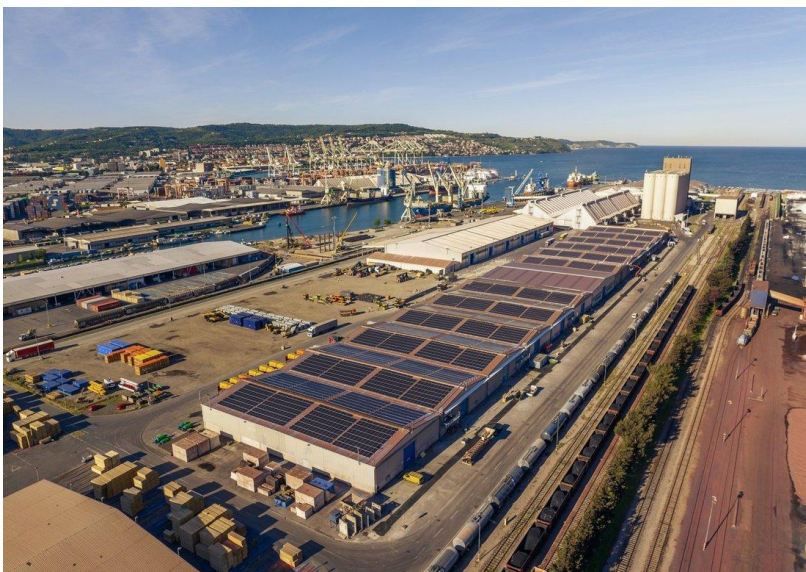


Title				
Solar farm for electricity production: Installing new Solar Farm (7,2 MW) to supply electricity at the territory of the Budapest Airport.				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Hungary	Renewable energy sources	Airport	Air	on-going (2024)
Description				
Electricity is a key issue in the daily safe operation of the Airport. Moreover Budapest Airport's strategic goal is to be a Net Zero Airport by 2030. The aim is to use solely green energy and reduce energy dependence. Budapest Airport has available land (11 ha for this purpose) and decided to install a completely new solar PV plant and produce the electricity needed. Background: In 2021 Budapest Airport concluded its first ESG-based financing agreement, i.e. one that is responsible from an environmental, social and corporate governance perspective, which is unique among airports not only in the region, but also in Europe. Eligibility for ESG financial products highlights the company's commitment to sustainability, as well as other socially relevant issues, in its day-to-day operations. ESG-linked instruments can provide benefits in the form of lower financial costs (or "greenium") for organizations that achieve ambitious ESG goals. As part of the agreement, Budapest Airport committed, amongst other things, to meeting its full electricity needs entirely from renewable sources. The project started with initial feasibility studies. Several permits have to be gained during the course of project, meeting legal and service provider requirements during which process designs had to be modified. The produced energy 7,2 MW will be used by the airport and it will be measured in details. The solar energy will be fed into our medium voltage network, it will be visible how much the energy consumption is lowered in 15-minutes period data. Due to the airport function, an assessment of the glare occurrence and its impact was needed; an anti-reflective coating will have to be used on the panels. From service provider point of view, this is a unique case as there are not any huge consumers using all electricity produced by this size of solar farm. Status: Designs are available, construction tender is ongoing. Due to prolonged design phase with several time-consuming permitting procedures and because of the nature of the fast changing innovative industry the selected and designed size of panels - 600 W/panel- are no longer available. Recalculations were needed, also realized that the constructor will have to redesign before execution works.				



	There is a significant ground squirrel habitat at Budapest Airport territory. In this pilot project, the population will not be relocated but studied what changes the solar plant will have on their natural environment, although during construction it will be affected, the panels will provide shelter and shade.	
Estimated costs	over 8 million EUR	
Standards used	No information	
Additional notes	/	
Implemented by	Budapest Airport	
Information and contact	N/A	Emese Varga emese.varga@bud.hu



Title				
SOPOREM - Solar power for reduction for reducing emissions				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Slovenia	Renewable energy sources	Sea port	Sea	2024
Description	The SOPOREM project aimed to increase renewable energy production in Koper Port and the Municipality of Koper, Slovenia. It involved constructing two large solar power plants: one at Koper Port (3.3 MW capacity) and another on the roof of a parking garage (459 kW capacity). The project aimed to reduce CO2 emissions by over 1,500 tons annually and improve energy independence. The project received funding from Iceland, Liechtenstein, and Norway through the EEA Financial Mechanism.			
Picture				
Estimated costs	2,128,624.00 EUR			
Standards used	No information			
Additional notes	/			
Implemented by	Port of Koper			
Information and contact	https://soporem.si/o-projektu/		Tina Bizjak tina.bizjak@luka-kp.si	



3.2. Environmental impact

Title	Holistic and green airports (OLGA)			
County of origin	Type	Transportation facility	Transport mode	Year of implementation
France	Air quality and GHG	Airport	Air	Ongoing (2024)
Description	OLGA's initiatives include CO2 reduction, air quality improvement, and biodiversity preservation, engaging the entire airport and aviation value chain. These sustainable impacts will be felt on local, national, and European scales, addressing societal, environmental, and economic dimensions. OLGA unites a wealth of expertise from airports, airlines, handlers, industry, research institutions, and Small and Medium Enterprises (SMEs) to tackle the complex climate challenge. Their solutions focus on efficient and carbon-neutral airport and airline operations, sustainable logistics, smart energy and mobility, intermodal passenger and freight transport, emission and air quality assessments, green construction, and circular end-of-life solutions. Their best practice consists of TaxiBot, which is a semi-robotic towing vehicle designed to move aircraft from the boarding gate (parking area) to a designated area near the runway threshold without using engine power. This innovative technology is expected to significantly reduce CO2 emissions, fuel consumption, and taxiway congestion, contributing to greener airport operations. The evaluation of this innovative solution's results is now underway, marking a significant step forward in sustainable aviation practices. Environmental Benefits: The main scope of the TaxiBot project is to significantly reduce the environmental impact of airport ground operations. By enabling aircrafts to taxi without using their main engines, the TaxiBot is expected to drastically reduce emissions of CO2 and Nox , which are major contributors to air pollution and climate change. In addition, the use of a TaxiBot should reduce noise pollution, creating a quieter environment for airport employees and neighbouring communities. Economic Benefits: The TaxiBot could also bring economic benefits by reducing engine operating time and saving fuel. While reducing the need for engine power during taxiing, the TaxiBot should reduce wear and tear on aircraft engines, thereby cutting maintenance costs and extending engine life.			



Picture		
Estimated costs	34,000,000,00 EUR	
Standards used	No information	
Additional notes	/	
Implemented by	Air France	
Information and contact	https://www.olga-project.eu/olympics-innovations/taxibot-to-allow-engine-off-taxiing	contact@olga-project.eu



Title				
Anima: Aviation noise impact management through novel approaches				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Slovenia	Noise and vibrations	Airport	Air	2020
Description	The ANIMA project aims to develop new methods, strategies, and tools to manage and mitigate the impact of aviation noise on people, especially as air traffic increases. It focuses on reducing the annoyance caused by aircraft noise rather than lowering the noise levels themselves, addressing both acoustic and non-acoustic factors that contribute to annoyance. The project explores why some individuals are more affected by noise than others, under similar conditions, and seeks ways to improve overall noise management. From the project ANIMA Ljubljana airport adopted three measures for dealing with noise annoyance of the population: 1) Night flying restriction (limiting the flying of noisy aircraft between 22:00-0:00 and not permitting the flying noisy aircraft between 0:00-6:00); 2) Vegetation noise barrier (growing trees in the noisiest places - to reduce the horizontal/ground aviation noise by 1-2dB when the trees are full-grown) 3) Airport Environmental Partnership (collaborative decision-making group made of all relevant stakeholders, established to develop standard noise policy. The outcomes of the partnership lead to less noise above populated areas in the vicinity of the airport).			
Estimated costs	N/A			
Standards used	No information			
Additional notes	/			
Implemented by	Airport Ljubljana			
Information and contact	https://anima-project.eu/		info@anima-project.eu	



Title				
Accelerate PoSitive Clean Energy Districts: ASCEND project				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Hungary	Renewable energy sources	Urban transport - combined terminal	Rail Road	on-going
Description	The ASCEND project aims to integrate various sustainable solutions for transformation of city districts into Positive Clean Energy Districts combining zero-carbon buildings, smart energy grids, decarbonised public spaces and mobility, and digital tools. Part of the project deals with decarbonisation of mobility and freight logistics. The large-scale implementation in Budapest focuses on Megyeri Street surrounding area, in the 4th district of Budapest. The area is 33ha, of which 282,259m² is green space. The main actions will cover a former school system, a church and an elderly care institution. With the end of ASCEND, the proportion of electricity consumption supplied by renewable energy systems will have reached a minimum of 30%. Additionally, there are plans to implement five storage and flexibility systems. The city aims to actively engage its residents in the development of a PCED through participatory budgets and collaborative design of solutions. The concept of Sustainable Urban Development will become the standard approach in urban development processes in Budapest.			
Picture				



Estimated costs	58,125.00 EUR	
Standards used	No	
Additional notes	/	
Implemented by	Municipality of Budapest	
Information and contact	https://www.ascend-project.eu/	Bálint Szemenyei balint.szemenyei@bkk.hu +367 03 903 595



Title				
Installation of photovoltaic (PV) panels on unused surfaces (OLGA)				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
France	Renewable energy sources	Airport	Air	Ongoing (2024)
Description	To enhance sustainability and operational efficiency, OLGA is proposing the innovative installation of photovoltaic (PV) panels on unused surfaces, such as the roofing of passenger boarding bridges. This solution aims to improve the sustainability of aircraft stands by integrating solar panels and an electric Ground Power Unit (eGPU) based on Nissan car batteries into the Passenger Boarding Bridge (PBB). This approach generates clean electrical energy to supply aircraft, reducing reliance on diesel-powered Ground Power Units (GPUs), significantly cutting CO2 emissions and noise. Additionally, the photovoltaic installation may serve as a solar shield, further reducing the need for thermal regulation within the PBB. This initiative highlights OLGA's commitment to sustainable aviation operations and energy efficiency. OLGA aims to propose significant improvements by installing solar panels on the PBB roof and side walls to generate electrical energy, charging a mobile eGPU integrated into the PBB. This eGPU (new ITW GSE GPU product, based on Nissan car batteries) using solar energy to cover 25% of the electrical needs of CODE C type aircraft parked on a contact station will replace conventional electrical 400Hz converters, supplying aircraft with necessary power while minimizing local emissions and nuisances. Additionally, the PV installation may serve as a solar shield, reducing the thermal regulation needs of the PBB.			
Picture				



Estimated costs	N/A	
Standards used	No information	
Additional notes	The project involves the installation of PV panels on the roof (36m²) of the boarding bridge. This solar installation is designed to supply power to medium haul stands with moderate rotations. The generated electricity will be used to charge an Electric Ground Power Unit (eGPU) integrated into the PBB, replacing the current electricity converters that are sources of local air pollution and other nuisances. The installation of the panels on a passenger bridge at Paris CDG is foreseen at the end of November, for a one-year test from December 2024 to December 2025.	
Implemented by	Groupe ADP DGAC ITW GSE	
Information and contact	https://www.olga-project.eu/olympics-innovations/solar-installation-on-passenger-bridge	contact@olga-project.eu



Title				
Fuel Cell Locomotives: Implementation of fuel cell-generated hydrogen in rail freight locomotives				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
France	Renewable energy sources	Railway terminal	Rail	2025
Description	In line with its supply chain decarbonization roadmap, Nestlé Waters will be the first company in Europe to benefit from the hydrogen fuel cell solution developed by Alstom and ENGIE, for rail freight. The purpose is to operate the first hydrogen-powered freight train from the Vosges plant, using a hydrogen generator wagon system developed by Alstom and supplied with renewable hydrogen by ENGIE, from 2025. This should enable Nestlé Waters to reduce emissions by 10'000 tons of CO2 equivalent per year compared to the current solution using diesel locomotives.			
Picture	 Copyright Alstom Advanced & Creative Design			
Estimated costs	N/A			
Standards used	No			
Additional notes	/			
Implemented by	Alstom + Nestlé			
Information and contact	https://www.alstom.com/press-releases-news/2022/11/2025-nestle-waters-france-will-use-first-hydrogen-powered-freight-train-through-innovative-solution-developed-alstom-and-engie		Philippe Molitor (Alstom) philippe.molitor@alstomgroup.com	



Title				
Clean Berth - Cross-border institutional cooperation for ports environmental sustainability and energy efficiency				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Slovenia	Spills or incidents	Sea port	Sea	2014-2022
Description	This project, co-financed by the Interreg V-A Slovenia-Italy 2014-2020 program, focused on sustainability and energy efficiency at ports. Activities included the installation of a radar system for monitoring pollutant spills in the sea and the installation of wall-box plug-ins for electric cars. This was aimed at reducing the environmental impact of the ports and promoting cross-border cooperation in environmental sustainability and energy efficiency.			
Picture				
Estimated costs	881,842.06 EUR			
Standards used	No information.			
Additional notes	/			
Implemented by	Port of Koper			
Information and contact	https://www.luka-kp.si/en/news/ports-in-north-adriatic-for-closer-cooperation-on-environmental-and-energy-projects/ https://2014-2020.ita-slo.eu/en/clean-berth		Richter Roberto roberto.richter@luka-kp.si	



Title				
Green and intermodal solutions for Ports and Airports (ADRIGREEN)				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
EU	Waste management	Airport	Air	2008, 2010, 2013, 2019
Description	From the previous BP, from the project ADRIGREEN they have searched up several reference studies aimed at waste management in airports. Best practices from several reference studies are: 1) Economic incentive for recycling more and generating less waste (promoting waste prevention and recycling) (London Stansted Airport 2010); 2) Disposable plastic cutlery and beverages replaced with easily degradable materials (Glasgow Airport 2019) 3) Training of employees on recycling (promoting waste recycling) (London Stansted Airport 2010; Airport International Council) 4) Use construction waste and amend construction standards to reflect best practice in material reuse (London Stansted Airport 2010) 5) Use of environmentally friendly asphalt for repaving parking lots and runways (Hamburg, Frankfurt Munich and Cambridge Airports 2008; Logan international airport 2008)			
Estimated costs	N/A			
Standards used	No information			
Additional notes	/			
Implemented by	Different organisations			
Information and contact	https://programming14-20.italy-croatia.eu/web/adrigreen		Nina Vojnić Žagar Nina.Vojnic@airport-pula.hr	



Title				
Waste sorting facility at Budapest airport				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Hungary	Waste management	Airport	Air	2008, moved to a new site: 2012, some continuous process development throughout the years
Description	The recyclable waste is sorted at the airport in a manual pre-sorting station which is operated by a third party. The selected waste is then transported to off-site facilities for further handling. In 2023, 2837 tons of waste was generated in the area of Budapest Airport by passengers and third parties during their activities at the airport premises (excluding hazardous waste, for which only the airport operator's data are featured in the report). Typical types of waste and the activities that generate them include: - Terminal operations, catering and commercial activities: packaging and food waste - Waste from aircraft: packaging and food waste - Cargo handling: packaging waste - Maintenance works: equipment, machine parts, oil rags, fluorescent tubes and other hazardous waste. The recyclable waste is sorted at the airport in a manual pre-sorting station operated by a third party. Selected waste is then transported to off-site facilities for further handling, in line with the new MOHU (National Waste Management Company) concession introduced in Hungary from July 2023. Proper waste management is controlled in cooperation by environmental specialists and BUD's head of terminal services. Waste is handed over to third parties with licenses in all cases. Furthermore, in order to ensure the proper flow of waste management activities, regular meetings are held with external waste management partners to assess the quality of the service and identify improvement measures. If needed, internal partners (tenants) are also consulted and changes are made. The premises of BUD's waste management partners as well as the airport sorting facility are regularly inspected. Besides, documents relating to the handling and transportation of waste (i.e. delivery notes, weighing slips) are checked, while data on the communal waste handled is received monthly and archived in the central databases. Cooperation with Partners: The measures taken to make waste management more efficient and sustainable have yielded results. Single use plastics have			



been phased out, the waste sorting plant has been refurbished and recycling rates have continued to increase, all of which has been supported by our partners' increasing commitment to sustainability. In 2023, BUD's waste collection and manual pre-sorting partner (FCC Magyarország Kft.) upgraded its infrastructure to increase efficiency and replaced its previous waste collection vehicle with a compactor garbage truck. The new vehicle has made waste collection and disposal more sustainable, as it can collect waste in fewer rounds. To increase the share of waste collected selectively by partners, BUD transports recyclable waste free of charge and supplies partners with recycling bins, to help them manage their waste more sustainably. Budapest Airport's waste management and terminal operations staff are always ready to support our partners' sustainability efforts.

Picture



The sign on the trash cans on the terminal says "We'll sort the waste for you".



Estimated costs N/A



Standards used	No information	
Additional notes	N/A	
Implemented by	Budapest Airport	
Information and contact	https://budplanet.hu/en/waste-treatment	Zita Szederkényi Zita.Szederkenyi@bud.hu



Title				
TRENITALIA: Trenitalia implementation of the SAP SuPM Platform				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Italy	Other	Railway terminal	Rail	2011
Description	In 2011, Trenitalia, Italy's leading train operator, launched the "Implementation of the Sustainability Performance Management Process (SAP SuPM) IT platform" to enhance its environmental management and sustainability efforts. This innovative platform enabled Trenitalia to systematically monitor, manage, and improve its sustainability performance across its operations. By integrating environmental, social, and governance (ESG) metrics into its decision-making processes, Trenitalia was able to implement more effective and sustainable policies. The success of this initiative is reflected in several key achievements. Trenitalia's parent company, FS S.p.A., obtained ISO 14001 certification for its Environmental Management System, demonstrating compliance with international standards for environmental management. Additionally, Trenitalia's Sustainability Report achieved the GRI (Global Reporting Initiative) level A+ certification, underscoring the company's commitment to transparency and sustainability. By 2020, Trenitalia had further solidified its environmental credentials by reaching an A- level in the Carbon Disclosure Project (CDP), highlighting its significant progress in reducing carbon emissions and addressing climate change. This platform and the subsequent certifications exemplify Trenitalia's leadership in integrating sustainability into its core business strategy.			
Picture	The infographic illustrates a sustainable railway terminal. It features a large orange building with solar panels on its roof, a wind turbine, and a train. People are shown using public transport, including a car and bicycles. The background shows a city skyline. Text boxes highlight key features: 'Sustainable and Energy Efficient', 'Renewable Energy', 'Sustainable Transport', 'Sustainable Infrastructure', and 'Sustainable Environment'.			
Estimated costs	N/A			
Standards used	Yes			



Additional notes	/
Implemented by	Trenitalia
Information and contact	https://www.fsitaliane.it/content/fsitaliane/en/sustainability.html https://www.fsitaliane.it/content/fsitaliane/en/sustainability/environmental-commitment/environmental-management-system.html https://www.fsitaliane.it/content/dam/fsitaliane/en/Documents/commitment/sustainability-report/2017_FS_Italiane_Sustainability_Report.pdf



3.3. Management systems

Title				
Creating the E-Mobility Strategy of Budapest: E-Mobility Strategy under the USER-CHI project				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Hungary	Electrical energy	Urban transport - combined terminal	Rail Road	on-going (2024)
Description	In the H2020 USER-CHI project, the city of Budapest will create its E-Mobility Strategy. The strategy examines the European Union and national regulatory environment, reviews the current situation of electromobility in the capital city of Budapest, reviews EU and national trends in electromobility and electric transport, the related infrastructure (software and hardware) conditions, examines the different market and operational models, and identifies the possible role of Budapest in this context. Furthermore, the strategy analyses the stakeholders of electromobility, and defines the main KPIs related to this field, their targets and their integration into higher level strategies (Budapest Mobility Plan - BMT, Sustainable Energy and Climate Action Plan of Budapest - SECAP). Finally, this strategy analyses in detail the energy links and interrelationships of electromobility, and performs an opportunity analysis, defines action plans to achieve the targets.			
Picture				
Estimated costs	50,000.00 EUR			
Standards used	No			
Additional notes	/			

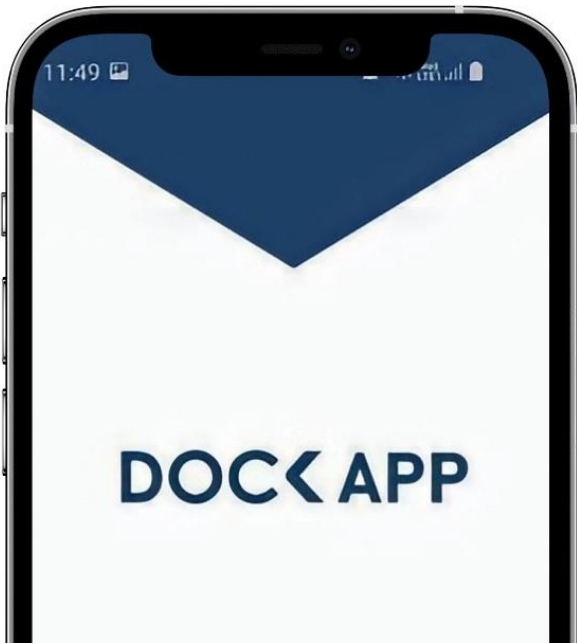


Implemented by	BKK	
Information and contact	https://www.userchi.eu/	Bálint Szemenyei balint.szemenyei@bkk.hu +367 03 903 595



Title				
Energy Efficiency for Public Transport Infrastructure in Central Europe: Action Plan in the EfficienCE project				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Hungary	Renewable energy sources	Urban transport - combined terminal	Rail Road	2022
Description	A transnational guide and four transnational handbooks were prepared within the EfficienCE project and translated in all Central European languages. The transnational guide on recommendations for policies, legal and institutional frameworks describes the project's activities and results in developing the action plans and implementing pilots to 1. increase the share of RES (renewable energy sources) integration, 2. enable multipurpose usage of PT infrastructure, and 3. share and use data to plan for energy-efficient public transport infrastructure. The document contains the partners' recommendations based on their approaches to public transport infrastructure planning, testing, and evaluation.			
Picture				
Estimated costs	123,975.00 EUR			
Standards used	No			
Additional notes	/			
Implemented by	BKK			
Information and contact	https://bkk.hu/en/about-bkk/strategy/research-development-and-innovation/completed-projects/efficiency/		Bálint Szemenyei balint.szemenyei@bkk.hu +367 03 903 595	



Title				
DOCK App: Navigation application for truck traffic within Csepel Freeport				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Hungary	Other	Inland waterways port	Road	2019
Description	The Csepel Freeport has a navigation application (DOCK App) functioning as an intelligent system, developed based on a third-party mapping service solution. The solution used by the Csepel Freeport utilizes open-source map data (OpenStreetMap), which can be edited and updated with roads, buildings, gates, and traffic regulations. The digitalized positions of the tenants can also be integrated into this solution as a list/database, allowing anyone visiting one of the tenants of the Csepel Freeport to plan their route in advance and reach the tenant's site using the mobile application. Additionally, the system can track individual loading times, which can assist in making future decisions (e.g., calculating buffer times, redirecting drivers), potentially reducing traffic congestion within the port. There are several possibilities for further developing the application, including expanding the types of data collected (e.g., available parking spaces), uploading information for tenants and road carriers, and developing new functions (e.g., a call-in system).			
Picture				
Estimated costs	100,000.00 - 120,000.00 EUR			
Standards used	Yes			
Additional notes	The DOCK App mobile application is an integral part of the automatic admission and traffic management system of the Budapest Freeport Logistics			



	and Industrial Park (DOCK) operated by Budapesti Szabadkikötő Logisztikai Zrt. (BSZL Zrt.). The application was developed as part of the CE-1278 CORCAP project supported by Interreg CENTRAL EUROPE with the aim of helping to orientate and support traffic management in the freeport area. Drivers arriving at DOCK tenants can plan transport addresses along the route that help not only navigation but also through the app. The app can be downloaded in the AppStore or Google Play	
Implemented by	Freeport of Budapest Logistics Ltd.	
Information and contact	Dock App - Budapest Dock (bszl.hu)	Attila Juhász



3.4. Combination

3.4.1. Energy consumption + Environmental impact

Title				
AEROPORTO MARCONI CARBON NEUTRAL: Participation of Bologna's G. Marconi Airport in the 'D-Air' (Decarbonated Airport Region) project in the Interreg IVC (ERDF) programme				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Italy	Other - CO2 reduction	Airport	Air	2012
Description				
The "Marconi Airport Carbon Neutral" project, part of the dAir (Decarbonated Airport Regions) program, is an initiative by Bologna's Guglielmo Marconi Airport aimed at achieving carbon neutrality. The project focuses on reducing CO2 emissions through a series of sustainable actions, including energy efficiency improvements, the use of renewable energy sources, and the adoption of electric vehicles for airport operations. Key measures include the installation of photovoltaic panels, upgrading lighting systems to energy-efficient LEDs, and optimizing heating and cooling systems. Additionally, the airport has implemented a comprehensive waste management system and promotes sustainable transportation options for passengers and staff, such as electric shuttle buses and carpooling initiatives. Through these efforts, on 2022 Marconi Airport successfully achieved ACA (Airport Carbon Accreditation) Level 3+ certification, the highest recognition for carbon neutrality in airports. The project underscores the airport's commitment to environmental stewardship and aligns with broader regional and global goals for reducing the aviation sector's environmental impact. By setting an example in sustainability, the Marconi Airport initiative contributes to the ongoing transformation of airports into greener and more eco-friendly transportation hubs.				
Picture				
				



Estimated costs	N/A
Standards used	Yes
Additional notes	/
Implemented by	Guglielmo Marconi Airport
Information and contact	https://www.bologna-airport.it/en/the-company/press-room/news/bologna-airport-obtains-the-level-3-neutrality-environmental-certification-from-aci-europe-/?idC=62350&idO=2388055 https://www.bologna-airport.it/en/innovability/sustainability/environment-e-energy/our-activity/?idC=62379 https://sit.comune.bologna.it/alfresco/d/d/workspace/SpacesStore/c7f85c2d-8995-4a2b-a689-3ddaeb19291d/AccordoTerritorialeDecarbonizzazioneMarconi_def1.pdf



Title				
LEED Environmental certification in real estate development				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Hungary	Other	Inland waterways port	All	2015 2017
Description	One of the main activities of the Csepel Freeport is real estate development, offering customized and green logistics solutions. The C1 and E2 warehouses are LEED Silver certified, meaning they meet environmental standards aimed at minimizing and preventing environmental pollution (such as soil erosion, pollution of natural waters, and dust pollution) during the building's construction process. The buildings are easily accessible via various public transportation methods, and priority parking spaces are provided for low-emission and fuel-efficient vehicles, accounting for 5% of the total parking capacity. With this certification, the Freeport commits to planting native or naturalized plants on the property, reducing light pollution at night, selecting water-efficient appliances and fixtures to reduce indoor water usage, prioritizing the purchase and use of green energy during property operation, ensuring easily accessible waste-sorting facilities for building users, and striving to use rapidly renewable materials (<10 years) during construction. To promote a healthier working environment, smoking is only allowed in designated areas.			
Picture				
Estimated costs	100,000.00 - 120,000.00 EUR			



Standards used	Yes	
Additional notes	/	
Implemented by	Freeport of Budapest Logistics Ltd.	
Information and contact	https://bszl.hu/en/fejleszteseink/	Attila Juhász



Title				
BREEAM Environmental certification in real estate development				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Hungary	Other	Inland waterways port	All	2016
Description	The port area includes properties registered with the BREEAM (Building Research Establishment Environmental Assessment Method) environmental certification system, supporting buildings with reduced energy consumption, solutions for reducing water usage, and investments that do not require new greenfield development but instead are realized as brownfield projects, thereby having a smaller environmental impact. The certifications for these warehouses also guarantee a high standard of occupational safety. The materials used for interior paints and coatings must meet specific VOC emission limits. At least 90% of workstations feature individually controllable lighting systems. Additionally, 75% of workstations and other regularly used areas are ensured proper daylighting, making the jobs available at the Freeport more attractive compared to those of market competitors.			
Picture				
Estimated costs	150,000.00 - 170,000.00 EUR			
Standards used	Yes			
Additional notes	/			
Implemented by	Freeport of Budapest Logistics Ltd.			
Information and contact	https://bszl.hu/en/fejleszteseink/		Attila Juhász	



3.4.2. Electrical energy + Renewable energy sources

Title				
Electric tractors, vehicles and machines in airports and ports (ADRIGREEN)				
County of origin	Type	Transportation facility	Transport mode	Year of implementation
Italy Croatia	Electrical energy	Airport	Air	2019 - 2022
Description The ADRIGREEN project, approved under the INTERREG V-A Italy-Croatia CBC Programme 2014-2020, aimed to improve the integration of Croatian and Italian ports and airports with other modes of transportation to enhance passenger handling during summer seasons and improve environmental performance in the Adriatic maritime and aviation systems. The project focused on adopting and implementing operational and technological solutions that could easily be transferred and adapted to improve intermodal connections and sustainable management of ports and airports. The overall objective was to demonstrate the feasibility, effectiveness, and replicability of identified solutions, and to disseminate these practices to other ports and airports. The best practices that were implemented in the project were: 1) Electric tractors at Rimini Airport (2021) - Mentioned airport replaced diesel tractors with electric tractors for aircraft handling operations. This change was aimed at significantly lowering CO2 emissions and energy consumption. The initiative improved airport's overall environmental performance contributing to a zero-emission strategy. 2) Electric Vehicles at Dubrovnik Airport (2021) Dubrovnik airport introduced electric vehicles, including an electric vehicle for waste management, a vehicle for the ICT department and electric scooters / bicycles for use by airport staff. This initiative helped reduce CO2 emissions and energy consumption. 3) Electric cleaning machine and scooters at Pula port (2021) - Mentioned airport introduced an electric cleaning machine for the coastal wall and pier, as well as electric scooters /bicycles for staff for faster and cleaner operations. This practice aimed to reduce CO2 emissions, fuel consumption and maintenance costs while promoting sustainable environmental policy.				



Picture		
Estimated costs	2,104,217.00 EUR	
Standards used	No information	
Additional notes	/	
Implemented by	Rimini Airport (IT) Dubrovnik Airport (HR) Pula Airport (HR)	
Information and contact	https://programming14-20.italy-croatia.eu/web/adrigreen	Nina Vojnić Žagar Nina.Vojnic@airport-pula.hr



3.4.3. Decreasing water consumption + Decreasing fossil fuels consumption

Title	Decreasing the fossil fuel and water consumption in airports and ports (ADRIGREEN)			
County of origin	Type	Transportation facility	Transport mode	Year of implementation
EU	Decreasing Water and fossil fuels consumption	Airport	Air	2013
		Sea port	Sea	2018-2019
Description	From the previous BP, from the project ADRIGREEN they identified several reference studies aimed at decreasing the fossil fuel and water consumption:			
	Decreasing fossil fuel consumption: 1) Purchase of electric vehicles (Copenhagen airport 2018) 2) Provide charging stations for electric vehicles (Helsinki airport 2019) 3) Anti-idling communications campaign (Copenhagen airport 2018) 4) Use of alternative renewable fuels (diesel from waste and residue) for diesel vehicles. (Helsinki Airport and other Lapland Airports (2018) Decreasing water consumption: 1) Monitoring of water consumption (Port of Venice) 2) Rainwater reuse 3) Surface water and groundwater quality monitoring 4) Ships reward system to reduce consumption (Port of Rotterdam) 5) Wastewater treatment plant (Port of Nantes-Saint Nazaire) 6) Surface water and groundwater quality monitoring 7) Organize training and education of port staff 8) Monitoring of water consumption and leaks (Manchester airport, London Heathrow international airport 2013)			



Picture		
Estimated costs	N/A	
Standards used	No information	
Additional notes	/	
Implemented by	Different organisations	
Information and contact	https://programming14-20.italy-croatia.eu/web/adrigreen	Nina Vojnić Žagar Nina.Vojnic@airport-pula.hr