

Action Plan for enhancing
environmental sustainability and
energy efficiency for the port of
Ancona
D.3.3.6

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1. Introduction

This document has been drawn up as specified in the “Cross-border model of an action plan for enhancing port environmental sustainability and energy efficiency (D.3.3.1)” to illustrate the Action Plan of the Port of Ancona, developed from the results of the analysis of the “carbon footprint” (D.3.2.2) and of the best practices already underway to define the measures that in the medium and long term can face the critical issues identified within the Territorial Needs Assessments (TNA) of the port.

As reported in the TNA, the carbon footprint of the Port of Ancona includes two types of emissions:

- terrestrial emissions, related to the relevant emission sources on land-side of the port area;
- maritime emission, related to the relevant emissions sources on sea-side of the port area.

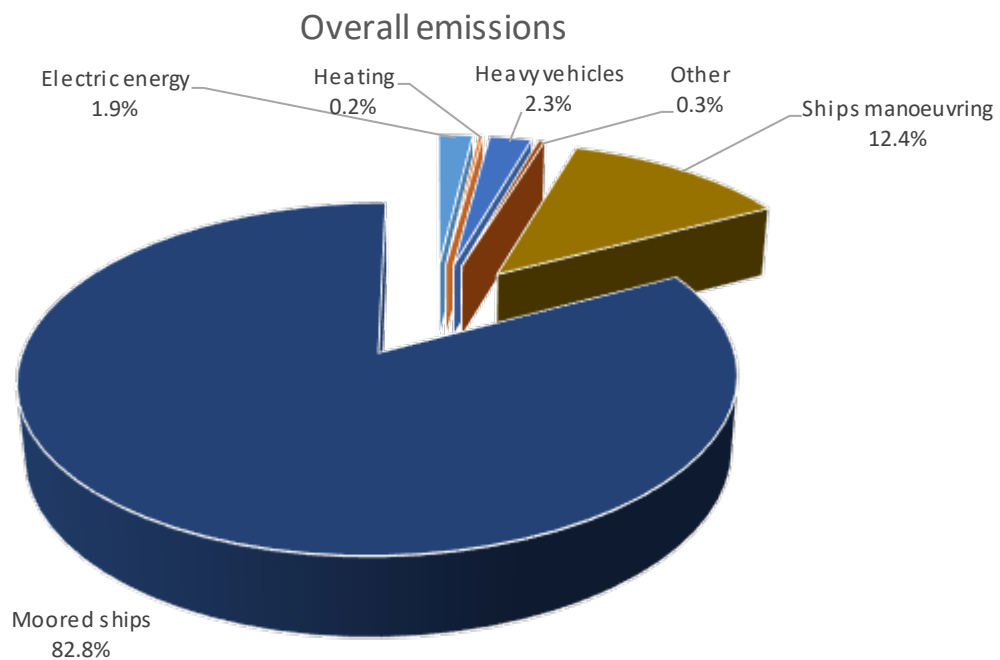
The total emissions of greenhouse gases related to the port of Ancona are shown in Table 1 and Figure 1. The overall emissions are mainly due to ships at berth, responsible for almost 83% of the total amount, and, generally, maritime emissions represent more than 95% of total emissions. Road traffic in the port area is responsible for less than 3% of total emissions while direct and indirect emissions related to buildings and public lighting plants represent almost 2% of total emissions.

Category	t CO_{2eq}	%
Electric energy	541.47	1.9%
Heating	69.80	0.2%
Service vehicles		0.0%
Operational port vehicles		0.0%
Heavy vehicles	666.07	2.3%
Naval port service (e.g. pilot/tug)		0.0%
Railway tractors		0.0%
Other	98.40	0.3%

Table of the overall percentage ratios of all GHG Emissions from the Port of Ancona in 2019		
Category	t CO _{2eq}	%
Anchored ships		0.0%
Ships manoeuvring	3'576.01	12.4%
Moored ships	23'797.57	82.8%
TOTAL	28'749.32	100%

Table 1 - Summary table of direct and indirect emissions from the Port of Ancona, divided by categories and activities, for the year 2019 ("Territorial needs assessments of the Port of Ancona" – 2020)

Figure 1 - Percentage distribution of total emissions by category



Starting from the results obtained with the emission inventory and the estimation of the carbon footprint of the Port of Ancona, in the following chapters the planned actions are described and their reduction impact on emissions is considered.

2. Weaknesses and Threats of the SWOT analysis included in the TNA

The SWOT analysis carried out in the TNA of the Port of Ancona (D.3.2.2) has identified some weaknesses and threats, as shown in the table below.

	Positive Impact	Negative impact
Internal factors	STRENGTHS	WEAKNESSES
	<ol style="list-style-type: none"> 1. Strategic role and position of the port on the Italian Adriatic coast 2. Port Environmental Energy Plan in preparation (DEASP – Documento di pianificazione Energetico Ambientale del Sistema Portuale) 	<ol style="list-style-type: none"> 1. Direct/indirect emissions due to port facilities represent only the 2% of total emissions
External factors	OPPORTUNITIES	THREATS
	<ol style="list-style-type: none"> 1. Cold ironing of Ancona’s port could represent an important opportunity for reducing air pollutant emissions and GHGs emission if electricity is, at least partially, produced with renewables 	<ol style="list-style-type: none"> 1. More than 80% of total emissions of the port are due to ships at berth, that are not under the control of the port authority

Table 2 - SWOT analysis (“Territorial needs assessments of the Port of Ancona” – 2020)

This Action Plan aims to tackle the following items of the SWOT analysis:

1. Impact of emissions due to ships at berth (threat No. 1);
2. Impact of direct/indirect emissions due to port facilities (and vehicles, weakness No. 1).

In the following chapters, the actions identified by the Central Adriatic Ports Authority to answer to these specific problems are described in detail.

3. Actions for environmental sustainability and port energy efficiency

The actions identified by the Central Adriatic Ports Authority to be taken to improve environmental sustainability and port energy efficiency are listed in the following table.

Action	Item of the SWOT Analysis	Emission savings (t CO _{2eq})	% of TNA
a. Cold ironing	Threat No. 1	2'100 ÷ 5'400	7% ÷ 19%
b. Replacement of 4 light towers	Weakness No. 1	0.5	< 0.1%
c. Purchase of 2 electric vehicles	Weakness No. 1	Not estimated	-
d. Feasibility study on supply of alternative fuels	Weakness No. 1	Not estimated	-

Table 3 – Summary of the actions included in the Action Plan

The Action Plan includes 4 actions: one of them (“Cold ironing”) is meant to be the principal one, due to the amount of emission savings that could be achieved through its realization; two actions (letters b and c) have instead a pure symbolic meaning, due to the presence of other actions of the same kind already founded by different projects currently in progress, the effects of which have therefore not been considered in this document; finally, the last one (“Feasibility study on supply of alternative fuels”) has not been estimated in terms of emission savings as it has not yet been possible to define a detailed strategy on this topic, due to the recent evolution of the regulatory context.

More details on actions and specific data sources employed to estimate the related emission savings are provided in the paragraphs below.

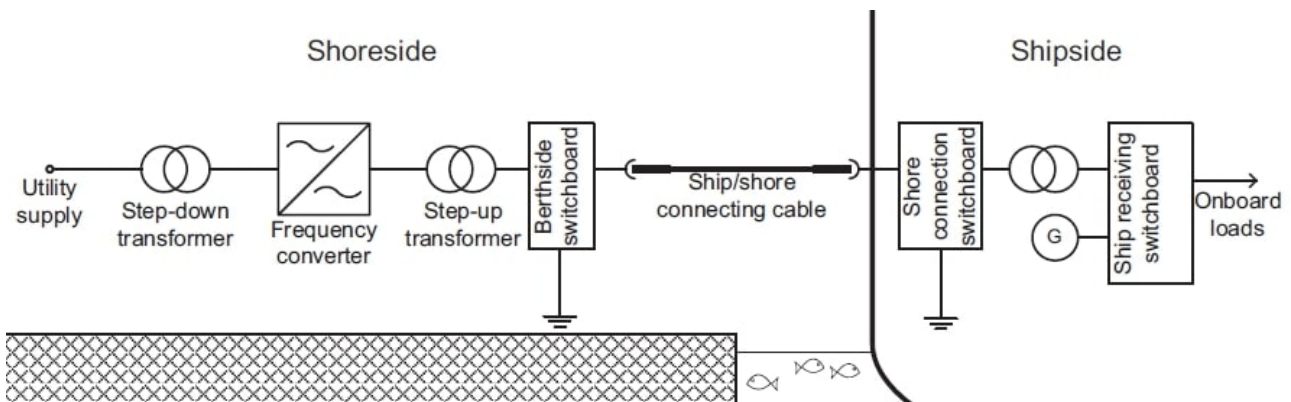
a. Cold ironing

One of the possible solutions that could reduce the amount of emissions of ships at berth, also discussed in the draft of the DEASP currently in its final phase of preparation, is the electrification of the docks dedicated to the mooring of ships (the so called “cold ironing”). Auxiliary diesel generators that power cargo handling equipment and other ship’s services while in port are the

primary source of both GHGs and air pollutants emissions from ships at berth. Cold ironing mitigates harmful air and acoustic emissions from diesel engines by connecting a ship’s load to the electrical network based at port, neutralising direct air pollutants emissions, eventually with a shore-based source of electrical power, such as cogeneration systems or renewable energy plants (e.g. photovoltaic systems), that could drastically reduce also indirect GHGs emissions. By creating an infrastructure that allows a ship set up for connection to connect to the port electricity grid during the mooring phase, the ship could switch off the engines remaining operative for all activities on board and on the quay.

Since more than 80% of Port of Ancona total GHGs emissions is due to ships at berth, this solution could lead to their significant reduction, if eventually partially covered with renewables. Indeed, as already cited, this solution has a great potential in terms of benefits to air quality, but also to noise reduction. In this sense, for port located near the city centre, such as the Port of Ancona, this latter factor is of fundamental importance.

Figure 2 – Functional diagram of cold ironing



The following paragraphs provide all the available information related to this topic that led to the estimation of the emission saving potential.

i. Estimates reported in previous studies

One of the planned interventions reported in **DEASP draft** between the ones promoted by public entities is the electrification of dock No.17. The proposed intervention consists of obtaining a new supply of electricity divided into three separate electrical points of delivery (POD) of about 70 kW each (three-phase 400V, 50Hz). Moreover, in order to ensure power supply for all ships, a frequency converter must be installed. The expected investment is around € 300'000, with a technical life of the project of 25 years, and it has been assumed that the construction of the intervention could start in 2022 and end in 2023. As reported in the document, this proposal could lead to energy savings equal to 240.2 MWh/year, which is equivalent to a reduction in emissions of 66 tons of CO₂ (less than 1% of total emissions of moored ships), 0.04 tons of PM_{2.5} and 0.13 tons of NO_x.

The Central Adriatic Ports Authority has deepened the cold ironing item through a **feasibility study drawn up in collaboration with the Università Politecnica delle Marche**. The evidence relating to the Ancona Pollution Project (PIA, "Progetto Inquinamento Ancona"), an agreement between the Marche Region, the Municipality of Ancona and the Central Adriatic Ports Authority, has clearly shown that the emissions of moored ships have the greatest impact on the surrounding inhabited areas. The supply of electricity from the quay could therefore bring a significant benefit to the air quality of the city of Ancona and certainly significantly reduce emissions from the port area. The study aimed to identify the most suitable plant solutions for meeting the various energy requirements of ships while stationed in ports. In the port of Ancona, the docks to which this technology should be applied have been identified, in order to analyse the frequencies of the traffic and define the energy needs of the ships that moor there. The docks subject to intervention are Nos. 8, 9, 11, 13, 15 and 16. The choice of applying this solution to the docks intended for ferry traffic is linked to the fact that the structures used for this type of traffic are characterized by a fairly regular frequency of arrivals and departures, albeit variable during the seasons of the year, and do not require particularly high powers.

In addition to the estimate reported in DEASP draft, the Central Adriatic Ports Authority has proposed another project within the Mission 3 – Component 2 – Investment 1.1 of the National Recovery and Resilience Plan (PNRR, Piano Nazionale di Ripresa e Resilienza): **“Green ports: renewable energy and energy efficiency interventions at ports”**. This proposal (“Porto di Ancona: obiettivo Smart Grid”) involves the constructions of 2 electrical backbones (circuit “A” and “B”) in order to eliminate most of the spot supplies, required over the years and currently present in the port, and the reorganization of power supplies for public lighting, cargo handling cranes, water lifting systems, air conditioning systems, fire-fighting systems, special security systems (such as video surveillance, gates, bars, access control, etc.), electrification of the docks (powering self-propelled cranes - currently fossil fuel).

The proposed intervention will allow to rationalize and make the current power supplies and distribution networks more efficient for port activities, enhancing the energy infrastructure in anticipation of the electrification of the docks. The objective of the investment, quantified in about 8.4 million euros, is to reduce greenhouse gas emissions by minimizing dependence on fossil fuels and the environmental impact associated with port activities. The project proposal foresees a reduction of electricity consumption due to buildings and public lightning, estimated in 560 MWh/year, which leads to a decrease of the indirect emissions equal to 161 tons/year of CO_{2eq} (30% of the total emissions due to electricity consumption, 11% of the total terrestrial emissions and 0.5% of total emissions reported in the TNA).

ii. Estimation of the emission saving potential

The effects on emissions deriving from the implementation of a cold ironing project depends on many factors, including for example:

- the reluctance of shipowners to install the necessary arrangements on their ships;

- the inclusion of renewable generation (e.g. photovoltaic systems, cogeneration) as part of a cold ironing project;
- the number of docks included in the project.

Therefore, a maximum emission reduction potential has been estimated starting from the results reported in the TNA (based on data collected by Central Adriatic Ports Authority about each ship at berth during the year 2019), considering different hypothesis and methods. In particular, more than 80% of total emissions of the port of Ancona are due to ships at berth (equal to about 24 thousand tons of CO_{2eq}) and about 20 thousand tons of CO_{2eq} are due to auxiliary engines (69% of total emissions in the port). The primary energy consumptions of auxiliary engine during the hotelling phase are approximately equal to 88 GWh while the hypothetical energy amount provided, estimated from the auxiliary power reported in the TNA, is equal to about 54 GWh. Considering the emission factor estimated by ISPRA (Istituto Superiore per la Protezione e la Ricerca Ambientale) for consumption of electricity used in the TNA (268.6 g CO₂/kWh¹, reference year: 2019), the following two hypothesis has been evaluated:

1. Electric energy consumption after the electrification of all the docks will be equal to the current hypothetical energy amount provided by auxiliary engine;
2. Electric energy consumption after the electrification of all the docks will be equal to the primary energy used by auxiliary engine multiplied by an estimated efficiency of the engine, cautiously assumed equal to 75%.

As shown in Figure 3, in both cases the effect of cold ironing is positive, with a reduction of emissions equal to about 5'400 t CO_{2eq} and to about 2'100 t CO_{2eq}, respectively (corresponding to 23% and 9% of total emissions due to ships at berth – 19% and 7% of total emissions of the port). In fact, the use of electricity allows to neutralise direct emissions causing air pollution at port and partially reduce

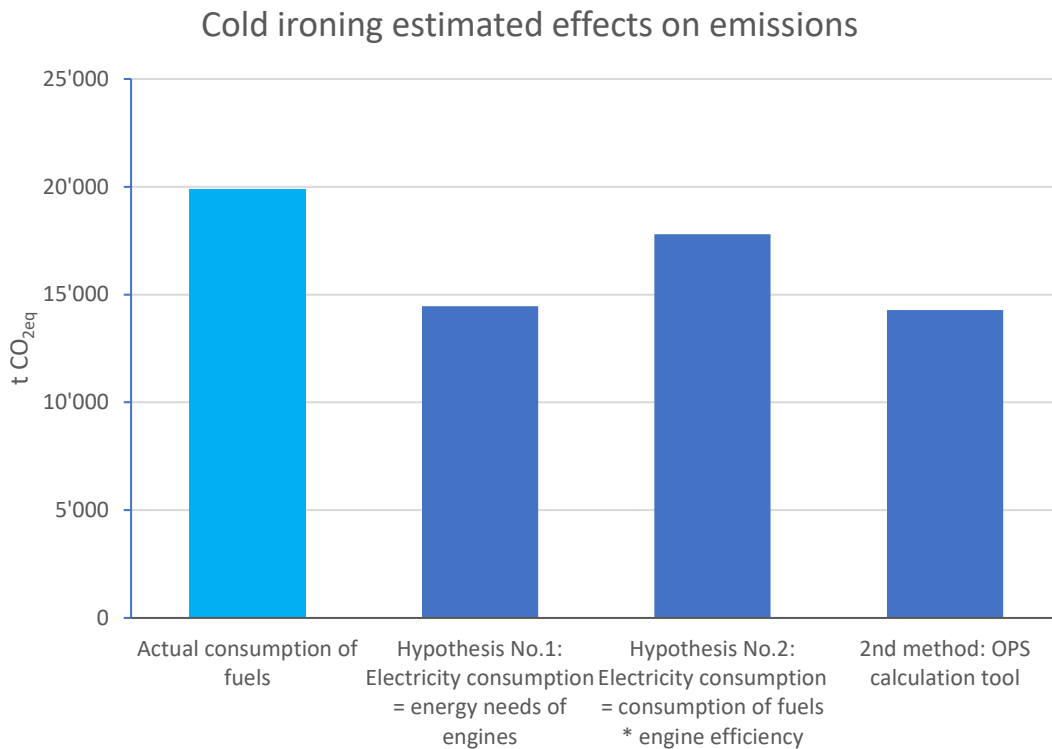
¹ “Emission factors for the production and consumption of electricity in Italy” (ISPRA, 2021)

GHGs emissions due to indirect emissions thanks to a lower emission factor. Better results are achievable through the integration of renewable sources in the project, which would make it possible to reduce the emission factor of the electricity consumed in the port.

Another estimation has been carried out using the “OPS² calculation tool”, an electronic sheet available on the website <https://sustainableworldports.org/ops/>, created by one of the first working groups that was established under the umbrella of the International Association of Ports and Harbours (IAPH) World Port Climate Initiative (WPCI). The website provides a wealth of practical information about OPS for seagoing vessels as a measure to improve air quality in ports and port cities and reduce emissions of air pollutants and noise and to a lesser extent carbon dioxide, by replacing onboard-generated power from diesel auxiliary engines with electricity generated onshore. The emission benefits are estimated by the tool from total annual consumption, calculated on the basis of the number of ships per category (RoRo, Container and Cruise) and the number and duration of the port calls. The result obtained using the same data about ship traffic used in the TNA and considering natural gas as main energy source used for power generation is shown in the last column of the histogram reported in Figure 3: the expected emissions are equal to about 14 thousand of CO_{2eq}, with a reduction equal to 24% of emissions of ships at berth and 20% of total emissions of the port, consistent with the previous estimations.

² Onshore Power Supply

Figure 3 – Emission savings deriving from the implementation of cold ironing estimated according to different methodologies and hypotheses



b. Replacement of 4 light towers

Since the TNA of the Port of Ancona has reported that indirect emissions related to buildings and public lighting plants represent almost 2% of total emissions, the replacement of light towers has been considered. With specific reference to the lighting in use in the areas of competence of the Port of Ancona, the replacement of the lighting towers and most of the lighting placed on poles or buildings with LED technology lamps has already been planned, with a significant forecast saving of electricity consumption. In fact, replacing sodium lamps with LED lamps leads to a significant reduction in installed power. Furthermore, the presence of LEDs allows a significant reduction in the hours of operation at full power, thanks to the installation of operating regulators that allow the

power to be modulated according to the lighting needs, which varies considerably depending on the variation of the traffic and consequently of the needs during the night.

The action here described refers to the replacement of 4 light towers in the area known as “Darsena Commerciale”, in particular light towers No. 5, 7, 8 and 12, already ongoing. This project is part of a wider plan of requalification of the public lighting systems in the Port of Ancona proposed within the Mission 3 – Component 2 – Investment 1.1 of the National Recovery and Resilience Plan (PNRR, Piano Nazionale di Ripresa e Resilienza): “Green ports: renewable energy and energy efficiency interventions at ports”. This proposal (“Porto di Ancona: obiettivo zero emissioni – illuminazione”) aims to substitute all the current lamps with LEDs. The cost for the replacement of the 4 light towers mentioned before, which also includes the reconstruction of the foundations, is equal to 422’849 €. The estimation of the emission reduction generated by the replacement of the 4 light towers has been carried out using the same methodology adopted for the Green Ports project, based on the power of the light system and the operative time before and after the intervention. The expected results are shown in the following table.

Indicator	Before the intervention	After the intervention	Percentage reduction
Energy consumption (kWh/year)	4’000	2’010	-49.8%
Estimated CO ₂ emissions (kg/year)	1’065.3	535.3	-49.8%

Table 4 - Expected results due to replacement of 4 light towers

The expected emission reduction is about 0.5 tons of CO_{2eq}, equal to 0.1% of emissions related to the electricity consumption in the Port of Ancona.

c. Purchase of 2 electric vehicles

The Central Adriatic Ports Authority has foreseen specific actions to raise the awareness of port operators on the use of electric vehicles within the draft of the DEASP currently in preparation, in

order to achieve the objective of reduction of current energy needs. In particular, the replacement of 3 old vehicles with new electric vehicles has been estimated among the interventions founded by public entities, more specifically proposing a project within the Mission 3 – Component 2 – Investment 1.1 of the National Recovery and Resilience Plan (PNRR, Piano Nazionale di Ripresa e Resilienza): “Green ports: renewable energy and energy efficiency interventions at ports”.

Regarding the SUSPORT Project, the Central Adriatic Ports Authority proposes to purchase 2 additional vehicles powered by electric energy instead of fuel-powered vehicles in order to reduce in advance air emissions related to fossil fuels.

d. Feasibility study or guidelines for the supply of alternative fuels in the port area

The Port of Ancona has been identified as one of the possible core ports of the Italian network for the storage and distribution of LNG on the national territory within the project GAINN4MOS³ that aims to improve the Motorways of the Sea network in 6 Member States (Spain, France, Croatia, Italy, Portugal and Slovenia) by carrying out engineering studies on ship retrofitting and/or new buildings, port LNG infrastructures, bunkering stations and a large set of pilot projects. In particular, at the beginning of 2017 a feasibility study has been carried out, focusing on potential and future demand of LNG at the Port of Ancona, sizing and choice of storage system technology, supply solutions and more.

Some years after this study, on 14 July 2021, the European Commission presented a package of proposals to make the EU’s climate, energy, land use, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels, known as the “Fit for 55” package, that included also the proposal to revise the 2014 Directive on alternative fuels infrastructure (DAFI). On 2 June 2022 the EU Council of Transport Ministers approved three proposals for Regulations of the European “Fit for 55” package, relating to the creation of a

³ <http://www.gainnprojects.eu>

European infrastructure network for alternative fuels, as part of the policy implementation process of the European Green Deal. In particular, the FuelEUMaritime aims to increase the demand and use of renewable and low-carbon fuels in the maritime sector, through the setting of targets for reducing the intensity of gas greenhouse effect of energy used on board by ships.

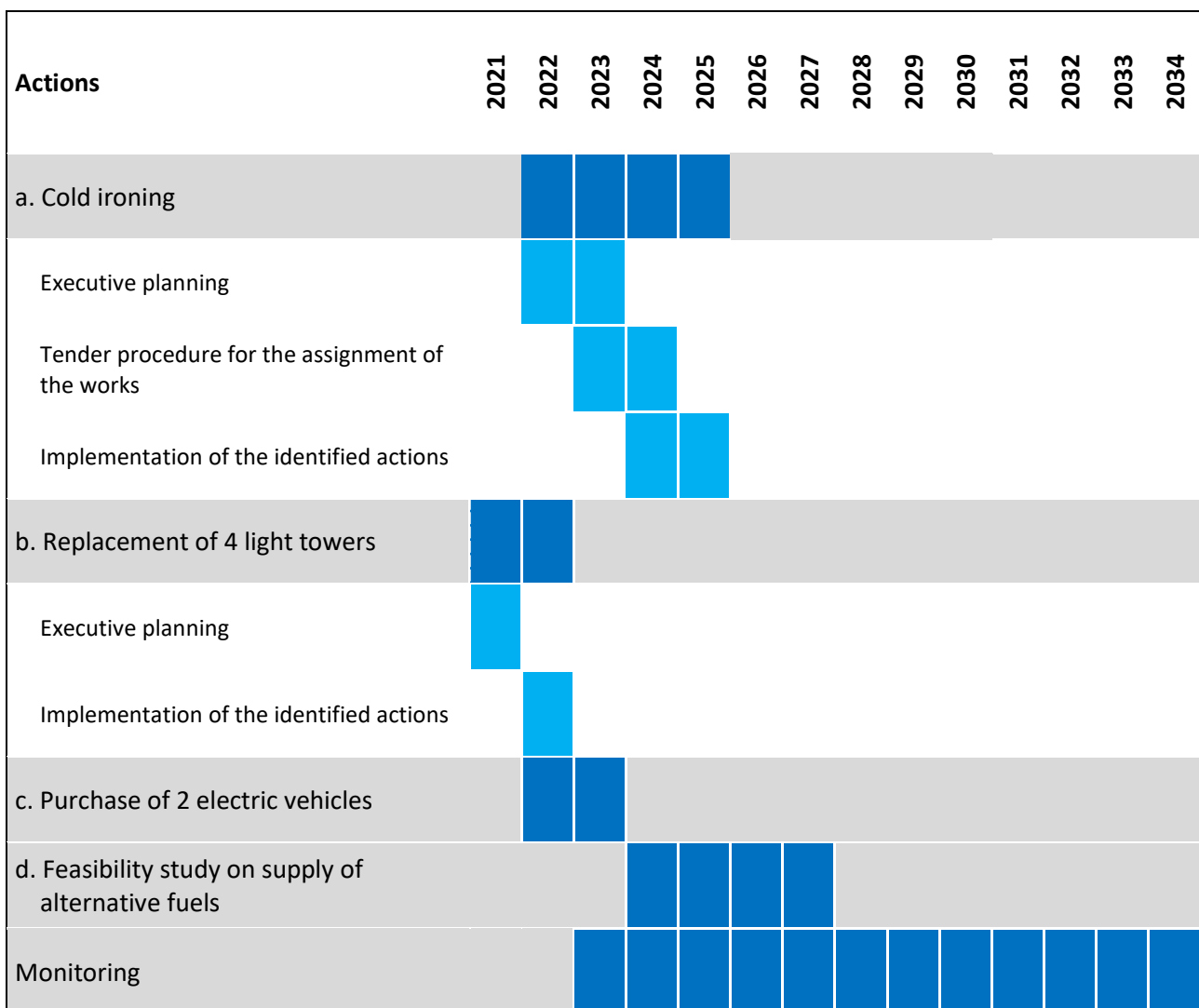
Due to this significant evolution of the legislation relating to alternative fuels (and the consequences that will be on the strategies adopted at a national scale), the Central Adriatic Ports Authority intends to carry out a new feasibility study in the next years to identified practical solutions for encouraging the use and diffusion of alternative fuels. The effects of this action on emissions of the port cannot be estimated in the current state.

4. Time frame and possible sources of funding

In this chapter a time frame of the Action Plan is given together with a list of the possible sources of funding that could finance the actions identified in the previous chapter.

a. Time frame

The project schedule is reported in the following Gantt chart.



In particular, the target to 2027 is to achieve full implementation of action b, c and d while the process of electrification of the docks requires a longer time for realization. Starting from 2023, a transversal monitoring activity is scheduled to evaluate the real effects of the actions on port emissions.

b. Possible sources of funding

In this paragraph, a brief list of the sources of funding that could finance the actions included in this Action Plan is given, differentiating the resources available at European level from those at national level.

i. EU level

The possible sources of financing that are available at national level derive from:

- **European Green Deal Investment Plan**

The “European Green Deal Investment Plan” aims to ensure the implementation of the actions envisaged by the Green Deal, which provides for the allocation of one trillion euros to be disbursed during the period 2021-2030 and it is structured on three dimensions:

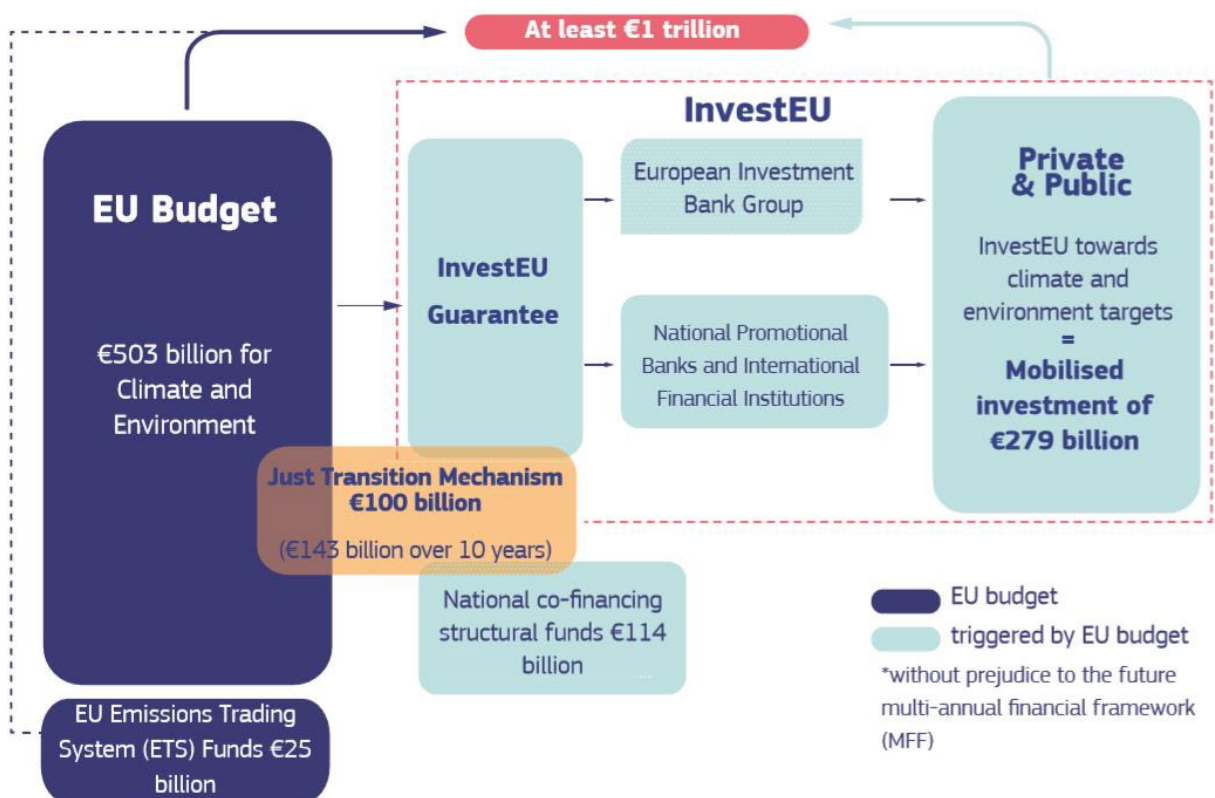
- 1) project funding;
- 2) creation and development of a common framework aimed to guarantee adequate conditions for the implementation of the plan through legislative initiatives and incentives;
- 3) organization of a support system for public administrations and private individuals involved in the implementation of the plan.

As shown in Figure 4, this huge investment will be financed, first of all, by increasing the resources already allocated by the European Union to the fight against climate change while the remainder will come from other investments, both public and private, including: the intervention of the European Investment Bank (EIB) and other partners under the InvestEU

program, the Just Transition Mechanism (JTM), the contribution of the Member States and, finally, the European Emission Trading System (EU ETS).

Figure 4 – Green Deal Investment Plan (source: European Commission)

WHERE WILL THE MONEY COME FROM?



*The numbers shown here are net of any overlaps between climate, environmental and Just Transition Mechanism objectives.

- **Connecting Europe Facility (CEF)**

The Connecting Europe Facility (CEF) is a key EU funding instrument in delivering the European Green Deal and an important enabler towards the Union's decarbonisation objectives for 2030 and 2050. It supports the development of high performing, sustainable and efficiently interconnected trans-European networks in the fields of transport, energy and digital services. CEF investments fill the missing links in Europe's energy, transport and digital backbone.

In particular, the Trans-European Networks for Energy (TEN-E) framework will be a key enabler towards the Union's decarbonisation objectives for 2030 and 2050 while contributing to sector and market integration, security of supply and competition. To address the energy infrastructure needs at regional and European level, the TEN-E policy identifies priority corridors and thematic areas and establishes a biennial list of Projects of Common Interest (PCIs) that help the EU meet its short and long-term energy and climate objectives. For the 2021-2027 period, the energy budget of 5.84 billion euros (CEF for Energy) should help the transition towards clean energy and complete the Energy Union, making the EU energy systems more interconnected, smarter and digitalised. The focus is on cross-border renewable energy projects, interoperability of networks and better integration of the internal energy market.

Moreover, the CEF for Transport is the funding instrument to realise European transport infrastructure policy. It aims at supporting investments in building new transport infrastructure in Europe or rehabilitating and upgrading the existing one. Trans-European Networks for Transport (TEN-T) policy objectives foresee:

- completion by 2030 of the Core Network, structured around nine multimodal Core Network Corridors;
- completion by 2050 of the Comprehensive Network in order to facilitate accessibility to all European regions.

With a budget of 25.81 billion euros, CEF Transport focuses on cross-border projects and projects aiming at removing bottlenecks or bridging missing links in various sections of the Core Network and on the Comprehensive Network (link), as well as for horizontal priorities such as traffic management systems. CEF Transport also supports innovation in the transport system in order to improve the use of infrastructure, reduce the environmental impact of transport, enhance energy efficiency and increase safety.





- **Horizon Europe**

Horizon Europe is the EU's key funding programme for research and innovation with a budget of €95.5 billion euros. It tackles climate change, helps to achieve the UN's Sustainable Development Goals and boosts the EU's competitiveness and growth, facilitating collaboration and strengthening the impact of research and innovation in developing, supporting and implementing EU policies while tackling global challenges.

Figure 5 - Horizon Europe, budget (European Commission, Directorate-General for Research and Innovation, 2021)

HORIZON EUROPE BUDGET

Horizon Europe programme structure

	Total <i>in € million</i>
 EXCELLENT SCIENCE <i>of which</i>	25 011
The European Research Council (ERC)	16 004
Marie Skłodowska-Curie Actions (MSCA)	6 602
Research infrastructures	2 406
 GLOBAL CHALLENGES AND EUROPEAN INDUSTRIAL COMPETITIVENESS <i>of which</i>	53 516
Health	8 246
Culture, creativity and inclusive society	2 280
Civil Security for Society	1 596
Digital, Industry and Space	15 349
Climate, Energy and Mobility	15 123
Food, Bioeconomy, Natural Resources, Agriculture and Environment	8 952
Non-nuclear direct actions of the Joint Research Centre (JRC)	1 970
 INNOVATIVE EUROPE <i>of which</i>	13 597
European Innovation Council (EIC)	10 105
European innovation ecosystems	527
European Institute of Innovation and Technology (EIT)	2 965
 WIDENING PARTICIPATION & STRENGTHENING THE EUROPEAN RESEARCH AREA <i>of which</i>	3 393
Widening participation and spreading excellence	2 955
Reforming and enhancing the European R&I System	438
TOTAL HORIZON EUROPE	95 517

The Program, also making use of the experience and successes recorded in previous programs, features a strong focus of funding lines aimed at supporting the implementation of the European Union's intervention priorities of the Green Deal and addressing global challenges that affect the quality of life in line with the Sustainable Development Goals (Agenda 2030) and the Paris Agreement on climate.

- **European Territorial Cooperation**

European Territorial Cooperation is the goal of cohesion policy that aims to solve problems across borders and to jointly develop the potential of diverse territories. Cooperation actions are supported by the European Regional Development Fund through three key components: cross-border cooperation, transnational cooperation and interregional cooperation.

In 2021, the EU entered a new multiannual programming period. The rules for ETC in the 2021-2027 period have been established in a regulation on specific provisions for the European territorial cooperation goal (Interreg). In the 2021-2027 period, ETC will have four components (strands):

- Cross-border cooperation (Interreg A);
- Transnational cooperation (Interreg B);
- Interregional cooperation (Interreg C);
- Outermost regions' cooperation (Interreg D);

The proposed regulation also sets out two Interreg-specific objectives:

- Better cooperation governance;
- A safer and more secure Europe.

During the 2021-2027 programming period, around 8 billion euros will be allocated to ETC, of which 72.2% for land and maritime cross-border cooperation.

- ii. National level

The possible sources of financing that are available at national level derive from:

- **National Recovery and Resilience Plan (PNRR, Piano Nazionale di Ripresa e Resilienza)**

In accordance with the decarbonisation objectives in transport defined in the National Integrated Plan for Energy and Climate, the document that establishes the energy and environmental objectives for 2030, the National Recovery and Resilience Plan (PNRR, Piano Nazionale di Ripresa e Resilienza) provides for investments aimed at energy efficiency and the promotion of the use of renewable energies in ports, with the ultimate goal of saving 20% of total annual CO₂ emissions in the port areas concerned. In particular, the PNRR provides for a total investment of 270 million euros between 2022 and 2026 in projects to be selected from those that the individual Port System Authorities have indicated in their Port Systems Environmental Energy Planning Documents (DEASP, Documento di pianificazione Energetica e Ambientale del Sistema Portuale). The “Green Ports” program is also expected to achieve a significant reduction in other pollutants deriving from combustion, which are the main cause of the deterioration of air quality in port cities. Moreover, this investment includes the purchase of zero-emission vehicles and service boats and the conversion of fossil fuel vehicles and service boats into zero-emission vehicles.

- **National plan for investments complementary to the PNRR (PNC, Piano Nazionale per gli investimenti Complementari)**

The Italian Government has integrated and enhanced the contents of the PNRR through the National plan for investments complementary to the PNRR by allocating an additional 30.6 billion euros of national resources, in addition to the funds provided for in the Recovery and Resilience Facility (RRF). In particular, with the Decree of the Ministry of Sustainable Infrastructure and Mobility of 13 August 2021, the program of infrastructural interventions in the port area, synergistic and complementary to the PNRR, was approved, for a total amount of 2’835.63 million euros, relating to the financial years from 2021 to 2026.

The resources are intended for the following types of interventions:

- "Development of maritime accessibility and resilience of port infrastructures to climate change" for a total amount of 1'470 million euros, of which 687.70 million euros were allocated to interventions in the southern regions (approximately 46.8%) and 782.30 million euros for interventions in the central and northern regions (approximately 53.2%);
- "Selective increase in port capacity" for an amount of 390 million euros, of which 119.35 million euros were allocated to interventions in the Southern regions (approximately 30.6%) and 270.65 million euros for interventions in the central and northern regions (about 69.4%);
- "Last/Penultimate railway/road mile", for a total amount of 250 million euros, of which 40 million euros were allocated to the southern regions (approximately 16%) and 210 million euros were allocated to the regions from the central and northern regions (about 84%);
- "Energy efficiency", for a total of 50 million euros, entirely intended for the southern regions;
- "Electrification of the docks (cold ironing)" for a total of 675.63 million euros, of which 326.43 million euros were allocated to interventions in the Southern regions (approximately 48.3%) and 349.20 million euros for interventions in the central and northern regions (approximately 51.7%).

5. Consistency with environmental sustainability and energy efficiency policies

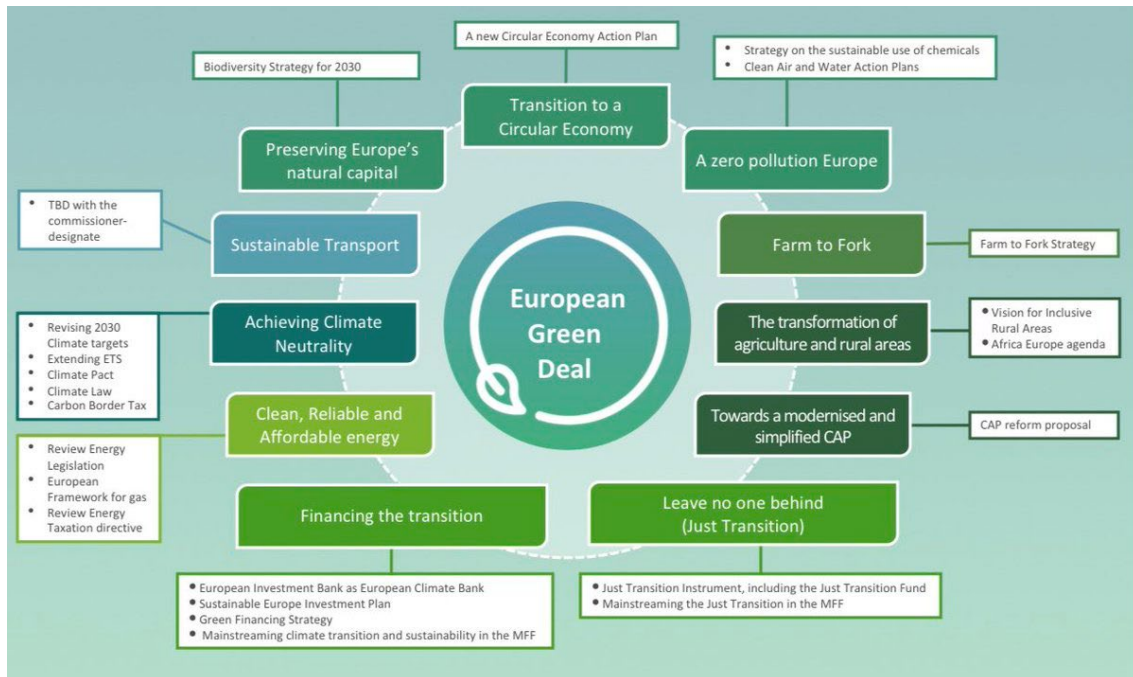
In this chapter the main policy initiatives relevant to the various actions presented in this Action Plan are listed.

a. EU level

The **European Green Deal** (described in paragraph 4.b.i) represents the heart of a progressive effort towards sustainability carried out over the last decade in response to the challenges facing sustainability. In 2021, the EU made climate neutrality, the goal of zero net emissions by 2050, legally binding in the EU. It set an interim target of 55% emission reduction by 2030. This goal of zero net emissions is enshrined in the climate law. The European Green deal is the roadmap for the EU to become climate-neutral by 2050. The concrete legislation that will allow Europe to reach the Green Deal targets is laid down in the Fit for 55 package that the Commission presented in July 2021. It will include the revision of existing legislation on emissions reduction and energy.

In consideration of the guiding principle referred to above, and the transversal objectives that derive from it, the Green Deal represents the most important reference to which all the actions described in chapter 3 are inspired and oriented.

Figure 6 - General outline of the elements of the European Green Deal, Political guidelines for the next European Commission 2019-2024



b. National level

Environmental sustainability and energy efficiency policies at national level are defined in the **National Recovery and Resilience Plan** (PNRR, Piano Nazionale di Ripresa e Resilienza) and in the **National plan for investments complementary to the PNRR** (PNC, Piano Nazionale per gli investimenti Complementari) mentioned and described in paragraph 4.b.ii. Actions similar to action a “Cold ironing”, b “Replacement of 4 light towers” and c “Purchase of 2 electric vehicles” have been already financed by the Ministry of Ecological Transition through the Green Ports project, a program related to PNRR, therefore it is possible to state that this Action Plan is consistent with national policies.

c. Regional level

The **Regional Environmental Energy Plan** (PEAR 2020)⁴ was approved by the Regional Legislative Assembly with Administrative Resolution no. 42 of 20 December 2016. The Regional Environmental Energy Plan (PEAR) identifies the planning and guidelines of the environmental energy policy in the regional territory. The Plan provides an analysis of the current energy situation, reworking the regional energy balance and evaluating the results of the implementation of PEAR 2005; it also identifies the scenarios, objectives, actions and tools to increase the share of renewable energy in gross final consumption and to save energy in all consumption sectors (INDUSTRY, TERTIARY (Commerce, Transport, Public Administration, etc.), DOMESTIC and AGRICULTURE), focusing on energy efficiency.

One of the pillars of the regional energy strategy (see chapter 6.6 of the document) is the **transition to renewable sources of energy**. In particular, the transition will first have to involve the reduction of liquid fossil fuels, until their use is relegated to those uses for which there is no alternative (at the moment, air and partly sea transport). The fossil fuel to be favoured during the transition must be natural gas, even in the liquefied version (LNG) for those uses that require greater energy density (maritime transport, heavy transport by road and rail). Moreover, to reduce pollution caused by emissions from mobility at sea, the suggestion is to move towards the conversion to the use of LNG both in the local navy (fishing) and in the ferry sector. These principles are consistent with action c “Purchase of 2 electric vehicles” and d “Feasibility study or guidelines for the supply of alternative fuels in the port area”.

Lastly, one of the key actions listed among those requiring regional initiative (see paragraph 7.1.4 of the document) is the renovation of public lighting systems with the integration of LED

⁴ <https://www.regione.marche.it/Regione-Utile/Energia/Piano-Energetico-Ambientale-Regionale>

technologies and smart lighting solutions, in line with action b “Replacement of 4 light towers” of this Action Plan.

6. Conclusions

In this section the main outcomes of the Action Plan are summarized.

This Action Plan aims to tackle the following items of the SWOT analysis:

1. Impact of emissions due to ships at berth (threat No. 1);
2. Impact of direct/indirect emissions due to port facilities (and vehicles, weakness No. 1).

The Action Plan includes 4 actions. One of them (“a. Cold ironing”) is meant to be the principal one, due to the amount of emission savings that could be achieved through its realization (up to 19% of emissions estimated in TNA). Two actions (“b. Replacement of 4 light towers” and “c. Purchase of 2 electric vehicles”) have instead a pure symbolic impact, due to the presence of other actions of the same kind already financed through different projects currently in progress, the effects of which have therefore not been considered in this document. Finally, the last one (“d. Feasibility study on supply of alternative fuels”) has not been estimated in terms of emission saving as it has not yet been possible to define a detailed strategy on this topic, due to the recent evolution of the regulatory context.

In particular, the target to 2027 is to achieve full implementation of action b, c and d while the process of electrification of the docks requires a longer time for realization. Starting from 2023, a transversal monitoring activity is scheduled to evaluate the real effects of the action on port emissions.

All the actions are consistent with policies at all the level (European, national, regional) and therefore could be financed through resources made available by the various public entities.