MED ATLANTIC ECOBONUS

Co-financed by the European Union Connecting Europe Facility

MED ATLANTIC **ECOBONUS**

ADMINISTRATIVE PIPELINE

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Contents

1. Introduction

The purpose of this document is to examine and plan the regulatory and administrative structure that must be created for the purpose of developing an incentive scheme to promote maritime freight transport and its connection with other modes of transport between Member States.

With the agreement n°. "INEA/CEF/TRAN/M2014/1027558" between INEA (Agency for Innovation and Networks of European Union) and Spain, Italy, France and Portugal, under the coordination of Puertos del Estado, the Commission intended to develop a study on a system of incentives providing a financial support towards road hauliers and freight forwarders, stimulating the use of the "Motorways of the Sea" instead of the more environmentally and socially wasteful road transport. The project aims to provide the European Union with a feasible method to incentivize road hauliers or freight forwarders who make use of maritime transport instead of road transport, to reduce the pollution and road traffic.

According to the feedback received during the presentation of the project results to the European Parliament in December 2018, it is in theory possible to finance the incentive through the Connecting Europe Facility, which is part of the so called "direct management programs", whereby the European Union, through the Commission, directly manages their design and financing (also through the mechanism of delegation to the agency concerned). This analysis is assuming that CEF is the EU funding program in which the presented eco-incentive scheme should be submitted.

For the purposes of the project presented through this manual, therefore, it is necessary to consider the relevant European legislation, the Guidelines on maritime transport issued by the Commission in 2004 and 2008, as well as the Union's policies related, which will be analyzed later on.

In this context, the viability and effectiveness of the proposed incentive scheme will depend on its means of implementation, with particular reference to the administrative procedures and the use of technological means.

To said extent, the MAE study is issuing, as part of its final report, this analysis on a possible design for the implementing process of the MAE case study, both for the administrative and the technological aspects. In particular, the study is aimed at the key implementing aspects of the scheme, related basically to the relevant procedures -timings , the entities involved, , registration, boarding events collection, route monitoring, payments, etc.-, backing technologies -system architecture, compatibilities with NSW and MRV systems, transactional files, databases, reporting, etc.-. Also, the analysis describes the main legal aspects that should be addressed prior to any implementing action, such as the binding contracts with the scheme beneficiaries -both direct and indirect-, the possibility to take data from NSW and THETIS MRV databases or the limitations from data protection regulation.

2. Procedures

This analysis makes use of the experiences achieved through the Italian Ecobonus program, which already implemented direct incentives to the users of the motorways of the sea. MAE presents a different approach, bringing a greener performance of the maritime services to the upfront of the measure and thus introducing the need for more suitable procedures. Nevertheless, it maintains a demand based approach which entails similar procedures.

The analysis is aimed at a first approach to the key implementing aspects of the scheme, related basically to the relevant procedures.

The implementing process of the eco-incentive is outlined in the following figure.

The procedures for the awarding of the EU funding would be very similar to the current CEF procedures. To this extent, the work programs should incorporate as eligible the proposed common EU approach to eco-incentive measures. As for the national funding, the procedure implies the approval on the national budgets as well as the assessment on the compliance with state aid rules. In this regard, it is emphasized that the 2008 Motorways of the Sea guidelines should be updated to the CEF standards regarding the maximum duration and intensities of the EU funding. The ex-ante analysis for the MAE case study simulates a 5 year period for the eco-incentive measure which would meet current CEF standards as well as it would equal the maximum duration as interpreted for the rail transport -leading also to a level playfield for all modes of transport.

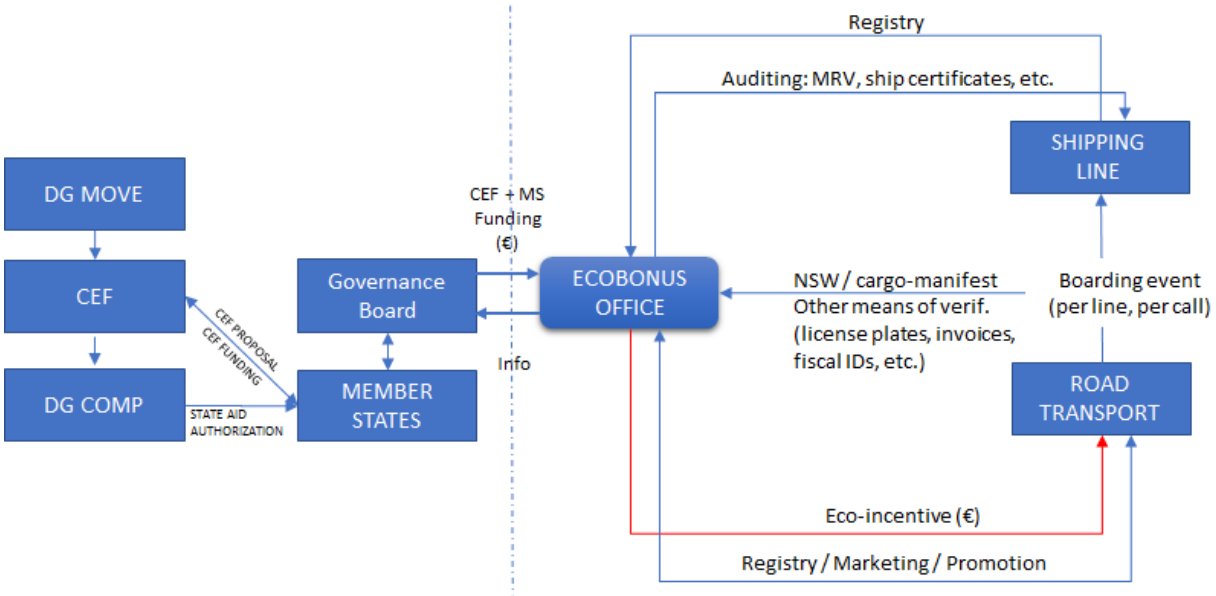


Figure 1.- Possible implementing chart for the eco-incentive scheme through CEF. MAE study case

With this system the Member States' co-responsibility in the implementation of the scheme is also secured. In fact, according to the CEF structure, the Member States would submit the eco-incentive scheme proposal and would be responsible for its implementation in case of award.

Ultimately, to streamline this part of the process, it would be possible to coordinate from the Commission the awarding process for the EU funding and the state aid authorization process, being both linked through their respective assessments.

Regarding the implementation of the eco-incentive scheme -once the funding is secured-, one of the most relevant procedures refer to how the beneficiaries shall be granted access to the program features.

To this extent, a 'dual call mechanism' approach is proposed, which will be explained more in detail in the next sections.

2.1 Overall Process

The whole incentive process for the grant of the “Med-Atlantic Ecobonus” (MAE) has as its primary objective the development of a sustainable freight transport service through the use of global network infrastructures and the reduction of carbon dioxide emissions and any other highly polluting element by increasing the cargo flows transported by sea traffic and the development of intermodal freight transport services. This development must be included, however, within an improvement of the environmental and social performance carried out by the shipowners.

By achieving this goal, moreover, it will be possible to achieve, as a natural consequence, the modal shift from the transport system of goods prevailingly used so far in the context of the movement of goods in the territories of the European Union, that is the road (a system that produces extremely damaging consequences from an environmental and social point of view) to a system that combines the road transport with the maritime one (road-maritime transport mode). Through this transfer from a totally road transport method to one that combines road and maritime transport we will obtain those benefits that are part of the objectives that the European Union, as a whole, has set itself since years: firstly, with the strengthening and development of cargo flows transported via maritime traffic, the problem of traffic congestion is being partially solved,, avoiding or at least diminishing the impact that the most cumbersome goods transport can have on the road traffic. Secondly, the implementation of a system of incentives that provides new blood to maritime traffic may allow the overcoming of the loopholes related to land connections between Atlantic and Mediterranean regions of the European Union. To date, these problems have had a seriously negative impact on European policies for the development of internal cohesion and the functioning of the market.

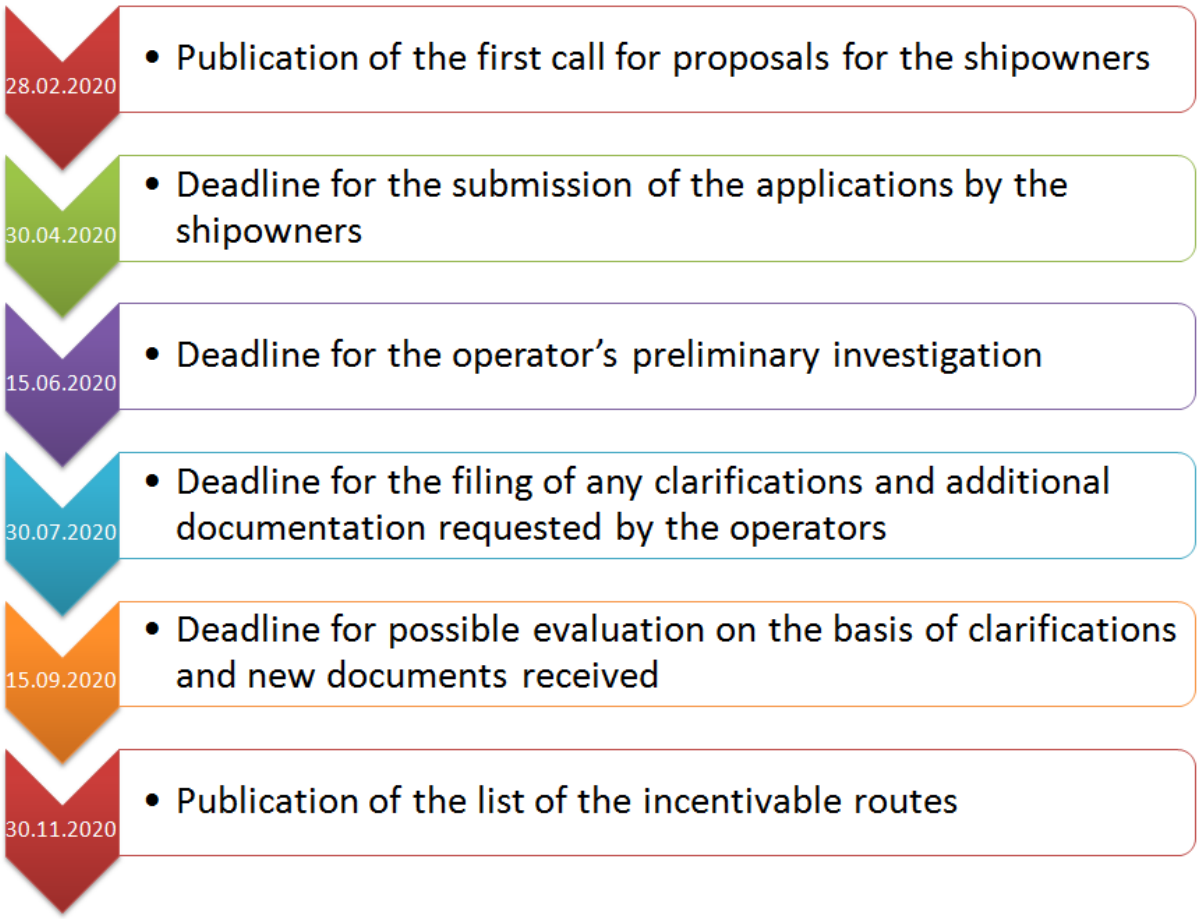
The players of the project contained in this manual are, as we have already seen, the direct beneficiaries, i.e. road hauliers / freight forwarders, that is those who will receive directly the grant of the incentives provided, by virtue of the costs incurred for the transport of goods through the sea routes declared eligible for subsidies instead of the road routes used up to now. However, a key role will be played also by the shipowners, who, as a result of socio-environmental improvements on the routes already used, as well as due to the development of new routes for the transport of goods by sea, will have an increase in transport prices, which will be covered by the incentive provided for in the present project and which, therefore, will provide the shipowners with an increase in the traffic of the goods transported without an excessive increase in the costs incurred.

The objective of this section is the definition, in detail, of the operating procedure related to the introductory phase of the process, through the double "Call" system that will be repeated for each year of the duration of the incentive program (one addressed to shipowners and one addressed to road hauliers / freight forwarders), to the preliminary investigation phase of the requests presented by the companies involved, as well as the final phase, which is related to the final payment of the incentive. Firstly a general timeline will be presented, then the procedure will be discussed more in detail.

2.2 Timeline

As illustrated more in detail in the following sections (see sections 2.3 and 2.4), a "dual call mechanism" approach is proposed for the MAE case study. As the name suggests, this mechanism is composed of 2 distinct calls for proposals, the first would be addressed to the shipowners (Phase 1) while the second would be addressed to the actual and potential users of the maritime services (Phase 2). A general overview of those phases along with their timeline is represented in the following pages. The timeline has been designed considering the year 2021 as the reference year (the year starting which the incentive scheme will be considered valid).

PHASE 1



PHASE 2

01.01.2021 31.12.2021	• The beneficiaries of the incentive perform trips on the eligible routes
15.01.2022	• Publication of the 2nd call for proposals dedicated to road hauliers and freight forwarders
28.02.2022	• Deadline for the submission of the application
31.03.2022	• Deadline for the operators' preliminary investigation
30.04.2022	• Deadline for the filing of any clarifications and additional documentation requested by the operators
15.05.2022	• Deadline for possible evaluation on the basis of clarifications and new documents filed
30.06.2022	• Boarding event collection
31.07.2022	• Route Monitoring
31.08.2022	• Deadline for the filing of any documentation and clarification on boarding events and route monitoring
15.09.2022	• Deadline for the deposit of requests for payment by the beneficiaries
30.10.2022	• Deadline for the payment of the incentive

2.3 Ship Owner Line Registration

As anticipated, the project envisages a double "Call for proposals" system: the first will be addressed to shipowners, while the second will be addressed to road hauliers / shippers. This system will be repeated for each year for which the incentive system will be in place.

From the day following the publication of the first Call for Proposals (which must be published for each year of the project duration), on the Official Journal of the European Union, on the homologous Official Journals of the single Member States involved and on the website of the platform operating the Eco Incentive system, no later than February 28th of the reference year, the deadlines for the submission of the request by the shipowners will start. With such submission the shipowners will produce evidence that they have the requisites for access to the project. This request, with the related documentation, must be filed no later than April 30th of the same year.

All the shipowners who in the previous period have operated on international routes between the Member States involved in the project and who have their registered office in any of the Member States of the European Union or of the European Economic Area can apply for access to the incentive scheme.

Registration requests will be automatically registered with an identification code, to which the ship owners will refer for the entire project.

In the registration request, the shipowners must complete the Attachments, inserting their general data, i.e. the company name, the address, the telephone number and the email, as well as the VAT number, the Fiscal Code or the identification number and the name of the person legally representing the company. They will also have to perform a self-declaration, in which they will declare that they have no public service funding/compensation in progress, deriving from previous obligations or contracts.

If, as a result of this filing, a public service funding in progress is detected, the application for registration cannot be considered eligible, as an incompatibility, in this regard, is currently provided by European regulations on the maritime transport of goods (Communication C (2004) 43). Alternatively, if the Commission positively assesses the possibility of cumulating the above mentioned benefits, a maximum ceiling of 30% of the expenses incurred could be envisaged as a limit to the amount of the incentive (in case of cumulation with further contributions).

Enclosed to the same request, then, the shipowners will file the documentation related to the improvements of routes already used or to the opening of new routes made in the (previous) period concerned. It will not be possible to present documentation regarding the year of the Call, as the evaluation of the improvements will have to be carried out over the whole year. For this reason, the interested shipowners will be allowed to respond and activate the participation for each Call that will be published during the five years foreseen by this project.

The documents relating to the new routes, for the purposes of their admissibility to this project, must contain some minimum requirements, listed below:

i) Description of the new maritime transport service, the qualitative and quantitative standards obtained (quantity of goods loaded per trip, environmental impact of each trip, comparison of the

environmental impact with the impact that the same journey would have if operated on the road, time for loading and unloading of the goods, etc.);

ii) A minimum frequency of the line for which the incentive is requested, which must not be less than a departure per week.

The documents concerning the improvement of routes already operated, instead, must contain the following requirements:

i) The demonstration of the environmental improvement of the route;

ii) The reduction of the times of the overall intermodal chain (for example by reducing the time for boarding and disembarking or navigation);

iii) The demonstration of an increase in the frequency of line services.

In any case, specific documents will be elaborated to evaluate said improvements.

2.3.1 Investigation

After the registration, the operator must complete the preliminary investigation by June 15th on the basis of the documents received: if these documents are incomplete, the operator can request clarifications or additions and, from the moment of the request, the shipowner will have 45 days to comply.

The operator's evaluation will focus on the following:

i) **Date of submission of the application:** the operator must first check that the application has been submitted within the deadlines set by this project. If the filing date of the presentation of the documentation is after the expiry of the deadline, the preliminary investigation can already be considered completed and the application will be submitted to the second evaluation, which the authorizer must perform, as an "inadmissible application". If the filing date, on the contrary, results within the deadlines, the investigation will proceed to the next stage.

ii) **Reference year of the services and number of trips for each year:** the operator must check that the documents refer to journeys made over the years taken into consideration by the Call of Proposals to which the single ship owner has requested to participate (the two / three years preceding it). Furthermore, the verification must also focus on the minimum frequency required by this document and by the Call of Proposals referring to the trips made for each year. If these requirements are not met, the investigation will be concluded and the application will be submitted to the evaluation of the authorizer as "Registration not admissible". If, on the contrary, these requirements are satisfied, the investigation will proceed to the next phase.

iii) **Environmental and social impact:** the operator must verify that the documentation effectively demonstrates the required environmental characteristics. For the purposes of this assessment, including for assessing the impact on external costs of such improvements

and consequently calibrating the intensity of the incentive for the individual carriers using these routes, the verification of the documentation will focus, in particular, on parameters that will be included in the MAE Calculator, concerning, among others, for new routes, fuel consumption, the type of fuel, techniques for reducing environmental impact and emissions of polluting elements. For the improvements of routes already operated, the progress of the line on the environmental impact, the sustainable reduction of the times of the overall intermodal chain, the greater frequency in scheduled services, the enhancement of the level of safety on board for the cargo, the increase in capacity, the improvement of the embarkation and disembarkation services and the services on board during navigation will be evaluated.

It can be said, therefore, that the documents' evaluation will be completed following the check made in the first instance by the operator and, secondly, by the authorizer. Once this evaluation has been successfully completed, it is up to the authorizer to enter the data to calculate, with the Med Atlantic Ecobonus (MAE) Calculator tool, the intensity of the incentive that can be provided to the carriers who will use the routes that are admitted.

Once the evaluation is completed, by and no later than November 30th of the reference year, the routes deemed suitable and, therefore, admitted to the present project will be published on the web platform, so that they are known to road carriers who can use them to access the incentives.

2.4 Road Haulier Registration

Road hauliers and freight forwarders wishing to access the incentive system named "Med-Atlantic Ecobonus" may be road transport companies, with registered office in one of the Member States of the European Union, including permanent consortia and simple non temporary associations of operators wishing to place trucks and articulated lorries, in compliance with Community legislation, with or without drivers, on cargo ships in order to use sea routes instead of road routes.

The road carriers can register, following the opening of the second Call of Proposals, which will take place by January 15th of each year starting from the one following the beginning of the service on the approved routes, by completing the online application by February 28th of the year following the one in which the trip is performed. All road hauliers with their registered office within a Member State of the European Union can apply.

Together with the application, the haulier must attach:

- Certification of enrollment in the Register of Companies issued by the Chamber of Commerce, Industry, Handicrafts, Agriculture or similar registers of its member State, which is valid and which certifies the activity carried out;
- Certification attesting the name or names of persons holding corporate positions and their powers;
- Community license or equivalent document for the carriage of goods on behalf of third parties;

- Certificate and / or statement of the carrier, invoice or bill of lading receipt, credit note or other accounting document issued by the shipping carrier attesting the payment of the trips for which it requests and that the trips were actually carried out by the hauler.

Also in this case, the operator can make a request for the integration of missing or clarified data and documents, necessary for the evaluation. The administrative control, in any case, must be completed within May 15th of the year in which the application is submitted.

Once the administrative control is deemed to have been concluded and the road haulier is considered to be eligible for financing, the operators will be able to check the actual shipments carried out, in order to reach the final payment stage.

In order to achieve the objectives of the project, the possibility of recognizing an increase in incentives to transporters who, in the year prior to the signing of the agreement, demonstrate that they have carried out a high number of shipments should be positively evaluated (e.g.: it can be foreseen that, if over a year, the carrier has carried out a number of shipments of more than 800, the same can be recognized an amount increased by a substantial percentage).

In this way, the subjects involved will be further encouraged to carry out a greater number of trips through the routes improved from an environmental and social point of view, with the beneficial consequences in the field of road transport and air pollution

2.5 Boarding Event Collection

This check is necessary to allow the verification of the correspondence between the declarations of road hauliers on the shipments made and on the routes envisaged by the project and the existing registers: the objective is to obtain an incisive control on the actual performance of the shipments carried out.

The verification can be done through the control, carried out by the operators, on the correspondence of the declarations of the road hauliers with the already existing registers, such as the official declarations of the ships arriving and departing from the ports of the single Member States involved (National Maritime Single Window).

If this control system can not be usefully carried out, due to an excessive amount of checks to be performed or due to logistical difficulties regarding the verification of the registers necessary for the control, it would be possible to ask the shipowners to produce for the hauliers who carried out travels in routes subject to the incentive, special comprehensive receipts indicating not only the total taxable amount of freight but also the number plates of the vehicles used and the number of trips. Random checks may also be possible: if such a type of verification were to be deemed necessary, the Med Atlantic Ecobonus Committee, would send an official registered letter to the individual managing authorities of the public registers located in the ports where the loading and unloading of goods was carried out, with the request to notify the actual boarding of the declared trucks and trailers.

In any case, this check must be completed by and no later than June 30th of the year following the one on which the boarding took place.

In order to obtain the right to the incentive, the road carrier must perform the trip on the admitted route between (at least) two ports of different Member States.

2.6 Route monitoring

A second check, in chronological order, will concern the actual performance of the journeys planned by the shipowners in their documents: the shipowners will have to provide, every year, the documentation related to the journeys made on the allowed routes, which will be compared with the MRVs AIS data, and the other electronic sources of registration of the journeys performed, from the ports of departure to those of destination.

If it's not possible to carry out this check on all the declarations received, due to the size of the same or due to logistical difficulties regarding the verification of the registers necessary for the control itself, a "sampling" type of control can be provided, even in this case. The Authorizer will send an official letter, on behalf of the Med-Atlantic Ecobonus Monitoring Committee, to the authorities managing the information concerning the registers of the Ports of departure and destination, with which the actual performance of the individual journeys declared by the shipowners will be requested.

In any case, this monitoring phase must be completed by and no later than July 31st of the year following the year of the journeys.

If these checks, provided for in paragraph 2.5 and 2.6 of this document, result in a discrepancy between the documentation provided by shipowners and by road hauliers and the results of the registers, the Authorizer will request clarification, to which the addressee must provide an answer, with all the additional documentation attached, no later than 31 August.

If such clarification is not forwarded or, if submitted, still results in discrepancy with respect to the monitoring carried out, the route will have a reduced incentive in next years or a penalty could be imposed if and within the limits provided in the signed contract.

2.7 Payment

Within the deadline of 15th September of the second year following the reference year, the interested road hauliers will be sked to submit the request for payment of each single journey made, by signing the form on the online platform. Thus, the calculation phase of the incentive based on the requests of the hauliers and on the monitoring evaluations mentioned in the previous points 2.3 and 2.4 of this manual begins.

In this phase the operator, verifying the exact correspondence between the submitted documentation and the routes admitted to the incentive, inserts in the system the various data, on the basis of which

the percentages to be applied in the calculation must be calculated (number of trips made, environmental improvement etc).

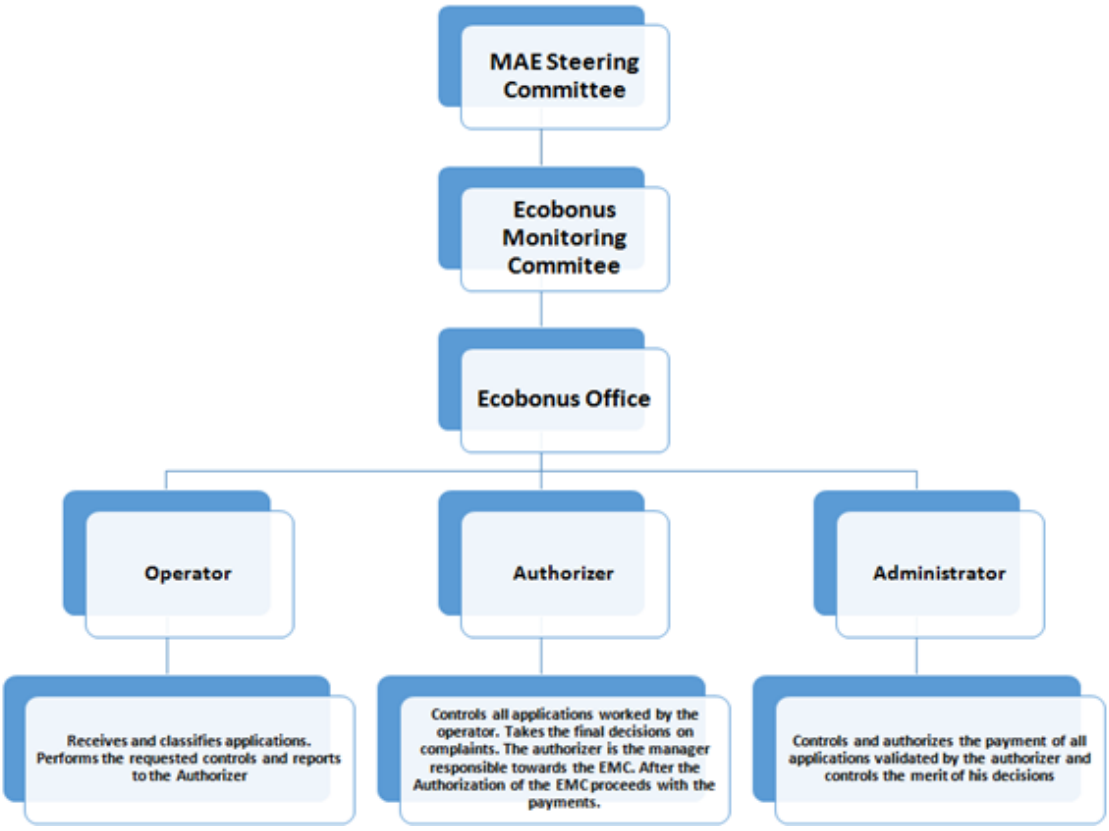
When each trip for which funding is requested is assessed by the operator and the incentive has been calculated, it is forwarded to the authorizers for the purposes of the second check.

The approval of the payments takes place, following the checks carried out on the basis of the procedures referred to in paragraphs 2.3 and 2.4 of this document, following a positive evaluation by the authorizer and the Administrator, who, despite being a component of the "supranational" part of the MAE Office, refers directly to the MAE Monitoring Committee.

The approval or rejection of the request for payment must take place by the 15th October of the second year following the reference year and, if the request has been approved, by 30th October of the same year, payment must be made, by means of bank transfer by the MAE Office.

3. Project management bodies

In this chapter the bodies participating in the project will be presented, both from the institutional and from the beneficiary points of view.



In the first part of this chapter we will address the issues related to the roles and powers of the entities that have been set up or will be set up to manage the project. These entities will be three, two of them with strictly operational roles and one with a supervisory role: MAE Steering Committee (MAESC), MAE Monitoring Committee (MAEMC) and MAE Office (MAEO).

In the second part, we will analyze the profiles of the subjects who will take part in the project on the demand side, i.e. the road carriers and ship owners.

3.1 MAE Steering Committee

The agreement signed between INEA and the beneficiary Member States mentioned above defines the MAE Steering Committee as the body tasked with approving the final project of the incentive scheme.

Since the role of such a body can be defined more "political" and "administrative" rather than organizational and management, a composition that includes at least one member for each Member State participating in the Consortium seems appropriate; in addition, if the Commission (or INEA) considers it necessary, a number to be defined of members could be appointed on its behalf.

This composition appears necessary, mainly because the Member States involved (Spain, Italy, Portugal and France) and the European Union need to participate in the evaluation phase of the project and its approval, especially with regard to the linearity of the procedure and its compatibility with the regulations in force, both at national and at Community level.

From a purely operational point of view, this body is asked to sign agreements with the beneficiaries and the shipowners, following all the approvals provided for in the previous chapter.

3.2 Med Atlantic Ecobonus Monitoring Committee

This is the body responsible for supervising the entire process: firstly, it will have to adopt the final decisions on the incentives, following the check carried out on the documents submitted by the shipowners and on the shipments performed by the road hauliers by the Med Atlantic Ecobonus (MAE) Office, and, secondly, it will authorize the payment of the same. The Authorizers answer to this committee directly (the Authorizers being the subjects that are part of the MAE Office and are entrusted to carry out a final check of the documentation and provide the final assessment of the awarding of grants, as well as to provide for payment following the authorization from the MAE Monitoring Committee itself).

Furthermore, the MAE Monitoring Committee is the entity which the Member States and the European Union provide with the sums necessary for the payment of the incentives for the purpose of the subsequent distribution to the direct beneficiaries admitted to the financing. Each Member State involved and the European Union, in fact, formally establishes its own budget to be allocated to the

project on the basis of the ceiling calculated through the so-called MAE Calculator, according to the necessary internal legislative procedures, for each year of the "Med- Atlantic Ecobonus" and, following the approval of the budget, allocate the amounts that have been decided directly to the EMC, which is subsequently asked to pay the incentives.

It seems appropriate, therefore, being the entity provided with the power to carry out the final check for the final decisions for the granting of incentives, that it is structured as a centralized office that includes, within it, operators of the Member States of the European Union involved in the project, who can directly assess the individual projects submitted and issue, therefore, the authorization to pay following the checks provided in this document.

3.3 Med Atlantic Ecobonus Office

The role of this body develops throughout the process, from the registration of shipowners and the filing of documentation certifying the requirements for access to the project, up to the final payment of incentives to road carriers, being an entity with a purely operational and managerial role. In fact, the MAE Office is expected to perform the following activities:

- to receive the shipowners' registrations on the portal, and evaluate the presence, within the documentation contained in the archives, of the required requisites as well as of the information needed for the evaluation of the same;
- to request, if necessary, clarifications and additions to shipowners;
- to provide for the publication, on the portal, of the projects and routes that have been admitted to the incentive scheme;
- to receive the registration of the road hauliers and shippers, to request an integration of the documents and information, if necessary, and to carry out the first administrative check on the attached documents;
- to make the final payment of the incentives following the approval by the MAE Monitoring Committee.

Being, as mentioned, an entity that will have an almost exclusively operational role throughout the procedure, it will be structured at a supranational level, based at the European Commission, and will be characterized by a varied composition, based on the necessary different roles that must be developed within it.

Therefore, there will be the presence of operators who will have roles corresponding to the different phases of the procedure.

3.3.1 Operators

The operators are the subjects within the MAE Office that deal with the registration and admissibility phase of all the applications for registration of shipowners and road carriers, the registration of the projects and the initial assessments of admissibility on the same, any requests

for clarifications and additions, as well as the monitoring phase, once they are considered valid and accepted for financing and published the routes and performed the shipments and the journeys.

They are included in the structure of the MAE Office and will therefore take care of the financing related to the routes that have, as a port of departure, a port of a State other than its own.

In any case, they report to the authorizers, to whom they forward the results of each control entrusted to them.

3.3.2 Authorizer

The authorizers are the subjects of the MAE Office who carry out the second check on all the evaluations expressed by the operators, in order to avoid evaluation errors. Therefore, they are subjects who perform the function of validating the work of the operators.

These subjects also will be included in the MAE Office structure.

3.3.3 Administrators

The Administrators are the subjects that are asked to verify and supervise the entire validation and investigation process. Furthermore, at the end of the procedure, they are responsible for the payment of the incentives.

Their verification and supervision function suggests a superior hierarchical position with respect to both the authorizers and the operators.

3.4 Direct beneficiaries (road-hauliers, freight forwarders, etc.)

If all the requirements are met the direct beneficiaries of this project will receive directly the incentives provided by the "Med-Atlantic Ecobonus" system. Among said beneficiaries are included all the road transport companies, the forwarding agents and, in general, those who perform the carriage of goods having their registered office in one of the Member States of the European Union, including permanent consortia and simple non temporary associations of operators wishing to load trucks and articulated lorries, in compliance with Community legislation, with or without drivers, on cargo ships in order to perform the carriage making use of sea routes instead of roads.

In order to access the benefits envisaged by this project, these subjects must therefore demonstrate that they possess the requisites required by this manual.

3.5 Shipowners

The shipping companies that will be admitted to access the incentive system must be established in a Member State of the European Union and provide documentation that attests the socio-environmental improvements achieved in one or more international routes that they manage or the opening of new routes which will succeed in developing a reduction of equivalent road traffic.

These improvements or the opening of new routes must have been made no later than the period before the year in which the Call of Proposals to which they want to take part is open. The parameters of these improvements are better described in the MAE Calculator. The projects may concern newly opened routes (i.e. that in previous years had never been operated) or routes that are already operated, but on which shipowners have made tangible improvements from a socio-environmental point of view. The shipping companies will also be allowed to access the incentive for each of the four years following the first, providing documentation certifying improvements or opening of new routes in the previous year. As regards the duration of the financing, however, it must be underlined that the Commission, in the Community guidelines on State aid to maritime transport in 2004, provided for a duration of not more than 3 years, while in “Communication from the Commission providing guidance on State aid complementary to Community funding for the launching of the motorways of the sea” (2008/C 317/08) has foreseen a duration that can reach 5 years within the Marco Polo II Program. This situation has created confusion, also due to the fact that the Program was interrupted in 2013 and, although the Commission has often stated the need to provide new guidelines in order to overcome the previous limitations and contradictions, to date this intention has not following. Therefore, it is necessary to ask the Commission, as a preventive measure, the possibility of designing a system of incentives with a duration of 5 years, making its analogous descent from the Communication concerning the Motorways of the Sea of 2008

4. Legal aspects

4.1 Preliminary remarks

As we have already seen, the "Med-Atlantic Ecobonus" project can be regarded as State aid within the meaning of Article 107 (1) TFEU, being, in fact, aid granted by the Member States (this definition includes, in addition to the aid provided by individual States at national level, also funds eventually subsidized by the European Union but managed by the Member States) "*in any form whatsoever, which distorts or threatens to distort competition, by favouring particular companies or products*".

However, the same Article 107 (3) TFEU proposes a list of aid that the Commission can consider compatible with the internal market of the European Union and, among these, "*aid to facilitate the development of certain economic activities or of certain economic areas, where such aid does not adversely affect trading conditions to an extent contrary to the common interest*".

It is emphasized that, based on the analyzes carried out on past experiences, the state aid measures envisaged for the maritime sector in general have always been governed by the compatibility rules set out in the same Article 107 (3) TFEU. In fact, it is evident that a development of the maritime transport of goods and the modal shift of goods from road transport to the same maritime transport, for the reasons already mentioned (lower environmental impact, decongestion of roads, lower risk of accidents, greater ease of connection between ports that would otherwise be difficult to reach, etc.), are part of the "common interest" of the Member States and, above all, of the European Union, also thanks to the numerous Commission Guidelines published in recent years.

Article 108 (3) TFEU provides for a specific procedure for the assessment of the compatibility of State aid with European legislation by the Commission: firstly, a "communication" to the Commission is needed to enable it to carry out this assessment of merit. Council Regulation no. 1589 of 13 July 2015 establishes detailed rules for the entire procedure: firstly, in fact, in Article 2, the Regulation requires that, with the notification, the Member State (or the Member States, as in our case), provide the Commission with all the information necessary to enable it to adopt the final decision. Throughout the verification phase, Member States must refrain from implementing the aid, with an obligation to suspend them for the same.

In the two months following the notification (it is considered that the notification can only be considered completed from the moment in which the Commission has all the information necessary for the assessment), the Commission must take a decision on this, if it does not want, in the silence of the same, that the aid is considered as duly adopted.

The outcome of this verification can be of three types:

i) Following the preliminary examination, the Commission considers that the notified draft does not constitute State aid, declaring it by a Decision;
ii) After a preliminary examination, the Commission finds that there are no doubts as to the compatibility with the internal market of the notified measure, to the extent that it falls within the scope of Article 107 (3) TFEU, declaring it compatible with the internal market;

iii) After a preliminary examination, the Commission finds that doubts exist as to the compatibility with the internal market of the notified measure, deciding to initiate the procedure under Article 108 (2) TFEU.

This last procedure is a formal investigation, which begins with the publication of the decision in the EU Official Journal and with the notification to the Member States involved, who have one month to submit their observations. Within 18 months after the starting of this procedure, the Commission can take a positive decision, stating that the requested measure is not considered state aid or, if it is, declaring that it is considered compatible with the internal market. The Commission, however, can also declare the measure conditional, considering it compatible, but subject to certain specific conditions to which it must comply, according to the Commission itself, or negative, considering it incompatible and, therefore, not feasible.

In the event that the Commission adopts a positive decision, the project can be considered approved and it will therefore be up to the Member States involved to take the necessary decisions to develop the project through their own internal legislative procedures.

Over the years, the European Commission has repeatedly tried to favor the maritime transport of goods: firstly through the Community Guidelines on State aid to maritime transport (Communication C (2004) 43), with which it has provided that the same Commission could approve certain aids if the projects relating to them complied with some rather stringent requirements, which would not allow State aid to be used to favor certain categories or companies and thus end up with the distortion of free competition in the internal market. Within these requirements, among others, it was included that "*aid must be to cover not more than 30 % of the operational costs of the service in question*" and that aid should have "*a duration not exceeding three years*".

These requirements, however, are not in line with those provided by the subsequent Communication of the Commission which established the guidelines for State aid supplementary to the Community funding for the opening of the motorways of the sea (Communication C (2008) 317), which specifically for the Marco Polo II program (to date no longer used), it allowed the maximum aid intensity to be 35% of the total costs necessary to create and manage transport projects and that the duration could be up to 60 months.

It is evident that, if a project of this size is effectively desired and that its main objective is to create a system that allows road hauliers to prefer transport by sea to road transport and which will last over time, beyond the time needed for the start-up of the system itself, it is necessary to provide for the widest possible duration of funding, in order to allow maritime operators and carriers to amortize the costs incurred for joining the project and establish, in this way , a virtuous system that can proceed beyond the necessary incentive period.

For this reason, it will be necessary to establish a fruitful dialogue between the Committee composed of the Member States involved and the Commission of the European Union, through which it can be concluded that, in order to establish a virtuous mechanism through which, in the future, the means of maritime transport for goods at European level are used where possible, instead of road transport, a start-up period longer than the three years provided for in the 2004 Guidelines above is needed.

4.2 Legal Status of the Med Atlantic Ecobonus Office

The MAE Office will be the structure created to support the individual States in the assessment and investigation phase of the entire procedure, as well as the one that materially provides for the payment of incentives to direct beneficiaries, following the payment authorization of the MAE Monitoring Committee.

The MAE Office, although structured as a unitary body, with a single summit, will have a hierarchical subdivision within it, with a pyramidal structure that, from the base to the top, will be composed of Operators, Authorizers and Administrators. In any case, these subjects will form a unitary body, set up and structured at European level

The logic of the division of roles and of the different control systems has a twofold objective:

i) to support, in the initial phase of the procedure, the shipping companies and road carriers providing them with information, clarifications and assistance in the registration and filing of documents (help desk);
ii) to carry out the checking of the projects and of the routes, implementing and managing a non-discriminatory verification system.

The employees of the MAE Office are asked to intervene at different times in the whole procedure. For this reason it is useful to divide them into three categories:

i) The "operators" are the subjects within the MAE Office that deal with the registration phase and the first assessment of the acceptance of the registrations of shipowners and road carriers, with the forwarding of any necessary request for clarifications and additions, as well as, once the routes are deemed to be valid and eligible for financing and the shipments and the journeys are duly performed, the monitoring phase on the same. In addition, they are the subjects asked to enter data in the MAE Calculator, in order to obtain the intensity of the incentive to be provided to individual road hauliers. In any case, they refer to the "authorizers", to whom they forward the results of each control and verification entrusted to them.
ii) The "authorizers" carry out a check on all the evaluations expressed by the operators, in order that on each request for registration received a double check is carried out and, in this way, errors of assessment are avoided. So they are the subjects who perform the function of providing a validation to the work done by the "operators";
iii) The "administrators" are the subjects asked to verify and supervise the entire validation and investigation procedure, as well as to verify the distribution of the incentive to the individual subjects admitted to the same. Furthermore, it is the body that, at the end of the procedure, for each year of operation of the incentive, will make the payment following the approval by the MAE Monitoring Committee.

In order not to violate the principles of the European Union, such as transparency and non-discrimination, during the entire procedure the subjects operating at any level within the MAE Office will have to respond to an internal regulation that defines the various steps of each phase of the procedure to which they are asked to participate, as well as the obligations of the subjects themselves

and the solutions to the possible problems concerning the role of the subjects that compose it (e.g. conflict of interest).

4.3 Binding contract with ship owners

Once the assessment of the records and documentation provided by the shipping companies and declared eligible for funding is carried out, the shipowners will be asked to sign an agreement with the European Commission and/or with the National Ministries. In these agreements the rights of the shipowner, the obligations to which he is bound and the consequences of any non-compliance will be defined.

This contract will have an annual duration: in fact, each contract will only be valid for the year following the subscription year. Shipowners wishing to participate in the project over several years will have to annually demonstrate that the improvements made or the standards maintained on the routes are constant and, consequently, eligible for funding for the following year. Among the various conditions that must be respected the ship owner will be asked to maintain its vessels on the incentivized route for the entire reference year, since ship owners often switch their vessels during periods where ports are congested (e.g. in the summer).

On the first year the assessment of merit on the standards will be carried out over the previous three years period. However, starting from the second year of incentive the evaluation of the improvements on the routes will take into account only the previous year (in 2022, for example, the documentation referring to the year 2021 will be taken into account).

However, the shipowner must also undertake to maintain high standards for the three years following the one for which he is a candidate to participate in the project, as provided in the 2004 Maritime Transport Guidelines.

If during this period the shipowner will not maintain the standards expected for the period subsequent to the year of reference of the contract, he will incur some penalties that will be indicated in the contract itself. It is necessary to reiterate, in fact, that it is absolutely necessary for the purpose of eligibility of State aid within the European Union rules and for the objective to be achieved, namely the development of maritime transport that is not temporary, but long-term, beyond the terms of the project envisaged by this study, that the start-up of this modal shift is extended over several years.

The presentation of some kind of guarantees (to be used in some specific cases) could be asked, at the request of the Contractor.

4.4 Binding contract with beneficiaries

Just like the shipowners, direct beneficiaries are also asked to sign a contract with the entities involved. Direct beneficiaries are European Union road transport companies, including permanent consortia and simple non temporary associations of operators wishing to load trucks and articulated lorries in compliance with Community rules (with or without drivers) on cargo ships in order to use the sea routes instead of the road ones.

Within the contract, also in this case, the rights and obligations of the beneficiaries will be established. The agreement will cover the trips made in the year prior to the date of signature. For this reason it will not be necessary to provide any type of guarantee in favor of public bodies in case of failure to perform the boarding. In order to streamline the operations, the contract could be signed digitally and directly uploaded on the Ecobonus Platform.

The agreement must be signed by May 30th of the year following the reference one, or the one in which the trips were made. Controls relating to the online application of carriers, in fact, as indicated in the previous chapter 2 of this document, must be completed by May 15th and, therefore, the parties will be in condition to sign the agreement from the following day, except for any requests for integration , to be processed within 15 days.

4.5 Data Protection Scheme

The personal data of the parties involved in the proceeding will be subject to protection based on the regulations laid down by the European Union. In this regard, in fact, it should be emphasized that, although the Regulation 2016/679 of the European Parliament and of the Council specifically regulates the processing of personal data relating to natural persons, information relating to individual enterprises may constitute personal data if they allow identification of a natural person. In addition, the provisions contained in the above Regulation also apply to all personal data relating to individuals in the course of a professional activity, such as employees of a company / organization. Regarding legal entities, however, to date the Regulation does not regulate them.

However, despite this lack, it should be noted that in several countries, such as Italy, regulations are in force that provide for a system of protection of personal data of legal persons similar to the one of natural persons' data. It is therefore necessary to provide a system of protection that is equally effective, for the companies involved in the process of the Méd-Atlantic Ecobonus, with respect to the European Union Regulation

For this reason, it is necessary to prepare an informative report that meets the requirements required at community level for individuals, with which the subjects participating in this process are informed of the purposes of data processing, the types of data collected, the recipients and their rights in the field of data protection. This information document must be signed by individual participants, whether they are individual enterprises or companies, so that they have clear the purposes and the methods of data processing by the data controller, in order to allow the person concerned to make a valid consent.

In addition, a data protection officer will be appointed at central level; moreover all appropriate technical and organizational measures will be taken for the purpose of data protection.

7.0 Technology

The task consists of a functional analysis of an IT tool that will be used to manage the Med Atlantic Ecobonus scheme, and that will mainly support the administrative process. The IT tool should be able to import and manage useful data coming from other ICT systems, like MSW and AIS. To facilitate the reading of this document, a table of acronyms is provided below:

LIST OF ACRONYMS	
AIS	Automatic Identification System
B2B	Business to business
B2MSW	Data exchange format
DBMS	Database Management System
BPMS	Business Process Management System
CO2	Carbon dioxide
CoG	Course Over Ground
DB	Data Base
DDoS	Distributed-Denial-of-Service
EDMS	Electronic Document Management System
EMSA	European Maritime Safety Agency
EO	Ecobonus Office
FAL	Ship Formalities
GDPR	General Data Protection Regulation
GUI	Graphical User Interface
HTML	Hyper Text Markup Language
IaaS	Infrastructure as a Service
ICT	Information and communication Technology
IMO	International Maritime Organization
IT	Information Technology
ITU	International Telecommunication Union
J2EE	Java 2 Enterprise Edition
JSON	Data exchange format
KPI	Key Performance Indicator
M2M	Machine to machine
MMSI	Maritime Mobile Service Identity
MRV	Monitoring, Reporting, Verification
MSW	Maritime Single Window
NMSW	National Maritime Single Window
NOX	Nitrogen oxides
OWASP	Open Web Application Security Project
PaaS	Platform as a Service
PDF	Document format
REST	Representational State Transfer
SaaS	Software as a Service
SOAP	Simple Object Access Protocol
SoG	Speed Over Ground
SOX	Sulfur oxides
TIN	Trade Identification Number
W3C	World Wide Web Consortium
WASC	Web Application Security Consortium
XML	Data exchange format

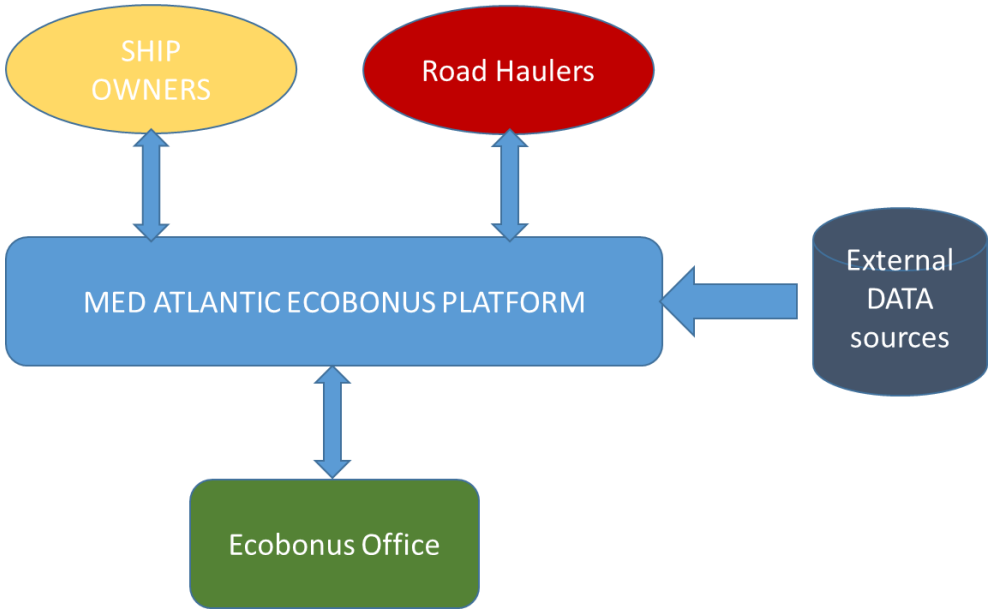
7.1 - System Architecture

7.1.1 Scenario

The following subjects and elements are involved in the project:

- Shipowners. They must submit for approval the voyage legs on which the incentive will be calculated.
- Road Haulers. They could take advantage of the routes deemed eligible and ask for economic incentives.
- MAE office. It is in charge of approving the legs proposed by the shipowners, monitoring the regular management of administrative processes and providing to issue the incentives, once the MAE Monitoring Committee has given its authorization.
    - External Data source. Information coming from private or public entities, enabling the verification

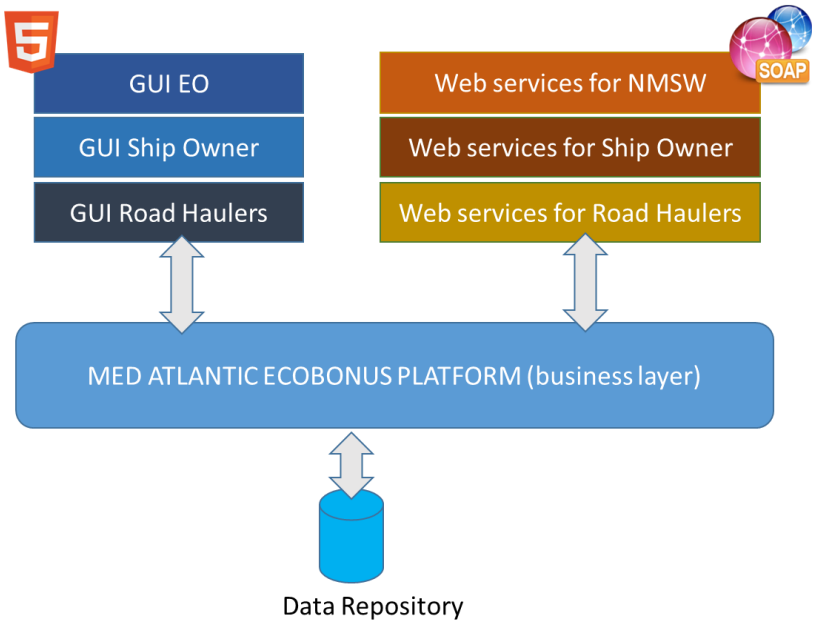
and control processes of the platform. (e.g. National Maritime Single Windows)



7.1.2 Technical Infrastructure

The proposed platform should consist of three fundamental logical levels:

- An interface layer (GUI and M2M).
- A “Business Layer” that would play as the engine of the application and would manage the decision-making and calculation functions.
- A Data Repository to store all the information.



7.1.3 Graphical User Interface

The system should be able to manage various operating users at different levels interacting with the same Graphical User Interface.

The users will also have the possibility to use the system manually to: enter data, create reports, check information, etc., as an alternative to the Machine-to-Machine communication between the platform and other information systems.

In order to develop this type of interface, HTML5 technology should be considered for the reasons listed below.

HTML5

HTML5, Hyper Text Markup Language, is a markup language used for the creation of web documents.

The display of HTML files, called web pages, is entrusted to a browser that translates the HTML language into content that can be seen by the users.

HTML5 is the latest evolution of the HTML standard and it is the result of years of study and debates aimed at the construction of a new expressive paradigm for the WEB. In terms of the choice of the browser to be used for the eco incentive scheme, it should be noted that the latest generation of browsers (such as Google Chrome, Mozilla Firefox, Apple Safari, Microsoft Edge) comply with the latest HTML5 specifications to date.

Interest in HTML5 by the majority of developers instills confidence in the evolutionary development and the longevity of this technology.

HTML5 incorporates two different concepts:

- A new HTML version with new elements, features and behaviors.
- A broader usage of technologies which enables the user to design websites and applications that are more diverse and expressive.

This new standard is free of charge and has several new functionalities such as:

- Semantics: to describe contents more precisely.
- Connectivity: to communicate with the server in new and innovative ways.
- Storage for offline use: to allow webpages to store client data in order to work more efficiently when offline.
- Multimedia: to make the usage of audio and video a common component in web design.
- 2D/3D Graphic Effects: to incorporate a wider range of options.
- Performance & Integration: to optimize loading speed and get better use out of hardware and software resources.
- Device access: to use various input and output devices.
- Style: to enable the designer to create more sophisticated themes.

7.1.4 WEB Services

Web services are software services designed to support M2M interoperability between different computers in a distributed context.

In this study, such structures are designed to enable interaction between company systems (haulers' and shipowners' systems) and the MAE platform, with the possibility of supporting data flow deriving from external data sources, such as i.e. National Maritime Single Windows systems.

Currently, the most widely accepted methodologies for carrying out these tasks are SOAP (Simple Object Access Protocol) and REST (Representational State Transfer).

The main difference between the two approaches is that while SOAP is a proper protocol based on XML with clear and precise rules, REST is a system architecture and therefore can be implemented in a variety of ways and allows the developer a lot of customizable design in the setting up phase. Furthermore, it is not bound to any specific format in terms of data exchange (JSON is currently the most common one; XML is also broadly used).

The following table highlights the main differences between the two methodologies:

SOAP	REST
SOAP is a protocol: it has a defined set of rules that must be followed rigorously	REST is an architectural style
SOAP defines rules and security levels	REST uses the security measures of the underlying transport protocol
SOAP has a slower processing time than REST	A REST message request is processed faster than a SOAP one would be
SOAP only supports the XML data format	REST supports a variety of data formats: text, XML, HTML, JSON, etc.
It is complicated to implement and manage	Simple to implement
Uses more bandwidth than REST	Uses less bandwidth than SOAP
It does not have a web cache system.	Has a web cache system
Uses a WSDL to describe the web service	There is not a describing tool for the services shown
SOAP is commonly used within systems dealing	REST is commonly used in social media sites, chat

with payments, finances and telecommunication	sites, and mobile phone services

As the project's approach is more oriented towards regulations and security, SOAP would currently represent the most functional and effective option in order to quickly develop an M2M service that can facilitate the interaction between largely different software platforms.

7.1.5 Business Layer

The Business Layer is a software layer on a server that provides several services. This task is carried out through the support of an Application Server, an IT environment, within which the business programs "run" based on a specific technology with the known specifications.

One of the technologies which has been in constant and consistent development since the 90s is JAVA (that gets its name from the same programming language). It is continuously introducing ever more innovative solutions in direct response to a market that is continuously evolving.

The JAVA 2 Enterprise Edition (J2EE) technology has become synonymous with the development of robust, secure and efficient business applications over the years. These characteristics have made it one of the most significant development platforms, especially in scenarios where security and robustness are a must.

The JAVA object-oriented language has been very successful amongst developers as it has enabled to implement a wide range of standard modules and libraries, some of which were used to build J2EE technology.

The "J2EE specification" defines the set of rules, best practices and official libraries that govern software development using this technology.

The specification is constantly evolving thanks to the most influential information technology companies. In addition to Sun Microsystems, creator of the JAVA language, companies like IBM, Oracle and BEA are collaborating in its evolution.

Currently, the most common and widespread J2EE application servers used to support these solutions are:

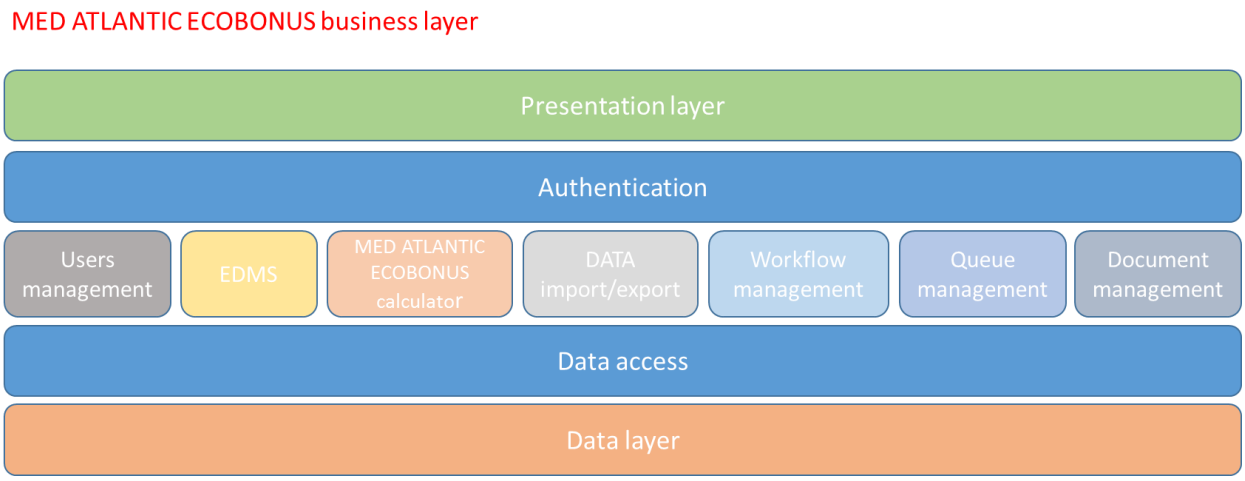
- Apache Tomcat (opensource)
- Jboss
- Wildfly
- Glassfish (opensource)

In order to fully understand how J2EE (most recently dubbed JEE) technology came about, it is important to focus on the first "E" that stands for Enterprise. It is possible to state that JEE technology is adapted for businesses in the design and development of applications that must be reliable and robust in a distributed context.

Using this technology, it has become possible to manage potentially complex business models more easily, since different users can take part.

The object-oriented approach enables the developer to create applications with module logic, using standard components in the architecture as opposed to developing modules ex-novo.

The following figure is an example of how the MAE platform modules could be designed and distributed:



JEE technology could facilitate the creation of B2B modules like those represented above, by supplying tools suitable for implementing standard modules for: authentication, managing users, importing/exporting data, reports, managing queues, access to basic data, etc.

7.1.6 Infrastructure characteristics

From an infrastructural point of view all this is achieved with a tiered technological structure, where each level implements a specific feature and it is supported by appropriately sized servers.

Each server is dedicated to a specific task as in the following:

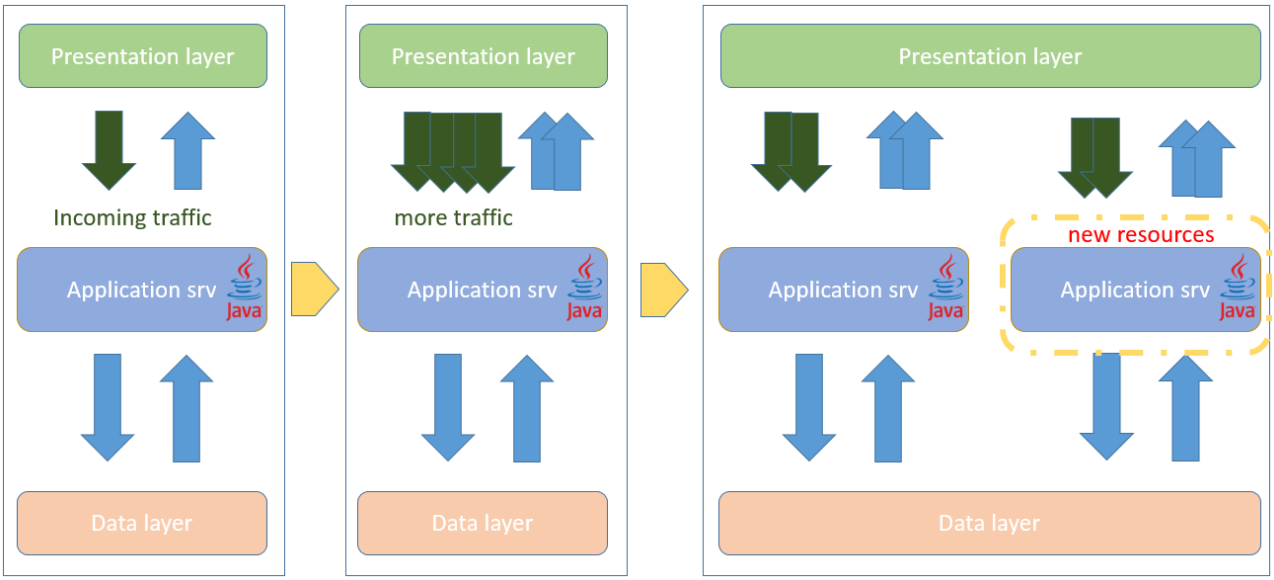
- Web server for the presentation layer
- Application server for the business layer
- Server DB for the data layer

In order to manage the increasing number of requests, with new server instances or new resources (CPU, memory, etc.) supporting the additional workload, each layer must be scalable.

Both "horizontal" and "vertical" scalability must be guaranteed.

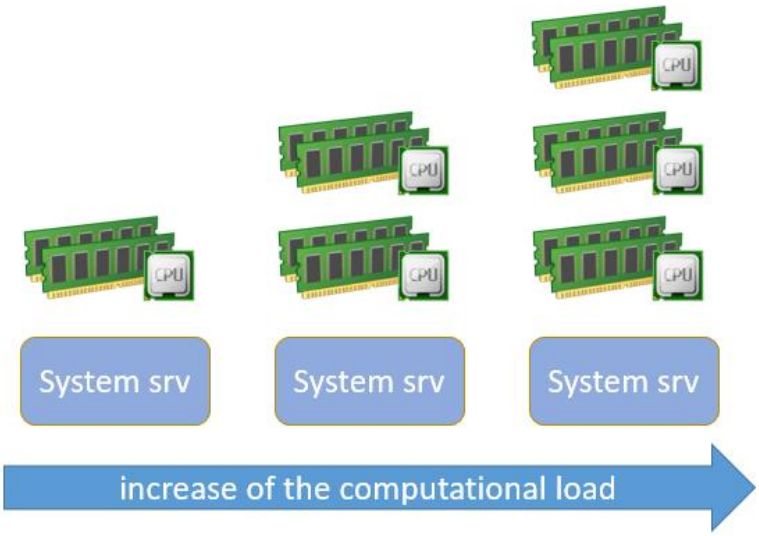
Horizontal scalability: application instances increase with increasing of the requests of use (increasing of number of instances).

Vertical scalability: increase / decrease of the availability of resources for the application, as the computational load increases / decreases.

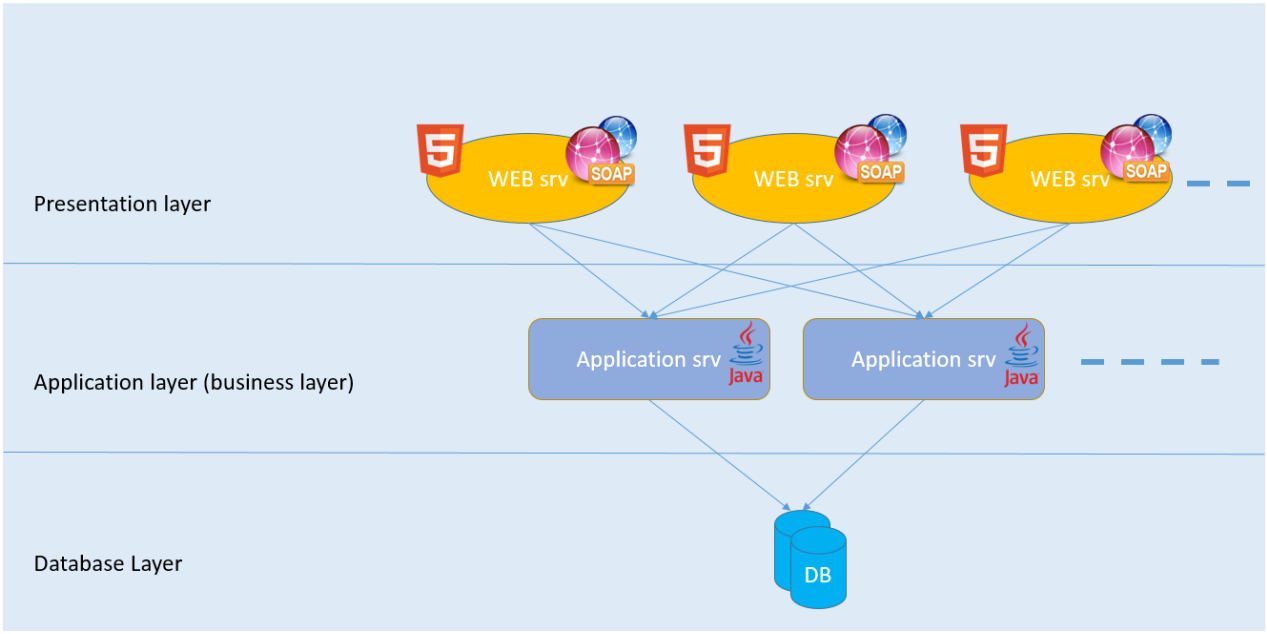


In the figure above, an example of how the application resources can scale horizontally, increasing the capability to face the increase of the incoming traffic.

The following is an example of vertical scalability with the assignment of resources to the system proportionally to the increase in the computational load.



Proposal of a scalable, three-level technological platform



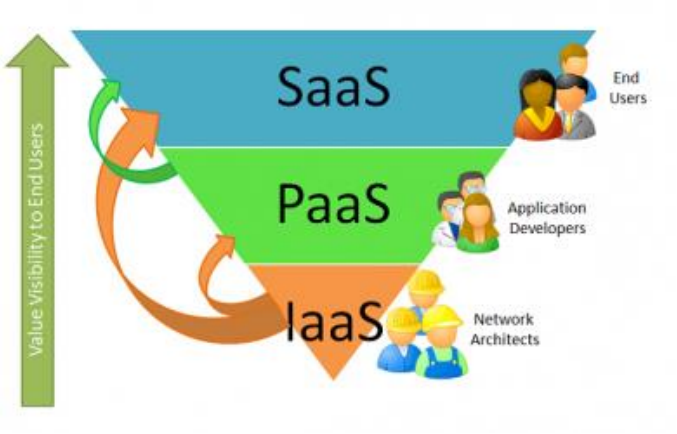
The option of cross-platform technologies such as HTML5, JAVA and SOAP completely disengages both from the choice of a particular operating system and from a specific kind of hardware.

Additionally, due to the high scalability of the proposed configuration, a properly designed solution could fully take advantages from its features while working in cloud environments.

7.1.7 Considerations about cloud solutions

There are three types of standard (commonly available) cloud services: Saas, PaaS and IaaS.

- SaaS (Software as a Service): this is the most frequent type, so instead of installing a traditional third-party software directly into its machines, it makes use of a third-party company (hosting service provider) that prepares infrastructure and programs by making them accessible via the Internet anywhere and on any device, by providing a payment based on actual use;
- PaaS (Platform as a Service): it is a software platform represented by a series of programs, libraries, services, etc. to be provided by third parties, very similar to SaaS as functioning;
- IaaS (Infrastructure as a Service): it foresees the use of hardware resources made available remotely by third parties. It is a process of virtualization of hardware structures outside the company to be used for the applications in use.



At the MAE platform design scope, it is appropriate to consider the PaaS and IaaS modes.

Choosing the PaaS service, it is possible to focus only on software development using the programs (including the Data Base program, the libraries, the database tables which will be defined / developed once the platform is implemented), since the virtual hardware and application environments (application servers) maintenance must be done by the service provider.

The application scalability mechanisms are also managed by the supplier, to meet the need for more or fewer resources; he can therefore expand or limit the infrastructure with extreme flexibility.

Considering these features, however, it should be noted that to fully take advantages of this type of service, it is necessary that applications are developed taking into account certain specifications imposed by the service itself, necessary to harmonize these with the hosting environment: in other words, the software produced is connected to the environment made available by the PaaS service provider.

In IaaS mode this last constraint is not present, so the software gains in "portability", i.e. the possibility of being hosted by different IaaS service providers without modifications.

On the other hand, all architecture must be designed, monitored and managed. The service provider will only make available the architecture and guarantees its basic functioning.

In case of a cloud solution it is necessary to assess the risks related to computer security:

- there is a risk of manipulation or data stolen, since data is stored in virtual servers often subject to maintenance by the cloud service provider;
- the security risk is difficult to estimate, since there is no visibility of the perimeter security implemented to protect the production infrastructure;
- server Farms, where sensitive data is stored, often belong to companies located in countries other than those of the users, so in case of violation there could be serious difficulties in proceeding legally.

To date, public administrations make use of the so-called "private clouds", i.e. infrastructures able to provide cloud services but located in server farms controlled by authorized entities. This solution could be the best one for the MAE environment itself.

7.1.8 The Database

The most common type of database are Relational databases.

The reasons for this success are basically two, that is relational databases actually:

1. provide simple and efficient systems to represent and manage data

2. are based on a relational model with solid theoretical foundations and standard implementation rules.

The relational model was already proposed in the seventies and thanks to its consistency and usability, it has become the most used to produce DBMS since the eighties.

The fundamental structure of the relational model is the "relation" concept, i.e. a two-dimensional table made up of lines (tuples) and columns (attributes).

The relationships represent the entities that are of interest in the database.

Currently on the market it is possible to:

- buy products (typically Oracle and MS SQL Server) offering a high-level of features and services
- download open source or free products (PostgreSQL and MySQL), which in any case guarantee adequate reliability and efficiency among highly active developer communities also in providing support.

The process of how to structure the tables to support the administrative process presented in this project is described in next paragraph 4.3 and 4.5.

7.2 – Existing Standards

Currently, among the European standards regarding data formats for administrative / commercial issues, it is possible to identify a set of structures, from which some functional to the Med Atlantic Ecobonus project data elements can be extracted.

Such data elements of interest are voyage data (route, cargo, carries data), but also static ship data, propulsion efficiency, emissions and ship performances.

The adopted approach is particularly advantageous since it allows the development of the "Machine-To-Machine" data import-export logics.

To adopt this approach, an analysis of the existing standards that could be used has been performed and the result is shown in the table below. Following this table some evaluations regarding each standard are expressed.

MONITORING OF THE SHIP PARAMETERS xxx			
PARAMETER (from Basic Data - Line Registry)	**SOURCE (to be confirmed)**	**data available from MRV/THETIS**	**NOTE about MRV data**
Average speed	Calculable from 1) B2MSW data; 2) AIS data; 3) vessel journal	no	
Capacity (lane meters)	Certificate conserning the ship	no	
Average number of passengers per vessel	calculable from 1) B2MSW; 2) MRV	yes	For Pax ships (also ro-ro): Effective number of pax onboard is inputed for every voyage --> it is possible to calculate the average number
Average number of new vehicles per trip and per ship (to calculate the number of trucks equivalent transporting the new vehicles?)	Cargo Manifest?	no	
Yearly trips	Calculable from 1) B2MSW data; 2) AIS data (to be verified); 3) MRV	yes	They are condidered only trips between UE Ports, from the last extra-EU port to EU port and from EU port to a next extra-EU port. Calculable from the list of voyages.
Navigation - Type of fuel	MRV	yes	
Navigation - consumption of fuel (ton/day)	Obtainable from MRV	yes	Expressed in tons/voyage. Voyage is expressed both in hours and in nautical miles --> it is possible to calculate ton/h, ton/day, ton/km
Navigation - abatement technologies	IAPP certification	no	
Navigation - CO2 (K/hours)	Obtainable from MRV	yes	Expressed in tons/voyage. Voyage is expressed also in hours --> it is possible to calculate ton/h
Navigation - NOX (K/hours)	Difficult to calculate	no	
Navigation - SOX (K/hours)	Calculable according to fuel consumption and type of fuel	no	
Navigation - PM (K/hours)	No source available	no	
Port - Fuel type	MRV	yes	
Port - fuel consumption (k/hour)	MRV	yes	Expressed in tons/ port stay. Port stay is expressed also in hours --> it is possible to calculate ton/h
Port - abatement technologies (cold ironing)	IAPP Certification (not for cold ironing). In case of cold ironing the turning off of engines is registered in the ship journals.	no	
Port - CO2 (K/hours)	1) calculable from fuel consumption and type of fuel 2) obtainable from MRV	yes	Expressed in tons/ port stay. Port stay is expressed also in hours --> it is possible to calculate ton/h
Port - NOX (K/hours)	Difficult to calculate	no	
Port - SOX (K/hours)	Calculable according to fuel consumption and type of fuel	no	
Port - PM (K/hours)	No source available	no	
Port - average layover time (hours)	Calculable from 1) B2MSW data 2) MRV data	X	Real time at berth

NOTE 1: In the case of ships that makes more then 300 route starting or ending in an EU port, MRV data can be given on annual basis, instead of for each route.

NOTE 2: Many data are known by Shipowner, registered on ship journals

7.2.1 - B2MSW – Business to Maritime Single Window

B2MSW is one of the latest international standards developed to satisfy the Reporting Formalities Directive requirements regarding the National Maritime Single Windows and ship formalities.

Even if the European Directive 2010/65/EU does not define the data standard for the B2MSW message, it is highly recommended by the European Union to define only one standard to be adopted

in the nearest future for the European Maritime Single Window platform by all the European Member States.

In the meantime, it is possible to use the standard defined in the Connecting European Facilities project AnNA. The standard has been defined within the project and its use is recommended at least for the compulsory Ship Formalities (Annex A and Annex B of the Directive 2010/65).

For the purpose of the Med Atlantic Ecobonus project it is relatively simple to identify the voyage data in the B2MSW, while no information is present about the billing data or any other information able to associate the carrier "tax identification" data and the voyage data.

Below is the list of information that can be extracted or gathered from the B2MSW format:

- Number of trips per year
- Average number of passengers per trip
- Average ship turnaround time
- Average speed

To obtain also the hauler voyage data information from the B2MSW format, it is possible to:

1. Use the “additional information” field, which can be used to fulfill the required carrier “tax identification” data and license plate which currently cannot be extracted from the existing ship voyage data standards. In this case, the information would not be considered by the Authorities responsible for controls, in the absence of a specific regulatory requirements.

2. Require to the “European Maritime Single Window” working group to add the additional information aiming to support the business-oriented processes.

7.2.2 – CUSTOMS and COAST GUARD

In-depth analysis was carried out in collaboration with the Italian Authorities to verify the possibility to extract the carrier tax identification and the vehicle license plate from the information they already have.

Regarding the customs formalities, it has been found that the vehicle license plate is not always provided in the customs manifest.

The tax identification is not provided but could be obtained from the EORI (Economic Operator Registration and Identification) and / or from the TIN (Trade Identification Number), since one of these identifiers is always present.

However, it has also been stated that Regular Shipping Lines, which are exactly those for which the eco incentive scheme contribution is foreseen, are exempt from presenting the customs declarations to Authority, so the information could not be extracted from this source.

Regarding the cargo information to be provided to the Coast Guard, it has been found that this is contained in the IMO FAL 2, which is provided through the National Maritime Single Window.

Even in this case the system therefore could not be used as a source for the hauler tax identification and license plate data since this data are not contained in IMO FAL 2.

7.2.3 – Monitoring Reporting Verification – MRV Regulation

Regulation (EU) 2015/757 on CO2 emissions Monitoring, Reporting and Verification in maritime transport is in force from 1st July 2015 and the first monitoring period started on 1st January 2018.

The regulation applies to the voyages to, from and within the EU sea spaces.

Implicitly, starting from 1st January 2018 the shipping companies must provide themselves with tools, to provide the requested data electronically.

Differently from the B2MSW standard, MRV does not use a predefined and shared format for data exchange: it is an information repository through which it is possible to build reports in compliance with the requirements of the aforementioned Regulation.

If this information is managed electronically, and the system has communication interfaces to third-party systems, it becomes feasible to design a Machine-To-Machine transfer approach towards the MAE platform. (interoperability concept)

Whereas this interface is not possible, the manual data entry using the Graphical User Interface of this information is required, (MAE platform must provide a required user interface).

As required by the Regulation, the shipowner must submit to the THETIS system (available via the EMSA platform) the annual Emission Report for each ship.

It can be made via manual data entry or via XML data upload.

The possibility to electronically access the data contained in the THETIS system by the authorized MAE users would allow to have the data mentioned in the table above. Otherwise the final report will be the only one official data source.

In this latter case, the list of information (contained or deriving from the Emission Report) that can be used is the following:

- Fuel type
- Fuel consumption (ton/day)
- CO2 (K/hours)
- SOX (K/hours)

7.2.4 – Automatic Identification System - AIS

All ships exceeding 300 tons, passenger ships and platforms must transmit AIS data.

The aim is to allow all the ships, platforms and the Coast Guard control centers to real-time visualize the identification data of the sea traffic, as well as the risks of collision between vessels based on routes and speed.

According to the ITU - International Telecommunication Union regulations, from the ship's AIS transponder are continuously transmitted: ship name, MMSI code, latitude and longitude, speed, route, conditions/activities and other information.

There are two classes of AIS transmitters:

- Class "A" is intended for ships or fishing vessels with this obligation.
- Class "B", limited in the power supplied, in the information provided and in the frequency with which data is transmitted, is intended for leisure ships.

Information available via AIS:

	Class A	Classe B
Power TX	12,5 W	2 W
Data frequency	From 2 to 15 seconds	30 seconds
Data frequency at anchor	3 minuts	3 minuts
MMSI	Yes	Yes
SoG (Speed Over Ground)	Yes	Yes
Position error	Yes	Yes
Latitude and Longitude	Yes	Yes
CoG (Course Over Ground)	Yes	Yes
Current route	Yes	Yes
Information time/data stamp	Yes	Yes
Ship name	Yes	Yes
Ship type	Yes	Yes
Ship size	Yes	Yes
Ship position via GPS	Yes	Yes
Type of differential receiver	Yes	Yes
Navigation Status	Yes	No
The level and the direction of rotation	Yes	No
IMO Number	Yes	No
Radio Call Sign	Yes	No
Sea current	Yes	No
Destination	Yes	No
Estimated Time of Arrival	Yes	No

For the scope of this study, only A class AIS should be considered, since it contains extractable data related to the routes done, the navigation times and obtain the average speeds. These are useful data to verify what was declared by the shipowners and used directly in the calculation of the incentives.

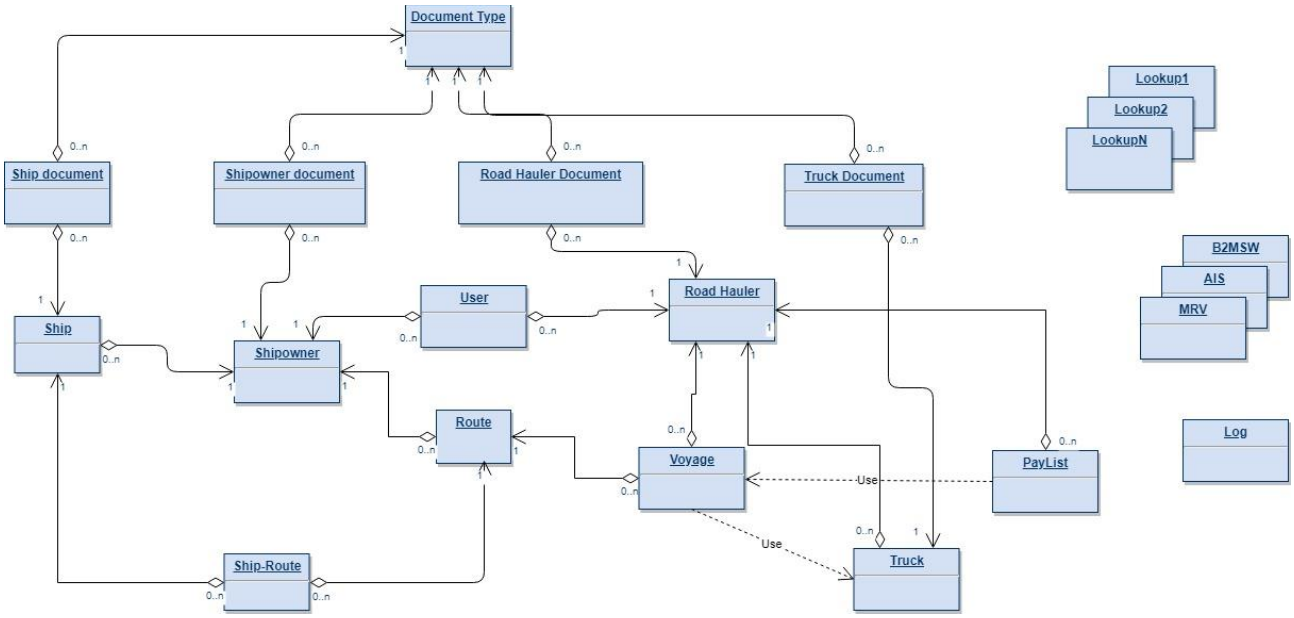
In particular, the following items could be considered:

- IMO Number
- Ship name
- SoG
- CoG
- Latitude and Longitude
- Position error
- Current route
- Navigation Status
- Destination
- Information time/data stamp

This information, if properly elaborated, could help to obtain some fundamental data as indicated in the table at section 4.2.

7.3 - Transactional Database design

The MAE platform data layer is transactional: in the following the details of the schema (entity-relations) with a proposal of the main tables of the software platform database, and, additionally, a suggestion of a possible sizing of the fields.



The main tables (core tables) within the general scheme shown in the above figure will be detailed in this chapter, while the tables used by the different modules of the platform will be detailed in the following chapters.

Shipowner table: Table of records fulfilled through the shipowner registration

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
Company_Name	nvarchar	500	
Address	nvarchar	500	
City	nvarchar	500	
state_prov_reg	nvarchar	500	
ZIP	nvarchar	500	
Country	nvarchar	500	
Fiscal ID	nvarchar	500	
Telephone number	nvarchar	500	
Fax number	nvarchar	500	
Email	nvarchar	500	
Enabled	bit	1	Active subject or disabled subject by the system

Road Hauler table:

Table of records fulfilled through the road haulers registration

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
Company_Name	nvarchar	500	
Address	nvarchar	500	
City	nvarchar	500	
state_prov_reg	nvarchar	500	
ZIP	nvarchar	500	
Country	nvarchar	500	
Fiscal ID	nvarchar	500	
Telephone number	nvarchar	500	
Fax number	nvarchar	500	
Email	nvarchar	500	
Enabled	bit	1	Active subject or disabled subject by the system

Route table: Table of records fulfilled through the legs registration

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
FromEU	bit	1	If “true” the leg is from EU country to extra EU
ToEU	bit	1	If “true” the leg is from extra EU country to EU
EUtoEU	bit	1	If “true” the leg is within EU countries
ArrivalPort	int	4	OID from the table of Port
DeparturePort	int	4	OID from the table of Port
OtherPort	int	4	OID from the table of Port
Accepted	bit		If “true” the leg has been accepted
Enabled	bit		If “true” the leg is active
CompanyOID	int		Referred to an OID of the Shipowner table
Denied	bit		If “true” the leg is forbidden; only ports related fields are fulfilled

Ship table: Table of records fulfilled through the ships registration

Column_name	Type	Length	Note
OID	int	4	Automatic ID code
Name	nvarchar	500	
IMO number	nvarchar	14	
Cold ironing	bit	1	
Technical_efficiency_type - EEDI = 1 - EIV = 2	int	4	

Technical_efficiency_value	int	4	
CompanySameAsShipOwner	bit	1	
SpeedMin	decimal	9	
SpeedMax	decimal	9	
Avarage Speed	decimal	9	
DisplacementMin	decimal	9	
DisplacementMax	decimal	9	
Capacity	int	4	
Avarage occupancy	int	4	
PAX number	int	4	
Avarage PAX number	int	4	
Number of new vehicles (average figures for a sailing).	int	4	
Yearly sailings	int	4	
Fuel consumption (at sailing Tons/day)	int	4	
Fuel Type ID (at sailing)	int	4	An OID of the Fuel Table
Abatement tech ID	int	4	An OID of the Abatement_Tech Table
CO2 (at sailing Kg/Hour)	int	4	
NOX (at sailing Kg/Hour)	int	4	
SOX (at sailing Kg/Hour)	int	4	
PM (at sailing Kg/Hour)	int	4	
Fuel Type ID (at port)	int	4	An OID of the Fuel Table
Fuel consumption (at port Tons/day)	int	4	
CO2 (at port Kg/Hour)	int	4	
NOX (at port Kg/Hour)	int	4	
SOX (at port Kg/Hour)	int	4	
PM (at port Kg/Hour)	int	4	
average time at port (hours)	int	4	
Enabled	bit	1	If “true” the record is enabled

Truck table: Table of records fulfilled through the transport means registration

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
Brand	nvarchar	250	
Model	nvarchar	250	
Plate	nvarchar	250	
IsAtrailer	bit		If “true” is not a Truck but a Trailer
Enabled	bit		If “true” the record is enabled

CompanyOID	int		Related to OID of the Road Hauler table

Voyage table: Table of records fulfilled through the generation from the haulers of the incentives

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
RouteOID	nvarchar	250	Related to an OID of the Route table
Departing date	date		
Departing time	datetime		
TruckOID	int	4	
TrailerOID	int	4	
Enabled	bit		If “true” the record is enabled
CompanyOID	int		Related to OID of the Road Hauler table
TicketCost	Float	5	
Value	Float		Default 0, updated by the calculator
Status	int		If 0 (default)=to be checked, 1=approved, 2=refused, 3=clarification request (request is written on comment field)
Comment	nvarchar	500	

Ship-Route table: the table links the leg to the ship in an identified period. This link is useful to the calculator in order to carry out its calculation.

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
RouteOID	int	4	Related to an OID of the Route table
From date	datetime		
To date	datetime		
ShipOID	int	4	Related to an OID of the Ship table
Enabled	bit		If “true” the record is enabled

Besides the "core" tables presented above, there is a series of data structures necessary for the management of the platform workflow, in particular:

- User Management
- Lookup tables (containing static and fixed data)
- Tables supporting information deriving from external systems

As far as the "Shipowner" and "Roadhauler" users are concerned, it is important to envisage both the role of administrator, enabled to insert changes and cancellations, and the role of the user authorized to consultation only (view).

As far as the figures of the MAE Office are concerned, it is necessary to clearly define the different roles and duties.

User table: Table of records fulfilled through the user's registration

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
Username	nvarchar	500	
Password	nvarchar	500	
ForcePasswordAtLogon	bit	1	
UserType	int	4	User type: 1 EO, 2 SO, 3 RH
PasswordExpire	datetime	8	Password change date
IsAdmin	bit	1	If "true" the user RH or SO is administrator
CompanyOID	int	4	Referred to an OID of the Shipowner table or Roadhauler table
EOuser	bit	1	If "true" the user belongs to the MAE Office
EOrole	int	4	If the user is EO it defines the role
Name	nvarchar	500	
Surname	nvarchar	4	
Email	nvarchar	1	
Enabled	bit		If "true" the record is enabled

With reference to the lookup tables, the following are mentioned in the notes of the previous tables:

- Port table
- Fuel table
- Abatement_tech table

Surely, during the extended design of the production database, the need to introduce others to support the infrastructure will arise.

Port table

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
Name	nvarchar	500	
Latitude	decimal	5	
Longitude	decimal	5	
LOCODE	nvarchar	500	
EU	bit	1	If "true" is an European port
Enabled	bit	4	If "true" the record is valid

Fuel Table

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
Fuel type	nvarchar	500	

CF [t-CO2 / t-Fuel]	decimal	9	
Sulfur weight perc	decimal	9	Sulphur %
Enabled	bit	1	If “true” the record is valid

Abatement_tech table

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
Name	nvarchar	500	
type			
Enabled	bit	1	If “true” the record is valid

In order to be able to carry out appropriate checks on what has been inserted / declared by the users, it is necessary to be able to store data coming from external sources.

In the current study the following sources have been identified:

• B2MSW

• AIS

• MRV

For these sources it is necessary to provide tables to store data at least temporarily, waiting for them to be "consumed" in order to populate the fields of the "core tables" functional to the computer module.

7.4 - Technical description of the key processes

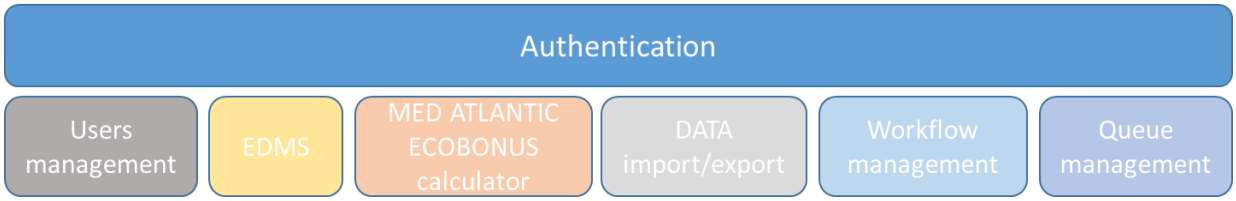
Below it will be analyzed, at a high level, with which modules and reports the technological platform will support the administrative process in the different phases.

For this scope, some mockups of user interfaces will be used, to represent the interaction between GUI and data structures.

Mockups should not be considered exhaustive of the GUI design but should be considered as examples in order to understand how the user interacts with the database.

As described in paragraph 4.1 the platform will be centralized with a WEB interaction front-end (GUI) and a data base to support the information storage and management.

In the middle there are some modules to support the processes. These modules will perform the activities required to optimize the workflow.



Here below the description:

Authentication: verifies the user identity based on the credentials entered, comparing them with those stored in the database.

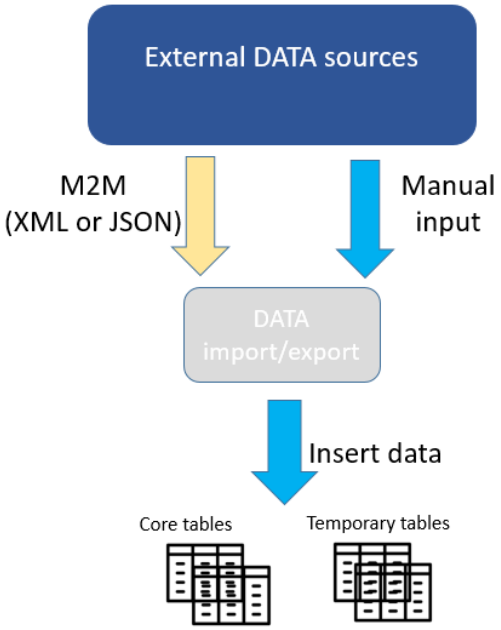
User Management: an administrative module allowing the system operator to enable / disable the MAE platform users, managing their rights individually or for groups.

Electronic Document Management System: a documentation module designed to manage documents (images and PDF) downloaded to the system.

Detailed module functionality is described in paragraph 4.5.

Data import / export: series of sub-modules able to manage the flow of incoming data/documents and reporting/export to the user.

The data import has a particular importance in both cases, from manual data input and from M2M (Machine-To-Machine) systems, since the module should implement the rules necessary to process the raw data and transform them into useful information for subsequent processing (i.e. data functional to the Calculator), inserting them in the fields of the main or temporary tables to be used to validate previously inserted information.



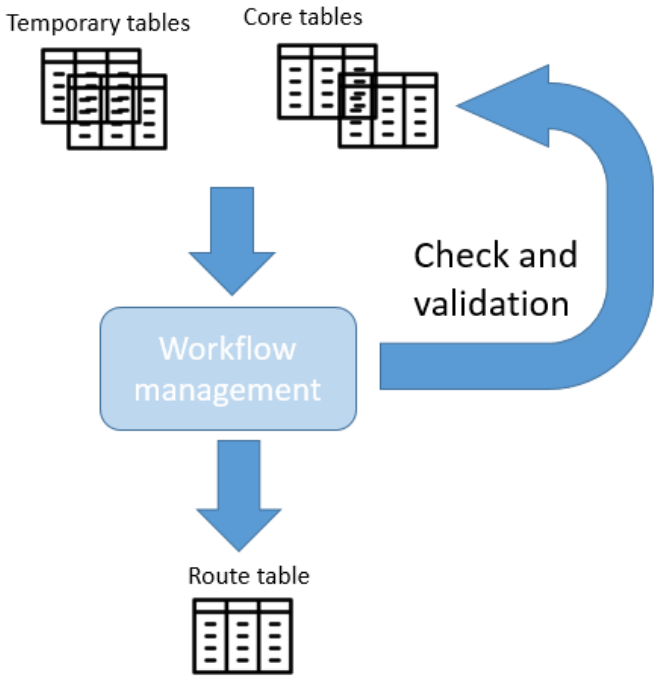
XML and JSON are the most commonly used data types in the M2M exchange.

The module must be able to support the data in temporary tables if the available data set does not allow completion of processing. Furthermore, the module must be able to access the group of main tables (core tables) shown in the previous paragraph to obtain the correct references to the elements being processed.

Workflow manager: the module useful to define the workflow.

The module will retrieve the information from the main and support tables in order to validate the submitted data and will change the status of the involved elements.

This operation involves the voyage table, as the voyage is validated and can be transferred to the calculator (the field "Checked" will become equal to 1).

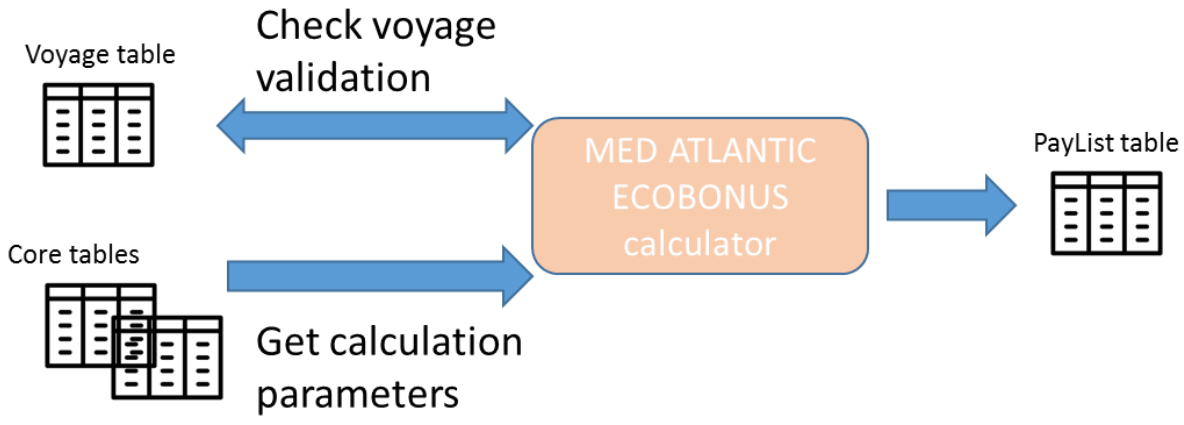


Any discrepancies or shortcomings are stored in a "log" table in order to be managed.

MAE calculator: module used for the calculation of incentives.

The existing routes and the ships' environmental performance on these routes are used as input data.

The main element is the voyage (voyage table) appropriately checked and validated. The data of this table are supported by the data present in the rest of the main tables, appropriately referenced, are then taken from the form and processed in order to calculate the amount to be paid.



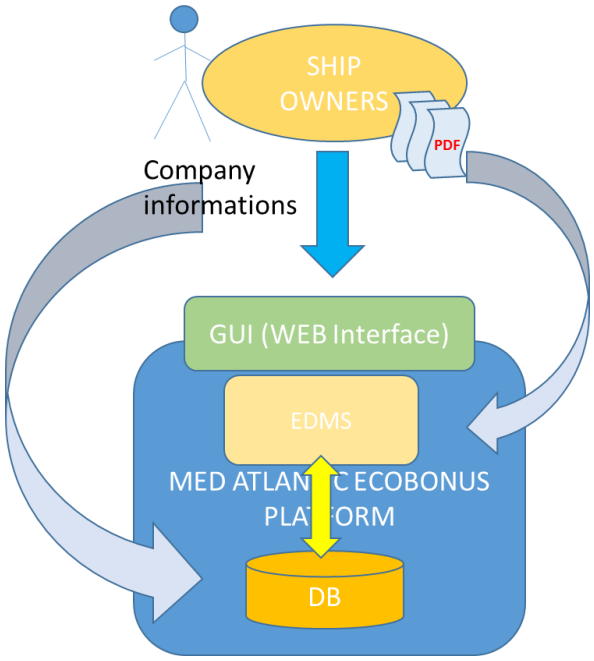
The result is inserted in the PayList table pending validation by the MAE Office.

Queue management: allows to make the input / output data flow series, preventing information leaks or inconsistencies in the data.

7.4.1 – Phase 1

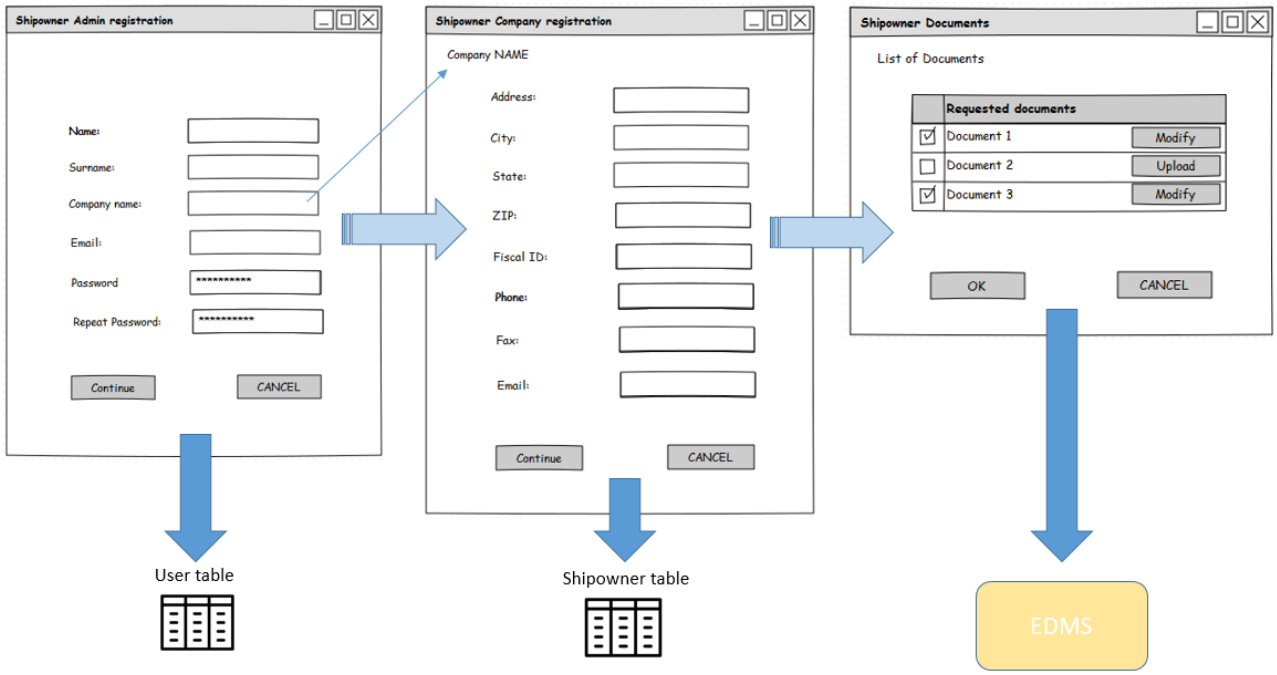
Ship owner registration

The system registration requires the company registration and the registration of at least one user from this company.



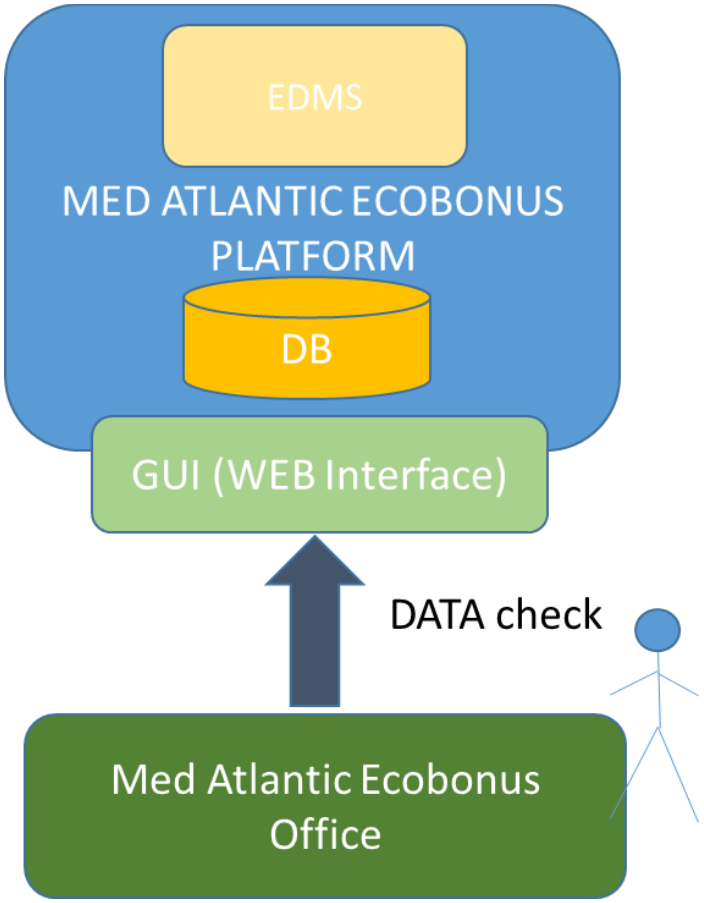
The requested information is related to the company data and the users' personal data. These data are used as input for the appropriate database table.

Some examples of interfaces related to the data entry sequence necessary for the registration:



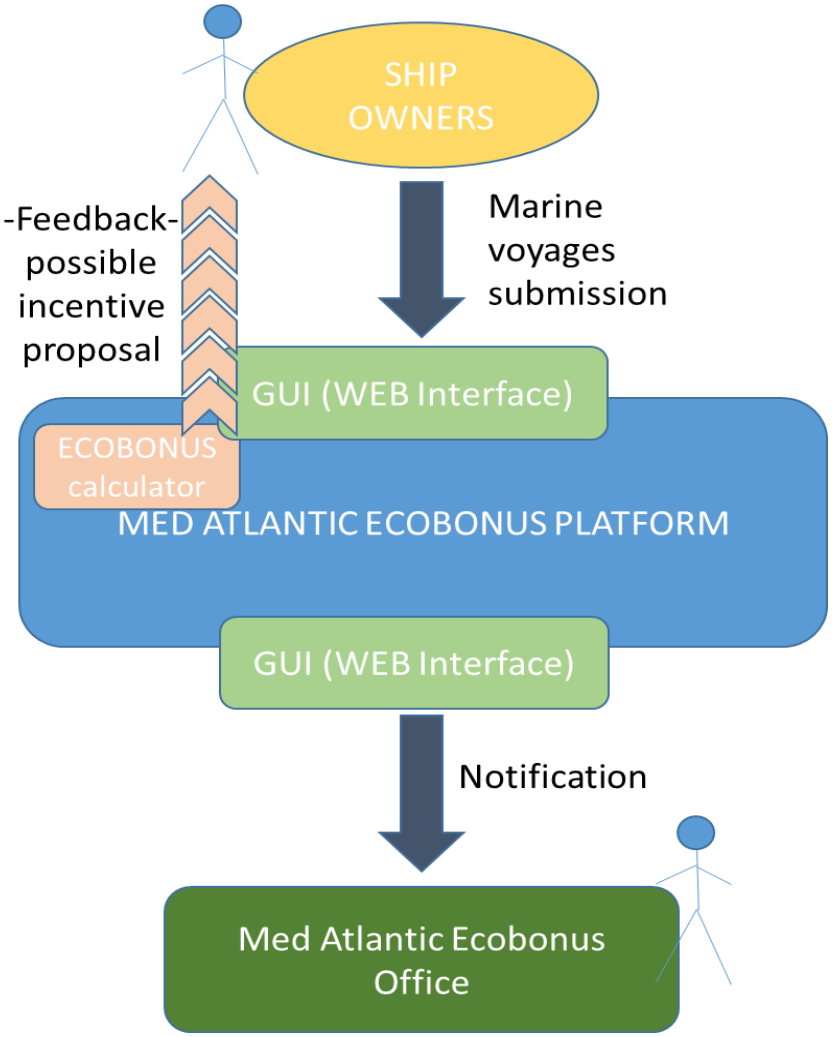
The submitted documents must be considered by the document management module, maintaining the link with the company data.

The collected data and the documents are verified by the MAE Office which could request changes and/or additional information.

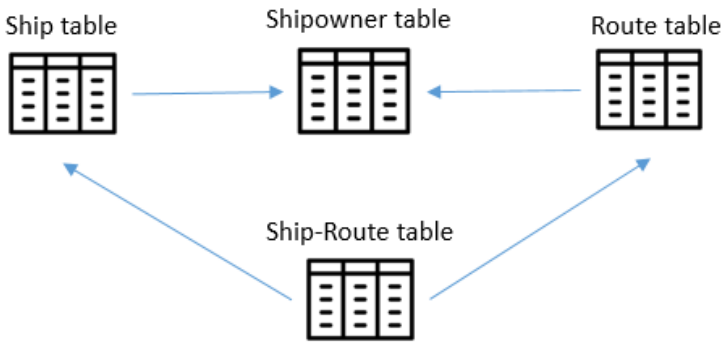


Route presentation

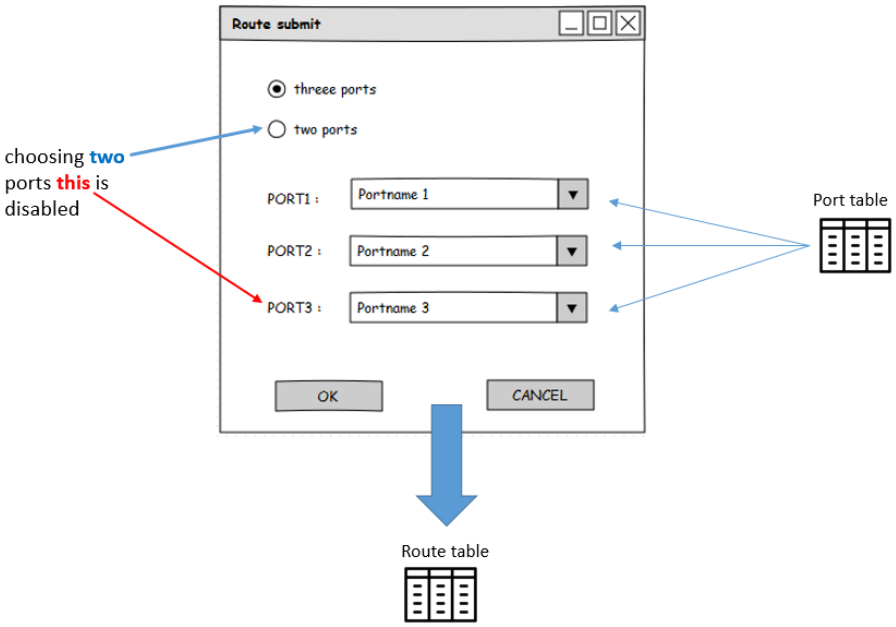
Interested Ship Owners must submit at least one route selected within the EU28 territory.



This operation consists in the single voyage and ships' technical characteristics data entry on that specific route (data insert in the tables relating to the voyage [Route] and the vessels [Ship]).

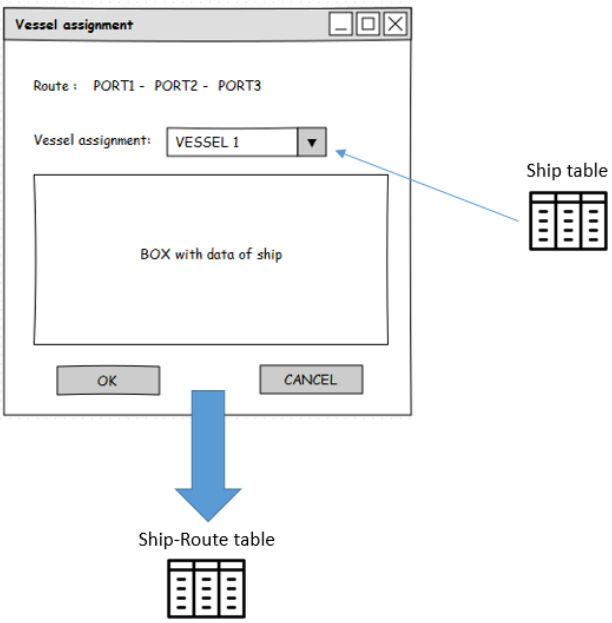


In particular, the shipowner will have to compose the route to be proposed by selecting in order two or three ports (Port table) and assign to the route one or more ships previously entered in the system. The Platform will prevent more than three ports being entered for a route.



On the figure above is an example of how this functionality could be implemented using a GUI.

Here below it is represented a possible interface for the assignment of the ship to the route, with evidence of the relative supporting tables.



The platform will verify that the proposed route meets the eligibility criteria: internationality and non-seasonable.

The Platform will also check whether the proposed route is already exercised by another Shipowner, if “yes”, the system will qualify the route as "non-eligible".

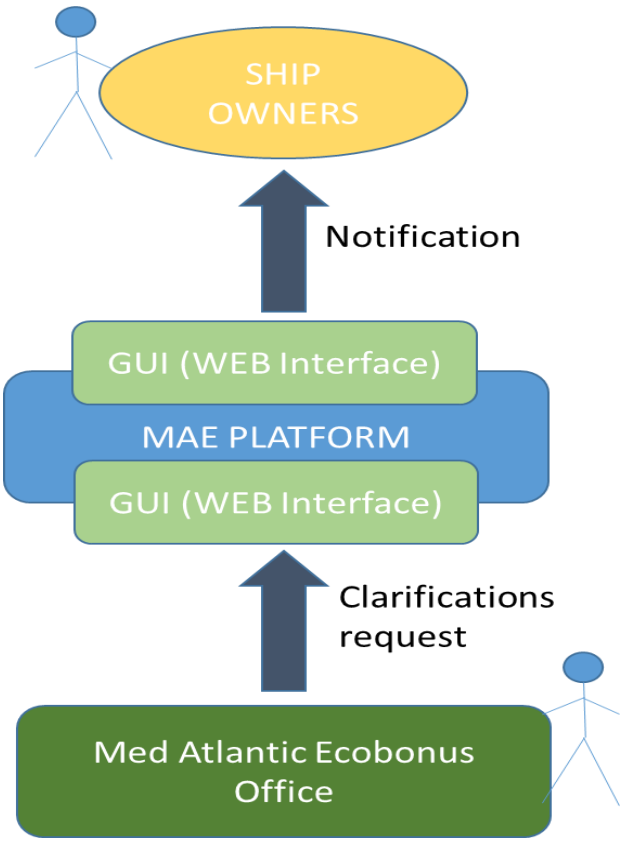
If the route is already exercised by the Owner proposing it, the route could become eligible only if the ship owner provides evidence of the measures that have been taken to improve the ship's performance in terms of emissions.

In this case, therefore, the Platform requires Ship owner to provide data useful for calculating the performance improvement through the calculator module; these data will be referred both to the situation before and after taken measures. EO will obtain from the Platform the outcome of this comparison which will result in confirmation or not of the route's eligibility.

If the route is new, the Platform will require the Owner to insert the data to be included in the externality calculator and will report to EO the need to insert the data relating to the alternative road route into the computer, as well as subsequently carry out a verification that the route "beats the road". Otherwise, the route could be considered “non-eligible”.

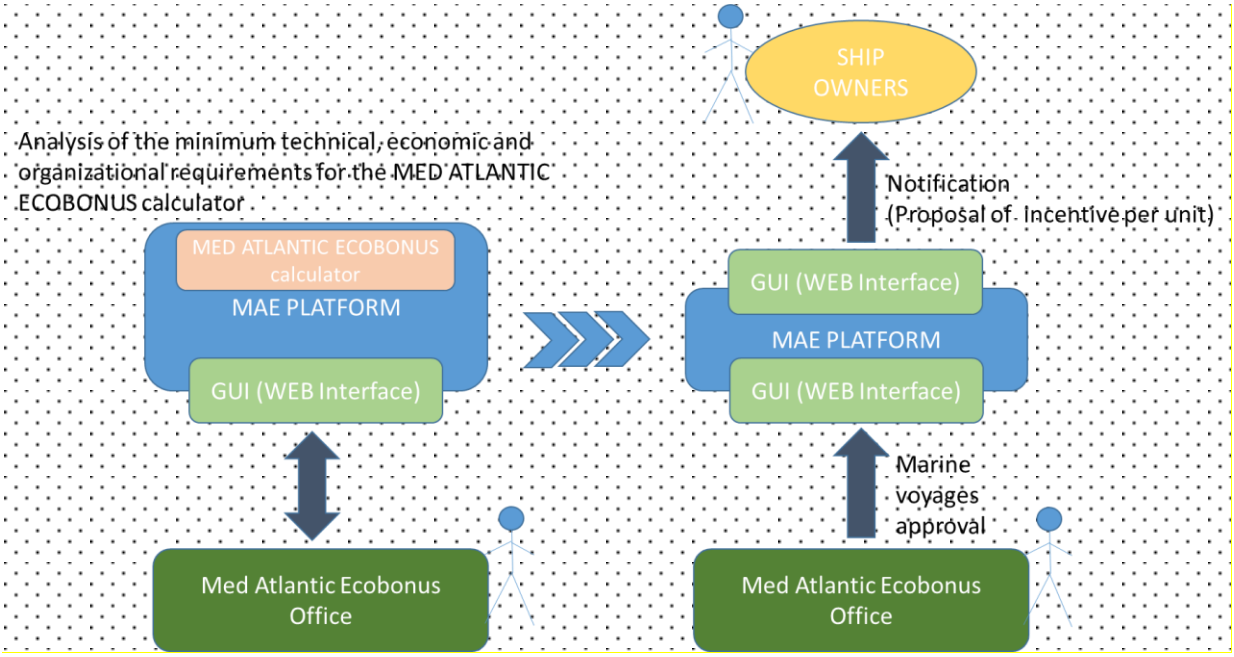
When the proposal for a new route or improved route is submitted, the EO Office has the possibility to view the possible incentive, through the elaboration of the calculator module.

MAE Office therefore has the right to request clarifications regarding the data submitted by the Owner.



If the verification is successful, EO transfers the useful information to the MAE Steering Committee for the evaluation of the route and its possible approval.

For each approved route it will be assigned an ID code and EO will publish on the Platform Portal all the approved routes, to which the carriers can refer to request the contribution related to the voyages done on these routes during the next year.



Possibility of cancellation / termination

It should be foreseen for the shipowner the possibility to conclude the contract.

This procedure must provide for the possibility of keeping the transactions valid even when the data has been deleted.

7.4.2 – Phase 2

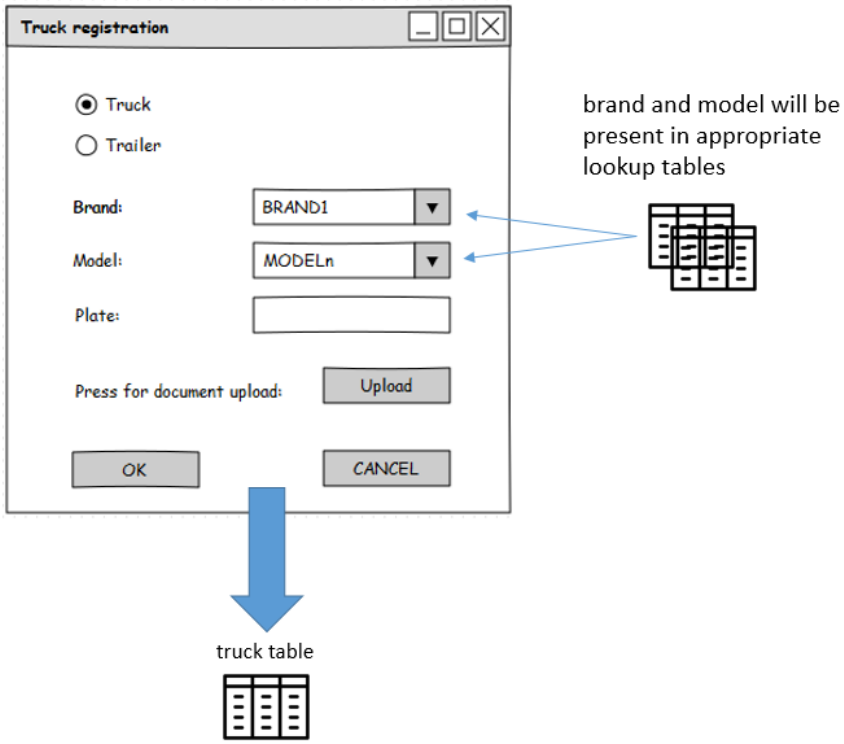
Road haulers registration

The procedure is similar to the registration shown for the shipping company.

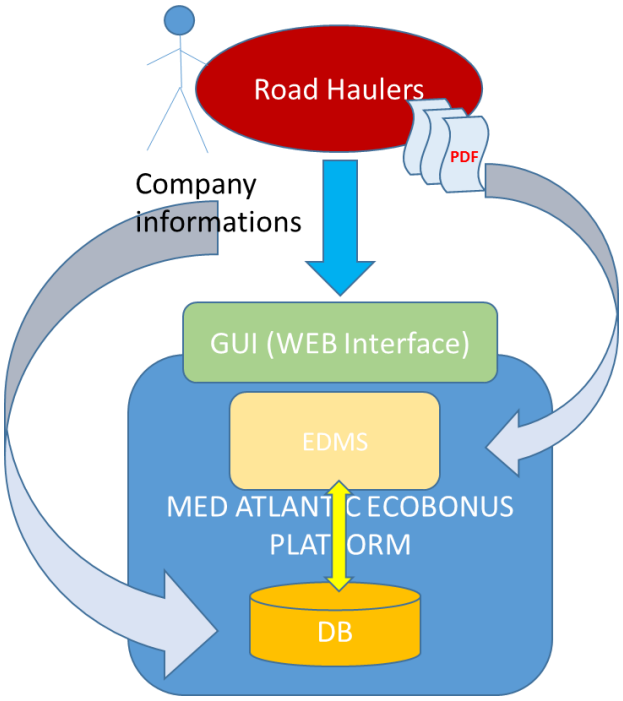
The road hauler registration will take within the set deadline and the Platform will not accept registrations after that date.

The road hauler is required to insert through the GUI the license plates of trucks used for the voyages for which the contribution is requested.

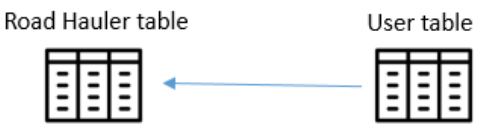
Furthermore, some documents have to be submitted in PDF format.



In the figure above, it is shown the mockup of a possible interface designed to manage the trucks' data insertion. Here below is the process.



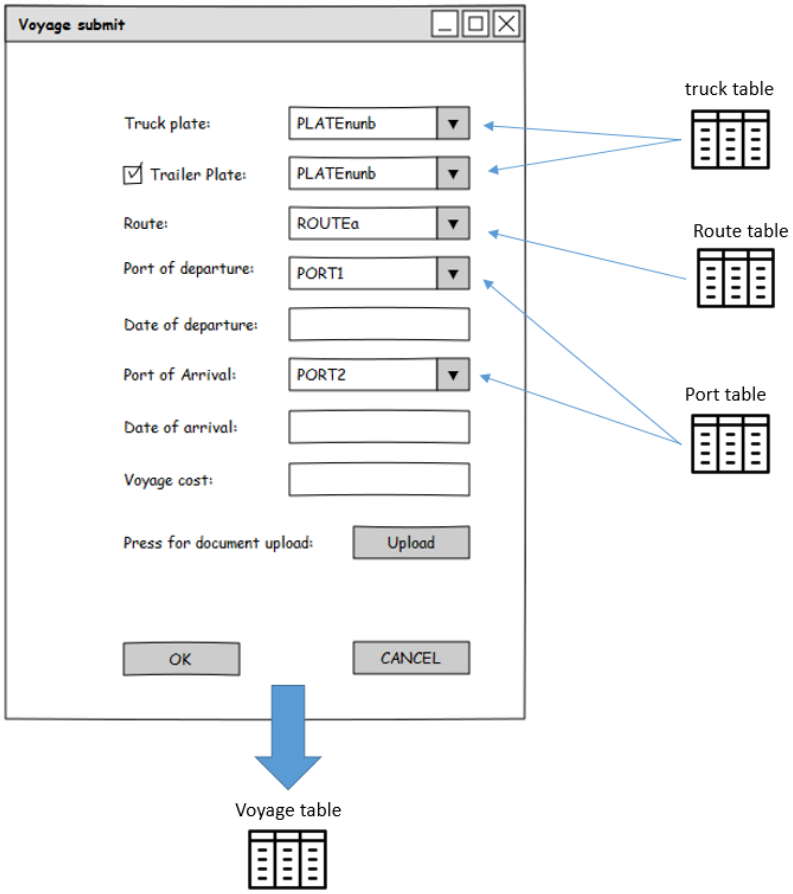
With the population of the related tables.



Even in this case MAE office has the possibility to revise the submitted data and to request some additional data and / or modifications.

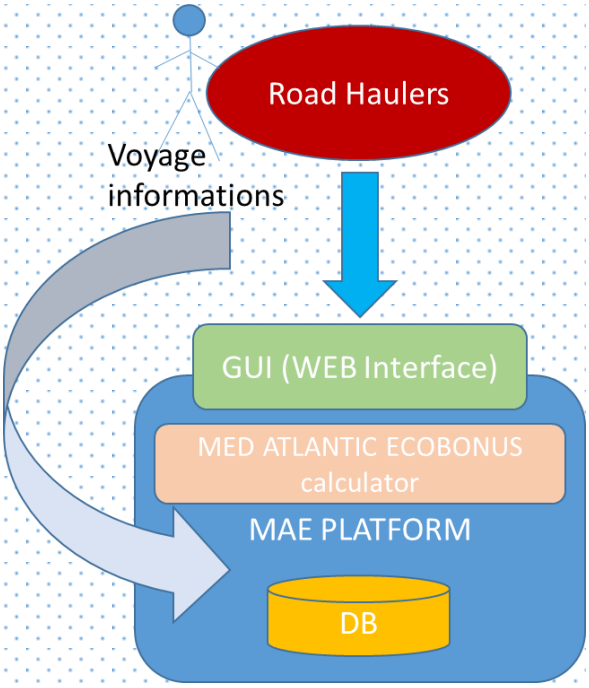
7.4.3 – Phase 3

By February 28th of the second year following the reference year, the road haulers will be able to present the incentive request for each single voyage: the operation must be done through the GUI, inserting the voyage data, including costs (VAT excluded) and uploading the necessary documents in PDF format.

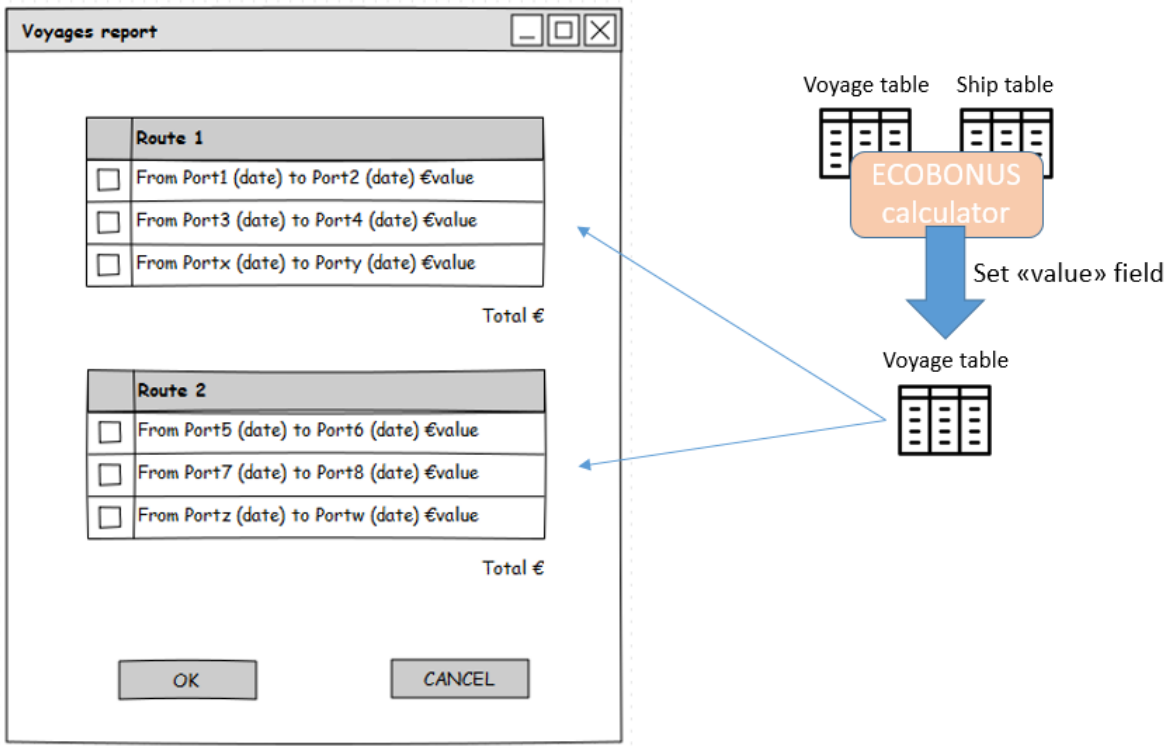


The figure above shows the interface where to insert each voyage.

The diagram of the analyzed process is shown below.

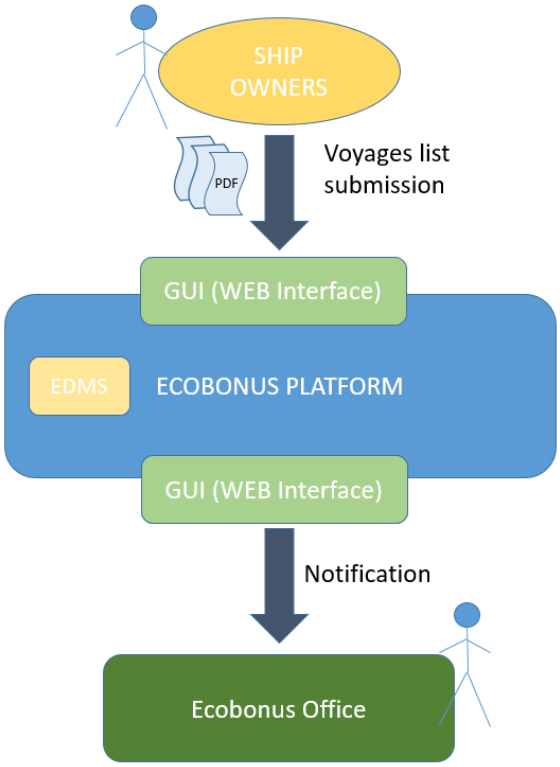


The road hauler will then be able to view the list of voyages sorted by route, with the total of the incentives earned.

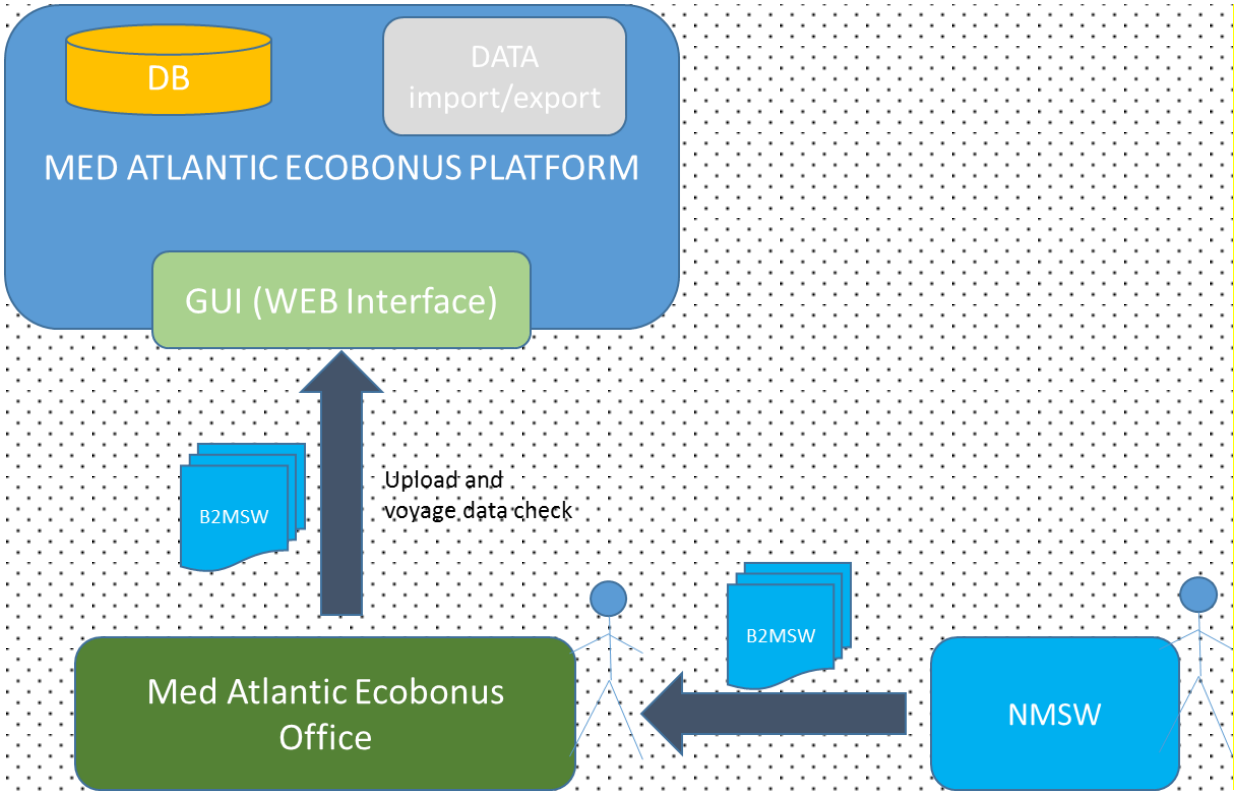


Verification of information submitted by road haulers

The requests submitted by the road haulers must match the voyage lists, organized by single route, submitted by the shipping companies: these lists contain useful data to check the presence of the trucks transported for each route (i.e the trucks' license plate) and can be submitted through the GUI and uploading information to PDF files.



For the verification purpose, it will be the EO's responsibility to request the documents to Authorities using the National Maritime Single Window (in B2MSW format) necessary to confirm the voyages done.



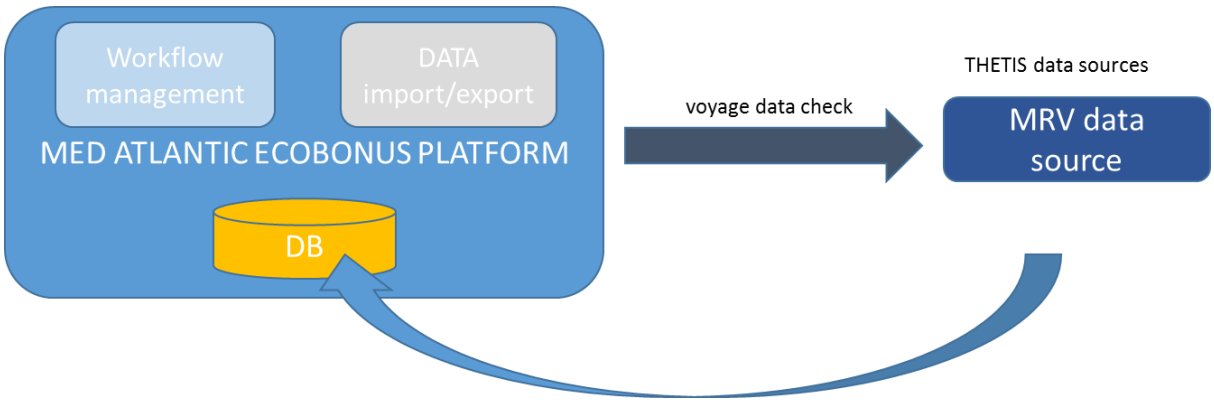
7.4.4 – Phase 4

Verification of the information submitted by the shipowners

For each year of incentives, it is foreseen a verification phase, also for the data submitted by the shipowners, with focus on the environmental performance data declared for each ship.

If the centralized management system of MRV data (THETIS) is opened, it could be possible that at least part of the checks will be carried out automatically.

The MAE platform must therefore be able to acquire data and perform the necessary comparisons.



Even in this case, if the automatic verification attempt is not successful, it will be EO to ask the authorities for the necessary documents to perform the operation manually.

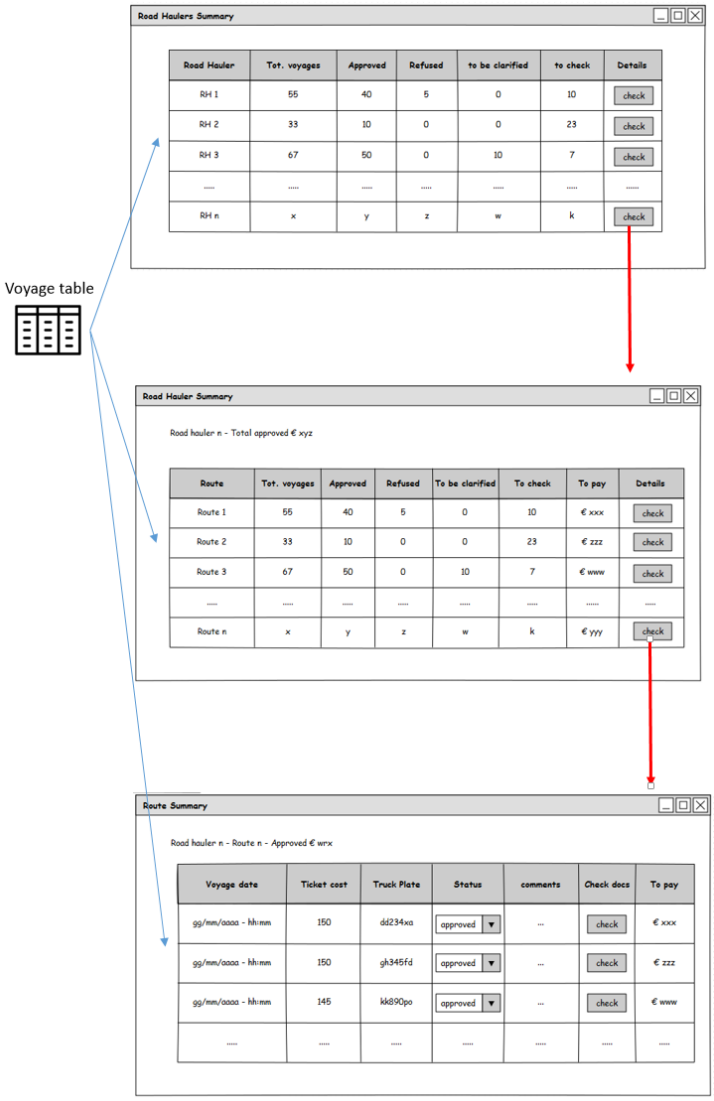
7.4.5 – Phase 5

Support for payments

The MAE platform has to support EO in approving road haulers' requests and authorizing payments.

The information supporting these operations can be found in the voyage table. Thanks to this table it is possible to create summary dashboards.

In the example below, it is shown how it is possible to create a report starting from the summary list of all road haulers to the details of each voyage.



By using the data contained in the "voyage table" it will be possible to print out documents to support the MAE Office for the payments.

7.5 - Documentation Database

The MAE project authorization processes need to receive from the shipowners and the road haulers some documents in electronic format. Such documents are often a result of paper documents scans (PDF or image format).

The platform must therefore implement at least the basic Electronic Document Management System – EDMS to manage, organize, share and archive this information set.

The software can be considered EDMS if a server of the application performs some massive operations on documents, catalogs and indexes them according to previously defined algorithms.

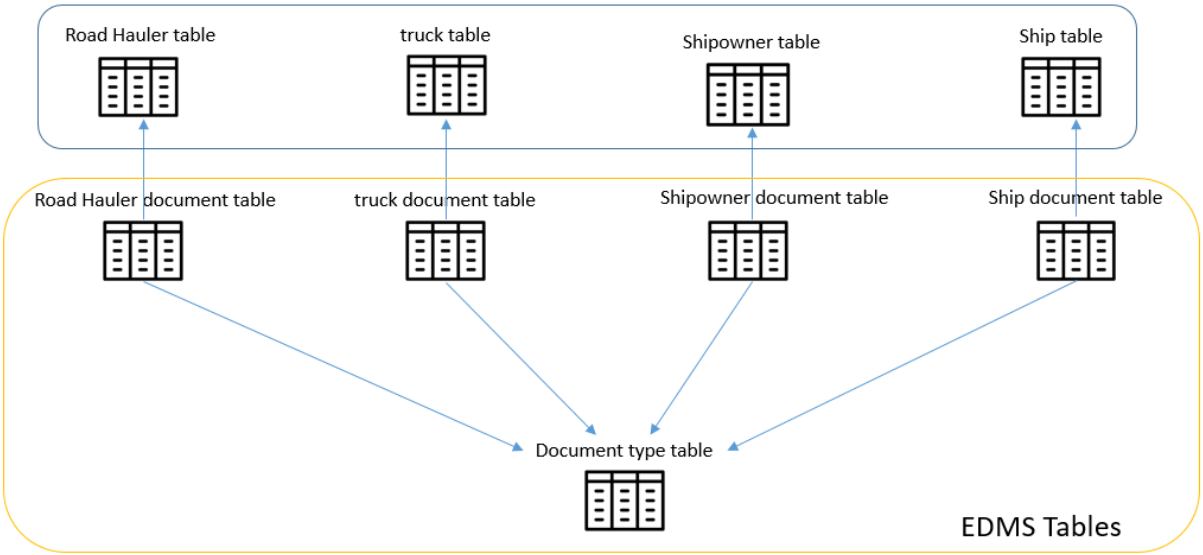
Generally, the document systems also include the Business Process Management System (BPMS), which makes automatic and/or manages processes related to data and documents (i.e. multi-level approvals).

In this case the EDMS will have the following basic functionalities:

- data entry, modification of attributes, display, document cancellation (only if not approved) by shipowners and road haulers
- display, approval, document cancellation by the MAE Office

The submitted documents will be saved directly in the database as a "blob" (the blob is a type of data designed to save entire files in the table).

To support the EDMS module it is necessary to provide a minimum set of tables to be linked to the main group of tables described previously in paragraph 4.3.



The Document tables contain the documents and related attributes. These tables are directly linked with the shipowners', road haulers', trucks' and vessels' tables and define the documents contained by the "Document type table" lookup.

Here below is the structure of a generic documents table.

These tables could have a greater number of fields and could be configured according to the users' needs. The example shown below clarifies the functional aspects.

Document Table

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
EntityOID	nvarchar	500	Related to an OID of Shipowner table, Road hauler table, truck table or Vessel table
DocumentName	nvarchar	500	
DocumentAttribute	nvarchar	500	
Description	nvarchar	500	
EmissionDate	datetime	8	
ExpirationDate	datetime	8	
DocTypeOID	int	4	Related to an IOD of Document table
State	int	4	Indicates the document state (submitted, approved etc.)
Enabled	bit		Active subject or disabled subject by the system

Document Type table

Column_name	Type	Length	NOTE
OID	int	4	Automatic ID code
DocumentType	nvarchar	500	Document type
Description	nvarchar	500	
Enabled	bit		Active subject or disabled subject by the system

7.6 – Security

A computer security solution is a system that significantly reduces the information system level of risk. This architecture must be able to meet the following needs:

- Make IT resources accessible anywhere by the authorized users ensuring an adequate level of protection.
- Ensure data confidentiality, integrity and availability.
- Ensure the continuity of services, manage controversies, prevent unauthorized use.
- Effectively and promptly prevent DDoS (Distributed-Denial-of-Service) attacks.

The scenario is quite complex. However, by using the layers approach and facing the problem from the most external levels up to the core application, it is possible to meet the listed requirements and to guarantee a good level of information security.

7.6.1 Perimeter security

The perimeter security is the outermost level, usually provided by the Service Provider, marking the boundary to protect the infrastructure.

The perimeter security is implemented through hardware and software solutions imposing the rules of firewalling, intrusion prevention, intrusion detection and reverse proxy.

7.6.2 Access control

It is possible to reach the application login interface, by crossing the perimeter security, usually transparent to the user.

There are three levels of security for this layer, each of them corresponds to a different level of ID identity:

• Level 1: allows access to services with username and password.

• Level 2: allows access to services with a username and password combined with a temporary code sent by a text message or provided by a dedicated mobile application.

• Level 3: allows access to services with a username and password combined with the use of an access device (smartcard, USB key).

It is necessary to define what could be the most suitable level of security and whether to differentiate by types of access.

It is also necessary to check with the relevant public administrations which are the accredited identity provider.

7.6.3 Application security

To build up a robust software it is necessary to design the application and develop it according to the existing security guidelines and the available best practices.

There are several principles of application security such as collections of properties, behaviors, design and implementation practices, all of them aiming at reducing the possibility of the threat and its impacts, if such threat occurs.

This kind of approach is independent from the programming languages and surrounding architecture and can be taken into consideration in most software development methodologies to design and build applications.

These best practices are important because they help users to make decisions in new situations with the same basic ideas.

By considering all these principles, it is possible to obtain recommendations about the security requirements, the platform architecture, implementation, and to identify possible system weaknesses.

Currently, the most accredited organizations providing proven guidelines for the development of secure software are:

• OWASP

• W3C (security guidelines)

• WASC

7.6.4 Privacy

The application must comply with the provisions of the General Data Protection Regulation [GDPR (EU) 2016/679] in force starting from 25th May 2018.

7.7 – Reporting and business intelligence (KPI)

To understand the evolution of the project it is important to have interfaces that can present aggregated and elaborated information, simple to be interpreted and able to be used as indicators.

7.7.1 Key Performance Indicators (Proposal)

The whole process managed by the MAE platform must be monitored, extracting “performance data" through specific indicators derived from the information stored in the database.

As a proposal the following indicators could be evaluated periodically:

- Number of trips reported by hauliers and deemed eligible (total per year)
- Number of trips reported by hauliers and deemed eligible (by route and by year)
- Average CO2 reduction per trip (annual basis)
- Average SOX reduction per trip (annual basis)
- Average NOX reduction per trip (annual basis)
- Trend of the number of sea trips on all eligible routes
- Trend of the number of sea trips by route and by year
- Number of routes allowed for funding
- MAE economic entity paid per year

7.7.2 Indicators representation

The trends of the indicators listed in 4.7.1 can be elaborated and represented by a Business Intelligence module that must be developed and integrated into the platform. Alternatively, there are software able to draw on the information available in the database, perform the processing according to the desired criteria and graphically represent the results in the most usable way.

The most accredited leading market products are listed below:

- Pentaho (open source)
- Qlik Sense (commercial)
- Tableau (commercial)
- Cognos (commercial)