



Sustainable, safe and economically feasible energy concepts and technologies for European Inland Shipping

D6.6: Launch of App "I-STEER" to realise key-user buy in

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Abstract

Within PROMINENT, the I-STEER app / IWT Greening Tool is developed and launched as an instrument to disseminate the PROMINENT outcomes to vessel owners/operators. The Tool provides vessel-owners information and guidance on availability and impact (financial and environmental) of mature greening technologies in order to motivate vessel owners to deploy these innovations.

Based on the selection of a representative vessel, default values are presented on operational details and (investment) costs of the vessel and greening option, that may be changed according to personalised vessel and operational characteristics. Furthermore, the Tool fulfils the function as common market place where vessel operators/owners can be linked to technology suppliers to further research greening options or receive a more in-depth assessment.

The European Inland Barging Innovation Platform (EIBIP) has the intention to integrate the I-STEER app / IWT Greening Tool as set of toolkits, in order to secure the preservation and in particular the further development of PROMINENT results. Until the I-STEER app / IWT Greening Tool is fully integrated within the EIBIP environment, the Tool will remain accessible via www.inlandwaterways.nl.

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Introduction

The activities within the European research project PROMINENT (Promotion of Innovation in Inland Waterway Transport) are focussed on the development of standardised concepts for reducing emissions for the European inland waterway fleet. The aim is that by 2020 these concepts will be applicable to at least 70% of the European inland waterway fleet, while bringing down implementation costs of these concepts by 30%. The standardisation of these concepts is the focus of WP2 of this project, with a close interaction to the pilots performed in WP5 and resulting in the roll-out of these technologies in WP6.

In order to share the results of PROMINENT with vessel-owners wishing to invest in greening technologies, in order to comply with emission standards, the I-STEER app / IWT Greening Tool has been developed. With the launch of the I-STEER app / IWT Greening Tool, vessel-owners are able to compare the PROMINENT technological concepts and see the impact in terms of investment costs, operational costs, as well as the possible return, and emissions saved, tailored according to the characteristics of their own vessel (such as dimensions, engine, operational profile). The I-STEER app / IWT Greening Tool brings together outcomes of several research activities and reports of PROMINENT.

In SWP 1.1 of this PROMINENT project, a study was performed to gain insight into the composition of the European inland waterway fleet and the operational use of these vessels. This resulted in a macro model of the European fleet with 12,263 vessels, a categorisation in groups of comparable vessels ('fleet families') and a selection of 60 representative journeys on the different European waterways¹. For most of the representative IWT journeys the operational profiles (providing a power distribution over time) were elaborated in detail. The fleet families, and in particular the representative vessels per fleet family, are the basis for the vessel types and their default values within the I-STEER app / IWT Greening Tool.

In SWP 1.2 of this project best available technologies were identified². To assess the applicability and feasibility of these best available technologies and the further development of concepts for mass implementation, an understanding of the fleet and how this fleet is used, is essential. As there are major variations between the different vessel types and the operational use (in e.g. power, fuel consumption), different technologies can be beneficial for different parts of the fleet. In WP2 of this project the development of the selected concepts from SWP 1.2 were targeted. These concepts are LNG, diesel after-treatment, energy-efficient navigation, right-sizing and hybrid configuration. For all of the concepts, ex-ante analyses of the costs were performed, which are used in the I-STEER app.

This report describes the development of the I-STEER app / IWT Greening Tool, for which the tool itself is the actual result of this development (as presented on www.inlandwaterways.nl/greeningtool) and the development foreseen to maintain and enlarge the content of the tool.

¹ See: Prominent D1.1 - List of operational profiles and fleet families (2015)

² See: Prominent D1.2 - Best available technologies (2015)

1. Development of the I-STEER app

Starting point for the I-STEER app / IWT Greening Tool was the description of the user requirements, with the objective to develop a user-friendly tool that is easy accessible, gives a concise overview of the available technologies that comply with emission standards and their results/impact with regards to costs/benefits and emissions. Moreover, the user requirements outline the required content and specifications of the I-STEER app / IWT Greening Tool, to be programmed by means of (default) values and formulas.

Objectives

The objectives of the I-STEER app are in line with the description of action. Summarised, the I-STEER app shall:

- Provide the user with financial information (costs and benefits) on the application of emission reducing technologies on a particular vessel;
- Provide the user with information on the impact on the emissions (NOx, PM, CO2) by these technologies.

Functional requirements

Concerning the functionality of the I-STEER app / IWT Greening Tool, requirements were set for the availability, the design and maintenance.

Availability

Availability is an important requirement for the I-STEER app / IWT Greening Tool; the tool should be accessible on computer, tablet and smartphone. For this reason, the I-STEER app / IWT Greening Tool is developed as a web application (instead of a dedicated mobile application / "app"). To properly function on a tablet and smartphone, the website is mobile-friendly (responsive design) and can be accessed on at least Android and Apple devices (and in the mobile browsers). To access the tool on a computer / notebook, the tool is available as website and accessible by means of the five most commonly used internet browsers (Chrome, Safari, Firefox, Internet Explorer/Edge, Opera).

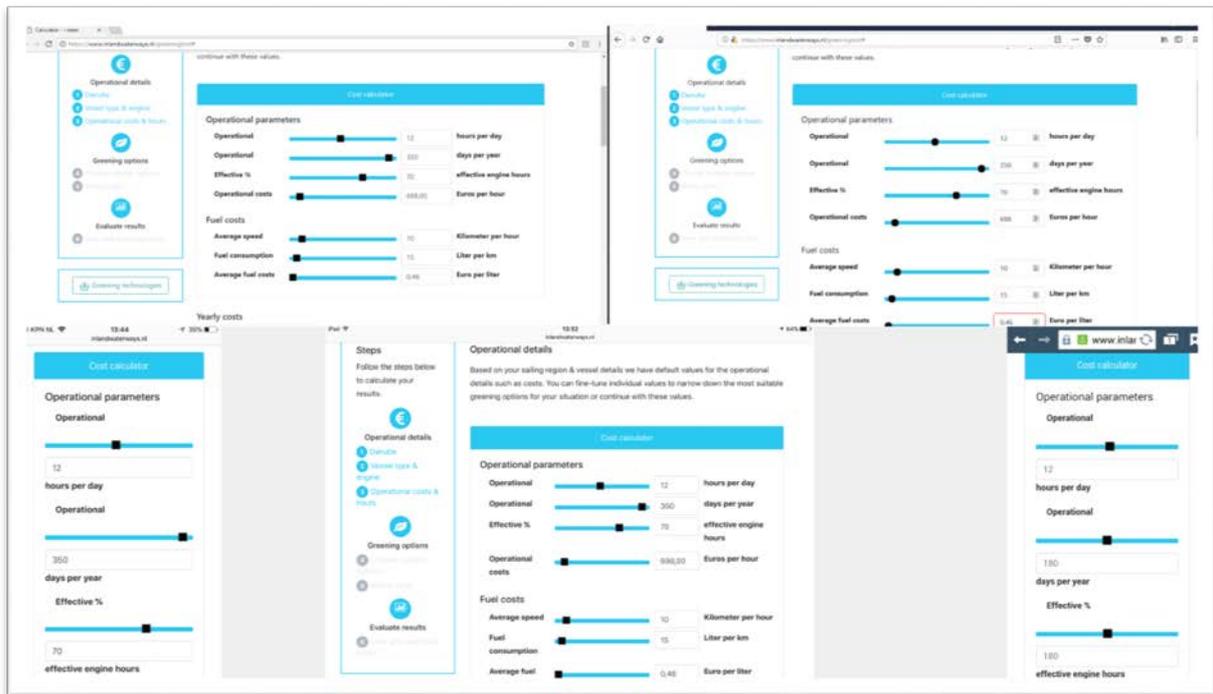


Figure 1: Overview of the I-STEER app in several browsers (Chrome, Firefox, iPhone, iPad, Android mobile device)

Design of the tool

The design of the I-STEER app / IWT Greening Tool has been based on layout and principles used in the IWT Greening Tool developed under PLATINA 2 - Platform for the implementation of NAIADES. This makes it possible to further build upon technological solutions included in the previous tool, to update the tool with results from the PROMINENT study and extend its functionality and content. In the basis the tool can be described as a decision tool, in which a user can fill out relevant parameters for their vessels / engines/ operational profile and operational data (e.g. operational hours and costs, including fuel consumptions and costs). Based on these input parameters / data, (default) values are calculated for operational costs and fuel costs. For each of the default value, it is possible to adapt the computed yearly costs to the particular situation of the user and their vessel. The following step in the tool provides information on the available technologies. The user can select one or more technologies, according to their interest. If they have knowledge on investment costs and operational costs, the default parameters may be adjusted. The last step in the tool shows the calculated investment and operational costs and impact on emissions. The tool includes the possibility to link to other tools (in particular the Right-Sizing Tool, developed under PROMINENT) and shares information on technology suppliers.

The design of the I-STEER app / IWT Greening Tool is in accordance with the Rules for Communication of Horizon 2020 projects, with reference to the respective acknowledgement of the Horizon 2020 programme.

Content management

Important for the (future) maintenance and updates of the website, anticipating on future developments in (new) technologies and changes in (default) values, is the requirement that the content can be managed by means of a content management system (i.e. Craft CMS).

For the decision tool, the following items can be edited:

- Add/edit (new) technologies;
- Add/edit (new) vessel types;
- Add/edit parameters;
- Edit (default) values and calculations;
- Add links/supplier profiles for technologies.

Selection of designer and development of the I-STEER app

The design of the website was subcontracted. Three web developers were asked to submit a proposal and offer to develop the I-STEER app / IWT Greening Tool based on the functional requirements. The company Agile Marketing Agency was able to submit an offer that complied with the specifications of the tender, in terms of budget, planning, quality and experience. In several work sessions with STC-NESTRA, SPB/EICB and Agile Marketing Agency, the functions, design and the content of the website have been developed.

2. Result: I-STEER app / IWT Greening Tool

Based on the objectives, functional requirements and PROMINENT research, the I-STEER app / IWT Greening Tool has been developed and can be accessed via www.inlandwaterways.nl. By following the five integrated steps of the Tool, users get insight into the application of greening options for their particular vessel characteristics (based on the selection of a vessel type, building year of the engine and greening option, for which default values are provided). Outcomes of these combinations are in line with the cost-benefit analyses in PROMINENT, which have been compiled for the various fleet families, respectively for representative vessels. Moreover, the IWT Greening Tool enables the user to change each default parameters / values according to personal preferences and (detailed) information.

Vessel and engine selection: Current operational and fuel cost parameters

The selection of the vessels is subdivided into typical vessels operating on waterways in Western-European waterways (Rhine region) and vessel types operating on the Danube (Danube region), in accordance with the PROMINENT vessel types / fleet families. In addition to the PROMINENT vessel types / fleet families, also a self-propelled motor vessel for the Danube region is added as vessel type in the Tool. In total 22 vessel types are available in the Tool including default values for vessel operational and investment costs and greening options, of which 19 typical vessel types operating in the Rhine region and 3 typical vessel types for Danube region. After the selection of a region and vessel type, also the building year of the existing installed main engine is requested.

For each of the vessel types, default values have been set, based on the average operational parameters and average fuel consumption. For each of the parameters, the value can be changed by using either the slider or the entry box. The yearly operational and fuel costs change directly, as a result of the changes of the parameters. For the yearly operational costs, the total amount in the result box can be directly overwritten, without the need to change the individual operational parameters. This can be seen in Figure 2 below.

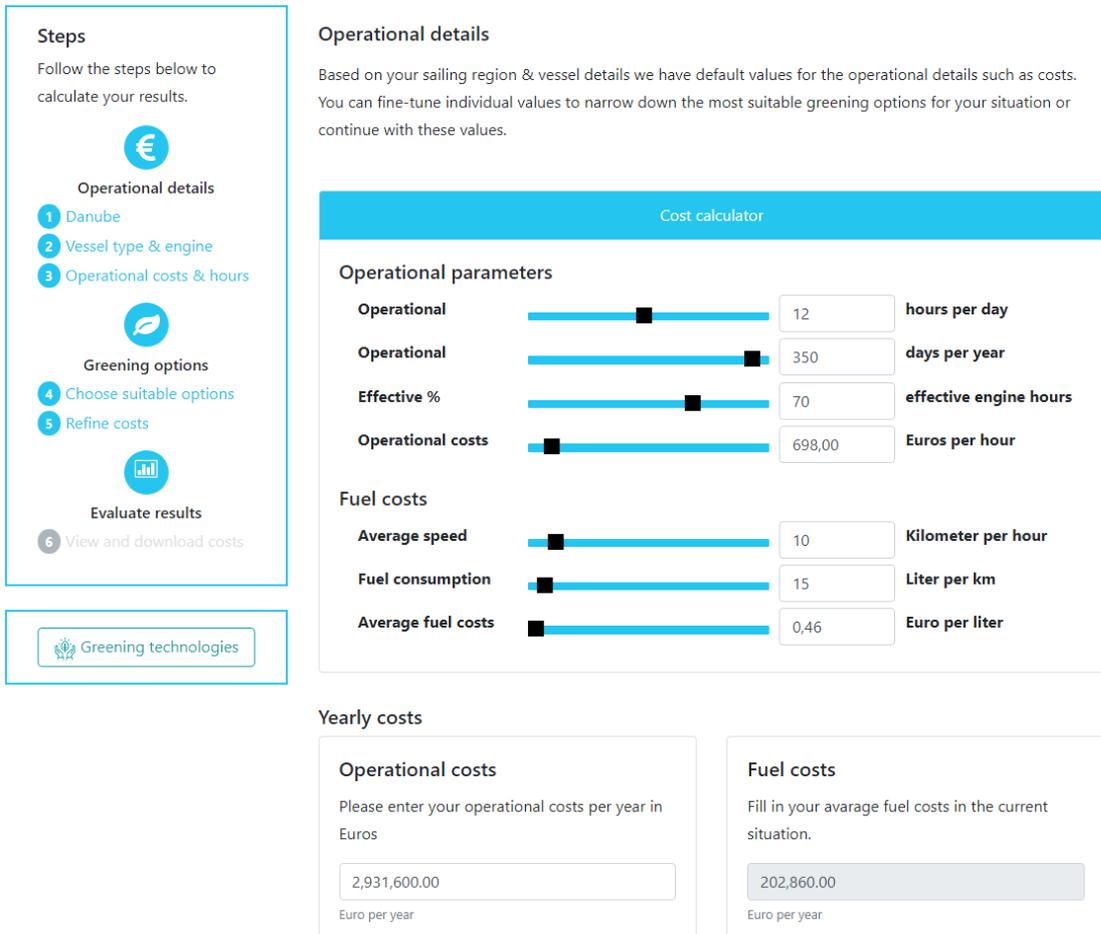


Figure 2: Operational parameters and fuel costs

On the same page, it is feasible to change the engine and emission profile parameters of the vessel. In default, the emission profile (NOx and PM) is based on the building year of the main engine and on the annual fuel consumption (annual CO2 emission). All these parameters can be changed based on own insight or actual emission (on board) measurements. This is shown in Figure 3.

Emissions profile

Based on your sailing region & vessel details we have default values for the operational details such as costs. You can fine-tune individual values to narrow down the most suitable greening options for your situation or continue with these values.

2007	<input type="text" value="1.164.240"/>	<input type="text" value="6"/>	<input type="text" value="0.3"/>
	CO2 (kg per year)	NOx (g/kWh)	PM (g/kWh)

Engine details

Total power	<input type="range" value="1492"/>	<input type="text" value="1492"/>	in KW
	The total engine propulsion power of your vessel		
Main engine power	<input type="range" value="746"/>	<input type="text" value="746"/>	in KW
	Engine power of main engine		
Number of engines	<input type="range" value="2"/>	<input type="text" value="2"/>	Total engines
	Number of engines your vessel has in operation		

Next step

Figure 3: Emission profile and engine details

As can be seen in Figure 3, there are also default values for the engine parameters (total and main engine power and number of engines), which differ per vessel type. With the use of the sliders or entry boxes, these parameters may also be changed upon personal information. These engine details are important input variables in the cost calculations of the greening technologies, as most of the investment costs are based on installed power or number of units (in line with number of engines) or a combination of both.

Selection of Greening Technology: Investment and operational cost scenarios

Based on the steps in the previous section, a business-as-usual case can be determined. The next steps focus on the change in costs and emissions, if one of the greening options is selected. This selection can be made in the 4th step in the navigation menu (in the left side of the page on computers and tablets, in the upper part of the page on smartphones). This navigation menu gives the user the opportunity of selecting another technology, while keeping the operational parameters the same as in the calculation of the previous technology. There's a link to a detailed description of the technology, which is also possible to extend in the future with a link to providers of the technology.

After the selection of a technology, an overview page with the related cost parameters is shown. These parameters are based on the default values of the technologies and a result of or derived from the ex-ante cost benefit analyses in WP2 of PROMINENT. For each of these cost parameters,

also the sliders and entry boxes can be used to amend the default values according to preference or personal information. This is shown in Figure 4.

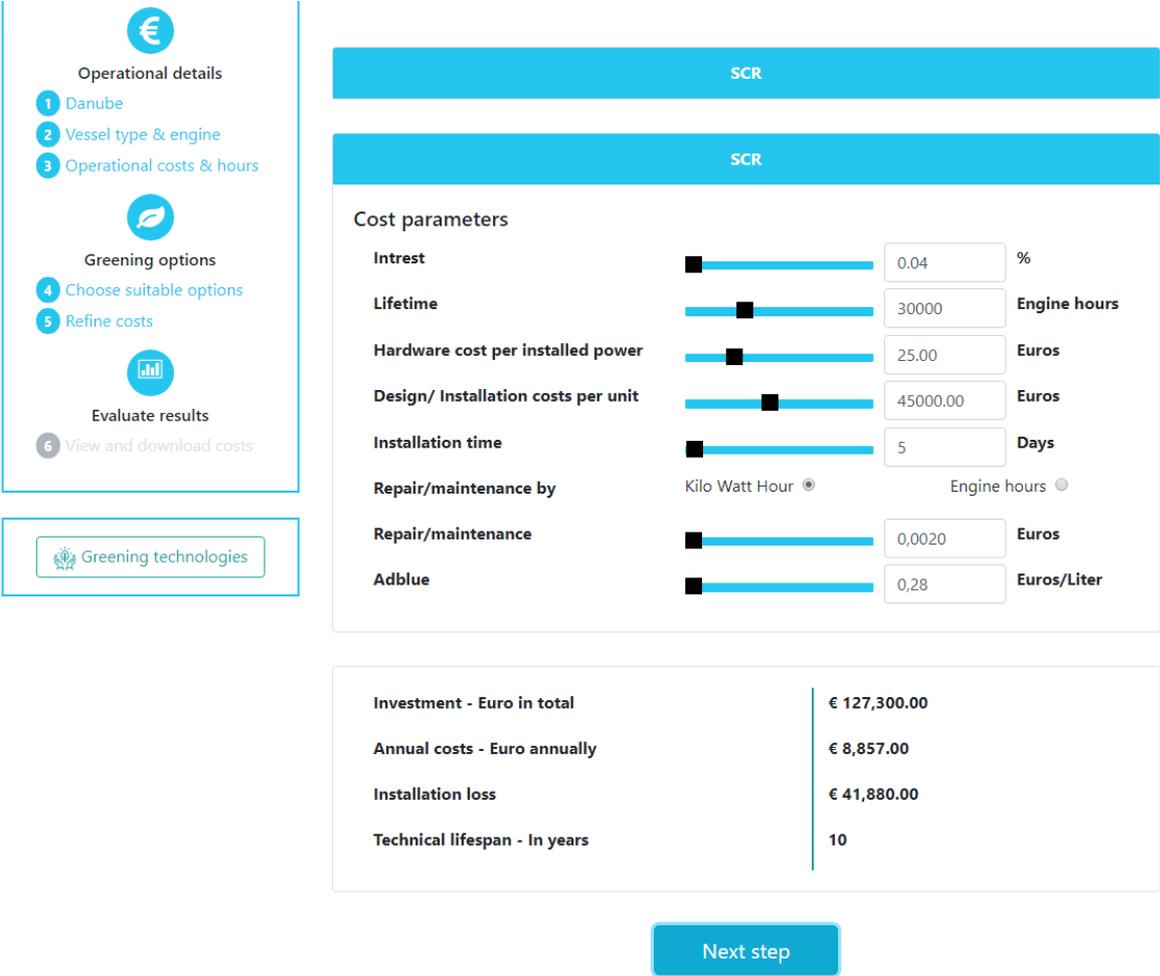


Figure 4: Cost parameters and calculations for an SCR (Note: some of the labels and texts are still subject of editorial changes)

The cost parameters consist of: the interest on a loan to finance the greening option (if applicable, or as an opportunity cost of interest on savings); the lifetime in engine hours and the installation time in days.

For the investment costs, the costs are separated in hardware costs per installed power (based on the total engine power, as can be seen in Figure 3) and design/installation costs per unit or per vessel (depends on technology).

For the repair and maintenance costs, the user can select the costs by either energy consumption (in kWh) or engine hours. The operational costs also include fuel costs, which depends on the selected greening option. For SCR these costs reflect the incremental fuel costs of AdBlue. For the selection of LNG, the input value is actual price of LNG fuel itself. In the box on the next page, a first overview of the investment and annual costs as well as the operational costs during installation time (missed revenues) and the technical lifespan is given.

Outcomes: Costs and emissions

The result page of the IWT Greening Tool provides an overview of the emission reduction and the annual costs plus depreciation of the greening technology over its lifetime. This is visualised in a graph, as illustrated in Figure 5. In this graph, the costs are calculated over a period of 20 years (If, based on the operational profile, the lifetime of a greening technology / engine is limited to 10 years, the Tool assumes that the investment costs return two times within a time period of 20 years. For some technologies this may be a slight overestimation of actual costs, since only a part of the installed technology has to be replaced and not the entire system).



Figure 5: Overview of annual costs and depreciation

Additionally, at the bottom of the result page, a brief overview is given of the costs and emissions for the current situation and compared with the situation when greened (including difference). Finally, the user is able to save the results as PDF-file.

3. Future developments

With the launch of the I-STEER app / IWT Greening Tool a user-friendly Tool is available to disseminate the PROMINENT results and to provide vessel-owners information and guidance on available and mature greening technologies for market update and their financial and environmental impact.

Common market place

Furthermore, the Tool foresees in the demand to function as a common market place where vessel operators/owners can be linked to technology suppliers, by means of receiving more information on available technologies, assessing financial and environmental effects on vessel level (according to personalised vessel characteristics) and the ability to further research greening options by downloading results and contact technology suppliers for a more in-depth assessment.

Moreover, the success of the I-STEER app / IWT Greening Tool will largely depend on whether the Tool remains up-to-date, in terms of specific parameters (price of fuel, investment/operational costs for technologies, adding new technologies). Therefore, it is important that the Tool will be updated on a regular basis, integrating the outcomes of new demonstrations, studies, technologies and business cases. The option to update the Tool has been an integrated part of the functional requirements and design of the Tool (backend interface) and is facilitated by implementing a content management system.

Business model

The I-STEER app / IWT Greening Tool is developed as an instrument to be updated and kept alive after the finalisation of PROMINENT in order to secure the preservation and in particular the further development of PROMINENT results. For the next year the tool will remain accessible on www.inlandwaterways.nl.

During this (transition) period, the application will be integrated in the activities of the European Inland Barging Innovation Platform (EIBIP) also to replace the previous version of the IWT Greening Tool³. One of the activities under EIBIP is to manage a set of toolkits (e.g. Innovation Radar, Funding Database), in order to disseminate information on innovations and greening options to the IWT sector in a more interactive way, with the ambition to realize a larger market uptake.

Under EIBIP, the business model will be further developed, ensuring that the website will be maintained and updated regularly, making sure that the information provided is topical and up-to-date. Moreover, an important aspect that will be addressed is the generation of sufficient revenues for the costs of maintenance, while the objectivity of the I-STEER app / IWT Greening Tool stays guaranteed.

³ See: <https://greeningtool.eicb.nl/>