CRISIS - Project Main Output O.T2.1

Output Title: ICT platform for monitoring and hazardous materials' transportation

12/2023

Summary

1 INTRODUCTION

The main output of the CRISIS project is an ICT Platform for monitoring and supporting decision-making regarding hazardous materials' transportation in the area. The system developed, considers weather conditions (waves and wind), quay and ship structure, protected marine areas and traffic conditions when assigning berths and the shortest navigation route. This innovative solution takes safety into account not only in the definition of the applied algorithms, but also in the implementation of the best solution and during the execution of operations. The platform assists stakeholders in allocating ships to berths and routing shipments, minimizing transport risks, ensuring environmental sustainability (safety in marine protected areas) and worker safety, using real-time numerical simulations for all procedures.

2 CRISIS: User Interface

The URL for accessing the CRISIS project platform is: https://93.62.63.242:30001/crisis/login

Username: test

Password: test

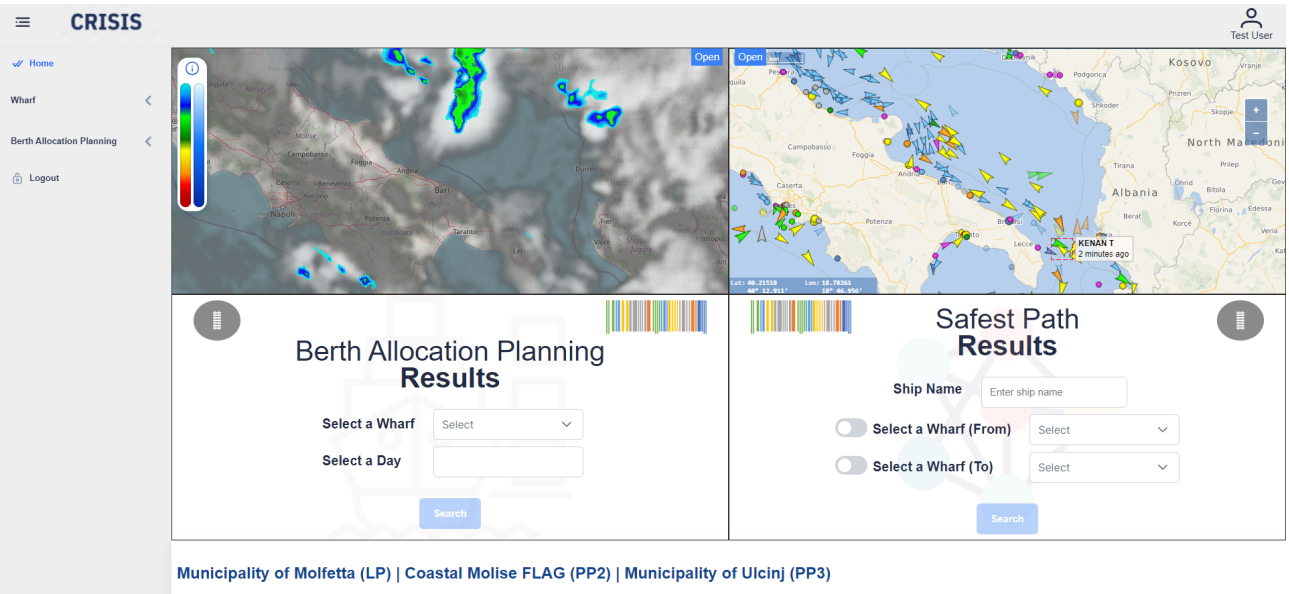


Figure 1: Home page

The online platform home page contains a dashboard with four panels, useful to have a global insights on the maritime traffic and ports.

- The top left quadrant contains information about the current weather, centered on the domain of interest
- The top right quadrant shows the current maritime traffic in the desired area. Clicking on a ship in this quadrant there is the possibility to show the real-time track of the selected ship until the current time.
- The bottom left quadrant allows the user to quick search for a specific Berth Allocation planning for a wharf
- Finally, the bottom right quadrant allows a user to query the suggested safest path given the starting and ending points. These points may be a specific wharf from those registered on the platform or a coordinate. It is possible to select the point type by toggling the switch.

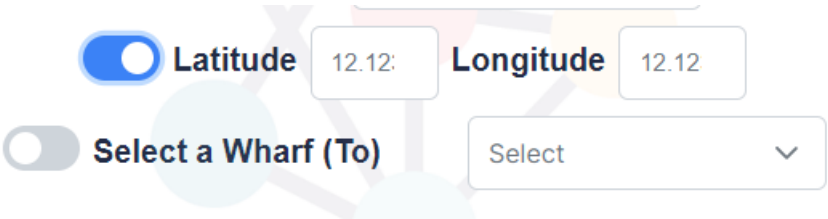


Figure 2: Toggling switch to change point type

After a short time since the path planning request, a toast will appear in the lower-right part of the screen to alert the user that results are available. Clicking on the toast, the following pop up appears:

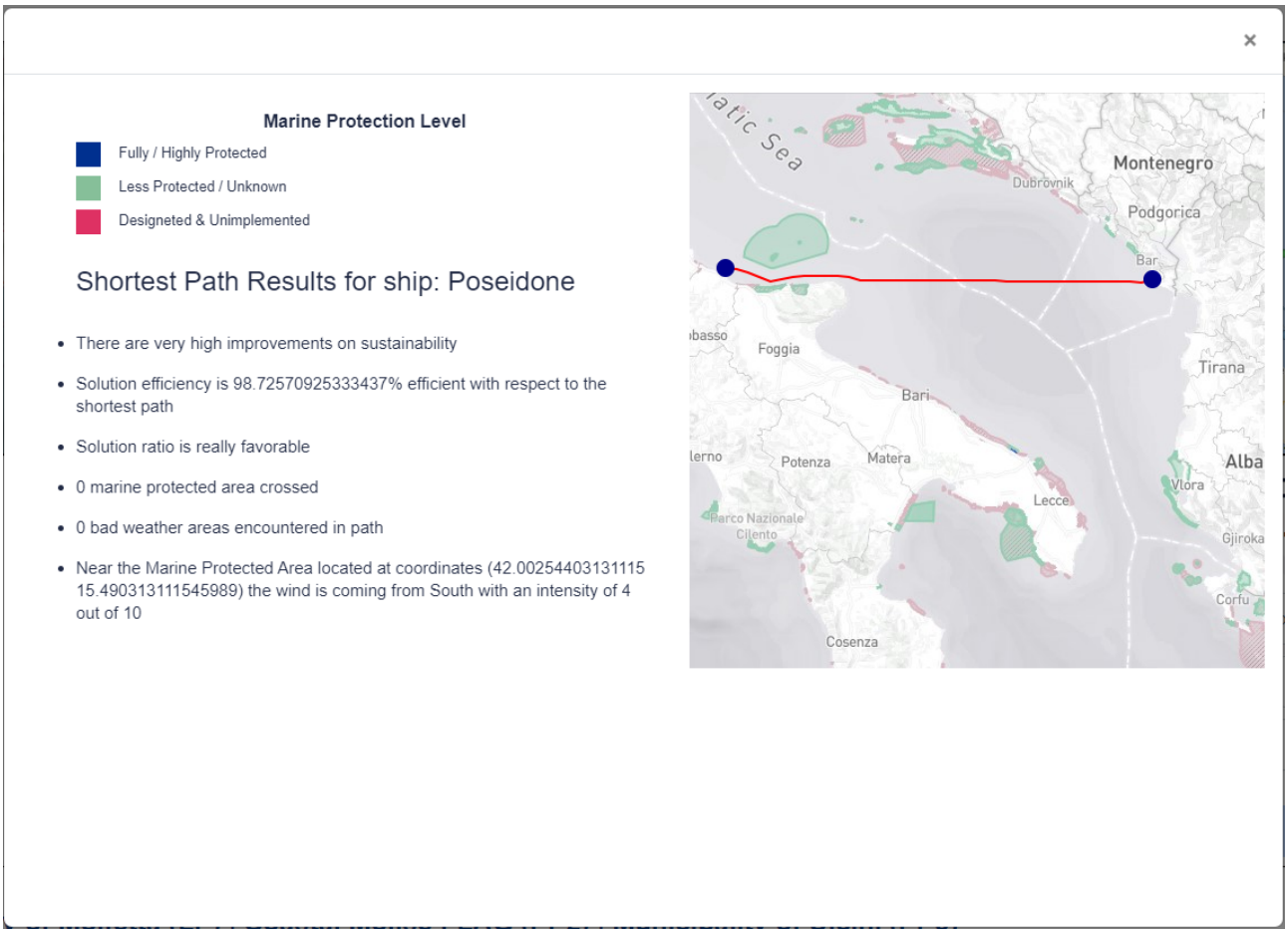


Figure 3: Ship safest path results interface

The previous interface sums up the results from shortest safe path algorithm. The core of the result is the map showing the trajectory a ship should follow to reduce the risk of encountering bad weather or marine protected areas. The shown map has colored zones, which indicate marine protected areas, whose color corresponds to the legend shown on the top-left of the window. Just below the legend there are annotations produced by the DSS, indicating how the suggested path improves sustainability (reducing pollution risks, especially in marine protected areas), as well as the percentage of efficiency with respect to a time-optimal solution.

Moving on the left part of the screen, a sidebar menu on the home page allows the user to seamlessly navigate into detailed features of the platform.

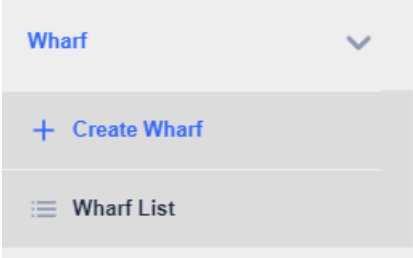


Figure 4: Wharf submenu

By clicking on the wharf label, a submenu opens showing two features. The first one is the creation of a wharf, allowing the user to insert wharf information such as its name, specific safety entrance times (in minutes, based on the wharf regulation), its coordinate and its structure (berthing points and safety scores assigned to them)

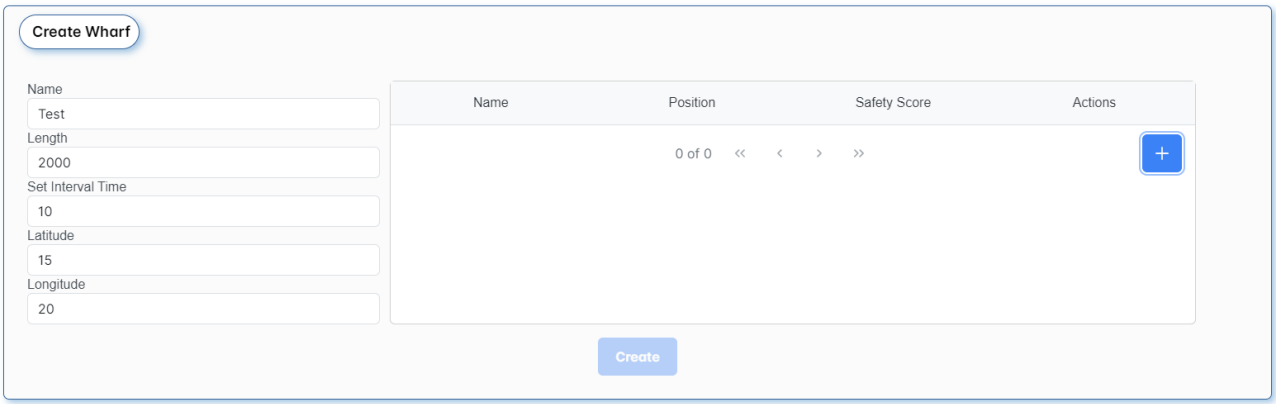


Figure 5: Wharf creation interface

Once fields on the left are populated, the blue “+” button become available, allowing the user to insert berthing points inside the specific pop up. Berth position is based on the position (in meters) from the entrance of the wharf, while the safety score is based on a wharf’s structure assessment, including protection from both strong winds, waves and/or extreme weather conditions.

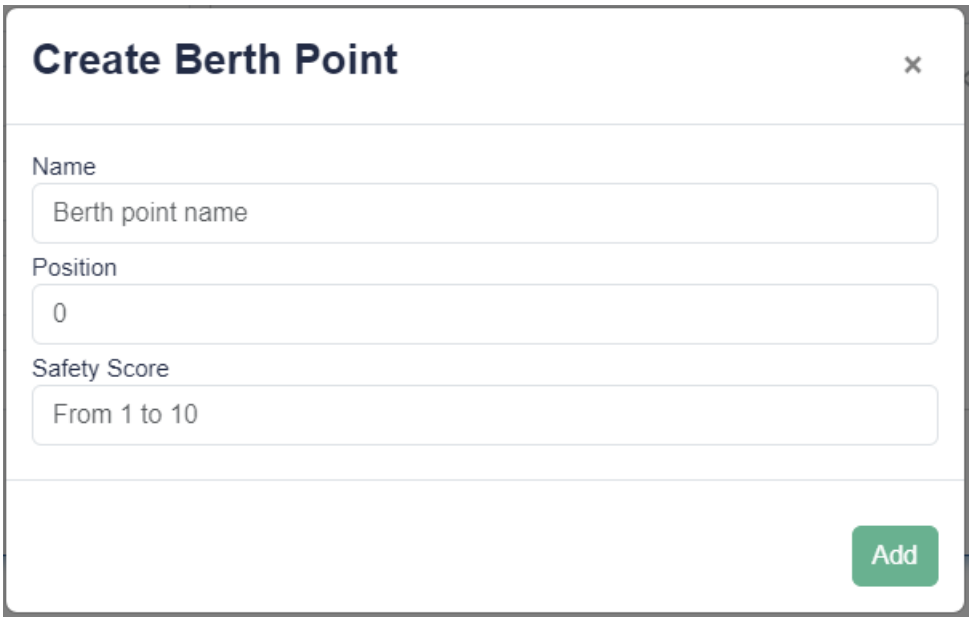


Figure 6: Berthing Point pop-up form

Upon successful creation, the wharf will be available in the wharf list interface. Here the user is able to immediately see wharf generic information:

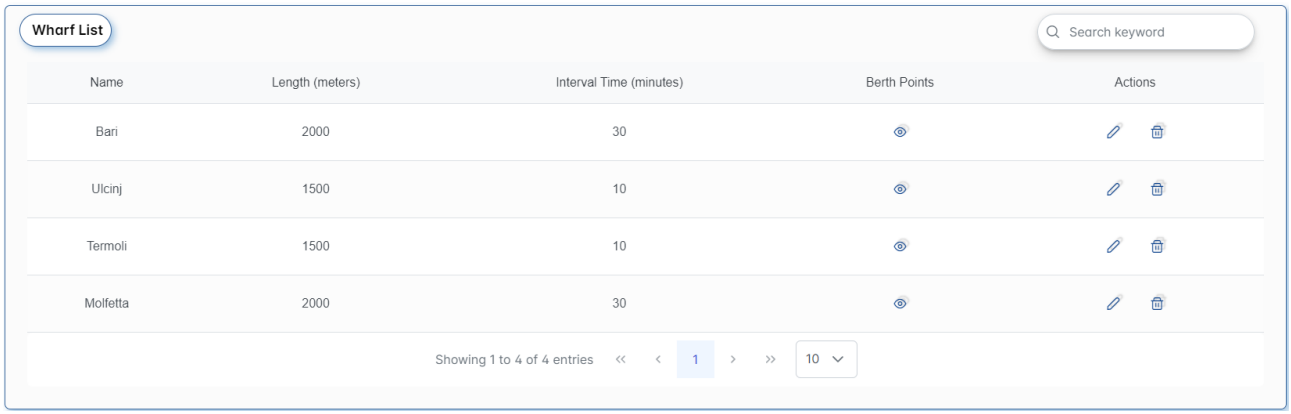


Figure 7: Wharf List Interface

By clicking on the eye symbol in the Berth points column it is possible to see the list of berthing points for the corresponding wharf, whereas by selecting the pencil icon it is possible to modify wharf information previously inserted into the systems. Finally, the bin icon allows you to delete a wharf.

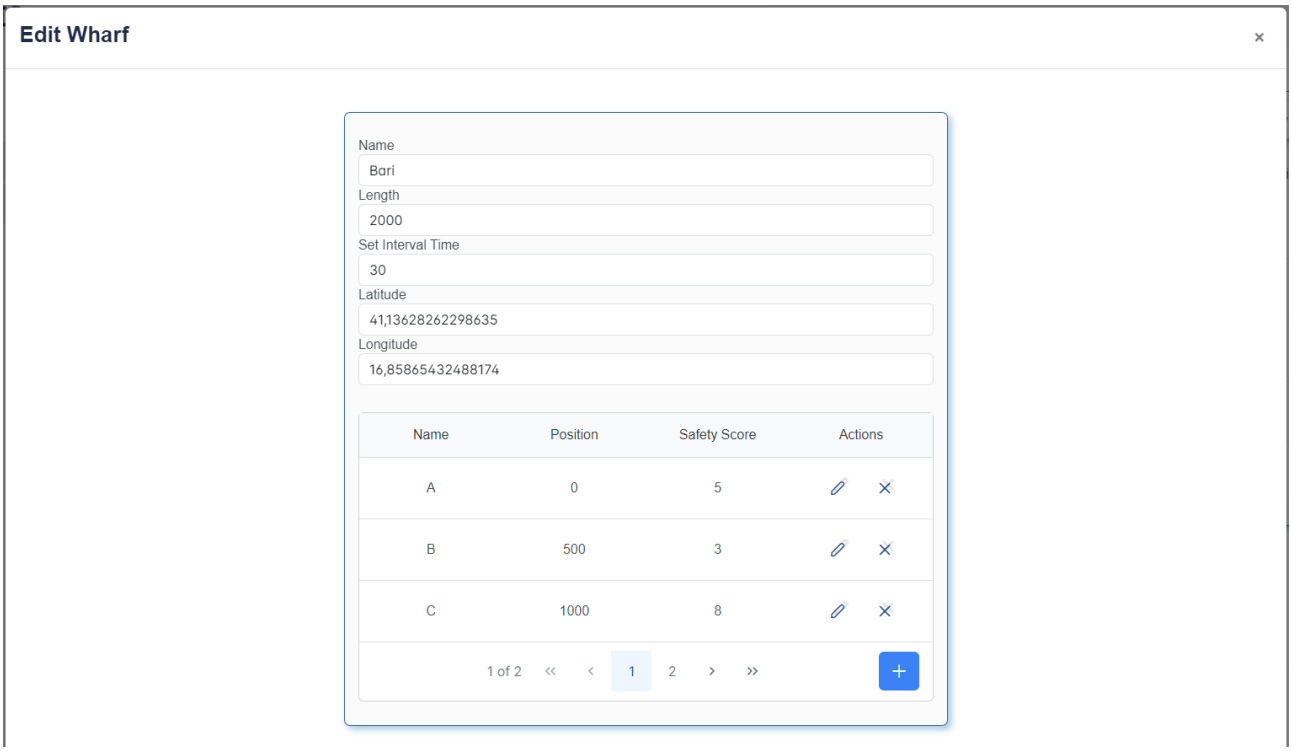


Figure 8: Wharf modification interface.

By clicking on the “Berth Allocation Planning” label on the side menu, instead, the BAP submenu opens:

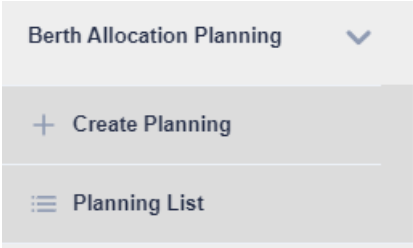


Figure 9: BAP Submenu

By clicking on “Create Planning” the planning interface opens:

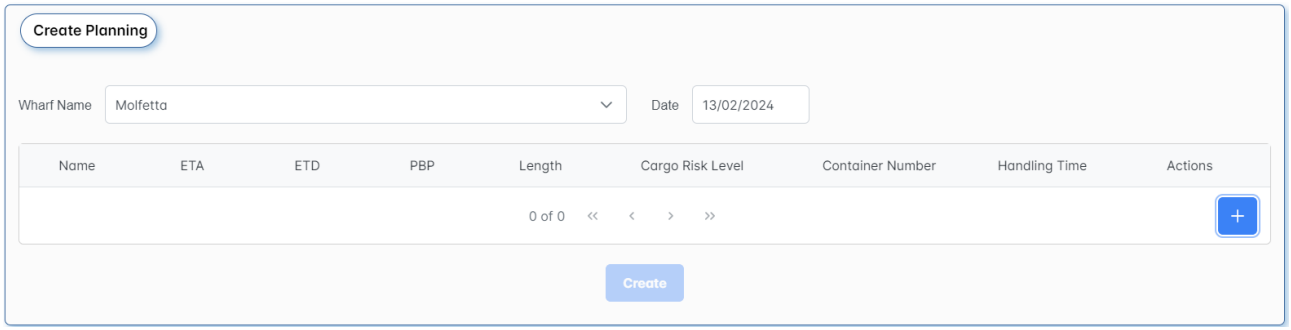


Figure 10: BAP planning creation interface

This interface requires the user to select an existing wharf and a date, starting from the current day. After selecting the two information, the blue “+” button becomes available, allowing the user to insert the list of ships that will berth at the selected wharf for the selected day.

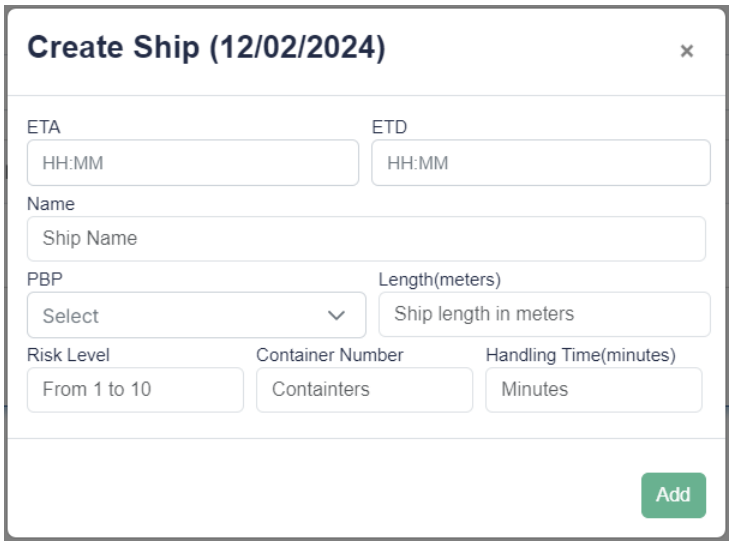


Figure 11: Pop-up form for ship insertion

For each inserted ship, the following information are required:

- **ETA:** Expected Time of Arrival, meaning the estimated arrival time for the ship. ETA should be greater than current time
- **ETD:** Expected Departure Time, meaning its estimated departure time. ETD should be greater than ETA
- **Ship Name**
- **PBP:** Preferred Berthing Point, from the list of Berthing points available at the wharf
- **Length:** length of the ship, in meters
- **Risk Level:** from 1 to 10, an assessment of risk based on type of cargo loaded on that ship. It included a series of metrics based on pollution risk, danger to marine ecosystem, environmental impact of cargo dispersion etc.
- **Container Number**
- **Handling Time (minutes):** Expected handling time for that ship, based on previously-happened bargaining between the incoming ship and the host wharf.

Once the planning request is complete, it is possible to access the planning list by selecting a specific wharf and date. The following interface will show a series of plannings for the selected wharf and date:

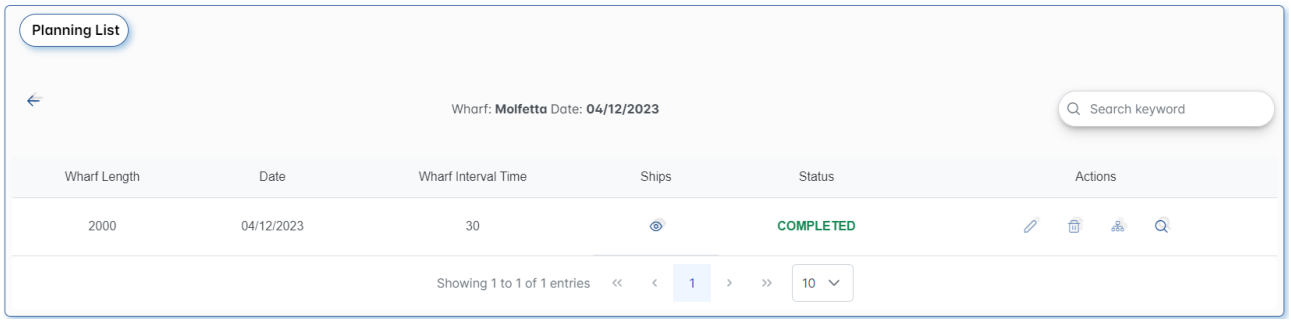


Figure 12: Planning list interface for specific wharf and date

In this interface it is possible to notice, apart from general information, a status code. It includes the following possibilities:

- **STANDBY:** The planning request is created and it is ready to be launched. While in the standby phase, the planning could be modified by clicking the pencil icon. When in standby status, it is possible to launch the DSS computing by clicking the diagram icon next to the bin one.
- **PENDING:** The planning request is delivered to DSS and the platform is waiting for results. While in pending status, all icons are disabled. When the DSS answer with a planning, a toast will appear in the bottom right part of the browser to notice the user of the results availability. By clicking the toast it is possible to check
- **COMPLETE:** The planning is complete ad it is possible to browse the results by clicking the magnifying glass icon.

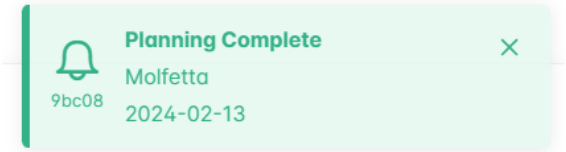


Figure 13: Planning Complete toast

When checking BAP results, the following plot is shown to the user:

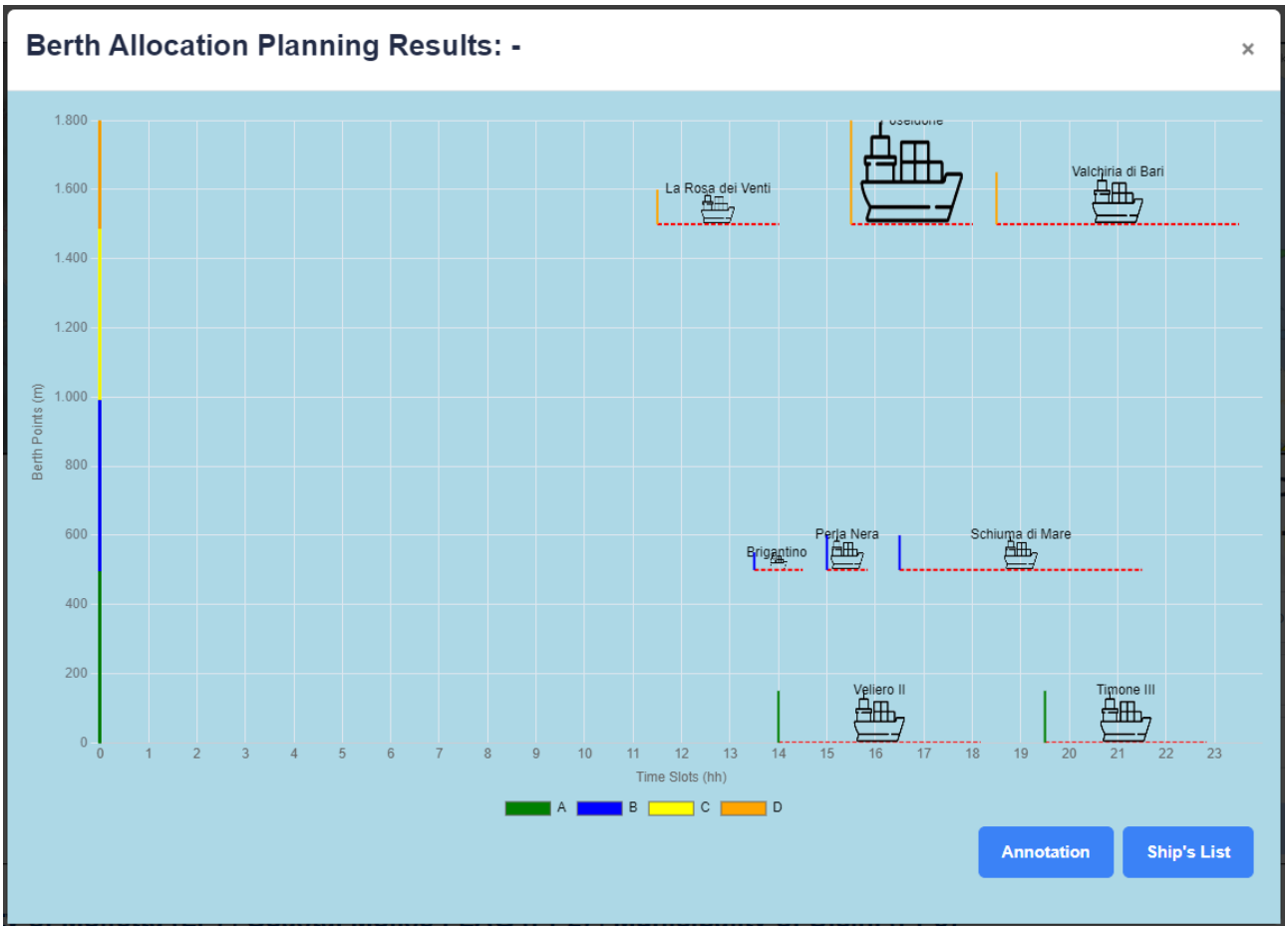


Figure 14: Planning Results for Berth Allocation

The plot shows, on the x-axis, the day hour, while in the y-axis the length of the wharf. A ship is contained in a box indicating, from the y-axis length, the space occupied in the wharf, while in the x-axis the time in which the previous space is occupied.

By clicking the ship's list button it is possible to see the planning request that produced the shown result.

Search keyword

Name	ETA	ETD	PBP	Length	Cargo Risk Level	Container Number	Handling Time
La Rosa dei Venti	11:22	17:18	A	100	10	30	150
Perla Nera	13:21	18:21	B	100	5	10	50
Veliero II	13:54	20:20	C	150	1	50	250
Schiuma di Mare	15:20	20:20	D	100	7	40	300
Brigantino	13:21	17:21	B	50	10	5	60
Valchiria di Bari	12:22	20:22	B	150	7	60	300

Figure 15: Ship List for planning

Instead, clicking the Annotation button, it is possible to access additional information and insights about the proposed planning.

Search keyword

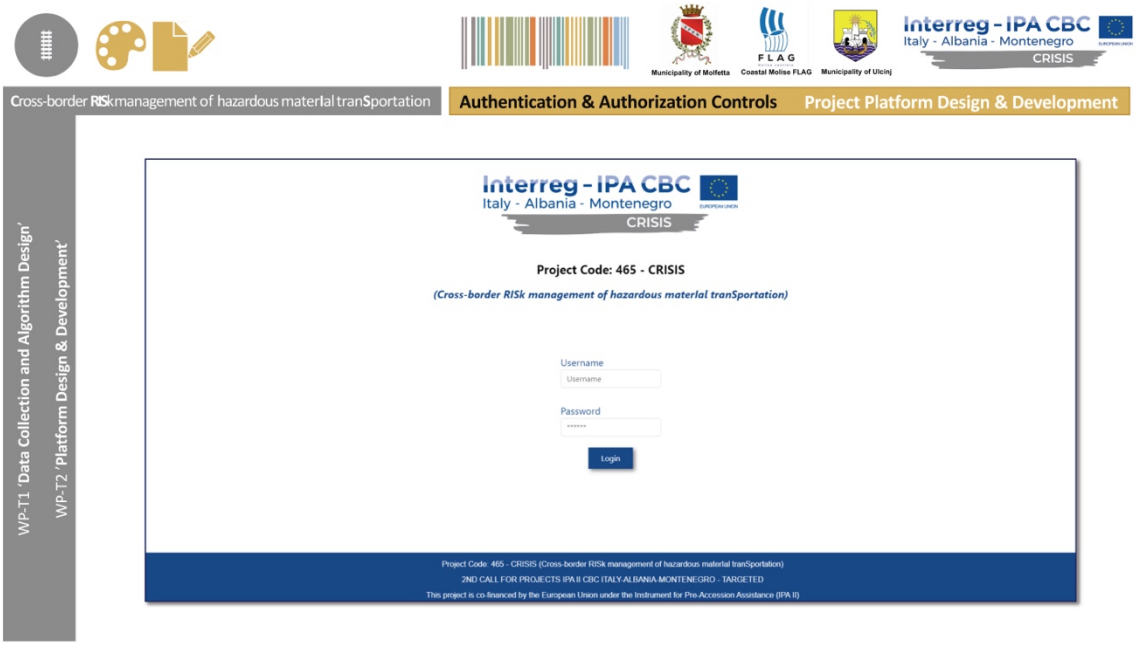
Note
There are exceptional improvements on sustainability
The planning preserves 29.67% efficiency compared to a time optimal solution
The ratio between sustainability and efficiency is exceptionally favorable

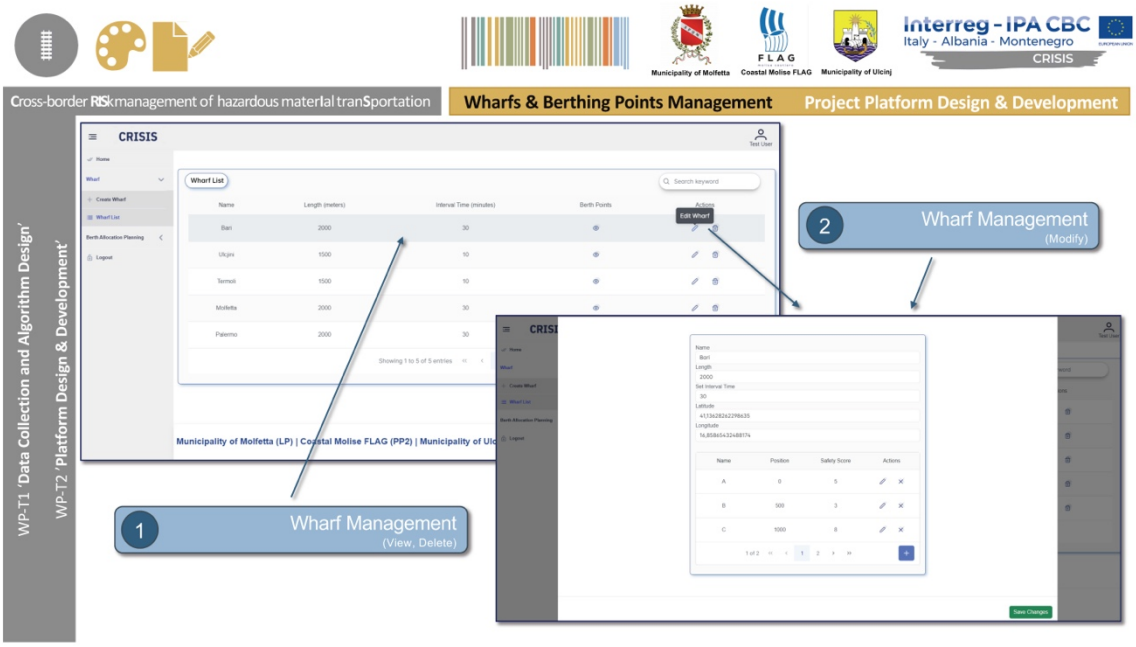
1 of 1 « ‹ 1 › »

3 ANNEX

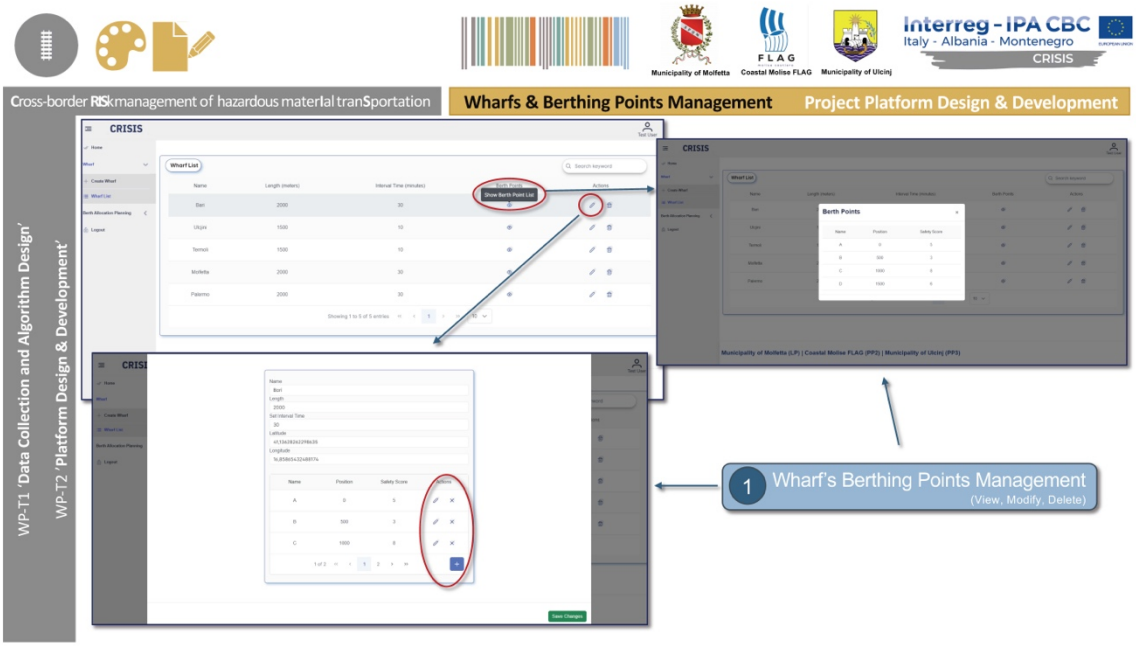
CRISIS Technological Platform Overview

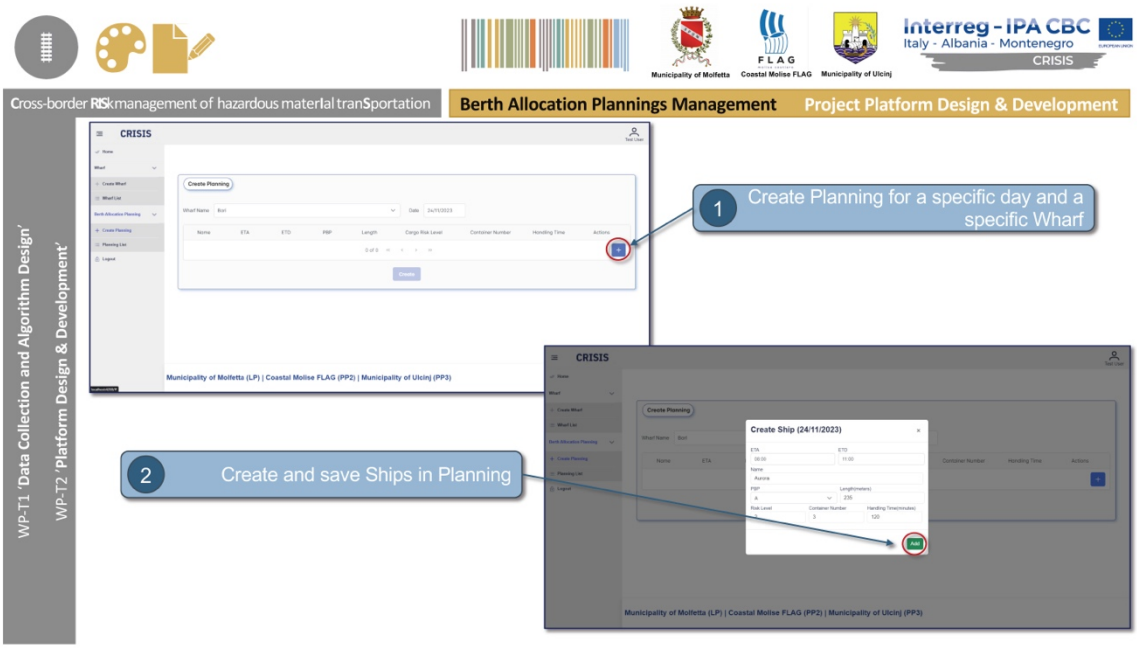

Interreg - IPA CBC
Italy - Albania - Montenegro
CRISIS
CRISIS
Berth Allocation Planning
Results
Safest Path
Results
Municipality of Molfetta (LP) | Coastal Molise FLAG (PP2) | Municipality of Ulcinj (PP3)
Municipality of Molfetta
FLAG
Coastal Molise FLAG
Municipality of Ulcinj
CRISIS
Cross-border RISk management of hazardous materIal tranSportation
https://crisis.italy-albania-montenegro.eu

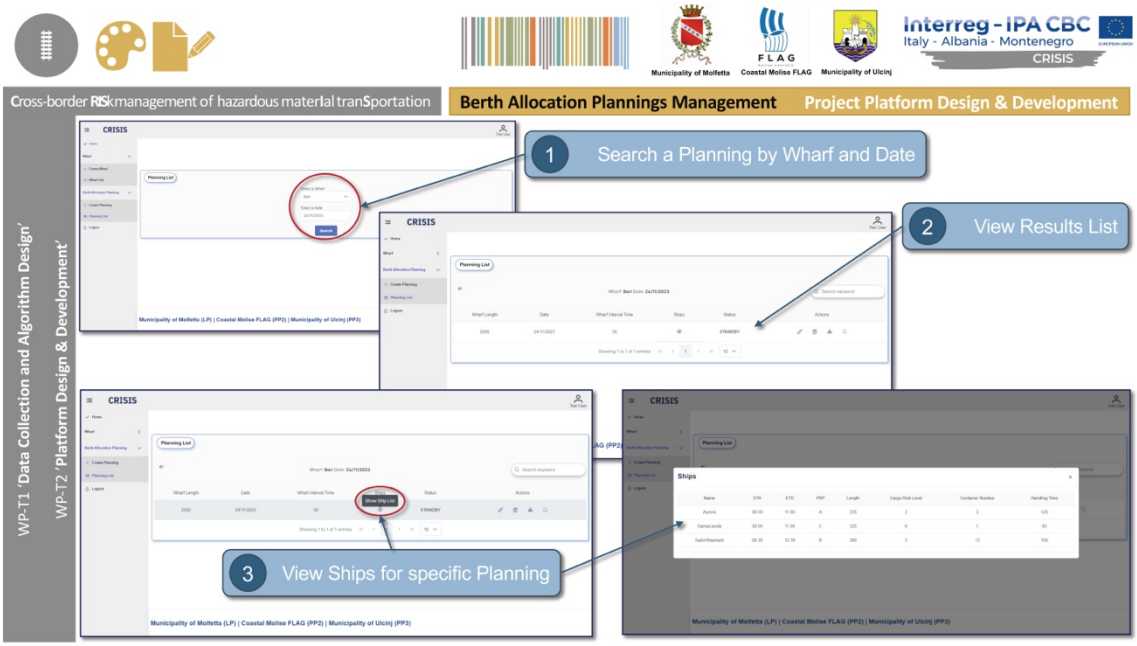

Cross-border RISk management of hazardous materIal tranSportation
Authentication & Authorization Controls
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
Interreg - IPA CBC
Italy - Albania - Montenegro
CRISIS
Project Code: 465 - CRISIS
(Cross-border RISk management of hazardous materIal tranSportation)
Username
Password
Login
Project Code: 465 - CRISIS (Cross-border RISk management of hazardous materIal tranSportation)
2ND CALL FOR PROJECTS IPA II CBC ITALY-ALBANIA-MONTENEGRO - TARGETED
This project is co-financed by the European Union under the Instrument for Pre-Accession Assistance (IPA II)

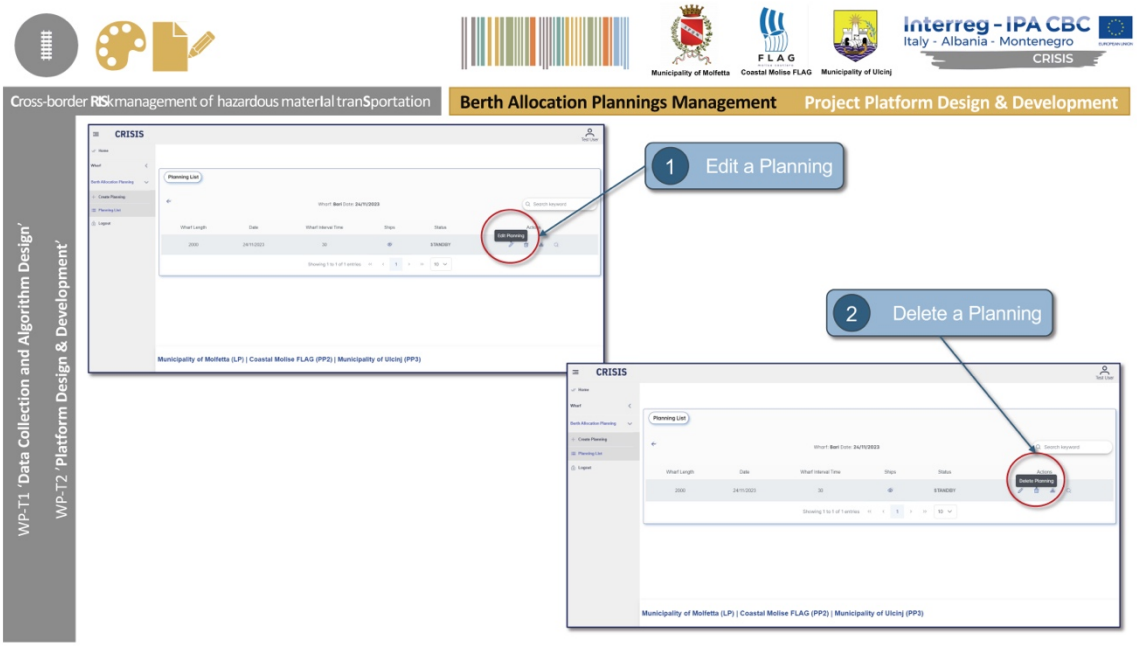

Cross-border RISkmanagement of hazardous materIal tranSportation
Wharfs & Berthing Points Management
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
CRISIS
Wharf List
Edit Wharf
1 Wharf Management (View, Delete)
2 Wharf Management (Modify)
Municipality of Molfetta (LP) | Coastal Molise FLAG (PP2) | Municipality of Ulc

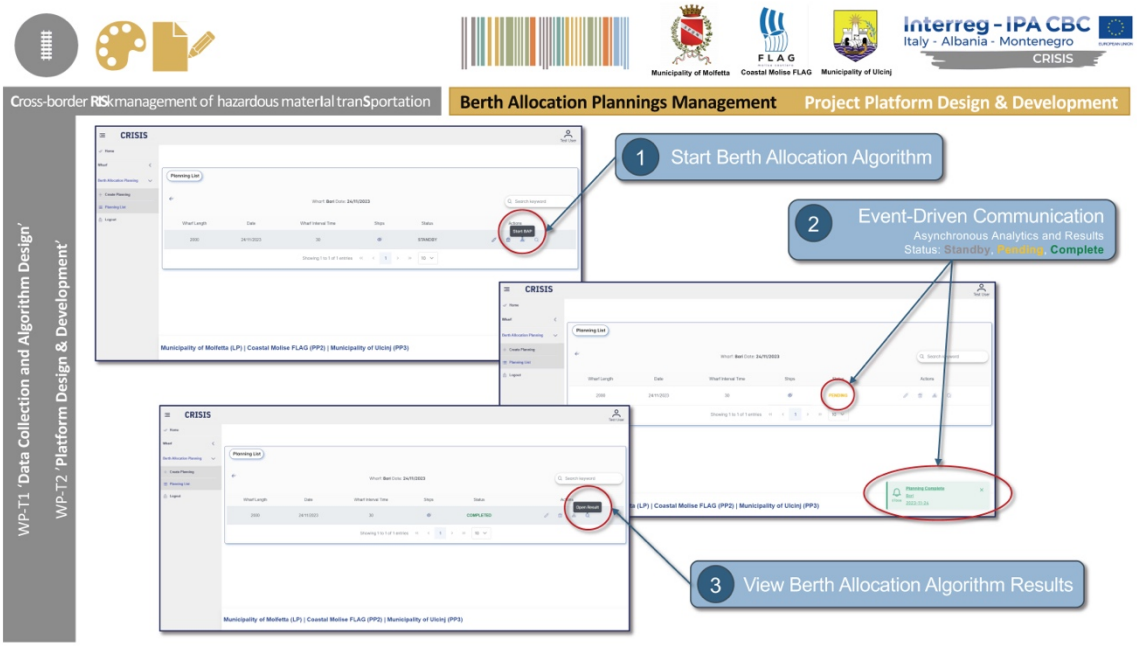

Cross-border RISkmanagement of hazardous materIal tranSportation
Wharfs & Berthing Points Management
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
CRISIS
1 Create & Save Wharf
2 Create & Save Berthing Points
3 Wharf & Berthing Points Management (View, Modify, Delete)
3 Save Wharf & its Berth Points
Municipality of Molfetta (LP) | Coastal Molise FLAG (PP2) | Municipality of Ulcinj (PP3)

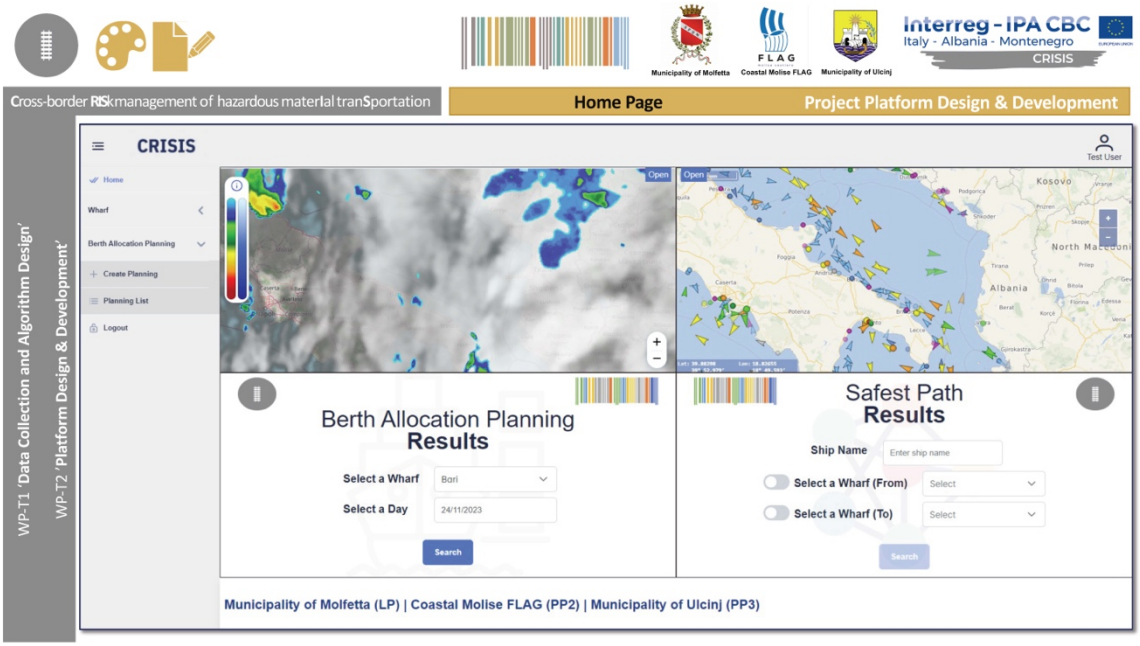

Cross-border RISkmanagement of hazardous materIal tranSportation
Wharfs & Berthing Points Management
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
1 Wharf's Berthing Points Management
(View, Modify, Delete)


Cross-border RISkmanagement of hazardous materIal tranSportation
Berth Allocation Plannings Management
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
1 Create Planning for a specific day and a specific Wharf
2 Create and save Ships in Planning


Cross-border RISkmanagement of hazardous materIal tranSportation
Berth Allocation Plannings Management
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
Municipality of Molfetta
Coastal Molise FLAG
Municipality of Ulcinj
Interreg - IPA CBC
Italy - Albania - Montenegro
CRISIS
1 Search a Planning by Wharf and Date
2 View Results List
3 View Ships for specific Planning


Cross-border RISkmanagement of hazardous materIal tranSportation
Berth Allocation Plannings Management
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
Municipality of Molfetta
Coastal Molise FLAG
Municipality of Ulcinj
Interreg - IPA CBC
Italy - Albania - Montenegro
CRISIS
1 Edit a Planning
2 Delete a Planning


Cross-border RISkmanagement of hazardous materIal tranSportation
Berth Allocation Plannings Management
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
Municipality of Molfetta
Coastal Molise FLAG
Municipality of Ulcinj
Interreg - IPA CBC
Italy - Albania - Montenegro
CRISIS
1 Start Berth Allocation Algorithm
2 Event-Driven Communication
Asynchronous Analytics and Results
Status: Standby, Pending, Complete
3 View Berth Allocation Algorithm Results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Home Page
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
Municipality of Molfetta
Coastal Molise FLAG
Municipality of Ulcinj
Interreg - IPA CBC
Italy - Albania - Montenegro
CRISIS
CRISIS
Test User
Home
Wharf
Berth Allocation Planning
Create Planning
Planning List
Logout
Open
Kosovo
Albania
Berth Allocation Planning
Results
Select a Wharf
Bari
Select a Day
24/11/2023
Search
Safest Path
Results
Ship Name
Enter ship name
Select a Wharf (From)
Select a Wharf (To)
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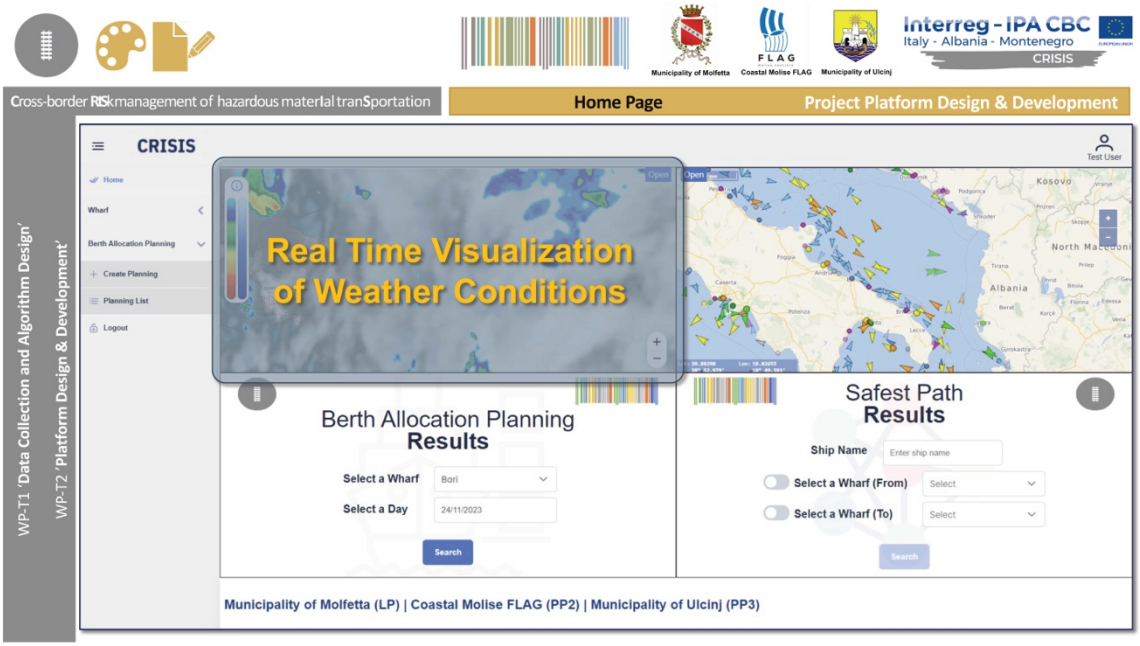
Search
Municipality of Molfetta (LP) | Coastal Molise FLAG (PP2) | Municipality of Ulcinj (PP3)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Coastal Molise FLAG
Municipality of Ulcinj
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
CRISIS
Test User
Home
Wharf
Berth Allocation Planning
Create Planning
Planning List
Logout
Real Time Visualization of Weather Conditions
Kosovo
Albania
Berth Allocation Planning Results
Select a Wharf
Bari
Select a Day
24/11/2023
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Safest Path Results
Ship Name
Enter ship name
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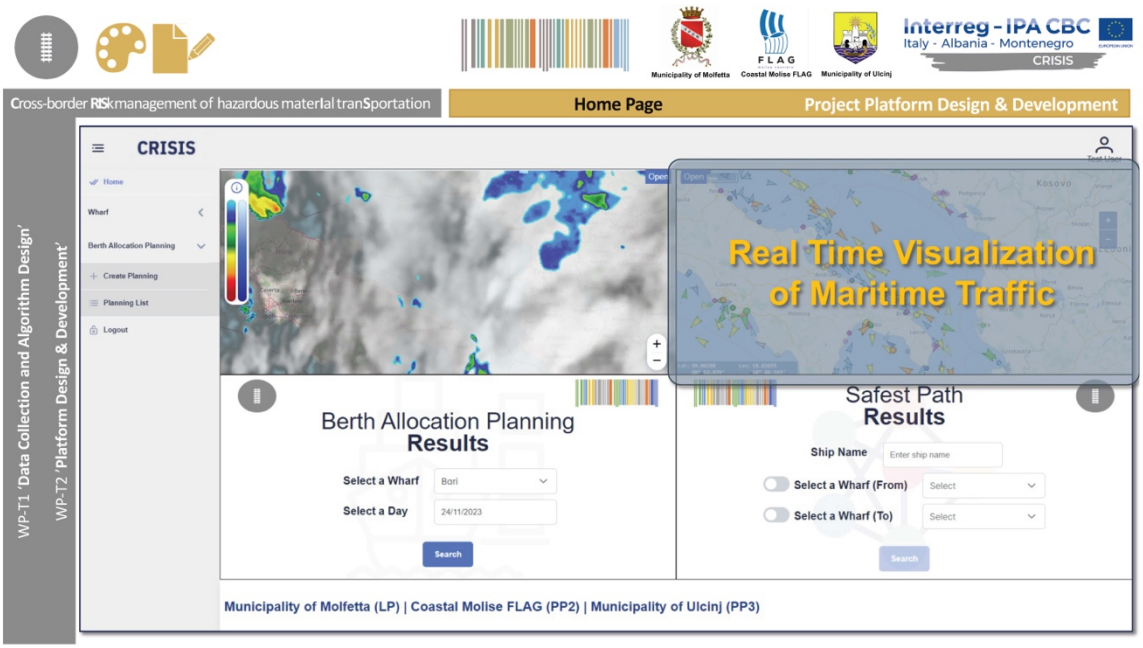
Cross-border RISkmanagement of hazardous materIal tranSportation
Home Page
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Coastal Molise FLAG
Municipality of Ulcinj
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
CRISIS
Home
Wharf
Berth Allocation Planning
Create Planning
Planning List
Logout
Real Time Visualization of Maritime Traffic
Kosovo
Berth Allocation Planning Results
Select a Wharf
Bari
Select a Day
24/11/2023
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Safest Path Results
Ship Name
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Select a Wharf (To)
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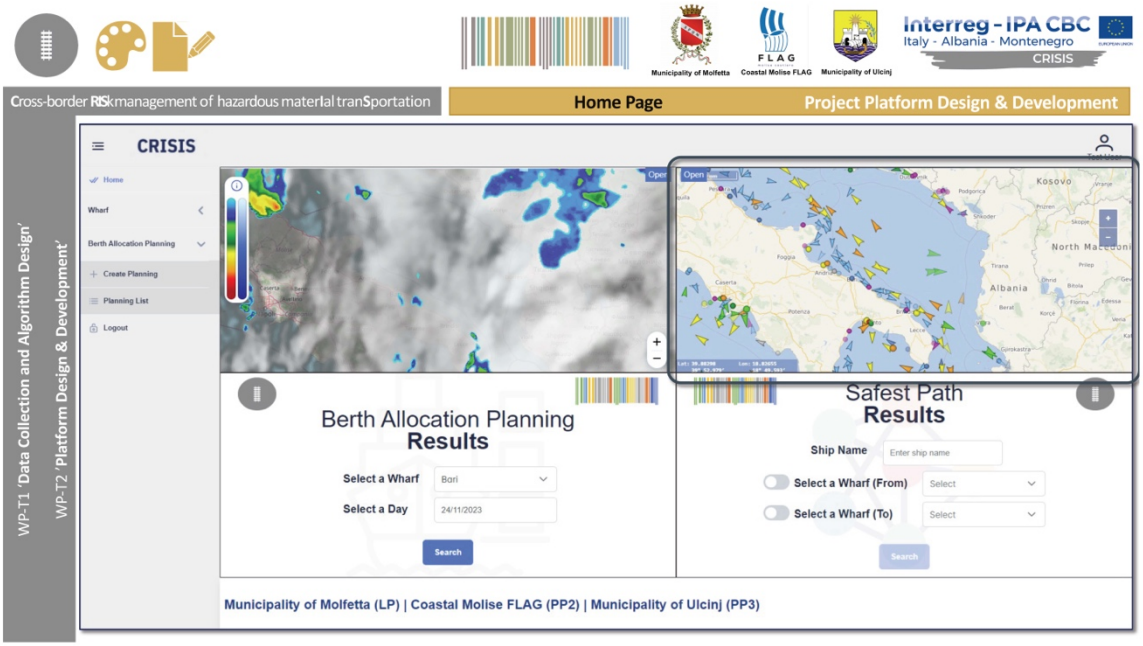
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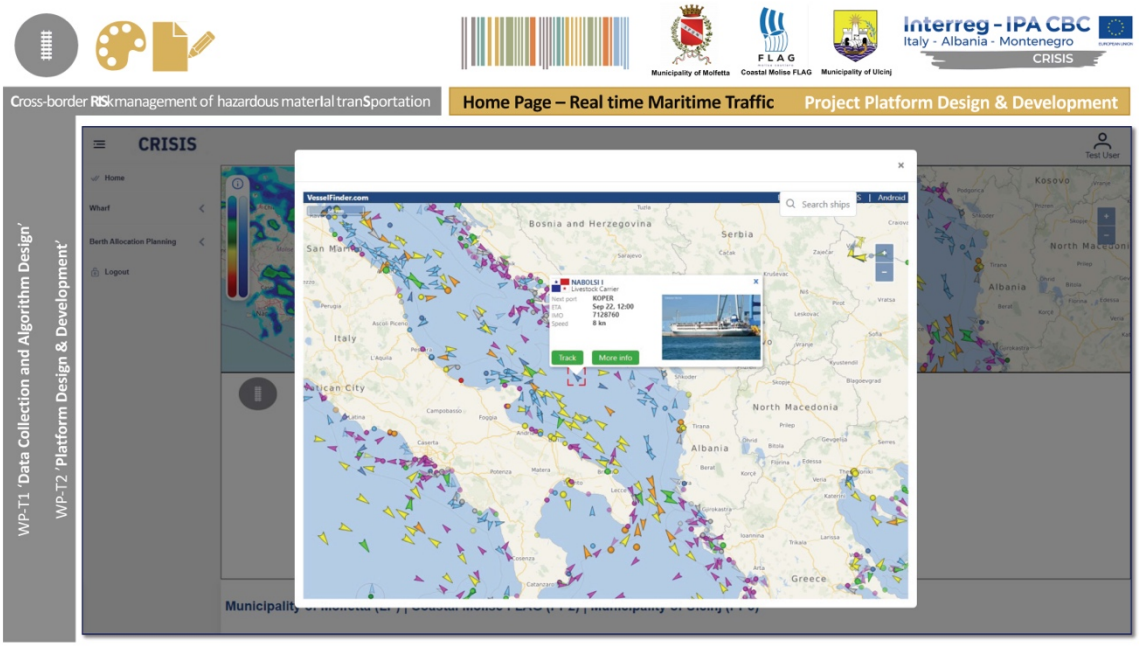
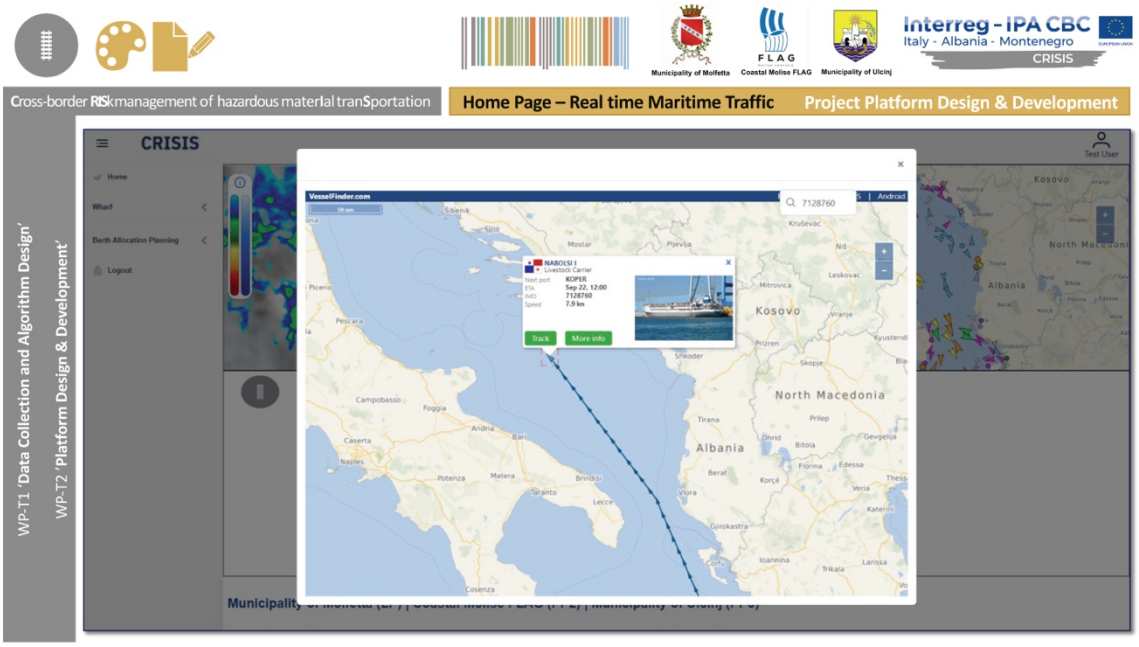
Berth Allocation Planning
Create Planning
Planning List
Logout
Berth Allocation Planning
Results
Select a Wharf
Bari
Select a Day
24/11/2023
Search
Safest Path
Results
Ship Name
Enter ship name
Select a Wharf (From)
Select a Wharf (To)
Select
Search
Municipality of Molfetta (LP) | Coastal Molise FLAG (PP2) | Municipality of Ulcinj (PP3)


Cross-border RISkmanagement of hazardous materIal tranSportation
Home Page – Real time Maritime Traffic
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
CRISIS
VesselFinder.com
Bosnia and Herzegovina
Serbia
Italy
North Macedonia
Albania
Greece
Track
More info


Cross-border RISkmanagement of hazardous materIal tranSportation
Home Page – Real time Maritime Traffic
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
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Wharf
Berth Allocation Planning
Logout
Test User
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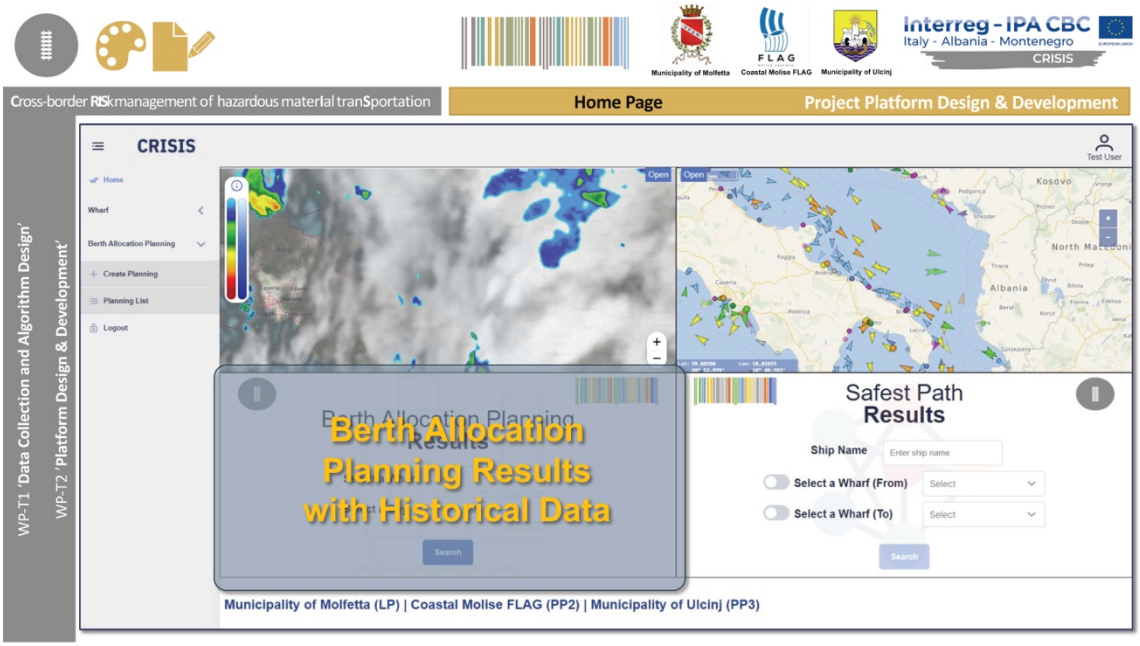
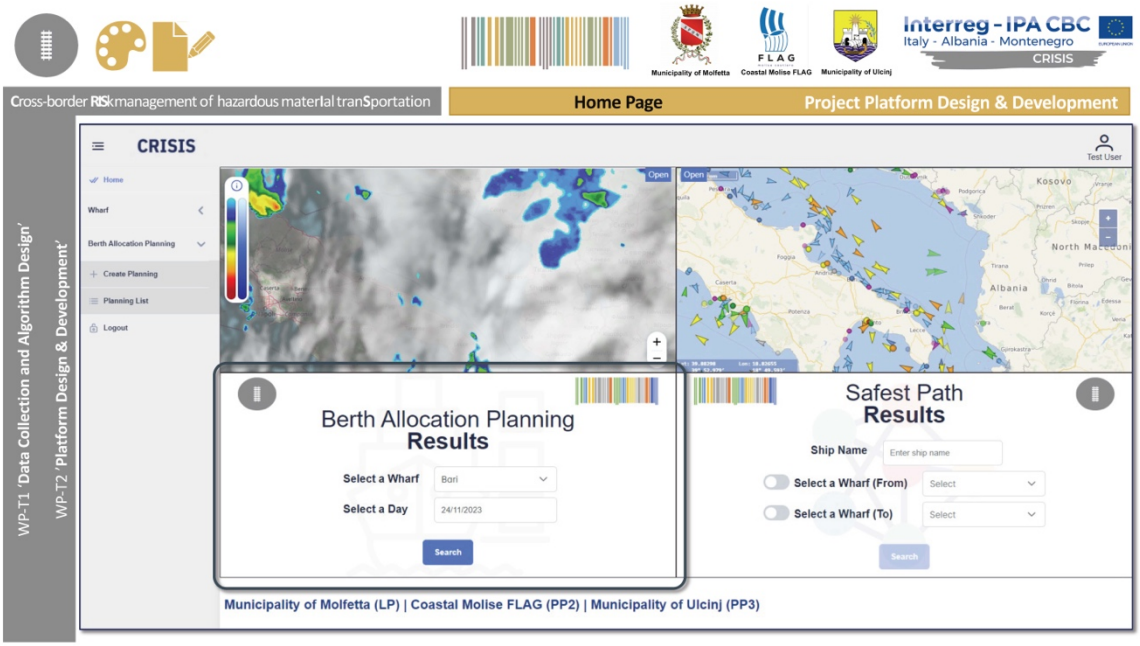
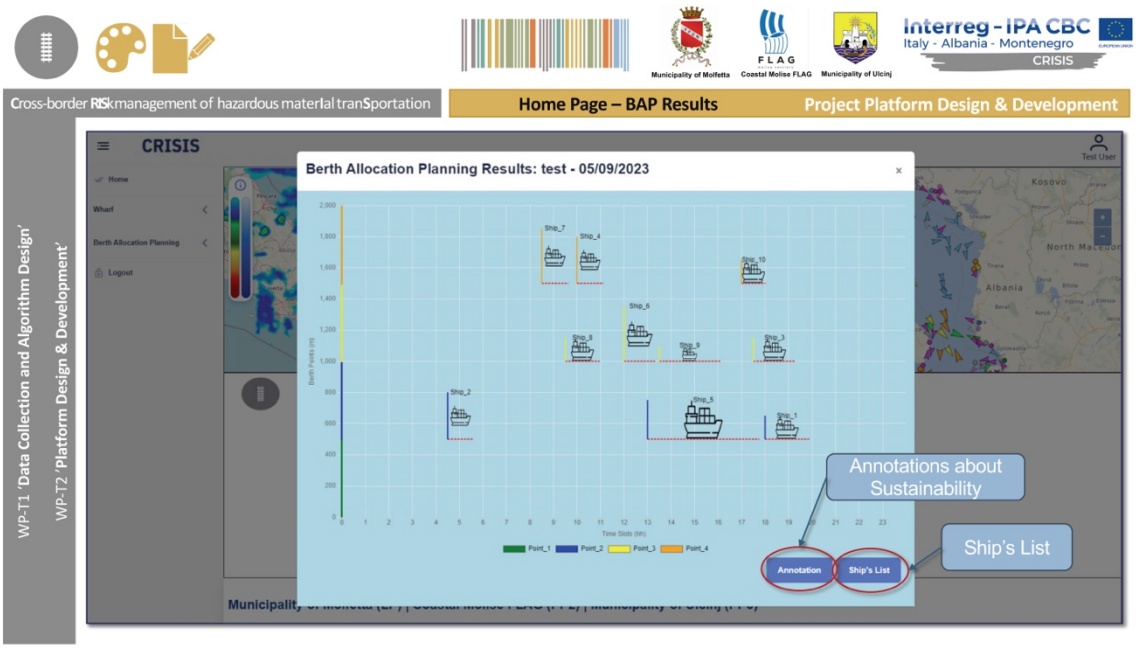
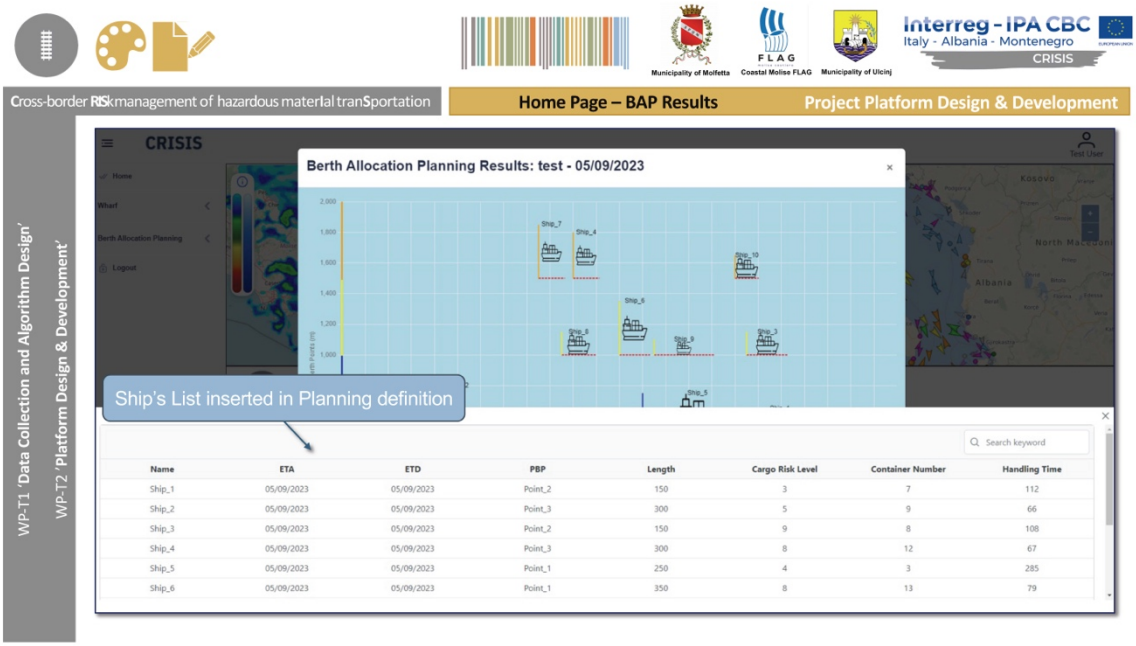
North Macedonia
Albania
Municipality of Molfetta
Coastal Molise FLAG
Municipality of Ulcinj


Cross-border RISkmanagement of hazardous materIal tranSportation
Home Page
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
CRISIS
Home
Wharf
Berth Allocation Planning
Create Planning
Planning List
Logout
Test User
Berth Allocation Planning Results with Historical Data
Safest Path Results
Ship Name
Select a Wharf (From)
Select a Wharf (To)
Search
Municipality of Molfetta (LP) | Coastal Molise FLAG (PP2) | Municipality of Ulcinj (PP3)


Cross-border RISkmanagement of hazardous materIal tranSportation
Home Page
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
CRISIS
Berth Allocation Planning
Results
Select a Wharf
Bari
Select a Day
24/11/2023
Search
Safest Path
Results
Ship Name
Select a Wharf (From)
Select a Wharf (To)
Municipality of Molfetta (LP) | Coastal Molise FLAG (PP2) | Municipality of Ulcinj (PP3)


Cross-border RISkmanagement of hazardous materIal tranSportation
Home Page – BAP Results
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
CRISIS
Berth Allocation Planning Results: test - 05/09/2023
Annotations about Sustainability
Ship's List
Annotation
Ship's List


Cross-border RISkmanagement of hazardous materIal tranSportation
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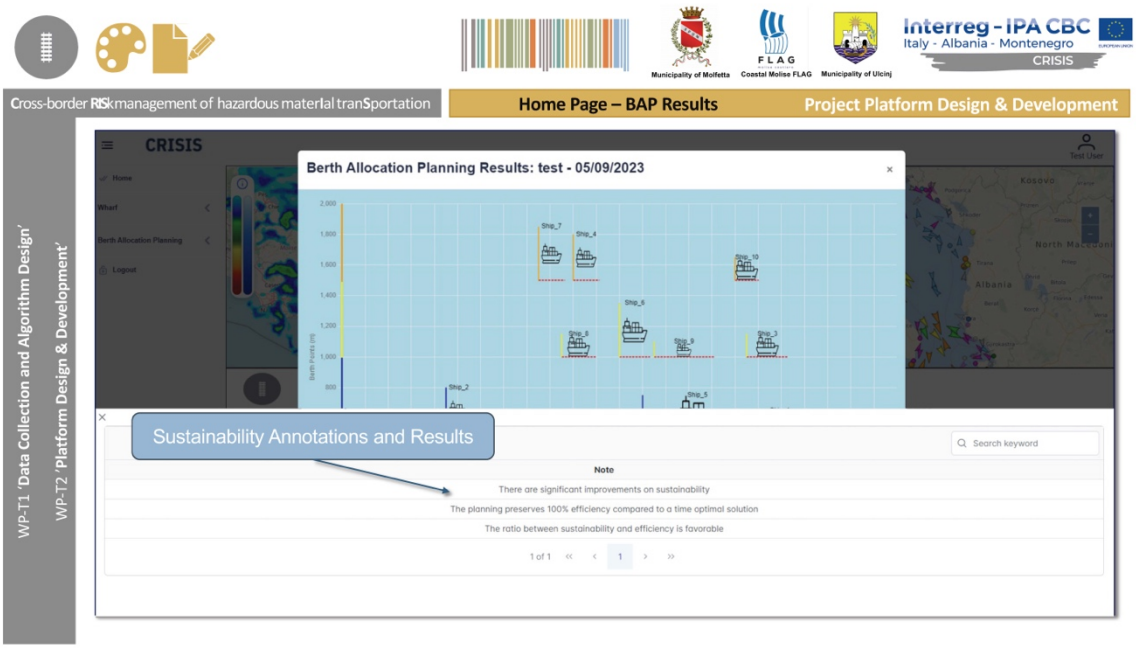
CRISIS
Berth Allocation Planning Results: test - 05/09/2023
Ship's List inserted in Planning definition
Name | ETA | ETD | PBP | Length | Cargo Risk Level | Container Number | Handling Time
Ship_1 | 05/09/2023 | 05/09/2023 | Point_2 | 150 | 3 | 7 | 112
Ship_2 | 05/09/2023 | 05/09/2023 | Point_3 | 300 | 5 | 9 | 66
Ship_3 | 05/09/2023 | 05/09/2023 | Point_2 | 150 | 9 | 8 | 108
Ship_4 | 05/09/2023 | 05/09/2023 | Point_3 | 300 | 8 | 12 | 67
Ship_5 | 05/09/2023 | 05/09/2023 | Point_1 | 250 | 4 | 3 | 285
Ship_6 | 05/09/2023 | 05/09/2023 | Point_1 | 350 | 8 | 13 | 79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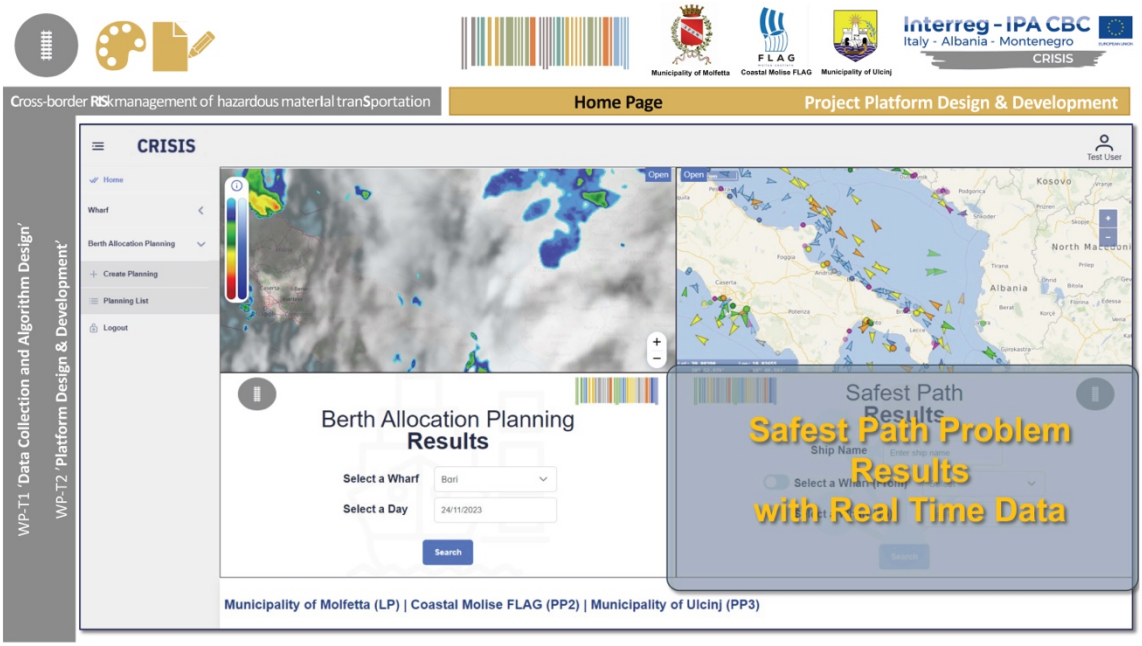
CRISIS
Berth Allocation Planning Results: test - 05/09/2023
Sustainability Annotations and Results
Note
There are significant improvements on sustainability
The planning preserves 100% efficiency compared to a time optimal solution
The ratio between sustainability and efficiency is favorable


Cross-border RISkmanagement of hazardous materIal tranSportation
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Project Platform Design & Development
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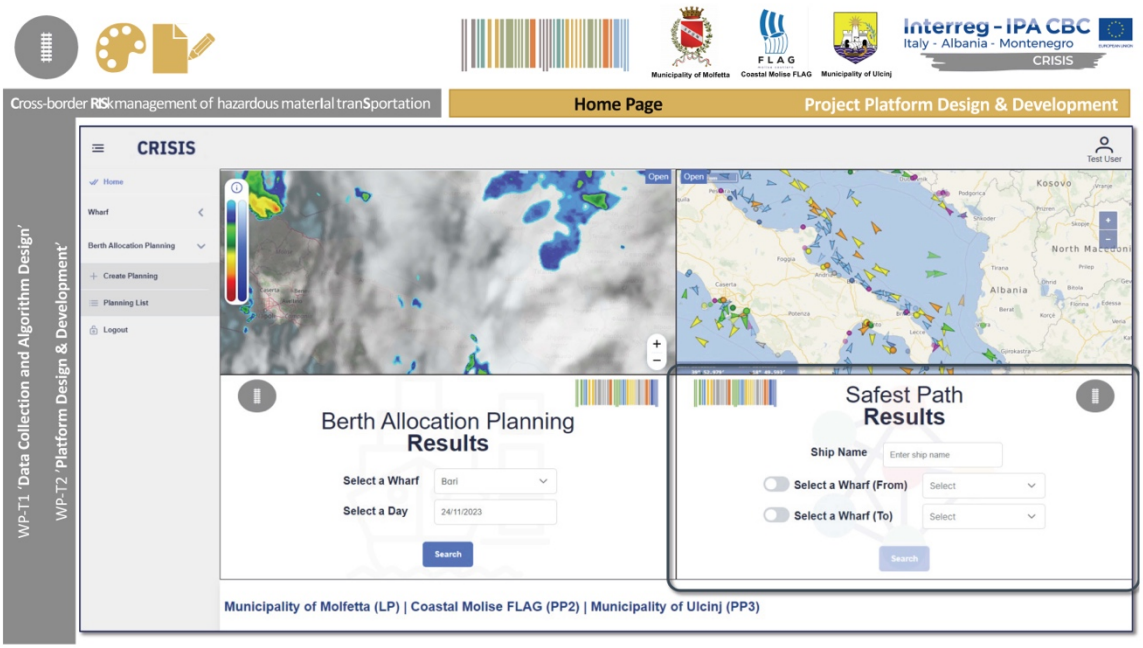
CRISIS
Berth Allocation Planning
Results
Select a Wharf
Bari
Select a Day
24/11/2023
Search
Safest Path
Results
Safest Path Problem
Results
with Real Time Data
Municipality of Molfetta (LP) | Coastal Molise FLAG (PP2) | Municipality of Ulcinj (PP3)


Cross-border RISkmanagement of hazardous materIal tranSportation
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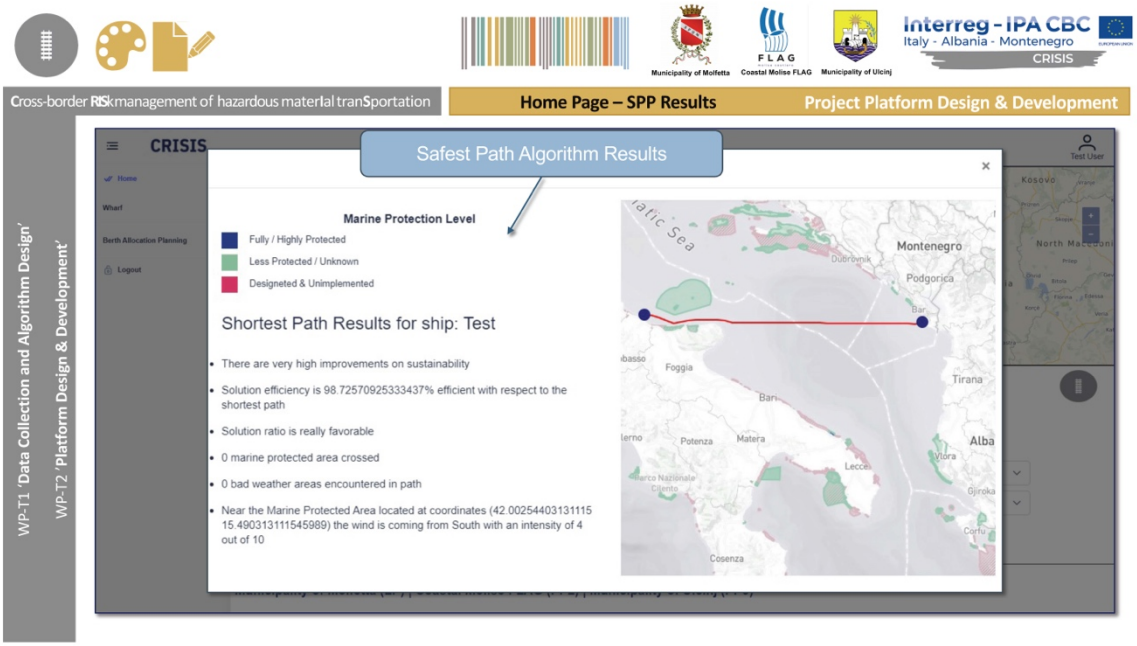
Berth Allocation Planning
Results
Select a Wharf
Bari
Select a Day
24/11/2023
Search
Safest Path
Results
Ship Name
Enter ship name
Select a Wharf (From)
Select a Wharf (To)
Select
Search
Municipality of Molfetta (LP) | Coastal Molise FLAG (PP2) | Municipality of Ulcinj (PP3)


Cross-border RISkmanagement of hazardous materIal tranSportation
Home Page – SPP Results
Project Platform Design & Development
WP-T1 'Data Collection and Algorithm Design'
WP-T2 'Platform Design & Development'
Safest Path Algorithm Results
Marine Protection Level
Fully / Highly Protected
Less Protected / Unknown
Designeted & Unimplemented
Shortest Path Results for ship: Test
There are very high improvements on sustainability
Solution efficiency is 98.72570925333437% efficient with respect to the shortest path
Solution ratio is really favorable
0 marine protected area crossed
0 bad weather areas encountered in path
Near the Marine Protected Area located at coordinates (42.00254403131115 15.490313111545989) the wind is coming from South with an intensity of 4 out of 10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CRISIS
Berth Allocation Planning Results
Safest Path Results
Municipality of Molfetta (LP) | Coastal Molise FLAG (PP2) | Municipality of Ulcinj (PP3)
Municipality of Molfetta
Coastal Molise FLAG
Municipality of Ulcinj
CRISIS
Cross-border RISk management of hazardous materIal tranSportation
https://crisis.italy-albania-montenegro.eu

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