



EUROPEAN UNION
European Regional Development Fund



Interreg
Central Baltic



MAREA

Joint testing of the portal and active discussion

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MAREA project final event
03.11.2022



Accessing the portal and tools

<http://www.sea.ee/planwise4blue>

PlanWise4Blue

The Baltic Sea is one of the most intensively used seas of the world and therefore impacted by many burdens affecting the sustainability of the marine environment. Spatial decision support tools (DST) help us to allocate sea space for different human uses without compromising sustainability. The PlanWise4Blue (PW4B) DST tool can be used to estimate cumulative effects of various human activities on nature assets. It does not require special GIS software or GIS knowledge by the user. This knowledge can give decision-makers a head start in assessing the spatial extent of different types of human activity in specific locations.

PW4B tool characteristics

- Open source online tool.
- Based on the best available scientific data.
- Capable of quantifying both single and combined effects of human activities and uses on a broad range of marine nature values.
- The PW4B algorithm is based on spatial maps of environmental data and impact coefficients, which determines expected ecological changes for a given combination of human activities in a selected area.
- PW4B is dynamic: users can upload novel information on the marine environment and this ecological knowledge is then used to quantify cumulative effects.

Further development of the PW4B

The PW4B tool is being regularly updated, i.e. environmental data and knowledge of ecological effects, and when needed, refinements to model algorithms. This will result in enhanced predictions and a reduction in uncertainty in particular regions, as well as the ability to measure the accuracy of the model and to stream-line modelling and calculation processes.

Versions of the PW4B

- PlanWise4Blue - Estonia, Pan Baltic Scope project, ver 1.0
- PlanWise4Blue - Estonia vers 2021, ADRIENNE project, ver 2.0
- PlanWise4Blue - Gulf of Finland, ADRIENNE project, ver 3.0
- PlanWise4Blue - Baltic Sea, MAREA project, ver 4.0 (under development)

Use links on the left side menu to access each version of the PW4B DST tool.

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Accessing the portal and tools

<http://www.sea.ee/planwise4blue>

versions

The screenshot shows the PlanWise4Blue portal interface. On the left is a vertical menu with icons and labels for different versions: PlanWise4Blue - Estonia, PlanWise4Blue - Estonia vers 2021, PlanWise4Blue - Gulf of Finland, PlanWise4Blue - Baltic Sea, and Supporting material. The main content area displays the title 'PlanWise4Blue', a descriptive paragraph, 'PW4B tool characteristics', 'Further development of the PW4B', and a section titled 'Versions of the PW4B' with a list of four versions. A dashed box highlights the 'Versions of the PW4B' section, and a larger dashed box highlights a callout text box containing a list of versions and a note to use the left menu. At the bottom, logos for the Republic of Estonia Ministry of Finance, EST | RUS Cross Border Cooperation Programme, Pan Baltic Scope, European Union Cohesion Fund, and Interreg Central Baltic are visible.

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Use links on the left side menu to access each version of the PW4B DST tool.

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Accessing the portal and tools

<http://www.sea.ee/planwise4blue>

The screenshot shows the PlanWise4Blue portal interface. On the left is a dark sidebar menu with icons and labels: Home, PlanWise4Blue - Estonia, PlanWise4Blue - Estonia vers 2021, PlanWise4Blue - Gulf of Finland, PlanWise4Blue - Baltic Sea (highlighted with an orange arrow), and Supporting material. The main content area has a header 'PlanWise4Blue' and a descriptive paragraph. Below are sections for 'PW4B tool characteristics', 'Further development of the PW4B', and 'Versions of the PW4B'. A large callout box on the right, titled 'Versions of the PW4B', lists four versions, with the fourth version (Baltic Sea, MAREA project, ver 4.0) highlighted in orange and pointed to by an orange arrow. Below the callout, blue text reads 'Use links on the left side menu to access each version of the PW4B DST tool.' At the bottom of the page are logos for the Republic of Estonia Ministry of Finance, EST | RUS Cross Border Cooperation Programme, Pan Baltic Scope, European Union, Environmental Investment Centre, European Union Cohesion Fund, Investing in your future, European Union European Regional Development Fund, and Interreg Central Baltic.

PlanWise4Blue

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Accessing the portal and tools

The screenshot displays a web portal interface. At the top, a teal navigation bar contains a home icon, three location-based tabs: 'PW4B - Estonia', 'PW4B - Estonia vers 2021', and 'PW4B - Gulf of Finland', and 'Home' and 'Log in' links. A left sidebar lists three main tool categories: 'Input Layers', 'Sustainability compass', and 'Cumulative impact model'. The main content area features the 'MAREA' logo and a title: 'From marine ecosystem accounting to integrated governance for sustainable planning of marine and coastal areas'. Below the title is a 'SUMMARY OF THE PROJECT' section with three paragraphs of text.

Home PW4B - Estonia PW4B - Estonia vers 2021 PW4B - Gulf of Finland Home Log in

Input Layers
Sustainability compass
Cumulative impact model

MAREA

From marine ecosystem accounting to integrated governance for sustainable planning of marine and coastal areas

SUMMARY OF THE PROJECT

The ecosystem-based approach is a strategy for the integrated management of land, water and living resources that promotes their conservation and sustainable use in an equitable way. EBA is a cornerstone of many EU directives but to date there is no clear guidance on how to implement it in practice, for instance, in the maritime spatial planning processes.

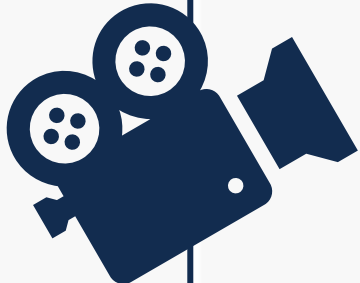
Ecosystems are linked to human well-being through the flow of ecosystem services, i.e., the benefits the marine environment and its resources deliver to society such as, the production of economically exploitable biomasses. A weak integration of ecology and economy results in a disconnection of economic analysis from the functioning of ecosystems. Current evaluation approaches hardly capture the cumulative impact of different human activities on ecosystem services thereby failing in the achievement of sustainable use of natural resources.

The MAREA project will develop and test novel concepts of ecosystem services mapping, environmental accounting and sustainability assessment as well as embed these elements into the PlanWise4Blue portal capable of supporting sustainable planning solutions in two transnational pilot areas: Finland-Estonia in the Gulf of Finland and Estonia-Latvia in the Gulf of Riga.

The main result of the MAREA will be (1) the realisation of a system of accounting of marine environment and the benefits they deliver, also in terms of regulating services for climate and ecosystems' sustainability, and (2) a connected model of integrated sustainable governance in the use of natural resources and marine space. The ecosystem accounting models as well as sustainability assessments are generated and updated through participatory learning including authorities responsible for MSP and marine management planning, environmental experts and general public.

Accessing the portal and tools

The screenshot displays the MAREA v.2 Cumulative Effects Assessment portal. The top navigation bar includes a home icon, three project links: "PW4B - Estonia", "PW4B - Estonia vers 2021", and "PW4B - Gulf of Finland", along with "Home" and "Log in" options. A left sidebar contains three menu items: "Input Layers", "Sustainability compass", and "Cumulative impact model". The main content area features the MAREA logo and a video player titled "MAREA v.2 - Cumulative Effects Assessment" by Mihhail Fetissov. The video player shows a document titled "Cumulative Effects Assessment" with a summary of the project. The summary text reads: "The ecosystem-based approach to integrated management of best available living resources that promotes their conservation and sustainable use in an equitable way. EBA is a cornerstone of many EU directives but to date there is no clear guidance on how to implement it in practice, for instance, in the maritime spatial planning processes. Ecosystems are linked to human well-being through the flow of ecosystem services, i.e. the benefits the marine environment and its resources deliver to society such as, the production of economically valuable biomass. A weak integration of ecology and economy results in a deterioration of ecosystems, analysed from the functioning of ecosystems. Current evaluation approaches hardly capture the cumulative impact of different human activities on ecosystem services thereby failing in the achievement of sustainable use of natural resources. The MAREA project will develop and test novel concepts of ecosystem services mapping, environmental accounting and sustainability assessment, as well as embed these elements into the FlexAble4Sea portal capable of supporting sustainable planning solutions in two transitional pilot areas: Finland-Estonia in the Gulf of Finland and Estonia-Latvia in the Gulf of Riga. The main goals of the MAREA will be: (1) the realization of a system of accounting of natural environment and the benefits they deliver, also in terms of regulating services for climate and ecosystems' sustainability; and (2) a connected model of integrated sustainable governance in the use of natural resources and marine space. The ecosystem accounting models as well as sustainability assessments are developed and applied through participatory learning including stakeholders responsible for MSP and marine management planning, environmental experts and general public." Logos for Interreg Central Baltic, European Union, and VIK are visible. The video player includes a play button, a 04:00 duration indicator, and a Vimeo logo.



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from the functioning of ecosystems.
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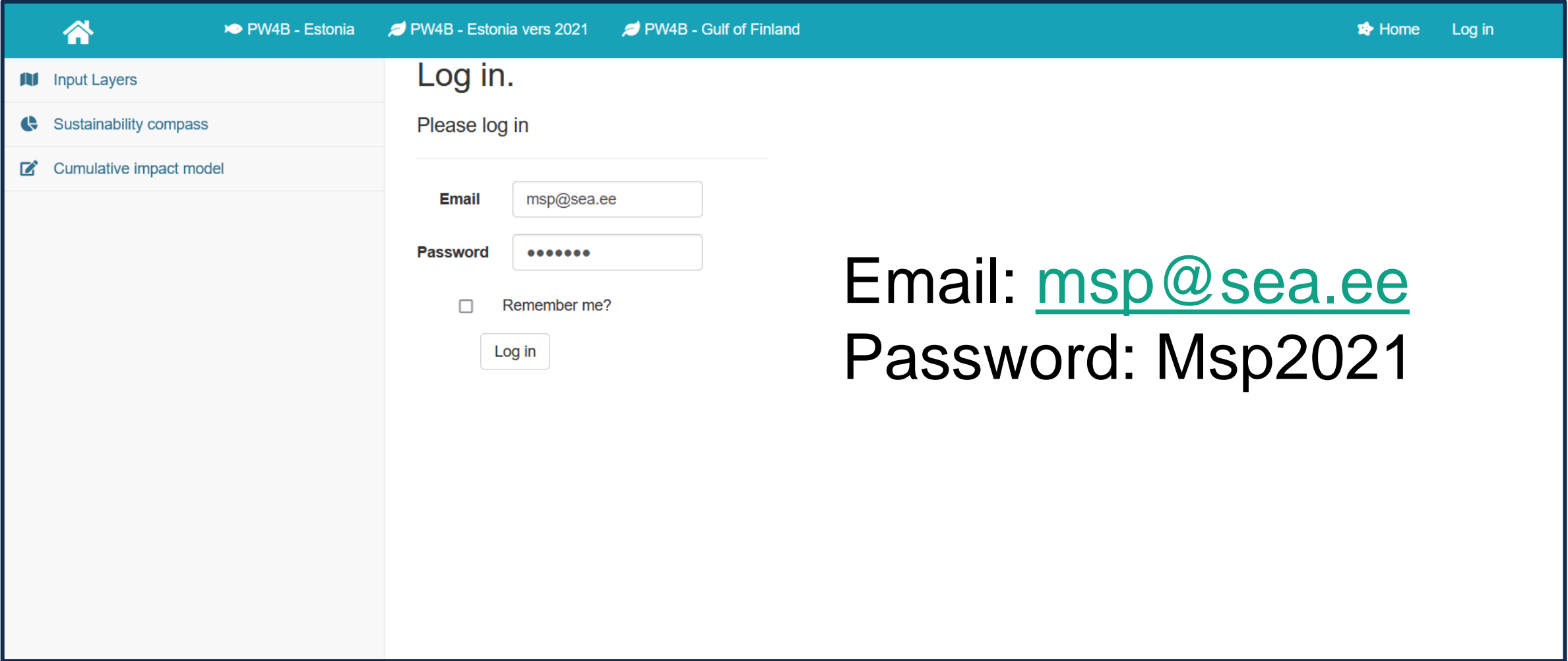
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in the Gulf of Finland and Estonia-

terms of regulating services for
marine space. The ecosystem
nsible for MSP and marine

Accessing the portal and tools

The screenshot displays the MAREA portal interface. At the top, there is a teal navigation bar with a home icon, three location tabs ('PW4B - Estonia', 'PW4B - Estonia vers 2021', 'PW4B - Gulf of Finland'), and 'Home' and 'Log in' links. A left sidebar contains three menu items: 'Input Layers', 'Sustainability compass', and 'Cumulative impact model', with the latter highlighted by a black box. The main content area features the MAREA logo and a title: 'From marine ecosystem accounting to integrated governance for sustainable planning of marine and coastal areas'. Below this is a 'SUMMARY OF THE PROJECT' section. A large black box highlights the 'Cumulative impact model' link, which is accompanied by a pencil icon. A dashed line connects the 'Cumulative impact model' menu item in the sidebar to this highlighted link. The project summary text includes: 'The ecosystem equitable way processes.', 'Ecosystems a production of', 'Current evalu natural resources.', 'The MAREA project will develop and test novel concepts of ecosystem services mapping, environmental accounting and sustainability assessment as well as embed these elements into the PlanWise4Blue portal capable of supporting sustainable planning solutions in two transnational pilot areas: Finland-Estonia in the Gulf of Finland and Estonia-Latvia in the Gulf of Riga.', and 'The main result of the MAREA will be (1) the realisation of a system of accounting of marine environment and the benefits they deliver, also in terms of regulating services for climate and ecosystems' sustainability, and (2) a connected model of integrated sustainable governance in the use of natural resources and marine space. The ecosystem accounting models as well as sustainability assessments are generated and updated through participatory learning including authorities responsible for MSP and marine management planning, environmental experts and general public.'

Accessing the portal and tools



The screenshot shows a web portal interface. At the top, there is a teal navigation bar with a home icon, three project links: "PW4B - Estonia", "PW4B - Estonia vers 2021", and "PW4B - Gulf of Finland", and two user links: "Home" and "Log in". On the left, a sidebar contains three menu items: "Input Layers", "Sustainability compass", and "Cumulative impact model". The main content area is titled "Log in." and contains the text "Please log in". Below this is a login form with an "Email" field containing "msp@sea.ee", a "Password" field with masked characters, a "Remember me?" checkbox, and a "Log in" button.

Email: msp@sea.ee
Password: Msp2021

Inside the cumulative impact assessment tool

Home PW4B - Estonia PW4B - Estonia vers 2021 PW4B - Gulf of Finland Home msp@sea.ee

Input Layers

Sustainability compass

Cumulative impact model

Enter new workspace name... +

Workspace	Timestamp
scenario 1	31.05.2022 10:24:20
scenario 2	01.06.2022 23:00:02
SYKE Workshop	17.06.2022 14:37:12
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04

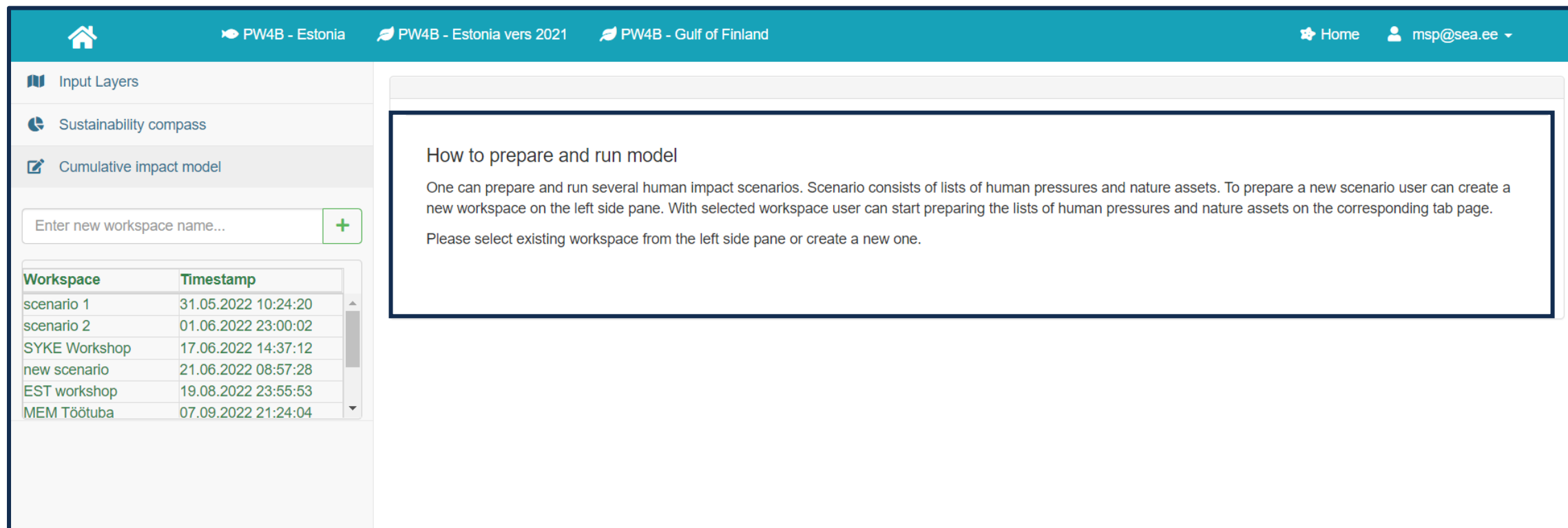
How to prepare and run model

One can prepare and run several human impact scenarios. Scenario consists of lists of human pressures and nature assets. To prepare a new scenario user can create a new workspace on the left side pane. With selected workspace user can start preparing the lists of human pressures and nature assets on the corresponding tab page.

Please select existing workspace from the left side pane or create a new one.

Inside the cumulative impact assessment tool

Explanation of how to prepare and run the model



The screenshot displays the user interface of the cumulative impact assessment tool. The top navigation bar includes a home icon, three workspace tabs labeled "PW4B - Estonia", "PW4B - Estonia vers 2021", and "PW4B - Gulf of Finland", and a user profile section with "Home" and "msp@sea.ee".

The left sidebar contains three main menu items: "Input Layers", "Sustainability compass", and "Cumulative impact model". Below these is a text input field for "Enter new workspace name..." with a green plus icon to its right. A table below the input field lists existing workspaces with their names and timestamps.

Workspace	Timestamp
scenario 1	31.05.2022 10:24:20
scenario 2	01.06.2022 23:00:02
SYKE Workshop	17.06.2022 14:37:12
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04

The main content area features a large text box with the following text:

How to prepare and run model

One can prepare and run several human impact scenarios. Scenario consists of lists of human pressures and nature assets. To prepare a new scenario user can create a new workspace on the left side pane. With selected workspace user can start preparing the lists of human pressures and nature assets on the corresponding tab page.

Please select existing workspace from the left side pane or create a new one.

Inside the cumulative impact assessment tool

Generate a new workspace or select the existing ones

The screenshot displays the user interface of the cumulative impact assessment tool. At the top, a teal navigation bar contains a home icon, three workspace tabs labeled 'PW4B - Estonia', 'PW4B - Estonia vers 2021', and 'PW4B - Gulf of Finland', and a user profile section with 'Home' and 'msp@sea.ee'. On the left, a sidebar lists 'Input Layers', 'Sustainability compass', and 'Cumulative impact model'. The main content area features a heading 'How to prepare and run model' followed by explanatory text: 'One can prepare and run several human impact scenarios. Scenario consists of lists of human pressures and nature assets. To prepare a new scenario user can create a new workspace on the left side pane. With selected workspace user can start preparing the lists of human pressures and nature assets on the corresponding tab page. Please select existing workspace from the left side pane or create a new one.' Below this text, two callout boxes highlight the workspace management interface. The first callout shows a text input field 'Enter new workspace name...' with a green plus icon, and a table of existing workspaces. The second callout is a magnified view of the same table. The table lists the following workspaces and their timestamps:

Workspace	Timestamp
scenario 1	31.05.2022 10:24:20
scenario 2	01.06.2022 23:00:02
SYKE Workshop	17.06.2022 14:37:12
new scenario	21.06.2022 08:57:28
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Inside the cumulative impact assessment tool

The screenshot displays the user interface of a cumulative impact assessment tool. At the top, there is a navigation bar with a home icon, project names (PW4B - Estonia, PW4B - Estonia vers 2021, PW4B - Gulf of Finland), and a user profile (msp@sea.ee). The left sidebar contains menu items: Input Layers, Sustainability compass, and Cumulative impact model. Below the sidebar is a workspace management section with a text input 'Enter new workspace name...' and a '+' button. A table lists existing workspaces with their names and timestamps.

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

The main content area features a tabbed interface with four tabs: Overview, Human pressures (not ready), Ecosystem Services (not ready), and Model results (not ready). Below the tabs is a section titled 'How to prepare and run model' with explanatory text and a 'Submit' button. A form below the text includes fields for 'Workspace name' and 'Timestamp' (02.11.2022 10:48:48). A second, larger tabbed interface is shown below, with the 'Human pressures' tab selected and marked 'not ready'. The bottom section, 'Model inputs for current scenario', contains three input areas: 'Human pressures', 'Nature assets', and 'Human impact calculation' (not ready), with a 'Run model' button.

Inside the cumulative impact assessment tool

Overview of the workspace

The screenshot shows the workspace overview page of the cumulative impact assessment tool. The interface is divided into several sections:

- Top Navigation:** Includes a home icon, three workspace tabs labeled "PW4B - Estonia", "PW4B - Estonia vers 2021", and "PW4B - Gulf of Finland", and a user profile section with "Home" and "msp@sea.ee".
- Left Sidebar:** Contains navigation options: "Input Layers", "Sustainability compass", and "Cumulative impact model". Below these is a text input field "Enter new workspace name..." with a green "+" button. A table lists existing workspaces with their names and timestamps.
- Table of Workspaces:**

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48
- Current workspace's layers:** A section for managing the layers of the current workspace.
- Overview Tab:** The active tab, highlighted with an orange box. It contains a sub-header "How to prepare and run model" and a paragraph explaining the process. Below this is a form with fields for "Workspace name" and "Timestamp" (pre-filled with "02.11.2022 10:48:48"), a "Description" text area, and a "Submit" button.
- Model Inputs:** A section titled "Model inputs for current scenario" containing three sub-sections: "Human pressures", "Nature assets", and "Human impact calculation". The "Human impact calculation" section includes a "Run model" button and a "not ready" status indicator.
- Other Tabs:** "Human pressures" (not ready), "Ecosystem Services" (not ready), and "Model results" (not ready) are visible as inactive tabs.

Inside the cumulative impact assessment tool

Overview of the workspace

The screenshot displays the workspace overview interface. At the top, a teal navigation bar contains a home icon, workspace names (PW4B - Estonia, PW4B - Estonia vers 2021, PW4B - Gulf of Finland), and user information (Home, msp@sea.ee). The left sidebar includes sections for 'Input Layers', 'Sustainability compass', and 'Cumulative impact model', with a text input field for 'Enter new workspace name...' and a '+' button. Below this is a table of workspace entries.

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
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Below the table is the section 'Current workspace's layers'. The main content area features an 'Overview' tab and a 'Human pressures' section with a 'not ready' status. A text box explains how to prepare and run a model, followed by a 'Submit' button. At the bottom, there are sections for 'Model inputs for current scenario', including 'Human pressures', 'Nature assets', and 'Human impact calculation' (with a 'not ready' status and a 'Run model' button).

Workspace name MAREA Final Event **Timestamp** 30.10.2022 12:49:42

Workspace name **Timestamp** 02.11.2022 10:48:48

Description

Submit

Model inputs for current scenario

Human pressures

Nature assets

Human impact calculation **not ready**

Run model

Inside the cumulative impact assessment tool

Overview of the workspace

The screenshot displays the workspace overview in the cumulative impact assessment tool. The interface is divided into several sections:

- Header:** Shows the current workspace name "PW4B - Estonia" and other workspace names like "PW4B - Estonia vers 2021" and "PW4B / Gulf".
- Left Sidebar:** Contains navigation options: "Input Layers", "Sustainability compass", and "Cumulative impact model". Below these is a text input field "Enter new workspace name..." with a green "+" button.
- Workspace List:** A table with two columns: "Workspace" and "Timestamp".

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48
- Main Content Area:** Features a "Description" field with a "Submit" button. Below this is a "Model inputs for current scenario" section with three sub-sections: "Human pressures", "Nature assets", and "Human impact calculation". The "Human impact calculation" section includes a "Run model" button and a "not ready" status indicator.

A callout box highlights the "Description" field with the text: **Please provide concrete and informative descriptions**. The "Submit" button is also visible within this callout.

Inside the cumulative impact assessment tool

Overview of the workspace

Input Layers

Sustainability compass

Cumulative impact model

Enter new workspace name... +

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

Current workspace's layers

Overview

How to prepare

One can prepare and new workspace on the

Please select existing

Workspace name

Description

Submit

Model inputs for current scenario

Human pressures

Nature assets

Human impact calculation

Run model not ready

Inside the cumulative impact assessment tool

Selecting the human pressures for our scenario of interest

The screenshot displays the user interface of a cumulative impact assessment tool. The top navigation bar includes a home icon, workspace names (PW4B - Estonia, PW4B - Estonia vers 2021, PW4B - Gulf of Finland), and user information (Home, msp@sea.ee).

The left sidebar contains the following sections:

- Input Layers**
- Sustainability compass**
- Cumulative impact model**
- Enter new workspace name... (+)
- Workspace** table:

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

- Current workspace's layers**
- Human pressures (selected)

Below the sidebar, it states: "There are currently no items to display."

The main workspace area features a navigation menu with "Overview" (selected), "Human pressures" (highlighted with an orange box and an arrow), "Ecosystem Services" (not ready), and "Model results" (not ready).

The central workspace is divided into two main sections:

- Available human pressures:** A list of 10 categories with corresponding icons and a right arrow button to add them to the workspace. The list includes: Dredging and dumping areas [1], Windpark areas [2], Fish farming [3], Shipping intensity [4], Underwater cables [5], Pelagic trawling [6], Benthic trawling [7], Harbours [8], Military activities [9], and Wastewater discharge outlet [10].
- Human pressures in workspace:** An empty list with a right arrow button to add more pressures.

Below these sections are two buttons: "Save list" (not saved) and "Build combinations" (ready).

On the right side, there is a "Human impact calculation" section with a "Run model" button (not ready).

At the bottom of the interface is a map of the Gulf of Finland region, showing various geographical locations such as Hämeenlinna, Lahti, Lappeenranta, Vyborg, Turku, Helsinki, Kotka, Saint Petersburg, and Leningrad Oblast. The map includes zoom controls and a home icon.

Inside the cumulative impact assessment tool

Selecting the human pressures for our scenario of interest

The screenshot displays the 'MAREA Final Event' workspace in the cumulative impact assessment tool. The interface is divided into several sections:

- Input Layers:** A sidebar on the left containing 'Sustainability compass' and 'Cumulative impact model'.
- Workspace Management:** A table with columns for 'Workspace' and 'Timestamp'. A '+ ' button is used to add a new workspace.
- Overview:** A central area with tabs for 'Human pressures' (not ready), 'Ecosystem Services' (not ready), and 'Model results' (not ready).
- Available human pressures:** A list of 19 pressures, including 'Wastewater discharge outlet [10]', 'Nutrient load [11]', 'Mussel and algal cultivation [12]', 'Coastal defence [13]', 'Extraction of minerals [14]', 'Marine plant harvesting [15]', 'Tourism and leisure activities [16]', 'Round goby [17]', 'Mud crab [18]', and 'Modified wave climate [19]'. A green arrow button is used to move a pressure to the workspace.
- Human pressures in workspace:** A list of selected pressures: 'Fish farming [3]', 'Windpark areas [2]', 'Nutrient load [11]', and 'Mussel and algal cultivation [12]'. A red arrow button is used to move a pressure back to the available list.
- Human impact calculation:** A section with a 'Run model' button (not ready) and a 'Save list' button (not saved).
- Map Editor:** A map of the Gulf of Finland region with an 'Editor' overlay containing 'Edit feature' and 'Add feature' options.

The 'Mussel and algal cultivation [12]' pressure is highlighted in the 'Available human pressures' list, and a dashed line indicates its selection process.

Inside the cumulative impact assessment tool

Selecting the human pressures for our scenario of interest

The screenshot displays the 'MAREA Final Event' workspace in the cumulative impact assessment tool. The interface is divided into several sections:

- Input Layers:** A sidebar on the left containing 'Sustainability compass' and 'Cumulative impact model'. Below these is a field to 'Enter new workspace name...' with a '+' button.
- Workspace List:** A table showing a list of workspaces with their names and timestamps.
- Current workspace's layers:** A section below the workspace list.
- Overview:** A central area with tabs for 'Overview', 'Human pressures', 'Ecosystem Services', and 'Model results'. The 'Human pressures' tab is active, showing 'not ready' status.
- Available human pressures:** A list of potential pressures including 'Wastewater discharge outlet [10]', 'Nutrient load [11]', 'Mussel and algal cultivation [12]', 'Coastal defence [13]', 'Extraction of minerals [14]', 'Marine plant harvesting [15]', 'Tourism and leisure activities [16]', 'Round goby [17]', 'Mud crab [18]', and 'Modified wave climate [19]'. A green arrow points from this list to the 'Human pressures in workspace' list.
- Human pressures in workspace:** A list of selected pressures: 'Fish farming [3]', 'Windpark areas [2]', 'Nutrient load [11]', and 'Mussel and algal cultivation [12]'. A 'Save list' button (with a checkmark) and a 'Build combinations' button are visible, both with 'not saved' and 'not ready' status indicators respectively.
- Human impact calculation:** A 'Run model' button with a 'not ready' status indicator.
- Map:** A map of the Gulf of Finland region showing locations like Helsinki, Kotka, and Lappeenranta. An 'Editor' panel is open over the map, with options for 'Edit feature' and 'Add feature'.

Dashed blue lines indicate the flow of information: from the 'Available human pressures' list to the 'Human pressures in workspace' list, and from the 'Human pressures in workspace' list to the 'Human impact calculation' section. A blue box highlights the 'Save list' and 'Build combinations' buttons, with a red arrow pointing to the 'Save list' button.

Inside the cumulative impact assessment tool

Building combinations among selected human pressures

The screenshot displays the 'MAREA Final Event' workspace in the cumulative impact assessment tool. The interface is divided into several sections:

- Input Layers:** Includes 'Sustainability compass' and 'Cumulative impact model'.
- Workspace Management:** A table lists various workspaces with their timestamps.
- Human pressures:** A list of available human pressures is shown, including 'Wastewater discharge outlet [10]', 'Nutrient load [11]', 'Mussel and algal cultivation [12]', 'Coastal defence [13]', 'Extraction of minerals [14]', 'Marine plant harvesting [15]', 'Tourism and leisure activities [16]', 'Round goby [17]', 'Mud crab [18]', and 'Modified wave climate [19]'. A 'Build combinations' button is highlighted in orange.
- Human pressures in workspace:** A list of selected human pressures is shown, including 'Fish farming [5]', 'Windpark areas [2]', 'Nutrient load [11]', and 'Mussel and algal cultivation [12]'. A 'Build combinations' button is highlighted in orange.
- Human impact calculation:** A 'Run model' button is shown, which is currently 'not ready'.

A dashed line indicates the flow of data from the 'Build combinations' button in the 'Human pressures in workspace' section to the 'Build combinations' button in the 'Human impact calculation' section. A 'Save list' button is also visible, which is currently 'saved'.

The interface also features a map of the Gulf of Finland region, showing locations like Helsinki, Lahti, and Lappeenranta. An 'Editor' panel is open over the map, with options to 'Edit feature' and 'Add feature'.

Inside the cumulative impact assessment tool

Building combinations among selected human pressures

The screenshot displays the 'MAREA Final Event' workspace in the cumulative impact assessment tool. The interface is divided into several sections:

- Header:** Shows the workspace name 'PW4B - Estonia', version 'PW4B - Estonia vers 2021', and location 'PW4B - Gulf of Finland'. It also includes a home icon and the user email 'msp@sea.ee'.
- Left Sidebar:** Contains navigation options: 'Input Layers', 'Sustainability compass', and 'Cumulative impact model'. Below these is a field to 'Enter new workspace name...' with a '+' button. A table lists previous workspaces with their timestamps.
- Workspace Overview:** Shows the current workspace 'MAREA Final Event' with tabs for 'Overview', 'Human pressures' (marked 'success'), 'Ecosystem Services' (marked 'success'), and 'Model results' (marked 'not ready').
- Human Pressures:** Two lists are shown: 'Available human pressures' and 'Human pressures in workspace'. The 'Available' list includes items like 'Wastewater discharge outlet [10]', 'Nutrient load [11]', and 'Mussel and algal cultivation [12]'. The 'In workspace' list includes 'Fish farming [3]', 'Windpark areas [2]', 'Nutrient load [11]', and 'Mussel and algal cultivation [12]'. Green arrows indicate the movement of 'Mussel and algal cultivation' from the available list to the workspace.
- Actions:** A 'Save list' button (marked 'saved') and a 'Build combinations' button (marked 'success') are visible. A 'Run model' button (marked 'ready') is also present.
- Map:** A map of the Gulf of Finland region is shown at the bottom, with an 'Editor' panel overlaid on the right side, containing 'Edit feature' and 'Add feature' options.

Dashed lines highlight the flow of the process: from the 'Available human pressures' list, through the 'Build combinations' button, to the 'Human pressures in workspace' list, and finally to the 'Run model' button.

Inside the cumulative impact assessment tool

Generating polygons for a selected human pressure

The screenshot displays the user interface of a cumulative impact assessment tool. On the left, there is a workspace management section with a table of workspaces and a list of current layers. The main area is a map of Latvia with a grey polygon highlighting a specific region. An orange arrow points to the 'Expand Layers' button in the top right corner of the map.

Enter new workspace name... +

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

Current workspace's layers

Human pressures

- Mussel and algal cultivation [12]
- Nutrient load [11]
- Windpark areas [2]
- Fish farming [3]

Lat/Lon 57.751 25.142

Esri, HERE, Garmin, USGS | Esri, HERE

Powered by Esri

Expand Layers Ed

Inside the cumulative impact assessment tool

Generating polygons for a selected human pressure

The screenshot displays the user interface of a cumulative impact assessment tool. On the left, there is a workspace management panel with a table of workspaces and a list of layers. The main area is a map with a dashed blue line indicating a selected feature. Two 'Editor' panels are overlaid on the map, showing options to 'Edit feature' or 'Add feature'. An orange arrow points to the 'Add feature' option in the foreground editor panel.

Workspace Table:

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

Current workspace's layers:

- Human pressures
- Mussel and algal cultivation [12]
- Nutrient load [11]
- Windpark areas [2]
- Fish farming [3]

Editor Panel (Top Right):

- Edit feature >
- Add feature >

Editor Panel (Bottom Center):

- Edit feature >
- Add feature >** (highlighted with orange border and arrow)

Inside the cumulative impact assessment tool

Generating polygons for a selected human pressure

The screenshot displays the cumulative impact assessment tool interface. On the left, a workspace management table is visible:

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

Below the table, the 'Current workspace's layers' section shows a list of human pressures:

- Human pressures
- Mussel and algal cultiv
- Nutrient load [11]
- Windpark areas [2]
- Fish farming [3]

The main map area shows a geographical region with labels for 'SALACGRIVA NOVADS', 'LIMBAŽU NOVADS', and 'PARGAUJAS NOVADS'. Two 'Select feature type' dialog boxes are overlaid on the map. The dialog box in the foreground is highlighted with a blue border and an orange arrow pointing to the 'Windpark [2]' option. The dialog box in the background is also highlighted with a blue border. Both dialog boxes show a search bar 'Filter types' and a list of feature types: 'Windpark [2]' (represented by a blue triangle) and 'Fish farming [3]' (represented by a light blue trapezoid). The 'Windpark [2]' option is selected in both dialog boxes. The bottom right corner of the map area contains the text 'Powered by Esri'.

Inside the cumulative impact assessment tool

Generating polygons for a selected human pressure

The screenshot displays a web-based interface for a cumulative impact assessment tool. On the left, there is a sidebar with a workspace management section and a layer list. The workspace management section includes a text input for a new workspace name and a table of existing workspaces. The layer list, titled 'Current workspace's layers', shows a category 'Human pressures' with four checked items: 'Mussel and algal cultivation [12]', 'Nutrient load [11]', 'Windpark areas [2]', and 'Fish farming [3]'. The main map area shows a coastal region with a polygon being drawn. A 'Place feature' dialog box is open over the map, containing the instruction: 'Click on the map to continue drawing then double-click to complete.' The map includes navigation controls (zoom in, zoom out, home) and a coordinate display showing 'Lat/Lon 57.610 24.012'. The map is powered by Esri and includes labels for 'SALACGRIVAS NOVADS', 'LIMBAŽU NOVADS', and 'PĀRGĀIJAS NOVADS'.

Enter new workspace name... +

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

Current workspace's layers

Human pressures

- Mussel and algal cultivation [12]
- Nutrient load [11]
- Windpark areas [2]
- Fish farming [3]

Lat/Lon 57.610 24.012

Esri, HERE, Garmin, USGS | Esri, HERE

Powered by Esri

Place feature

Click on the map to continue drawing then double-click to complete.

Inside the cumulative impact assessment tool

Generating polygons for a selected human pressure

Enter new workspace name... +

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

Current workspace's layers

Human pressures

- Mussel and algal cultivation [12]
- Nutrient load [11]
- Windpark areas [2]
- Fish farming [3]

Map showing a blue polygon with a central crosshair and a red dot above it. The map includes labels for SALACGRIVAS NOVADS, LIMBAŽU NOVADS, and PĀRGAIJAS NOVADS. A coordinate box at the bottom left displays Lat/Lon 57.504 23.775.

Form fields:

- Navigation: < 1 >>
- Label: wpc_id
- Input field: 76
- Button: Add

Powered by Esri

Inside the cumulative impact assessment tool

Selecting the nature assets of interest

The screenshot displays the 'MAREA Final Event' workspace in the cumulative impact assessment tool. The interface is divided into several sections:

- Header:** Shows the workspace name 'MAREA Final Event' and navigation options like 'Home' and 'msp@sea.ee'.
- Input Layers:** A sidebar on the left containing 'Sustainability compass' and 'Cumulative impact model'.
- Workspace Management:** A table listing previous workspaces with columns for 'Workspace' and 'Timestamp'.

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48
- Overview:** A central panel with tabs for 'Overview', 'Human pressures' (status: success), 'Ecosystem Services' (status: success), and 'Model results' (status: not ready).
- Available nature assets:** A list of assets with navigation arrows. The selected asset is 'Aquatic vegetation nutrient storage on hard bott...'.
 - Aquatic vegetation nutrient storage on soft bott...
 - Aquatic vegetation nutrient storage on hard bott...**
 - Aquatic vegetation toxin storage on soft bottoms
 - Aquatic vegetation toxin storage on hard bottom
 - Aquatic vegetation habitat maintenance on soft
 - Aquatic vegetation habitat maintenance on hard
 - Aquatic vegetation flood protection on soft botto
 - Aquatic vegetation erosion protection on soft bo
 - Aquatic vegetation bioremediation on soft bottor
 - Aquatic vegetation bioremediation on hard bottc
 - Aquatic vegetation oxygen production on soft bo
- Nature assets in workspace:** A list of assets currently in the workspace.
 - Mytilus trossulus population N sequestration (kg
 - Mytilus trossulus population induced N flows (kg
 - Herring spawning areas
 - Zostera marina population C stock (tons C per k
 - Fucus vesiculosus population nitrogen content (
 - Aquatic vegetation nutrient storage on hard bott
- Actions:** A 'Save the list' button (status: saved) and a 'Run model' button (status: ready) under the heading 'Human impact calculation'.
- Map:** A map of the Gulf of Finland region showing cities like Helsinki, Turku, and Saint Petersburg.

Inside the cumulative impact assessment tool

Running the model

The screenshot displays the 'MAREA Final Event' workspace in the cumulative impact assessment tool. The interface is divided into several sections:

- Header:** Shows the workspace name 'PW4B - Estonia' and navigation options like 'Home' and 'msp@sea.ee'.
- Left Sidebar:** Contains navigation links for 'Input Layers', 'Sustainability compass', and 'Cumulative impact model'. It also features a 'Workspace' table and 'Current workspace's layers' section.
- Main Content Area:** Titled 'MAREA Final Event', it includes tabs for 'Overview', 'Human pressures' (status: success), 'Ecosystem Services' (status: success), and 'Model results' (status: not ready).
- Asset Lists:** Two columns show 'Available nature assets' and 'Nature assets in workspace'. A dashed line indicates the transfer of an asset from the available list to the workspace list.
- Human Impact Calculation:** A central box highlights the 'Human impact calculation' step, which is currently 'ready'. A large blue 'Run model' button is prominently displayed below the text.
- Map:** A map at the bottom right shows the geographical context, including locations like Tallinn, Saint Petersburg, and Kirishi.

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

Inside the cumulative impact assessment tool

Running the model

The screenshot displays the user interface of a cumulative impact assessment tool. A modal dialog box titled "Please wait..." is centered on the screen, indicating a loading or saving process. The dialog contains the text "Saving result set 4/4" and a progress bar showing 16% completion. The background interface is dimmed and includes a top navigation bar with workspace names like "PW4B - Estonia" and "PW4B - Gulf of Finland". On the left, there is a sidebar with "Input Layers", "Sustainability compass", and "Cumulative impact model". The main area shows a workspace overview table, a list of "Available nature assets", and a list of "Nature assets in workspace". A "Human impact calculation" section is visible on the right with a "Run model" button. At the bottom, a map of the Gulf of Finland region is shown with various geographical labels.

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

Available nature assets

- Aquatic vegetation nutrient storage on soft bott
- Aquatic vegetation nutrient storage on hard bott
- Aquatic vegetation toxin storage on soft bottom
- Aquatic vegetation toxin storage on hard bottom
- Aquatic vegetation habitat maintenance on soft
- Aquatic vegetation habitat maintenance on hard
- Aquatic vegetation flood protection on soft botto
- Aquatic vegetation erosion protection on soft bo
- Aquatic vegetation bioremediation on soft bottor
- Aquatic vegetation bioremediation on hard bottc
- Aquatic vegetation oxygen production on soft bo

Nature assets in workspace

- Mytilus trossulus population N sequestration (kg
- Mytilus trossulus population induced N flows (kg
- Herring spawning areas
- Zostera marina population C stock (tons C per h
- Fucus vesiculosus population nitrogen content (
- Aquatic vegetation nutrient storage on hard bott

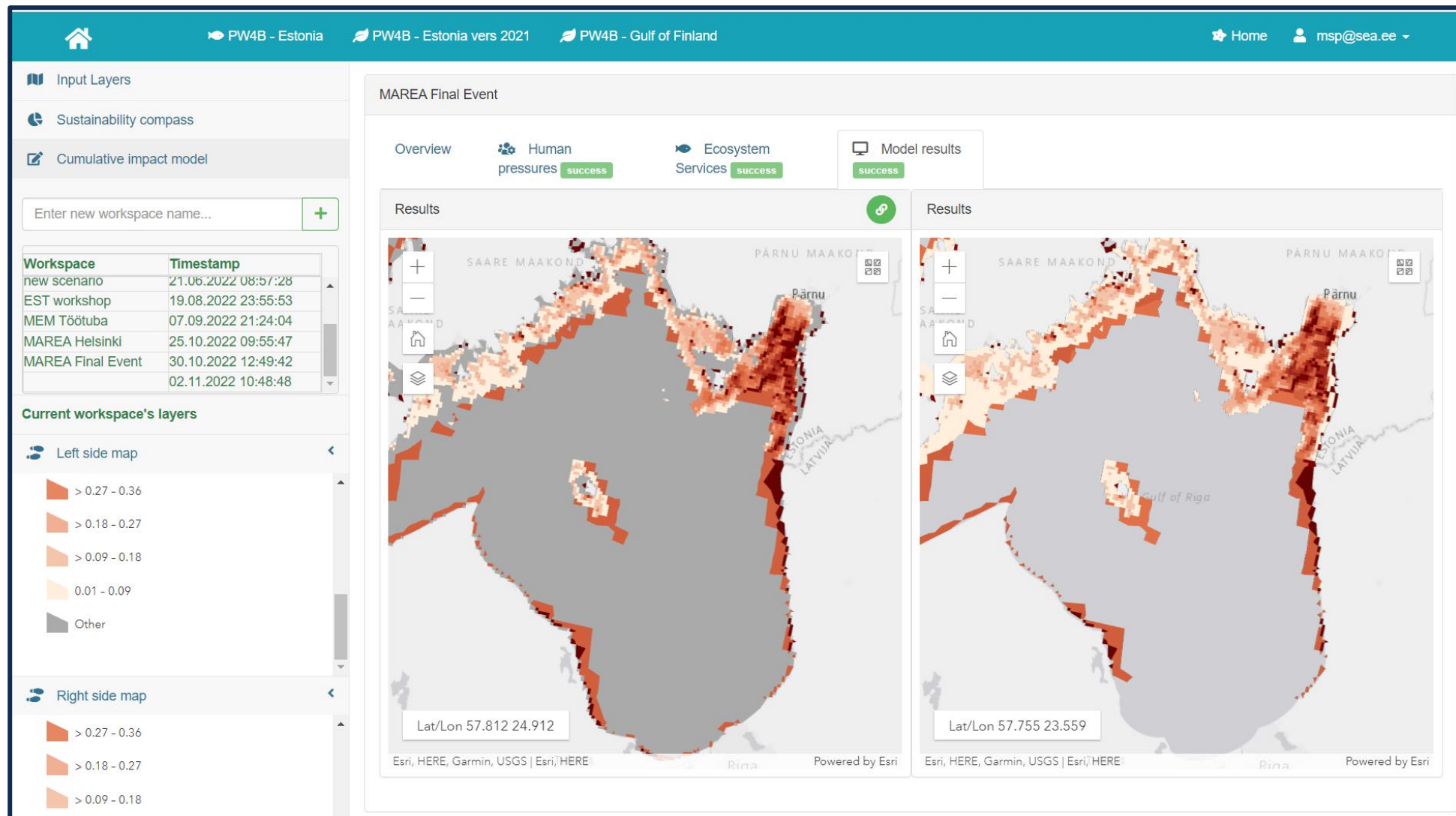
Human impact calculation

Run model

Saving result set 4/4

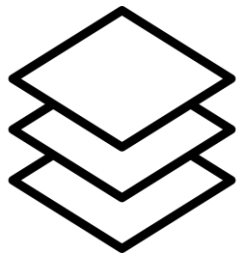
Inside the cumulative impact assessment tool

The results



Inside the cumulative impact assessment tool

The results



The screenshot displays the 'MAREA Final Event' workspace in the cumulative impact assessment tool. The main map shows a heatmap of the Gulf of Finland region, with an orange arrow pointing to a specific area. The heatmap is color-coded according to the legend on the right, ranging from light orange (low impact) to dark red (high impact).

Workspace History:

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

Current workspace's layers:

- Left side map:
 - > 0.27 - 0.36
 - > 0.18 - 0.27
 - > 0.09 - 0.18
 - 0.01 - 0.09
 - Other
- Right side map:
 - > 0.27 - 0.36
 - > 0.18 - 0.27
 - > 0.09 - 0.18

Legend (Right sidebar):

- Human activities edit test
 - Fish farming [3]
 - Windpark areas [2]
 - Nutrient load [11]
 - Mussel and algal cultivation [12]
- Ecosystem Services Impact
 - Aquatic vegetation nutrient storage on hard bottoms (index 0...1)
 - init value
 - end value
 - end maximum value
 - end minimum value
 - decrease
 - increase
 - Fucus vesiculosus population nitrogen content (g per m2)
 - Zostera marina population C stock (tons C per km2)

Inside the cumulative impact assessment tool

The results

The screenshot displays the user interface of a cumulative impact assessment tool. The top navigation bar includes a home icon, the workspace name "PW4B - Estonia", and a version indicator "PW4B - Estonia vers 2021". The main interface is divided into several sections:

- Input Layers:** A list of layers including "Sustainability compass" and "Cumulative impact model".
- Workspace Management:** A table for managing workspaces with columns for "Workspace" and "Timestamp".
- Current workspace's layers:** A panel for selecting layers for the "Left side map" and "Right side map".
- Results:** A map showing the spatial distribution of impact results, with a legend for "Ecosystem Services Impact" and "Herring spawning areas".

Workspace	Timestamp
new scenario	21.06.2022 08:57:28
EST workshop	19.08.2022 23:55:53
MEM Töötuba	07.09.2022 21:24:04
MAREA Helsinki	25.10.2022 09:55:47
MAREA Final Event	30.10.2022 12:49:42
	02.11.2022 10:48:48

Current workspace's layers

Left side map

Ecosystem Services Impact

Herring spawning areas

init value

- > 0.91 - 1
- > 0.83 - 0.91
- > 0.72 - 0.83

Right side map

- > 0.27 - 0.36
- > 0.18 - 0.27

Results

Map showing impact results with coordinates: Lat/Lon 57.812 24.912

Map showing impact results with coordinates: Lat/Lon 57.755 23.559



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Assessing cumulative impacts of human-induced pressures on reef and sandbank habitats and associated biotopes in the northeastern Baltic Sea

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Future directions



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Interreg
Central Baltic



MAREA

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