MSP and Information Management Workshop, Dar es Salaam Nov 29th

Hands on with WIO Symphony tool

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www.nairobiconvention.org/wio-symphony

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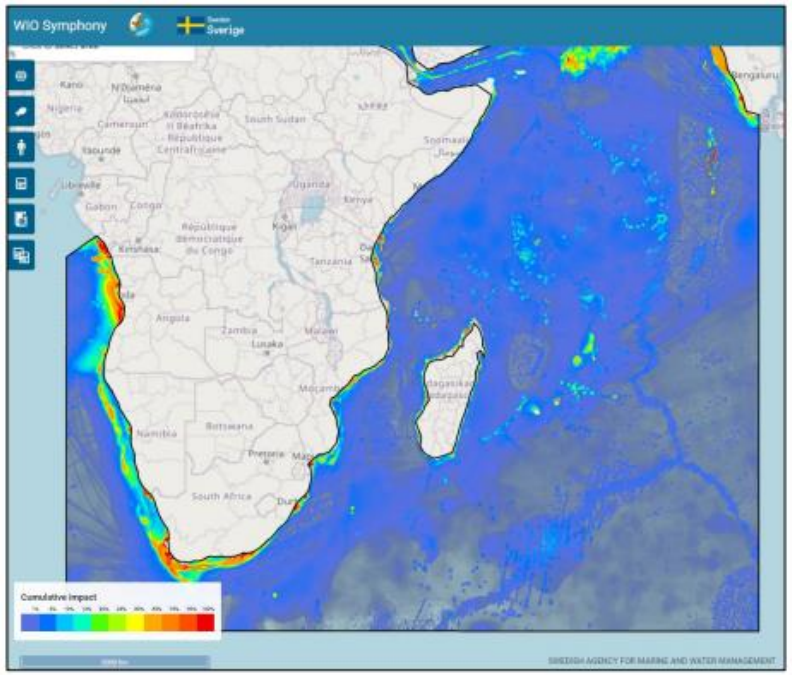
WIO Symphony user manual

Manual v 1.0 / Symphony 1.6.0-SNAPSHOT-wio

WIO Symphony stands for *Western Indian Ocean Symphony*. It is a co-developed tool for the assessment of combined – cumulative – environmental impact of different human activities across vast ocean spaces. This open-source tool is useful for marine spatial planning (MSP) and other area based management. The tool is accessible at: www.symphony.nairobiconvention.org



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WIO Symphony tutorial

The following tutorial will help you learn how to use the WIO Symphony tool. You may work in small groups, alternating the "driver seat". The different steps will invite you to discover different parts of the tool. Some tasks can be solved in different ways.

When you have completed the tutorial you will:

- Be familiar with the tool and its data content.
- Better understand the method and some of the limitations to the tool.
- Have a good idea of the potential of the tool in relation to your own work in marine planning, management or research.

Let's get started. You should have achieved a personal or organizational user name and password. Log in as a user at: https://symphony.nairobiconvention.org

General

A couple of functions are good to know from start:

- The "eye" symbol use used to visualize data layers, this does not affect the calculations.
- You may always reset everything by refreshing your web browser (press enter). Your completed analyses are saved but everything else is new and fresh.
- The "reset" button in the tool is used to return to default regarding which pressures and ecocomponents are selected for the analysis, and turn all scenario settings (increase/decrease/adding of pressures) back to zero.
- The tool is still Beta version. Some of the layers are insufficient, there might be errors. These will be updated early 2023. If you identify specific errors / inaccuracies in the data layers, please let us know, it might be something we have not yet identified.

Tutorial theme A. Marine Spatial Planning

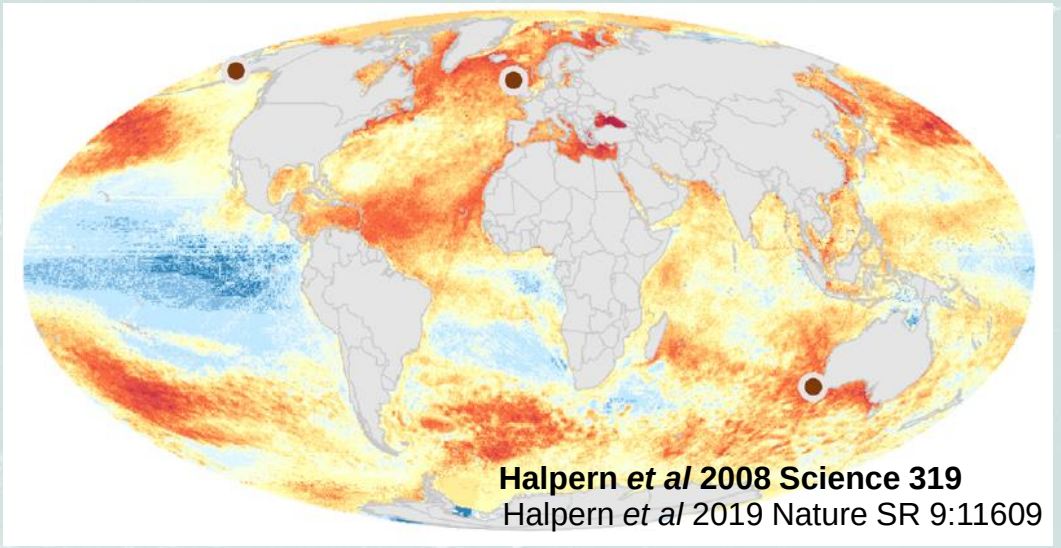
You work at the *Ministry of Blue Planning* where your team has been tasked to develop MSP solutions based on stakeholder objectives, and analyze different alternatives with respect to environmental impact. You will present your findings to the planning council in the afternoon.

Inventory

1. Browse the ecosystem component list to get an idea of the categories and sorting. A basic difference is Habitat versus Taxa. Habitat is an environment including all its associated organisms. Taxa is a specific species or group. All habitats are pre-selected by default. Another categorization is tropical versus temperate. Each component represents a map. Upwelling areas are nutrient rich habitats often with a lot of sea life. Where in the region do you find upwelling hotspots?

allmodelsarewrong somearereuseful

Cumulative impact assessment



Halpern *et al* 2008 Science 319
Halpern *et al* 2019 Nature SR 9:11609

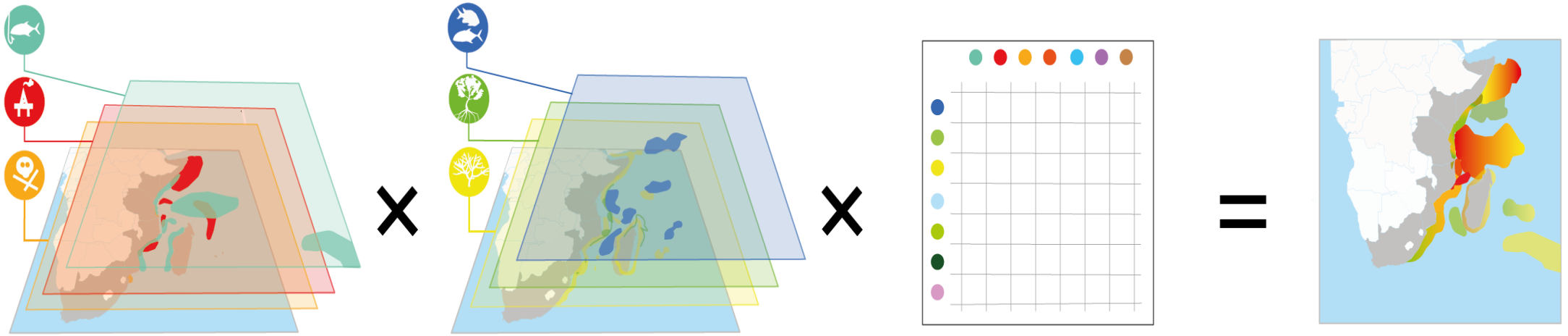
Models behind the map

Environmental pressures
From human activities

Ecosystem components
Nature values

Sensitivity matrix
The specific effect of each pressure on each eco-component

Results
Figures and tables



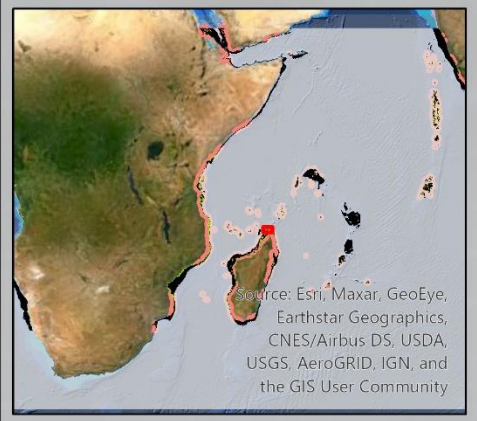


Illustration of coral data processing

Step 8. Uncertainty map

-> Show where coral reefs might occur, but data is missing

Kilometers

0 2,5 5 10 15 20

coral uncertainty

outside range

very good model

good model

no data

Data gaps can lead to underestimated impacts

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Considerations as you put WIO Symphony to work…

1. What can WIO Symphony tool answer? Additional science needed needed for your question?

2. How does data quality & availability effect the analysis

3. How does the sensitivity matrix connect pressures and ecosystems in space and time

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WIO Symphony

https://symphony.nairobiconvention.org/login

Western Indian Ocean

SYMPHONY

Username

sgu.common

Password

.....

LOG IN

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Areas

Areas of interest

Search for area

- ABNJ
- Climate zones
- Coastal waters
- LME

To view

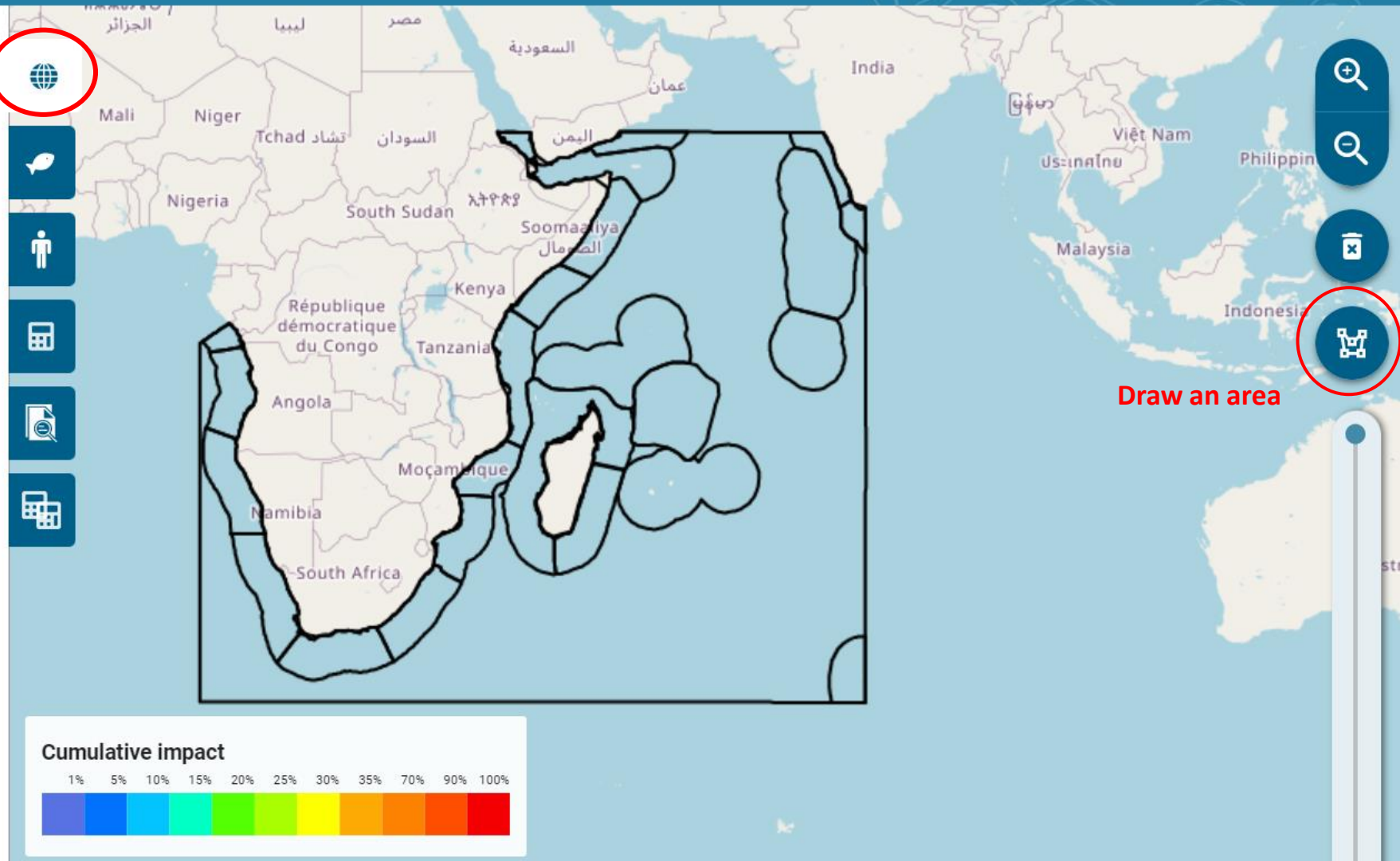
- Marine ecoregions
- National waters
- Protected Areas Marine

User-created Areas

To upload your polygon: GeoPackage

No areas

Draw an area



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Ecosystem Components

To reset or clear your selection

No area selected

RESET

Search for nature value

- Habitat Oceanic pelagic
  - Deep pelagic
  - Midwater pelagic
  - Photic pelagic
  - Upwelling pelagic
- Habitat Oceanic seafloor

Metadata

Metadata regarding ecosystem: Deep pelagic

Method summary

Proportion of abyssal deep waters in relation to full ocean depth based on GEBCO 2022 bathymetry grid.

Known limitations

Metadatum missing.

Value range

0-84

Data processing

Kagesten G, Queste B 2022. Swedish WIO Symphony Team. Software: R. Script: eco_ocean_reg_s01_v01.1.Rmd

Data sources

- Global Monitoring and Forecasting Center (2018) Global Ocean NRRS, BBP, CDM, KD, ZSD, SPM (Copernicus-GlobColour) from Satellite Observations: Monthly and Daily-Interpolated (Reprocessed from 1997), E.U. Copernicus Marine Service Information [Data set]. Available at: https://resources.marine.copernicus.eu/?option=com_csw&view=details&product_id=OCEANCOLOUR_GLO_OPTICS_L4_REP_OBSERVATIONS_009_081 (Accessed: 31th May 2021).
- GEBCO Compilation Group (2022) GEBCO 2022 Grid (doi:10.5285/e0f0bb80- ab44-2739-e053-6c86abc0289c)
- Jarvis A., H.I. Reuter, A. Nelson, E. Guevara, 2008, Hole-filled seamless SRTM data V4, International Centre for Tropical Agriculture (CIAT), available from https://srtm.csi.cgiar.org

CLOSE

India

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Pressures

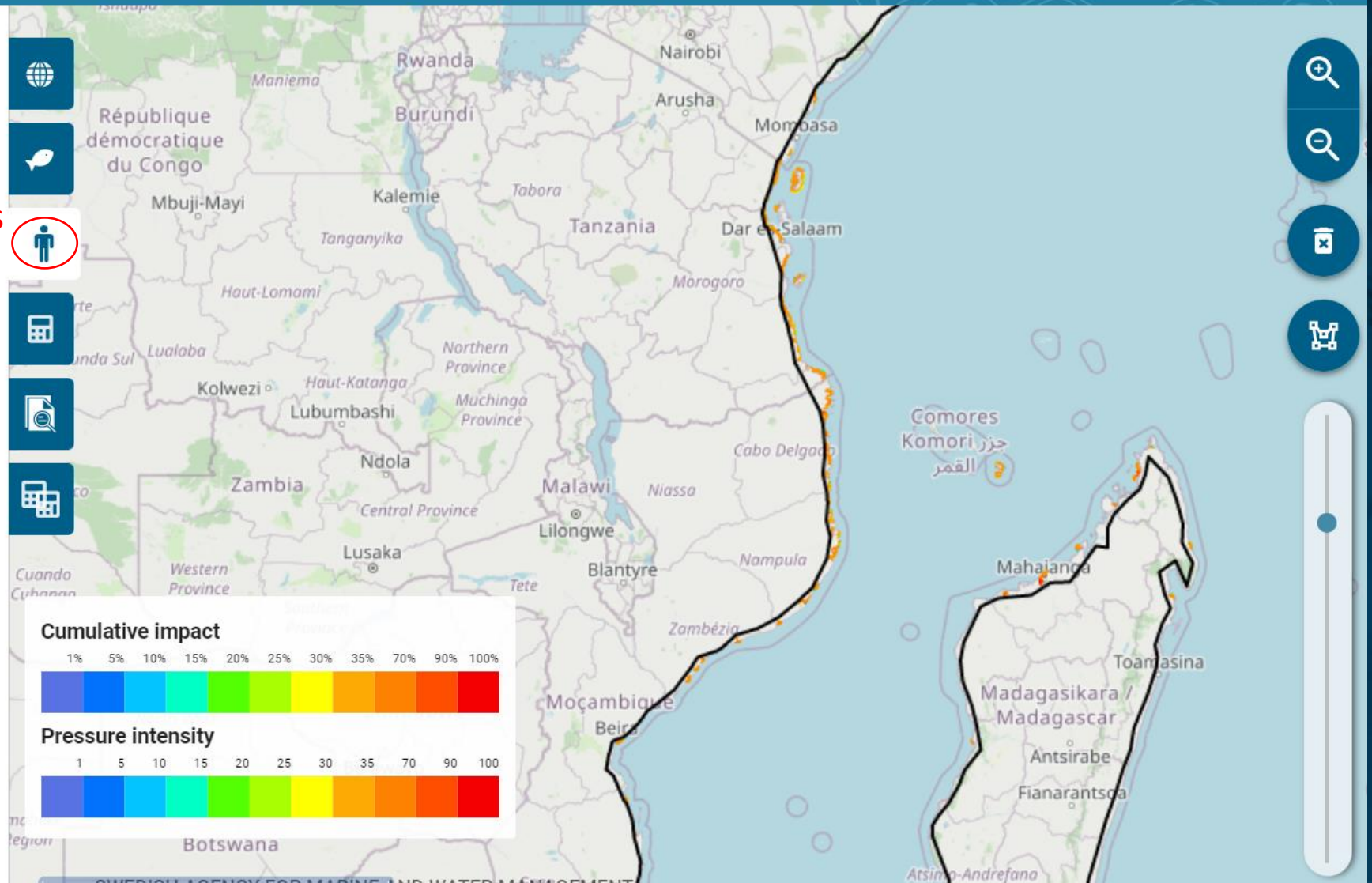
No area selected

RESET

To view pressures

Search for pressure

- Aquaculture
  - Algae farming
  - Mariculture
- Biological disturbance
  - Invasive species



Analyzing cumulative impact

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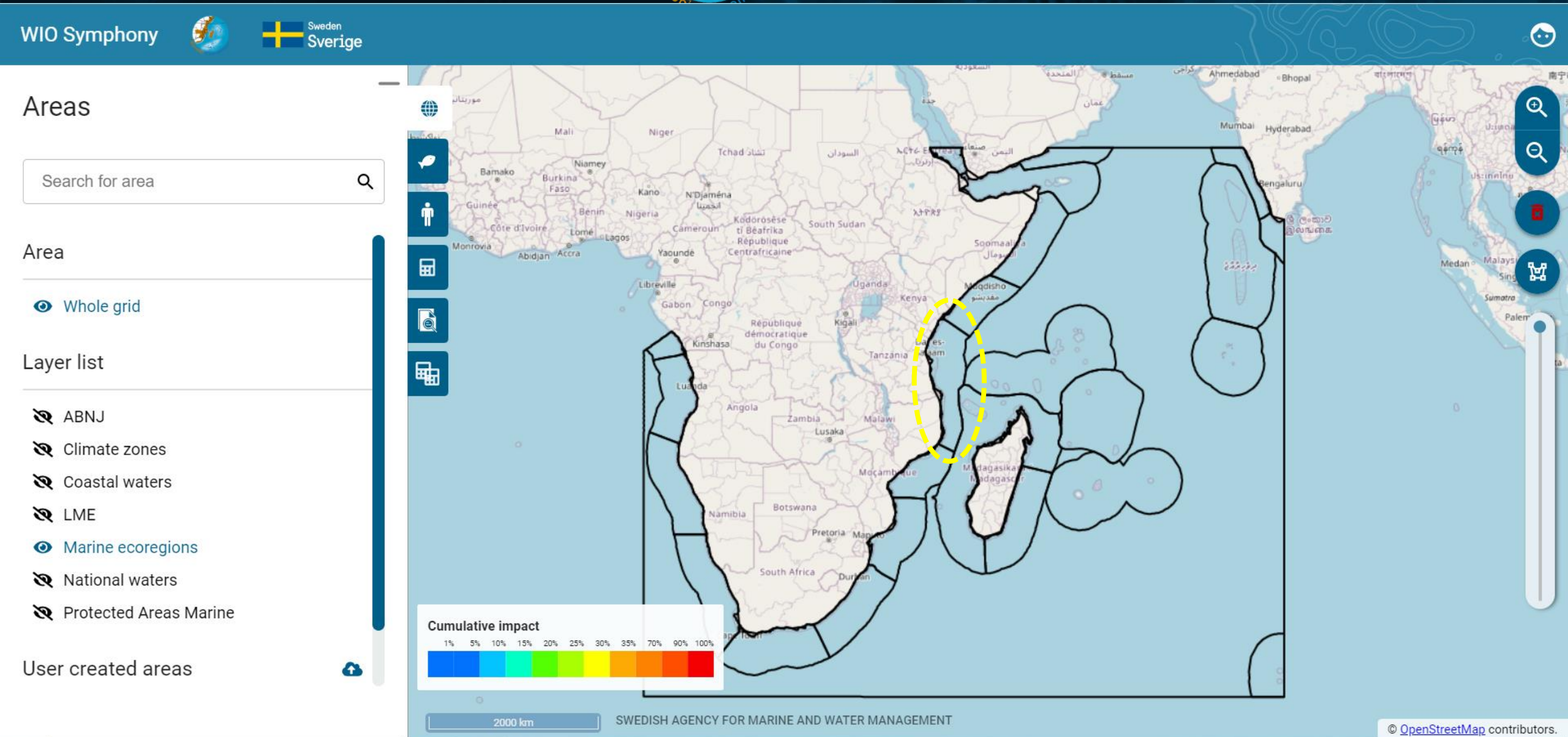

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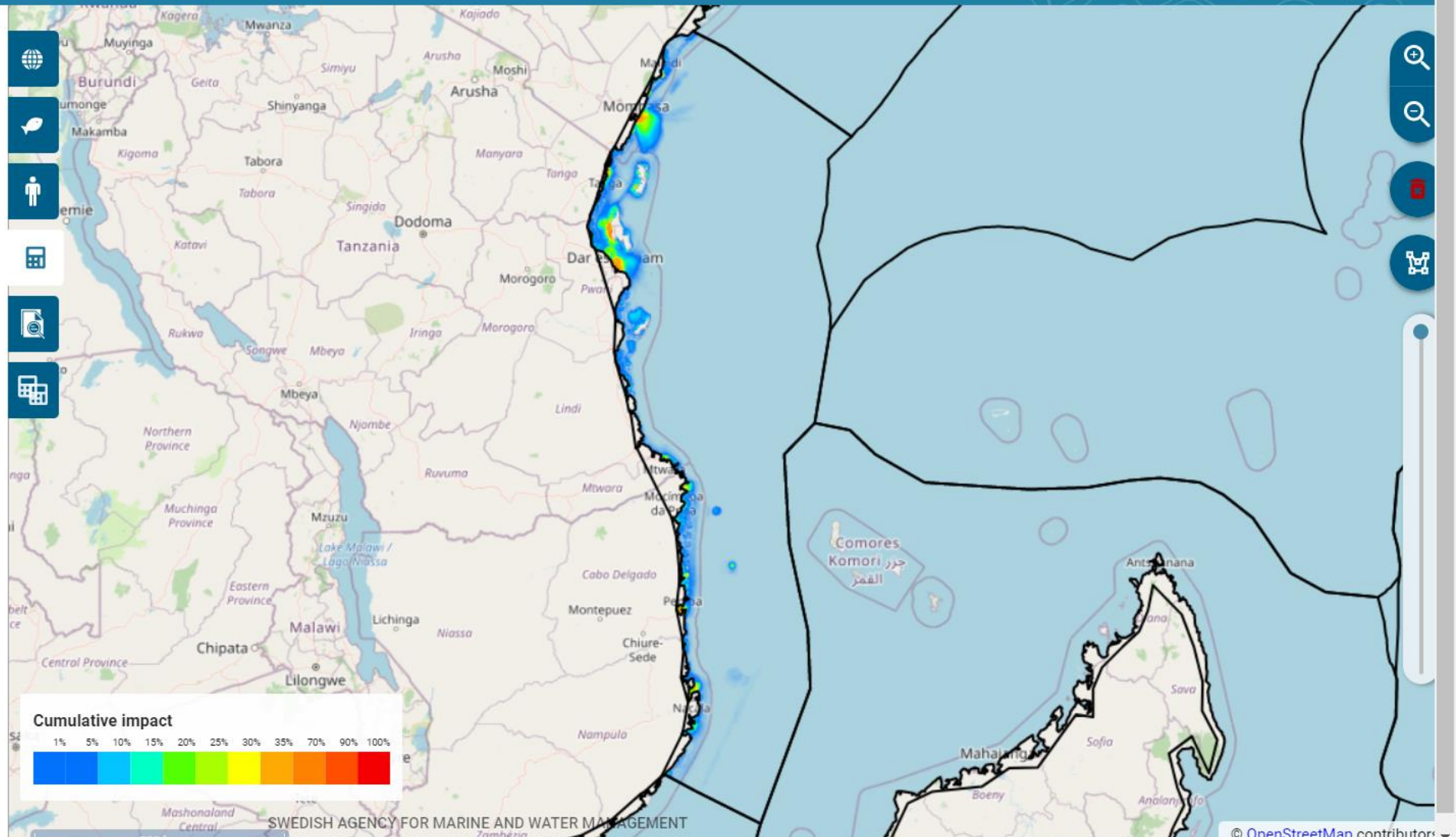
Scenarios

No area selected

User scenarios

Baseline East African Coral Coast (200...
2022-10-11 09:35



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No scenario changes

Select an area and make changes in the Ecosystems Components or Pressures tab

Sensitivity Matrix

- (●) Default matrix (Western Indian Ocean)
- ( ) User-defined matrix

Välj matris

EDIT MATRIX

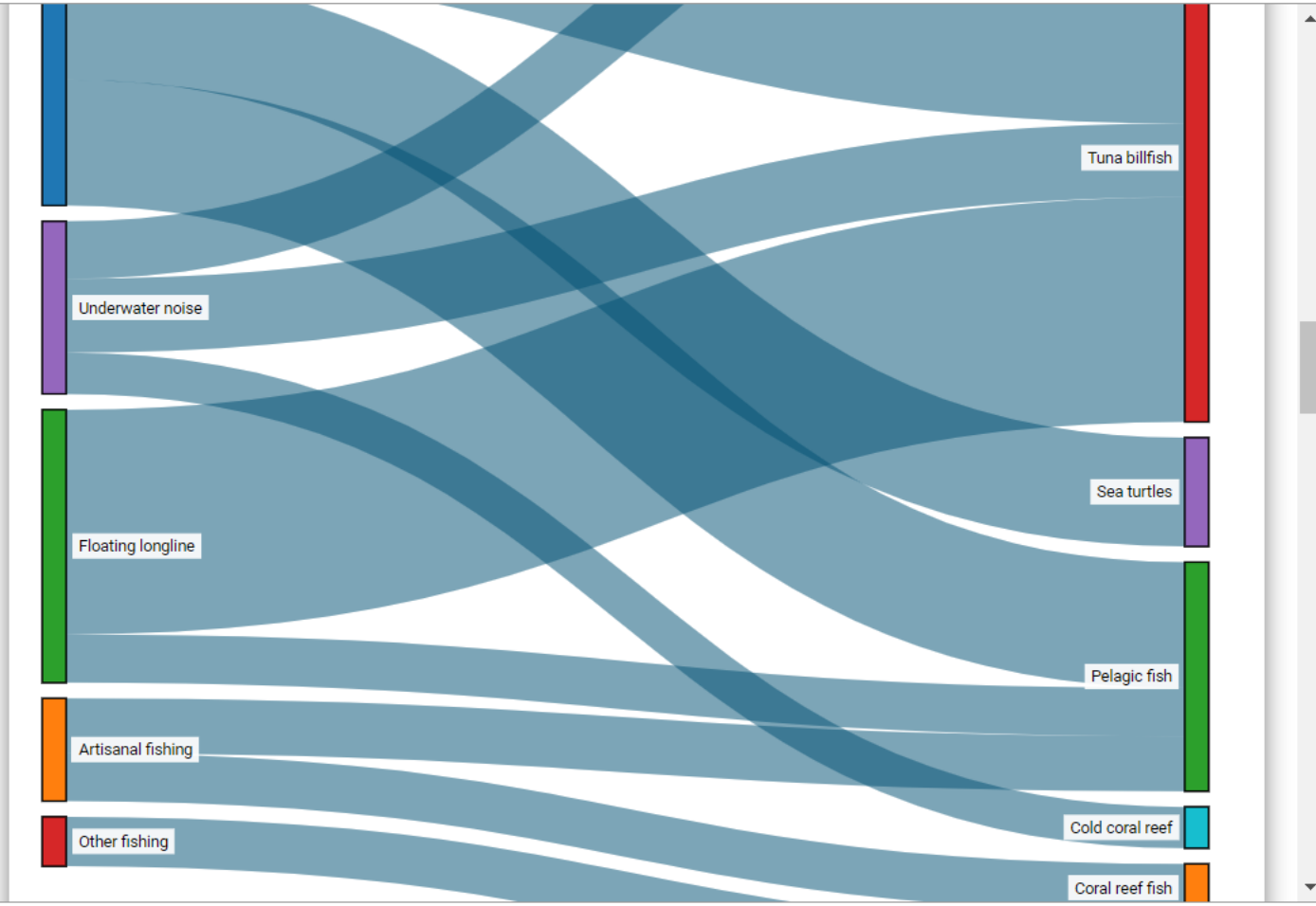
Result Colormap

Set maximum value based on:

- ( ) Maximum value in MSP area
- (●) Maximum value in computed area
- ( ) User-defined value

DELETE CALCULATE

Calculation Report



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Rarity adjusted cumulative impact

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Rarity East African Coral Coast

Algorithm

Rarity-adjusted cumulative impact

Calculate rarity indices based on:

- ○ Data grid extent
- ◉ Calculated area extent

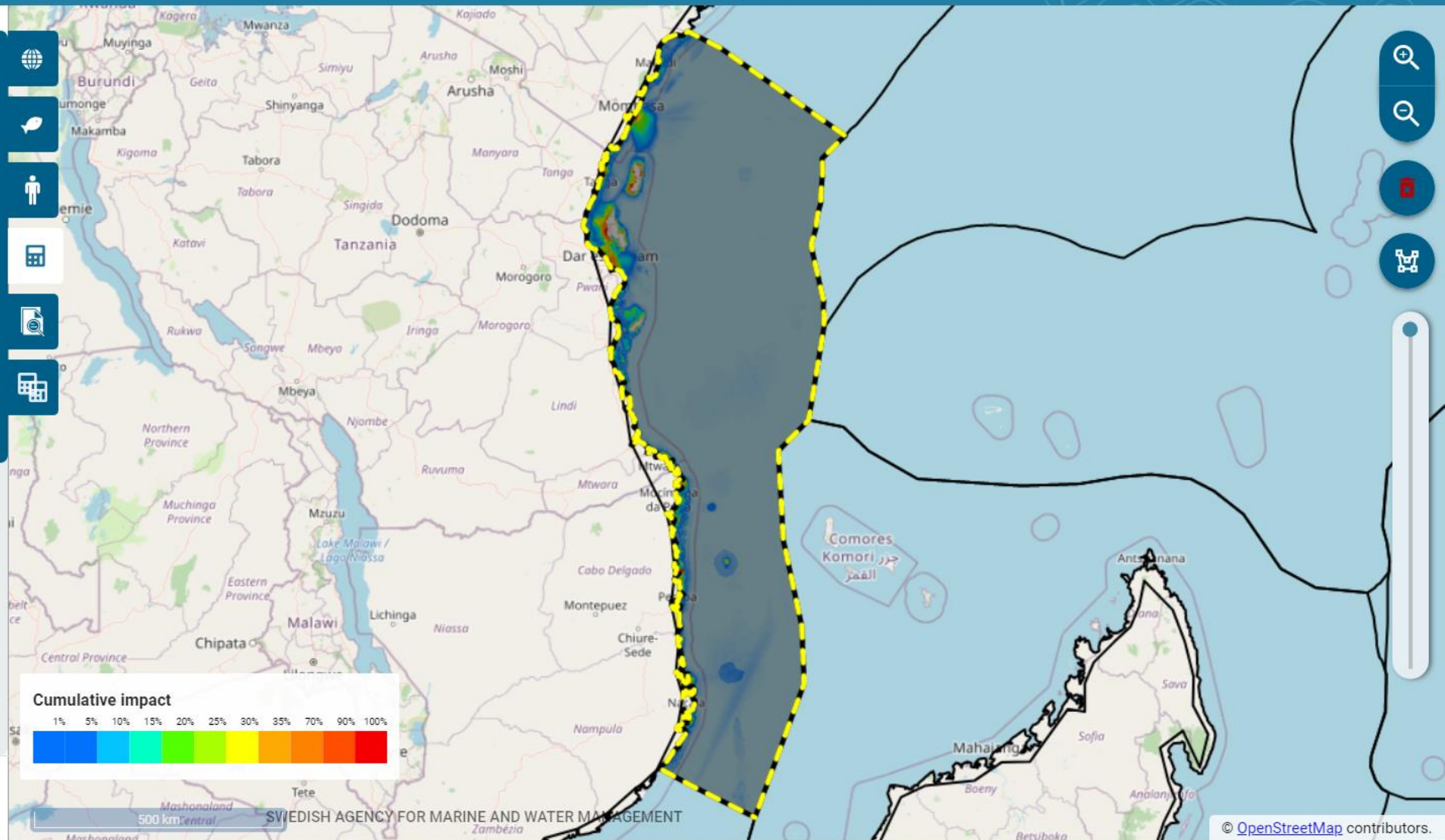
Scenario Changes

East African Coral Coast (20095)

Sensitivity Matrix

- ◉ Default matrix (Western Indian Ocean)
- ○ User-defined matrix

‹ DELETE CALCULATE



Rarity adjusted cumulative impact

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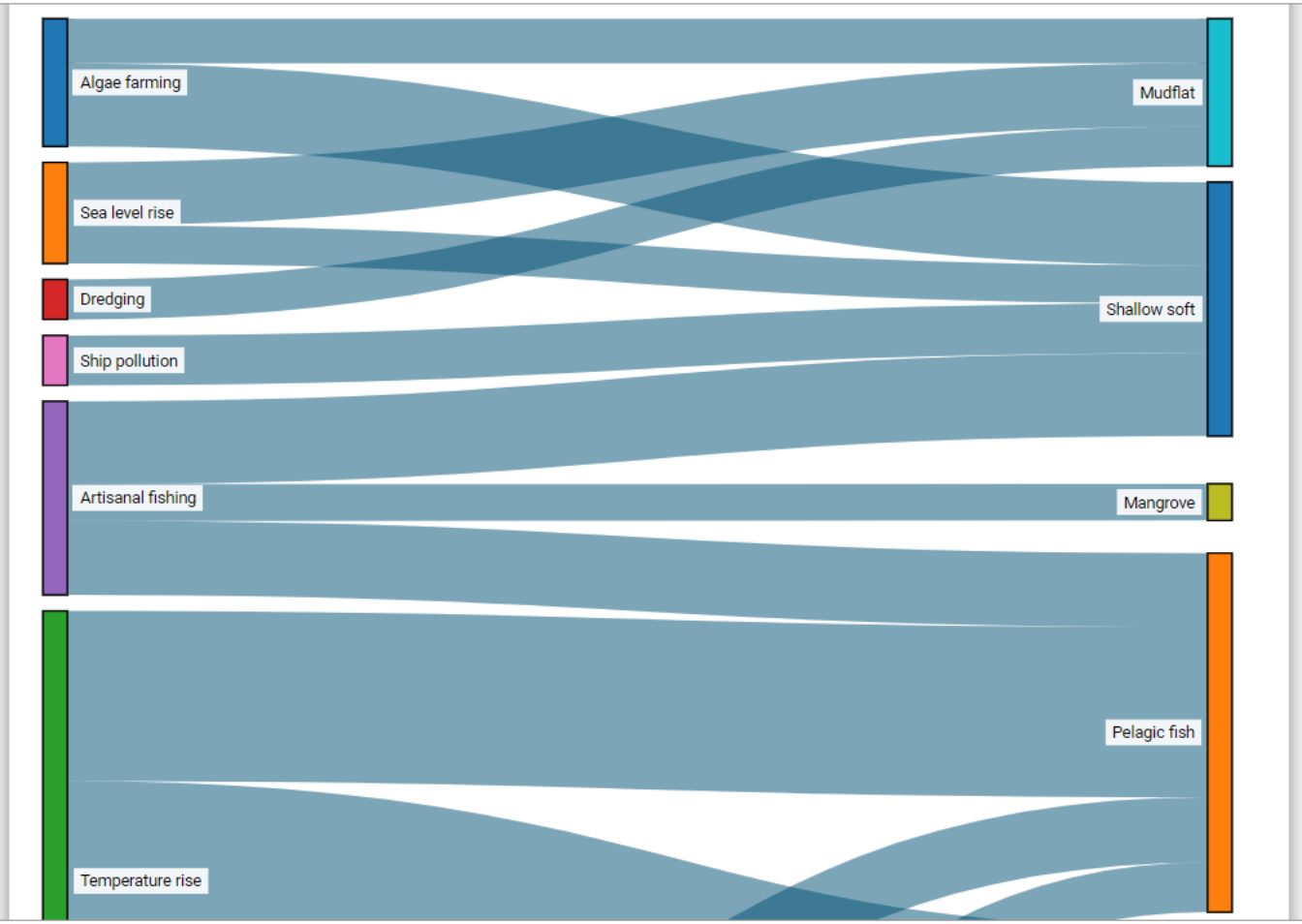
Scenarios

No area selected

User scenarios

- Rarity East African Coral Coast
  2022-10-11 09:57
- Scenario East African Coral Coast (20...
  2022-10-11 09:51
- Baseline East African Coral Coast
  2022-10-11 09:41
- Baseline East African Coral Coast (200...
  2022-10-11 09:35

Calculation Report



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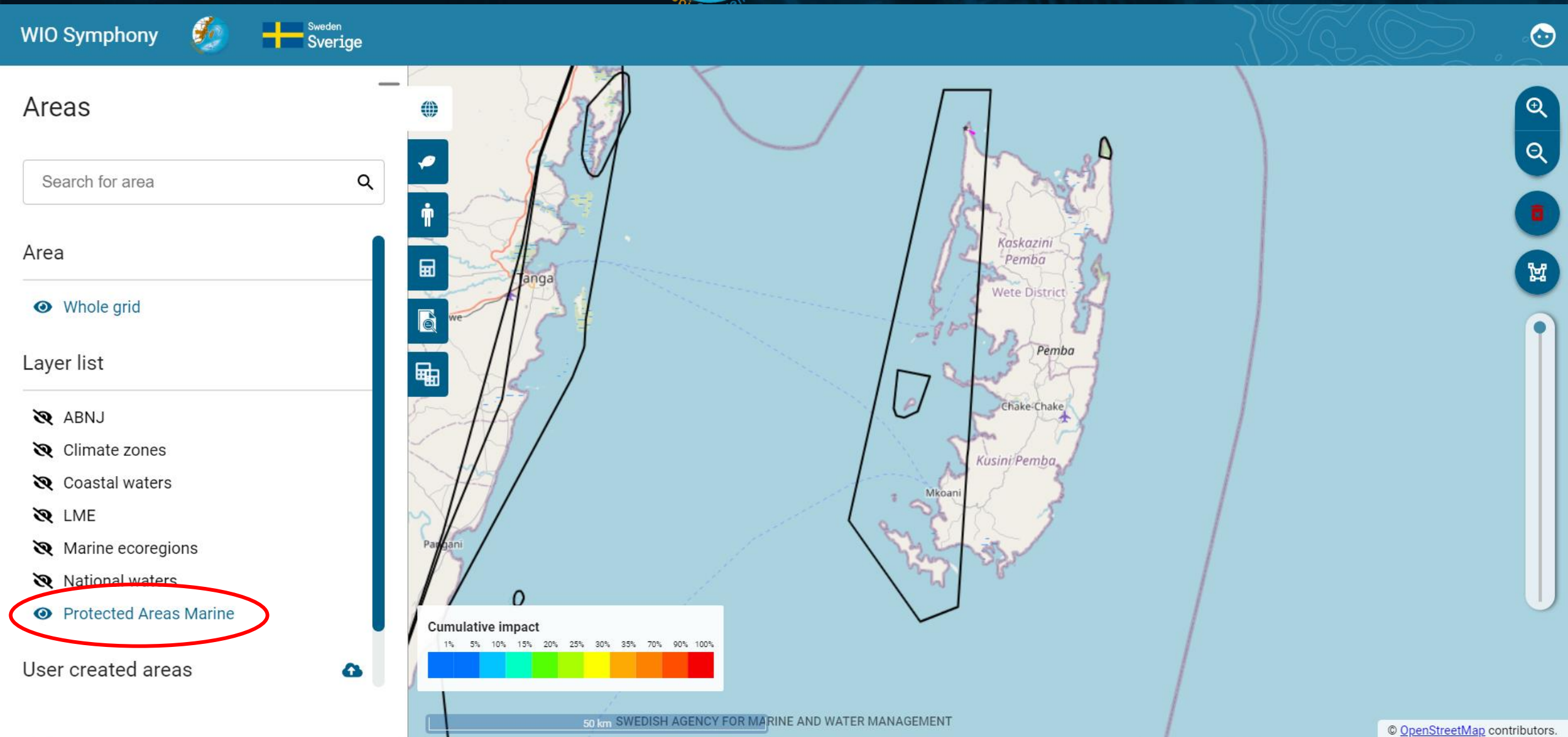

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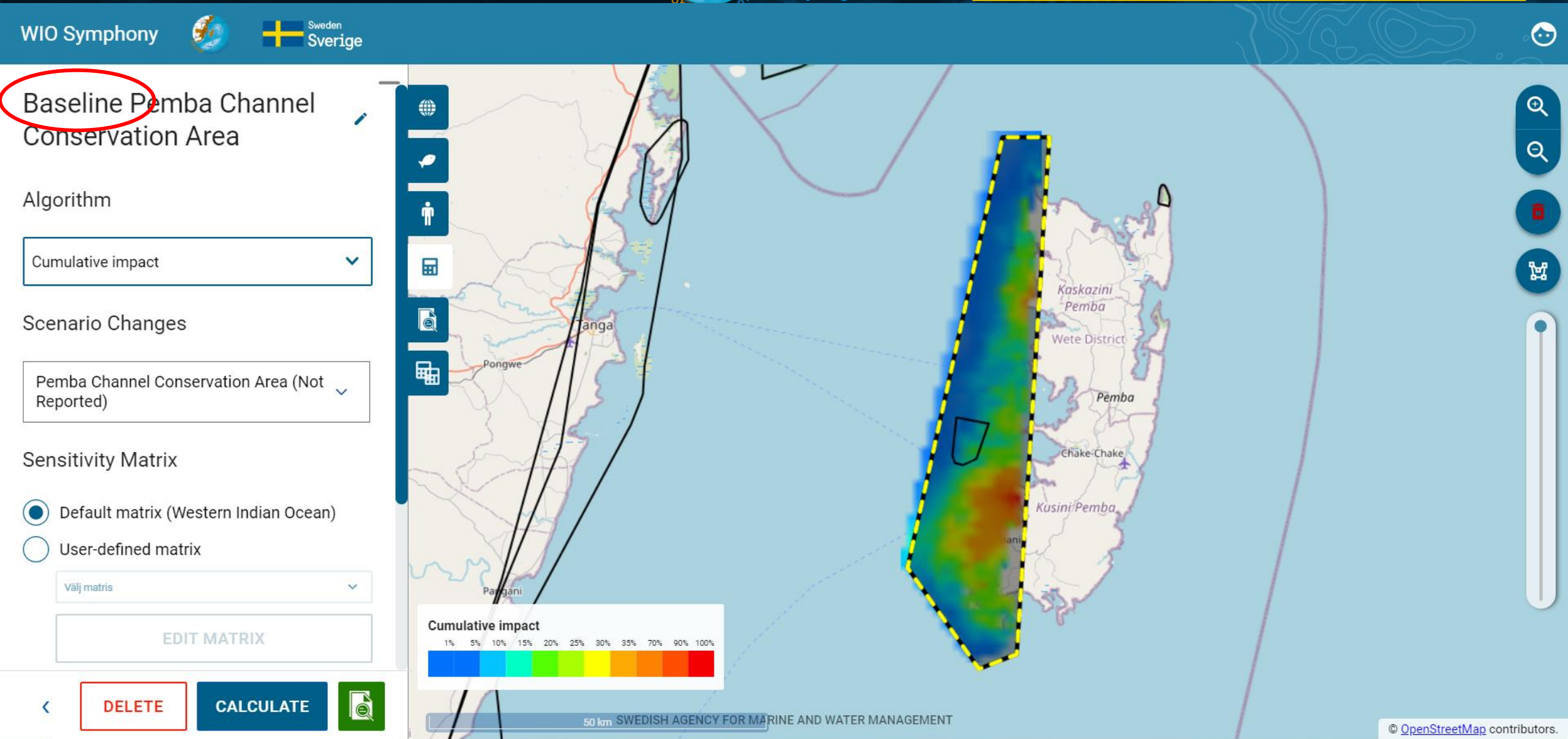

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Baseline Pemba Channel Conservation Area

Algorithm

Cumulative impact

Scenario Changes

Pemba Channel Conservation Area (Not Reported)

Sensitivity Matrix

Default matrix (Western Indian Ocean)

User-defined matrix

Välj matris

EDIT MATRIX

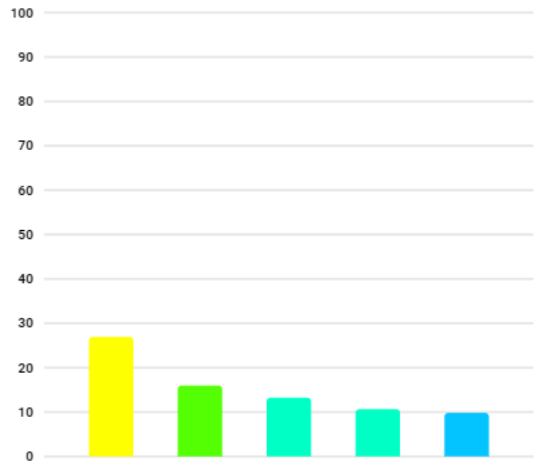
DELETE

CALCULATE

Calculation Report

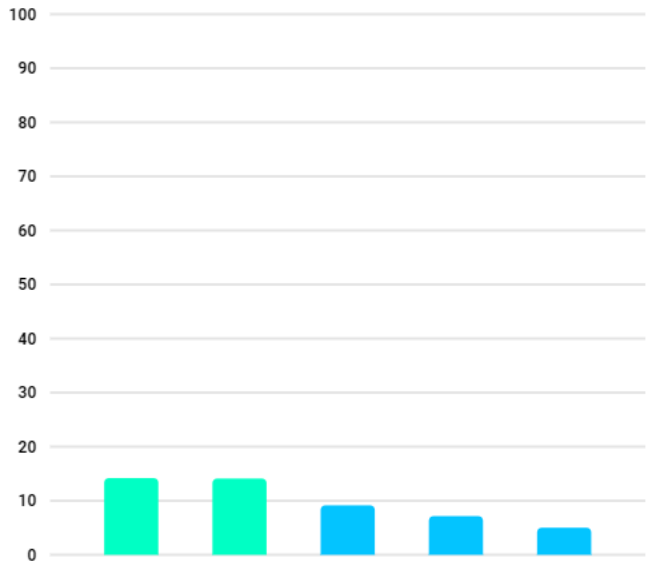
Pressures with highest impact

Artisanal fishing	26.93%
Algae farming	15.97%
Underwater noise	13.24%
Ship pollution	10.65%
Temperature rise	9.82%



Nature values with highest impact

Coral reef fish	14.18%
Coral reef	14.11%
Seagrass bed	9.15%
Shallow soft	7.16%
Dolphins	5.01%



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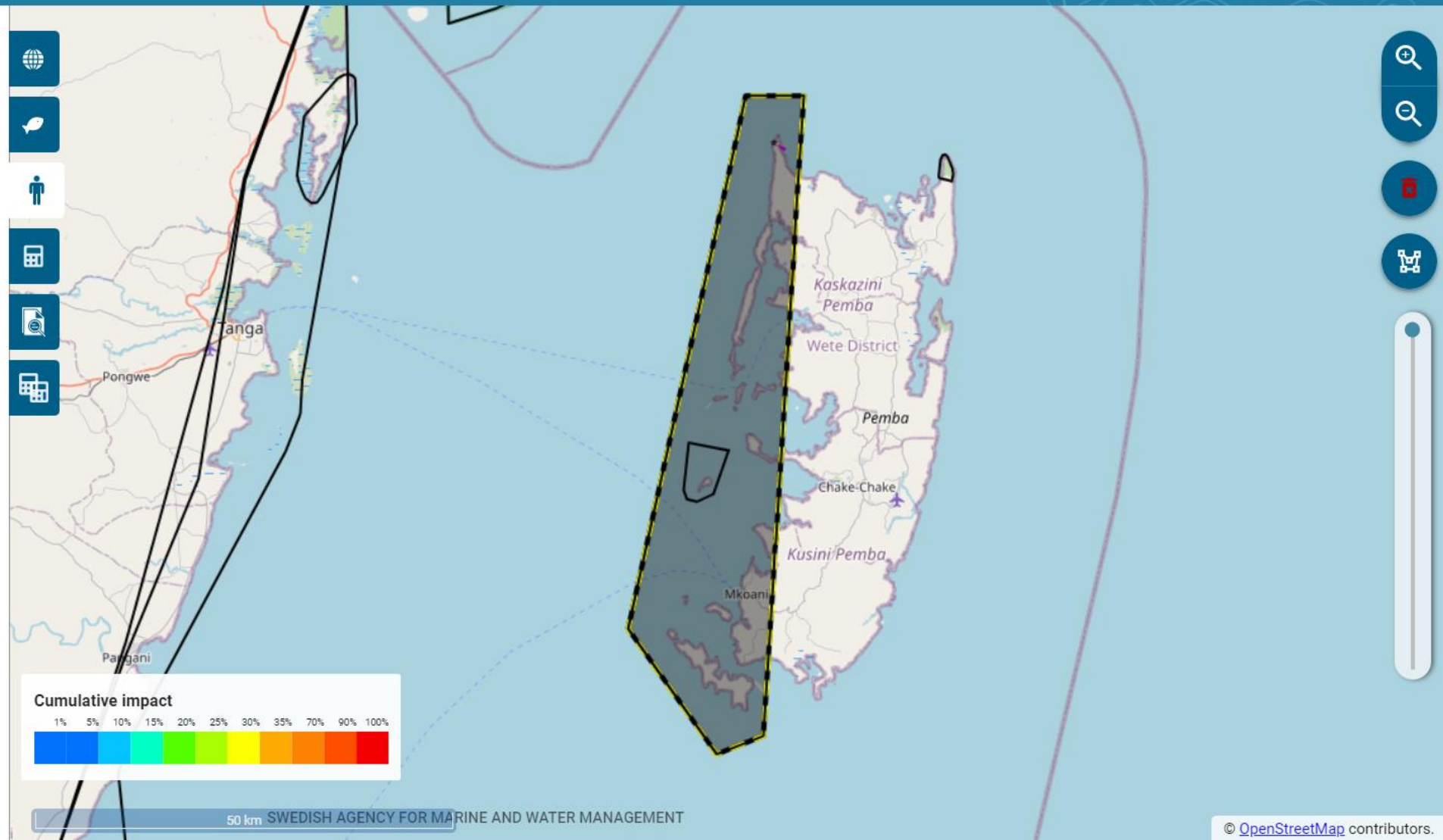
Pressures

Pemba Channel Conservation Area (Not Reported)

Search for pressure

- [x] Aquaculture
  - [x] Algae farming
    - Edit intensity
    - Percentage +11% Constant
    - 0
  - [x] Mariculture
    - Edit intensity
    - Percentage +13% Constant
    - 0
- [ ] Biological disturbance



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Scenario Changes

Pemba Channel Conservation Area (Not Reported)

Sensitivity Matrix

- (•) Default matrix (Western Indian Ocean)
- ( ) User-defined matrix

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EDIT MATRIX

Result Colormap

Set maximum value based on:

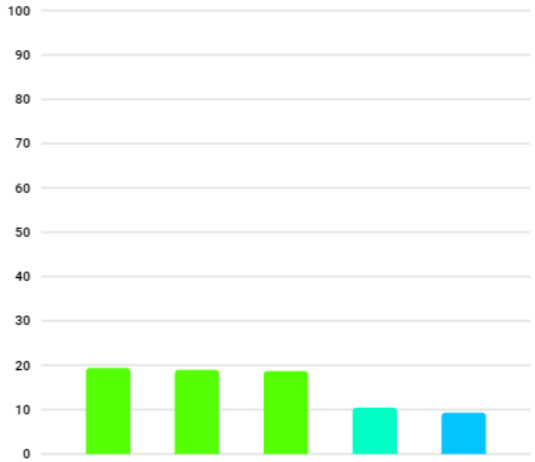
- ( ) Maximum value in MSP area
- (•) Maximum value in computed area
- ( ) User-defined value

DELETE CALCULATE

Calculation Report

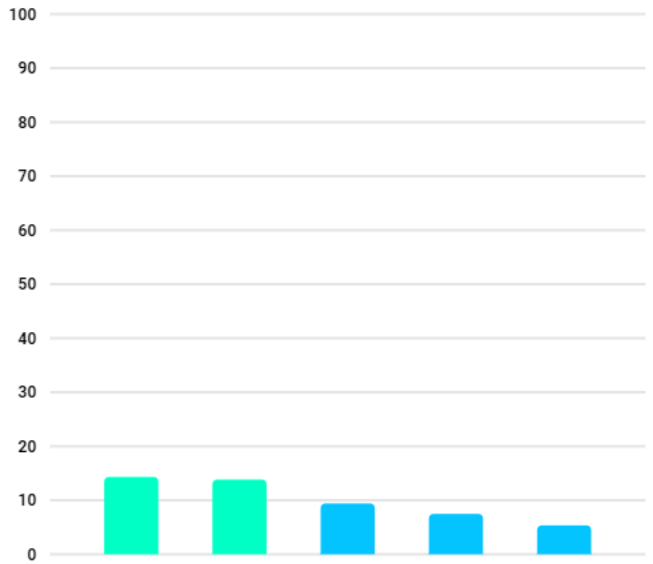
Pressures with highest impact

Artisanal fishing	19.38%
Boating	18.98%
Algae farming	18.69%
Temperature rise	10.45%
Underwater noise	9.32%



Nature values with highest impact

Coral reef	14.31%
Coral reef fish	13.83%
Seagrass bed	9.41%
Shallow soft	7.48%
Dolphins	5.35%



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Compare calculations

Calculation A

Baseline Pemba Channel Conservation Area

Calculation B

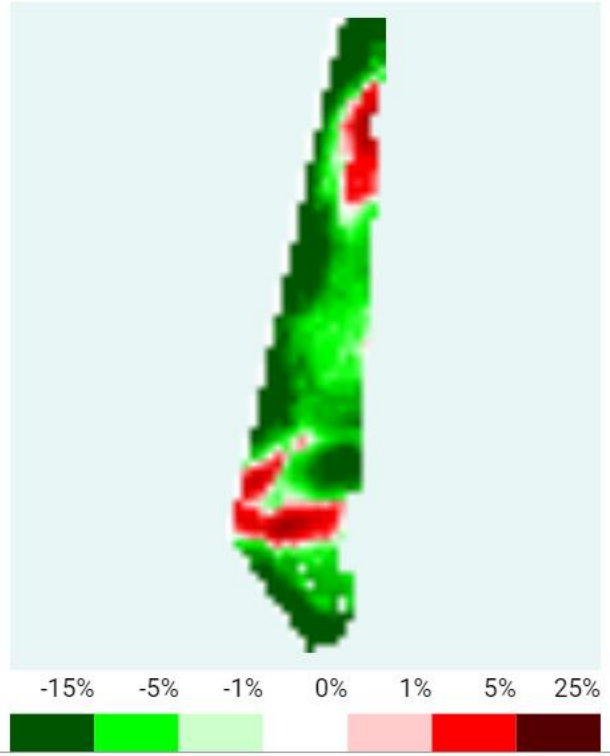
MSP Scenario Pemba Channel Conservation A

COMPARE CALCULATIONS

Calculation Comparison Report

Baseline Pemba Channel Conservation Area and MSP Scenario Pemba Channel Conservation Area

Havs och Vatten myndigheten



Baseline version: BASELINE2022-v5

Algorithm: Cumulative impact

Cumulative effect

	Baseline Pemba Channel Conservation Area	MSP Scenario Pemba Channel Conservation Area	Relative change
Total:	15,646,293	29,421,176	+88.04%
Average:	9,902.7171	9,310.4987	-5.98%
Min:	0	0	0%
Max:	111,926	94,743	-15.35%
Std. Dev:	14,608.5369	13,499.1685	-7.59%
Calculated area:	98.75 km²		

* The image shows the relative difference in total cumulative impact between the base and what-if scenario.

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Find a location for blue economy development

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Offshore Comoro DEV

Algorithm

Cumulative impact

Scenario Changes

Comoro DEV

Sensitivity Matrix

- (●) Default matrix (Western Indian Ocean)
- ( ) User-defined matrix

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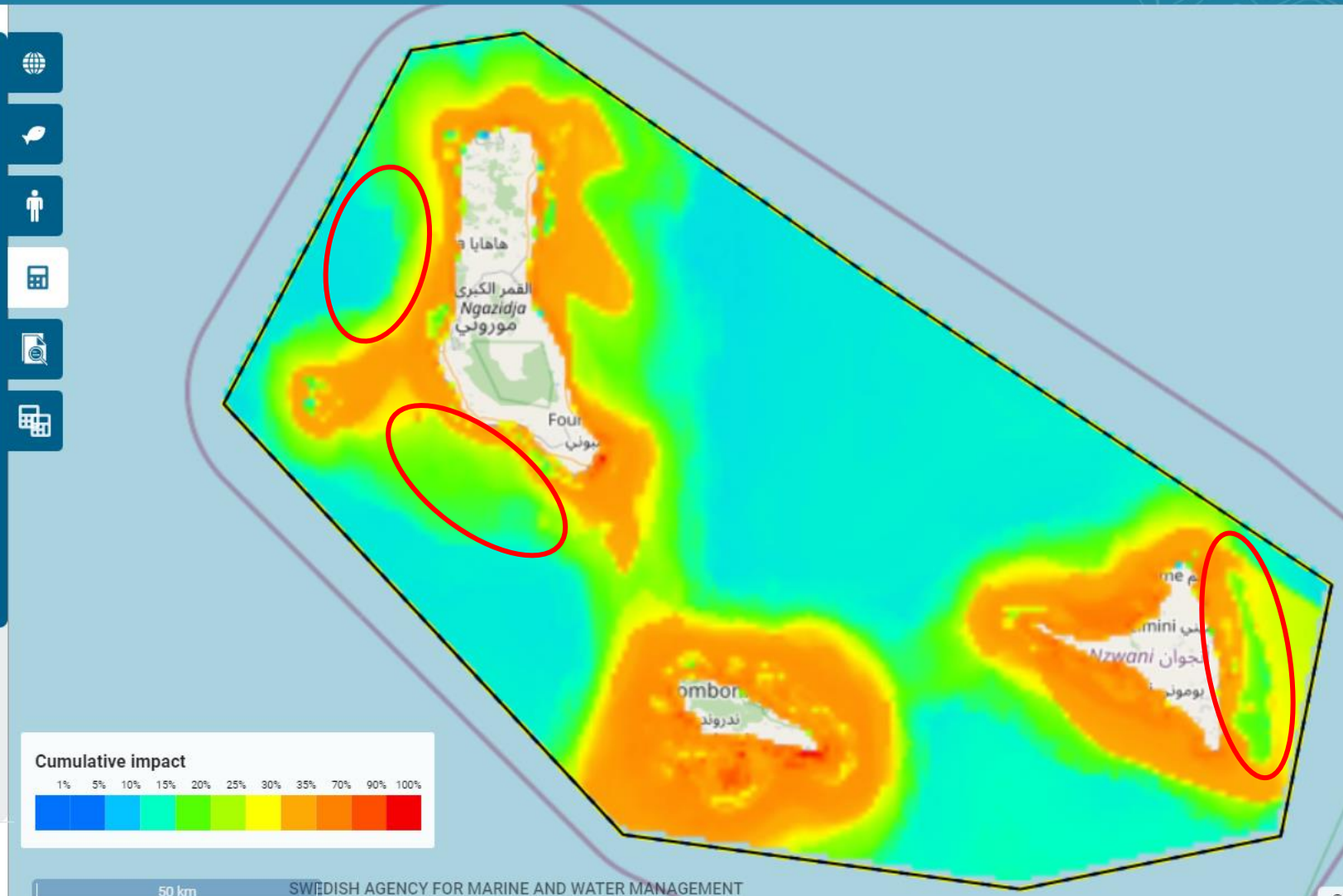
EDIT MATRIX

DELETE

CALCULATE



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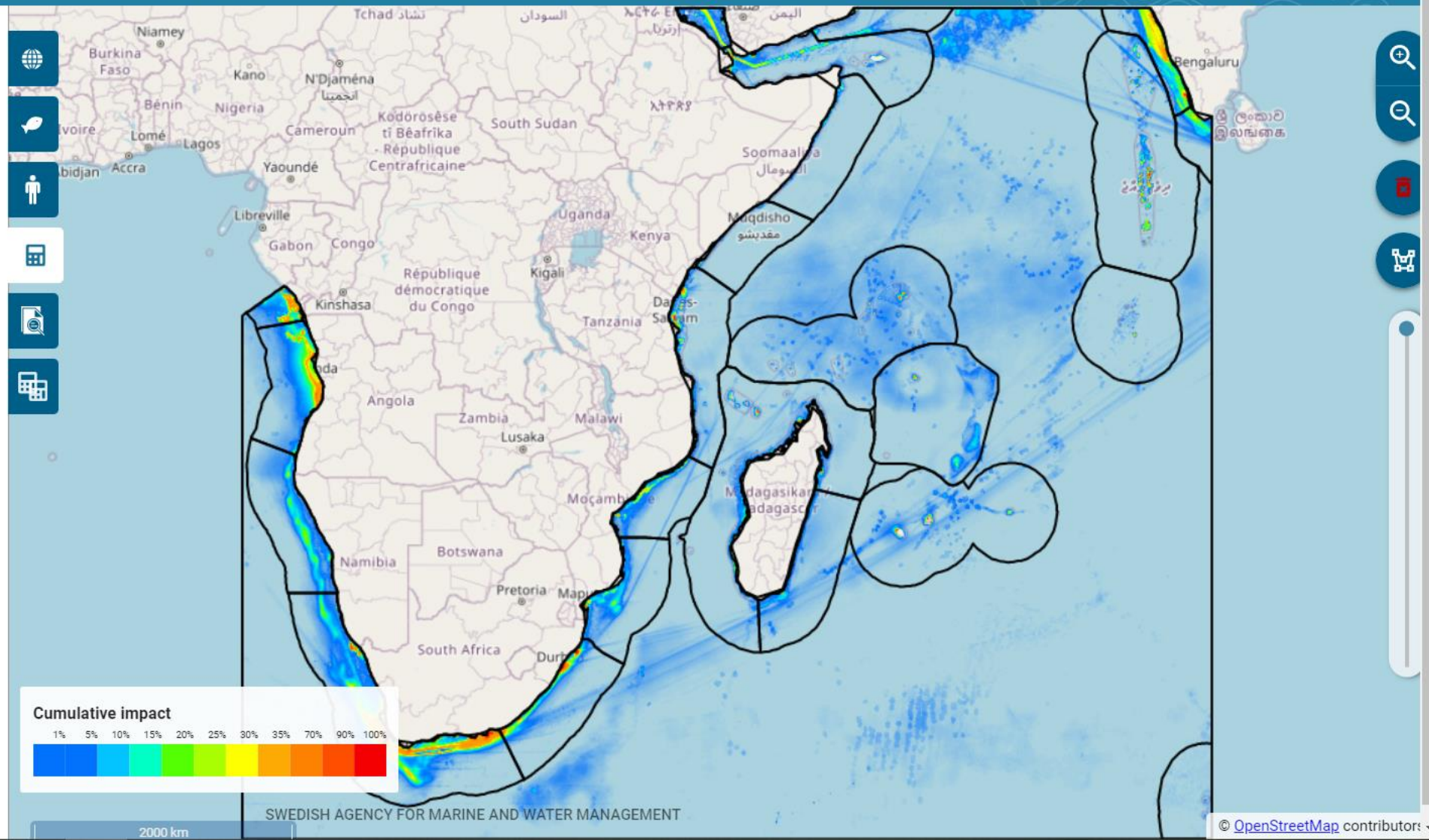
Scenarios

No area selected

User scenarios

- Scenario Whole Grid
  2022-10-11 10:35
- Scenario Whole Grid
  2022-10-11 10:30
- MSP Scenario Pemba Channel Cons...
  2022-10-11 10:19
- Baseline Pemba Channel Conservati...
  2022-10-11 10:15
- Rarity East African Coral Coast
  2022-10-11 09:57
- Scenario East African Coral Coast (2...
  2022-10-11 09:51
- Baseline East African Coral Coast
  2022-10-11 09:41



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Calculation Report

Pressures with highest impact

Floating longline	21.52%
Temperature rise	13.29%
Other fishing	11.58%
Pelagic seine	8.58%
Underwater noise	8.33%

Nature values with highest impact

Tuna billfish	10.46%
Pelagic fish	10.24%
Abyss soft	8.75%
Dolphins	6.71%
Rays skates	6.49%

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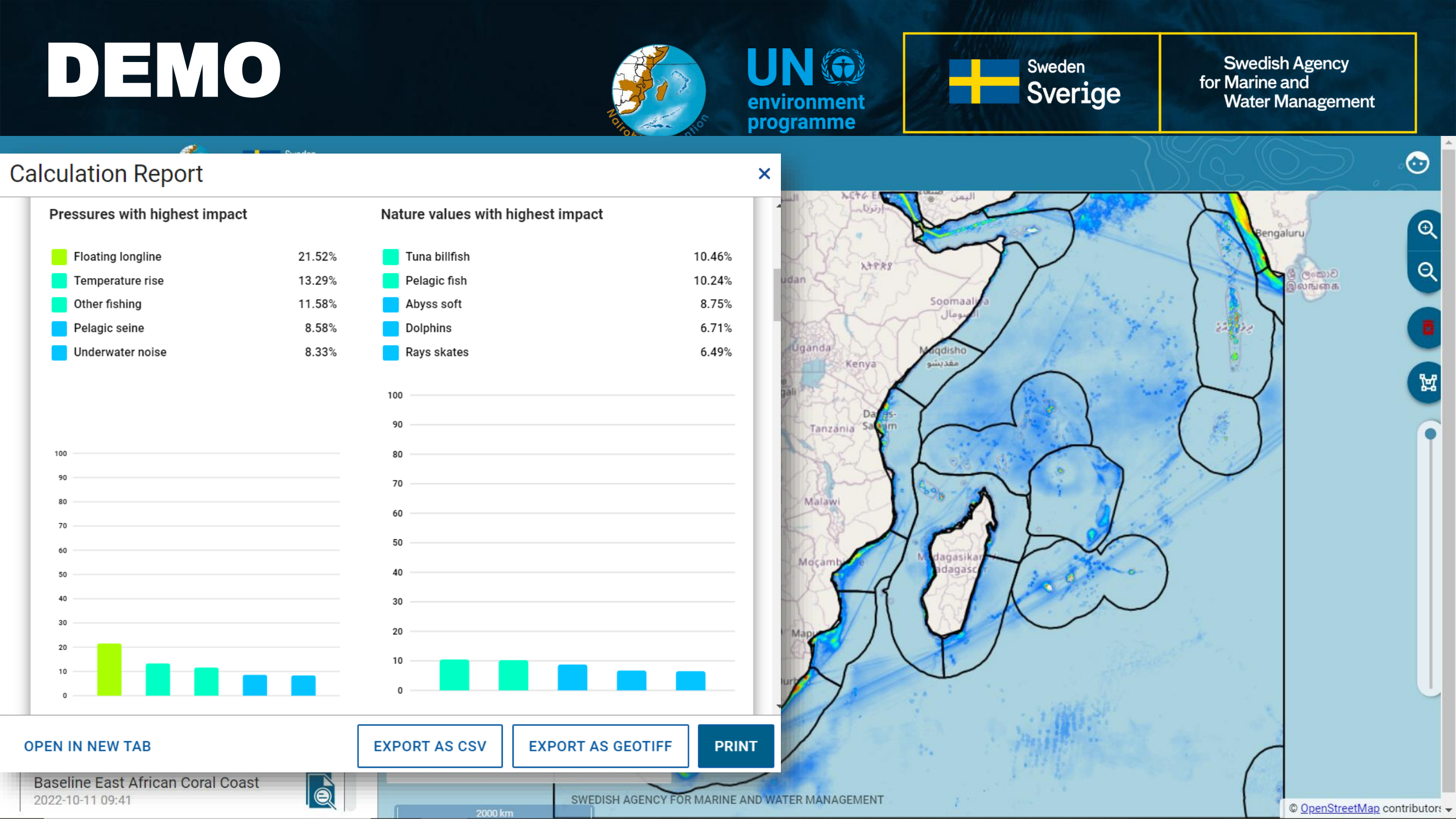
Baseline East African Coral Coast
2022-10-11 09:41