



Workshop summary

Cumulative Impacts of Maritime Activities

The workshop was organised by Alborg University at the campus in Copenhagen as a physical event on 6-7th December 2021

Capacity4MSP Workshop 6th-7th December on Cumulative Impacts of Maritime Activities

The Workshop 'Cumulative Impacts of Maritime Activities' took place on 6-7 December 2021 at the campus of Alborg University Copenhagen, Denmark.

Aim and content of the workshop

The aim of the workshop was to discuss the cumulative impact assessment, its principles and approaches, as well as the topics of multi-use, synergies, and conflicts in maritime spatial planning.

The MYTILUS toolbox is a general-purpose tool for cumulative impact assessment (CIA) and the spatial scope spans from local sea areas over regional seas like the Baltic Sea to global level. The MYTILUS toolbox was originally developed as a research tool within the INTERREG North Sea project NorthSEE and the BONUS BASMATI project. The software has been used in PhD courses and currently efforts are directed towards a broader application of MYTILUS as a decision support tool in real-world MSP processes.

MYTILUS is an independent desktop application running under Windows 10, is fully free and open source, requiring no additional licenses. Workshop participants should bring a laptop with Windows 10 or later versions, datasets for the exercises will be provided by organisers.

Content of the workshop

The workshop was organised as mixture of presentations, hands-on exercises and discussions covering the following topics:

- Cumulative impact assessments – introduction to principles and approaches
- Cumulative Impact Assessments – introduction to the MYTILUS Toolbox suite followed by hands on exercises
- Multi-use, synergies, and conflicts – introduction to principles and approaches
- Hands on exercises using the MYTILUS Toolbox suite
- Hands on exercises using the MYTILUS Toolbox suite
- Wrap up and future perspectives

Experiences from the workshop

Due to the pandemic situation, the workshop had been postponed several times in order to be able to perform it as a physical event making room for direct interaction and dialog with MSP planners. Still in December 2021, only a few participants were able to travel and take part in the workshop. Though, despite the limited number of participants, the workshop contributed to the ongoing dialog on how to include cumulative impact assessments in the MSP planning processes. The material and experiences from the Capacity4MSP workshop will be further developed to serve the needs of MSP planners and has already been utilised for a PhD course in the Knowledge Flows for MSP project. A movie introducing the cumulative impact assessments as part of MSP and a user guide introducing the MYTILUS tool will be ready when the project ends.



Foto: Workshop participants concentrating on the exercises

Exercises in MYTILUS

Four hands on exercises introduced the participants to assessing cumulative impacts of maritime activities by means of the MYTILUS Toolbox suite.

Exercise 1 – Maps and data

The aim of this exercise is to learn based principles of MYTILUS and the Maps interface.

Open MYTILUS and take a look at the user interface. Select 'Base maps' from the **Maps** menu.

1. Click on one of the base maps. Try to zoom in, zoom out and pan using the buttons above the map window. Select some of the other maps. Close the map window.
2. Select a scenario by clicking on a scenario in the scenario box to the right side. Currently there is only one scenario – the baseline scenario. Select *Pressure* from the **Map** menu. Click on '14_fishing of herring' and observe the results. Activate the *Quantile classification* and click once again on '14_fishing of herring'. (*Be aware: You need to move to another dataset and then back to '14_fishing of herring' for the new setting to update. Furthermore, if the Quantile button and below it, the metadata button, is NOT visible in the left, lower window corner, you need to change the overall screen resolution settings of the pc to a smaller size percentage.*) Remark the different visual appearance. Visualise some of the other pressures, and zoom in on some interesting areas.
3. Click the *Metadata* button and find the data source for the fishery data. Close the Pressure Map window.
4. Select *Ecosystems* from the **Maps** menu and click on one of the Ecosystem layers. What is the data source for that layer? [hint: metadata button] Try visualising some of the other ecosystem layers.
5. Select *Compare maps* from the **Maps** menu. Select a pressure map in the list to the left and an ecosystem map from the list in the right side. Try some other combinations of pressures and ecosystems.

Exercise 2 – Impact

The purpose of this exercise is to learn how to use MYTILUS to calculate various indices including cumulative impact assessment.

Open MYTILUS (if closed) and select *Cumulative pressure* from the **Analysis** menu.

1. Click on *All pressures* and *Calculate*. Assess the result and click on Legend to see the intervals (write down the intervals). Repeat by activating *Quantile classification* and click again on

- Calculate*. Click on Legend and Compare the result with the previous map using equal intervals. Which classification do you prefer – and why?
2. Click on *Selected pressures* and select more than one pressure from the list [you can use CTRL to add multiple pressures to the same selection]. Consider which classification you will use and click on *Calculate*. Assess the result. Close the Cumulative pressure window.
 3. Select *Ecoogical complexity* from the **Analysis** menu and click Calculate. Repeat by activating *Quantile classification* and click again on *Calculate*. Compare the results. Close the window.
 4. Select *Edit sensitivity matrix* from the **Analysis** menu. Explore the matrix without changing it.
 5. Select *Cumulative Impacts* from the **Analysis** menu, select *All pressures and ecosystems*, choose eventually *Quantile classification* and click Calculate. Inspect the results. Is it as expected – and why? Try to do the same calculation on a specific ecosystem by clicking *Select ecosystem* and then *Calculate*. Try other combinations of pressures and ecosystems as well as variate between the methods *Additive impact index* or *Mean impact index*. Try, for example, to select terrestrially-arrived, thus indirect pressures in the form of nitrogen and phosphorous.
 6. Finally, select *All pressures and ecosystems*, *Max pressure index* and *Calculate*. Click *Legend*. Which pressure is dominating in the largest part of the Baltic Sea?
 7. Select *Impact statistics* from the **Analysis** menu. Click on *Pressures* and select *Sub_basins_17* from the *Zone map* list. Select *Name* in *Name field* list, and two specific areas in the *Area* list (use CTRL to select the second area). Click Calculate and assess the result. How do the two areas compare? Are the same pressures dominating in both areas?
 8. Click on *Ecosystems* and select *Sub_basins_17* from the *Zone map* list. Select *Name* in *Name field* list, and ONE specific areas in the *Area* list. Click Calculate. Which ecosystems are mostly affected in the chosen area? Close the window when done.

If more time, Select Compare maps from the Maps menu and explore some of the pressures in relation to the distribution of the most affected ecosystems according to the area you just focused on in the statistics.

Exercise 3 – Alternative scenario

The objectives of this exercise is to use the scenario facility of MYTILUS to analyse the effect of various spatial planning initiatives, and compare them with the baseline scenario. In the current MYTILUS setup, we implement scenario change by changing pressures directly instead of changing activities, while we need of course to make the logical link to activities while doing this.

We will work with changing the pressure of *16_fishing_of_sprat*, since this can directly be linked to a specific activity (this is both a pressure and an activity at the same time), and since this is the third largest pressure in the Bornholm Basin – and we will now focus on the Bornholm Basin which includes the Polish coast (the first and second largest pressures in this basin are phosphorous and nitrogen which are related to terrestrial activities). However, before we make a new scenario, we want to explore the existing data.

1. First, we explore the distribution of the Bornholm Basin sub-area – thus, select *Basemaps* from the **Maps** menu, choose the 17 sub-area map and notice the dark-yellow (not light-yellow and not orange) coloured area near Poland and notice its spatial extent. Close the window.
2. Second, we explore the distribution of 16_fishing_of_sprat – thus, select *Pressure* from the **Maps** menu and investigate the sprat fishing distribution, before closing the window.
3. Third, we want to investigate the pressure distribution for the Bornholm Basin to check the current sprat fishing in this area – thus, select *Impact statistics* from the **Analysis** menu (Be aware: If you have closed the program, since you ran the cumulative impacts analysis – you need to run the cumulative impacts analysis again, before being able to investigate the impact statistics – also if you have not yet run the cumulative impacts analysis, you need to do this first – pick *All pressures and ecosystems* and *Additive impact index*). In the impact statistics, explore the pressure impact distributions for the Bornholm Basin (pick *Sub_basins_17* and *NAME*), before closing the window.
4. Now, you make the new scenario. Make a copy of the *Baseline* scenario by selecting *Copy scenario* from the **Scenario** menu. Write a logical name for the new (copied) scenario describing the case (or just call it test1 or similar). Make sure you pick this new scenario in the Scenarios bar in the main MYTILUS window to work with this scenario in the following.

In the new scenario, as the first step, select *Adapt pressure* from the **Models** menu to change the sprat pressure. Choose the Bornholm Basin after picking the 17 sub-basins and the variable called *NAME*, and then select the sprat pressure layer. Assign value choosing *Setting a specific value* and then set sprat fishing to 0, and then click *Calculate*. Close the windows.

As second step in the new scenario, close down MYTILUS and open it again to reset the parameters.

As third step in the new scenario, choose *Pressure* from the **Maps** menu – and explore how the Metadata has changed for the sprat fishing layer.

As fourth step in the new scenario, run a Cumulative impacts analysis – pick *All pressures and ecosystems* and *Additive impact index*, before closing the window.

As the fifth step in the new scenario, choose *Impact statistics* from the **Analysis** menu and explore how the sprat pressure has changed for the Bornholm Basin. Next, explore how the impact statistics for the ecosystems have changed by picking ecosystems instead of pressures. To compare more easily between the two scenarios, do the impact statistics calculations for both scenarios and copy the resulting graphs into another program e.g. a Word document to compare them.

As the last step in the new scenario, select *Compare scenarios* from the **Maps** menu to explore the visual consequences of the change between the two scenarios. Select both available scenarios. Select the cumulative impact map. Click on the globe symbol, if the two scenario-based cumulative impact maps do not show up immediately. Compare the visible changes to the two maps by zooming on the Bornholm Basin. Close the window, when done.

Exercise 4 – Use-use interactions

Open MYTILUS (if closed) and select *Activities* from the **Map** menu. Explore different Activities one-by-one. Try to change to Quantile classification. Which classification method do you prefer? And how are the different activities represented – do you think they are represented in adequate ways with adequate resolution?

Select Conflict-synergy Score from the **Analysis** menu. Click on *All activities* and *All values* and *Calculate*. Assess the result. Can you see any patterns, even though the small extent? Try again with the *Quantile classification* and click again on *Calculate*. Try to view similar maps for respectively only *Positive values* and *Negative values*. Do you find it the most useful to view positive, negative, or both in the same maps?

If more time, explore specific pairwise use-use entries in the separate Excel file with the matrix content.



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