

CIA Tool presentation

Baltic Sea Pressure and Impact Indices (BSPI/BSII)



Introduction

- Baltic Sea Impact Index (BSII) tool, is an ArcGIS based tool developed at HELCOM for HOLAS II.
- With the tool it is possible to calculate the Baltic Sea Pressure Index (BSPI) and BSII.



Uses

- BSII was originally developed to carry out the Baltic wide cumulative impact assessment in HOLAS II and has since been used by DK, FI, DE, LT and SE for various national purposes.
- The same principle was already used for HOLAS I, but HELCOM used EcoImpactMapper to carry out the calculation.
- After HOLAS II, the tool has been also used and further developed in Pan Baltic Scope project focused on MSP.



Spatial scope

- The spatial scope of BSII in HOLAS II was the entire Baltic Sea (HELCOM Marine area).
- The spatial scope is based on the scope of the input data, and input data from any area can be used



Input data

- The tool uses pressure and ecosystem GIS raster layers and a csv sensitivity scores as input data
- All data layers are normalized to be between 0 and 1
- All input data need to have the same resolution, if layers have different resolution, they need to be converted to matching (finest) resolution



Resolution

- Results are provided at the resolution of 1 x 1 km grid, covering the whole HELCOM Marine area



Confidence/uncertainties

- The tool itself doesn't have any inbuilt functionality to assess the confidence of the assessment
- For HOLAS II the confidence was considered separately as a completeness of underlying input data
- The quality of individual input datasets is mentioned in the metadata, as far as it was possible to assess



Calculation principle

- BSII uses the principles outlined by Halpern et al.
- It is possible to select in the tool whether it calculates pressure index, impact index sum, impact index mean etc.
- The formulas are part of the open source script and can be edited if needed



Platform

- BSII is originally built as a toolbox to be used in ArcGIS products
- There is also a [web version of the BSII tool](#), that can be used on any device via the browser for recalculating the index
 - User can select all or any combination of pressure and ecosystem layers and also edit the sensitivity scores
 - enables testing of different sensitivity score and pressure composition



Ownership

- The BSII tool is an open source tool and the source code is also published at GitHub for anybody to download and develop
 - <https://github.com/helcomsecretariat/Cumulative-impact-Assessment-Toolbox>
 - Software/script is free software: can be redistributed and/or modified under the terms of the GNU General Public License
- Online tool is free to be used by everyone
- Desktop version (ArcGIS Toolbox) is also free but requires ArcMap software



Strengths (optional)

- Open source tool, that can be edited to fit future needs
- Flexible, fast and easy to use
- Result statistics: Generates a pressure – ecosystem impact contribution matrix as one output
- Input data can be of any spatial scope and resolution – as long as they are all the same



Weaknesses (optional)

- Confidence aspects would need to be developed further
- Results of the tool are heavily dependent on the predefined assumptions when preparing input data (e.g. how different input rasters are normalized)



Proportional values

- As one output the tool provides tabular information of the proportions (contribution) of different pressures (and ecosystem components) of the calculated total impact
- For some HELCOM work strands the contributions of different human activities behind the pressures have been calculated after HOLAS II, but for time being this is not integrated into the tool, as it is also not possible to create pressure layers from human activities inside the tool
 - With further development this is possible to be integrated into the tool, but requires work



Indirect and direct pressures

- The tool in its current implementation doesn't automatically differentiate between direct and indirect pressures, but their proportions can be calculated from the end results
- The tool can be run with any kind of pressure – ecosystem combination, so it is possible to run the tool separately for direct and indirect pressures and present them also spatially. This functionality is also possible to be integrated into the tool.



Scalable spatial presentation

- The spatial end result of the tool is a raster map that can be zoomed and explored
- It is possible to include e.g. some ecosystem components on a finer scale, but then all other layers need to be scaled (artificially) to the finest resolution



Pressure-effect response

- The tool in its current form is designed to accommodate the rather simple mathematical formulas of the Halpern method, and doesn't support non-linear responses
- The script can be edited to also incorporate more complicated formulas



Aggregations and constellation analyses

- It is possible to run the tool with any kind of pressure – ecosystem layer combinations
 - Sensitivity scores can also be edited in the on the fly (web tool)



Uses for ecosystem based management (EBM)

- What potential concrete management uses (in addition to the current uses already listed in the presentation) do you foresee the tool could support in its current form/with further development?



Climate change

- In HOLAS II climate change was not incorporated in the tool
- Climate change could be included as a separate pressure layer, or included as “coefficient layer” to be used to change certain layers in a desired direction.



Forecasting/projections

- In the PanBalticScope project the tool was used to compare different offshore wind energy production development scenarios in the Baltic Sea
- Any other change in input layers (e.g. human activities/pressures, ecosystem components) can be projected and outputs analyzed



Thank you!

