

Saving Our Seas in 3D

Visualizing the governance of eutrophication in the Archipelago Sea

Project rationale

The Finnish Archipelago Sea remains a designated **"Hot Spot"** for nutrient loading, driven by persistent agricultural runoff and the accelerating pressures of climate-induced eutrophication.

SOS3D develops a new way to understand, systematize and communicate the complex interaction between responsibilities and tasks, interests, policy and planning priorities, and governance means and goals across international, EU, national, regional and local governance layers. The model helps researchers, decision-makers, and stakeholders to navigate and understand how nutrient loading and eutrophication in the Archipelago Sea is governed.

Achieving **"Good Environmental Status"** by 2030 deadline requires action on multiple governmental levels (municipal, national, regional, EU), by public and private actors, through various measures, targeting a range of different sources of environmental pressure. Managing the complexity of this task is the very essence of *the ecosystem approach*.

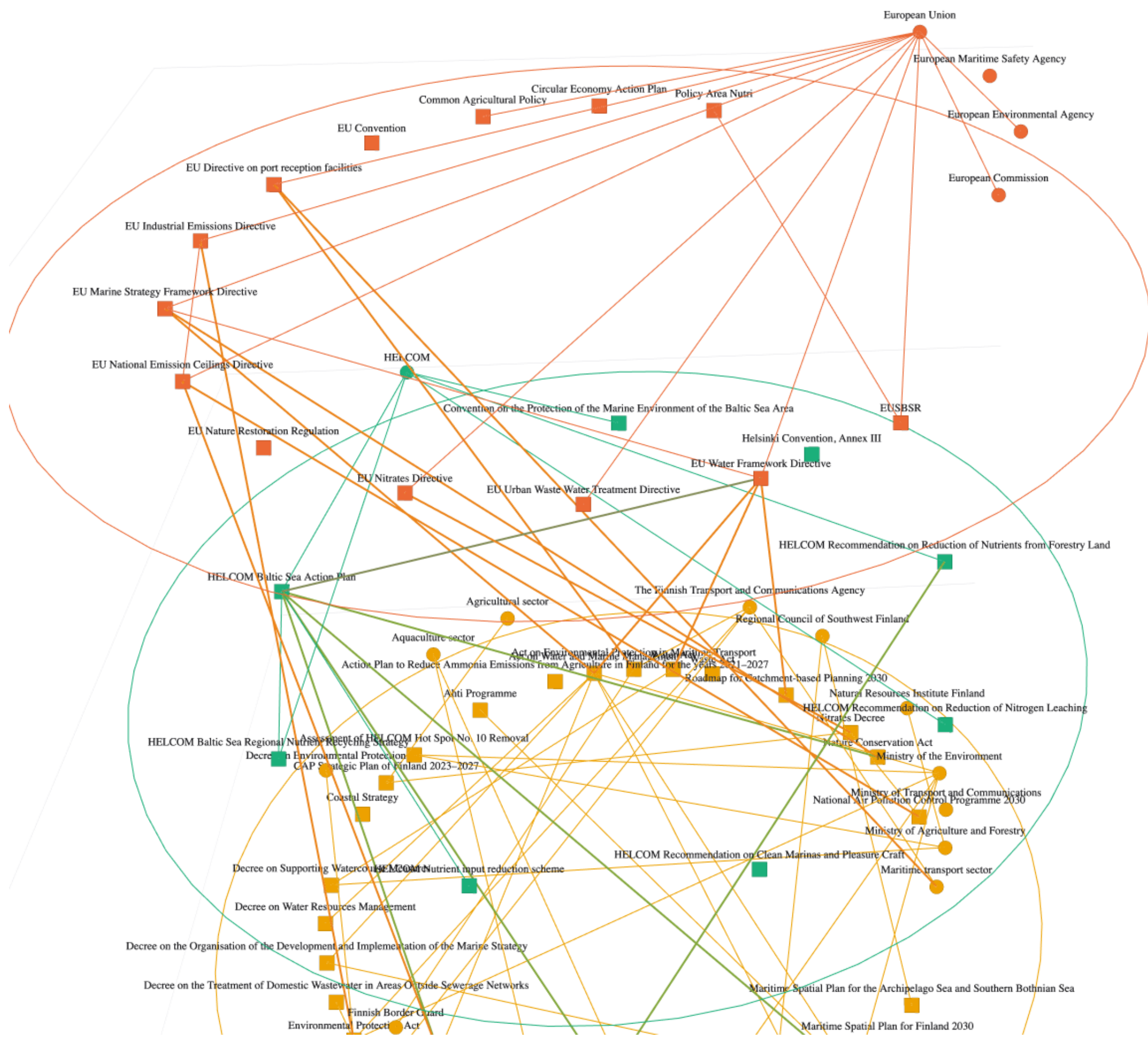
Progress on holistic integration of an ecosystem approach suffers from four recurring obstacles:

Fragmented responsibilities Lack of coordination and cooperation between authorities.	Competing priorities Environmental goals balanced against economic interests.
Siloed planning Sectoral policy and strategic planning working in isolation.	Layered complexity Scientific, technical and managerial complexity of the task.

Overcoming such concerns requires that contradictory structures, omissions, conflicting assumptions and competing practices can be revealed.

Saving our Seas in 3D (SOS3D) responds by developing a new way to understand, systematize and communicate the complex interaction between responsibilities and tasks, interests, policy and planning priorities, and governance means and goals. The 3D model allows multiple governance layers and interconnections to be visualised simultaneously without losing readability and shows the complexity of the governance network in multiple dimensions.

3D multilayer governance network



Actors and legislation are placed on five governance layers. Intra-layer edges show relationships within a layer; inter-layer edges show interconnections between layers. Views can be rotated and zoomed. Layers and information can be filtered through toggles. Information on instruments, actors, and interconnections are displayed in a textbox.

Project outcomes

- OUTCOME 1 — **Repository** on governance layers in the Archipelago Sea
- OUTCOME 2 — **Data** on actors and instruments in managing eutrophication
- OUTCOME 3 — Visual and interactive **3D model**
- OUTCOME 4 — **Funding application** for upscaling

Research group

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|-------------------|---------------------------------|
| Viljam Engström | Project responsible, data input |
| Carolina Grönberg | Researcher, data input |
| Sukrit Pant | Researcher, coding |
| José Teixeira | Coding expertise, mentoring |

Explore the interactive model

- <https://blogs2.abo.fi/sos3d/>
- <https://research.abo.fi/en/projects/3d-visualization-of-governance-and-regulatory-layers>

Project design

The project collects and systematizes information on actors, legislation, and policy instruments across governance layers into a program-readable format, and creates open source code for generating the 3D model.

Data was collected, processed and interlinked using **Obsidian**. That data was then used to generate the visual model through **Python**, building a 3D **Plotly** graph, together with a front-end for non-technical users in **HTML, CSS and JavaScript**.

The model does not aim to exhaust governance of the Archipelago sea, but is limited to:

- legal and governance structures related to **nitrogen and phosphorus**
- instruments and actors that govern **waterborne and airborne** nutrient inputs
- regulatory acts and policies** (including planning, monitoring and enforcement)

01 Obsidian Legislation and actors identified and interlinked	02 Structured data Data output in program-readable format	03 Python + Plotly 3D graph in open source code	04 Web front-end HTML, CSS and JavaScript
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OPEN SCIENCE

The systematized data and the code generating the 3D model are published as open source, so the model can be extended to other pressures, sea areas and governance questions.