

# SPATIAL MODELLING OF MULTIPLE PRESSURES TO SUPPORT THE IMPLEMENTATION OF THE MARINE STRATEGY FRAMEWORK DIRECTIVE AND MARITIME SPATIAL PLANNING

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## Abstract

We present two different approaches to study human pressures within the context of the Marine Strategy Framework Directive (MSFD) and further developments on Maritime Spatial Planning (MSP). The first approach considers a single driver or sector (ie., maritime transport) and its relation to multiple pressures and their relationship with descriptors from MSFD. We use data of automated identification systems (AIS) and highlight the potential applications of this new source of data. The second approach integrates multiple drivers, which results in multiple pressures, into an integrative cumulative index. The study area is the Gulf of Lyon (NW Mediterranean), as a trans-boundary case study developed in the FP7 project KnowSeas. The results obtained highlight the potential of both approaches to be used in different steps of the MSFD.

**Keywords:** Mapping, Conservation, Gulf of Lyon

## From one driver to multiple pressures

Maritime transport plays an important role in the world trade and its economic developments. In Europe the “motorways on the sea” concept has been an important issue since the launch of the EU Transport white paper (EC 2001). An enclosed sea such as the Mediterranean is particularly vulnerable to ship-associated pressures due to a high-volume of shipping routes, long history of use, and sensitive shallow and deep-sea habitats [1]. Maritime transport is related to most of the descriptors targeted by the MSFD and associated negative pressures are more specifically related to biodiversity loss, introduction of alien species, pollution, marine litter and underwater noise [1,2,3]. We developed a system to store, manage, analyse and visualize AIS data based on open-source components (PostGIS, R). Using this information, different products may be generated [2]. We illustrate these products in the Gulf of Lyon area using an AIS dataset for the year 2012 (Figure 1).

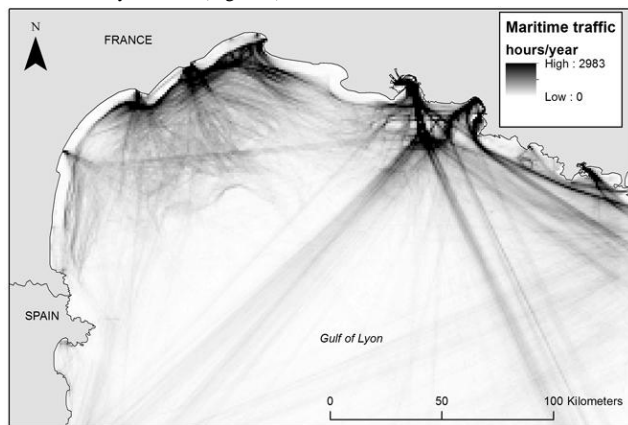


Fig. 1. Marine traffic density in the Gulf of Lions derived from AIS data

## From multiple drivers to a single pressure index

The good environmental status of marine environments is conditioned by a wide set of pressures exerted by human activities. Therefore, long-term economic, environmental and social aspects have to be considered simultaneously to understand the complex network linking sea uses and environmental pressures and impacts. The acquisition of a holistic approach is essential for the management of marine areas: the identification, comparison and quantification of cumulative pressures are critical in order to understand effects on marine ecosystems [4]. We conducted a high-resolution cumulative pressure analysis based on [4]. We generated 35 pressure maps, and included 16 ecosystem types. Due to the absence of a current vulnerability matrix for the Mediterranean we used the same matrix developed at global scale [4]. The final map of the cumulative pressure index in the Gulf of Lions is presented in Figure 2.

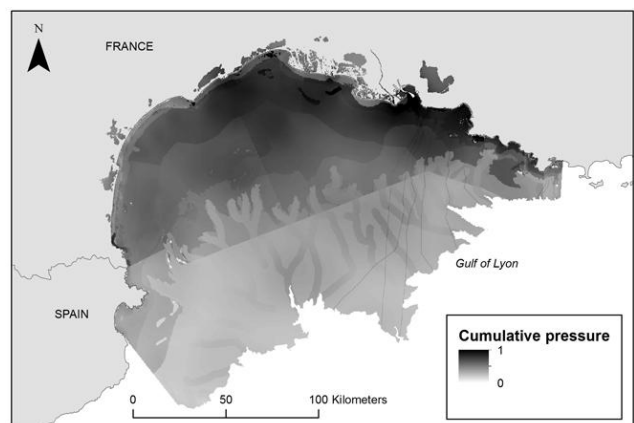


Fig. 2. Cumulative pressure index

## Implications for the MSFD

Both approaches are suitable for supporting the Initial Assessment by providing quantitative data on different pressures considered in the MSFD [2]. In addition, the example of generating soundscapes from marine traffic data highlights its potential for modelling indicators of good environmental status. Finally, the information provided in this study can also be incorporated into Decision Support Systems for supporting the design of further monitoring programs and assessing plans of mitigation measures considered in the MSFD.

## References

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