

Improving the sustainability of the maritime transport in the Adriatic: The eco-routes of GUTTA-VISIR

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Credit: Adrian Pingstone/public domain

The International Maritime Organization (IMO) has recently approved mandatory norms for reducing carbon intensity of shipping, starting from 2023. In its act, IMO does not prescribe how, but how much ships should reduce their Carbon Intensity Indicators (CII). In the short term,

various measures have been proposed to accomplish this task, such as the installation of energy saving devices, engine power limitation, and use of voyage optimization.

Voyage optimization appears to be a viable operational measure for short-sea shipping to meet short-term targets for both absolute emission and carbon intensity reduction. It is the topic of GUTTA-VISIR, an operational tool devised for computing least-CO₂ ferry routes in the Adriatic Sea, depending on forecast meteo-oceanographic conditions. Designed and developed in the framework of GUTTA—savinG fUel and emissions from mariTime Transport in the Adriatic region, a project funded by 2014-2020 Interreg V-A Italy—Croatia CBC Programme, the new tool for ferry eco-routes represents an important milestone for planning routes that minimize ferry CO₂ emissions, making use of the knowledge of the sea state and circulation.

"GUTTA-VISIR is based on three main components", explains Gianandrea Mannarini, senior scientist at the CMCC Foundation and Scientific Leader of the project. "The environmental forecasts related to waves and sea-surface currents from the Copernicus—Marine Environment Monitoring Service (CMEMS); the VISIR (discoVerIng Safe and effIcient Routes) ship routing model in its "VISIR-2" upgraded version; and a web application for browsing the operational results."

The VISIR-2 model can compute optimal routes by suggesting a spatial diversion which leads to avoidance of rough sea and related ship speed loss, and exploitation of sea currents; it is based on a graph-search method and makes use of dynamic meteo-oceanographic fields for computing optimal maritime tracks. It keeps into account both coastline and vessel draft, allowing computation of [optimal routes](#) even in archipelagic domains such as coastal Croatia. Besides least-distance and least-time routes, the new version of VISIR can compute routes of minimum CO₂ emissions. The ferry sea-keeping and emissions are

parametrized through data sampled from a ship simulator installed at the University of Zadar, a Partner of the GUTTA project. The CO₂ and CII savings obtained through VISIR are computed for routes between various sea ports, departure times, and ship's engine loads. This provides a picture of the order of magnitude and variability of the potential savings in relation to the changing meteo-oceanographic conditions.

"Carbon intensity is a possible point of convergence between the International Maritime Organization (IMO) and EU policies to cut GHG emissions and decarbonize shipping. GUTTA-VISIR may be useful for assessing the amount of the CII reductions achievable through an optimal use of the meteo-marine forecast information", Mannarini explains. Moreover, the GUTTA-VISIR web tool offers some routes, such as the Zadar-Barletta [route](#), that are not currently available, and therefore it may also contribute to assess how to improve the cross-border maritime links between Italy and Croatia.

The research appeared in the *Journal of Marine Science and Engineering*.

More information: Gianandrea Mannarini et al, Towards Least-CO₂ Ferry Routes in the Adriatic Sea, *Journal of Marine Science and Engineering* (2021). [DOI: 10.3390/jmse9020115](https://doi.org/10.3390/jmse9020115)

Web tool: www.gutta-visir.eu/

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