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Accelerating the research on Biodiversity and Ecosystems: Best Practice on Climate Change vs Non-Indigenous Invasive Species (NIS)

Cristina Huertas-Olivares[1], Alberto Basset[1], Katrina Exter[7], Giorgios Kotoulas[5], Nicola Fiore[1], Marc Portier[7], Rory Meyer[7], Dick Schaap[3], Ioulia Santi[4], Matthias Obst[6], Alex Vermeulen[2], Peter Thijsse[3], Nicolas Pade[4], Juan Miguel González-Aranda[1], Joaquin López[1], Nikos Minadakis[1], Lucia Vaira[1], Christina Pavloudi[5], and **Christos Arvanitidis**[1]

[1]LifeWatch Eric
[2]Icos Eric
[3]Maris
[4]Embrc Eric
[5]Hmrc
[6]Ugot
[7]Vliz

The current knowledge on the risk of climate change for biodiversity and ecosystems needs to be improved by seeking evidence from cross-domain analyses. As a demonstration case, this study analyses how to investigate and monitor the rapid increase of Non-Indigenous Invasive Species (NIS) in European ecosystems. These species may not only replace indigenous ones but also alter habitats, interacting with the changing environment and eventually severely influence established socio-economic regimes. The challenge is to adopt a comprehensive approach by considering the bulk of the biotic and abiotic variables and their interactions, which may be even more important for the distribution of the NIS than the occurrence of the NIS. Such approaches require access to big datasets (from genomics to *in situ* and satellite borne environmental data) and high computational power, especially for those models with iterative algorithms.

This study aims to: integrate data from different scientific disciplines in the marine subdomain (e.g. chemistry, physics, biodiversity, ecosystems, genomics, socio-economics) into an analytical framework in order to advance our knowledge on the impact of NIS on European marine biodiversity and ecosystems; to connect the analytical framework and federate access to relevant data infrastructures at the EOSC portal in order to mobilise and empower a larger community of researchers and potential data providers; and to demonstrate and promote the benefits and potential of web-based science using EOSC.

A break-through Technical Composability Layer (Tesseract, which includes an additional option with Jupyter Notebook) is used in order to achieve the horizontal composability of the services. Only FAIR-compliant datasets are used in this study. However, because the nature of the project is

primarily multidisciplinary and cross-domain, the only way to guarantee that the results deriving by the different disciplines/domains are comparable is to FAIR-ify the web services used, too. This way, it is ensured that both the quality and process potential in the different disciplines and domains are comparable and therefore so are their results.

This paper brings together scientists making basic research on biodiversity and ecosystems, computer engineers, including software and web developers, in order to create a FAIR-compliant virtual research environment (VRE) to achieve both the scientific goals and the community engaged.