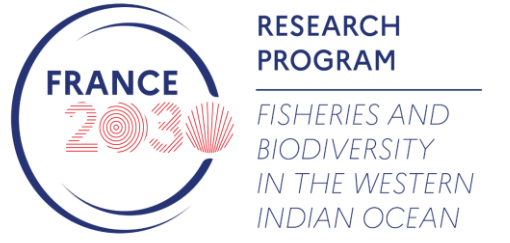


**Ocean Health & Resilience**



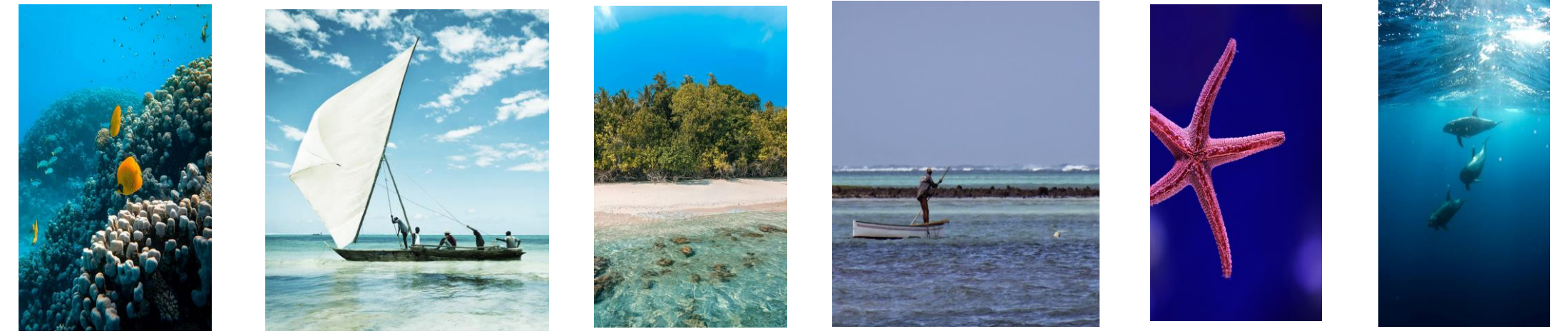
# BRIDGES-AVATAR: a new research project to building digital avatars of social-ecological systems of the South-West Indian Ocean

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## The BRIDGES research program

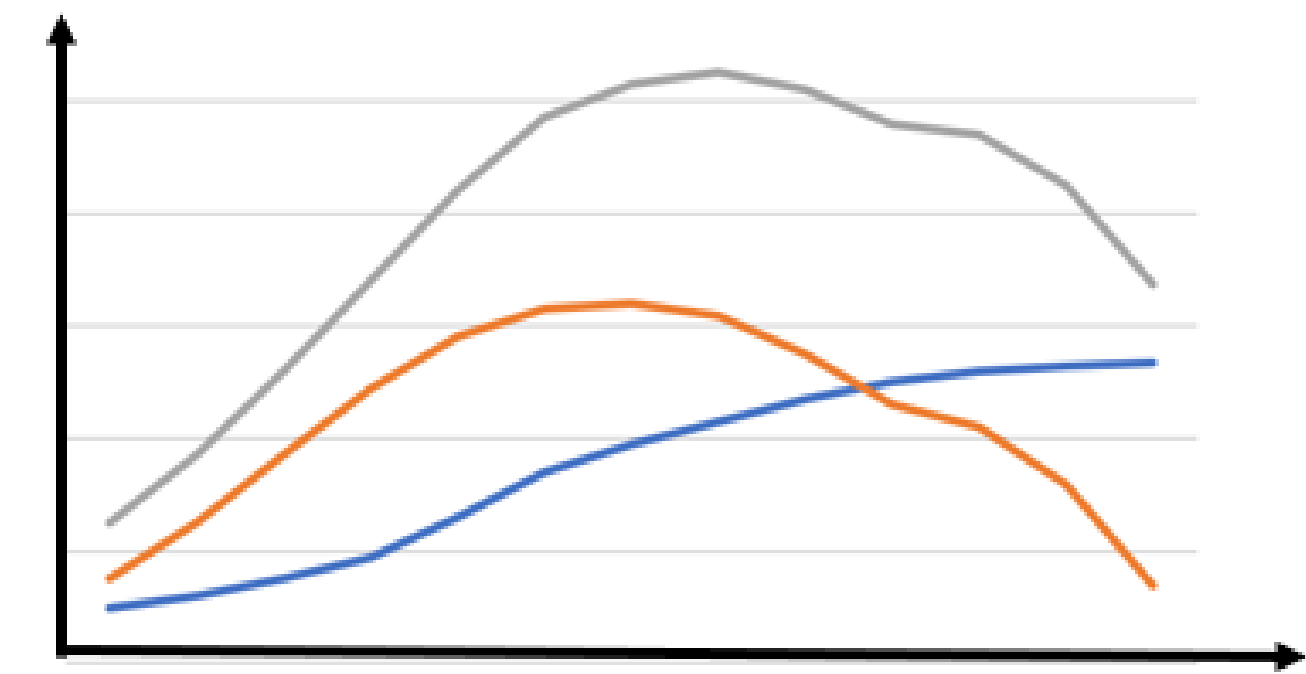
BRIDGES is a new exploratory research program funded by France 2030 over the period 2024-2033 that will implement ground-breaking studies on regional marine social-ecological systems (SES) in the South-West Indian Ocean (SWIO).

Within BRIDGES, several targeted projects will be implemented, including BRIDGES-AVATAR to simulate the dynamics of two types of SES associated to (i) coral reef resources (fish, invertebrates, etc.) and related habitats (seagrass, mangroves, etc.), and (ii) large pelagic resources (e.g. tuna and by-catch species) and associated coastal and deep ocean habitats.

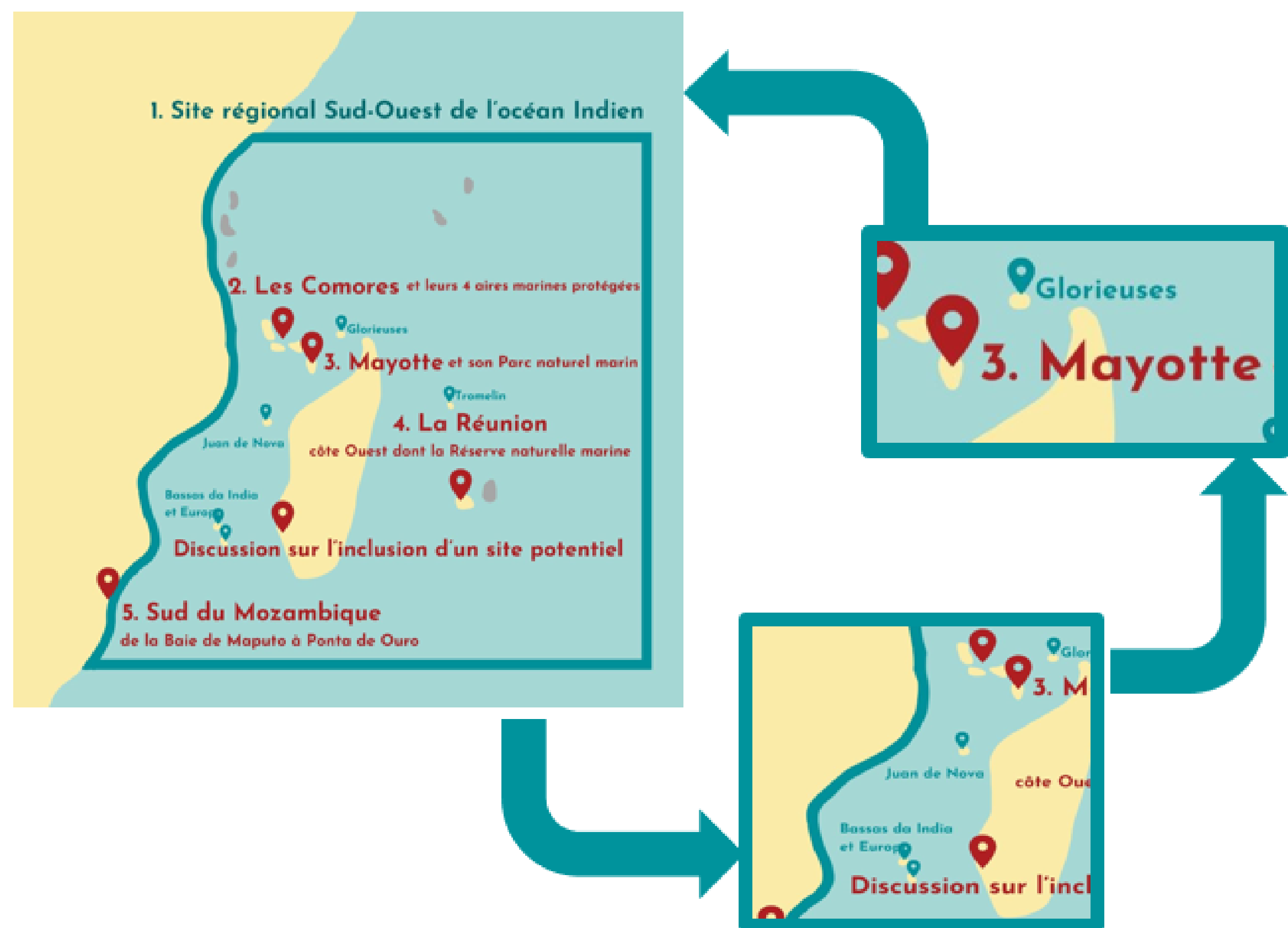


How spatial management of social-ecological systems (e.g., MPAs, LMMAs) can contribute to more effective biodiversity **conservation** and equitable and sustainable **exploitation** of marine resources ?

$$J_{MPAs} = \alpha_1 ||biodiversity|| + \alpha_2 ||exploitation||$$



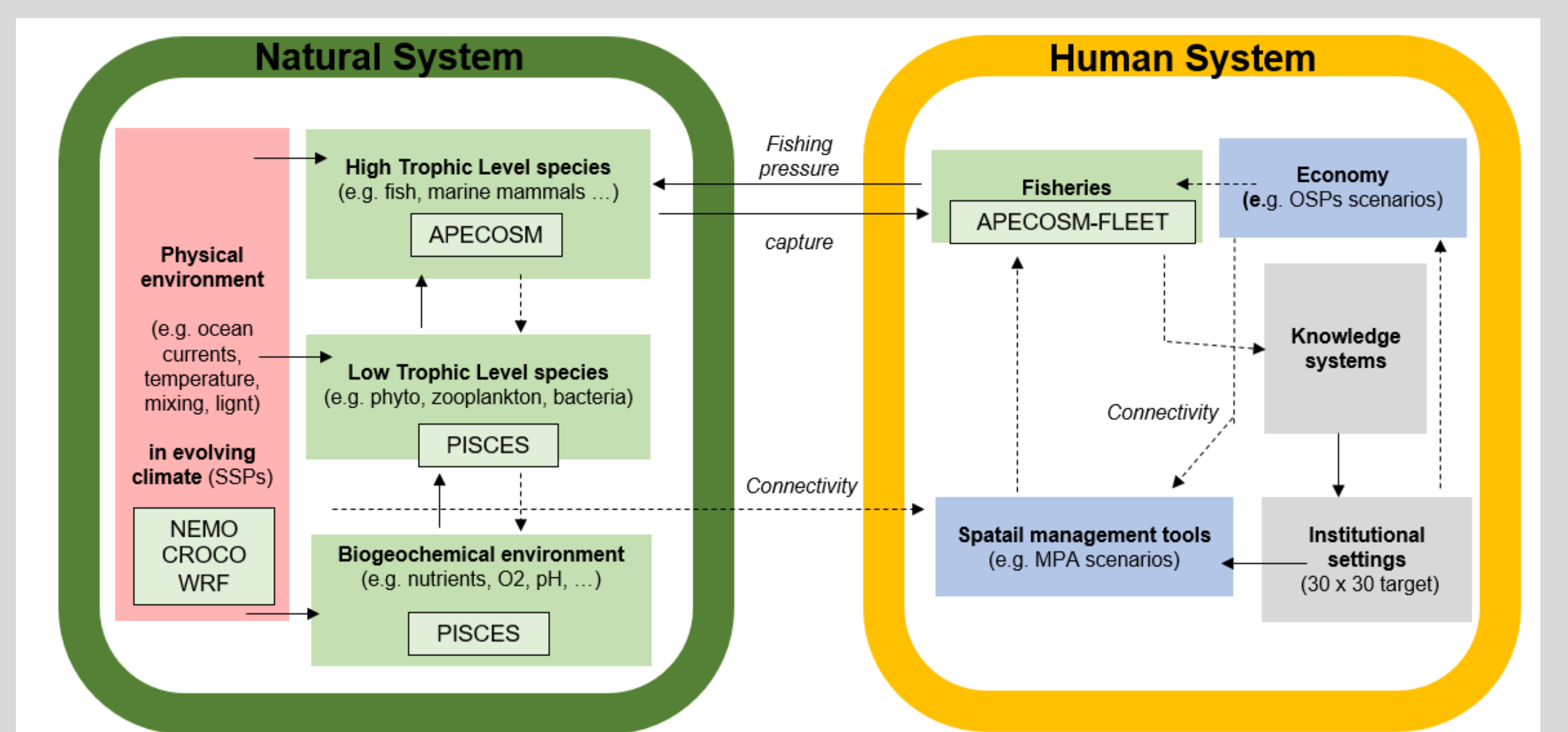
### Multi-scale, multi-level nested approach (downscaling, upscaling)



Digital avatars will be developed and used to explore the likely trajectories of regional and local SES in different contexts of climate, economic, societal changes, small-scale fisheries management and marine spatial planning.

## BRIDGES-AVATAR

The digital avatars are conceived as assemblages of mechanistic and statistical models, complemented by observational data and analytic tools that can be used individually or together to test a variety of "what-if" scenarios. Ultimately, the BRIDGES avatar will provide scientific data and associated uncertainties to guide practitioners towards appropriate strategies for the deployment of spatialized management tools. It will encompass regional climate, physical oceanography, biogeochemistry, marine and coastal ecosystems, fisheries and socio-economic conditions under which the living resources are exploited.

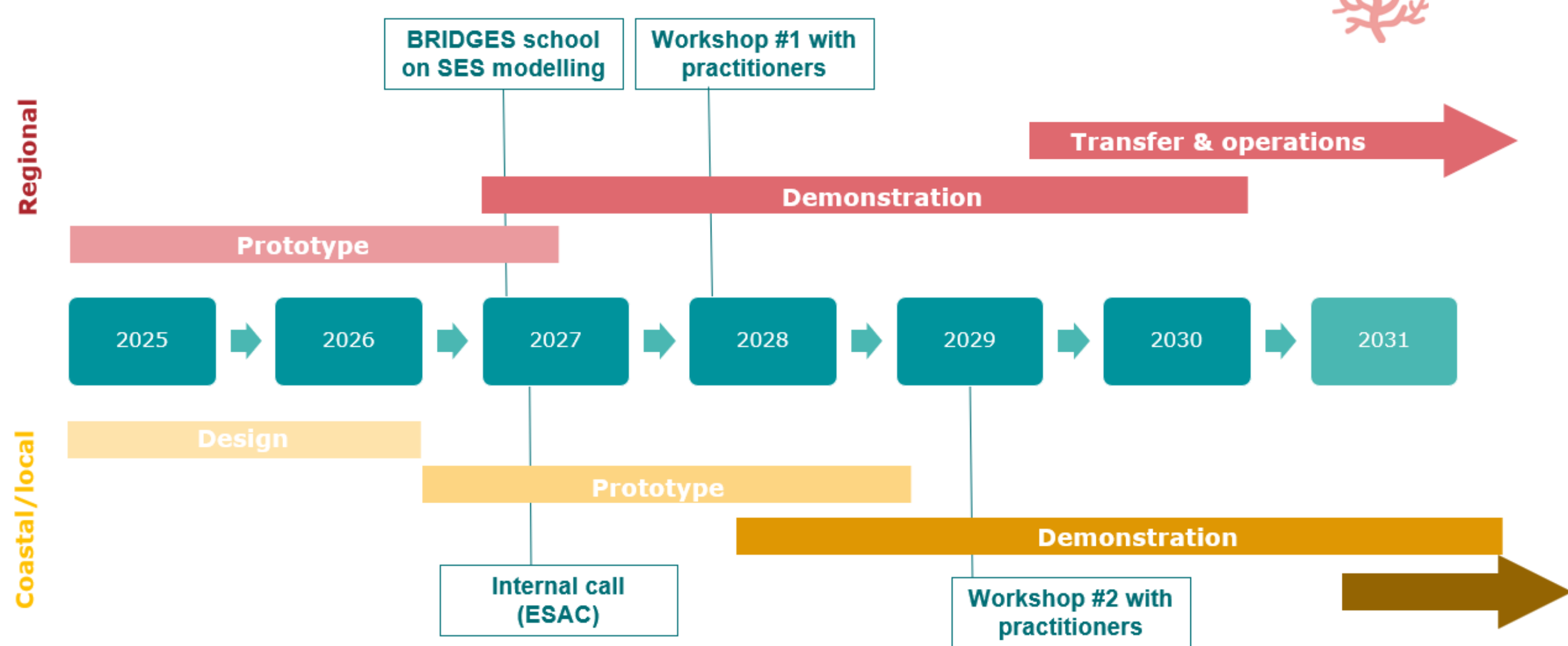


A particularly innovative aspect will be the implementation of a combination of quantitative process-based models describing the natural system with simplified, qualitative representations of human drivers such as fishing pressure.

## Implementation

The digital avatars will be deployed incrementally over the SWIO region, with the "large-scale" climate information (Indian Ocean basin) feeding into regional domains (around the Mozambique Channel including the Scattered Islands), which in turn will provide environmental conditions for high-resolution systems dedicated to the 5 coastal study sites of BRIDGES (Réunion, Mayotte, Comoros, Mozambique, and potentially Madagascar). It will be used to run projections over a period of several decades (typically 2020-2060) to help design Area Based Management Tools such as marine protected areas. It will provide opportunities for strengthening international collaborations with research teams from the SWIO region and beyond.

### Development roadmap



The BRIDGES-AVATAR project is supported by the French government under the France 2030 program managed by the Agence Nationale de la Recherche (grant no. ANR 22 EXBR 0004).

### Partners



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