# The Pillars of Hercules: A Mediterranean MOSE?

A Proposal for an International Workshop to be held in Venice in 2025

**Preface**

The Pillars of Hercules, commonly identified with the high mountain relief on both sides of the Strait of Gibraltar, have stood for centuries at the separation of the Mediterranean Sea and the Atlantic Ocean. They are named after the demigod Hercules, who ventured beyond the outer limits of the world, to perform one of his Twelve Labors. According to Greek mythology, shared by Etruscans and Romans, the Strait was opened by the hero himself in the mountain range that joined Africa and Europe. Both *Seneca* and later *Plinio il Vecchio*, in the first century AD, recall how Hercules decided not to go around the obstacle, but rather split the mountains with a blow from his sword, to pass through the narrow strait. Conversely, in the preceding century, *Diodorus Siculus*, held that instead of smashing through an isthmus to create the Gibraltar opening, Hercules actually narrowed an existing, larger strait to prevent the Atlantic Ocean monsters from entering the Mediterranean. This second mythological hypothesis seems to point at a similar labor which faces us today: how to prevent the Atlantic Ocean itself from entering the semi-enclosed seas between Europe, Africa and Asia, engulfing their coasts, submerging their riches, destroying their irreplaceable infrastructures. The sea-level-rise monster is here, menacing to burst into *Mare Nostrum*, nullifying all efforts to properly manage its present near-coastal *milieu*.

Global average sea level rise shows an exponential increase, which has reached 25 cm above pre-1900 values in 2022, and will reach 40 cm by the year 2050, 1 m by 2100 and 2.5 m by 2150. This will have dramatic effects on the entire world's coasts, in the next 10 to 100 years, so that all shorelines that are not natural rock, will become either heavily eroded or heavily reinforced artificially. Anthropogenic stiffening of coastal environments, strengthened to protect existing formations, will hinder the natural system's ability to adjust and adapt to any change. While sea level rise consequences will need to be considered for all shorelines worldwide, the coasts of marginal and enclosed seas, especially those exhibiting high residential density, abundance of historical and cultural sites, and great economic value, due to local maritime activities such as tourism, commerce, transportation, aquaculture and fisheries, will represent special cases to be carefully studied. The cluster of semi-enclosed basins in the Mediterranean region, where geography and history combine to create the cradle of our civilization, embodies such a critical hotspot. At the same time, the basins' morphology offers a unique opportunity to study possible remediations to unchecked sea level rise based on environmental engineering at the basin scale, not dissimilar from the Venetian *MOdulo Sperimentale Elettromeccanico* (MOSE) concept.

A possible solution to provide long-term, sustainable and affordable protection for all coastlines of the Mediterranean Sea and Black Sea, would be to close the Strait of Gibraltar with a dam, thereby regulating the water flow from and to the Atlantic Ocean, and ultimately controlling sea level within the whole basin. The artificial closure of Gibraltar would require a careful evaluation of its effects, difficult international agreements, long realization plans, and relatively high costs. If such a project could ever be realized, the long-term stability of water levels, and of the resulting new environmental equilibrium, would entail appropriate management. Both positive and negative effects would result. On the plus side, the closure would allow an effective control of sea level and provide coastal protection through the inner basins, as well as a significant power generation potential and a land link between Europe and Africa. Adverse effects would include still unknown results of limiting the water exchange with the Atlantic Ocean; rising salinity in the Mediterranean Sea and stronger stratification in the Black Sea; changes in nutrient cycling and ensuing ecological repercussions, including disrupted migration patterns of various species; the need for maritime traffic to go through locks at both Gibraltar and Suez. Specific studies, and a wide debate, should be undertaken, to evaluate the merits of such a solution.

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## Workshop Aim

Aim of the proposed International Workshop would be to discuss (a) impacts of the foreseen sea level rise on semi-enclosed marine basins, the Mediterranean Sea and Black Sea providing the most classical of examples; (b) ecological dangers of widespread coastal reinforcements, which might be adopted in the effort to prevent erosion and flooding; and (c) possible future actions that might be undertaken to protect coastal sites, infrastructures and urban settlements, of which Venice represents the archetype.

## Workshop Structure

The structure of the proposed International Workshop would follow a two-day, four-session scheme:
Day 1, morning session: invited lectures from prominent experts, concluded by Gibraltar Dam address;
Day 1, afternoon session: presentation of and visit to MOSE infrastructures; social event;
Day 2, morning session: round-table discussion, involving selected speakers, and public debate;
Day 2, afternoon session: press conference, to summarize the event and illustrate key findings.

## Workshop Participants

Invited lecturers, and staff, from Institutions based or represented in or nearby Venice (*e.g.*, Universities; *Consiglio Nazionale delle Ricerche*; UNESCO; *Consorzio Venezia Nuova*; Municipal, Provincial, Regional Administrations; NGO's). Further, a limited number of key-note speakers could be selected from the wider international scene, subject to the availability of funds for travel expenses. Morning sessions, in both days, should be open to the general public. Press representatives should be notified and invited.

## Workshop Outcome

Presentations and discussions could be made available online, via live streaming, depending on available funding. Invited lecturers, and international key-note speakers, will be asked to provide a written, summarized version of their presentation. A collection of these short papers will be published in a pamphlet, to be widely distributed in print and online. A comprehensive press release will also be distributed, using the same channels, and later used as an Executive Summary of the event.

## Workshop Follow-up

The Workshop could become a pilot for a series of events, devoted to sea level rise, its consequences and possible remediations, in the greater Mediterranean region. Follow-up workshops, or even full-fledged international conferences, could be envisioned on a multi-annual time scale (*e.g.*, at three-year intervals). A summer school, or a permanent course, could be developed and then offered jointly by local Universities. A proposal for an in-depth study could be submitted to proper funding agencies.

## Workshop Contact

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**Workshop Draft Program**

| | | | |
|---|---|---|---|
| Day 1 | Venue TBD | 09:00 | Opening |
| | | 09:20 | Invited Presentation: sea level rise |
| | | 09:40 | Invited Presentation: semi-enclosed marine basins |
| | | 10:00 | Q&A |
| | | 10:20 | *break* |
| | | 10:30 | Keynote Address: coastal ecological dangers |
| | | 10:50 | Invited Presentation: erosion, flooding, losses |
| | | 11:10 | Invited Presentation: classical coastal protections |
| | | 11:30 | Q&A |
| | | 11:50 | *break* |
| | | 12:00 | Keynote Address: the Gibraltar Dam proposal |
| | | 12:20 | Invited Presentation: Mediterranean basin |
| | | 12:40 | Invited Presentation: Venice future plans |
| | | 13:00 | Q&A |
| | | 13:20 | *lunch break* |

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|---|---|---|---|
| Day 1 | Venue TBD | 15:00 | MOSE Presentation & Visit |
| | | 19:00 | *social event* |

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| Day 2 | Venue TBD | 09:00 | Guided Round-Table Discussion & Public Debate |
| | | 13:00 | *lunch break* |

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| Day 2 | Venue TBD | 14:00 | Drafting of Press Release |
| | | 16:00 | Press Conference |
| | | 18:00 | Closure |