

Unconventional Solution to Control the Sea Level Rise in the Mediterranean (Proposed Idea)

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Abstract The Mediterranean basin is one of the most prominent hotspots of climate and environmental changes. The most common and dangerous impact of climate change is sea level rising. Several countries are suffering from this risk disaster especially the countries of Mediterranean basin. The need for an unconventional and sustainable solution has become necessary and urgent. The current idea is proposing to maintain the level of the Mediterranean by controlling the flowing waters, whether from the Atlantic Ocean or the Indian Ocean, by constructing two mega dams at the western and eastern outlet. The western dam is erected on Gibraltar, and the eastern dam is erected at the Gulf of Seuz. Many environmental, economic and social objectives could be achieved. The solution will need strategical environmental impact assessment study, beside of other geological, hydrogeological and engineering complementary activities. These activities should be preceded construction.

Index Terms— climate change, global warming, sea level rise, unconventional solution, maintiam the Maditreanean level, Gibraltar's dam the Gulf of Suze.

1 INTRODUCTION

The Mediterranean Sea represents the largest of the semi-enclosed seas and occupies a basin of almost 2.6 million km², which corresponds to 6.5 percent of global land area. The length of its coastline amounts to 46,000 km. The basin itself measures about 3,800 km from east to west and 900 km from north to south at its maximum between France and Algeria (UNEP/MAP, 2012). The Mediterranean Sea is surrounded by 23 countries and is home to around 480 million people, corresponding to 7.3 percent of the global population in 2015. The region is located at the crossroad of three continents: Africa, Asia and Europe (European Environment Agency, 2015).

On August 7, 2021 in Geneva a report of the intergovernmental on climate change (IPCC) was released on the physical sciences (IPCC 2021). The report provides new estimates of the potential to exceed 1.5°C of global warming in the coming decades, and concludes that there is no way to limit global warming to 1.5°C or even 2°C without immediate and rapid reductions in greenhouse gas emissions. This assessment is based on improved observational data sets to assess historical warming as well as advances in scientific understanding of the response of the climate system to anthropogenic greenhouse gas emissions.

The 2021 IPCC report notes that climate change is widespread, rapid and intense, and system-wide, and many of these changes have not been seen in hundreds, if not hundreds of thousands of years. Some of these changes, such as the continuous rise in sea level, are irreversible for hundreds and perhaps thousands of years." The role of human influence in the climate system is indisputable"

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hotspots of climate and environmental changes. The Mediterranean region is warming 20% faster than the global average; where regional temperature increases of 2.2°C by 2040 with current policies (Paris agreement target of 1.5 °C) (MedEC,2019). The most dangerous and common impact of climate change is sea level rising. Similar to worldwide trends caused by warming and loss of glacial ice. Sea level in the Mediterranean has risen between 1945 and 2000 at a rate of 0.7 mm per year (Calafat FM, Gomis D., 2009) and between 1970 and 2006 at the level of 1.1 mm per year (Meyssignac B et al., 2010). There has been a sharp increase during the last two decades as sea level rise reached about 3 mm per year (Tsimplis MN et al. 2013). Sea level rises may be exceeded 1m by 2100, impacting 1/3 of the region's population. half of the 20 global cities set to suffer sea level rises by 2050 are in the Mediterranean (MedEC,2019).

Human-caused carbon dioxide (CO₂) emissions should be fall by 50% by 2030 relative to 2010, and to net zero by 2050. Reaching these targets will require serious, interconnected economic and societal transitions at macro and micro levels that depend on technological innovation and commitment from governments and businesses. Failure to implement effective regional or global climate policies increases the risk that countries may decide unilaterally to implement engineering projects. (Proctor, J., et al. 2018).

JUSTIFICATIONS

The recent failure at the 2019 UN climate change conference (COP25) to develop a rule book for a new global carbon mar-

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ket means there is not yet a credible system that would allow countries to pay each other for projects that reduce emissions. Finally, in November 2021 a global cry launched by the United Nations at its twenty-sixth summit (COP26) on climate change in Glasgow, which included 195 countries in an attempt to reach a global agreement that would spare the planet catastrophic scenarios that threaten its future. Being the last chance to take decisive action to reduce carbon emissions is a lifeline for humanity.

Either current international or local efforts and actions still aren't enough to reduce the carbon dioxide emissions, therefore it is expected the negative impacts of climate change will be more numerous and the associated risk disaster will be dangerous. The artificial and induced projects that are used to protect the coastal cities and deltas in Mediterranean region aren't sustainable and not integrated.

PROPOSED SOLUTION

The need for an unconventional and sustainable solution has become necessary and urgent. The current idea is proposing to maintain the level of the Mediterranean by controlling the flowing waters, whether from the Atlantic Ocean or the Indian Ocean, by constructing two mega dams at the western and eastern outlet. The western dam is erected on Gibraltar, and the eastern dam is erected at the Gulf of Suze.

These two mega dams would have led to the maintaining and controlling the water level in the Mediterranean Sea and as well the Black Sea, protect many coastal cities from the sea flooding and many agricultural acres from the salt water inundation. Proposed solution would provide land, food, employment, electric power, and, most of all, a new vision for Europe and neighboring Africa and Asia.

The proposed dams aren't to prevent the water flows as a whole, it will save the level of Mediterranean Sea and prevent any increase in the future due to the climate change manifestations. The construction works will be consisting of two parts; first as a dam to control water flow, second as a lock to allow ship's movements. Sites of the two engineering constructions should be selected carefully, according to their functions and some other considerations.

Proposed solution is not for colonization purposes or for generating the power as main target. But it deals firstly with environmental purposes, another addition economic benefits can be achieved automatically. It concerned with controlling of the Mediterranean inflow from the Atlantic and Indian oceans not outflow.

The proposed Gibraltar's dam can belong to storage or gravity dams, but its scale will be large, and construction would require an unprecedented effort probably over many decades. The maximum underwater height is twice that of the Great Pyramid of Egypt (~= 274m). If the dam has a 70-m-wide top, and if a rock material is used with a 30° angle of repose, the required volume would be 1.27 km³. (EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION (1997).

The comparison between the specifications of the proposed dams with the another famous mega dams in the world in the terms of construction, it proved that the construction of it may be both politically and technically feasible. "Nurek dame in

Tajikistan is 300m high and 700 m wide, while Tarbela dame in Pakistan is 143,3m high, 2743,2m long". Past experience of Netherlands has been able to design many like such dams to protect the newly cultivated land.

Dam design, methods and the material of construction would need to be developed to avoid underwater debris flows of dam material while the dam is being built, and afterward under seismic stresses.

COMPLEMENTARY ACTIVITIES

Expected environmental impact assessment for biodiversity, special flow, wave pattern, and Water salinity, beside of many other Physical environment activities must precede construction. Such other activities as far as the following elements: field survey; geotechnical exploration structures; geological and hydrogeological history; the paleo-morphological characteristics; geotechnical tests on obtained samples by means of coring and lastly realization of a comparative study of off-shore drilling techniques. Engineering activities deal with engineering designs should be compatible with optimize functions of dams. All of these complementary studies will be completed after the idea is reviewed, approved and published.

REFERENCES

- UNEP/MAP (2012): State of the Mediterranean Marine and Coastal Environment, UNEP/MAP - Barcelona Convention, Athens, Greece, 96 pp.
- European Environment Agency (2015): Mediterranean Sea region briefing Meyssignac B. et al (2010): Two-dimensional reconstruction of the Mediterranean Sea level over 1970–2006 from tide gage data and regional ocean circulation model outputs. *Global and Planetary Change*, 77(1-2), 49-61
- Environment Agency, Source: www.eea.europa.eu/soer/2015/countries/Mediterranean, Access date: 25.06.2020, 2015.
- Intergovernmental Panel on Climate change (PCC) (2021): Climate Change 2021. The Physical Science Bases. Six Assessment Report of the Intergovernmental Panel on Climate change.
- MedEC (2019): Risks Associated to Climate and Environmental Changes in the Mediterranean Region.
- Calafat FM, Gomis D (2009): Reconstruction of Mediterranean Sea level fields for the period 1945-2000. *Global and Planetary Change*, 66(3-4), 225-234.
- Tsimplis MN et al. (2013): The effect of the NAO on sea level and on mass changes in the Mediterranean Sea. *Journal of Geophysical Research: Oceans*, 118, 944-952
- Proctor, J., S. Hsiang, J. Burney, M. Burke and W. Schlenker. (2018): Estimating Global Agriculture Effects of Geoengineering Using Volcanic Eruptions". *Nature* 560 (2018): 480-83. <https://www.nature.com/articles/s41586-018-0417-3>.
- Sörgel, Herman (1932a): *Atlantropa* (3rd, illustrated ed.). Zürich: Fretz & Wasmuth.).
- United Nations (Economic and Social Council) (2001): Project for a Europe-Africa permanent link through the Strait of Gibraltar. Substantive session of 2001 Geneva, 2-27 July 2001 Item 10 of the provisional agenda* Regional cooperation.

EOS, TRANSACTIONS, AMERICAN GEOPHYSICAL UNION (1997): Climate Control Requires a Dam at the Strait of Gibraltar. Eos, Vol. 78, No. 27, July 8, 1997, PP 277-284.

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