

Twin Transitions in the Mediterranean: Environmental & Digital

The Green Transition in Mediterranean Countries: Challenges and Perspectives

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The Mediterranean (MED) region's peculiarities make it a microcosm of economic, social and environmental characteristics at the global level. Heterogeneous ethnic groups with diverse religious beliefs reside in the coastal states. A strong divergence at the economic and social level between the northern and southern coasts is consolidating, with a worsening trend over the last decade in conflict areas. Mediterranean countries differ also in terms of environmental vulnerabilities and tipping points for biodiversity losses (Aurelle et al., 2022). Furthermore, institutional systems differ greatly, indicating the potential for asymmetric responses in case of serious climate events. Climate change will aggravate the fragility of the Mediterranean ecosystems and anthroposphere. The increasing frequency of heatwaves and extreme events has the potential to drastically reduce agricultural productivity, which will inevitably affect the MED region's food self-sufficiency, with possible consequences in terms of political stability and climate-related conflicts (Ali et al., 2022; Cappelli et al., 2022). Moreover, the Mediterranean is one of the most vulnerable areas to sea-level rises: coastal exposure and coastal GDP are twice as high as the rest of the world (Dasgupta et al., 2011; Guida et al., 2022). This means that the negative implications of climate change will be par-

ticularly severe on the coastline where much of the local GDP is concentrated.

Among climate-related problems, water scarcity plays a central role in the MED area. In this region, around 180 million people live in conditions of water poverty, and an additional 60 million people live under water stress (MedECC, 2020). A relevant indicator explaining the exposure of MED to water scarcity is the use of freshwater for human consumption. This is measured by the Water Exploitation Index (WEI), defined as the average annual consumption of freshwater as compared with the long-term average freshwater resources. As shown in Chart 2, the most water-stressed Mediterranean countries have a WEI above 40%, which is often considered a policy-relevant threshold, and some of them (Egypt, Israel, Syria, Libya and Malta) have WEIs exceeding 80%.

Interestingly enough, all the water-stressed countries represented in Chart 2 are in the Middle East and North Africa (MENA) region. In this area, water scarcity is set to increase between 15% and 45% by 2100 because of climate change (Waha et al., 2017). Moreover, in the MENA region the population is estimated to double by 2070 (Selvaraju, 2013), thus exacerbating water scarcity problems. According to existing projections, water poor will exceed 250 million within 20 years.

The likelihood of overshooting natural resource consumption obviously increases with the population, and the implications of water overshooting is dire, to say the least. The UN expects the MED area to reach a demographic plateau at around 650 million people by 2060 (United Nations, 2019). Within the MED area, however, we can distinguish two separate trends between northern and southern countries. The northern countries are those in the European sphere of influence from Türkiye to Spain, including

Cyprus and Malta, while the group of southern countries encompasses the geographic area stretching from Morocco in the west to Syria in the east. As Chart 3 shows, population growth in the northern countries is expected to stop by 2030, whereas the population in southern countries will keep rising until the end of the century. Indeed, the high birth rates of countries such as Egypt will boost population growth

in the South, while the very low birth rates of countries such as Italy and Greece will inevitably imply the depopulation of northern countries. In around five years, the southern countries are expected to become more populous than the northern ones, thus further worsening water scarcity in an area that is already above its threshold in terms of the exploitation of its water resources.

CHART 2 Water Exploitation Index (WEI)

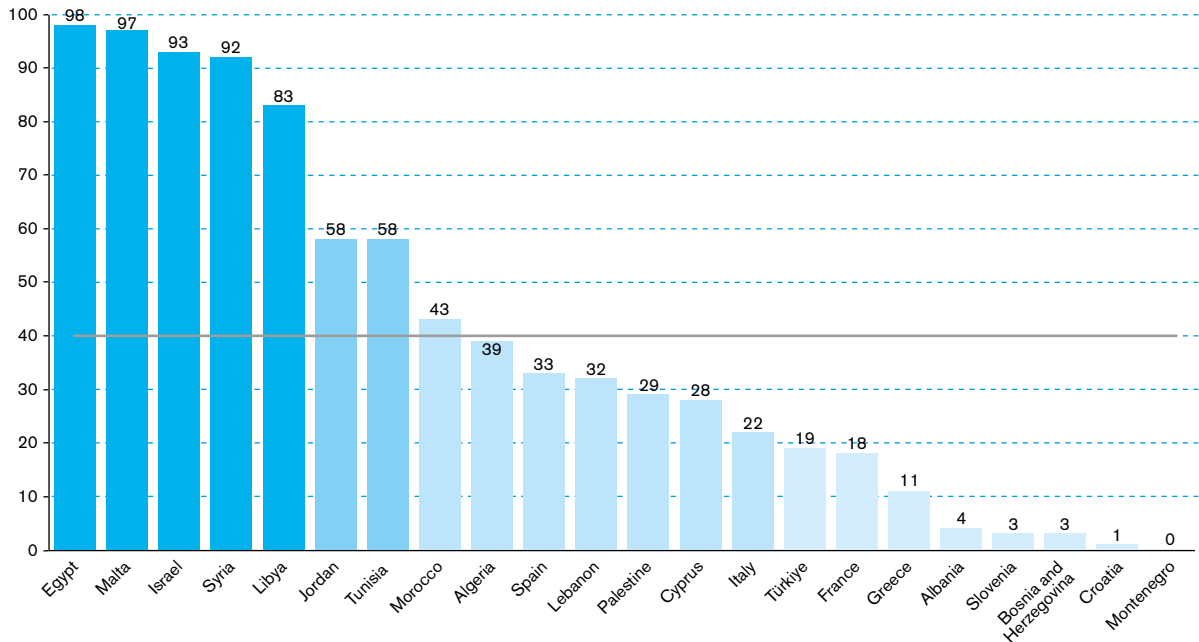
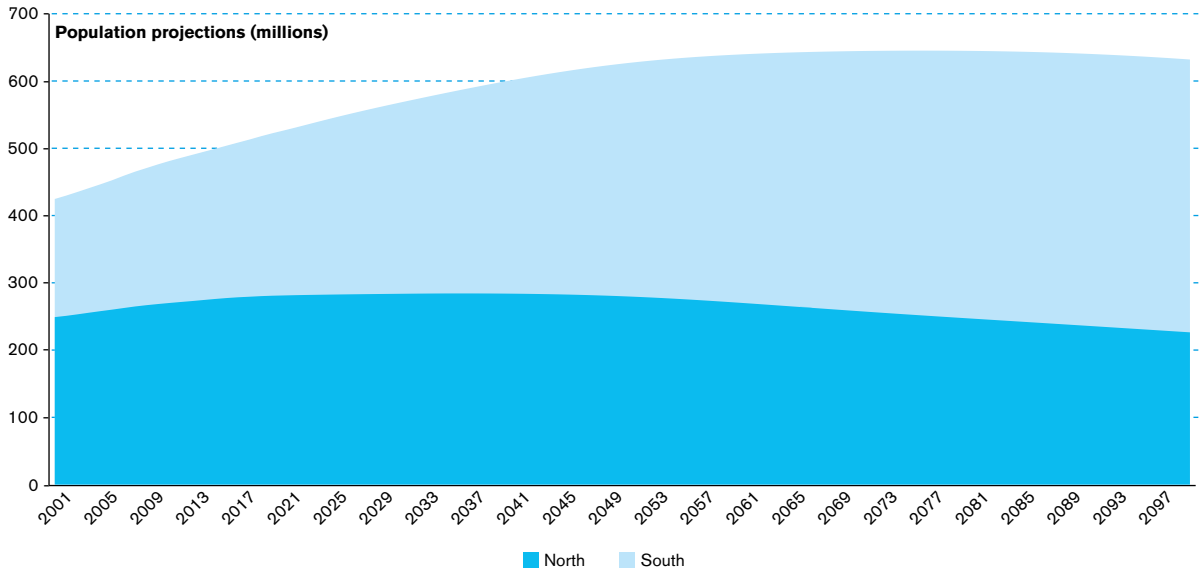


CHART 3 Population of the MED Countries Divided by Geography



The role of water is tied to various aspects of economic development and, therefore, long-term political stability. Among these aspects, we find energy and food that are strictly intertwined with water for their very nature, thus forming what is known as the Water-Energy-Food (WEF) nexus.

The Water-Energy-Food Nexus in the MED Area

Water plays a key role in many energy production processes. Among these, energy production from cheap energy sources such as oil and gas requires water to convert potential energy into electricity. Green technologies such as wind or solar panels require water in the manufacturing process as well as the refining of precious minerals. Water, moreover, generates hydropower energy and allows the growth of biofuel crops that are used for energy production. While these examples clearly show that energy depends on water, the opposite is also true. Indeed, energy is essential for the abstraction, purification and distribution of water. And both water and energy are essential for food as they allow us to grow crops, raise livestock, process food and increase land productivity. At the same time, sustainable land management through livestock and crop growth supports the water cycle rather than depleting it by returning water to the environment. Thus, water, energy and food are connected in a complex nexus, vital for the long-term stability of the MED area. Outward and inward vulnerabilities characterize the nexus. Putting it in simpler words, if each node works, the whole network may perform well. If one node does not work, the entire network fails. And, as happens in network theory, the strength of the overall network is equal to that of its weakest node.

Water drives the economic progress, welfare and health of all countries across the world. Its abundance or absence determines the stability of countries. The intricate yet delicate ecosystems of the MED regions are no exception to this rule. The existing vulnerabilities of the WEF nexus in the MED area exacerbate the instability problem of many countries in this region. In particular, due to lack of water and energy, only a few MED countries are self-sufficient in terms of food, while most of them rely on some level of imports (Clapp, 2017). However, the situation differs remark-

ably between the northern and southern coast of the Mediterranean. Most of the countries on the northern coast of the Mediterranean have a geographical advantage, consisting of access to the Black Sea, where two of the world's major food exporters (Ukraine and Russia) need to pass to access global markets. Moreover, as Baer-Nawrocka & Sadowski (2019) point out, while most countries on the northern coast have some need to import food, such a trade deficit is offset in value by crops like olives and wine.

Conversely, the southern coast of the Mediterranean is largely dependent on external producers to satisfy its growing demand for food. The situation is dire as crop yields for cereals have been in a steady state since the start of the 20th century, particularly in a country like Egypt, which has one of the most rapidly increasing populations on the planet. The demographic trend of the southern MED countries risks triggering a vicious circle of increasing demands for food and energy, increasing water scarcity and increasing import dependence, at a time when energy and food prices are dramatically high due to the war in Ukraine. This is bound to raise inequality between northern and southern countries in the MED area, thus reinforcing the migration flows that have been observed, sometimes with dramatic consequences, in recent years.

Water, energy and food are connected in a complex nexus, vital for the long-term stability of the MED area and characterize by outward and inward vulnerabilities

Breaking the vicious circles of the WEF nexus requires a rapid change in the socioeconomic paradigm that should be based on the Green Growth paradigm (World Bank, 2012) and on the targets set by the Sustainable Development Goals (SDGs). The latter provide a solid multidimensional framework to measure the advancements in the social, economic and sustainable spheres that are simultaneously needed to transform the WEF nexus from a vicious circle into a virtuous one in the MED area.

SDG Trends in the MED Area

The three pillars of the WEF nexus are also three key goals among the 17 Sustainable Development Goals set by the United Nations in 2015 for a sustainable future. In particular, water is strictly related to SDG6 (clean water and sanitation), energy to SDG7 (affordable and clean energy), and food to SDG2 (zero hunger). But the WEF nexus ends up affecting all other SDGs as well. Think, for instance, of SDG10 (reduced inequalities). A differential access to water, energy and food is likely to enhance inequalities both within and across countries, thus hindering the achievement of SDG10. On the contrary, a cooperative approach across countries/regions aimed at improving the WEF nexus can lower existing inequalities and help achieve SDG10.

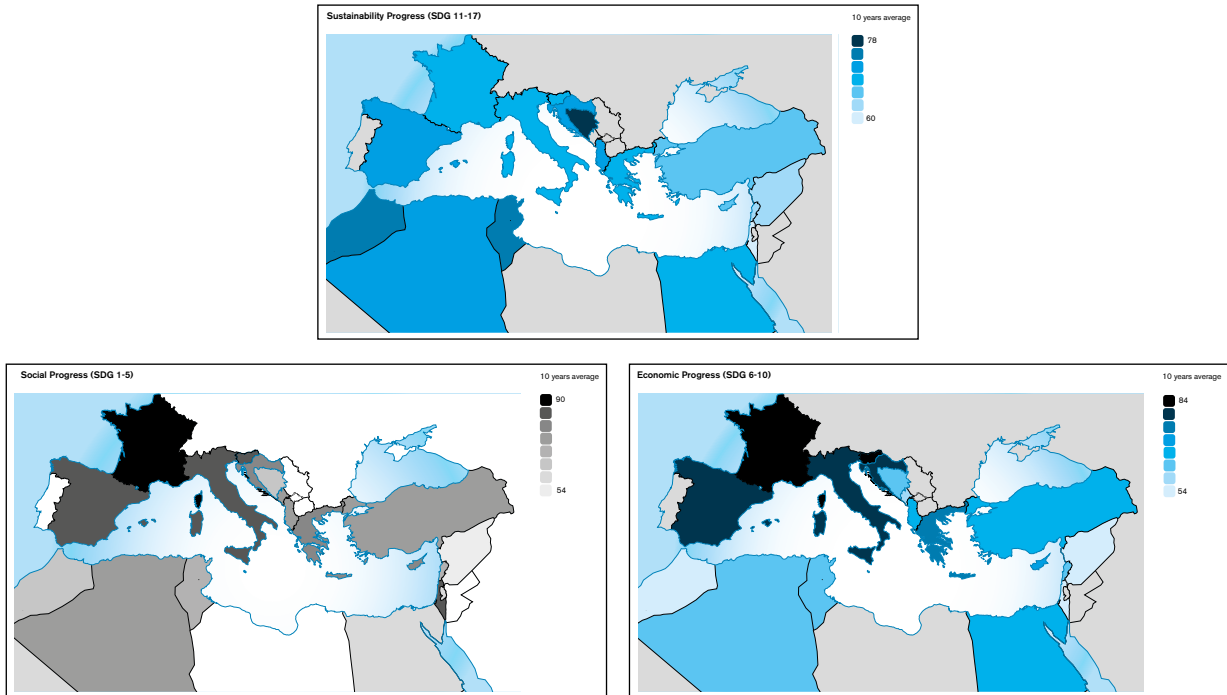
In this section, we will dig deeper into the trends of the SDGs in the MED area in order to capture advancements in social, economic and sustainable spheres in the region. For this purpose, we will aggregate the SDG indicators into three groups: the Social Progress area encompassing SDGs 1 to 5; the Economic Progress area including SDGs 6 to 10; and, finally, the Sustainability Progress area with

SDGs 11 to 17. These indicators vary between 0 (for the worst performing countries) and 100 (for the best performing ones). Map 1 shows the average values of the three resulting indicators measured between 2012 to 2021.

The map is useful for highlighting major differences between the sub-regions of the MED. The northwestern coast presents the highest performance in terms of economic and social progress. In fact, the observed values of such areas score above 80 indicating that these nations perform better than 80% of all countries at the global level in terms of quality of life and societal well-being. However, these nations perform relatively poorly in terms of sustainability. The sustainability area suggests that countries on the southwest coast present the best performance in the region. They score more than 70, indicating that their performance is relatively high compared with other nations at a global level. Cross-sectionally, the social and economic thematic areas present the greatest gap among regions of the MED area, with more than 30 points of difference between northern and southern areas. Regarding sustainability, instead, we see only ten points of difference between the laggard State of Syria compared to Morocco, the top performer.

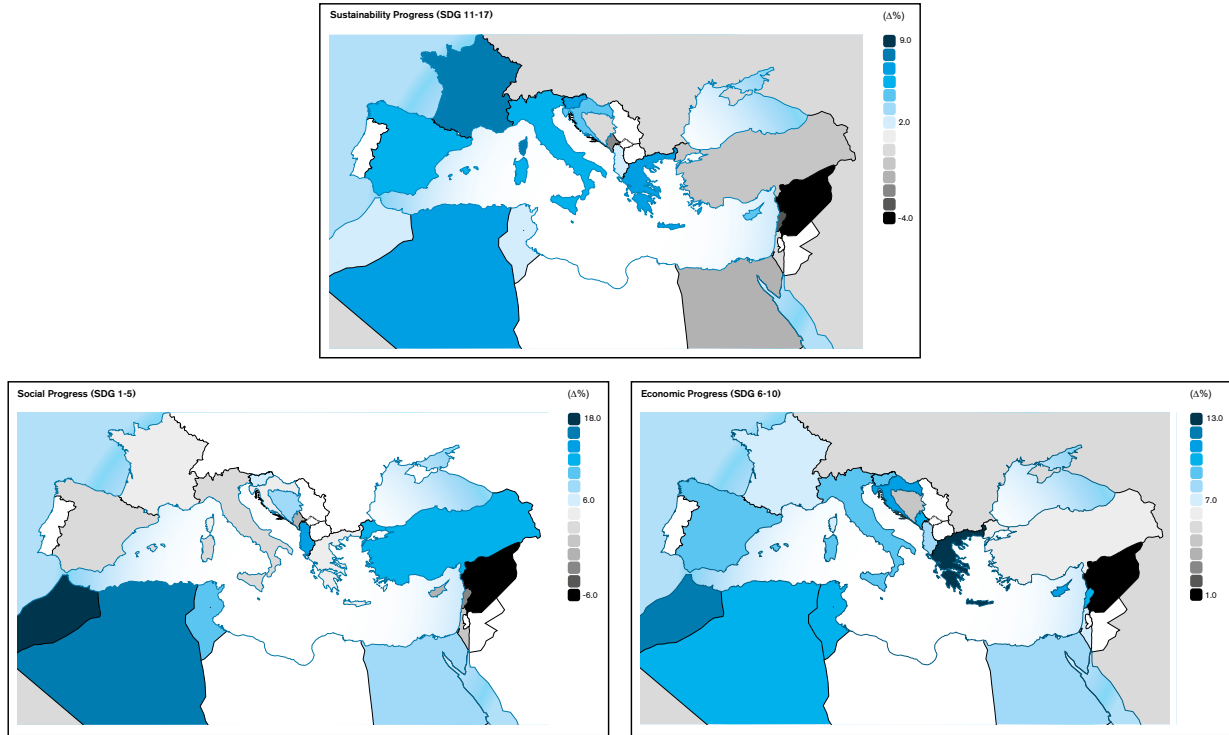
MAP 1

SDG Areas, 2012-2021 Averages



MAP 2

Percentage Variations in the Different Countries



The map also provides other interesting insights. First, there is no data for Libya, as can be seen on the map. The country has registered no entry for the SDGs since the beginning of the observation period, which is the year after the Libyan crisis began. The impossibility of having one government in the country makes it hard to catalogue and thus observe changes. The second relevant area is Syria, which shows a poor performance (worse than all other MED countries) in all thematic areas. This is a country facing conflict since the emergence of ISIS. From these two instances, we can intuitively argue that local conflicts can either stop a country's progress or cause it to roll back from its past achievements.

Further insights could be gained from a dynamic perspective, by following the evolution of the indicators over time. Map 2 presents the percentage variations for each indicator over the whole observation period (2012-2021).

The different subregions of the Mediterranean are experiencing forms of convergence in certain SDG areas and divergence in others. For instance, a few countries (Montenegro and Syria) display wors-

ened performances in terms of sustainability, showing negative variations in the observed period. Overall, the greatest improvements have been registered on the northwestern coast. While these are the biggest economies with the greatest footprint, advanced climate policies and decreasing total emissions are yielding their fruits. Conversely, some form of north-south convergence appears in the societal and economic thematic areas, in which the southeastern coast shows a very positive performance in general, while the northwestern coast has had modest improvements. However, it must be noted that the starting points were rather different. The former group was made up of developing countries, while the latter was formed by G7 members. Finally, as regards sustainability progress, even in this case, Syria and Montenegro show significant backsliding in both the economic and societal thematic areas, with negative variations of up to six points. Bosnia and Herzegovina also regressed in economic terms over the observed period. This confirms once more that conflict and institutional fragility are likely to play a key role in determining the failure of the SDGs.

Discussion and Conclusions

The MED region is characterized by various complexities and unexplored potentialities in the long term. While there is vulnerability to climate change and its fragilities, there is also growth potential and regional synergies. The most relevant challenge in the long term concerns the interdependency between water, energy and food. Mastering the WEF Nexus is a necessary step toward a MED that may become resilient not only to climate change but also to political and systemic crises. Another closely related challenge is the persistent gap between the northern and southern coasts of the Mediterranean, both in economic and social terms, that the SDG indicators underline. Evidence shows encouraging signs of a progressive convergence in economic and social indicators, although there is a long way still to go, given the large differences in the starting points of northern and southern MED countries. This progressive convergence is highly desirable if we are to achieve some form of cooperation capable of sustaining the WEF Nexus. Indeed, the natural characteristics of the region make isolated solutions difficult and potentially ineffective, especially regarding food, energy and water.

Achieving self-reinforcing and positive dynamics in the WEF requires at least four elements. As pointed out above, conflicts can significantly hurt a country's performance in the SDGs' three thematic areas. This means that institutional stability provides one of the founding pillars of a self-reinforcing WEF nexus. The main conflicts afflicting the Med areas are internal rather than international. This suggests that intraregional diplomacy could assist in solidifying institutional stability, making it the second pillar. If national and international institutions operate according to a democratic mandate based on the rule of law, data collection could provide solid measurements of actual improvements and progress towards the SDGs. The third pillar is, therefore, open information. This requires the proper monitoring of the most critical situations, and supports intraregional dialogue, necessary to promote and implement the policies needed to improve the WEF nexus. Finally, the creation and improvement of a financial and/or fiscal space among MED countries could help the creation and diffusion of better technologies, thus representing the fourth pillar in support of the WEF nexus stability.

Political asymmetries and economic divergences characterize the MED area. Attempts to achieve convergences have been tried within nations. A good example of this is Italy, presenting an exemplary difference between the laggards' performances of the South versus the competitiveness of the North. While geographical and historical reasons have been used to motivate such a divergence, unstable politics, inefficient policymaking, and victim culture have a responsibility in shaping the distance between the two areas. The approach of direct transfers from the northern to the southern regions has achieved little or no results with respect to convergence. Solutions need to be found by applying lateral thinking rather than tested (and failed) policy approaches based exclusively on market deregulation, minimal public intervention and weak international institutions. A more holistic approach should be adopted incorporating the idea that resource policies in one country will necessarily spill over to other nations, especially in a scarcity context such as ours (Antoci et al., 2017). Cooperative approaches could overcome long-term conflicts over access to resources such as water and fisheries and mitigate the transboundary issues and inter-country competition, as long as they are based on common intentions.

The natural characteristics of the region make isolated solutions difficult and potentially ineffective, especially regarding food, energy and water

However, purely political solutions, even when backed by democratic and open institutions, may fail to correctly weigh up the costs and benefits of resources. The market provides openly generated signals when backed by the rule of law and competition. Furthermore, market signals offer indications of risk and scarcity. While it is not a perfect institution, the market is useful to price commodities and give the correct measure of how valuable and scarce a resource is, whether it is water or the skills of a doctor. Environmental economists think that pricing can be a suitable instrument to address environmental prob-

lems such as pollution, water scarcity and energy efficiency. While it is not the only instrument and not the panacea to all problems, it can be (and has been) used to design effective environmental policies in the past, generating positive spillovers in the present.

In this respect, a pricing approach based on virtual water trade could be influential in determining a cooperative solution to the WEF nexus in the MED area. By virtual water, we mean the amount of water embodied in the products that are traded across countries. Some countries import very water-intensive goods, shifting the burden of water consumption on the exporting countries. Sometimes, we have observed that this creates a perverse mechanism: water-rich countries, which are often wealthy, import water-intensive goods from water-poor countries, which incidentally are economically poorer. This occurs, for instance, at the global level with the trade of avocados (Caro et al., 2020). To prevent this from happening, one could use virtual water trade so that consumer countries pay for water embodied in imported products. A pricing mechanism could produce a signal that motivates efficiency measures and reduces water pollution, waste and scarcity, all problems that are particularly severe in the MED area.

The adoption of a pricing mechanism based on virtual water trade across MED countries could represent a prototype for similar applications at the regional or global level in the future, and it could spur cooperative solutions to be implemented among MED countries. While at first glance, these proposals may sound provocative and politically unfeasible, they may be needed if we do not want the WEF nexus to become a poverty trap for the MED area in the long run.

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