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The contribution of clean energy to stability, cooperation and shared prosperity in the Mediterranean region

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Abstract

Blessed with high levels of solar irradiation throughout the year, as well as wind power in desertic areas, southern Mediterranean countries like Egypt, Tunisia, Morocco and Algeria hold massive renewable energy potential which is considered to be among the highest in the world. Such conditions would seem to provide an unprecedent rationale for promoting greater renewables' penetration as a driving force for transformative socio-economic development in the region. Additionally, given its strategic geographical position, North Africa is a place of election for future clean electricity/green hydrogen interchange with the larger European market, which is currently on a race to zero carbon footprint by 2050. However, such conditions *per se* would not allow the success of a hypothetical "Euro-Mediterranean" Green Deal and several challenges keep standing on the way to a virtuous change of pace in North African economic models and reinvigorated between-shores energy cooperation. This work seeks to formulate broad recommendations on the crucial steps to be taken to unlock the full potential of clean energy to contribute to shared prosperity and stability across the Mediterranean basin.

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“Prosperity, like peace, is indivisible. We cannot afford to have it scattered here or there among the fortunate or to enjoy it at the expense of others.

Poverty, wherever it exists, is menacing to us all and undermines the well-being of each of us. It can no more be localized than war, but spreads and saps the economic strength of all the more-favored areas of the earth “

Address by Henry Morgenthau, US Secretary of the Treasury, at the Inaugural Plenary Session of the Bretton Woods Conference (July 1, 1944)

Introduction

New policy roadmaps and development models are shaping the context in which energy cooperation between the European Union and North Africa will be pursued in the forthcoming decades. Among them the European Green Deal, an all-encompassing strategy aimed at profoundly restructuring the EU's social and industrial ecosystems, and whose ambition is to make Europe the first carbon-neutral continent by 2050. Most significantly, the EU Green Deal is a key component of what the Von Der Leyen Commission defined as a more "geopolitical EU".

This scenario couples with the launch of the European Union's "new Agenda for the Mediterranean 2021-2027", which in February 2021 welcomed a "renewed partnership with the southern Neighborhood". Adopted ten years after the Arab uprisings, the political vision on which the document is grounded aspires to relaunch dialogue and cooperation, by incorporating the twin strategic priorities of the green and digital transitions.

In parallel, North African governments themselves are increasingly considering diversifying their respective energy landscapes, with a transition that is slowly gaining momentum despite mixed results and speeds. Indeed, already in the past decades fossil fuel exporters have been challenged by a drastic upward trend in domestic power demand and were forced to divert shares of production away from exports; with global climate ambitions expected to exert significant pressure on major economies' trade partners, the rationale for diversification becomes increasingly compelling.

The first chapter of this work investigates the requisites to be met in order to implement decarbonization pathways that are firmly anchored to North Africa's socio-economic development. The area witnesses the presence of both regional energy exporters and energy importers; if the former are expected to embark through a period of increasing uncertainties for their revenues, for the latter energy diversification could be a game-changer with regards to "soft power" and commercial

relations. However, the chapter argues that there will be no clear-cut redistribution of winners and losers from the global energy transition, and that the final outcome of the process is far from intuitive. In order to develop a roadmap for sustainable energy transition, different sections discuss present weaknesses in the regional energy landscape along with the nexus existent between energy and water-food security. Finally, special attention is dedicated to the assessment of how diversification plans fit into North African governments' external policy agendas.

The second chapter deals with aspects of energy diversification that can be leveraged to catalyze broader benefits across the Mediterranean region, by dwelling on those that can contribute to alleviate drivers of instability in North Africa. Object of analysis are the effects of the Green Deal on future EU energy diplomacy; the extent to which energy diversification and the objectives of the "new Agenda for the Mediterranean 2021-2027" are mutually reinforcing; the possible impact of clean energies (both locally deployed and traded) on the mitigation of irregular migration flows, as well as on the revitalization of popular support for the fragile democratic institutions in Tunisia.

The third chapter provides a comprehensive analysis of future dynamics that are expected to restructure and relaunch energy cooperation between the northern and southern shores of the Mediterranean basin; these are underpinned by innovative policy frameworks such as the "EU Hydrogen Strategy for a carbon free Europe". The chapter introduces the political and economic case for the creation of electrical interconnections between the two continents, along with the related projects already underway and past initiatives that failed to deliver and from which several lessons can be learnt. The second part presents existent outlooks for the creation of a hydrogen economy in North Africa that entails a green hydrogen export market to bridge the two continents through new positive bounds of energy interdependence.

A final chapter deals with the importance for the EU to play a constructive role in the implementation of clean energy plans in its southern Neighborhood. It briefly introduces the different instruments leveraged by the Union and its individual Member States to impulse the creation of clean energy

ecosystems within North African countries while explaining why an engagement at a more cohesive EU level would be more advisable than the present strategy. As an integral part of this reflection exercise, it presents the commercial and diplomatic threats possibly arising from the rapid entrenchment of competitors powers in the emergent markets, notably referring to China.

CHAPTER ONE

Tying energy diversification to socio-economic development in the EU' southern neighborhood

1.1 The North African region: winner or loser of the global energy transition?

The decarbonization pathways which global economies appear to inevitably undertake in the foreseeable future, present North African countries with an imperative to re-think and re-evaluate their traditional energy strategies, accelerating clean energy transition as part of their economic growth trajectories.

The regional landscape is witnessing a powerful combination of economic development, exponential demographic growth and hyper-urbanization. In parallel, North Africa faces a number of challenges such as unstable energy imports and exports, increasing pressure on environmental resources, youth's expectations of socio-economic advancement and political transformations. The projected rise in domestic energy demand driven by upward demographic trends, combined with the untapped opportunities for energy efficiency improvements and the vast, yet largely under-exploited abundance of low-carbon energy sources, hold important premises for the region's future energy systems. North Africa is in fact home of some of the most favorable sites in the world with respect to solar irradiance and wind potential in both coastal and desertic areas.

Hence, sustainable energy transition offers opportunities for North African countries to transform their energy infrastructure, including how energy is supplied and consumed across the region, in ways that can *meet a growing energy demand, diversify the economy, create much needed employment and promote a more inclusive socio-economic development*. In parallel, it could contribute to building climate resilience, achieving Sustainable Development Goals and aligning with the principles set out in the vision of the African Union's Agenda 2063. The business case for diversification of energy supply in North Africa is supported by a reduced import dependence for regional net energy importers, whereas traditional net exporter would have the chance to focus on high-value exports, strengthening local value-chains and better managing the growth of external demand.

Furthermore, energy transition is a fundamental ally with regards to *environmental resilience*, contributing to reduce air pollution and improving quality of life and welfare. Urban air quality has indeed deteriorated dramatically across the whole MENA region in the last decades: only 3% of cities with more than 100 000 inhabitants in low- and middle- income countries meet WHO air quality guidelines.[1] Equally, climate resilience acquires particular relevance within the regional energy transition debate, as North Africa has been identified as one of the world's most susceptible regions to climate change. Water stress, for example, represents an acute and growing problem: due to rapid population growth and depleting groundwater reserves, per capita water availability across the area is increasingly constrained: in Morocco, it has fallen by almost 80% since 1960,[2] whereas in Egypt, concerns over the impacts on water and electricity security underpinning the Ethiopian Renaissance Dam massive hydro-electric project prompted threats of war[3]. Egypt is in fact the only North African country where hydropower generation accounts at least for one-fifth of final energy consumption[4]. Rising sea levels and desertification are also shared concerns. In Egypt's Nile Delta, up to 15% of the most fertile arable land is affected by increasing saltwater intrusions, whereas in Tunisia an estimated

[1] IRENA, Global Renewables outlook: Energy Transformation 2050, April 2020
[2] IEA, *Clean Energy Transitions in North Africa*, 2020
[3] https://www.aljazeera.com/news/2021/4/7/egypt-warns-ethiopia-of-potential-for-conflict-over-blue-nile-dam
[4] IEA, *Clean Energy Transitions in North Africa*, 2020

95% of the arable land is to some extent affected by desertification[5]. Given that the agricultural sector is one of the largest sources of fiscal revenues in North Africa, prospects of future degradation could affect livelihoods across the region and food security in a broader sense. Such environmental vulnerabilities also entail that the region's energy infrastructure planning must be climate-resilient in order to ensure energy security for all. Hence, decarbonization pathways are instrumental for the regional governments not only to achieve their climate commitments, but also, crucially, to mitigate environmental obstacles to socio-economic development ambitions.

Notwithstanding the tremendous renewable sources' endowments of the region, the energy transition and the way the latter will redistribute winners and losers at the global level is unlikely to be a function of renewable potential, but rather a function of policy, market size and timing. Indeed, whereas the sun shines and wind blows on plenty of states, not all of them appear to be recipients of sufficient renewable technologies investments; this may be due to uncertain or non-existent policy and regulatory frameworks, to small and insufficiently attractive markets, or even to political paralysis and staggering financial conditions.[6] Likewise, trade in renewable energy technologies is unlikely to be shaped by the type of "natural" comparative advantage that involves trade in fossil fuels. On the contrary, since renewables are much less geographically concentrated, countries are expected to specialize in those aspects of renewables' supply chain in which they have a comparative advantage based on factors such as technology, relative price or cost of transport.[7] Hence, the winners of the post-carbon economy, also referred to as "hydrogen economy", are the countries that will manage to transform faster than the others, not only in terms of building infrastructures, but also in terms of innovative policies, fruitful political agreements and prosperous business environment.

[5] Ibid.
[6] IRENA, A New World: The Geopolitics of Energy Transformation, 2019
[7] Ibid.

Countries endowed with hydrocarbon resources are currently in a race of time assuming very ambitious plans and green agendas pursued either by the European Union and other major international players. This is especially true also given the re-engagement of the Unites States under the Biden administration, which has injected new energy into the international climate change debate. Indeed, such renewed commitment to decouple economic growth from resources abuse is expected to exert considerable pressure on major economies' trade partners.

While energy transition seems to be inevitable, there is no universal strategy for transformation. Every country must formulate its own responses to problems such as how to redistribute post-carbon economic wealth, what role and to what extent the state will play a role as a driving force for transition, what the new social contract will be like in societies where political consent has been traditionally underpinned by hydrocarbons-based wealth. The ability to answer to similar questions in a timely manner, as well as the type of answer given will largely determine the distribution of the new winners and losers of the post-carbon world. To this end, the interim period which will precede full deployment of hydrogen and renewable power by international economies will be crucial. With regards to the EU southern neighborhood, it would be advisable for regional economies to take advantage of such interim period to enhance cooperation in the energy sector. However, the area currently records one of the lowest levels of regional economic integration in the world. Suffice it to consider that with a mere 5.9% export to the region, intra-regional trade is a fraction of the countries' total trade[8]. The five countries spanning North Africa present also significantly different circumstances that influence their energy transitions trajectories: the region includes large hydrocarbon producers and exporters (Algeria, Egypt and Libya), as well as countries that rely heavily on imports to meet domestic energy demand (Morocco and Tunisia). In parallel, the socio-economic and political contexts vary widely and intra-regional frictions are not excluded. Nonetheless, the possibility to enhance cooperation with a view to maximizing energy

[8] https://ec.europa.eu/trade/policy/countries-and-regions/regions/euro-mediterranean-partnership/

diversification's benefits has been introduced in February 2020 by the Maghreb Electricity Committee (COMELEC). During its annual meeting in Tunis, the Committee announced the launch of a study for the gradual establishment of an integrated Maghreb electricity market, which should become operational by 2025. The creation of a cross-regional power pool should address the growing regional demand for energy by making full use of solar power, allowing flexibility in accessing power capacity from other countries, thus improving efficiency in a cost-effective manner. It would possibly cover a market of over 100 million inhabitants and contemplate the possibility to establish common power plants. Regional electricity trade would in fact allow utilities and market stakeholders to take advantage of economies of scale, enabling the development of large-capacity plants and access to low-cost and more efficient supply options. With this spirit, the first Pan-Arab Energy Trade Conference had likewise been organized in 2019 by the Arab League in cooperation with the World Bank, thus extending the business case for regional connectivity to the whole MENA area[9]. The ratification process of legal and market agreement has been approved in the summer 2020, setting the stage for the parties to finalize their internal procedures in preparation for signing the agreement in 2021. Despite the latter initiative constitutes beyond any doubt a milestone, the operationalization of the agreement will be a lengthy and complex process that will require sound political backing from relevant governments. Indeed, whereas the unique momentum created by the energy diversification agenda and COVID-19 brings a great deal of hope for the transformation of regional systems, the distinct national priorities and contrasting strategies, as Morocco's recent "pivot to Africa[10]", make the deepening of cooperation not to be overemphasized. Moreover, tensions between Algeria and Morocco reached a height not seen since the end of the 1970s over Western Sahara's separatist

[9] https://www.worldbank.org/en/news/press-release/2019/11/06/wbg-las-and-afesd-launch-the-first-pan-arab-energy-trade-conference

[10] In 2017 Morocco has rejoined the African Union after 33 years of "empty chair policy" over the organization's recognition of the Sahrawi Arab Democratic Republic. Morocco has also applied for membership to the Economic Community of Western African States (ECOWAS), while directing its commercial interests and 60% of the Kingdom's FDI towards West Africa.

conflict, led by the Algerian-backed POLISARIO front[11]. The historical rivalry between the two country is in fact deemed to have constituted a major factor in the inability to achieve regional economic integration so far, including the aborted project of the Arab Maghreb Union (AMU) in 1989[12].

Finally, whereas joining international efforts to mitigate climate change and cut Nationally Determined Contributions (NDC) would be beneficial for all North African actors, the level of urgency of transformation is higher for those countries which present structural weaknesses as oil rentiers. Indeed, the world in increasingly heading towards a future where markets for their ample resources may not be guaranteed.

[11] The rise of POLISARIO and its claim for independence was triggered by the Spanish decolonization of Western Sahara. Algeria's historical backing to the movement has been attributed to the latter's plan to establish a client state that would grant Algeria an outlet to the Atlantic Ocean

[12] The failed project mirroring the European Union should have led to free circulation of goods and people, a tariff union, and the creation of a single currency and a common market. However, none of this ever materialized. During his first speech at the 28th African Union Summit, King Mohammad VI has expressed disappointment with the Maghreb, as well as hope that Africa would provide a more cooperative environment in which to prosper: https://www.maroc.ma/en/royal-activities/full-speech-hm-king-28th-african-union-summit

1.1.2 Energy efficiency, energy wealth's concentration and the issue of fossil fuel subsidies

North African countries have already achieved a *nearly universal access* to electricity (99% rate of access) and clean cooking (98% rate of access) by 2010[13]. Today, rural settlements in Egypt and Morocco are home to the very last households lacking energy access, while countries like Algeria have counted on almost full energy availability for decades. Such outcome was the result of efficient public policies promoting major grid extensions and expansion of gas network distribution, together with ambitious and well-designed rural electrification programmes, hailed as global best practice, which allowed rural areas in North Africa to progress in electricity distribution faster than other regions of the world. In Morocco, the national electricity and water utility (Office National de l'Electricité et de l'Eau Potable [ONEE]) implemented a utility-led model focusing on grid extension for the vast majority of households, whereas dispersed or isolated areas were provided with solar home systems based on fee-for service model. The plan contributed to increase rural electrification rate from 18% in 1995 to 97% by 2009[14]. On the other hand, the Tunisian government implemented a comprehensive rural development strategy that combined rural electrification with the integration of health and education services. The overall progress in energy access across the region has significantly driven the growth of per capita electricity demand, which in 2018 doubled that of 2000, growing at an annual rate of 5%. With regards to demand for natural gas, Egypt alone accounts for 40% of natural gas demand of the whole African continent.[15]

Despite positive achievements, some challenges remain, as the necessity to improve the reliability of supply and offload the energy sector's burden on fiscal budgets. Progress on energy efficiency have in fact been stagnant across North Africa, necessitating further dedicated efforts that will allow for a

[13] https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=MA-TN-DZ-EG
[14] Ivi, p.9
[15] IEA,2020 data

range of important economic, social and environmental benefits to be unlocked. Enhanced services are especially needed in light of the foreseen long-term impact of Covid-19 crisis. Indeed, while the health emergency will not have direct effects on energy access, the economic slowdown is expected to cause millions to slide back into poverty, affecting households' ability to afford modern energy services. Therefore, to ensure that the most disadvantaged people won't lose access to essential energy sources is a key objective for the months and years ahead. In present times, as governments are designing plans for economic recovery, it is imperative to include ambitious policies that will maximize energy quality and reliability by integrating larger shares of sustainable energy sources to the overall final energy consumptions; thus, accelerating health and environmental improvements, while generating new employment and fostering sustainable economic growth.

Significant challenges arise from the issue of *fossil fuels subsidies* and their weight on the public budget. Indeed, if energy access strategies in North African have been possible due to regional resources such as natural gas and LPG, it was only thanks to public funding and policy support for energy subsidies that the affordability of the service has been *hitherto* facilitated. While subsidy policies have enabled a wider uptake of energy services by poor households and supported the growth in consumption, they nonetheless represent a substantial burden for countries' public finances. According to a study of the International Energy Agency (IEA), in 2010 the total bill for energy subsidies for Algeria, Egypt and Libya together exceeded USD 30 billion. Subsidies comprise from 5% to 13.5% of GDP and represent an even more outstanding amount if expressed in per capita figures: in Egypt they reach USD 158/person, in Algeria USD 305/person, and in Libya USD 661/person. Such situation has often raised questions about fiscal priorities in light of ongoing social challenges. Since subsidies incentivize wasteful consumption and drain national budgets, a reform of subsidy schemes would be strongly advisable. However, if on the one hand there is urgency to improve fiscal sustainability and impose a more limited burden on public finances, on the other hand the affordability of energy access needs to be maintained. Hence, any reform in this sense should be

attentively carried out through a careful impact-assessment and the creation of social safety net programmes, with a view to gradually implement a phase-out plan. Ideally, a *wider energy diversification and gradual integration of clean energy sources should target the reduction of public subsidies and energy bills to give impulse to North African economies, narrowing energy rents' concentration and redistributing wealth, allowing for more resources to be allocated elsewhere, including the health and education sectors. Additionally, initiatives to promote energy efficiency are fundamental to ensure that efforts devoted to integrating RES into the power system will not be outpaced by the spiking demand.* As it will be shown in the following paragraphs, energy efficiency interventions are the subject of several initiatives, that in many cases require more funding and more sound policies.

Another requisite to be met on the road towards a clean energy transition is that of improving the *reliability of power supply*. Indeed, technical electricity losses in North Africa are high (20%) and compare unfavorably with the average in other developing countries (9%), causing adverse economic impact. In 2020, the World Bank reported that due to poor operational performance on the part of utilities, which underpins frequent electricity disruptions, company losses could reach up to 25% of annual sales. The study also found that low-quality and unreliable electricity supply push not only firms but also individuals to turn to more expensive and polluting alternatives such as diesel generators. In Egypt, above 10% of firms are reported to own or share a generator. This obviously causes detrimental effects to air quality and economic competitiveness, together with increasing carbon emission. Thus, to strengthen the reliability of the grid should remain a priority for North African government, with a view to bringing larger efficiencies and accelerate development. To this end, *efforts to diversify the energy mix should go hand in hand and with commitment to enhance the reliability of electricity services*. In addition, the adoption of efficiency standards could further increase the affordability of supply. Suffice it to consider that households' consumptions, which in

2018 accounted for 40% of electricity demand[16], currently surpass basic needs. Efficiency measures represent "low-hanging fruits" that can help cutting consumers' bills, along with containing the upper race of energy demand and reduce GHG emissions. Whereas improving energy efficiency in North Africa is a priority to achieve sustainable economic growth and limit dramatic rise in demand, progress in such area have been stagnant across the region: instead of decreasing, the region's combined energy intensity increased by 7% in 2018 with respect to 2000[17]. By comparison, reduction in energy intensity was greater in other parts of the world including Sub-Saharan Africa and non-OECD countries. Yet, some countries performed better than others: according to IEA, energy intensity increased in Egypt and Algeria by 16% and 4% respectively between 2000 and 2017, while it decreased in Tunisia by 7 %, in Morocco by 4 % and in Libya by 1% over the same period. Since electricity demand in North Africa is expected to grow by almost 35% by 2030[18], the enhancement of energy efficiency is key to allow excess energy capacity to be freed up, ensuring a more stable supply and freeing up funds for other sectors of the economy. Significantly, the demand for cooling is projected to increase steadily (almost 40% by 2030)[19], driven both by a growing middle class which can afford increased living standards and by a warming climate expected to increase the number of hot days witnessed in the region. However, whereas energy efficiency measures have the potential to rein in peak power demand by an estimated 11% in 2030[20], the persistence of high subsidies for energy and fossil fuels reduce motivation to commit to serious changes and continue to stand in the way towards socially beneficial reforms. *The transformation of North African energy systems should be conceived as once-off opportunity to drive a structural and systematic change within such scenario*.

[16] Ivi, p.9
[17] Ivi, p.9
[18] Ivi, p.14
[19] Ibid.
[20] Ibid.

1.1.3 Clean energy and the struggle for natural resources: leveraging the energy-water-food nexus

The existent interdependencies between energy, water and food sectors in North Africa and elsewhere present important economic and social implications. Indeed, *energy policies influence water and food security outcomes, particularly in regional contexts vulnerable to climate extremes*. By applying an integrated multisectoral approach on the road towards clean energy transition it is possible to unlock new opportunities for resource efficiency, security, and productivity, by integrating a broader view of local economic development and providing for more durable and sustainable solutions. As opposite, if energy, water and food are managed independently, they could potentially hamper and constrain stability and development, by obstructing environmental systems. Therefore, the manner in which the nexus will be managed will largely determine the region's ability to meet its sustainable development ambitions, resource security, and harness the full benefits of energy system transformation[21].

With regards to *water,* for example, the upward demand trend which, coupled with urban population density, increased stress over water sources in North Africa, has forced countries to turn to alternative and more energy-intensive forms of water supply. By 2025, for example, Algeria aims to meet 25% of its water needs through desalination processes, while Tunisia already treats and recycles almost 25% of its treated wastewater, reaching the highest rate in the region (Egypt reuses 18% and Morocco 10%). The wastewater reutilization rate in Tunisia has been set to reach the target of 50%.[22] Today, natural-gas based thermal desalinization prevail in North Africa, but many countries looking to decarbonize and diversify energy mixes are increasingly considering alternative technologies that use electricity and are powered by renewables: Morocco is currently building the world's largest desalinization plant near the coastal city of Agadir, which will operate on wind-energy. The Douira

[21] Ivi, p.9
[22] Ibid.

desalinization plant is expected to be completed by the end of 2021 and will meet the city's domestic water demand as well as providing irrigation water to 3% of the region's agricultural land. To this end, the shift towards fully *renewable-based desalinization* mechanisms could lower the carbon footprint of the region, as well as its energy intensity.

Furthermore, El Gabal El Asfar wastewater treatment plant in Cairo offers a virtuous example of circular business model. The latter plant is one of the largest in the continent, serving 12.5 million people for a total of 2.5 million cubic meters of wastewater every day. In 2018 the plant was further expanded to include an energy recovery facility that produces biogas form the plant's waste sludge. By doing so, it recycles up to 60% of the plant's power needs.

Another water-related activity that is responsible for energy exploitation is groundwater pumping for agricultural purposes. Pumping is often needed due to groundwater depletion or/and increasing presence of saline water: in Tunisia almost 30% of surface water is saline, which increases the amount of energy required to provide fresh water. *Agriculture* is in fact the largest water-consuming sector in North Africa, also accounting for a considerable share of regional employment. The increasing threat of water scarcity, high variability of rainfall and limited land available to grow crops are all factors that are expected to trigger a more widespread use of energy for irrigation. At present, irrigation is a practice whose popularity across the region is currently limited, with less than 30% or North African cultivated lands being irrigated and vast reliance on rain-fed production. The only exception is Egypt as nearly all of the country's cultivated lands are irrigated. To increase access to modern energy for agricultural purposes is indeed beneficial to food security, as it doubles the productivity of croplands, thus improving yields and helping farmers to better manage fluctuations occurring from reliance on weather precipitations. Nevertheless, if not properly managed, more widespread irrigation could further impact the region's water scarcity, especially as efficiency of farm-level water use is estimated to be as low as 50% in Egypt. In order to avoid such side-effects, it is vital to increase efficiency and sustainability of irrigation and water pumping infrastructures, with

an emphasis on the integration of cleaner sources of energy like solar power. It is with this spirit that in 2016 Morocco has developed a national plan to increase agricultural productivity and optimize water use, by promoting solar water pumps. The National Solar Pumping Strategy Programme has been supported by the United Nations Development Programme (UNDP) and the Global Environment Facility (GEF) and will help scale up the adoption of solar PV-powered drip irrigation through technical training and institutional capacity building. By creating a conducive framework for the *exploitation of solar-powered technologies in the agricultural sector*, it is possible to displace diesel generators and LPG, improving sustainable use of water, reducing emission and enhancing agriculture resilience. A similar example can be provided by the Water Scarcity Initiative co-led by the Egypt's Ministry of Water Resource and Irrigation and the Food and Agriculture Organization (FAO). The aim of the project is that of exploiting solar energy to lift irrigation water from the Nile and pump it to the fertile lands of the Nile Delta. Egypt is also planning to extend the use of solar energy to all pumping stations of the Nile Delta region.

In conclusion, while planning the roadmap for energy systems transformation in North Africa, it is imperative to seize the important opportunities to mainstream energy efficiency in economic growth plans, thus unlocking financial gains and anticipating social and environmental challenges. Equally crucial is to understand that energy, water and food policies, technology and investment choices cannot neglect the needs of each other. They should instead identify potential synergies and capitalize on mutual efficiencies to ensure that the region remains on the track for a sustainable future, while delivering much needed structural socio-economic improvements.

1.2 Politics and the clean energy agenda in North African countries

1.2.1 Assessing regional progress in enhancing energy systems' sustainability

The previous section outlined the extent to which the North African region displays unique opportunities for clean energy transition: owing to high levels of solar irradiation throughout the year, as well as wind power in desertic areas, the Mediterranean basin holds in fact massive renewable energy potential, which is considered to be among the highest in the world. Despite these conditions per se would not allow countries to become self-sufficient through clean energy, they obviously provide unprecedent prospects to promote greater renewables' penetration as a driving force for transformative socio-economic change. Additionally, given the strategic geographical position of the region, North Africa is a place of election for future electricity/green hydrogen interchange with large European market, which is currently on a race to zero carbon footprint by 2050. Mindful of such scenario, which is coupled with declining costs of major renewable technologies and the interrelated and mutually reinforcing dynamics that the world is undergoing (Covid-19 pandemic, the ensuing economic crisis and the fossil fuel prices' oscillations), North African governments are increasingly considering the diversification of energy landscape, which is slowly gaining momentum despite mixed results and speeds.

Already in the past decades fossil fuel exporters have been challenged by a drastic upward trend in domestic power demand and were forced to divert shares of production away from exports. With both demand and price shocks, the rationale for diversification becomes more compelling. The boom in electricity consumption also exacerbates the environmental and health externalities associated with the use of low-quality and low-efficiency technologies, to which local utilities and governments mostly resort to meet energy demand.

There is awareness that most of the area's oil and gas producers will embark through a period of increasing uncertainties for their revenues, whose consequences will be more pronounced for those that were already experiencing economic and political troubles even before the pandemic[23].

In recent times, renewable electricity has grown more than 40% in North Africa, driven by a rapid expansion of solar photovoltaic, solar thermal and wind, with some countries making substantial progress towards enabling a mix of market-based mechanism, increasing the number of ad hoc institutions and establishing dedicated energy development zones. Not surprisingly, three-quarter of this growth appears to be supported by a regional net energy importer, namely Morocco: with 35% of domestic electricity supplied by renewables, the country presents the highest penetration rate of the region. In 2018, the average regional share of modern renewable energy was 1.9%, with a significant variation between countries, ranging from 1% in Algeria to 7.6% in Morocco. More recently, Morocco, Egypt, and to a lesser extent Tunisia, account for over 96% of the region's clean energy consumption, hydropower being the largest renewable source. More than 80% of regional hydropower is supplied by Egypt. On the other hand, wind and solar photovoltaic constitute the second and third more widespread clean sources, while a fourth, namely solar thermal, exists only in Morocco. Finally, biofuel is deployed only by Egypt. Despite such rapid trends, the overall share of electricity supplied by renewables in North Africa has slightly declined from 7.3% in 2008 to 6.7% in 2018. Such overall reduction is due to the fact that energy demand has grown much faster than renewables energy deployment, while less rainfall contributed to a decline in hydropower output.[24]

Whereas most regional efforts in the uptake of renewable energy are devoted to the electricity sector, green energy plays a minor role within the transport systems, with still very few electric vehicles powered by clean sources and low levels of biofuels. Nevertheless, the rapid demographic impulse

[23] Algeria was already concerned about stagnating economic activity, which is currently forecasted to contract by 5.2 per cent
[24] Ivi, p. 14

would suggest an implicit potential for the creation of a green transport industry and value chains within the domestic market.

It is clear that renewables penetration is still far below potential, and remains largely untapped relative to the sector's possibilities, including extending utilization to industrial heating and transports, as well as deploying green hydrogen technologies. Thus, fossil fuels remain an economic and political pillar in countries of the Mediterranean basin, mainly due to a number of *persistent regulatory barriers, insufficient or unreliable political backing and poor access to capital*. The region would in fact require significant investments and a forward-looking vision to undergo a gradual, yet effective transition. Additionally, fossil fuel subsidies continue to prevent renewable energy from achieving a relative cost advantage. The issue of energy subsidies is highly politically sensitive and keeps constituting a major impediment to the accommodation of larger shares of renewables. At the same time, any subsidies' phase-out plan should be implemented very carefully in order to avoid adverse impacts on the most vulnerable shares of society.

Despite persisting challenges, the portfolio of policies within the region is evolving and there is scope to accelerate and increase the level of ambition. The region's installed renewable energy capacity is expected to double up to over 20 GW by 2024, by means of support policies and renewed regulatory frameworks that should attract and enable private investments. To this end, it is worth considering that according to the World Bank "Doing Business" Index 2020, Morocco ranks 53rd for ease of doing business, Tunisia occupies the 78th place, while Egypt and Algeria rank 114th and 157th respectively. Equally, access to affordable financing is key to the success of the low-carbon transition in North Africa, as more capital must be mobilized for generation capacity, transmission and electricity distribution networks, along with the strengthening of grids. For example, the Moroccan Agency for Sustainable Energy (MASEN) has issued green bonds to finance the debt for the Noor photovoltaic project, while approximately 1 GW of the country's onshore wind was financed with the contribution of the German Development Bank and the European Investment Bank. On the other

hand, restrictions related to access to finance underpin Algeria's poor performance in the energy sector's decarbonization. As the process of energy diversification in the South Mediterranean region keeps hinging largely on access to international financing, it would be advisable to develop capacity for a greater involvement of local commercial banks in renewable energy projects.

In conclusion, North African countries increasingly acknowledge the transformative role that sustainable energy systems could play in their societies and, accordingly, implemented measures to reduce the carbon intensity of their economies. All five countries have successfully established renewable energy targets. However, progress has been uneven:

1.2.2 Morocco

The right to sustainable development is enshrined in article 31 of the 2011 Moroccan Constitution. With this spirit, the country has undertaken ambitious action to anchor future economic development to its energy system's transformation. As part of King Mohammed VI's agenda of renewal and repositioning of Morocco in the international context, a new National Energy Strategy was adopted in 2009 which put renewables at the forefront of the country's energy policy. Having set one of the highest renewable energy objectives in North Africa, Morocco is currently pursuing its ambition of becoming a regional leader in clean technologies, setting the example for all countries in the area and elsewhere.

To embark in such new economic and political initiative was no arduous task for the Alawite Kingdom as Morocco is the only North African country where hydrocarbon resources are lacking. On the contrary, Morocco is the largest coal importer of the whole MENA region and its energy policies are expected to be profoundly reshaped by the royal willingness of stepping up Morocco's role in international action for climate change. The country has ratified the Paris Agreement and hosted the 2016 United Nations Conference of the Parties (COP22) summit in Marrakesh. With a new vision targeting *a 52% share of renewables within the energy mix (20% solar, 20% wind, 12% hydro) by 2030*, Morocco's NDCs are among the very few considered to be "Paris-compatible". More recently, the King has announced his intention to develop offshore wind farms on the windy Atlantic coast, while the research hub "GreenH2 Maroc" has been launched to create a green hydrogen ecosystem.

In order to enhance the business climate and attract foreign investors, the National Energy Strategy has been supported by both *institutional and legal reforms*: the legal framework has been strengthened through the adoption of relevant provisions that promote investments in renewable energies, whereas the institutional fabric has witnessed the restructuring of old entities and the

creation of new ones, notably the Moroccan Agency for Sustainable Energy (MASEN). In 2018, the government also gave the green light for the establishment of an independent electricity regulator, the National Authority for Electricity Regulation (Autorité Nationale de Régulation de l'Électricité, ANRE). In terms of policy instruments, a tendering scheme has been utilized in order to open the market to private investors. Tendering schemes have proved effective in driving costs down, leading to some of the lowest bids in the world.

Such plan was intended to provide a clear positive signal to international economic actors, since the country will need substantial investments to be directed towards the Kingdom for the years ahead: in order to reach its 2030 objectives, an estimated USD 30 billion are required to be allocated in the Moroccan energy sector. International financial institutions, multilateral development banks and donors (including grants and concessional loans providers) have so far provided a fundamental contribution to the financing of renewable energy projects in Morocco. Whereas entities like the African Development Bank (AFDB) and the World Bank Clean Technology Fund have granted very attractive financial conditions to help kickstarting mega-projects, climate finance has also been mobilized for that purpose, together with equity finance provided by MASEN Capital. On the other hand, progress has been lacking concerning the involvement of local commercial banks.

To enhance energy efficiency constitutes another priority on Morocco's energy agenda, with a targeted 20% of energy savings by 2030. Despite being the area facing the most significant implementation challenges, some initiatives have nonetheless contributed to reposition the country on a more sustainable energy utilization's trajectory. For example, one may mention the ban on imports of old cars and improved thermal regulations for new buildings, which secured more efficient products and appliances. A remarkable initiative on this side, undertaken with the support of the German Federal Ministry for Economic Cooperation and Development, is the *"Green Mosque Programme"*. The latter involved the modernization of over 100 religious buildings' energy infrastructure through the introduction of LED lighting and thermal solar systems. The programme

was complemented by a local awareness raising initiative whereby the Ministry of Religious Affairs and the Agency for Energy Efficiency jointly drew up guidelines supporting the case for renewable energy from a religious perspective. Consequently, more than 600 imams and women preachers used them to pass on the knowledge they have acquired about energy efficiency and clean technologies to their communities. A website and a Facebook page with 18,000 followers have also been created to disseminate relevant information.

As far as production complexes are concerned, the first and most noteworthy project to be built was the *Noor solar plant*, located near the town of Ouarzazate. The project will be further expanded through Noor II, Noor III and Noor VI plants and once fully operational, it will cover an area of almost 3,000 hectares and produce up to 580 GW. Along with the massive Noor Ouarzazate complex, which has earned Mohammed VI the title of the "Sun King", the *Tarfaya wind complex* was also launched in 2015 and built in just two years. With 131 wind turbines stretching more than 100 square km west of the Sahara Desert, the Tarfaya wind farm produces enough energy to power a city the size of Marrakesh every day, while saving 900 tonnes of CO2 emission annually and USD200 million of oil imports.

However, the project sparked controversy over its proximity with the *Sahrawi community*, who claim that the turbines, which rise from the sand dunes of an area already sparsely surrounded by military checkpoints, are instrumental to cement Morocco's occupation of their land. According to government's officials, the project would bring development benefit to the region, with transmission lines built to guarantee power supply to the Sahrawi community, and the prioritization of local workforce for the project[25]. Nonetheless, opposition towards the project didn't stop: in 2016 the organization Western Sahara Resource Watch (WSRW) published a report labelling the renewable energy plans endorsed by the Kingdom as means to "power the plunder". WSRW also questioned how the revenues gathered by Rabat through the exploitation of Western Sahara's wind power

[25] https://ourworld.unu.edu/en/africas-biggest-wind-farm-sparks-controversy-in-the-desert

endowments could ever incentivize a genuine commitment to engage in the UN peace process[26]. Sahrawi refugee camps witnessed huge protests against Enel Green Power and Siemens, both winners of the 2012 tender launched by the Kingdom for the construction of five wind farms, of which three in proper Morocco and two in what were referred to as the "southern provinces". At present, there are three operational wind farms in occupied Western Sahara. A fourth is under construction, while a fifth is in the planning stage. Despite acute unrest, the operations went largely unchallenged, with few consequences to be borne by the two multinational companies.[27]

However, the Sahrawi issue was brought back on the table when, in the context of Morocco's presidency of COP22, a declaration was signed on 17th November 2016 between Rabat and Brussels, confirming the mutual intention to develop a roadmap for sustainable electricity trade between Morocco and the EU. The latter met the opposition of some European deputies, which submitted a parliamentary question[28] to the Commission in order to ensure that accountability and respect of international law would be granted with regards to energy trade between the Union and third countries. The question was notably referred to the inclusion of renewable energy plants in the territory of Western Sahara, over which neither the United Nations nor the European Union and its Member States had recognized Moroccan sovereignty. In response, the then Commissioner for Energy and Climate Action Miguel Arias Cañete affirmed that "the Declaration will be implemented taking due account of the separate and distinct status of the territory of Western Sahara under international law".[29] Although the 2016 declaration didn't give rise to legal obligations for the signatories, uncertainties remain from the part of NGOs, especially concerning how such principle could be implemented in practice, given the likely future connection of the relevant plants to Morocco's national grid. The same year, the Court of Justice of the European Union ruled out the

[26] since 1991, the UN brokered a ceasefire to end a war over Western Sahara and established a peacekeeping mission, known as MINURSO
[27] In 2021 the Norwegian financial services company "Storebrand" has excluded EGP and Siemens from its client list, due to alleged violation of international law over the Western Sahara issue.
[28] https://www.europarl.europa.eu/doceo/document/P-8-2016-009554_EN.html?redirect
[29] https://www.europarl.europa.eu/doceo/document/P-8-2016-009554-ASW_EN.html

application of the EU's Association and Liberalization Agreements with Morocco to Western Sahara's territory.

With regards to *cross-border connectivity*, Morocco is by far one of the most embedded countries of the MENA region: despite the four electrical grids between Morocco and Algeria remain largely unexploited, two lines connect the Kingdom to Spain, from which it imported around 15-20% of its electricity demand until achieving self-sufficiency in 2019, and a third connection is already planned between the two countries. In addition to that, the feasibility of cross-border connectivity with Portugal, Mauritania and UK is currently under study. These North-to-South and South-to-South connections present strategic opportunities to expand the market for renewable electricity exchanges. Such project aligns with Morocco's ambitions to become the "geopolitical gatekeeper" and *preeminent connectivity node in the nexus of commercial routes linking Europe to Africa and the Middle East*[30].

In conclusion, when considering whether Morocco's far-sighted approach to renewable energy mix could be replicated and applied elsewhere within the region, it is important to acknowledge the peculiarity of its political and socio-economic context, including the inherent incentive to transform its energy system. On the other hand, among the lessons learnt are the efficient and timely action undertaken to update the legal and institutional framework in order to accommodate enhanced flexibility, thus attracting foreign capital towards national energy objectives.

[30] As part of Morocco's strategy to strengthen its historical role of "Gateway to Africa", the capacity of the port of Tanger has been significantly expanded in 2019 with the opening of new terminals. Tanger Med has become the Mediterranean's largest port, surpassing Spain's Algeciras and Valencia's ports. The same year witnessed the construction by Rabat of "Al-Boraq", Africa's first high-speed rail transportation.

1.2.3 Egypt

The Arab Republic of Egypt is the most populous country in North Africa and home of one of the fastest-growing population at the global level. The ensuing upward trend in energy consumption, which is forecasted to become one of highest of the African continent by 2025, poses a strain to the country's contribution to energy exports in international markets. When that is coupled with market volatility and fuel shortages, the electricity generating capacity of Egypt struggles to keep pace with rapidly swelling demand. In 2014, crisis heightened due to electricity shortages up to six hours per day, aging power stations, waiting hours in gas station lines often long enough to stretch across entire neighborhoods, not to mention hundreds of terrorist attacks targeting infrastructures. At that time, Egypt was forced to introduce coal into its energy mix to lower its own dependence from imported gas, while the Energy Minister Mohammad Shaker had stated that avoiding blackouts was "impossible", especially in the summer, due to large-scale utilization of air conditioning units[31].

This scenario stands in stark contrast with the recent declarations made by the incumbent President Abdel Fattah Al-Sisi in occasion of the 2019 Aswan Forum for Sustainable Peace and Development[32], when he stated that Egypt was ready to export 20% of surplus electricity to its African Neighbors. What has changed since then?

The game-changers of the Egyptian energy outlook were mainly two: The introduction of the "*Integrated Sustainable Energy Strategy 2035*", whereby the authorities took steps to diversify the energy landscape by increasing the share of renewables and boost power sector's efficiency, and the 2015 discovery of the massive *Zohr natural gas field* by the Italian energy utility Eni. Zohr accounts for the largest eastern Mediterranean gas field found to date. Together, the two elements contributed to transforming the Arab Republic from a net energy importer to energy exporter. Since that moment,

[31] https://www.reuters.com/article/egypt-energy/preventing-summer-blackouts-in-egypt-is-impossible-minister-idUSL6N0N407L20140412?feedType=RSS&feedName=utilitiesSector

[32] The Forum was organized in the context of the Egyptian presidency of the African Union

the Egyptian government has made no secret of its prospects to transform the country into a regional energy export hub.

Egypt's economy hinges on the energy sector, which in 2021 reached a 24% quota of contribution to GDP. Therefore, the pursuit of an energy diversification strategy and commitment to scale up deployment of renewables must be interpreted in light of the need to *make the export sector keep pace with a burgeoning internal demand*, as well as to ensure the continuous stability and security of power supply. The Integrated Sustainable Energy Strategy sets a target of *20% share of clean sources in the energy mix by 2022 and 42% by 2035*. However, along with renewables, a total share of 16% would be occupied by coal, and 3.3% by nuclear energy. According to the plan, energy subsidies should be eliminated by 2022 so that different energy sources will be able to compete within a free and fair market structure. Results have so far been encouraging, with the target of 42% share of clean energy to be potentially achieved already in 2030, thus allowing for full elimination of coal. Additionally, a ministerial committee has recently been created to develop a hydrogen strategy, dealing with production and export of both blue and green hydrogen.

A 2018 report by the International Renewable Energy Agency (IRENA) stressed that the Egyptian strategy, developed in 2016, does not reflect the latest technological developments and is not aligned with the more pressing environmental concems characterizing more recent years, so that there is ample space to more ambitious plans updating green energy goals to 53% by 2030. The report also suggested that a more integrated uptake of clean technologies comprising also the transport sector would have the potential to reduce energy, environmental and health-related costs by USD 9 billion per year.

In February 2021, during a climate diplomacy roundtable organized in Cairo in preparation for the COP26, Egypt has earned international praise for its climate commitments. Indeed, in September 2020 the Egyptian Commercial International Bank (CIB) issued the first *green bonds* of the continent, whose proceeds will be directed to the financing of green projects in the field of transports and energy.

At the time of writing, Egypt is the only candidate in Africa for hosting the COP27. On the other hand, international actors such as the World Bank and UNDP urged the establishment of smaller and more dispersed plants which would maximize local communities' development gains, underlining the need to avoid limiting clean energy production (spanning hydropower, solar, wind and biomass) to mega-projects. *The Benban Solar Complex*, Egypt's flagship mega-project, ranks among the largest solar PV power plants in the world, with an installed capacity of 1.8 GW. The power plant has been developed by more than 30 companies from 12 different countries, including Spain's Acciona, UAE-based Alcazar Energy, Italy's Enerray, France's Total Eren and EDF, China's Chint Solar and Norway's Scatec. Benban has succeeded in bringing down the price of solar energy, drawing in dozens of companies, and giving Egypt's southern region an economic boost. Not least, it has showcased Egypt's seriousness in doing renewable energy business, compared to the stalled situation of other countries in the region. Furthermore, power generation technology procured from Siemens gave rise to another megaproject including 12 wind parks with approximately 600 wind turbines. Several utility-scale wind farms are also set to harness wind power potential in the Gulf of Suez.

It is worth considering that Egypt has significant comparative advantage with regards to manufacturing potential in different segments of the renewables value chain. Several of the industries necessary for solar photovoltaic are already operating, for example steel and glass manufacturing, as well as pump fabrication. Thus, given the region's outlooks concerning the expansion of renewable power, there might be a considerable rationale for taking up the initiative to become a competitive regional producer of the materials needed for such expansion. At the same time, it would enhance local manufacturing capabilities and unlock important socio-economic benefits, particularly in terms of job creation.

Since the government's vision relies heavily on private sector to pump capital into the market to achieve its strategy, bold steps shall be taken to address the problem of lengthy bureaucracy, which currently represents a hinderance to capital inflows. Indeed, since 2016 Egypt has struggled to attract

foreign investments outside the oil and gas sector, despite winning praise for an IMF-backed economic reforms program. Equally, the country has been urged to review its market framework to reduce complex administrative procedures that might discourage investors, as well as to clearly assign institutional mandates to facilitate the process. In the next stages of energy diversification, political and policy stability will also be fundamental.

As part of its bid to *export considerable energy surplus by 2035*, becoming a pivotal energy carrier in the Mediterranean, Middle East and Africa, and increasing its geopolitical weight, Egypt has signed *electricity interconnection deals* with several countries. Such deals are expected to allow the Arab Republic to export and import both renewable and non-renewable power towards all directions: to the East with Jordan and Saudi Arabia, where a joint power grid was expected to be operational by 2021 but has been suspended due to COVID-19; to the South with Sudan, with completion expected by 2024; to the West with Libya and to the North with Cyprus and Greece, where the "*Euro-Africa interconnector*", scheduled for completion in 2023, will carry almost double the capacity of the planned Tunisia-Italy Interconnector (1GW vis à vis 0.6 GW)[33].

Whereas the decision to establish the headquarter of the Eastern Mediterranean Gas Forum[34] in Cairo underlines Egypt's central role within the Eastern Mediterranean energy landscape, the prospect to reposition itself as *regional power trade hub* comes at the expenses of Egypt's main geopolitical rival, namely Turkey[35]. For the latter, the enhanced Egyptian connectivity, powered by both new gas

[33] Issues involving the Tunisia-Italy "Elmed" interconnector will be further discussed in the second chapter.
[34] Created on 22th September 2020, the forum gathers and coordinates political and commercial dialogue between all producers, consumers and transit countries of the EastMed Pipeline, namely Italy, Egypt, Greece, Cyprus, Israel, Jordan and the Palestinian Authority. The pipeline was confirmed as a European Project of common Interest (PCI).
[35] Turkey showed similar ambitions of becoming a pivotal energy carrier via the Turk Stream and the Trans-Anatolian pipelines

discoveries[36] and facilitated by large-scale deployment of clean energy, translates into further marginalization within the emerging Mediterranean energy architecture.

[36] The proximity of Zohr to the Israeli Leviathan and the Cypriot Aphrodite gas field prompted plans to develop a coordinated gas export infrastructure

1.2.4 Tunisia

Tunisia, the second closest country to the European Union from a geographical point of view, has set the target of increasing the share of solar and wind power in its domestic energy mix to *30% by 2030*. Tunisia's commitment to the Paris Agreement' s principles is also underpinned by a green energy programme revolving around the production of green hydrogen. Similarly to Morocco, Tunisia has not access to significant quantities of hydrocarbon resources compared to other North African states. Thus, developing renewables and hydrogen facilities would provide the country with an *asset in geopolitical relations* that it has hitherto lacked, along with helping *secure a greater degree of energy independence*, with sizeable savings to be allocated to other sectors, like education and health.

However, despite the promising renewable energy strategy developed in 2013, progress has been stalling in the country: at present, Tunisia's power generation is heavily dominated by gas-fired power plants, accounting for more than 90 per cent of the total capacity. A handful of hydroelectric power stations represent just 1.1 per cent of installed capacity, and their operations are often hindered by poor hydrology and water scarcity. Additionally, the country has only one solar power plant, which has been in operation since August 2019, together with three wind farms which provide for 4.1 per cent of installed capacity. The latter, which have recently suffered from major maintenance issues, are all owned and operated by the state utility, the Société Tunisienne de l'Electricité et du Gaz (STEG). STEG is Tunisia's dominant energy producer and unique Transmission System Operator (TSO), which fully controls the country's power system. The monopoly poses a significant strain to investment flows, which is exacerbated by complex administrative procedures and unclear definition of roles and stakeholders within the market governance.

Therefore, tenders for renewable energy projects have so far faced several challenges, underlining the need for additional capacity building and high-level support. For example, a number of solar projects were awarded in December 2019, but, since then, no concession has been signed. Notwithstanding

dedication and efforts from the part of key institutions such as the General Authority in charge of public-private partnership and the Ministry of electricity and gas, the implementation of clean energy projects has been advancing only very slowly. In addition to regulatory obstacles and budgetary constraints, which characterize neighboring countries as well, Tunisia is facing some *hardships in reaching political consensus for strategic projects*. Indeed, the latter would require sound institutional support, including parliamentary review and approval, a condition which has proven difficult to be met in Tunisia, given the succession of 11 ministers in charge of energy over the last decade. In recent years, ministerial reshuffles and restructuring also accompanied a number of dismissals and convictions of officials by the Tunisian courts, which resulted in the reluctance of some senior civil servants to engage in strategic economic decision[37]. To make the scenario more complex, even a bold political action would in any case require the approval of STEG itself, which employs more than 10,000 people and can benefit from the Tunisian Labor Union.

As noted above, in Morocco and Egypt energy diversification plans benefit from strong local institutional and political support. In the case of Morocco, for example, the implementation of the Kingdom's green agenda is being continuously monitored by key officials who directly report to King Mohammed VI. On the other hand, similar circumstances did not materialize in Tunisia, where both capacity issues and institutional challenges caused the wide gap between ambition over clean energy transition and the reality on the ground.[38]

Like other North African countries, climate mitigation and energy diversification efforts in Tunisia require copious funds for projects and capacity building programmes, hinging on the financial support of the international community. To this end, Tunisia enjoys the status of *privileged partner* of the European Union, as demonstrated by increased European involvement in the social and economic

[37] The stalled political landscape of Tunisia will be further discussed in section 1.4.4
[38] Bennis Amine, *Power Surge: How the European Green Deal can Succeed in Morocco and Tunisia*, European Council on Foreign Relations, January 2021

development of the country, enhanced trade relations and disbursement of several macro-financial assistance packages. At present, a planned connection linking the electricity markets of Tunisia and Italy and operated by the Italian utility Terna has been confirmed as a Project of Common European Interest (PCI). The project is scheduled for completion by 2027 and represents a key step in helping Tunisia realize is energy diversification ambitions.

1.2.5 Algeria

Algeria finds itself at a critical stage for its energy sector development. In addition to its status of second most populous country in North Africa, it is the wealthiest country in the region by GDP per capita, and the largest on the continent by land area. Algeria enjoys more than 3,000 hours of sunlight annually, showing the highest solar potential of the Maghreb, followed by Libya and Tunisia. Yet, it ranks third in Africa in terms of carbon dioxide (CO2) emissions. Indeed, Algeria is one of the largest African hydrocarbon producers and a member of OPEC since 1967. Natural gas comprises up to 96 per cent of Algeria's installed capacity, while the remaining 4 per cent is covered by a mix of oil, hydro, solar and wind technologies.

In June 2020, a dedicated Ministry of Energy Transition was created to strengthen the institutional framework for the transformation towards an energy model that generates prosperity. *The Algerian National Strategy for Renewable Energy and Energy Efficiency targets 27% electricity generation from renewable sources by 2030*, a 37% increase in renewable generation capacity by the same year and 10% of energy savings by 2021. To improve energy efficiency and consequently energy savings is indeed a priority for Algeria, a country that witnesses very high rates of energy consumption. The country's energy regulator, the Commission for Energy and Gas Regulation (CREG) has planned to expand total installed capacity by allocating a 15% increase of solar power, while decreasing the share of natural gas to 84% of the total installed capacity. Whereas the proposed action plan is unlikely to meet the National Strategy's targets, such step would nonetheless represent an important shift towards a greater integration of clean sources into the nation's power network. In particular, Algeria aims at expanding its renewable energy capacity onshore and gradually integrate offshore plants, paying special attention also to its own geothermal potential and to the application of solar energy to desert agriculture. To this end, an experimental technology platform for the application of solar energy to agriculture in the Sahara Desert, as well as for green hydrogen and solar thermal

technologies, has been launched in December 2020 in the northern city of Ghardaia, located 500 km far from Algeri, with the name of "Technopol Renewable Energies."

In order to help driving investments in renewables, Algeria has developed a reverse tender scheme, meaning that long-term contracts (known as Power Purchase Agreements) are awarded to the company offering to sell power at the lowest price. The counterparty to the PPA is Sonelgaz, an Algerian state-owned power utility. However, the first tender taking place in 2019 showed limited success as it was undersubscribed. The reasons for such poor performance are to be found both in the novelty of the process and in the tender rules. The latter envisaged in fact strict local content requirements around solar modules and equipment, in spite of the relatively small solar-related manufacturing capacity. Additionally, the tender restricted the opportunity to participate in the auction to Algerian companies or joint ventures with a mandatory 51 per cent stake for the Algerian entity, while funding was allowed only from Algerian financial institutions. Indeed, the traditional *limitations posed by the Algerian government with regards to foreign participation within strategic economic sectors* such as energy and infrastructures, continue to represent a substantial hindrance to direct investment flows towards the green power sector. This is in stark contrast with other regional governments which increasingly adopted an economic approach accommodating free market principles into the energy system's transformation.

In order to implement the renewable energy strategy envisaged by former president Bouteflika's government in 2011[39], Algeria has endorsed the construction of the 4,000 MW *Tafouk I solar project.* The gigantic power station should be divided in six parts covering six different southern "wilayaat" (regions) and is supposed to be completed by 2024. Importantly, the rationale being followed is that of operating on a "brown field", meaning that no land will be withdrawn from the agricultural sector. By means of a sustained financial support from the African Development Bank, the project is also expected to include an industrial section, whereby one or more factories will be built to produce the

[39] The Strategy was then updated in 2015 and given a full-fledged priority status in 2016

relevant equipment and manufactured components. According to an article published in 2017 by the Pan-African news magazine "Jeune Afrique", the factories' aim would be that of avoiding dependence from imported equipment, notably from China[40]. Given the size and the local manufacturing content requirements characterizing Tafouk I, the latter could considerably develop the nation's manufacturing capacity for solar components, including racks, cables and modules. Indeed, Algeria's location at the crossroad of Europe, Sub-Saharan Africa and the Middle East provides the country with the inherent potential to become a manufacturing supply hub for the nascent regional green energy industry, should the latter be further enhanced and made competitive. At present, Algeria counts three solar panel facilities totaling 260 MW of annual solar panel production, 40% of which became operational in 2020.

As applies for other countries in the region, a gradual shift towards a more competitive electricity market would be strongly advisable in that it would facilitate a more efficient supply and accommodate increased renewable energy penetration. Yet, despite progress in such direction, security threats in the south of the country[41] as well as the uncertain and unstable political process[42] which followed the 2019 Hirak protests[43], led Algeria to run considerably behind schedule concerning its energy diversification agenda. Therefore, while there is clear momentum for a sustainable repositioning of the country's energy sector, the precise path and timeline of the energy system's transformation is not foreseeable at present.

[40] https://www.jeuneafrique.com/417368/societe/lalgerie-se-lance-ambitieux-projet-de-photovoltaique/
[41] Ivi, p. 20
[42] After Bouteflika's dismissal, president Tebboune was pronounced the winner of the 2019 elections, to which less than half the Algerian population participated. Tebboune's restructuring of the government was marked by repression and popular dissent. Additionally, the recent November 2020 Constitution was not deemed credible by the population, only 23.8% of which went to the polls. Most recently, the president's prolonged absence due to COVID-19 complications has triggered doubts over his ability to handle the day-to-day management of the country.
[43] The 2019 Algerian protests, also called "Revolution of Smiles" or "Hirak Movement", were peaceful protests that had been ignited by Abdelaziz Bouteflika's announcement of his candidacy for a fifth presidential term and culminated with his resignation, forced by the army.

CHAPTER TWO

A Sea of prosperity: renewable energy's contribution to Mediterranean stability

2.1 How the EU's energy diplomacy can make the Green Deal succeed

On 11th December 2019, the European Commission presented a new policy roadmap known as "The European Green Deal for the European Union (EU) and its citizens"[44]. The latter represents an all-encompassing strategy set to profoundly reshape the European social and industrial ecosystems, and which aims at making Europe the first carbon-neutral continent by 2050, in application of the principles of the 2015 Paris Agreement. Most significantly, the EU Green Deal is a key component of what the European Commission defined as a more "geopolitical EU"[45].

As COVID-19 crisis injected new energy into the international debate on the sustainable transition, the European Union has declared its commitment to "lead by example" by stepping up internal reforms and enhancing its short-term Greenhouse Gas (GHG) emissions reduction target. Indeed, the EU has already pledged a decrease of at least 55% of its Nationally Determined Contribution (NDC) compared to 1990 levels, along with a 32% quota of renewables' share of final energy consumption and a 32,5% increase in energy efficiency. All of these targets are scheduled to be achieved by year 2030[46]. Furthermore, the EU has successfully showcased the extent to which climate action and

[44] https://ec.europa.eu/commission/presscorner/detail/en/ip_19_6691
[45] https://www.politico.eu/article/meet-ursula-von-der-leyen-geopolitical-commission/
[46] https://ec.europa.eu/clima/policies/strategies/2030_en

economic growth can go hand in hand, given that the Union's GHG emissions declined by 24% in the last 30 years while, in parallel, its GDP increased by 61%.[47]

Yet, there is no room for complacency as the EU accounts only for a decreasing 8% share of global GHG emissions[48] while the rest of the world remains on an unsustainable trajectory towards the delivery of the long-term objectives of the Paris Agreement. In order to maintain the global average temperature well below 2°C above pre-industrial level, a collective global response for ambitious climate action is urgently needed.

Therefore, to succeed in its mission, the European Green Deal has to be strictly tied to a consistent European external policy. A robust external projection of the EU climate policy to be pursued in all relations with third countries is critical to the success of the fight against climate change. Significantly, it would also contribute to avoid carbon leakage and levelling the carbon playing field. Hence, climate policy issues must form an integral part of the European strategic thinking and action on a global scale. Such concept has been explicitly acknowledged in the official document "Delivering on the external dimension of the European Green Deal"[49], which outlines the European Council's conclusions on Climate and Energy Diplomacy that followed the Council's meeting on 25th January 2021. Point number 20 of such conclusions urges Member States' Embassies and EU Delegations to increase their climate outreach, as well as cooperation and information exchanges to promote the Green Deal policy approach with EU partners across the globe. By doing so, the EU is pursuing the twofold aim of further projecting EU's leadership in the field and effectively deliver on the Paris pledges and the UN Sustainable Development goals.

Year 2020 has witnessed numerous demarches and outreach activities carried out by the European diplomatic network, both at influential political level and through wider public diplomacy, with the

[47] https://ec.europa.eu/clima/policies/strategies/progress_en
[48] https://www.eea.europa.eu/highlights/eu-greenhouse-gas-emissions-kept
[49] https://www.consilium.europa.eu/en/press/press-releases/2021/01/25/council-adopts-conclusions-on-climate-and-energy-diplomacy/

aim to support the case for a "green recovery" within all EU partners. Indeed, the COVID-19 pandemic and its economic consequences are confronting all EU partners with choices that present both opportunities and dangers: in order to transform the health crisis's challenge into an unprecedented opportunity it is imperative to direct recovery efforts towards ambitious green investments, thus advancing on the track to a sustainable global transition. In fewer words: "to build back better and greener". Hence, the role of EU Missions and Member States' Embassies, acting by means of a "Team Europe" approach, must be that of holding back EU partners' temptations for short-term aggressive recovery measures based on fossil fuels, which risk creating stranded asset and carbon-locked economies. On the contrary, it is imperative to decouple economic growth strategies from resource use and impairment of natural environment. Massive recovery plans at national, continental and global level shall consider adaptation and mitigation strategies in a complementary and integrated way, boosting resilience through natural ecosystem restoration and promoting the transition to circular economic models and clean energy systems.

In accordance with such roadmap, the opportunities for EU engagement with its partners may range from offering expertise, experience and know-how, to supporting access to finance. EU's development assistance and cooperation frameworks will follow a strategic green approach, designed to untap the full potential of a global sustainable transition. To this end, a deeper engagement will also be sought with International Development banks and International Financial Institutions. The EU institutions affirmed to be ready to mobilize public and private investments to support partner countries' climate goals, particularly through EU trade policy and green finance strategy. Such efforts are coupled with the decisive role played by the European Investment Bank, the Neighborhood, Development and International Cooperation Instrument (NDICI) and the European Fund for Sustainable Development (EFSD). The EU is already the biggest donor of climate finance (€23,2 billion in 2019).[50]

[50] https://ec.europa.eu/clima/policies/international/finance_en

It is worth noting that for climate action to be effective the latter must address the core of EU partner countries' economies, including their key domestic export industries and infrastructure, and especially their *energy systems*. The transformation of global energy systems is a non-negotiable priority for the achievement of the Paris objectives, being the sector responsible for over two-thirds of GHG emissions[51]. Consequently, EU diplomacy must be assertive in advocating for a gradual, yet effective energy transition with third parties as one of its main interests. Driving the change within power system structure is especially crucial with regards to fast growing, middle-income countries like those located in the European neighborhood, where important long-term infrastructures will be built in the coming 10-15 years. In such context the EU shall intervene timely and strategically to leapfrog the carbon stage, using a combination of policy dialogues, technical assistance and private sector engagement.

Given the abovementioned scenario, it is clear that the Green Deal policy will lead the authorities in Brussels to start *rethinking the EU energy diplomacy*: while a new official strategy on international energy engagement, jointly prepared by the Commission and the High Representative, is expected to be completed by the end of 2021[52], the future trajectories of EU energy diplomacy will most likely call for a global phase-out of environmentally harmful energy infrastructures projects and investments, including immediate end to all financing of unabated coal for energy production, unless "fully consistent with an ambitious clearly defined pathway towards climate neutrality in line with the long-term objectives of the Paris Agreement and best available science"[53]. The EU may likewise encourage the gradual elimination of fossil-fuels subsidies in third countries, especially in the EU southern neighborhood, while emphasizing the need to scale up technological innovations and new

[51] https://www.eea.europa.eu/signals/signals-2017/articles/energy-and-climate-change#:~:text=About%20two%20thirds%20of%20global,total%20EU%20emissions%20in%202015
[52] https://www.consilium.europa.eu/en/press/press-releases/2021/01/25/council-adopts-conclusions-on-climate-and-energy-diplomacy/
[53] Ibid.

development tools which are in line with a just transition towards climate neutrality, not least due to wealth generation opportunities that such transition is expected to unfold.

However, when urging EU partners to embrace energy diversification, an exclusively ideological and normative approach is least likely to succeed. Similarly, strategies working according to a "one size fits all" mindset shall be abandoned in favor of a country-tailored and context-specific approach, which will enable the creation of new patterns of incentives. The latter will ultimately lead third countries to declare their interests in cooperating with the EU and associate themselves with the European energy and climate agenda. This means that the transition of global energy systems shall first and foremost favor domestic socio-economic development, and not merely accommodate commercial and political interest (be it either of domestic or foreign nature). Accordingly, EU energy diplomacy shall redefine its instruments toolbox, including the identification of a set of key countries to (re-)engage with, based on both its strategic priorities and those of the identified partners[54].

Thus, fostering the deployment of safe and efficient clean technologies, including deepening international cooperation on hydrogen and integration of transparency standards will be some of the key points of the new European energy diplomacy strategy. Significantly, several new opportunities are offered by the greater uptake of energy from clean sources, like the creation of regional electrical interconnections, with a view to establishing cross-border power-grid connections and "grid communities".

Along with paving the way to new opportunities, it is widely acknowledged that the global race to renewables will have significant impacts on economies, societies and geopolitics globally, driving a shift in economic and trade patterns. The conception of energy security within the EU and abroad is most likely to evolve from concerns about the affordability and access to fossil fuels towards the need to harness the necessary technologies, securing supply chains, competing for raw materials required

[54] Pastukhova, Maria et al., *Beyond the Green Deal: Upgrading the EU's Energy Diplomacy for a New Era,* German Institute for International and Security Studies, 2020

for renewable production and storage, protecting critical infrastructures, in addition to cybersecurity concerns arising from the utilization of smart grids and complex power lines, and more generally from the greater digitalization and electrification of energy systems.

It should be the priority of EU energy diplomacy to pursue the promotion of rule-based, transparent and well-regulated global markets, ensuring diversification of supply and reducing energy dependencies, as well as promoting the use of the Euro in energy trading. the new energy trajectory will have the chance to enhance economic opportunities for European businesses operating in the context of both established and emerging renewable energy markets and in new digital technologies, with a view to promoting the export of European renewable energy equipment. It is also worth mentioning that efforts shall be devoted to counter disinformation campaigns against energy transition, both globally and within the EU.

Multilateral fora and summits, in particular the G7, G20, COP26 UNFCCC and the UN General Assembly High-Level Dialogue on Energy represent strategic occasions to mainstream the energy transition. To this end, to empower multilateral and regional governance mechanisms is crucial to address the challenges that will arise along with the energy transition. It could be argued, for example, that the mandate of the existing institutions, most notably the International Energy Agency (IRENA), the United Nations Sustainable Energy for All, the International Partnership for Energy Efficiency Cooperation should be enhanced in parallel with the fostering of renewed cooperation on energy transition within the G-formats[55], with a view to further reinforcing constructive dialogue on such contingent issues.

The EU may scale up efforts to secure adequate EU representation in decision-making bodies of multilateral organizations, as well as strengthening the agenda of international energy organizations, bodies and initiatives, with a view to narrowing the fragmentation of approaches. Indeed, one shall

[55] Pastukhova, Maria et al., *Beyond the Green Deal: Upgrading the EU's Energy Diplomacy for a New Era,* German Institute for International and Security Studies, 2020

not forget that alternative and competing visions for the future energy system are being pushed by other powers, which might erode multilateral energy governance mechanisms in favor of economic fragmentation and technological-normative competition. Hence, as competing visions for the future energy systems arise and multiply, it will be a task for the EU energy diplomacy to consolidate EU international position as norm-and standard-setter on energy transition, promoting transparent cooperation mechanisms for technical and regulatory matters[56]. A striking example is provided by the approach and vision exported by China, especially through its "no normative strings attached" policy and non-transparent contracts, combined with the propensity to cooperate with non-democratic regimes. In addition to that, one should also consider that nuclear energy remains an option for many countries, which consider nuclear power a full-fledged "clean" energy source.

The EU strongly upholds the belief that energy transition will ultimately benefit all countries, creating new jobs and more viable future for incoming generations. This notwithstanding, it acknowledges that in the medium-term it could also have adverse impacts on some countries and regions, notably those dependent on fossil fuels revenues and exports, including the EU' neighborhood. Such security ang geopolitical challenges must be anticipated as part of EU foreign policy and external action strategies, both providing technical assistance to the development of energy diversifications plans and assisting with targeted support the most affected, sharing European know-how and experience. Especially in the case of such fragile economies but not limited to it, the EU may pursue a socially just, fair and inclusive transition that will leave no one behind.

Finally, while creating a new roadmap for EU energy diplomacy following the Green Deal coordinates, some questions will need to be addressed:

What "historical" energy partnerships will remain, and what will change in the dynamics of future cooperation?

[56] Pastukhova, Maria et al., *Beyond the Green Deal: Upgrading the EU's Energy Diplomacy for a New Era,* German Institute for International and Security Studies, 2020

What new partnerships must be aspired to in the era of sustainable energy transition?[57]

[57] Pastukhova, Maria et al., *Beyond the Green Deal: Upgrading the EU's Energy Diplomacy for a New Era,* German Institute for International and Security Studies, 2020

2.2 Revitalizing the Barcelona Process: what role for energy transition?

The Mediterranean basin is one of the areas to which the European Union had devoted most efforts, compounded with a great deal of creativity, to continuously rethink spaces of collaboration[58].

Year 1995 marked a turning point for the Euro-Mediterranean relationships: twenty-seven countries gathered in Barcelona to agree on shared values and initialize a long-term process of cooperation. The new framework for bilateral and regional relations revolved around three main axes: *definition of a common area of peace and stability* through the reinforcement of political and security dialogue; *construction of a zone of shared prosperity* through an economic and financial partnership and the gradual establishment of a free-trade area; *rapprochement between peoples through a social, cultural and human partnerships* aimed at encouraging mutual understanding between cultures and exchanges between civil societies. Such principles paved the way for the establishment of the "Union for the Mediterranean"[59].

Despite the bright and encouraging premises, twenty-six years after the Barcelona Conference the region is nowhere close to what the then French President Sarkozy envisaged as a "union founded on the principle of strict equality"[60]. On the contrary, the broader picture that the Barcelona Process has unfolded resembles a puzzle of asymmetries, with regional gaps being larger than ever: the hoped-for "strengthening of democracy and respect for human rights" has turned out to be an undeniable failure, the "greater understanding and closeness between peoples" still leaves much to be desired, while as far as the "Euro-Mediterranean free-trade area" is concerned, it belongs to the realm of fiction.[61] Hence, a sense of frustration followed what, with the benefit of hindsight, was considered by many observers as a too ambitious plan for such a volatile region. On the other hand, critics pointed

[58] Amirah-Fernandez, Haizam, *The EU's addiction to false dilemma in the Mediterranean*, ISPI,2020
[59] The Union for the Mediterranean is an intergovernmental institution bringing together the European Union Member States and 15 countries from the Southern and Eastern shores of the Mediterranean to promote dialogue and cooperation.
[60] https://cn.reuters.com/article/idUSL23717555
[61] Amirah-Fernandez, Haizam, *The EU's addiction to false dilemma in the Mediterranean*, ISPI,2020

fingers at the alleged dilemma between European values and economic interests. Regardless of the perspective one may choose to embrace, it is clear that whereas the region has indeed witnessed a Mediterranean Sea of culture and civilization, the latter was never a Sea of stability and peace.

Within the manyfold identities of the Mediterranean region, what is the peculiar role played by the energy sector?

When attempting to investigate such concept, it is certainly difficult to decouple energy from geopolitical frictions and instability: while the volatility of fossil fuel prices often posed a struggle to fiscal resources in Egypt and Tunisia, hydrocarbon endowments contributed to the ongoing conflict in Libya, where competition over the country's natural resources impoverished millions, fostering chaos and radicalization, including presence of the Islamic State (IS). In Algeria, hydrocarbons' revenues and wealth were used to support an extensive political patronage system and cronyism, which secured autocrats' hold on power and prevented the Algerian people from the enjoyment of shared prosperity. In Algeria as elsewhere, the officially sanctioned culture of corruption that excluded the mass from the promised benefits of market liberalization in favor of personal gains, has contributed to unlocking a vicious circle of violence[62], which in the case of Algeria spilled over into eleven years of bloody civil war[63]. More recently, the contended Aphrodite gas field located in Cyprus' offshore waters is exacerbating the already fragile political situation of the divided island.[64]

In front of such past and present scenarios, *could the transformation of energy systems in North Africa change the conflict-ridden landscape and secure a more durable stability to the region? could an ambitious low-carbon Europe leverage political and commercial support to facilitate the success of the region's energy transition?*

[62] International Crisis Group, Algeria's Economy: The vicious cycle of oil and violence, Africa Report n.36, 2001
[63] The Algerian Civil War was fought between the Algerian government and various Islamist rebel groups from 1991 to 2002.
[64] In 2012, when the Republic of Cyprus awarded gas field exploration licenses to Eni and Total, the Turkish Republic of Northern Cyprus and Turkey claimed that the Cypriot Republic didn't have the authority to make unilateral decisions concerning the island's natural resources, at least until a settlement of the decades-old Cyprus issue was reached.

It is widely recognized that a transition from fossil fuels to renewable energy could transform global power relations no less than the historical shifts from wood to coal and from coal to oil[65]. However, even by substituting pipelines with electrical grids, interdependencies between the two shores of the Mediterranean may merely change in their appearance: as stated in section 2.1, the European Union already acknowledged that there would be no Green Deal without the participation of its neighbors, as well as there would be no carbon neutrality without large-scale deployment of hydrogen technologies, whose production potential reaches exceptional level in North Africa, compared to EU capacity. By enabling a better use of such complementarities, the *security of future clean energy supply* could be enhanced, while at the same time contributing to generate *new income opportunities* for North African countries and rebalance traditional asymmetries. By deepening collaboration in the green sector, the South could be viewed by the North always less as a critical source of migration flows, with "invaders" fleeing in millions in the pursuit of a better future on the other side of the Mediterranean. Since *climate change mitigation and energy transition are structural and common challenges, the clean energy sector could act as a catalysis to relaunch a more widespread and participative cooperation between the two shores of the Mediterranean*, provided constructive engagement of all parties. Additionally, as the EU southern neighborhood is expected to be one of the worst affected regions by the global shift to clean energy sources, the *cost of inaction could be greater than the cost of action*, as the adverse effects in terms of regional economic stability, social unrest and security of the South could be heard sooner than expected.

[65] IRENA, *A New World: The Geopolitics of Energy Transformation*, 2019

2.2.1 The "New Agenda for the Mediterranean" 2021-2027

On the 9th of February 2021, the European Commission released a communication presented as the "new Agenda for the Mediterranean", which welcomed a "renewed partnership with the Southern Neighborhood"[66]. Adopted ten years after the Arab uprisings, the strategy is aimed at relaunching dialogue and cooperation, by incorporating the twin strategic priorities of the green and digital transitions. According to the document, "The new Agenda aims for a green, digital, resilient and just recovery, guided by the 2030 Agenda for Sustainable Development, the Paris Agreement and the European Green Deal" [67]. In particular, the second pillar of the partnership mentions the commitment to a common agenda aimed at decreasing harmful emissions and speed up the green transition. In this sense, the document depicts a long-term scenario where new forms of low-carbon energy gradually replace fossil fuels across the region. According to the text, such objective should be achieved by means of comprehensive initiatives to be proposed by the Commission, with a view to endorsing renewable energy and energy efficiency in the South Mediterranean region. Significantly, special attention is also placed on fostering clean hydrogen production, in line with the EU "Hydrogen Strategy"[68], a key operative step of the Green Deal. The relevant initiatives should be tailored to the partners' diverse endowments, interests and needs. Such an ambitious plan underpins the integration of adequate regulatory and financial incentives, and prioritizes the *regional integration of electricity markets to harness the untapped potential of the shared Mediterranean region*, under the logic of mutual interest. The Action plan reiterates how The European Green Deal represents a unique opportunity for deepening the Euro-Mediterranean partnership, given the *interdependent, complementary and converging energy interests based on the priorities of fair transition and energy security, and in light of unparalleled clean energy cooperation opportunities stemming from the solar and wind resources to which the South-Med region is home.*

[66] https://ec.europa.eu/commission/presscorner/detail/en/ip_21_426
[67] Ibid.
[68] The EU Hydrogen Strategy will be further discussed in the second chapter.

The massive deployment of renewable energy for clean hydrogen production should target the installation of at least 40 Gigawatts of electrolysis capacity in the EU neighborhood for both domestic consumption and export by 2030, along with a strengthened interconnection of regional electricity systems. The plan is expected to evolve depending on progress on policy and political issues, as well as in bilateral relations between partner countries, and will rely on a specific Economic and Investment Plan (EIP) under the Neighborhood, Development and International Cooperation Instrument (NDICI)[69]. In addition to that, strategic engagement with International Financial Institutions (IFI) and with the European Investment Bank (EIB) will also be sought. The level of EU financial support will be proportionate to each partners' ambitions and commitment to shared values, the agenda of reforms, including reforms of governance, and the status of their implementation.

Indeed, the second point of the Agenda is devoted precisely to shared values, and reiterates EU commitment to the rule of law, human and fundamental rights, equality, democracy and good governance, while point number three addresses the need for a concerted effort to tackle forced displacement and irregular migration. The three elements spanning *energy transition, the strengthening of democratic governance and the struggle against illegal migration are uniquely linked to each other*, building the case for clean energy as a powerful unification factor between the two shores of the Mediterranean basin. Indeed, not only would a greater energy diversification modernize the energy sector and advance the objectives of the Paris Agreement and the Sustainable Development Goals, but it would also deepen trade and economic cooperation opportunities among partner countries across the area, thus contributing to the sustainable economic growth of the North African countries. Hence, it would unlock a virtuous circle of positive externalities, contributing to the overall hoped-for stability and prosperity of the South Mediterranean.

[69] The NDICI is the new comprehensive instrument to finance EU external action and cooperation, agreed by the Commission, the Parliament and the Council on 18th December 2020 as a merger of all the ten previous sector and region-specific financial instruments.

2.2.2 Clean energy and migration flows

As noted in section 2.1, the Green Deal diplomacy can help the European Union achieve several of its associated interests, including those that could closely affect its southern neighborhood. Nevertheless, as stressed in chapter 1, to capitalize on energy diversification patterns, they must be leveraged to the delivery of socio-economic improvements. Only then they will unlock development opportunities that will ultimately contribute to the overall stabilization goals, creating jobs in the green industry and potentially offsetting some of the "push" factors of irregular migration from North Africa. To this end, energy has been mentioned in the "New Pact for Migration and Asylum" proposed by the Commission in September 2020 as one of the policy areas to be developed to help build stability, prosperity and economic development in countries with a strong migration dimension.

At the beginning of 2021, the European border and coast guard agency "Frontex" has recorded 4.299 illegal border crossings over the Central Mediterranean Route, the top country of origin being Tunisia (755); the Western Mediterranean route has equally witnessed a number of 1532 illegal border crossings within the same period, mostly coming from Algeria (896) and Morocco (435). Additionally, over the last decade North African countries themselves have faced challenges related to migration flows both as host and transit countries; Morocco, for example, has experienced a significant increase in irregular migration inflows, especially those coming from Sub-Saharan Africa and Syria. In Tunisia, the impact of Libya's security issues has had a bearing on its ability to efficiently manage domestic migration outflows. Indeed, Tunisians have accounted for the largest national grouping of migrants crossing the Mediterranean to Italy, Greece, Spain, Cyprus, and Malta in 2020, according to the United Nations High Commissioner for Refugees. The concerns aroused in Europe with regards to such scenario have led the Union to gradually integrate development policy

instruments into its migration policy, explicitly acknowledging the need to create new opportunities for local workforce and address the root causes of migration, especially economic migration.[70]

To untap the renewable energy potential of the North African region could generate employment directly, in form of green jobs for wind farms and solar power plants, as well as for the construction and maintenance of such facilities. Yet, most significantly it could contribute to development in indirect ways, by *fostering the creation of a social and economic ecosystem where local value chains are fully integrated, developed and upgraded, while local workforce is engaged through capacity building and training programmes focused on innovative, future-oriented sectors*. Thus, in order to secure a win-win scenario, it is imperative to focus on the development of a domestic industry, the creation of a space for local investors and the application of "national content requirements", namely a quota of local contractors and local services to be respected[71]. According to a study by the Mediterranean Forum of Institutes of Economic Sciences, Morocco's renewable energy sector could generate between 267,000 and 482,000 jobs in the country by 2040. The employment opportunities offered by the sector would be further developed if countries specialized in different industries across the green energy value chain, for example the manufacture of relevant component. Within this context, there is room for the EU to engage in high-level cooperation with regional authorities and deepen policy dialogue with all stakeholders, as well as to provide critical technical assistance and capacity building. The focus on local job creation may be introduced through capacity building, technology transfers and training programmes, not least academic programmes targeting the new generations; in parallel, enhanced relationships and exchanges between international developers and local private sector must be pursued in order to secure the strengthening of local supply chains and sustain a future dynamic market.

[70] The phenomenon of economic migration links international relocation to the pursuit of greater economic opportunities in the receiving country

[71] Local-content requirements within contracts are not always easily enforced, as many international financial organizations, which constitute the main funders of the projects, are reluctant to accept them on a competitive base.

EU policymakers should therefore embrace a *"people-centred" approach that would maximize inclusion opportunities* for North African people, tailoring investments in green projects to regions most in need of economic support, for example those that have traditionally been a point of departure for irregular migrants travelling to Europe, or landlocked regions which record unemployment rates significantly higher than the national average. Considering that wind farms and solar power plants are often located in remote desertic areas, this could help increasing opportunities for young populations living in rural areas, thus contributing to mitigate internal relocation to urban areas[72]. Consequently, the process could offset hyper urbanization and the competition over resources taking place in capital cities, which in turns constitutes one of the officially recognized "push" factors of international migration outflows. By advancing such agenda, it is possible to avoid adopting a full export-oriented and unilateral approach whereby a country is selected only in quality of advantageous place to manufacture, without targeting the domestic market. A similar approach would indeed prevent the full exploitation of positive externalities and mutual benefits.

For some North African countries, notably Libya, Algeria and Egypt, the large-scale production and export of oil and gas provides vital revenues to finance national budgets. Additionally, some of them rank among the least diversified economies in the world: export of oil and gas account for over 90% of total merchandise export in Algeria and Libya. As previously outlined, this situation poses serious questions over the sustainability of such development model in the long run. Indeed, if volatile and undiversified sources of income have often caused economic downturns within producers' economies, the transformation of global energy systems set to take off within the foreseeable future is expected to have a *direct and adverse impact on economic migration flows, if met with slow action.* Hence, unless prompt measures are taken to tackle the dangers underpinning overdependence on fossil fuel income, a severe fiscal strain could hit hydrocarbons producers like Algeria. Since the

[72] Bennis Amine, *Power Surge: How the European Green Deal can Succeed in Morocco and Tunisia*, European Council on Foreign Relations, January 2021

required transformation presents a structural nature, *to diversify the economy too late could limit the ability to respond timely and effectively to future disruptions, as well as narrowing future financial capacity needed for the required investments.* As noted above, Algeria already accounts for one of the main countries of origin with regards to illegal and uncontrolled entrances in the Union's territory. Accordingly, further delays in the implementation of economic diversification could significantly exacerbate this scenario. Threats are not excluded even with respect to more virtuous countries: Egypt, for example, ranked 15 among the nationalities which characterized land and sea arrivals to European shores in 2020, according to the United Nations High Commissioner for Refugees. However, if the ongoing domestic energy diversification is not managed carefully and inclusively, the phenomenon might escalate. Albeit Egypt enjoys a more diversified economy with respect to Algeria, gradual global disinvestments in hydrocarbons, coupled with water scarcity, desertification and salinization adversely affecting the agricultural sector, could potentially exert a powerful attack to Egyptian economy, causing future waves of migration flows. Such hypothesis is further strengthened by the prospects of a declining protagonism of the Suez Canal in the global trade arena. Indeed, the new Arctic shipping routes, as the Northeast Passage, the Northwest Passage, and the Transpolar shipping route[73] are expected to allow for a shorter sailing distance and cost reduction for relevant trade routes, determining important shifts in international trade patterns. Consequently, the conventional Suez Canal route that connects Europe and Asia, hosting 8% of world trade, might see its traffic reduced by two-thirds[74]. Hence, transit fee revenues could plummet dramatically.

Climate change, as a threat multiplier, is indeed both a direct and indirect driving force for migration flows. It poses structural challenges from which no country can be sheltered and requires concerted efforts and responses to be offset. Accordingly, a sustainable transformation of energy systems is not only instrumental to mitigate climate change effects, but it would also contribute to adapt South

[73] New possibilities for maritime transportation are foreseen to open up due to the loss of the Arctic ice cap caused by climate change.
[74] Dellink, Rob et al. International Trade consequences of climate change, OECD Trade and environment working papers, 2017

Mediterranean economies to unprecedented climate-driven transformations, enhancing resilience of vulnerable sectors. *To strengthen political dialogue and economic cooperation on clean technologies offers the chance to build sound trust relationships, with a view to enhancing the present partnership aimed at curbing illegal migration.*

2.2.3 Clean energy and democracy: the case of Tunisia

The integration of a clean energy mix in the economy, democracy and institutions that fight inequalities are mutually reinforcing concepts: on the one hand *rule of law and strong institutions contribute to a safe and predictable business environment, helping attract foreign investments and financing the emerging clean energy technologies*. Indeed, in order to protect public and private investors' financial interests, it is imperative that the recipient country commits to efficiently address corruption, money laundering and misappropriation. Hence, a renewed commitment to transparent and responsive governance, along with accountable institutions is essential to earn the trust of local and international operators. In this sense, the new Agenda for the Mediterranean called for an agreement on priority areas where well-designed, measurable, and implementable reforms should be enacted. On the other hand, *the diversification of energy mix provides economic resilience (especially for sectors prone to economic shocks) and creates new opportunities for the youth. Accordingly, it can contribute to shield fragile democratic institutions from the risk of destabilization.*

The economic crisis and trends in youth unemployment that followed the 2011 Tunisian "Jasmine Revolution"[75], are widely recognized among the main reasons for the declining democratic achievements of the country. After having been hailed as the only success of the Arab uprisings, the Tunisian newborn democracy is currently struggling to stand, while illiberal tendencies among both political elites and public opinion are constantly gaining ground. Behind the Tunisian democratic "malaise" there is people's disenchantment over democratic institutions and improved living standards going hand in hand. As a result, popular support for democracy over any other political system continues to decline, dropping from 71% immediately after the revolution to 46% in 2018. According to a recent publication by the Pan-African research network "Afrobarometer", the proportion of Tunisians who reject authoritarian alternatives to democratic governance, as military

[75] The Tunisian Revolution, also called the Jasmine Revolution, included a series of street demonstrations which took place in Tunisia and led to the ousting of president Zine El Abidine Ben Ali. It launched the democratization process of the country with a new constitution and free, democratic elections

rule, one-man rule and one-party government has also decreased. In addition to that, 6 out of 10 Tunisian (62%) affirm that the country is "a democracy with major problems" or even "not a democracy"[76]. The signs of the democratic crisis can be observed inter alia in the very small electoral turnout recorded during the 2019 presidential elections compared to the post-revolution period (less than 42% vs 72% in 2013[77]), the overwhelming victory of the anti-establishment candidate Kais Saied, the appointment of technocrats to solve a government paralysis over allocation of ministerial offices and the absence of an effective opposition to challenge the two mainstream parties, namely the Islamist "Ennahda" and the Secularist "Nidaa Tounes". Youth, having been the real protagonist of the Jasmine revolution, felt increasingly disillusioned by a new democratic government that nonetheless failed to take bold action to implement desperately needed reforms. As a result, young, educated Tunisians now account for the share of population among which the incumbent conservative President[78] enjoys the greatest popularity.

Within this framework, the new economic and social outlooks that would possibly emerge from the green energy ecosystem, such as industrial diversification, specialization across the sustainable value chain, improvement of health and environmental standards, lower concentration of energy rents, as well the development of a thriving green hydrogen industry for consumption and export, could contribute to *address unemployment, foster sustainable development, and deliver much needed social guarantees to citizens*. Hence, it could pave the way to the *revitalization of popular support and trust for democracy and liberal forms of governance*[79].

[76] Meddeb Y. Support for democracy dwindles in Tunisia amid negative perceptions of economic conditions, Afrobarometer Dispatch No. 232, 2018

[77] The Economist Intelligence Unit, *Democracy Index* 2019

[78] The Tunisian President Kais Saied increasingly showed conservative stances and promoted a reconciliation between the progressive political left and traditional Islamic precepts.

[79] It is clear that economic growth alone cannot present itself as a substitute for the urgent institutional needs of the country, namely the building of participative institutions that guarantee transparency and accountability, the strengthening of decentralization, the agreement over the establishment of a Constitutional Court, the halt of Tunisian police abuses and of the long-standing "state of emergency" ,which since its first declaration in 2015 has allowed widespread violation of human rights to go unnoticed.

Energy transition presents a major opportunity for Europe to relaunch its close engagement with Tunisia. Within the described scenario, the European Union should play a positive role, pushing forward the agenda for energy diversification and offering the economic, commercial and political partnership needed to stabilize and consolidate the country's vulnerable democratic process. A full and sustained backing from the EU would not only help Tunisia diversify and open up its economy, but it would also strengthen the capacity of Tunisian institutions to embark in strategic economic projects, driving integrated and sustainable economic growth in the country and creating a favorable environment to support governance reforms.

In conclusion, countries spanning the European southern neighborhood are increasingly engaged in rethinking their energy systems, having to balance the challenges of keeping the lights on while driving their transformation and anticipate the future. With the European Green Deal as a reference model, a Euro-Mediterranean Green Deal should inspire the parties to deliver the hoped-for change for all citizens. Such a change would *boost sustainable development and economic growth in the southern shore of the Mediterranean Sea, thus enhancing overall regional stability and prosperity, also benefiting the EU*. Within this context, the European Union should insist in actively engaging in energy dialogues at political level with North African partners, not least with a view to diversify the Union's energy supply and routes. Indeed, *enhanced dialogue and cooperation* between all European and North African stakeholders is essential to achieve a fair and just transition, one that will insist on a *"two-ways" approach as the only way to secure more durable and meaningful benefits for the Mediterranean region*, leaving no one behind. Such new framework is set to update the energy sector collaboration between the parties and fully reflects EU's priority to influence clean energy transition as a key pillar of the external projection of the Green Deal.

CHAPTER THREE

Renewable energy and green hydrogen: framing scenarios of future energy cooperation

3.1 Potential advantages of building a "Mediterranean grid community"

As the focus in the energy transition debate shifts away from "if" to "how", time is ripe to bring the two shores of the Mediterranean closer and overcome shortcomings together. Ensuring shared prosperity, security and stability is a common objective of the Mediterranean countries and *the development of adequate clean energy infrastructures, integrated and efficient, is key to embark on a new development path. Such an approach should inject new energy into multilateral cooperation and provide a powerful response to global challenges like climate change. It should capture the ongoing process of energy diversification and related changes in the Mediterranean region to catalyze job creation, innovation and technology transfers, ultimately leading to new security outlooks;* the latter would be conceived both as security of energy supply and as the halt to uncontrolled migration flows and to the spread of radicalization. The Euro-Mediterranean region enjoys both the expertise and primary resources required to support such developments. Yet, converging rules and reduced constraints are needed to connect regional power systems.

It was precisely the willingness to set up a framework for multilateral cooperation in the electricity sector what encouraged the establishment on 9 April 2012 of "Med-TSO", the Association of Mediterranean Transmission System Operators currently hosted by the Italian utility "Terna" in Rome. Med-TSO counts 21 members operating the transmission grids of 19 EU and non-EU countries. Every two years, the Association produces a ten-years development plan for Mediterranean

networks, referred to as the "Master Plan of the Mediterranean Electricity Interconnections" (MMP), with the aim to boost regional energy cooperation. The document introduces a series of baseline energy scenarios which identify and assess potential electricity interconnection projects.

The last 2020 edition observed marked contrasts between the realities of Western European countries, which have witnessed stable or even declining energy demand in the last decade, and the South (and East) Mediterranean countries, that in turn experienced a 4 to 5% growth in energy demand over long periods. The reasons underlying these dynamics are to be found in a number of factors, notably the differentials in economic and demographic growth, development of new uses of electricity and deployment of energy efficiency measures. Consequently, electricity consumption in the Northern shore, which in 2018 had accounted for more than half (55%) of the consumption of the entire Mediterranean region, is expected to witness a saturation and drop significantly below 50% by 2030 (with an expected decline of -17%), being proportionally compensated by other regions.

On the other hand, in fact, demographic growth in the southern Mediterranean countries is expected to boost generation capacity needs which will ultimately challenge security of supply and decarbonization of power generation. Indeed, North Africa is expected to record a 30% increase in power demand by 2030, and over 50% by 2050.[80]Such evolutions in consumption patterns, coupled with the generalized expected increase in renewables' integration into the power systems, leads to the development of forecasts for 2030 paving the way for a new scenario where final energy consumption will be remarkably higher in the South compared to North.

These projections not only suggest the need for ambitious renewable energy generation plans to enhance security and sustainability of power supply on both shores, but also the opportunity to *establish interconnections that would enable the exploitation of such expected synergies and complementarities between Mediterranean national power markets*. Indeed, if the status quo will not

[80] Confindustria Energia, *Infrastrutture energetiche per l'Italia e per il Mediterraneo*, March 2020

be modified, some countries in North Africa risk witnessing an exacerbation of energy dependence while even producing countries could be forced to reduce exports in order to meet local needs; in both cases this would lead to socio-economic destabilization, with consequences to be suffered also by the EU, as specified in the previous chapters.

To prevent these circumstances from happening, in a first stage security of supply could be enhanced by establishing transmission links that would enable efficient exchanges of power supply, thus sustaining and facilitating the gradual deployment of virtuous green energy generation policies; over the mid-long term, comparatively cheaper RES generation costs could offer new export opportunities for some countries in North Africa, once they have met their national energy needs.

All hypothetical scenarios developed by the 2020 Med-TSO Master Plan predict a significant increase in the total installed RES capacity by 2030, with the largest capacity corresponding to assumptions of huge ambitions for RES development: the so called "Green Development" scenario indeed assumes the end of oil generation and a very sharp decline in the share of coal as a common ground to all Mediterranean countries; however, whereas in the north-western countries coal is assumed to be completely phased out by 2030, with the share of gas rapidly declining and being replaced by renewable energies (in accordance with the objectives set by EU Member States), in southern Mediterranean countries the share of gas is expected to be maintained in order to sustain the growth in consumption and reduce the amount of coal generated. Additionally, the Green Development scenario projects the achievement of targets reported in North African countries' respective NDCs, encompassing CO2 mitigation plans, deployment of energy efficiency measures and RES development.

With this evolution scenario in mind, it is clear that developing North- South interconnections would be strategic for both parties, allowing the pursuit of the following objectives:

1) *Increase energy security and supply diversification, thus minimizing overall energy dependence*. By providing power system's flexibility among countries, interconnection projects would allow all parties to draw on electricity generated from different sources and across a wide geographic area, limiting the risks of supply disruptions; it would also provide the opportunity for non or poorly interconnected countries to access less expensive energy, for the sake of Mediterranean stability and growth;

2) *Catalyze overall system efficiency*. The introduction of mechanisms for cross-border electricity trade would serve to entice countries to reform their national electricity sector by phasing out subsidies and enabling the necessary legal and regulatory environment for private investments, thus fostering economic competitiveness, job creation and technology transfers.

3) Facilitate greater RES penetration in the Mediterranean region through cost-effective electricity exchanges both North-South and South-South, thus reducing the environmental impact of the electricity sector and *achieve mutual objective of climate change mitigation and macroeconomic sustainability*.

4) Deepen participating countries' commitment to reinforce cooperation, build trust and solve shared security concerns, fostering economic cooperation, peace and solidarity;

5) *Promote EU's external policy goals* in line with the "external dimension of the Green Deal" and the Neighborhood Policy, such as integration of renewable energy towards long-term decarbonization objectives, enhancing security of supply and promoting regional and local-socio economic welfare;

6) *Generate new investment opportunities* and economy of scale, creating a market that can deliver advantageous prices for all.

It is evident that rules harmonization would be a crucial part of the interconnection process. Not by chance the promotion of shared principles (like liberalization and adoption of EU energy legislation to create a stable legal environment) that would be conducive to private investments was a key pillar of past EU energy policy and strategy in the broader neighborhood.

Such strategy led to different outcomes in different regions; for examples, in the Balkans and Eastern Europe, membership in the Energy Community and interest in EU accession underpinned countries' commitment to adopt the *acquis communitaire* into their respective national legislations. On the other hand, in the absence of similar prospects for EU accession, progressive harmonization with EU rules never materialized in the debate concerning North Africa. Nevertheless, gradual convergence towards EU rules does form an integral part of the European Neighborhood Policy and has been implicit in several Memoranda of Understanding signed with North African countries. The establishment in 2012 of Med-TSO described at the beginning of the paragraph also followed this direction. However, to date the Association largely served the only purpose of sharing best practices[81].

If further connections and electricity market integration are to be pursued, enhanced harmonization between the different systems will need to be sought. This will be once again achievable only through the reinforcement of multilateral cooperation.

In this sense, it must not be neglected that the creation of a "Mediterranean grid community" would involve complex geopolitical issues that may take time to be negotiated in such ways that will

[81] Tagliapietra, Simone and Zachmann, Georg, *Energy across the Mediterranean: a call for realism*, Bruegel, 2016

ultimately deliver mutually beneficial outcomes. However, the long-term outlooks for structured cooperation in both RES integration and the promotion of electricity exchanges should stay high on the regional agenda for the reasons so far discussed. *Progressive integration of national transmission networks represents a unique instrument to effectively harness energy transition's potential in the Mediterranean region, which is not only aimed at fostering regional socio-economic development, but also delivering mutual security and decarbonization objectives.* As already outlined elsewhere, global challenges like climate change require a concerted and coordinated effort to boost environmental resilience and overall efficiency of power systems. Likewise, *enhanced dialogue between policy makers and the private sector remains fundamental to identify the financial resources and mechanisms fit to help the development of a sustainable end resilient energy sector in the South Mediterranean region*.

3.1.1 Ongoing clean energy cooperation' s projects

With the notable exception of Morocco and Spain, between-shores electricity trade has not thrived so far. However, several projects are currently underway including the construction of a submarine cable between Tunisia and Italy. *Energy cooperation in the Mediterranean basin seems to have found renewed institutional impetus both at public and private level, with an increasing number of actors that committed to a wider integration* carried out in the name of sustainability. A significant input is being provided by intergovernmental organizations, mainly the Union for the Mediterranean, and specific associations and dedicated platforms (Observatoire Méditerranéen de l'Energie, RES4Med, etc.). On its side, the EU is supporting the technical and financial resources needed to harness clean energy potential in the Mediterranean region through the new Horizon programme, Connecting Europe Facility Funds, NDICI and the European Investment Bank. Private utilities also form an integral part of this exercise.

To date, Spain and Morocco are connected via the Maghreb-Europe Gas pipeline (focused on gas imports of Algerian origins) and two undersea electrical cables, commissioned respectively in 1997 and 2006. These two junctions connect the Moroccan substation of Ferdioua to the Spanish substation of Tarifa and until recently have been devoted to enabling electricity to flow from Spain to Morocco, helping the latter to meet its own energy demand. In 2019, following the commissioning of a new coal-fired power plant in the Moroccan city of Safi and the ensuing decrease of electricity costs in Morocco, the balance shifted away towards the Alawi Kingdom that became a net exporter to Spain[82]. The same year, the two signed a MoU for the extension of electricity transit through a third cable, which is scheduled for completion in 2025.

[82] These circumstances prompted the European Commission to consider applying a carbon border adjustment mechanism (finally adopted by the Commission on 14 July 2021) given that Morocco was not subject to the European Emission Trading System and therefore could profit from competitive dumping to the Iberian electricity market; Spain reduced the carbon-generated electricity imports, with the indirect consequence of putting initially in doubt projects for a new interconnection between Morocco and Portugal and the third interconnection with Spain.

Alongside the third interconnection between Morocco and Spain, in May 2019 Italy and Tunisia signed an intergovernmental agreement concerning the construction of an undersea interconnector linking El Haouaria with the Italian municipality of Partanna. The project known as ELMED, which would start in 2023 and targets 2027 as completion date, entails a positive step to connect Tunisia's power grid to the larger EU network and was indeed designated as EU Project of Common Interest. The World Bank, which carried out the feasibility study regarding the interconnector, stated that ELMED would significantly ease the gradual integration of solar and wind power into Tunisia's national grid by providing access to a large reserve of back-up power capacity and narrowing the country's reliance on imported Algerian natural gas.

As a matter of fact, most of Italy's solar power capacity is installed in the southern part of the country and Sicily, regions that also host a large number of projects under development. Thus, by securing lower-cost electricity and enhancing energy security, the cable will contribute to the diversification process of Tunisia's energy mix. Additionally, as Italy imports a substantial share of its energy, further RES development would make it possible to boost sustainable economic growth in Italy's economically depressed South, with the long-term goal of integrating the two markets with electricity flowing from North Africa to Scandinavia. Indeed, clean energy exports should be made possible after scaling up Tunisia's power potential, notably thanks to large-scale private sector investments planned to accompany the project. As ELMED enjoys the status of EU Project of Common Interest, half of the funding is expected to come from the EU, with the rest of the inflows stemming from public-private partnerships (mostly with the involvement of Italy's Terna and Tunisia's STEG).

By supporting EU's efforts to meet its obligations under the Paris Agreement and the new Climate Law[83], the Italy-Tunisia interconnector falls within the scope of the "external dimension of the Green Deal". A statement from the Italian government said: "The objective is to increase the safety and sustainability of electrical systems within an interconnected Euro-Mediterranean network, which also

[83] https://ec.europa.eu/clima/policies/eu-climate-action/law_en

gives the possibility of covering part of the growing demand of African countries with energy produced by EU countries."[84]In another statement, the EU said that "the project will contribute to reduce, under specific conditions, present and future limitations to the power exchanges on the northern Italian border, with France, Switzerland, Austria and Slovenia, and therefore it will allow to significantly increase the transmission capacity and its exploitation by at least 500 MW on that boundary."[85]

In this context, it is evident that formulating a list of projects that would enjoy the status of EU Projects of Common Interest plays an important role in the process of building a "Mediterranean grid community". It does so by easing the development of strategic solar and wind parks that would reduce CO2 emissions and maximize the production of electricity from renewable sources, also adding flexibility and boosting security of supply.

Starting from the findings of the three 2030 baseline scenarios, Med-TSO proposed several interconnection projects to be evaluated:

The first cluster has been built around the so called "West Mediterranean corridor" and involves countries like Algeria, Morocco, Portugal and Spain to reinforce the already existing interconnections between the Maghreb area and the Iberian electricity market. According to the Association, interconnection projects among those countries would offer a positive contribution to the integration of renewable energy in the relevant powers systems, for example by making it possible to avoid energy curtailment in Portugal and Spain by channeling excess supply to the Maghreb countries, ultimately leading to a reduction in the use of non-renewable sources in Algeria and Morocco. Additionally, the projects would start the process of reducing price differentials between the two regions, enabling the Maghreb to benefit from the lower prices observed in the Iberian Peninsula.

[84] https://industryeurope.com/italian-tunisian-elmed-interconnector-given-go-ahead/
[85] Ibid.

The second cluster, the "Central Mediterranean Corridor", would have the final purpose of strengthening links between Maghreb countries and connecting them to the Italian Network; the latter's energy mix already presents a high integration rate of renewables along with an overcapacity of thermal energy, both met by prospects of saturation of demand in the foreseeable future. The Algerian and Tunisian socio-economic dynamics, characterized but energy demand expected to double in the following years, offer promising new markets to optimize power flows from Sicily and Sardinia islands. Moreover, Tunisia's STEG hopes that the ELMED project will enable the North African country to avoid the otherwise constant need for new investments in power production as well as to lessen reliance on imports, all this by guaranteeing a lower electricity cost.

3.1.2 Connecting Europe and North Africa for green energy delivery: a modern form of eco-colonialism?

Notwithstanding mutual benefits pointed out in the previous sections, an excessively optimistic view of the energy integration process to be undertaken in order to establish a "Mediterranean grid community" would be certainly unrealistic. As a matter of fact, some of the possible obstacles to integration's success, which are often highlighted by sceptics, include:

- frictions to enhanced cooperation in the region, such as disagreement on other political dossiers[86];
- additional burden imposed by red tape and insufficient coordination among regulatory frameworks;
- political instability of partner countries in North Africa;
- water scarcity hampering the effective scaling-up of RES power in that region[87];
- ethical and socio-political risks stemming from the adoption of an "extractive approach and mindset"[88].

In particular, the last point has proved to be extremely challenging in the past and has underpinned the failure of former projects of this kind:

In 2003 the Trans-Mediterranean Renewable Energy Cooperation (TREC) initiative was launched, soon to evolve into the "Desertec" project; the latter was aimed at harnessing the potential of cooperation around renewable energy within the region and was specifically focused on tapping into the solar and wind resources of the deserts of the MENA area to supply clean energy to the EU. The

[86] An example would be the Ceuta migrant crisis between Morocco and Spain which took place in May 2021, and the divide over the Western Sahara issue in a broader sense
[87] Dust removal from solar panels and for cooling turbines generates high water requirements
[88] Franza, Luca, *Clean Molecules across the Mediterranean. The Potential for North African Hydrogen Imports into Italy and the EU*, Istituto Affari Internazionali, 2021

initiative was carried out under the auspices of the European Union, along with European private companies and banks, which set the ambitious target of importing up to 20% of EU's electricity demand from the MENA by 2050, at a cost of 400 billion euro. However, the Desertec project failed to deliver the hoped-for results. Developed between 2007 and 2009, already in 2014 as much as 47 out of 50 shareholders had withdrawn from the venture, including one of its founders, Siemens. In parallel, in 2008 the European Commission endorsed another similar project, namely The Mediterranean Solar Plan (MSP), a flagship initiative of the Union for the Mediterranean, with a view to strengthening synergies with Desertec. Nevertheless, MSP suffered the latter's same fate when UfM's energy ministers failed to find an agreement on the Master Plan, leading to the project's ultimate dissolution.

What are the lessons learnt from these previous failures and what kinds of improvements should be sought to succeed in implementing similar projects in the future?

From the political side, the project was doomed to failure as it applied an *unviable one-size-fits-all approach to a very much fragmented region*; furthermore, its *export-focused narrative merely replicated the obsolete mechanism of exploiting and importing energy sources to home markets*, with few value added and even leaving North Africa in a carbon lock-in. On the contrary, the essential priority for North African countries, already afflicted by booming energy demand, should be first to satisfy domestic energy needs and secure a pollution-free future for their own citizens.

The anachronistic discourse on which Desertec was based didn't go unnoticed and was fiercely criticized by some media, which claimed that EU outsourcing renewable energy from the MENA region was but a form of modern-day eco-colonialism. Overall, it is worth noting that rationality and market realities *de facto* pointed to the opposite direction with respect to the initial project's

objectives: an EU energy market characterized by excess generation capacity should be able to channel part of its surplus to near countries rather than the other way round.

Indeed, at that time some Member States were already struggling to absorb additional energy capacity; Spain, for example, was already penalized for not being allowed to export its own energy surplus to France due to congestion and lack of efficient intra-EU connections; not by chance, the Mediterranean Solar Plan was blocked by Spain itself, alienated by the inconsistencies of being asked to absorb additional renewable energy flows from third countries before solving EU's domestic bottlenecks.

Additionally, EU's counterparts were not spared from skepticism: during a conference in Algiers in 2012, the vice-president of Algeria's state-owned Conseil National Economique et Social (CNES) Mustapha Mekideche, affirmed that they had doubts over the electricity prices of the European Market being able to guarantee to Algiers a return on the required RES investments.[89]

In addition to that, *both projects were unable to provide an attractive narrative for both parties, by presenting grids as a mere substitution of pipelines and neglecting the fundamental role of the future project as a driver of sustainable growth across the whole Mediterranean region, contributing to industrial development, job creation and technology transfers.*

On top of these ill-informed strategies, the expectations generated by the projects simply couldn't cope with incompatible energy policies and institutional frameworks, too high electricity generation costs and insufficient physical interconnections between the northern and southern Mediterranean shores.

Notwithstanding previous episodes, connectivity projects have continued to be on the Neighborhood Policy agenda, albeit current and planned electricity exports are smaller compared to the original plans envisaged by Desertec. *These plans now enjoy additional impulse from the falling costs of*

[89] https://www.euractiv.com/section/trade-society/news/desertec-abandons-sahara-solar-power-export-dream/

renewables and the reinvigorated endorsement by the part of the international community to energy transition plans. In order to be able to carry out new plans, the socio-political stability of the region would of course need to be constantly monitored; however, the mechanisms characterizing former unilateral visions have been left out of the connectivity equation.

3.2 Mediterranean hydrogen geographies

3.2.1 Why hydrogen?

The first "European Hydrogen Strategy" has been presented by the European Commission in the last months of 2020 with a view to harnessing the potential of clean molecules and deliver on the EU's pledges for carbon neutrality by 2050; while the strategy contemplates "blue" hydrogen as an intermediate step. the long-term focus of the Union is placed on "green" hydrogen.[90] Hydrogen also plays a key role within the "EU Energy System Integration Strategy" and an official industrial partnership under the name of "European Hydrogen Alliance" has been launched.

As it becomes increasingly clear that not all energy uses and sectors can be electrified (the best case scenario foresees an achievable 60% direct electrification rate), hydrogen is set to become a fundamental ally and key enabler of EU decarbonized future; indeed, hydrogen has high energy when compressed or liquified and it constitutes a viable and efficient decarbonization option for those sectors that are commonly defined as "hard-to-abate", such as aviation, shipping, heavy duty vehicles, petrochemicals and industrial production that requires high-temperature heating.

Besides being an energy source, hydrogen can also be exploited to store energy; in this sense it represents an efficient and cheaper solution than batteries when it comes to renewable energy seasonal storage and could therefore be a game-changer in the management of market demand and supply. *By connecting different segments of economy and society, the hydrogen economy has the potential to trigger competition and innovation across sectors and geographies.* Additionally, molecules can be transported more easily and cost-effectively than electrons over long distances by using gas

[90] Hydrogen is produced by electrolysis, the process whereby electricity is used to split water (H2O) molecules, but as opposed to "blue" and "grey" hydrogen, the process to produce the "green" variant uses renewable sources of energy and thus has no direct carbon impact

pipelines.[91] Thus, it would be possible to repurpose gas pipelines and storage sites in the future, avoiding the risk of generating stranded assets while the global decarbonization accelerates. Finally, hydrogen would add flexibility and impose less fragmentation compared to a completely electric system. Today, there is an unprecedented momentum for hydrogen-focused projects across Mediterranean countries, given that decarbonization represents the policy area towards which the relative majority (37%) of Next Generation EU funds will be mobilized. The falling costs of renewable energy and related technology also allow for increased competitiveness, engaging the private sector. It is indeed expected that within some years hydrogen could be as cheap as diesel for certain applications.

The EU Hydrogen Strategy explicitly acknowledges that a number of factors will limit European self-sufficiency in hydrogen production, thus foreseeing a role for green hydrogen imports from high-yield regions located in its Neighborhood, where all-year irradiation and cheaper renewable energy generation used for electrolysis could deliver cost savings and efficiency gains. The Strategy notably endorses the 2x40 GW approach, which envisages the installment of 40GW electrolysis capacity within the European territory, while deploying another 40GW in neighboring Ukraine and North Africa, to be distributed in either local and earmarked-for-exports uses.

The existing gas network infrastructure provides ample capacity to transport the future green molecules: the Maghreb-Europe pipelines connects Hassi R'Mel gas field in Algeria to Morocco. Spain and Portugal, whereas the Trans-Mediterranean network runs from Algeria to Tunisia and Italy. In addition to that, green hydrogen may also be shipped by sea; in this sense, Morocco's Nador West Med port, currently under construction and scheduled for completion in 2022 is expected to include hydrogen storage facilities.[92]The ports of the future may indeed become centres for storage and

[91] It is estimated that the cost of transporting hydrogen via a pipeline is eight times lower than the cost of transporting electricity via a transmission cable, while storing hydrogen in salt caverns is at least 100 times cheaper than storing electricity in batteries.

[92] The project is financially backed by the African Development Bank Group and is expected to take advantage from its geostrategic position facing the Strait of Gibraltar to help eliminate regional disparities present in Morocco's oriental region. It would do so by accelerating and strengthening economic and social development through enhancement of its

delivery of green energy (including both hydrogen and electricity) produced offshore, thus forming an integral part of global clean energy trade fabric.

Green hydrogen is therefore increasingly identified as the solution to place at the heart of the efforts to ensure a greener future for the world. As for clean electricity networks, it holds likewise true for hydrogen that *the increase in overall energy interdependence could encourage cross-country cooperation, easing tensions and deepening dialogue between nations through trade*. *It would do so by simultaneously mitigating the impact of fossil fuels' phase-out and securing a fair energy transition*. According to Bloomberg New Energy Finance estimates, the path from North Africa to Germany via Italy could be one of the cheapest ways to deliver hydrogen in 2050. The Mediterranean area would therefore progress on its own green growth, contributing to the objectives of the Paris Agreement while in parallel stimulating future-proof industrial innovation and competitiveness (this is especially true for the low value-added North African economies), boosting clean energy ecosystems that foster job creation and socio-economic stability, to the benefit of every country facing the Mediterranean Sea. Once again, it will be imperative to *support local job creation* through technology transfers, capacity building and training programmes. On the other hand, *relationships between international developers and local private sector must be deepened with a view to strengthening local supply chains and sustain a future dynamic market.*

As it was previously pointed out, the challenges ahead are multifold: since the building of the hydrogen economy in North Africa keeps hinging on financial backing from international and regional institutions, a *"coalition of the willing"* comprising national governments, international organizations and the business world would be fundamental to ensure the success of the process. *It*

attractiveness and creation of wealth and jobs. It is also expected to contribute to enhance security of supply of energy commodities to the Kingdom.

will require time, efforts and sustained commitment by the part of policymakers, while adequate, innovative facilities and accountability measures to tap into sustainable finance and align international financial flows to decarbonization objectives must be put in place. Additionally, it would be necessary to strive for *local and country-tailored solutions* to unlock sustainable growth for the broader Mediterranean area, strengthening its stability.

3.2.2 North Africa and the hydrogen economy

North Africa and, in a broader sense, the MENA region could potentially witness a *paradigm shift in its historical role within the global trade scenario*, moving from an unsustainable economic model based on the exploitation of finite resources, invariably leading to scarcity, to a model entirely based on renewable sources. These would come from the huge and energy-rich desert regions, which bless those countries with some of the world's best solar and wind resources; such circumstances are crucial to produce green hydrogen at very low prices. As a recent paper[93] cites "according to Snam's projections, green hydrogen production costs in North Africa (Algeria and Tunisia) will be approximately 1.5 euro per kg in 2030, 1 euro per kg lower than in Southern Italy, [..] the window where North African green hydrogen is projected to be the most competitive relative to Southern Italian green hydrogen would be 2025–2040. [..] North African green hydrogen would remain attractive also after 2040, with a production cost discount of approximately 0.2 euro per kg between 2040 and 2050."[94]

As described in the first chapter, recent years have witnessed the introduction of strategies for "green molecules" alongside "green electrons" in several North African countries, albeit some are still at the early stages, while the most advanced plans are being developed by Morocco. Regional initiatives focused on market development in the Arab World have also expanded, such as Dii Desert Energy/Desertec 3.0 and the MENA Hydrogen Alliance. Compared to other regions of the world like Europe, land availability for such projects is much greater, enabling North Africa to develop larger and cheaper projects; an example would be that of wind-only green hydrogen projects, which could

[93] Franza, Luca, *Clean Molecules across the Mediterranean. The Potential for North African Hydrogen Imports into Italy and the EU*, Istituto Affari Internazionali, 2021

be located onshore with sites often well located close to the sea; these conditions allow for enormous cost-saving with respect to the off-shore wind projects currently developed in Europe.

Hydrogen production can be instrumental to foster the integration of renewables into the power system, while the variety of possible applications and synergies with existent industries' manufacturing value chains offer interesting possibilities to create local hydrogen economies. The concept of "Hydrogen Valleys" has already been envisaged in the EU Hydrogen Strategy, defining them as "local hydrogen clusters, such as remote areas or islands, or regional ecosystems, relying on local production of hydrogen based on decentralized renewable energy production and local demand, transported over short distances"; such concept could potentially be transferred and tested in North Africa as well. With regards to job creation, a study from Dii Desert Energy[95] observes that the breadth of industrial applications and value chains potentially stemming from hydrogen make the potential for job creation significantly higher than that of renewable energy's projects in general, even challenging the number of jobs in the oil and gas industries in the long term; thus, it would serve to offset and mitigate job losses from those sectors, whose employment rate is expected to peak necessarily with the decline in demand.

The building of North African hydrogen economies cannot be spared form the formulation of some environmental considerations: as the electrolysis process is water-consuming, issues arise on how to guarantee access to such natural resource in a region adversely affected by water scarcity and resources constraints, and how to do that in a publicly acceptable way. The options to source water all point to desalinization, although existent facilities would need to further expand their capacity; as already outlined in the first chapter, interesting synergies can and are already being developed between desalinization and renewable energy, improving the efficient use of natural resources and ultimately harnessing their potential to power green growth and sustainable development. Sewage

[95] Cornelius Matthes et al, *The Risk and Opportunities of Green Hydrogen Production and export from the MENA Region to Europe*, Dii Desert Energy on behalf of the Friedrich Ebert Foundation, November 2020

water conversion is also possible, but concretely not viable for large-scale utilization as treating water is more costly than producing newly desalinated water. Lastly, the direct utilization of seawater without desalinization might represent an alternative in the future, however, to date studies are only at the R&D stage.

By creating synergies with other industrial applications for which hydrogen is an input (fertilizers, petrochemicals, methanol, steelmaking), allowing export diversification, generating much-needed revenues and foreign currency inflows, it is possible to affirm that green hydrogen export plans do not necessarily neglect local economic development. As a matter of fact, opportunities to export green hydrogen are most likely to foster local development, given that as a new hydrogen market must be created from scratch, production and consumption have to be stimulated simultaneously and economy of scale will matter a lot. Therefore, local production of hydrogen earmarked for exports is expected to be a catalyst for local hydrogen consumption, enabling decarbonization paths in both Europe and its southern neighborhood. Moreover, industries related to green commodities, such as ammonia produced from green hydrogen, but also aluminum, iron or methanol, have an incentive to relocate close to low-cost renewable energy production clusters, potentially multiplying the positive socio-economic impact for those remote regions where clean energy is generally produced.[96]

Morocco is an example of North African country where plans to build an industrial architecture for green hydrogen have been gaining ground since COP22 in 2016. The country has been identified in 2018 by the World Energy Council as one of the world's six countries with the most promising potential to export green energy in the world and it now aims at becoming a regional and international hub for production and export of high value-added molecules (including green hydrogen, ammonia

[96] Industry relocation is driven by many factors as proximity to resources and consumers, availability of a competitive, skilled labour force and favourable political and regulatory environment, but the cost of energy can also play a significant role. In the case of green commodities, relocation could be considered economically viable where the energy cost benefits exceed the additional shipping costs

and methanol). As observed in the dedicated paragraph, Morocco's engagement in industrial acceleration programmes and in the establishment of a green energy ecosystem has been building on its own foreign policy's strategic axes. Hydrogen could be a real game-changer for Morocco due to several reasons: thanks to the country's massive phosphate reserve, accounting for up to 75% of the total global reserves, Morocco has been able to specialize in the fertilizer industry, which generates billions of exports value for the Kingdom; the public company OCP Group, for example, is a world leader in exporting phosphate-based fertilizers. Nevertheless, for the same reason Morocco has developed a chronic import dependency from ammonia, which needs to be mixed in a wide array of fertilizer's production processes. By adding nitrogen (NH3), hydrogen can be converted into ammonia, relieving the Kingdom from the related burden on its overall trade balance.

Unlike Algeria, Morocco and Tunisia, all connected to Europe via existing gas networks, Egypt would not be able to export hydrogen to large markets using the existent infrastructure. In this context, studies developed by Dii Desert Energy suggest the creation of a pipeline connecting Egypt to Europe via Greece and Cyprus. However, this would take time and strong political commitment on both sides in order to materialize.

By connecting Europe and North Africa for green hydrogen delivery, there is a unique opportunity to renew and reinvigorate the close partnership between the northern and the southern shores of the Mediterranean basin. Before taking up his current mandate, Frans Timmermans had already made supportive statements about such future developments, stating that: "In my dreams, we would create a partnership with Africa, especially North Africa, and we would help install a huge capacity of solar energy in Africa and transform that energy into hydrogen. Then we would transport that hydrogen to other parts of the world and Europe, through existing means that we already have. It is not that difficult to change the pipelines you now use for gas into hydrogen. It's not that difficult to use LNG terminals for hydrogen."[97] In the initial phase, lasting approximately until 2030-35, different types of

[97] https://ec.europa.eu/energy/sites/ener/files/documents/aouad_hany_-_gas_lng_europe.pdf

hydrogen, like blue hydrogen, would be needed to be deployed and produced by converting natural gas into hydrogen. As technology matures and costs fall, however, greener molecules would replace blue hydrogen, making the process entirely decarbonized. In Europe, this passage is crucial to meet the Green Deal's target, supporting technology leadership and guaranteeing in parallel energy security and diversification. Over the long run, with hydrogen potentially becoming the new oil, a consistent diversification of supply will still be imperative from a geopolitical point of view.

The positive bonds of interdependence promoted by large-scale exchanges of green energy could potentially favor the cultivation of good and durable political relationships, with hydrogen-based cooperation acting as a major deterrent for conflict, not only between Europe and North Africa, but also within the North African region itself; in particular, since Morocco and Tunisia are both transit countries for Algerian gas pipelines, energy cooperation and coordination to export hydrogen via the existing network linkages with Europe, could force countries to ease longstanding frictions between each other.[98]

Accounting for some of the least economically integrated countries of the world, characterized by economies much vulnerable to international dynamics that show low value-added production with limited innovative and job creation potential, North African countries all present fragilities that call for a change of pace in their socio-economic development models. *By helping industrial diversification, favoring future-oriented job training for the youth, providing export revenues and hard currency inflows, green hydrogen can offer a contribution to building resilience in the socio-economic fabric, ultimately benefiting overall stability; this includes reducing risks of radicalization and mitigating the phenomenon of economic migration*. In a context of growing fragmentation within the region and authoritarian temptations affecting also countries like Tunisia, which was previously hailed as the only democratic bastion in North Africa, hydrogen could contribute to much needed stability and revitalization of trust in the democratic institutions. However, building a hydrogen

[98] On 24th August 2021, Algeria and Morocco have severed diplomatic ties.

economy requires time and imposes committed efforts not only by the part of policy and decision makers, but also from the public and private sectors. On the road to a fair and just H2 transition, attention must be paid to guaranteeing the necessary system decentralization and ensuring a level playing field to local ventures, including as many local players as possible. These are indeed the pre-requisites to be observed, on the road to establishing mutually beneficial emission-free, affordable and secure energy systems, centered on green electrons and molecules.

CHAPTER FOUR

Securing a meaningful EU role in the Mediterranean energy systems' transformation

4.1 The EU's strategy for clean energy advancement in the southern Neighborhood: a fragmented approach

From a geopolitical point of view, North Africa is a region where different interests coexist with different actors (both regional and international) advancing their own agenda. The Maghreb itself appears to be a fragmented and poorly integrated area, not because of lack of economic complementary between those countries, but rather due to issues of political mistrust; enhanced cooperation between North African countries would certainly be beneficial and, as it has already been highlighted, common green energies export projects and infrastructures could potentially trigger a more cooperative approach.

By the part of the European Union, some initiatives of clean energy cooperation with individual North African countries are already underway[99], albeit they are still at early stages; however, a robust political consensus would be compelling in order for those to be extended at the broader regional level. The Euro-Mediterranean energy relationships had been first initiated in the 1970s, at the time of the construction of the Algeria-Italy pipeline, which has been the first large-scale infrastructure project to connect the two countries via Tunisia. To date, with more than 7000 km of pipelines built

[99] Ivi, p.62

across the region, it is possible to affirm that a bilateral approach has always been preferred over a truly regional one, with the only exception of recent attempts like "Desertec", described in the previous chapter.[100]

However, *whereas Euro-Mediterranean energy relationships followed a preferentially bilateral trajectory, the European Union's energy strategy towards its Neighborhood was founded on a broader regional basis*, notably pursuing harmonization of regulatory frameworks and policies within the region; the latter was expected to be conducive to the establishment of a Euro-Mediterranean market. Additionally, a multilateral approach is also entailed in initiatives such as Med-TSO or the Union for the Mediterranean's three cooperation platforms created in 2015: the UfM Gas Platform, the UfM Regional Electricity Market Platform and the UfM Renewable Energy and Energy Efficiency Platform. The aim of such platforms was to favor the development of partnerships based on mutual trust and transparency between the UfM's members as well as between relevant energy stakeholders in the region. Notwithstanding the merits of such initiatives, their impact to date has been relatively limited and energy cooperation on more substantial terms has largely remained attached to bilateral logics rather than multilateral or regional ones. Amongst the factors underpinning these circumstances, one is that North African countries never took ownership of the complex policy packages presented to them by the EU in exchange for increased energy cooperation[101].

Today, in the context of renewed clean energy commitments across the region and unique cooperation prospects for the broader Mediterranean scenario, such normative approach, which proved to be unproductive with respect to the initial goal of boosting collaboration among the parties, should be overcome to maximize opportunities stemming from large-scale green energies' deployment and the creation of new, positive ties of interdependence between Mediterranean regions.

[100] Tagliapietra, Simone and Zachmann, Georg, *Energy across the Mediterranean: a call for realism*, Bruegel, 2016
[101] Ibid.

Given the fragmented scenario undeniably characterizing the North African region, *a normative, one-size-fits all policy must be avoided as it doesn't represent a viable option to restructure and reinvigorate energy cooperation* between the two continents; to this end, the EU's connectivity strategy should upgrade energy diplomacy, including multilateral and bilateral energy dialogues to refocus the efforts in the southern Mediterranean neighborhood.

At the same time, one should be wary not to over-politicize clean energy cooperation in order to avoid interference from other political dossiers (e.g disagreement over migration issues) that could jeopardize the whole energy discussion. On the contrary, diplomacy and high-level political dialogues should run in parallel to the development of concrete projects that involve public-private partnerships to sustain clean energy transition in partner countries; hydrogen and renewable energy projects represent a promising business opportunities for EU companies and energy firms (electric utilities, companies specialized in manufacturing renewable energy and energy efficiency solutions), to expand their operation in an emerging market and within the context of sluggish domestic energy outlook. Alongside the European Bank for Reconstruction and Development (EBRD) and the European Investment Bank (EIB), partnerships with North African private sector should involve as many players as possible in order to secure that energy diversification is pursued in a way that is conducive to stability of the region, nurturing an ecosystem that unlocks economic benefits for all parties.

Such *new political and economic partnerships focused on clean energy should ideally be crafted at the pan-European level to secure a strategic presence in a context and market that is being targeted by other countries, like China and Russia*. To this end, it is crucial that the EU becomes an umbrella for cooperation between Mediterranean countries, overcoming the current fragmentation of action; special attention should also be paid to investments and/or physical interconnections to be possibly framed as European Projects of Common Interests.

The "Agenda for the Mediterranean 2021-27" prioritizes the strategic engagement of Mediterranean partners in joint initiatives on green finance (another main pillar of the "external dimension of the Green Deal") taking places between the Union and international finance institutions (IFIs); moreover, entities such as the International Platform on Sustainable Finance (IPSF) are expected to play a major role in encouraging the development of sustainable finance policies in partner countries[102], notably by sharing best practices and coordinating efforts to align private capital flows to the sustainable energy objectives, by developing green taxonomies, standards for climate disclosure and labels for green financial facilities, including green bonds; innovative financial mechanisms may indeed be leveraged to support the construction of electric cables, design and develop hydrogen value chains, measures to reduce carbon footprint of current power generation and maximize energy efficiency.

The Agenda for the Mediterranean's document points out that the preferred instrument for cooperation with the EU's neighbors across the Mediterranean during the 2021-2027 period will be the European Fund for Sustainable Development Plus (EFSD+) under the Neighborhood, Development and International Cooperation Instrument (NDICI), both following a "policy first approach". The innovative financial architecture of EFSD+ is designed to crowd in private sector investment, in cooperation with the European Investment Bank (EIB), the European Bank for Reconstruction and Development (EBRD), Member State development banks, and international financial institutions; the instrument specifically aims at promoting investments as means to contribute to sustainable and inclusive growth, the fight against climate change, and address root causes of irregular migration flows. Such financial component appears to be crucial given that private sector's broad engagement could be a real game changer in the energy transition debate; mobilizing private sector's resources is indeed a non-negotiable requisite as public funds alone are not sufficient to meet the decarbonization challenge.

[102] To date, Morocco is the only North African countries joining the Platform

Despite such exercise of implementing EU's flagship projects and programmes focused on clean energy in the South Mediterranean region, significant unilateral action is being pursued at individual Member States' level. A good example and useful case study for such individual engagement is provided by Germany, which has recently been very active in establishing bilateral corridors for green hydrogen with some North African partner countries: the German Federal Ministry of Economic Cooperation and Development (BMZ) has acknowledged the unprecedented opportunity that green hydrogen represents for developing and emerging economies that boast easy access to renewable energy resources and aims at leveraging cooperation to enhance local value chains, energy security, job creation and economic diversification in partner countries. To this end, Germany is intended to implement pilot projects for the production of green hydrogen, while the BMZ is developing "green hydrogen atlases" to showcase the potential for green hydrogen production in selected countries.

Immediately following the promulgation of the German "National Hydrogen Strategy" in June 2020 (which foresees a significant role for green hydrogen imports, up to the allocation of 2 billion US dollars on international partnerships, out of a total allocation of 9 billion US dollars funds), Morocco became the first country to sign an agreement of bilateral cooperation with Germany for the development of Power-to-X sector and products, which include the outputs produced by the green hydrogen industry. The German-Moroccan initiative seeks to realize two main projects: creating Africa's first industrial plant to produce green hydrogen and PtX products, and secondly, establishing a research platform to allow for knowledge transfers and skills training in close collaboration with the Moroccan Research Institute for Solar Energy and New Energies; technical studies for the feasibility of Power-to-X ventures in the Alawi Kingdom have also been conducted by the German research centre Fraunhofer with financing from the German Agency for International Cooperation (GIZ). More recently, in January 2021, the two countries signed a letter of intent to transport Moroccan-produced hydrogen from Tanger Med to Germany's Hamburg port.

Germany has developed similar hydrogen schemes with other North African States, such as Tunisia and Algeria and, significantly, it organized the first "MENA Event on renewable energy" in Berlin on 30 January 2020. The event was dedicated to German companies and enterprises pertaining to the solar and wind sectors to provide information on current demands and issues in Morocco, Algeria, Tunisia, Jordan, Saudi Arabia and the UAE.

However, the promising Power-to-X initiative has been temporarily paused following a recent rift in German-Moroccan diplomatic relationships: Rabat's suspension of diplomatic contacts with Germany on March 2021 was triggered by Berlin's opposition to Moroccan sovereignty claims over Western Sahara, along with dismay that the Kingdom had not been invited to a conference on the Libyan issue held in Berlin, and the fact that Germany has not tried to silence or expel Duisburg-based Moroccan social media activist Mohammed Hajib[103].

These circumstances seem to suggest that current fragmentation of action weakens the position of the EU in pursuing its interests, while clean energy cooperation's initiatives risk being jeopardized by disagreement on other political dossiers. This would also threaten the success of the external dimension of the Green Deal in the Neighborhood.

As opposite, if coordination challenges are appropriately addressed so that clean energy cooperation with partner countries is implemented at a more integrated EU level, the Union could benefit from a stronger political stance which would ultimately act as deterrent for conflict over other issues, thus effectively contributing to increase positive interdependence between the two shores of the Mediterranean.

[103] https://www.dw.com/en/tensions-rise-between-morocco-and-germany/a-57466437
As mentioned earlier in the chapters, tensions over the Western Saharan dispute had a bearing also on the relationship between Rabat and Madrid, culminated in May 2021 in the "Ceuta migrant crisis".

4.2 How a more cohesive EU can promote positive energy transformation in the region

If the European Union fails to effectively plan ahead and strategically coordinate on green industrial developments and hydrogen value chains' integration in collaboration with North African countries, individual EU Member States playing major roles in the Mediterranean connectivity scenario will be forced to partner with third actors from outside the EU system. This will contribute to further fuel internal divisions together with putting the broader objectives of the new "Agenda for the Mediterranean" at risk.

Despite massive investments in clean energy by the part of international actors are needed and welcome, one must not overlook the fact that the *involvement of non-EU countries in the regional energy landscape does not always offer sustainable solutions*: good examples would be Russia's partnership with Egypt for the construction of a nuclear power plant, together with Chinese investments in coal in Morocco. The growing engagement of countries that have been traditionally not involved in the Mediterranean region represents a warning that EU Member State should not take for granted their comparative advantage and geopolitical presence in the area, including on dossiers covering energy transition and the emerging hydrogen value chain.

Indeed, whereas the discussion on large-scale renewable energy deployment enjoys an overall political support in North Africa, the rising challenges faced by the region, such as increasing energy demand, unstable energy imports and expectations of socioeconomic development, mean that alternatives like nuclear power still represent attractive options for those countries and are likewise being contemplated on their respective development agendas. Threats of nuclear proliferation and coal-locked economies go towards the opposite direction of current efforts in promoting the "external dimension of the Green Deal" and are certainly not in the interest of EU Member State nor Mediterranean prosperity and sustainable growth.

Against this backdrop, *the EU has a critical and constructive role to play to impact the Mediterranean energy's trajectory and ensure it develops in a sustainable direction, consistently with the external dimension of the Green Deal and unlocking numerous benefits* discussed in previous chapters.

The manner and extent to which the European Union sizes the opportunities offered by the emerging energy diversification process and exercises its leadership in designing future energy cooperation's patterns can contribute to shape the parameters of its overall future influence in North Africa and even beyond, the latter region being the gatekeepers of the whole African continent.

However, the "no normative strings attached" policy advanced by international actors, in combination with proactivity to cooperate with illiberal regimes remains appealing to EU's counterparts, while the Union must navigate additional challenges, its policies being firmly anchored to good governance, rule of law, democracy and civil rights. Thus, *In the absence of a more coherent and cohesive action at EU level, a fragmented architecture will gradually develop where any space left by the EU is filled notably by China, Russia, Turkey and the Gulf States*[104]*, potentially introducing standards and practices that show little attention for the delivery of broader social, economic and sustainability benefits for the Mediterranean region. Additionally, this would further widen consensus divides among EU Member States and exacerbate geopolitical red lines across North African nations themselves.*[105]

European Union's Green Deal aspirations and hydrogen imports' plans related to North African neighbors could be pursued through joint European investments and coherent programmes at the EU level that are deployed at a strategically significant scale to secure the establishment of local green manufacturing and value chains, job creation and capacity building for their partners; they could also take the form of European-local joint ventures that facilitate local manufacturing of solar panels and

[104] In 2020, UAE entered Algeria's PV manufacturing value chain through a joint venture between the Dubai-based Qi-Energy and Algeria's Système Panneaux Sandwichs to build a production facility that will supply PV structures for locally produced solar panels to be sold in Algeria and the broader African market.
[105] Tanchum Michael, Europe-Mediterranean-Africa Commercial Connectivity: Geopolitical Opportunities and Challenges, Med dialogue series n.31, Konrad Adenauer Stiftung, November 2020

other components used in green power generation.. On the other hand, the emergence of a strong, non-European-led green energy value chain threatens to weaken EU-North Africa commercial relations, reconfiguring economic and political partnerships and reducing EU's clout in a region that holds a strategic importance for very sensitive topics, such as migration.

All North African countries are advancing their interests and expanding their power generation capacity in emerging, sustainable energy sources. The European Union should take the lead in developing constructive clean energy partnerships with its neighbors and accelerating the establishment of emerging Mediterranean hydrogen geographies, promoting the objectives of the Green Deal and the new Agenda for the Mediterranean to incentivize sustainable growth for the region and jointly combat climate change. Enhanced coordination and synergies between EU Member States are prerequisites to realize such outreach to North African economies, as well as to reframe and strengthen patterns of interaction between the two shores of the Mediterranean Sea. A robust engagement at EU level that targets solid partnerships between the European Union and North African countries for the development of green energy value chains would be instrumental to catalyze an environmentally sustainable, long-term economic growth for the southern Mediterranean region.

It is therefore crucial that a more cohesive EU, by acting at the supranational level and not on an individual Member State basis, commits to drive positive energy transformation; failure to acknowledge the strategic importance of North Africa and the opportunities it offers in terms of hydrogen and clean energy partnerships will not only harm climate neutrality goals, but also weaken the bilateral relationships needed to support political reforms and the democratic stabilization that the EU wishes to see in the area, particularly in Tunisia. Indeed, China. Russia, and other geopolitical actors clearly do not retain any interest in delivering broader benefits for the overall regional welfare.

The European Union can still capitalize on its longstanding political and cultural partnerships with North Africa to maximize its advantage over competitor powers; however, this will still require a collective diplomatic effort under the overall guidance of the European Green Deal to create

incentives for countries to join in with EU decarbonization policies and cooperation. Many of the tools and instruments needed to promote such agenda already exist, but they should be combined and strengthened to form a powerful whole. In order to succeed in delivering the socioeconomic benefits much needed in the region, Europe should strive to reinforce its coherence and common vision not least with respect to clean energy cooperation dossiers, which if not improved could lead to a much more fragile and less effective action on this front.

4.3 Clean energy and the competition with China

China is currently engaging in fierce economic competition around the world, which takes the form of many instruments and programmes, among which the Belt and Road initiative stands out as a major connectivity strategy. *Plans to strengthen cross-border and regional connectivity, including power-grid connectivity, are taking off across the globe, and they witness China's rapid involvement in building up its presence as a major investor and standard-setter.*

In 2016, under proposal of Chinese President Xi Jinping, the Global Energy Interconnection - Development Cooperation Organization (GEIDCO) was established in Beijing, an international non-profit organization aimed at facilitating efforts to meet global power demand with clean and green alternatives. At the Belt and Road Forum for International Cooperation in 2017, the President called for collective action "to seize opportunities presented by the new round of change in energy mix and the revolution in energy technologies to develop global energy interconnection and achieve green and low-carbon development"[106].

As far as North Africa is concerned, European efforts to capture opportunities stemming from the ongoing energy diversification's process overlap with those of other international actors, and China is among them; the visit of Morocco's King Mohamed VI in Beijing in 2016 established an energy cooperation axis with the Asian giant: the State company "Shandong Electric Power Construction" has invested in Noor II and III's projects, whereas the two countries are planning the construction of "Mohammed VI Tanger Tech", a smart city that is expected to have a neighborhood entirely dedicated to clean energy industries, and which will be strategically located in the area of Tanger Med port, which will function as logistic interface between the two countries.

[106] https://en.geidco.org.cn/aboutgei/initiative/

In addition to Morocco, China is able and willing to offer his expertise at a good price to other North African countries, as it increasingly becomes a leader in many areas of the clean energy value chain:

China started to look at the enhancement of its energy system' s sustainability at the time of its 12th five-year plan; the latter called for a change in energy priorities as a contribution to overcome the country's so-called fours "Uns": unstable, unbalanced, uncoordinated and unsustainable. The shift in direction was then formalized in 2014 with a publicly released policy paper setting out new targets and strategies for China's energy sector by 2030. In particular, the paper demanded an effort to enhance energy efficiency and reduce emissions from energy infrastructures, along with developing and commercializing next-generation energy technologies through innovation and international cooperation. Thus, *climate change mitigation was conceived as an opportunity for China to advance its bid for global technology leadership in the context of its industrial diversification programme.* Indeed, China's commitment to decarbonization is consistent and supportive of its ambition to rebalance the economy from energy-intensive heavy industries towards technology, services and innovation.[107]

Among the seven strategic emerging industries to receive preferential support, the 12th five-year plan highlighted renewable energy technologies and electric cars, while the following 13th five year-plan (spanning 2016-2020) enabled a role for the market, instead of state subsidies, in the selection of the most competitive green industries. However, the total amount of wind and PV subsidies in 2017 was still estimated to reach about 170 billion yuan, and Chinese-manufactured solar PV modules soon became the target of anti-dumping measures. Complaints about Chinese subsidies notably came from Brussels and Washington but were not limited to them; in 2013, the European Commission imposed trade defense measures against Chinese-manufactured solar panels that were deemed to be sold in

[107] Tagliapietra, Simone and Hafner Manfred, *The Geopolitics of the Global Energy Transition*, Springer Open 2020

Europe below cost.[108] The Commission called the decision a "life-saving oxygen" for European solar panels companies, which were at risk of losing an estimated number of 25.000 jobs.[109]

Notwithstanding global trade frictions, China's engagement in the renewable energy's industry effectively delivered wider benefits for the global battle against climate change: on the back of China's increased manufacturing capabilities, enhanced installed capacity at home and international exports of solar panel and wind turbines, the average global price of PV modules decreased by 79% in 2017 compared to 2010 and overall, by nearly 90% in the last decade, while the cost of wind power dropped by 50%[110]. Thus, *thanks in large part to Chinese companies' ability to reduce costs, China ultimately supported global investments in the low carbon economy and effectively drove renewables' consumption growth at the global level.*[111] As a result, more than two-thirds of the world's population now lives in countries where solar and wind power are the cheapest source of energy generation and in 2020 the world was able to add more net capacity of clean energy than fossil fuels and nuclear combined for the fourth year in a row.[112]

Furthermore, China is one of the world's leading investors in clean energy, having committed 758 billion US dollars in RES capacity in the period spanning from 2010 to 2019; in 2018, China was the destination of almost a third of overall global clean energy investments. In parallel, seven of the top ten solar panel manufacturing companies are Chinese-owned or operated, including the top three; similar figures can be observed with regards to wind turbines manufacturing market. As a result, despite some countries' attempts to limit Chinese manufacturers' expansion[113] in their domestic markets, *renewable energy's equipment sold worldwide is increasingly the product of a global value*

[108] The anti-dumping duty made solar energy more expensive than necessary in Europe, de facto imposing a constraint on market's expansion. Following the EU's renewed commitment to climate goals, the tariff was finally removed in 2018.
[109] https://www.euractiv.com/section/economy-jobs/news/commission-scraps-tariffs-on-chinese-solar-panels/
[110] Finamore, Barbara, *China's Quest for Global Clean Energy Leadership*, Istituto Affari Internazionali, 2020
[111] Ibid.
[112] Ibid.
[113] Some countries like India sought to indigenize renewable energy's value chains in multiple ways, including imposing domestic content requirements.

chain within which China plays a significant role. China's increasing competitiveness has sparked controversy around the world and the abovementioned circumstances highlight how the global energy transition's agenda has not been spared from such competition.

In North Africa, the European Union's overall influence is increasingly contested by China (alongside other powers); in the last decades the region has indeed witnessed a general expansion of the Asian giant's presence in terms of trade, investments and the establishment of Confucian Institutes. In its 2016 Arab Policy Paper, China referred to energy cooperation and investments as priority areas, designing a "1+2+3" cooperation scheme: "to take energy cooperation as the core, infrastructure construction and trade and investment facilitation as the two wings, and three high and new tech fields of nuclear energy, space satellite and new energy as the three breakthroughs"[114]; the Arab Policy Paper affirmed China's commitment to strengthening cooperation with Arab countries with regards to renewable energy such as solar energy, wind energy and hydropower, along with mentioning plans for the joint building of a China-Arab clean energy training center and developing all-round cooperation in related areas.

The EU's position when partnering with North African countries for the expansion of clean energy's frontiers presents some potentially weak points compared to that of China, the first one being related to the Western Sahara issue: whereas relations between Morocco and some EU Member States have recently encountered frictions related to such matter, including the suspension of joint hydrogen projects[115], China maintains a more neutral policy on the Western Saharan dispute; for example, as permanent member of the United Nations' Security Council, China has abstained from voting the UN resolution 2414, which in 2018 called for renewed efforts to end the decades-old Western Sahara conflict.[116] Indeed, China's need to carefully balance its interests connected to the Maghreb's geopolitical position and the BRI, forces the Asian power to apply a more pragmatic and impartial

[114] *China's Arab Policy Paper*, Ministry of Foreign Affairs of the People's Republic of China, 2016
[115] Ivi, p.85
[116] https://www.un.org/press/en/2018/sc13321.doc.htm

approach; not by chance, as the tension between Morocco and Algeria potentially threats China's economic engagement in the region, the latter is committed to act as a mediator and play a conciliatory role to solve the dispute.

Secondly, European conditionalities have traditionally been perceived by their North African counterparts as a mere promotion of unilateral interests rather than a commitment to establish alliances with equal partners. As opposite, the "no normative strings attached" policy advanced by China increasingly proves to offer an attractive option to many regional governments.

China's further entrenchment in new market's frontiers could potentially weaken commercial and diplomatic relations between the EU and North African countries, slowing progress towards positive cooperation initiatives that will address shared stability issues and vulnerabilities characterizing the Mediterranean basin. Alongside this, the European Union has an own commitment to pursue global leadership on the green agenda and to lead by example through the Green Deal policy and its external dimension; if the Union wishes to step up its impact as a more "geopolitical EU"[117], *it is crucial to secure a meaningful, constructive role in the emerging energy diversification process and hydrogen market's development taking place in North Africa*.

The total economic impact of China on the North African region is still limited compared to that of the European Union, which remains a key trading partner; despite a more modest presence, as its domestic clean energy sector grows China appears committed to scale-up investments in renewable energy projects in the region, as demonstrated by the successful December 2019 bid by TBEA Xinjiang New Energy Company to build a solar power plant in Tunisia's Kairouan governorate. China's attempts to secure the lion's share within clean energy value chains around the world and in North Africa is likewise suggested by recent discussions between Chinese PV manufacturers and

[117] Ivi, p.36

Algerian officials to create a Sino-Algerian PV value chain; the latter should be aimed at enabling competitive pricing for made-in-Algeria products and equipment.[118]

However, China's expansion in the North African green market is not limited to the renewables' sector; indeed, as part of the industrial strategy described above, the Asian power has also become the largest producer and deployer of lithium-ion batteries and electric vehicles, including electric cars, buses, taxis and bicycles, and has experience to offer in such field; currently, ninety-nine per cent of the world's electric buses are located in China, with almost one-fifth of the country's bus fleet electrified. In parallel, Egypt has been identified by analysts as Africa's next automotive manufacturing centre, entailing a transformation that is expected to be favored by the development of an EV value chain and a further switch from assembly to component manufacturing. In January 2021, the Egyptian El Nasr Automotive Manufacturing Company signed an agreement with the Chinese automaker Dongfeng to join forces and produce electric vehicles in Egypt; this should lead to the introduction of the first electric car in the Egyptian market by 2022, which will be made of 55% locally manufactured components. The first electric bus line launched in Cairo in 2019 was also a Chinese product, and the Asian giant is actively involved in investments for electric vehicles' charging stations.[119]

It is true that Chinese investments do not enjoy a strong environmental narrative or rationale to date, however China appears to be rapidly decarbonizing, and its enormous investment potential couples with a bid to technological expertise, which enables it to offer attractive packages to governments worldwide. Whereas geographical and cultural proximity bind together North Africa and Europe, if the Union doesn't embrace a more integrated approach to green agenda's advancement in its southern frontier, any space left will be filled by other competitor powers entrenching their presence within

[118] https://www.pv-magazine.com/2020/05/29/algeria-plans-4-gw-of-solar-tenders/
[119] Tanchum Michael, *Europe-Mediterranean-Africa Commercial Connectivity: Geopolitical Opportunities and Challenges*, Med dialogue series n.31, Konrad Adenauer Stiftung, November 2020

the emerging green markets and value chains; this could contribute to increase the fragility of the European Union's strategic involvement in a geographic area where it has traditionally played a protagonist role. The Chinese alternative, which appears committed to have a much bigger stake in the region compared to the one that history had traditionally reserved to it, could present undesired implications as the undermining of political and trade ties between Europe and North Africa; to this end, the green transition's battleground will function as one of the stress tests for such ties.

Against the backdrop of evolving dynamics affecting the global power balance, only a European Union that thinks and acts ambitiously and cohesively could lay the foundations for the success of the external dimension of the Green Deal.

Conclusion

This work has shed light on the different aspects whereby the ongoing and evolving energy diversification is set to profoundly reshape the Mediterranean landscape.

It was argued that a sustainable transformation of power systems has the potential to be a driver for more resilient and inclusive North African societies; however, such potential can be unlocked only if the energy diversification process is conceived as an opportunity to implement long-awaited, bold structural reforms to countries' socio-economic architecture.

The portfolio of green policies within the region is expanding and there is scope to accelerate and increase the level of ambition. Despite unparallel renewables' potential, reliance on fossil fuels imports and increasing pressure over security of supply would seem to provide some countries with unprecedented incentives to diversify their energy mix, analysis have shown that this conditions *per se* are far from being sufficient; sound political backing and broad institutional consensus remain non-negotiable priorities to succeed in implementing the required regulatory and institutional reforms conducive to a smart transformation. The latter would indeed be instrumental to attract necessary investments in clean energy projects and improve much-needed access to foreign capital, issues that are expected to pose persistent hardships to countries willing to take up the energy diversification challenge. In this sense, progress has proved to be sharply uneven at the regional level.

Furthermore, the level of ambition was found to be substantially higher when diversification plans are firmly anchored to other policy priorities, such as cementing Morocco's presence on the Western Sahara territory or Egypt's bid to marginalize geopolitical competitors within the Mediterranean energy scenario. Overall, the manner whereby energy transition will redistribute winners and losers at the regional level is unlikely to be a function of renewable sources' endowments, but rather a function of regulations and policies, attractive markets, fruitful international partnerships and timing.

It is worth recalling that market for hydrocarbons will not dissolve from one day to another, thus the interim period will be fundamental to lay sound grounds for long-term economic resilience.

Large-scale clean energy deployment's plans are crucial to offset the future instability expected to characterize southern Mediterranean's energy dynamics in the foreseeable future; to this end, efforts are already being channeled to the establishment of between-shores grid interconnections capable of capturing existent complementarities between European and North African energy markets, boost energy cooperation and facilitate the transition process in the neighborhood. Whereas the rationale for the European Union to be constructively involved as a major player in North Africa's energy diversification are manyfold, such as delivering on the Green Deal's pledges, pursuing common goals of energy security, foster the long hoped-for coordination in regulatory frameworks, finding new markets for European utilities and companies, the most significant is that the cost of inaction will be greater than that of action. The EU's southern neighborhood is indeed expected to be one of the regions that will be worst affected by an assumed global carbon phase-out, with some countries foreseen to embark through a period of increasing uncertainties for their revenues; this couples with the fact that all North African nations are projected to witness an exacerbation in energy generation capacity needs, driven *inter alia* by exponential demographic growth and hyper urbanization; in both cases, if the status quo is left unchanged, this would lead to dangerous socio-economic destabilization in Europe's southern periphery, with adverse effects in terms of increase in irregular migration flows, political unrest and spread of radicalization possibly making themselves heard sooner than expected.

Green hydrogen is expected to be the real game-changer within the Euro-Mediterranean energy landscape, by virtue of the weight and scale of the impacts it has the potential to catalyze on producers' economic and social fabric, as well as on the relaunch of between-shores energy cooperation; the "hydrogen economy" has the potential to trigger a paradigm shift in North Africa's historical role in global trade, fostering future-oriented industrial diversification and economic

resilience. Prospects for a restructured Mediterranean energy cooperation built around green hydrogen fully reflect the objectives of the external dimension of the European Green Deal, the EU Hydrogen Strategy, as well as Europe's commitment to play a more geopolitical role by becoming a global reference and standard setter in the green transition, starting from its immediate neighborhood; Equally, such future scenario would stand in close synergy with objectives falling within the scope of the EU's "new Agenda for the Mediterranean"; indeed, energy diversification, mitigation of irregular migration flows, and promotion of good governance can present some mutually reinforcing aspects, insofar as the transformation is carried out in a way that is conducive to longer-term socio-economic gains. To this end, the manner through which energy diversification is managed will be crucial as positive outcomes emerging from the ongoing Mediterranean energy evolution are by any means guaranteed. On the contrary, many challenges keep standing on the way to a hypothetical "Euro-Mediterranean Green Deal", including frictions to enhanced cooperation in the region, e.g disagreement on other political dossiers; precarious political stability in the EU' southern neighborhood, North African societies' lack of expertise and hardships in tapping sufficiently into foreign capital and investments.

Enhanced dialogue between international organizations, regional policy makers and the private sector, jointly forming a "coalition of the willing", remains fundamental to identify innovative mechanisms and resources necessary to shape a positive transition; as the business case for energy diversification receives new impulse from the falling costs of renewables and reinvigorated endorsement to climate finance by the part of the EU and international organizations, future clean energy projects must not lose sight of the required focus on win-win solutions; such condition remains indeed crucial as the final social and economic balance of energy transition for the broader Mediterranean region will be largely determined by the extent to which the whole process is people-centered and targeted to mutually beneficial outcomes; these would include local job creation, technology transfers, development and upgrading of local value chains and new opportunities for the

youth. In this sense, the promotion of energy diversification at the diplomatic level should abstain from imposing normative approaches or unviable one-size-fits-all narratives to such a fragmented region, as those kinds of interactions proved already flawed in the past. Furthermore, cooperation around green hydrogen should not be seen through export-focused lenses that would replicate obsolete mechanisms of importing energy sources to home markets; in order to create incentives for countries to join in with EU decarbonization policies, clean energy partnerships must provide an attractive narrative for both parties.

Against this backdrop, the European Union should show a clear common vision and integrated strategy to become an umbrella for clean energy cooperation in the Mediterranean region, overcoming the current fragmentation of action and cementing its presence within a market and geopolitical area that is increasingly under the radar of other major powers, notably China, Russia, Turkey and the Gulf States. The growing engagement of external actors threatens to possibly shift the balance away from the EU's priorities through the introduction of standards and practices that show little attention for the delivery of broader social, economic and sustainability benefits for the broader Mediterranean region. The manner and extent to which the European Union will exercise its leadership in designing future energy cooperation's patterns and offer a constructive engagement to North African partners can contribute to successfully deliver on the external dimension of the Green Deal, while shaping the parameters of the EU's overall future influence in the southern Mediterranean shore.

In conclusion, energy transition pathways offer a brand-new roadmap and toolbox to bring Mediterranean civilizations closer to each other. The premises are there, but only time will tell the degree to which such opportunities will be sized and cherished.

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Executive Summary

The present thesis seeks to investigate the peculiar contribution that clean energy, notably renewable energies and green hydrogen, could provide to the enhancement of overall stability, cross-country cooperation and prosperity in the Mediterranean region, with a specific focus on the interchange between Europe and North Africa. It takes into consideration both local deployment of clean energy and future-oriented energy partnerships that might be established between the two regions in the forthcoming years. The aim of this work is not to argue that energy transition is a silver bullet for all regional problems, however, if certain requisites are met, it could provide a significant impulse to mitigate drivers of regional instability.

The first chapter investigates how energy diversification could be leveraged to boost sustainable socio-economic development in North Africa. It argues that the vast, yet largely under-exploited abundance of low-carbon energy sources, holds important premises for the region's future energy systems; North Africa is in fact home of some of the most favorable sites in the world with respect to solar irradiance and wind potential in both coastal and desertic areas.

The region is currently facing a number of challenges such as exponential demographic growth and hyper-urbanization putting pressure on domestic energy supply, along with unstable fossil fuel exports and energy subsidies limiting the space for fiscal maneuver, increased constraints on environmental resources and youth's expectations of socioeconomic development. Against this backdrop, large-scale deployment of renewable energy sources, including the creation of an hydrogen export market, offers opportunities to transform regional energy systems in ways that can help meeting the growing domestic energy demand, facilitate future-proof industrial development focused on high-value exports, strengthening local value chains and offset possible socio-economic destabilization driven by a gradual global shift to low-carbon sources; indeed, the world is increasingly heading towards a future where market for fossil fuel resources in Algeria and Egypt

may not be granted; In parallel, to promote greater renewables' penetration and hydrogen exports would grant regional energy importers such as Morocco and Tunisia an asset for international positioning they have *hitherto* lacked.

While planning a roadmap for sustainable energy diversification, it is imperative to seize opportunities to mainstream energy efficiency measures, narrow energy rents' concentration and target the reduction of energy subsidies as part of economic growth plans. Albeit such topics are highly politically sensitive, they would help limiting the current burden of energy bills on governments' coffers and represents a crucial step to redistribute wealth and make funds available for other sectors of the economy, including health and education. Additionally, initiatives to promote energy efficiency are fundamental to ensure that efforts devoted to integrating RES into the power system will not be outpaced by the spiking demand.

Another way through which decarbonization pathways could give significant impulse to North African economies and societies is by capturing synergies existent between energy policies and water-food security outcomes; the region is indeed particularly vulnerable to climate extremes like desertification and sea level rise, both resulting in productivity constraints and agricultural sector's degradation; by capitalizing on the efficiencies of renewable energy-based agricultural processes and technologies, such an important pillar of regional economies could be strengthened and made climate-resilient, thus securing numerous jobs and livelihoods.

Hence, in order to harness the full benefits of energy systems' transformation, it is crucial that the latter is conceived as once-off opportunity to drive a structural and systematic change of pace in North African development models.

The chapter likewise points out that North African governments have acknowledged the transformative role that decarbonization pathways could play in their societies and, as the rationale for diversification becomes increasingly compelling, have implemented measures to reduce the

carbon intensity of their economies; all four countries considered (Morocco, Algeria, Tunisia, Egypt) have successfully established renewable energy targets. However, progress has been uneven. To this end, the chapter attempts to analyze to what extent RES-deployment is consistent and supportive of countries' external policies and geopolitical ambitions. In particular, it highlights how sound institutional and political support for clean energy projects is paving the way towards diversification's success in some individual countries such as Morocco and Egypt, while in others like Tunisia and Algeria, political uncertainties and hardships in finding consensus for strategic economic projects is causing severe delays in the achievement of clean energy targets, despite unparalleled potential and outlooks. Overall, political backing for energy diversification and readiness to innovate is found to be stronger in those countries where the latter can be instrumental to achieve related regional ambitions.

Whereas countries across the region all share renewable resources' endowments, winner or losers from the emerging energy transformation process will ultimately be determined by the ability to manage change, design innovative policies and regulatory frameworks that are conducive to foreign investments, and the establishment of fruitful political partnership and agreements.

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The second chapter connects the achievement of benefits outlined in the first chapter with broader stability and prosperity gains for the Mediterranean region and the promotion of associated interests of the European Union; indeed, energy transformation in the southern Neighborhood could contribute to address local vulnerabilities that might have spillovers into the broader Mediterranean landscape.

Renewed political visions and economic models are shaping the context in which energy cooperation between the EU and North Africa will be pursued in the foreseeable future; these include the launch of the European Green Deal, which has a strong external dimension set to form an integral part of the European strategic thinking and action on a global scale. In order to succeed in the global fight against

climate change, a robust external projection of the EU climate policy would be pursued in all relations with third countries.

This couples with the release of the European Commission's new "Agenda for the Mediterranean 2021-27", which promises to spur investments and public-private partnerships to promote socio-economic sustainability in Europe's southern Neighborhood. To this end, the chapter argues that investments in clean energies could be supportive of most of the goals outlines in the "Agenda", including mitigation of irregular migration flows and strengthening of good governance and democracy.

In order for energy transition to catalyze broader benefits for the Mediterranean region, it is imperative that the latter is pursued through a people-centered approach and by applying country-tailored solutions, notably by targeting local job creation through capacity building, technology transfers and training programmes, not least academic programmes targeting new generations; in parallel, enhanced relationships and exchanges between international developers and local private sector should be pursued in order to secure both the creation and the strengthening of local RES-related supply chains and sustain a future dynamic market for emergent commodities. Furthermore, inclusion opportunities for North African citizens could be maximized by tailoring investments in green projects to regions most in need of economic support, for example those that have traditionally been a point of departure for irregular migrants travelling to Europe. To relaunch and restructure economic cooperation on strategic RES projects including those focused on hydrogen, ultimately enables the building of sound political and trust relationships between the EU and North African governments, which is necessary to enhance the existent partnerships aimed at curbing illegal migration and promoting governance reforms.

In parallel, the expected socio-economic improvements underpinned by a lower concentration of energy rents, industrial diversification, specialization across the sustainability value chain, enhancement of health and environmental standards could contribute to the revitalization of popular

support for liberal forms of governance, shielding fragile democratic institutions from the risk of further destabilization. To this end, the chapter especially dwells on the case of Tunisia, where recent polls and surveys have linked popular disillusionment for democracy with, *inter alia*, political inadequacy to drive bold economic shifts and deliver the hoped-for social guarantees.

However, since the concrete rethinking of North African energy systems largely keeps hinging on improved access to capital and financial backing from international and regional institutions, a "coalition of the willing" comprising governments, international organizations and the private sector is fundamental to ensure the success of the process. This will require time, efforts and sustained commitment by the part of policymakers, while adequate, innovative facilities and accountability measures to tap into sustainable finance and align international financial flows to global decarbonization objectives must be put in place.

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The third chapter affirms that in the era of clean energies, a European Union – North Africa energy partnership will remain something that can be aspired to, albeit the dynamics of future cooperation will be profoundly reshaped.

In light of unparalleled opportunities determined by the solar and wind resources of which North Africa in endowed, the establishment of grid interconnections for clean electricity exchanges and the creation of a market for green hydrogen (of which renewables are inputs) is expected to relaunch energy collaboration between the two shores of the Mediterranean in the following decades; significantly, it would do so by creating positive bounds of interdependence between countries and providing a powerful response to global challenges as climate change.

The two regions are witnessing opposite but complementary tendencies in their domestic energy markets, with the northern Mediterranean countries increasingly heading towards a saturation of energy demand, while the south is experiencing upward trends in generation capacity needs; the latter

is even expected to challenge security of supply and the pace of decarbonization. Such disparities are largely determined by diverging economic and demographic patterns, development of new uses of electricity and deployment of energy efficiency measures. Against this backdrop, the development of electrical interconnections capable of exploiting existing synergies between energy markets and enhancing flexibility of power systems would be strategic for all parties:

In the short to medium-term, energy surplus in some northern Mediterranean countries could be channeled to the South, where it is expected to enhance security of supply and minimize energy dependence, thus sustaining and facilitating the gradual deployment of virtuous renewable energy generation plans; over the mid-long term, once North African countries have met their national energy needs, new opportunities related to clean electricity trade could unfold for some of them, notably due to comparatively cheaper RES generation costs. Alongside this, prospects of between-shores electricity exchanges would generate new investment outlooks for utilities, entice countries to reform their regulatory and legal environment, foster technology transfers and economic competitiveness, boost mutual objectives of macroeconomic sustainability, deepen participating countries' commitment to reinforce economic cooperation and, lastly, promote EU's external policy goals in line with the "external dimension of the Green Deal" and the Neighborhood Policy, such as integration of renewable energy towards long-term decarbonization objectives, enhancing security of supply and promoting regional and local-socio economic welfare.

It must not be neglected that the creation of a "Mediterranean grid community" would involve complex issues related to geopolitics, rules' harmonization and access to capital that may take time to be negotiated in such ways that will ultimately deliver mutually beneficial outcomes. However, the long-term outlooks of structured cooperation in both RES integration and the promotion of electricity exchanges should stay high on the regional agenda for the abovementioned reasons.

Energy cooperation in the Mediterranean basin seems to have found renewed institutional impetus both at public and private level, with an increasing number of actors that committed to a wider

integration carried out in the name of sustainability. To this end, the chapter provides on overview of connectivity projects already underway, such as the planned third electrical interconnection between Spain and Morocco and the "Elmed" undersea cable that will link Tunisian an Italian power grids; the latter has earned the status of European Project of Common Interest and is scheduled for completion in 2025. Additionally, the chapter draws on the lessons learnt from the failure of previous initiatives of this sort, such as the "Mediterranean Solar Plan" and "Desertec", both developed in 2008, to formulate broad recommendations for future projects. In particular, it is widely acknowledged that both initiatives failed to deliver as they were unable to provide an attractive narrative for both parties, by presenting grids as a mere substitution of pipelines and neglecting the fundamental role of clean energy trade as a driver of sustainable development across Mediterranean regions; the obsolete export-focused narrative on which the plans were grounded was even labelled as eco-colonialism. Therefore, it is argued that in order for future projects to succeed, strategies guided by mere unilateral visions must be left out of the clean energy equation.

The second part of the chapter focuses on future energy cooperation opportunities to be developed around hydrogen, notably green hydrogen; the latter is produced from renewable sources and thus, through a completely carbon-free process. These outlooks are grounded on the conclusions coming from the recent EU "Hydrogen Strategy", which not only identifies hydrogen as a key enabler of a EU's decarbonized future, but also explicitly acknowledges a role for green hydrogen imports from high-yield regions located in its Neighborhood including North Africa, where all-year irradiation and cheaper renewable energy generation are expected to generate advantageous costs; such conclusion is also determined by the fact that a number of factors will limit European self-sufficiency in hydrogen production.

Hydrogen can be transported via existent gas networks, thus allowing to repurpose pipelines and storage sites and avoid the risk of generating "stranded assets"; additionally, by developing hydrogen clusters in North Africa countries, industries related to green commodities, such as ammonia

produced from green hydrogen, but also aluminum, iron or methanol, would have an incentive to relocate close to low-cost production sites, potentially multiplying the positive socio-economic impact for those regions where hydrogen is produced. Hence, by connecting different segments of economy and society, the hydrogen economy has the potential to trigger competition and innovation across sectors and geographies, fostering future-proof industrialization and strengthening resilience for North African economies, with shared prosperity gains across the Mediterranean region.

One of the purposes of the third chapter is to explain how clean energies and especially hydrogen could enable a paradigm shift in North Africa's historical role within the global trade scenario; once again, this would only be possible by mobilizing international capital flows towards sustainability goals, along with by focusing on country-tailored solutions that involve as many local players as possible to integrate and upgrade domestic value chains, so that export plans go hand in hand with inclusive local development.

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The position advanced by the fourth and last chapter is that the European Union should pursue a strategically coordinated approach to the clean energy dossier, as it progressively unfolds in its southern Neighborhood. This entails that new political and economic clean energy partnership must not follow bilateral logics but would ideally be crafted at the European level to secure a strategic presence in a context and market that is being targeted by other countries, like China and Russia.

The normative, one-size-fits-all approach which has generally guided the EU energy policy towards North Africa (traditionally pursuing the harmonization of legal and regulatory frameworks with those of the Union) has proved to be unproductive with respect to boosting greater collaboration among the parties. Mindful of such experience, and in light of renewed clean energy commitments across the Mediterranean region, this approach should be overcome to maximize unique cooperation opportunities to be developed around emergent energies; to this end, the EU's connectivity strategy

should upgrade energy diplomacy, including multilateral and bilateral energy dialogues to refocus the efforts in the southern Mediterranean Neighborhood.

Is important that the EU becomes an umbrella for cooperation between Mediterranean countries, overcoming the current fragmentation of action. Indeed, the "Agenda for the Mediterranean 2021-27" prioritizes the strategic engagement of Mediterranean partners in joint initiatives on green finance (another main pillar of the "external dimension of the Green Deal") taking places between the Union and international finance institutions (IFIs); the Agenda's document also points out that the preferred instrument for cooperation with the EU's neighbors across the Mediterranean during the 2021-2027 period will be the European Fund for Sustainable Development Plus (EFSD+) under the Neighborhood, Development and International Cooperation Instrument (NDICI).

Despite such exercise concerning European Union's flagship projects and programmes focused on clean energy in the South Mediterranean region, significant unilateral action is being pursued at individual Member States' level. As a case study for such individual engagement, the chapter reports the example of Germany, which has recently been very active in establishing bilateral corridors for green hydrogen with some North African partner countries. However, it is pointed out that some promising clean energy initiatives have encountered frictions due to interference of other political issues and have, accordingly, been suspended. Such circumstances seem to suggest that current fragmentation of action weakens the position of the EU in pursuing its interests, with clean energy cooperation's initiatives risking being jeopardized by disagreement on other political dossiers; this would also threaten the success of the external dimension of the Green Deal in the Neighborhood.

As opposite, if coordination challenges are appropriately addressed so that clean energy cooperation with partner countries is implemented at a more integrated EU level, the Union could benefit from a stronger political stance which would ultimately act as deterrent for conflict over other political matters.

If the European Union fails to effectively plan ahead and strategically coordinate on green value chains' development in collaboration with North African countries, individual EU Member States playing major roles in the Mediterranean connectivity scenario will be forced to partner with third actors from outside the EU system. This will contribute to further fuel internal divisions together with putting the broader objectives of the new Agenda for the Mediterranean at risk. Additionally, the involvement of non-EU countries in the regional energy landscape does not always offer sustainable solutions: good examples would be Russia's partnership with Egypt for the construction of a nuclear power plant, together with Chinese investments in coal in Morocco. Indeed, one must not neglect that alternatives such as nuclear power still represent attractive options for those countries having to struggle with increasing energy capacity needs, and are therefore equally contemplated within their respective development agendas. Threats of nuclear proliferation and coal-locked economies go towards the opposite direction of current efforts in promoting the "external dimension of the Green Deal" and are certainly not in the interest of EU Member States nor Mediterranean prosperity.

The growing engagement of countries that have been traditionally not involved in the Mediterranean region represents a warning that EU Member States should not take for granted their comparative advantage and geopolitical presence in the area, including on dossiers covering energy diversification and the emerging hydrogen value chain. Against this backdrop, the EU has a critical and constructive role to play to impact the Mediterranean energy's trajectory and ensure it develops in a sustainable direction, consistently with the external dimension of the Green Deal and unlocking numerous benefits discussed in previous chapters.

The manner and extent to which the European Union sizes the opportunities offered by the emerging energy diversification process and exercises its leadership in designing future energy cooperation's patterns can contribute to shape the parameters of its overall future influence in North Africa and even beyond, the latter region being the gatekeepers of the whole African continent.

However, the "no normative strings attached" policy advanced by international actors, in combination with proactivity to cooperate with illiberal regimes remains appealing to EU's counterparts, while the Union must navigate additional challenges, its policies being firmly anchored to good governance, rule of law, democracy and civil rights. Thus, In the absence of a more coherent and cohesive action at EU level, a fragmented architecture will gradually develop where any space left by the EU is filled notably by China, Russia, Turkey and the Gulf States , potentially introducing standards and practices that show little attention for the delivery of broader social, economic and sustainability benefits for the Mediterranean region. Additionally, this would further widen consensus divides among EU Member States and exacerbate geopolitical red lines across North African nations themselves.

The European Union can still capitalize on its longstanding political and cultural partnerships with North Africa to maximize its advantage over competitor powers; however, this will still require a collective diplomatic effort under the overall guidance of the European Green Deal to create incentives for countries to join in with EU decarbonization policies and cooperation. In order to succeed in delivering the socioeconomic benefits much needed in the region, Europe should strive to reinforce its coherence and common vision not least with respect to clean energy cooperation dossiers, which if not improved could lead to a much more fragile and less effective action on this front.

A last reflection provided by the chapter concerns the extent to which the clean energy dossier fits into the broader debate revolving around economic competition with China. The latter is indeed rapidly building up its presence as a major investor and standard-setter in connectivity projects, including those focused on grid-connectivity; furthermore, China has become a leader in numerous green sectors so that clean energy equipment sold worldwide increasingly represents the product of a global value chain within which China plays a significant role. Chinese green investments in North Africa have already touched every country in the region, spanning from shares in renewables-related megaprojects to the establishment of joint PV value chains; this couples with a solid presence in the nascent electric vehicles' industry.

China's further entrenchment in new market's frontiers could potentially weaken commercial and diplomatic relations between the EU and North African countries, slowing progress towards positive cooperation initiatives that will address shared stability issues and vulnerabilities characterizing the Mediterranean basin. Alongside this, the European Union has an own commitment to pursue global leadership on the green agenda and to lead by example through the Green Deal policy and its external dimension; hence, if the Union wishes to step up its impact as a more "geopolitical EU", it is crucial to secure a meaningful role in the emerging energy diversification process and hydrogen market's development taking place in North Africa.

In conclusion, against the backdrop of evolving dynamics affecting the global power balance, only a European Union that thinks and acts ambitiously and cohesively could lay the foundations for the success of the external dimension of the Green Deal in the southern Neighborhood. A sustainable, collaborative and inclusive transformation of Mediterranean energy systems offers the opportunity to reinforce political relationships towards the achievement of mutual stability and security goals.

The contribution provided by clean energy, both locally deployed and traded, in the Mediterranean region encompasses a paradigm shift in traditional energy dependence patterns, one that can harness the potential of green electrons and molecules to unlock a prosperous future for all Mediterranean civilizations.