

Navigating the Transition in Times of Uncertainty:

From a paradigm of energy security
to electricity security in North Africa



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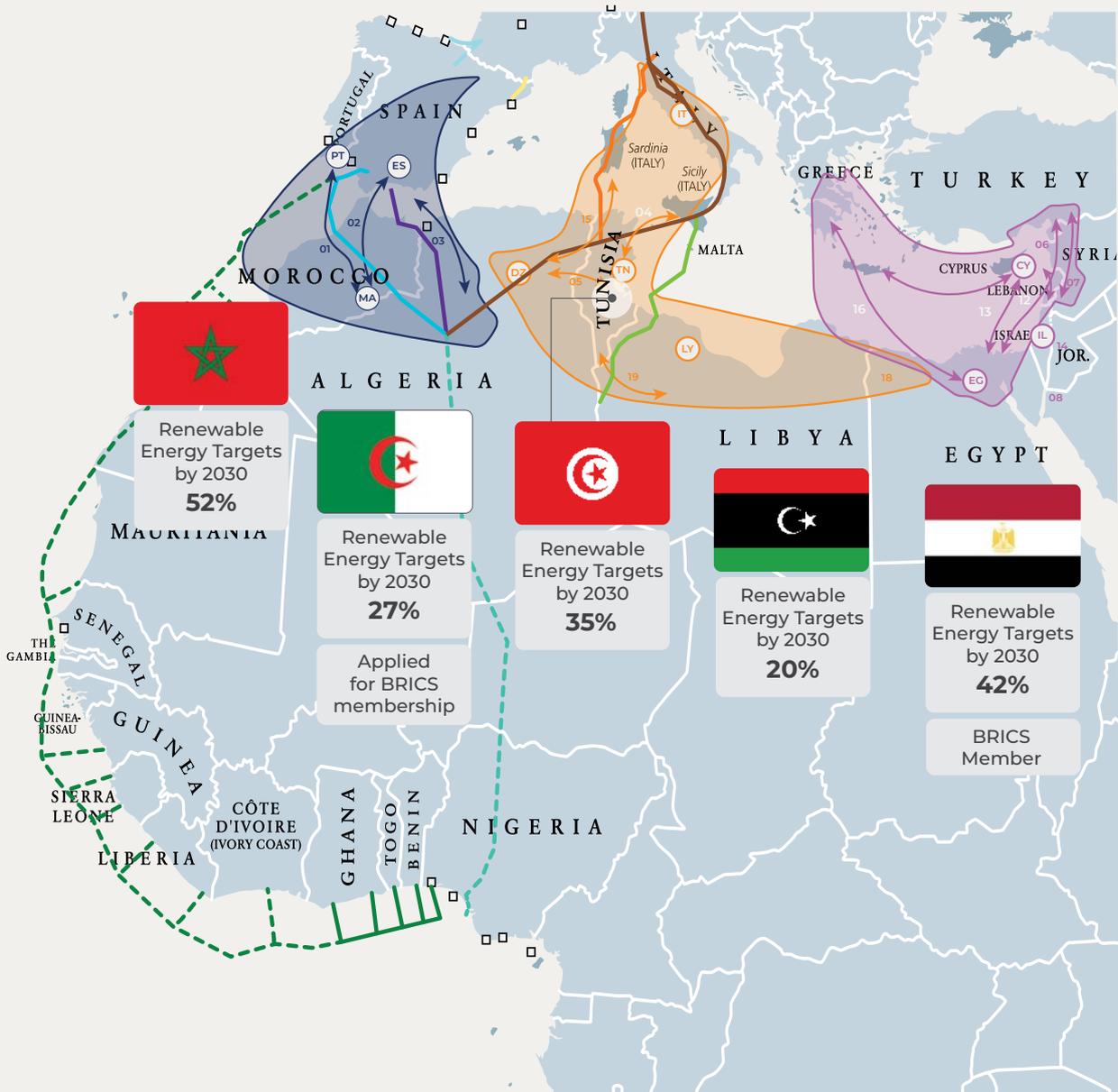


List of Acronyms

Bcm	Billion Cubic Meters
BRI	Belt and Road Initiative
BRICS	Brazil, Russia, India, China, South Africa
CBAM	Carbon Border Adjustment Mechanism
COP2	Conference of the Parties 28
EBRD	European Bank for Reconstruction and Development
EM&MI	Emerging Market and Middle-Income
EU	European Union
G20	Group of Twenty
GDP	Gross Domestic Product
GFDC	Green Finance & Development Center
GH2	Green Hydrogen
GW	GigaWatt
IMEC	India Middle East Europe Economic Corridor
IMF	International Monetary Fund
LDC	Least Developed Countries
LFP	Lithium Ferrophosphate
LIC	Low-Income Country
LNG	Liquefied Natural Gas
MED-TSO	Mediterranean Transmission System Operators for electricity
MENA	Middle East North Africa
MTPA	Million Tonnes Per Annum
MW	MegaWatt
OCP	Office Chérifien des Phosphates
SDG	Sustainable Development Goal
TSGP	Transaharan Gas Pipeline
UAE	United Arab Emirates
UN	United Nations
USD	United States Dollars
ISA	International Solar Alliance
VRE	Variable Renewable Energy
NZE	Net Zero Emissions
EV	Electric Vehicle
STEPS	Stated Policies Scenario
TW	TerraWatt

Energy Landscape in North Africa

Adapted from: MED-TSO (2022) and The new lines institute for Strategy and Policy (2023)



Key

Central Mediterranean Corridor and North America Backbone

East Mediterranean Interconnectors

West Mediterranean Corridor

Existing gas pipeline

- Maghreb-Europe (Offline)
- MedGaz
- Galsi
- Trans-Mediterranean
- Greenstream
- MidCat (Stopped)

Planned gas pipeline

- - - Nigeri-Algeria (NIGAL)
- - - Nigeria-Morocco (NMGP) offshore pipeline
- Existing offshore pipeline

□ LNG terminals

↔ New interconnection project/ cluster

● Existing grid continuity across seas or straits



About this Policy paper

The current decade is critical for global decarbonization. The ongoing energy transition will bring about changes in technology, commodities, infrastructure, supply chains, as well as geopolitical factors, which could give rise to new energy security challenges. It is therefore important to undertake a thorough re-evaluation of energy security dynamics, with a view to enhancing the resilience of power systems.

In this paper, we examine North Africa's energy transition trajectory through the lens of the international energy crisis in order to address the energy trilemma and propose a reflection on the paradigm of energy security, which continues to evolve against the backdrop of a changing global governance landscape. The paper also proposes recommendations on how to align energy security with the energy transition and build a regional common ground to achieve a secure, affordable and sustainable energy future for all.

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Authors: Camellia Mahjoubi (RES4Africa), Rim Berahab (Policy Center for the New South), Hamza Mjahed (Policy Center for the New South)

Peer-reviewers: RES4Africa (Paolo Cutrone, Cristiana Lisi, Rima Jreich), Enel Foundation (Nicolò Sartori)

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Solar energy panels and wind turbines.
Photo Credit: GettyImages/ Chinaface



Part 0

Setting the scene: the energy trilemma in action

Energy security stands as a critical pillar for the effective functioning of energy systems, and it remains a top priority for governments and economic actors globally. Typically defined as the uninterrupted availability of energy sources at an affordable price,¹ it has far-reaching implications for supply chains, economies, societies, and international frameworks. People, businesses, and national institutions rely on the assurance of secure and continuous energy access at reasonable costs.

With the threat of climate change, a fast-growing global population, and calls for a just and inclusive transition, energy security still looms over as a major challenge for policymakers. The complexity and interconnectedness of the challenges in today's energy landscape cannot be addressed in silos and thus necessitate comprehensive and systemic solutions to address them effectively.

The recently concluded COP28 in Dubai leaves no room for doubt. The era of fossil fuels must inevitably end to ensure the limiting of global heating to 1.5°C, and the landmark deal to 'transition away' from fossil fuels has been reached for the first time. According to the Global Stocktake report, the Parties are urged to implement measures that will lead to a threefold increase in global renewable energy capacity and a twofold improvement in energy efficiency by 2030. The report also emphasizes the need to expedite the reduction of unabated coal power, eliminate inefficient fossil fuel subsidies, and adopt other actions that facilitate the shift away from fossil fuels in energy systems. It highlights the importance of carrying out this transition in a fair, organized, and equitable manner, with developed nations taking the lead role.²

At the same time, the war in Ukraine resulted in an unparalleled energy crisis, impacting nations worldwide and leading to significant macroeconomic consequences among which the disruption of global trade, increasing transport costs, and limiting farmers' access to essential supplies like fertilizers. These soaring energy and food prices triggered cascading effects on inflation, economic growth, and food security because the interconnectedness of global supply chains exacerbates the challenges and extends their impact. Adding to this is the fact that the world was already grappling with the vulnerabilities caused by climate change and the COVID-19 pandemic, while simultaneously undergoing a comprehensive global energy transition.³

In North Africa, despite the growing adoption of renewable energy sources for electricity generation over the last ten years, the majority of the region's primary energy supply still relies on fossil fuels (Figure 1), specifically natural gas, oil, and coal. As a consequence, energy security has thus once again become a prime imperative amidst global economic and geopolitical uncertainty.

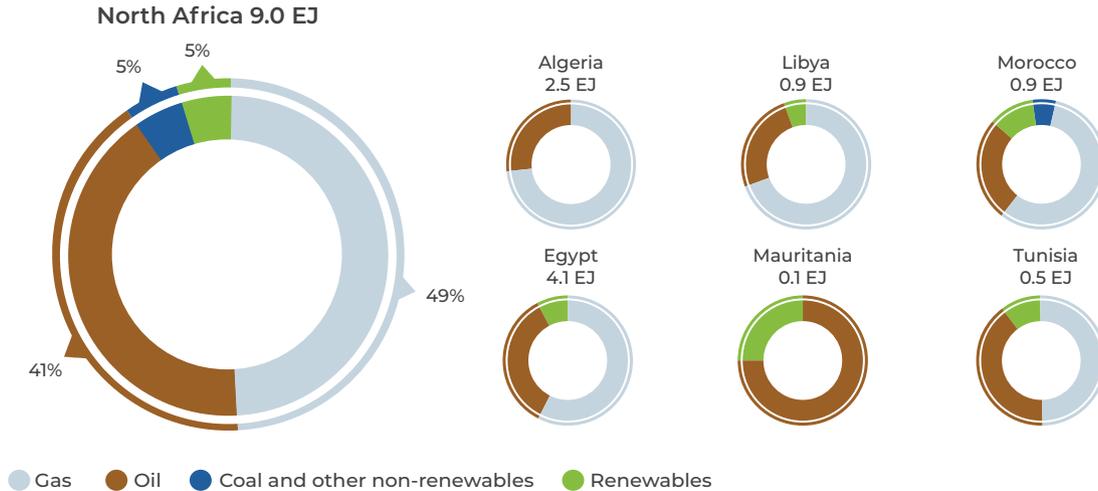
¹ IEA, World Energy Outlook, 2022

² UNCC, COP28 Agreement Signals "Beginning of the End" of the Fossil Fuel Era, 2023, Available at: <https://unfccc.int/news/cop28-agreement-signals-beginning-of-the-end-of-the-fossil-fuel-era>

³ World Economic Forum, Securing the energy transition, 2023



Figure 1. Total primary energy supply structure in North Africa



Source: IRENA (2023)

Commodity exporters like Egypt, Libya, and Algeria have found themselves in a situation of balancing their domestic energy needs with export opportunities, while the impact of the global energy transition is making an increasingly compelling case to implement reform measures aimed at achieving economic diversification and industrial growth. According to UNDP, these countries are likely to experience the most severe fiscal and economic impacts stemming from global decarbonization.⁴ On the other hand, for commodity importers, the crisis has exacerbated pre-existing vulnerabilities, impacting both energy and food security and the balance of payments, because of international price fluctuations.

Despite differences in the resulting external positions, North African countries have been indiscriminately hit by inflation which reached a regional average of 8.2% in 2022, up from only 4.6% the year before. This has raised concerns about the affordability of food prices and pushed governments to implement generalized subsidies and a series of other temporary measures, although at a considerable expense and in tighter global financial conditions.

The energy crisis has also highlighted important geopolitical shifts, reflecting the continuous interplay between regional and international energy dynamics. Unlike its Northern Mediterranean counterpart or the GCC, North Africa has long been characterized by a poor level of integration and the crisis has had a reinforcing impact on the patterns of non-integration and competition. However, the decarbonization plans of North Africa's main economic partners and the imperative of the energy transition are inducing a strategic shift in the regional energy landscape (both within the region and with its traditional and new partners).

For the European Union, the crisis has led to transformative shifts in its energy strategy and external relations. Indeed, REPowerEU, the European Union's landmark plan to transition away from Russian fossil fuels and to decarbonize the EU economies has redefined priorities and renewed EU-North Africa energy relations. In particular, the decarbonization

⁴ UNDP, Global Decarbonization in Fossil Fuel Export-Dependent Economies, 2023.

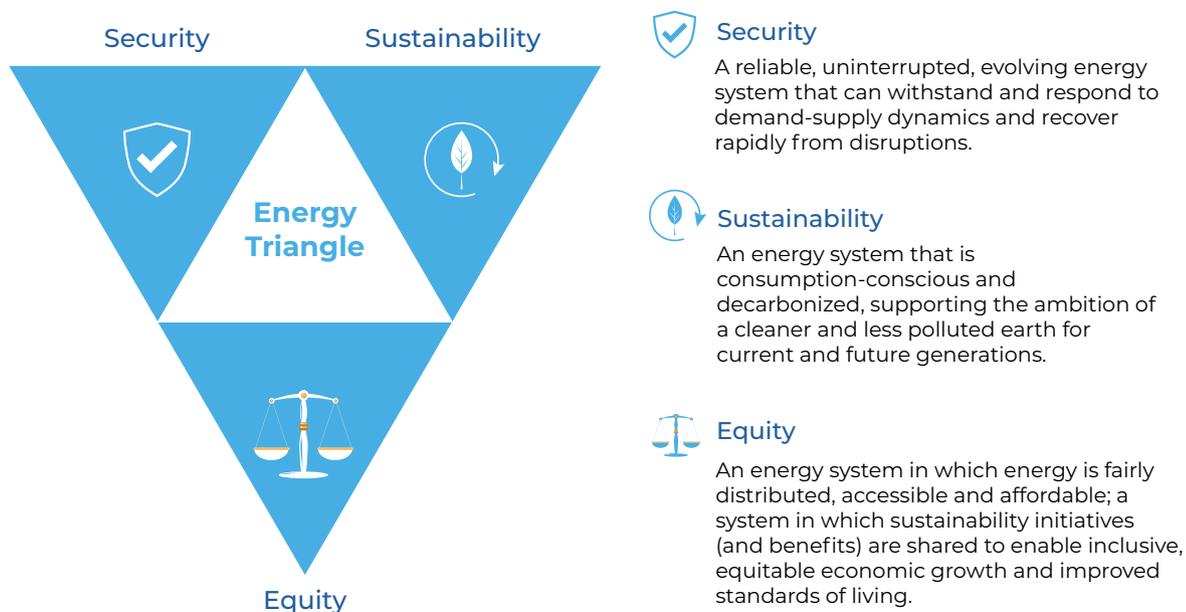


axis of REPowerEU comes about as a promising avenue for energy cooperation between the EU and North Africa in support of their mutual energy transitions. In addition to renewable energy investments and climate finance, other areas of cooperation that gained momentum include Euro-Mediterranean electricity interconnections, green hydrogen, and energy storage. North Africa will therefore play a pivotal role in supplying the EU's short-term energy demands and, in the medium to long term, it will maintain an important role thanks to its renewable energy potential.

Moreover, and mirroring shifts in the international system, another important trend is the growing partnership diversification of countries in North Africa, especially towards economic powerhouses such as China, India, and the BRICS which were recently joined by Egypt. The relevance of these players becomes even more important in view of the global transition from fossil fuel dependency to technology/minerals dependency, where China plays a prominent role in the supply chains.

This complex web of factors placed North African countries in the middle of the so-called energy trilemma in which finding a balance between energy security, energy equity, and environmental sustainability (Figure 2) becomes crucial.

Figure 2. The energy trilemma



Source: World Economic Forum 2022

However, now more than ever, the energy transformation can respond to the three angles of the trilemma:

- Security:** Critics often argue that renewable energy sources are intermittent and unreliable, as they depend on weather conditions. However, innovative solutions can address this concern. One approach is to diversify the renewable energy mix by combining different sources. For example, wind power may be more reliable during certain seasons, while solar energy can be harnessed during sunny periods. Additionally, advancements in energy storage technologies, such as large-scale



batteries, allow excess energy to be stored and deployed when demand is high or during periods of low renewable generation. Furthermore, smart grid systems and demand response programs enable better management and distribution of renewable energy, enhancing the reliability and stability of the overall energy system.

 **Equity:** While renewable energy technologies have historically been more expensive than fossil fuels, significant advancements and economies of scale have made them increasingly cost-competitive. The prices of solar panels and wind turbines have dramatically decreased, making renewable energy more affordable for both individuals and businesses. Moreover, renewable resources are abundant and widely distributed, reducing the reliance on costly imports of fossil fuels. By embracing renewables, we can create a more affordable energy system that is less vulnerable to price fluctuations and geopolitical tensions.

 **Sustainability:** Renewable energy sources, such as solar, wind, hydro, and geothermal power, offer a sustainable solution to the energy trilemma. Unlike fossil fuels, which contribute to climate change and environmental degradation, renewables generate electricity without greenhouse gas emissions or air pollution. By transitioning to a renewable-based energy system, we can significantly reduce carbon emissions and mitigate the impacts of climate change, ensuring a sustainable future for generations to come.

In other words, challenges such as natural disasters, geopolitical conflicts, economic recessions, and pandemics can be hedged against thanks to a transformed power system. For instance, according to IEA, the European Union has realized substantial cost savings of EUR 100 billion during the period from 2021 to 2023. These savings were made possible by the increased installation of solar photovoltaic (PV) and wind capacity, which resulted in the displacement of approximately 230 terawatt hours (TWh) of costly fossil fuel generation. As a direct consequence, wholesale electricity prices across all European markets experienced a reduction. It is noteworthy that without the additional generation from renewable sources, the average wholesale price of electricity in the European Union would have been 8% higher in 2022.⁵

Indeed, the increasing production of solar panels, wind turbines, energy storage systems, smart grids, and electric vehicles will lead to a growth in the demand for minerals not completely met by the announcements of new projects of extraction. In addition, their significance for the energy transition and their concentration in a few countries or regions could pose new security risks, such as disruptions in the supply chain, trade restrictions, and geopolitical tensions, which can lead to shortages and delays in the deployment of energy technologies. Nevertheless, a virtuous approach based on efficiency, innovation, and recycling can help future energy systems avoid falling into the trap that characterized the energy sector of the past.

In such a critical decade where the development pathways of North African countries are built today, a paradigm shift in energy security is therefore necessary. The energy crisis has demonstrated the fragility of a fossil fuel-based energy system and the vulnerability of North African states in the face of shocks and their adverse repercussions on their economies. On the other hand, renewable energies are not only the cheapest alternative

⁵ IEA, *Overcoming the Energy Trilemma: Secure and Inclusive Transitions* (2023).



for power generation, but they are also proving to be resilient and sustainable.⁶ The energy transition has the potential to enable regional integration and trust thanks to shared infrastructure and economic and regulatory harmonization. In this transition phase, building resilient energy systems in North Africa therefore means scaling-up a sustainable electrification, and a careful balancing of energy security and sustainability.

This paper positions the energy transition as the ultimate solution to the energy trilemma, and identifies several enabling factors and actionable measures that could pave the way for resilient energy systems in North Africa:

- ⚡ **Shifting from energy security to electricity security:** Energy security risks may not disappear with the energy transition, but they can be significantly toned down and mitigated through a combination of strategies including diversification of energy sources, investment in renewable technologies, energy storage solutions, smart grid infrastructure, and energy-efficient practices. This would allow for a greater electricity security for all countries in the region and would advance the economic diversification of commodity exporters.
- ⚡ **Prioritizing renewable energy production for domestic energy needs:** Ensuring that renewable energy production meets domestic energy needs before considering export and capitalizing on the domestic development benefits and employment benefits of the clean energy industry.
- ⚡ **Promoting energy efficiency:** Enhancing energy efficiency to mitigate overconsumption and energy waste should go hand in hand with a gradual phase-out of fuel subsidies.
- ⚡ **Reinforcing and developing reliable electricity grids:** Investing in modernizing electricity infrastructure, implementing advanced technologies, and developing resilience plans to protect critical infrastructure and maintain essential services during emergencies are crucial in ensuring grid security.
- ⚡ **Introducing a reform of energy subsidies coupled with safety nets:** Overhauling energy subsidies would create fiscal room for public services and enhance equity. The reform of safety nets could be coordinated with subsidy reform to provide targeted compensation and effective transmission of adjustments to energy prices.
- ⚡ **Safeguarding the most vulnerable segments:** Implementing measures like uniform flat-rate rebates on utility bills or targeted subsidies for low-income households to protect the most vulnerable. Reference tariffs for electricity could also be considered.
- ⚡ **Incentivizing self-consumption from renewables:** Promoting self-consumption of renewable energy to diversify sources, decentralize generation, enhance grid stability, and improve resilience.
- ⚡ **Supporting green industrialization and green hydrogen:** Exploring the potential of green hydrogen for hard-to-abate sectors would contribute to energy security and industrialization goals. Developing transparent policies and regulatory frameworks would be key to attract investments.

⁶ IEA, World Energy Outlook (2022).



-  **Securing a diverse and resilient clean energy supply chain:** To mitigate the risks associated with concentrated technology supply chains, it is crucial to diversify supply partners and promote circularity and recycling of end-of-life batteries, solar panels, and wind turbines through appropriate policies and incentives. Moreover, North Africa could also benefit from the friendshoring and near-shoring attempts by the European Union, undertaken in order to hedge against supply chain disruption risks.
-  **Supporting the development of new skills:** The energy transition creates the need to allocate new resources to comprehensive training initiatives for the development of skills and expertise in renewable energy integration, resilience planning, and policy and regulatory frameworks.
-  **Promoting public to private dialogue between energy stakeholders from the region:** For a smooth energy transition in North Africa, an exceptional level of multi-stakeholder engagement is needed. To this end, it is important to encourage energy stakeholders to engage in dialogue, share knowledge through regional energy forums, capacity-building initiatives and technical assistance.
-  **Fostering regional integration:** A secure and orderly transition can only happen through collaborative and mutually-beneficial efforts in a way that acknowledges the shared interest of all. Promoting cooperation and integration within the energy sector among North African countries, developing regional electricity interconnections and coordinating institutional and regulatory frameworks would allow for a smooth integration.



Wind turbine seen at El Alia town of Bizerte, Tunisia
on September 18, 2016.
Photo Credit: GettyImages/ Anadolu



Part 1

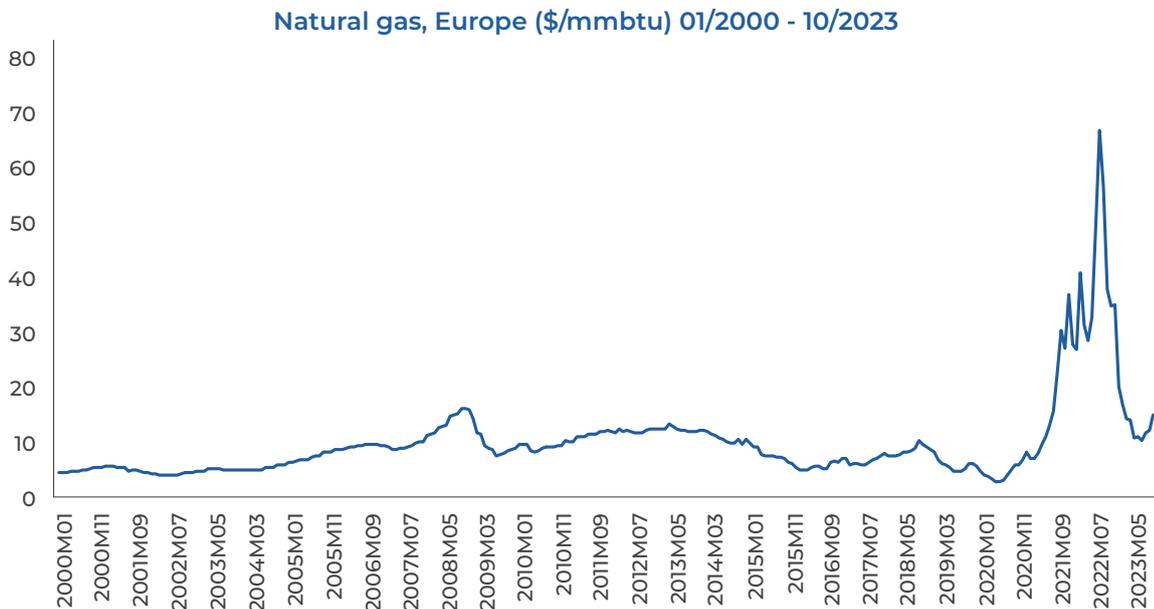
Unveiling the Economic Turmoil: How North Africa Navigated the 2022 Global Energy Crisis and Its Aftermath

In 2022, the international geopolitical landscape took a pivotal turn with Russia’s invasion of Ukraine, the energy crisis that had begun in the previous years and set in motion a series of spillover effects in North Africa. The 2022 energy crisis has been characterized by an unprecedented spike in international energy prices, exacerbated by the confluence of tighter global financial conditions, increased uncertainty, and the still ongoing challenges posed by the aftermath of the COVID-19 pandemic. This complex web of factors has placed North Africa in the midst of a challenging energy security dilemma and put significant fiscal pressure on the region. This section seeks to provide an assessment of the key near-term economic implications of the international energy crisis for North Africa, focusing on the region’s ability to safeguard its energy security interests. It also aims to shed light on the strategies and mechanisms that have allowed these countries to manage the crisis amid these challenging circumstances.

Unprecedented Volatility in International Energy and spillover effect on other sectors

The year 2022 saw an unprecedented increase in international energy and food price volatility. Although emerging apprehensions regarding a potential global economic slowdown have somewhat tempered the trend, energy prices continue to hover substantially higher than pre-pandemic levels (Figure 3).⁷

Figure 3: Evolution of Crude Oil and Natural Gas monthly Prices During the 2000-2023 Period



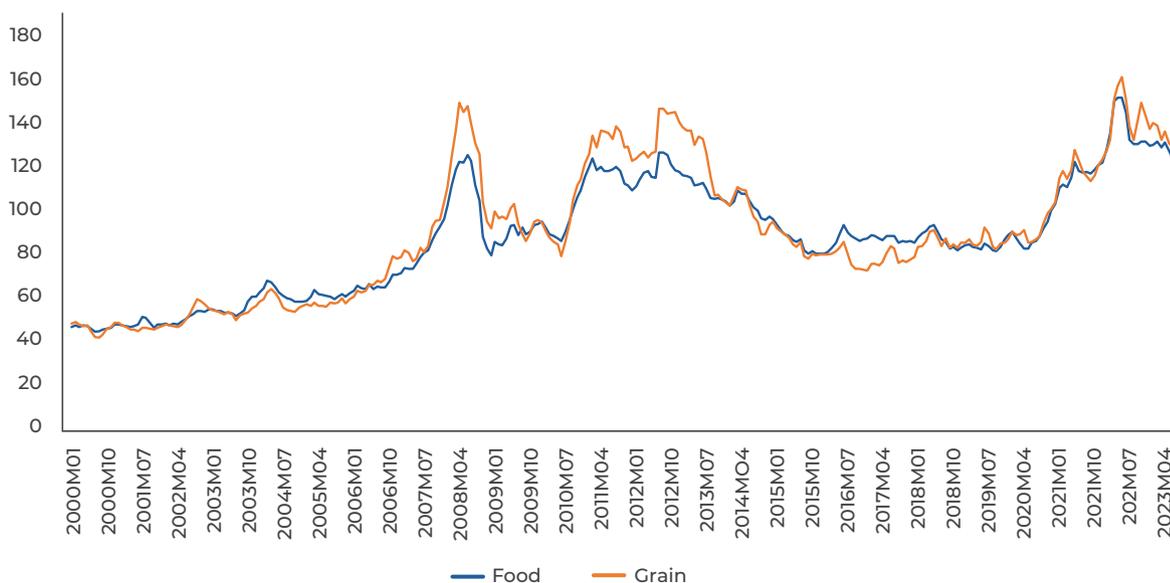
⁷ Amaglobeli et al., name of the publication, 2023



For NA, the energy crisis is particularly important because it is exposed on many sectors and in particular the food sector. As energy plays a crucial role in various stages of the food supply chain (from production and processing to transportation and distribution), agricultural activities rely heavily on energy inputs, including machinery, fertilizers, and irrigation systems. Consequently, the significant price hike in natural gas, a crucial component in the production of specific fertilizers, combined with trade disruptions, has contributed to the increased costs of food production. This rise comes at a time when global food prices have been steadily climbing since mid-2020, primarily driven by a sharp increase in cereal prices (as illustrated in Figure 4) and further accelerated by the Ukrainian crisis, as both Ukraine and Russia play a key role in the global trade of staple foods such as wheat, maize, and other key food commodities. Consequently, this situation has raised noteworthy concerns regarding food security in numerous emerging countries and regions, including North Africa, where cereals play a vital role in household diets and consumer spending.

Despite recent, albeit gradual, declines, partly attributed to the UN Black Sea Grain Initiative, food prices remain well above their long-term averages, exerting significant upward pressure on global inflation. Moreover, these persistently high prices will likely be influenced by the risks associated with the impacts of climate change.

Figure 4: Evolution of the International Food Monthly Prices from 2000-2023 (index 2016=100)



Source: World Bank Commodity Price Data (The Pink Sheet)

Contrasted Terms of Trade Evolution Between Energy Importers and Exporters Leading to Different External Positions

In economics, terms of trade are defined as “the ratio between the index of export prices and the index of import prices. If the export prices increase more than the import prices, a country has positive terms of trade, as for the same amount of exports, it can purchase

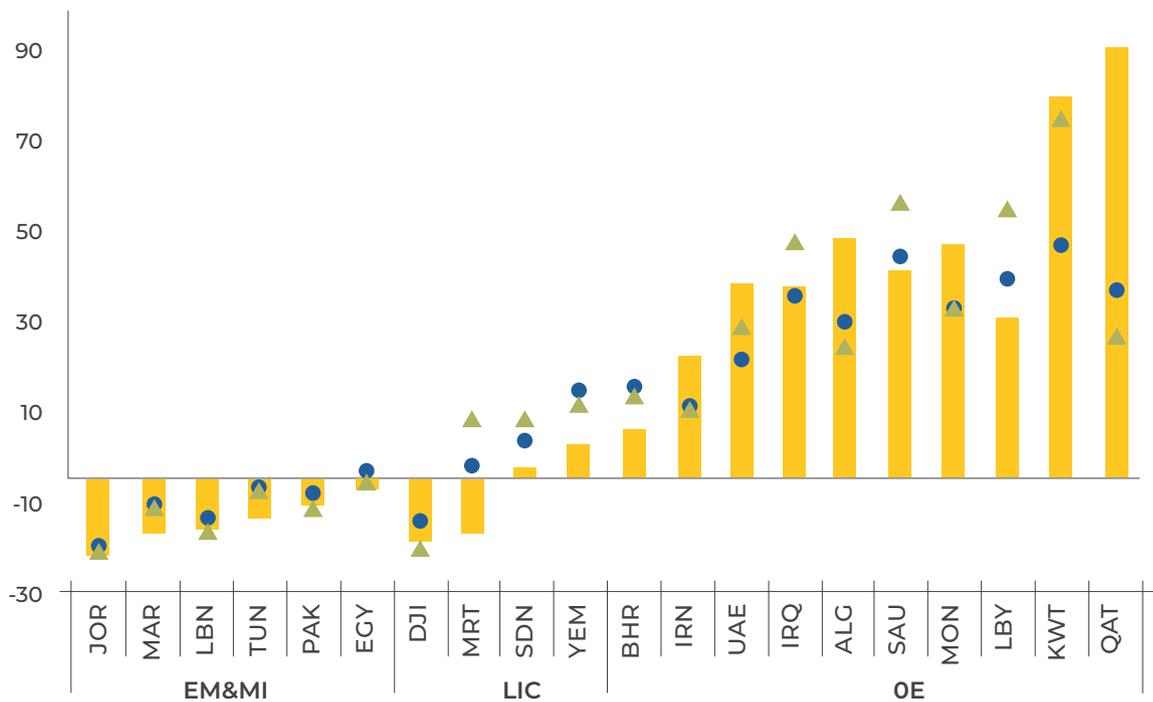


more imports”.⁸ In other words, the terms of trade quantify the amount of imports a country can purchase with a given amount of its exports.

North African countries have been particularly affected by recent movements in international energy and food prices because of the heterogeneity of their trade structures, which include countries that are either exporters or importers of these commodities. As a result, commodity exporters and importers in the region have faced diametrically opposed terms of trade shocks.

Oil exporters have seen a significant improvement in their terms of trade, while oil importers, particularly Morocco and Tunisia, have seen a significant deterioration in their terms of trade since May 2020 (Figure 5). On average, net commodity terms of trade gains for MENA oil exporters were around 6% of GDP in the first half of 2022, while oil importers lost about 0.5% of GDP in the same period.⁹

Figure 5: MENA countries Commodity terms of trade (percent change)



Source: IMF, Commodity Terms of Trade database; and IMF, World Economic Outlook database.

This resulted in higher energy and food bills for commodity importers in the North African region, leading to a widening of their trade balance deficits in 2022 under pressure from food and energy imports.¹⁰ Indeed, Tunisia and Morocco faced a trade balance deficit of -5% of GDP and -9% of GDP, respectively, in 2022. In Egypt, the trade balance deficit stabilized at -2% of GDP in 2022 due to positive performance in tourism and Suez Canal

⁸ OECD, name of the publication, 2023

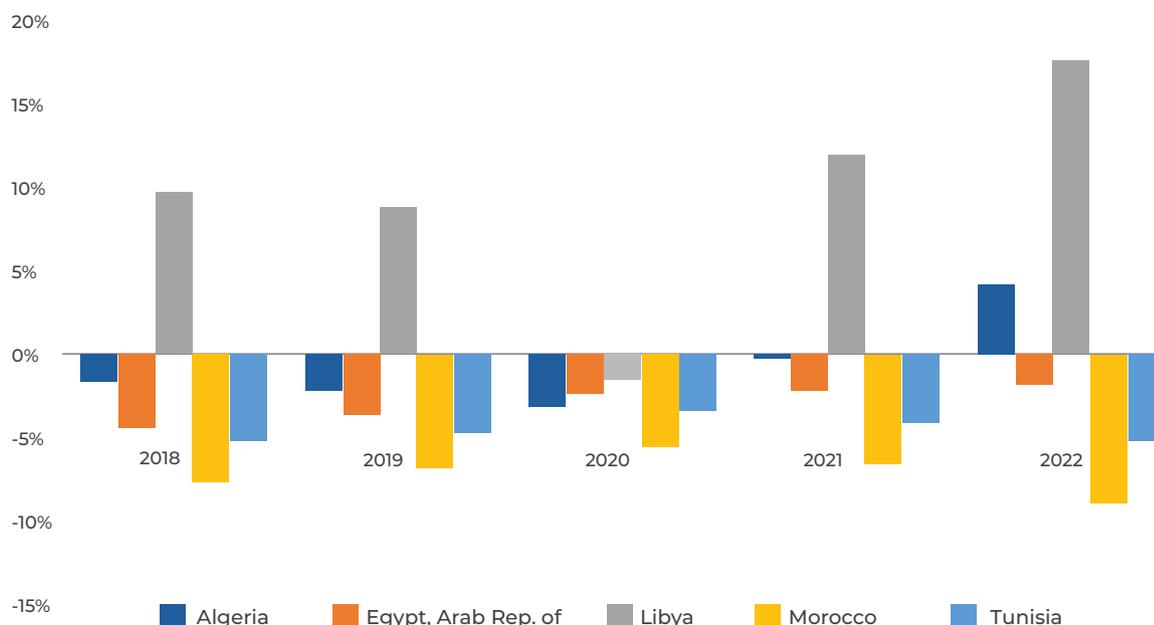
⁹ Gruss and Kebhaj, publication, 2019 Note: Country abbreviations are International Organization for Standardization country codes. EM&MI = emerging market and middle-income economies; LIC = low-income country; MENA = Middle East and North Africa; OE = oil exporter.

¹⁰ AfDB, name of the publication, 2023



revenues.¹¹ Conversely, oil-exporting Algeria and Libya experienced a surplus of 4% of GDP and 17% of GDP in 2022, respectively (Figure 6).

Figure 6: Trade balance as a percentage of GDP in North African countries (2018-2022)



Source: *Direction of Trade Statistics (IMF)*

Rising Inflation Amongst Both Commodity Importers and Exporters

Due to the above-mentioned factors and despite prudent monetary policies in most countries, inflation in North Africa has increased significantly, leading to a regional average of 8.2% in 2022, up from 4.6% in 2021.¹² Moreover, the inflationary impact of Russia’s invasion of Ukraine is unsurprising, as wheat accounts for a significant share of the region’s imports.

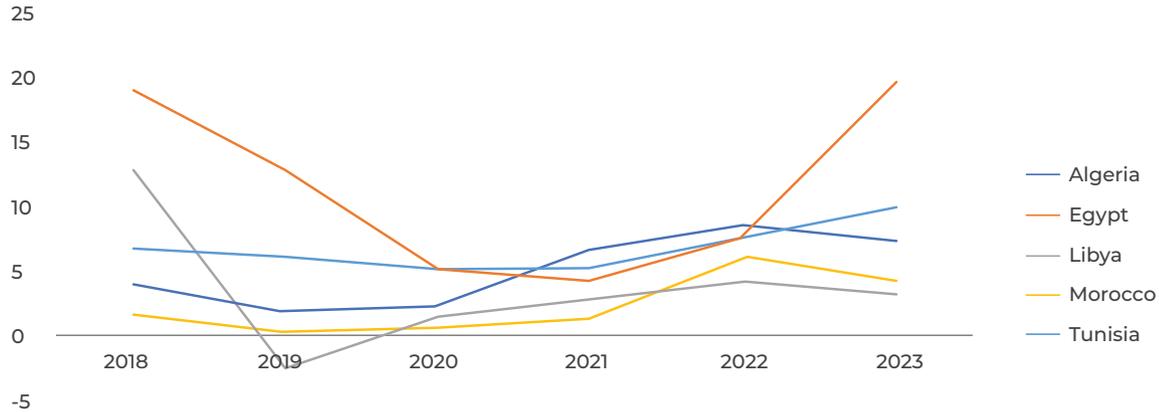
Notably, Algeria experienced a relatively high inflation rate of 9.3% in 2022 due to imported inflation and monetary policies that supported economic recovery while allowing for the financing of the fiscal deficit. Egypt also faced an inflation rate of 8.5% in 2022, partly due to the devaluation of the Egyptian pound, which pushed up import prices, as well as supply-side bottlenecks in critical sectors such as food and energy. In contrast, Libya is expected to witness a stable and relatively low inflation rate of around 4.5% from 2022 to 2024, despite the authorities’ limited capacity to tackle inflation, a slight currency depreciation in 2022, ongoing political instability, and supply-side constraints. Morocco, historically known for its low inflation rates, experienced an uptick to 6.6% in 2022, after which the central bank took a cautious approach to monetary policy rates while maintaining an accommodative stance, while Tunisia has also struggled with inflationary pressures, recording rates of 8.3% in 2022 (Figure 7).

¹¹ Due to instability in the Middle East, and its repercussions on ship traffic in the Red Sea, the numbers presented may be subject to variation.

¹² AfDB, publication, 2023



Figure 7: Inflation, average consumer prices (percent change)



Source: IMF, World Economic Outlook Database

However, domestic food and energy inflation have only partially followed global prices, reflecting the prevalence of subsidies and long-term import contracts, especially in the energy sector. For instance, despite an 80% increase in global food commodity prices since 2019, domestic food price inflation has ranged from 6% to 49% in oil-importing MENA countries and 7 to 24% in oil-exporting countries. Similarly, while international crude oil prices increased by 63% over the same period, domestic gasoline prices in the region increased by an average of 26% for importers and 12% for exporters.¹³

On a different note, and while the effects on commodity markets have been limited so far, the World Bank's latest Commodity Markets Outlook warns that a further intensification of the ongoing conflict in the Middle East has the potential to propel global commodity markets into uncharted territory.¹⁴

Energy Security: A Prime Imperative Amidst Global Economic Uncertainty

As countries in North Africa grapple with the economic uncertainties stemming from inflation and trade imbalances, ensuring a stable and affordable energy supply becomes a prime imperative for maintaining economic resilience. Indeed, a secure and reliable energy infrastructure can act as a mitigating factor against the adverse effects of fluctuating energy and food prices, fostering economic stability and safeguarding against external shocks.

The particularity of the energy crisis of 2022 is that it is different from historical crises which typically centered on oil and highlights the evolving dynamics of the global energy arena. Unlike in the past, when natural gas was primarily a regional resource transported through stable, long-term pipeline contracts, the widespread use of liquefied natural gas (LNG) has globalized the supply chain. As a result, a crisis in one region can have global repercussions through the interconnected LNG market.¹⁵

¹³ IMF, name of the publication, 2022)

¹⁴ World Bank, Conflict in Middle East Could Bring 'Dual Shock' to Global Commodity Markets, 2023 <https://www.worldbank.org/en/news/press-release/2023/10/26/commodity-markets-outlook-october-2023-press-release>

¹⁵ Berahab, Shaping a Renewed Atlantic Vision of Energy Security: Old Trends, New Paradigms, 2023(<https://www.policycenter.ma/publications/shaping-renewed-atlantic-vision-energy-security-old-trends-new-paradigms>)



Against this backdrop, energy security has once again become a paramount concern for both energy-importing and exporting countries in North Africa.

Indeed, North Africa's energy exporters found themselves in a situation of balancing domestic energy needs with export opportunities as Europe began to diversify away from Russia for its energy imports, particularly natural gas. Notwithstanding this, countries such as Algeria and Egypt have emphasized their commitment to prioritize domestic energy needs to ensure their own energy security over gas exports.

Conversely, energy-importing countries have found themselves vulnerable to volatile international energy markets, forcing them to intensify efforts to diversify their energy mix, with a particular emphasis on renewables, in order to strengthen their energy security and be less vulnerable to international price fluctuations. Energy-exporting countries in North Africa have made tentative progress on economic diversification and moving away from heavy reliance on oil, gas, and mineral exports while paving the way for the development of alternative sectors such as manufacturing and agribusiness. This strategic shift is not just a reaction to external shocks but a proactive approach to building economic resilience in an ever-changing global landscape.¹⁶

North Africa's First Line of Defense to the 2022 Global Energy Crisis: Keeping High Prices Under Control

In the past, policymakers have always responded quickly to commodity price spikes to mitigate their effects. However, these responses have often lacked targeting and prior planning, ultimately leading to adverse fiscal and distributional effects. Such reactions also led to heightened debt sustainability concerns among oil-importing countries and pushed their oil-exporting counterparts down the path of procyclical fiscal policies, followed by abrupt fiscal adjustments when oil prices inevitably fell.

In 2022, the North African region witnessed a familiar pattern of response to the commodity price shock among the majority of its countries, but this time, this response was somewhat restrained compared to previous instances, mainly due to reduced fiscal space coupled with relative progress in subsidy reform. Nevertheless, despite the apparent parallels with past commodity crises, the current price shock is unfolding in a global and regional context that is markedly different from its predecessors. North African countries are now operating in an environment characterized by tighter global financial conditions, exemplified by higher international and domestic interest rates, as well as heightened risk premiums stemming from higher debt levels or geopolitical linkages.¹⁷

In response to the disruptions witnessed in 2022, North African countries' immediate short-term economic priorities have been to combat rising inflation and protect small businesses and populations through coordinated monetary and fiscal policies. Similarly, maintaining and supporting food and energy security in the region remains a crucial objective (Table 1).

Generalized subsidies have served as an initial defense mechanism for most African nations against the surge in global commodity prices, but this policy approach has come at a considerable expense. In the Middle East and North Africa (MENA) region, energy subsidies, on average, accounted for 1.5% of GDP in oil-importing countries and

¹⁶ Ibid

¹⁷ IMF, Regional Economic Outlook- Middle East and Central Asia: Mounting Challenges, Decisive Times , 2022



a more substantial 5.8% in oil-exporting nations in 2021. Food subsidies were less costly, reaching as high as 1.5–2% of GDP for Algeria, Egypt, and Tunisia. At the end of 2022, the heightened energy and food subsidies have cost an additional 1.09 and 0.2% points of GDP on average for MENA countries, respectively.¹⁸ Nevertheless, the escalation in these subsidies is expected to be less pronounced than during previous crises, owing to prior subsidy reforms and the restricted fiscal leeway of countries in the region. Indeed, several countries in North Africa have approved upward adjustments in domestic gasoline prices, like Morocco and Tunisia, in addition to tax reductions primarily targeted at consumption taxes related to food, such as customs duties, in the case of Morocco.¹⁹

Table 1: Announced measures by Algeria, Egypt, and Morocco to cope with the 2022 commodity price shock.²⁰

Country	Measure description	Type of measure
Algeria	Restriction of exports of imported goods	Other non-fiscal measures
	Suspension of increase in taxes on sugar	Revenues
	Suspension of custom duties on sugar	
	Reduction of VAT and custom duties on edible oil	
	Subsidies of wheat sold to agribusinesses	Spending
Unemployment benefit (new) for young, first-time job seekers		
Egypt	Export ban on staple foods	Other non-fiscal measures
	Increased procurement of wheat from domestic producers	
	Diversification of wheat imports	
	Increased wheat import (change in categorization of imported wheat)	
Morocco	Removal of custom duties on wheat	Revenues
	Subsidy for transportation sector workers	Spending

Source: Database on Energy and Food Price Actions (DEFPA), IMF.

In addition to generalized subsidies, North African countries have adopted other targeted measures to mitigate the impact of rising food and energy prices on vulnerable people, such as temporary cash transfers in Morocco, food subsidies to support domestic wheat production in Egypt, and an increase in existing subsidies in Tunisia. In addition, some countries, such as Algeria and Egypt, have resorted to temporary trade restrictions, including export bans on certain products. The overall budgetary cost of these measures varies considerably from country to country, averaging between 0.8% and 1.3% of GDP.²¹ It should be noted that most of these measures have been announced as temporary.

¹⁸ IMF, Regional Economic Outlook- Middle East and Central Asia: Mounting Challenges, Decisive Times, 2022

¹⁹ Ibid

²⁰ *Other(non-fiscal measures): Price freeze/incomplete pass through OR Other

*Spending measures: cash transfers, semi-cash (vouchers and discounts), subsidies to energy companies, subsidies to food companies, wage bill, pensions

*Revenues Measures: VAT/sales tax, excises, custom duties (import tariffs), corporate income tax(CIT), Personal income tax(PIT), property tax, non-tax revenues

²¹ Ibid



Aswan High Dam - Aswan - Egypt.
Photo Credit: GettyImages/ Adrian Wojcik



Part 2

Reshaping Energy Geographies: Exploring the Interaction of the Regional Energy Landscape with Geopolitical Dynamics

As the world grapples with the escalating challenges of an international energy crisis, the intricate dynamics of global energy geopolitics come to the forefront. This chapter explores the interplay between those dynamics within North Africa, the multifaceted landscape of energy diplomacy through the REPowerEU plan, and the emerging energy partnerships with the East, notably with economic powerhouses China and India.

Bilateral Relations in North Africa under Strain: Between cooperation and competition

The current energy security paradigm in North Africa has had a reinforcing effect on the dynamics of competition and non-integration in the region. Historically, large-scale North African energy integration has been minimal, with only a few projects being developed, particularly between Morocco and Algeria, which ceased in 2021, and among the central Maghreb countries of Algeria, Tunisia, and Libya. This lack of integration can be attributed, to the fragmented nature of North Africa's regional politics, but also due to North Africa's energy relations being primarily vertical, following a North-South logic. The region's energy ties have revolved around the European Union as the predominant importer of North African energy. This trend has intensified since the Russo-Ukrainian war. Despite the pressing need for cooperation and diversification of energy sources, the prevailing energy security paradigm has impeded widespread integration efforts, thereby hindering effective collaboration among North African countries.

In August 2021, Algeria made the decision to sever its diplomatic relations with Morocco, resulting in significant implications for economic cooperation in the region, particularly the Maghreb-Europe Gas Pipeline. Subsequently, the pipeline's contract expired, leading to its suspension, and disrupting gas transportation from Algeria to Morocco and Europe. This development has raised concerns about the risks posed to industrial and economic development, as it hampers the only viable means for the two countries to collaborate on major economic projects that could foster regional integration. Despite the potential of energy cooperation to alleviate these tensions, the prevailing diplomatic climate renders such cooperation highly unlikely. The geopolitical competition between the two countries is now evident in two areas. Firstly, they are both vying to build gas pipelines from Nigeria. Algeria is taking the lead with the Trans Saharan Gas Pipeline (TSGP), which aims to connect Nigeria to Algeria via Niger to facilitate the transport of natural gas to Europe. In response, Morocco is undertaking the Morocco-Nigeria natural gas pipeline project with several objectives, among which: ensuring North-West Africa energy integration, meeting Morocco's energy needs, and eventually supplying Europe. Nonetheless, both projects face three significant challenges. First, the growing preference for liquefied natural gas (LNG) by European countries. Second, insecurity and instability in Nigeria and along the pipeline routes. Finally, the mobilization of private sector investment.

On the other hand, both countries are competing to establish themselves in the renewable energy sector. Morocco has taken proactive steps to reduce its energy imports



and increase exports to Europe by focusing on renewable energy sources in the medium-term. This goes hand in hand with Morocco's green industrial policy whose main axes are spelled out in the country's Long-term Low Carbon Strategy 2050. Although an official industrial decarbonization roadmap is still under development²², some major industrial actors such as the OCP Group have established a decarbonization plan, as exemplified by its 2023-2027 green investment program of \$13 billion USD, aimed at increasing OCP Group's mining and fertilizer production capacity, while achieving carbon neutrality by 2040.²³ In contrast, Algeria has not yet invested sufficient resources in developing renewable energy capacities but is increasingly developing this agenda, with a conditional target of 27% of electricity generation from renewables by 2030²⁴, especially green hydrogen, consequently unveiling its national hydrogen roadmap that includes the aim of supplying Europe with 10% of its green hydrogen needs by 2040.²⁵

In this context, Algeria has assumed a prominent role in the complex energy geopolitics between the Maghreb region and Europe with the energy crisis. As the EU endeavors to reduce its reliance on fossil energy imports from Russia, it has sought to diversify its energy supply sources. Being Africa's primary natural gas producer and exporter, Algeria's energy ties with Italy have assumed a central role. In 2022, Algeria's contribution to the EU's natural gas imports amounted to roughly 12% of the total gas imports into the European Union for that year.²⁶ This share was bolstered by Europe's transition towards LNG and a decrease in gas consumption. This was especially the case for Italy, who made remarkable strides in reducing its dependence on Russian natural gas dropping from 40% in 2021 to 16% in 2022. At the heart of enabling this transformation lies the Transmed Pipeline, which saw a rise in the transportation of natural gas from Algeria to Italy, exporting a total of 22 billion cubic meters (Bcm) in 2022, compared to the previous year's 20 Bcm.²⁷ The reduction of Algeria's natural gas export to Spain in 2022 by 40% facilitated this growth,²⁸ coupled with the total reduction of Algerian natural gas exports to Morocco through the Maghreb-Europe Pipeline. In the foreseeable future, Algeria's central role as a natural gas exporter to Europe is challenged by two significant factors: capacity issues and a rise in domestic consumption.^{29,30} Overcoming these challenges demands substantial financial investments. Meanwhile, its primary market, the EU, is actively engaged in decarbonizing its economy.

The Transmed Pipeline's importance for Algeria transcends Italy's energy needs, as it stretches from Algeria to Italy via Tunisia, thereby augmenting Algeria's strategic relevance in the Maghreb region and contributes to Tunisia's economy amidst challenging socio-economic conditions. Consequently, this energy infrastructure explains the reinforced bilateral ties between Tunisia and Algeria, especially considering Tunisia's political

²² UNIDO, Morocco: developing an industrial decarbonization roadmap framework, 2024

²³ OCP Group, OCP Group launches a \$13 billion Green Investment Strategy, 2022. Available at: <https://www.ocpgroup.ma/news-article/ocp-group-launches-its-new-green-investment-program-2023-2027>

²⁴ IRENA, Planning and prospects for renewable power: North Africa (2023)

²⁵ Hydrogen Insight, Algeria aims to supply Europe with 10% of its clean hydrogen needs by 2040 in new national H2 roadmap, 2023. Available at: <https://www.hydrogeninsight.com/policy/algeria-aims-to-supply-europe-with-10-of-its-clean-hydrogen-needs-by-2040-in-new-national-h2-roadmap/2-1-1426265>

²⁶ S&P Global, Algerian gas flows to Europe shrink, but Italy gains as trade ties strengthen, 2023.

²⁷ Ibid

²⁸ Zarkik, A., Gas Crisis in Europe: A Harbinger of Sustainable Cooperation with North Africa. IAI & Policy Center for the New South, (2023)

²⁹ Why can't Algeria solve Europe's gas woes? (2022). Euractiv. Available in link: <https://www.euractiv.com/section/energy/opinion/why-cant-algeria-solve-europes-gas-woes/>

³⁰ Algeria struggles to meet rising demand for its gas after Russian invasion of Ukraine. (2023). Financial times. Available in link: <https://www.ft.com/content/3236fa97-e041-425b-a2a8-4b9c66d3e39b>



landscape experiencing a shift with the ascent of President Kais Saïd to power. The relations between Tunisia and Libya have equally encountered notable headwinds, notably after the discovery of two oil and gas basins.³¹ Moreover, in order to alleviate its energy dependency and accelerate its energy transition, Tunisia has adopted an ambitious plan for energy efficiency and the deployment of renewables, aiming to achieve a 30% share of renewable energies in the energy mix by 2030. The new energy strategy for 2035, adopted in April 2023, has set a new goal of installing a renewable energy capacity of 8,530 MW by 2035 for electricity production.

In Egypt's interactions with other North African states, energy plays a significant role in shaping its strategic outlook as it aims to establish itself as a pivotal global energy hub. This ambition gained momentum in 2015, following the discovery of the Zohr offshore natural gas field by the Italian oil company, Eni. Situated within Egypt's Exclusive Economic Zone, Zohr stands as the largest gas field in the entire Eastern Mediterranean region. Its estimated reserve capacity of approximately 850 Bcm of gas is tantamount to nearly 15 years of Egypt's domestic gas consumption and the discovery has indubitably ignited Egypt's ambition to assert itself as a prominent player in the global energy landscape. It serves as a cornerstone of the nation's energy strategy, bolstering its efforts to enhance energy security and foster substantial energy cooperation and trade regionally and internationally. Driven by its pragmatic initiatives and strategic partnerships, Egypt has emerged as a prominent energy player in the region. However, the nation's long-term standing in this capacity remains uncertain, primarily due to Israel's continued status as the primary gas supplier in the region. As a result, Egypt has proactively taken steps to diversify its energy assets, focusing on the promising potential of renewable energy. In 2021, Egypt witnessed a significant progress in renewable energy, with approximately 19.2 GW of power being generated from renewable resources.

Looking ahead, the Egyptian government has set ambitious targets, aiming to achieve 50.5 GW of renewable energy capacity by 2030 and an even more substantial 62.6 GW by the years 2034/2035.³² These objectives reflect the country's strong commitment to not only enhance its domestic energy supply but also actively explore opportunities for exporting renewable electricity to Europe.³³ Additionally, Egypt envisions a regional market, with Libya as a potential electricity importer. In its bid to assert itself as North Africa's renewable energy leader, Egypt has forged several partnerships and agreements with foreign investors. One noteworthy initiative involves developing green hydrogen and green ammonia production facilities near the Suez Canal, with the intent of exporting these green commodities to Europe. This move places Egypt in competition with Morocco in attracting investments and market access, since the country shares similar ambitions for green hydrogen and green ammonia. However, due to the geographical separation between the two countries and the broader fragmentation of North Africa, a regional large-scale industrial cooperation remains elusive. Consequently, the energy-driven geopolitical dynamics in North Africa will remain characterized by non-integration and a North-South verticality paradigm that places each North African state in competition with others for influence and resources.

³¹ One of these basins extends along the eastern Tunisian coast, with a smaller portion onshore and the remainder offshore, stretching from the shores of Bizerte and the Gulf of Tunis to the Libyan city of Misrata. The other field lies off the coast of Sirte. According to the United States Geological Survey, these findings boast a staggering 4 trillion barrels of oil and 385 billion cubic feet of natural gas.

³² Moharram, N., Tarek, A., Gaber, M., Bayoumi, S., Brief review on Egypt's renewable energy current status and future vision, Energy Reports, Volume 8, Pages 165-172, 2022.

³³ Energy Industry Review, GREGY Interconnector to Be Included in the European Union's list of PMI's, 2023



REPower EU and North Africa: Prospects for Sustainable Energy Cooperation

After almost two years since the outbreak of the war in Ukraine, it is possible to evaluate the trajectory of EU-North Africa energy relations through the lens of REPower EU. Achieving the ambitious targets set in the latter entail a difficult balancing act of short-term energy shortages and long-term climate neutrality objectives on both shores of the Mediterranean. In these calculations, North Africa is proving to be a reliable partner for Europe’s energy security and will continue to play a pivotal role in the green transition. The success of REPower EU’s implementation and the vision conveyed in the European Green Deal will thus also depend on enabling North African countries to leap-frog carbon intensive development and unlock their renewable energy potential. As global climate dialogues are increasingly advocating for a just and socially fair energy transition, it is also important for the EU to build mutually beneficial partnerships with those countries. Beside scaling up the deployment of renewables and improving electricity transmission grids, building a local green industry (electric vehicles, battery cells, fertilizers, low-carbon steel) would put the energy transformation at the service of economic development in the region.

The disruptions caused to the world’s energy system but also to EU member states by the war have raised concerns on the EU’s energy security and prompted it to question its energy partnership with Russia. In March 2022, EU leaders agreed to phase out Europe’s dependency on Russian energy imports, leading to the inception of the so-called *REPowerEU Plan*.

The *REPowerEU plan* seeks to structurally transform the EU’s energy system to address its overdependence on Russian energy exports while speeding up the green energy transition to meet its long-term decarbonization objectives. According to the European Commission, the plan aims to save energy, diversify supplies, speed up Europe’s clean energy transition and efficiently combine investments and reforms³⁴.

Figure 8. EU Policy shifts since the Ukrainian crisis



Source: ECDPM (2023)

³⁴ European Commission, REPower EU Plan, 2022



However, these structural changes are not without challenges. They require a reconciliation of short-term energy diversification needs demanding new sources of energy supply-, with long-term decarbonization targets³⁵. This has prompted EU countries to adopt an updated external energy policy to serve as a guidance for the implementation of the REPowerEU Plan and address the latter's external implications, namely the *EU external energy engagement in a changing world*. In a fast-changing energy landscape, the new policy aims at engaging with old and new partners in order to fulfill the EU's energy needs.

In this context, both the energy diversification and the decarbonization aspects have had significant external implications and led to new energy partnerships to emerge where the Southern Mediterranean plays a significant role. Indeed, many EU member states have turned to North Africa to meet their energy needs, redrawing energy flows and routes as well as political relations.³⁶ In the short to medium term, the MENA region will play a pivotal role in the supply of oil and gas, and in the longer-term it will maintain an important role thanks to its renewable energy and trade potentials.³⁷

Diversification or a new energy diplomacy in the Mediterranean

Moving from a scenario where Russian gas represents 45% of all natural gas imports to Europe to a scenario where it is completely phased out is no easy task. It is a transition that requires striking a balance between the required infrastructure while avoiding the risk of stranded investments and assets, and keeping the pace with the green transition and decarbonization targets. In this equation, the Southern Mediterranean has become strategically important thanks to its oil and gas endowments and its vast renewable energy potential.

According to the *REPowerEU* plan, and in order to overcome its dependence on Russian gas, the EU must increase its gas imports from non-Russian LNG and pipeline suppliers by 50 billion cubic meters (bcm) for liquefied natural gas and by 10 bcm or more for pipeline gas. This had led to the creation of the EU Energy Platform, serving as a platform to pool demand, coordinate infrastructure use and conduct negotiations with international partners.³⁸ So far, the platform functions on a voluntary coordination basis and for some of the energy deals, EU countries have moved autonomously, relying on their existing historical ties and privileged relations with North African energy partners to sign bilateral agreements.

Central Mediterranean: Algeria and Libya

Being connected to Europe with several gas pipelines, Algeria has become one of the most important gas suppliers to the EU, namely through the Medgaz and the Trans-med pipelines which- before the war in Ukraine- had been underutilized, and LNG. In 2022, the country has supplied the EU with 11.6% of its gas imports,³⁹ making it the second largest exporter to Europe. Due to a deterioration of relations between Algeria and Morocco, the Maghreb-Europe pipeline connecting Algeria to Spain via Morocco has been shut

³⁵ IAI, *A changing Energy Diplomacy: The external Dimension of the REPower EU Plan*, 2023

³⁶ *Ibid*, page 3

³⁷ ISPI, *Energy Politics in the MENA region: From Hydrocarbons to Renewables*, 2022

³⁸ European Commission and High Representative of the Union for Foreign Affairs and Security Policy, *EU external energy engagement in a changing world*, 2022

³⁹ Council of the European Union, *Infographic - Where Does the EU's Gas Come From?*, 2023, Available at: <https://europa.eu/!Ry4j3d>



ever since. Algeria's new role as a key energy supplier to the EU has led to a diplomatic rapprochement with many European countries and fostered tighter relations with Italy.

On the other hand, despite its large reserves and existing infrastructure that connects it to Italy, Libya's contribution to the EU's energy diversification efforts is hampered by political instability and security concerns. Nevertheless, in January 2023, there was a notable shift when the newly established Italian government endorsed the initiation of a significant gas development initiative in Libya during Prime Minister Meloni's inaugural trip to Tripoli.

Eastern Mediterranean: Trilateral Agreement with Egypt and Israel

To the East, the EU has also worked on establishing relations with Eastern Mediterranean countries in the framework of its diversification efforts. In June 2022, during a visit to Cairo by European Commission President Ursula von der Leyen, a memorandum of understanding was signed between the EU, Egypt and Israel to boost gas exports to Europe. However, the recent rise of insecurity in the region due to the war between Israel and Gaza could have some ramifications on the agreement and the prospects of deepening integration for potential exports beyond the region.

Decarbonization and the green energy transition

European countries have sought valuable partnerships with countries in the Southern Mediterranean to bolster their energy security. Nevertheless, the European Union has consistently affirmed its dedication to upholding and advancing its climate goals both domestically and by supporting countries that embark on their green energy transitions, as detailed in REPowerEU. Indeed, demonstrating the advantages of a net-zero economy by the EU and its capacity to generate and fund opportunities outside the EU plays a pivotal role in finding common ground, and in defining future energy and business opportunities between both shores of the Mediterranean.

As stated in the EU external energy strategy, the green energy transition is the only way to meet the SDG7 objectives for a secure, affordable and sustainable energy for all, and the EU is resolute in its commitment to this path while engaging with partner countries and cultivating long-term relations in the field of energy. This could encompass financial support, technology transfers, and/or enhanced trade relationships.⁴⁰

As climate change is taking its toll on North African states, the latter have realized early on the imperative of the energy transition and what it means for their sustainable development. More recently, they have also recognized its implications for food and water security in their national policies, as demonstrated by the water, energy food nexus. The protracted droughts throughout the region, and the deadly floods in Libya unveiled the vulnerability and lack of preparedness of communities in the face of climate change crises. The international energy crisis has weighed significantly on public spending to alleviate social tensions, especially in energy-importing countries. In that regard, the importance of green energy transition lies not only in hedging against energy crisis-related uncertainties, but it also has a great role to play in climate change mitigation and adaptation.

⁴⁰ European Commission and High Representative of the Union for Foreign Affairs and Security Policy, EU external energy engagement in a changing world, 2022



Despite differences between energy exporters and importers in North Africa when it comes to energy security, the equalizing effect of their abundant renewable energy potential puts them on a common ground where the strategic decision to accelerate the energy transition and build mutually beneficial partnerships within the region and beyond is key for the future. Yet North Africa is characterized by a poor renewable energy cooperation and the main frameworks for climate cooperation extend beyond the region's scope. Countries like Morocco, Algeria, Egypt and Tunisia have announced ambitious RE targets and strategies for RE deployment and green hydrogen. Beside meeting their growing internal energy demand, these countries also strive to become exporters of renewable energy in the future. Leveraging that potential, and the EU's strong interest in clean energy, many North African countries have stepped up their renewable energy engagement with the EU.

At the regional level, one of the initiatives that best embodies this vision is the Union for the Mediterranean's Renewable Energy and Energy Efficiency platform which, building on the UfM Ministerial Conference on Energy of December 2016, strives to foster a dialogue between key stakeholders, including financial institutions, regional organizations, industrial enterprises, and energy experts from Euro-Mediterranean countries. Considering the importance of electricity interconnections and power systems integration, especially in a renewable energy future where grid stability and electricity exchanges are crucial, MED-TSO is a technical platform where both North African and European countries are actively engaged in developing an integrated and sustainable regional electricity transmission grid. Currently, the only existing link between North Africa and the EU is the electricity interconnection between Morocco and Spain (1400 MW).⁴¹ According to MED-TSO's Masterplan of Mediterranean interconnections (Figure 9), other projects that will see the light in the 2030 horizon include a new Morocco-Spain Interconnection, the Tunisia-Italy interconnection and the Euro-Asia Interconnector connecting Greece, Cyprus and Israel in the East Mediterranean.⁴²

In December 2022, the EU approved a sizable allocation of €307 Million for the implementation of the ELMED interconnection, linking Tunisia to Italy. Another project that has been announced recently is the Algeria-Italy interconnection linking the Algerian region of El-Chafia to the Italian island of Sardinia and which is planned to allow for an exchange of 2000 MW of electricity⁴³. Outside of the Mediterranean framework, Xlinks Morocco-UK Power Project is a first of a kind project where power will be transmitted using a submarine cable that spans 3,800 kilometers, connecting the Sahara to the village of Alverdiscott in the UK. Once there, the electricity will be incorporated into the United Kingdom's national power network. Other interconnection projects are currently under study and if approved, they could provide great complementarities among the Northern and Southern shores of the Mediterranean in the medium and long-term.

However, the prospect of clean electricity trade between the EU and North Africa is not without challenges. Despite holding tremendous solar and wind potential, only 0.3% of additional RE were installed in North Africa in the last decade.⁴⁴ This is in part due to the high reliance on fossil fuels, to policy and regulatory obstacles and to the high-risk perception which strongly affects private investments. While the policy and regulatory frameworks have improved, the financial constraints to scale up renewables remain.

⁴¹ ISPI, Energy Politics in the MENA region: From Hydrocarbons to Renewables, 2022

⁴² MED-TSO, Masterplan of Mediterranean interconnections 2022, 2022

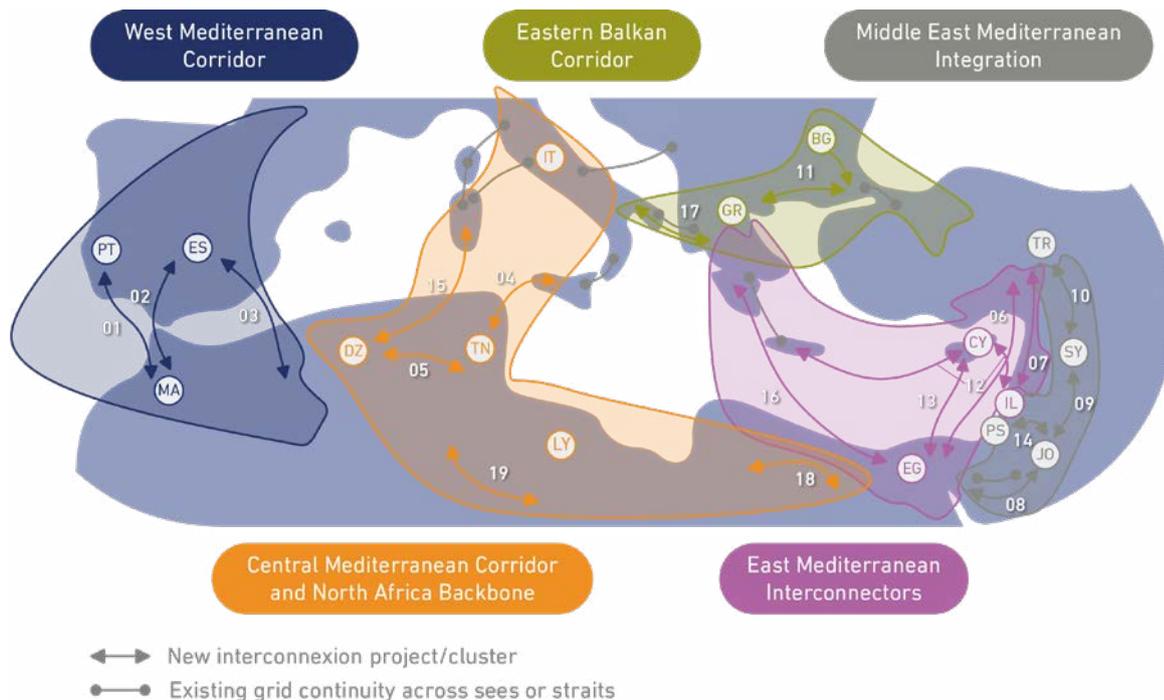
⁴³ EURACTIV, Italy boosts key energy ties with Algeria, 2023

⁴⁴ IRENA, IRENA statistics, 2022



In this regard, the EU could play a significant role in the mobilization of capital and RE investments, namely through its various financial instruments like the Global Gateway (expected to leverage up to EUR 300 billion of investment between 2021 and 2027). In 2022, the EBRD is reported to have doubled on its investments in Morocco, reaching a record investment of €360 million in the private sector and €170 million in the green economy⁴⁵.

Figure 9. Existing and prospective electricity Interconnections in the Mediterranean



Source: MED-TSO (2022)

Another area of cooperation that gained unprecedented political momentum in the last years is green hydrogen. As highlighted in the RepowerEU plan, the demand for green hydrogen will grow as an additional 15 million tons (mt) of green hydrogen will substitute 27 bcm of Russian gas imports by 2030. The plan foresees that 10 mt of that green hydrogen need will have to be imported from abroad. This has encouraged the EU to seek hydrogen partnerships with several countries in North Africa given the proximity and the enormous potential for the production of green hydrogen in the region. For their part, countries like Morocco, Egypt and Algeria have expressed their willingness to enter the green hydrogen market to decarbonize their industries - especially in view of the Carbon Border Adjustment Mechanism which will take effect in 2026, and to export a part of it to Europe. In the latter case, an important factor will be the geographical vicinity, the existence of pipeline infrastructure and/or port connectivity.

Morocco is one of the few countries in the region that have designed and published a National Roadmap for green hydrogen, making it an attractive player in a future green hydrogen market. In June 2020, an agreement was signed with Germany which has committed to providing €38 million for the construction of Morocco's first green hydrogen plant and to allow GH2 trade in the coming years. Similarly, during COP27

⁴⁵ EBRD, EBRD doubles its investment in Morocco in 2022, 2023



held in Sharm El Sheikh in 2022, the Egyptian Government unveiled its strategic plan for low-carbon hydrogen, signaling its intention to become a significant player in the low-carbon hydrogen sector with a target of up to 8% (10 MTPA) of the tradable market by 2040.⁴⁶ On the sidelines of COP27, the EU-Egypt Renewable Partnership was signed to support Egypt's blooming green hydrogen production and to prepare the ground for a renewable hydrogen industry and trade between the two parties. In a bid to spur development, Egypt passed a new green hydrogen subsidy law in January 2024, which includes from 33% to 55% discount on green hydrogen project tax and VAT exemptions on raw materials, machines, tools, equipment and transport.⁴⁷ According to IRENA, green hydrogen trade could open new development avenues through the potential of setting up local hydrogen value chains, stimulating green industries and job creation, particularly in renewables-rich countries. However, in North Africa, it remains to be seen how this will play into the bigger equation of renewables deployment, water availability, the future investment climate, while avoiding the North-South dependency pattern that negatively characterized the regional energy relations based on fossils.⁴⁸

Transitioning to a clean energy future requires not only a reflection on renewable energy trade, but the green economy at large, such as low-carbon transport, waste management, and sustainable agriculture. Therefore, energy dialogues between the EU and North African countries must incorporate the potential for economic development through the green transition in order to create sustainable and mutually beneficial partnerships. Being the largest trading partner for many countries in the region, for goods ranging from agricultural products and fertilizers to textiles and manufactured goods, the EU's decision to introduce the Carbon Border Adjustment Mechanism (CBAM) has raised concerns for North African countries about potential hurdles to access the European market. Taking effect in 2026, it is a requirement within the EU's Fit for 55 legislative package that enforces carbon tariffs on specific industries aiming to export their products to the EU, based on their carbon footprint. Although the impact of this policy will depend on various factors, including the design and implementation details, and the extent of exemptions or allowances, it does pose an energy challenge for countries that are not advanced in the deployment of renewables. Decarbonizing crucial industries and sectors will therefore be key for North African countries to meet their respective targets and keep their competitiveness on the international market. Investing in energy efficiency, green hydrogen and innovative technologies like agrivoltaics will also play a decisive role in the process of adaptation to the CBAM.

Emerging energy partnerships with the East: China and India

In a rapidly changing global scenario characterized by a more pronounced multipolarism, the Global South has become an important geopolitical lens for many countries. Moreover, as the impacts of climate change are intensifying in the Southern hemisphere, countries are grappling with substantial debt loads and significant gaps in economic and social infrastructure, with insufficient resources to tackle sustainable development goals. Global forums are therefore emphasizing the need to amplify the voices of developing and Least Developed Countries (LDCs) which suffer the most acute effects of global warming and lack the financial and technical resources to mitigate and/or adapt to them.

⁴⁶ UNIDO, Assessment of low carbon hydrogen production, demand, business models and value chain in Egypt, 2023

⁴⁷ Hydrogeninsight, 2024

⁴⁸ IRENA, The geopolitics of the Energy Transformation, 2022



In this context, and though North-South energy cooperation remains important, the war in Ukraine has highlighted the growing partnership diversification of countries in North Africa to the East, underpinned by the principle of South-South cooperation, where China and India play an important role.

As Beijing faces increasing domestic market demand and economic growth, the geographic significance of MENA countries becomes progressively crucial due to their proximity to European markets. Over the past ten years, driven primarily by the Belt and Road Initiative, China and Arab states have forged new collaboration frameworks. At the bilateral level, China formed comprehensive strategic partnerships with Algeria and Egypt in 2014, and with Morocco in 2016. By January 2022, and in the framework of the Belt and Road Initiative (BRI), 20 Arab states have concluded cooperation agreements with China in multiple fields including energy, trade, finance, infrastructure and high-tech⁴⁹.

Moreover, in December 2022, the first China-Arab States Summit was held in Riyadh, with leaders from 21 countries of the League of Arab States, in the presence of Chinese President Xi Jinping, marking a “new era” of China-Arab relations. The signature of several cooperation agreements during the Summit highlighted the mutual willingness to enhance bilateral relations with China and consolidate cooperation on traditional areas such as trade, energy and infrastructure, but also on green and low-carbon development, signaling a shift towards promoting the energy transition and addressing food and energy security challenges in the region⁵⁰. While a smaller percentage of the BRI projects were dedicated to renewable energy so far, green investments are now growing in number. According to the report of the Green Finance and Development Centre (GFDC) at Fudan University, in the first half of 2023, green energy investments (solar, wind, or hydropower) represented 56% of China’s engagement in BRI countries.⁵¹

China’s Middle East and North Africa policy has traditionally focused on the oil-rich Gulf region, with energy being a central aspect of China’s cooperation with the region. However, North Africa has also gained importance due to its strategic location between the Middle East, Europe and Sub-Saharan Africa, not to mention its rich natural resources, including oil, gas, renewable energy potential and phosphates.⁵² Egypt holds particular significance as it controls the vital Suez Canal, a key maritime route in the Maritime Silk Road. The country is the largest trading partner of China and remains the largest recipient of Chinese investments in infrastructure projects, power plants and industrial zones.⁵³

In Morocco, Energy China International Construction Group, in collaboration with a Moroccan and Saudi Arabian consortium, is set to undertake a green hydrogen project in southern Morocco. The project entails the construction of a solar power plant, a wind farm, and a green ammonia factory with the objective of producing 1.4 million tons of

⁴⁹ The Diplomat, Xi’s Visit Marks New Era for China-Arab Relations, 2022

⁵⁰ Ministry of Foreign Affairs of the People’s Republic of China, President Xi Jinping Attends the First China-Arab States Summit and Delivers a Keynote Speech, Underscoring the Importance of Carrying Forward the Spirit of China-Arab Friendship Featuring Solidarity and Mutual Assistance, Equality and Mutual Benefit, and Inclusiveness and Mutual Learning and Jointly Building a China-Arab Community with a Shared Future in the New Era, 2022, Available at: https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/202212/t20221211_10988748.html

⁵¹ Reuters, China’s Belt and Road energy projects set for “greenest” year, research shows, 2023, Available at: <https://www.reuters.com/business/energy/chinas-belt-road-energy-projects-set-greenest-year-research-2023-08-02/>

⁵² ISPI, Shifting Balances in the Mena Region: Russia and China No Longer Behind the Scenes, 2023, Available at: <https://www.ispionline.it/en/publication/shifting-balances-in-the-mena-region-russia-and-china-no-longer-behind-the-scenes-132066>

⁵³ Ibid



green ammonia per year, which is equivalent to approximately 320,000 tons of green hydrogen.⁵⁴ Another strategic growth area of China's engagement in the region is minerals and battery storage. Several cooperation agreements were announced recently, among which the partnership of CNGR Advanced Material Co, a Chinese company engaged in the manufacturing of battery components, with Moroccan private investment fund Al Mada to establish an industrial base in Morocco for an investment of \$2 Billion. The project, which will primarily target export markets, aims to leverage Morocco's abundant phosphate resources, which are crucial for the production of lithium iron phosphate (LFP) cells increasingly used in electric vehicles.⁵⁵

Another significant geopolitical shift in the last decade which became an undisputable power in the global economy is the BRICS. Representing about 40% of the global population and a third of the global economy⁵⁶, it is today a force to be reckoned with, especially as it is attracting new membership and striving to achieve a new political and economic architecture with more balance and a central role for the global south.

At the recently concluded BRICS summit, held in Johannesburg in August 2023, six new countries were granted admission to the group, renaming it BRICS+. Notably, four Middle Eastern countries, Egypt, Iran, Saudi Arabia, and the United Arab Emirates (UAE), were included. This significant development means that the MENA region, which previously had no representation in the BRICS group, is increasingly leaning towards other agents of multilateralism and diversifying its partners. Beside Egypt's admission which some hope will unlock new opportunities in trade and investments, Algeria had also officially applied to join BRICS, although unsuccessfully. Amongst other priority topics such as education and skills development, African Continental Free Trade Area opportunities, and the reform of global governance, the summit gave significant importance to the energy transition, with a focus on the theme of "BRICS and Africa". According to Rystad Energy, the bloc is poised to become a global leader in renewable energy in the coming decades, deriving over 80% of its power from renewable sources by 2050.⁵⁷

As a prominent member of the BRICS+ and by now officially the most populous country in the world⁵⁸, India has also emerged as one of the most important players in global affairs in recent years. As the host of the latest G20 Summit held in New Delhi in September 2023, which tackled a variety of topics among which climate change, the just and secure energy transition as well as climate and sustainable finance, the summit also presented the opportunity for India to articulate its new trade corridor plans linking it to Europe and the Middle East, namely the IMEC (India-Middle-East-Europe-Economic-Corridor). While multilateral forums of the kind have rarely achieved transformative commitments on climate issues, they nevertheless provide a platform to address complex global challenges

⁵⁴ Maroc Diplomatique, Hydrogène vert : Un consortium maroco-saoudien-chinois construit une usine dans le sud du Maroc, 2023, Available at: <https://maroc-diplomatique.net/hydrogene-vert-un-consortium-maroco-saoudien-chinois-construit-une-usine-dans-le-sud-du-maroc/>

⁵⁵ Challenge, Maroc-Chine. Investissement de 2 MMDH pour une usine de batteries électriques à Jorf Lasfar, 2023, Available at: <https://www.challenge.ma/maroc-chine-investissement-de-2-mmdh-pour-une-usine-de-batteries-electriques-a-jorf-lasfar-268388/>

⁵⁶ Atlantic Council, The BRICS come to the Middle East and North Africa, 2023, Available at: <https://www.atlanticcouncil.org/blogs/menasource/the-brics-come-to-the-middle-east-and-north-africa/>

⁵⁷ RystadEnergy, BRICS expansion to widen the renewable energy gap with the G7, ushering in new global market dynamics, 2023, Available at: <https://www.rystadenergy.com/news/brics-expansion-to-widen-the-renewable-energy-gap>

⁵⁸ UN DESA, UN DESA Policy Brief No. 153: India overtakes China as the world's most populous country, 2023, Available at: <https://www.un.org/development/desa/dpad/publication/un-desa-policy-brief-no-153-india-overtakes-china-as-the-worlds-most-populous-country/>



in an increasingly fragmented global environment. One of the important outcomes of this Summit was the admission of the African Union as a permanent member of the G20, signaling the growing role of Africa in these international platforms, and strengthening the voice of the Global South.⁵⁹

Equally noteworthy is the growing engagement of India in North Africa. India already has well-established trade relations with countries in the region, and is seeking to deepen its bilateral ties, especially in the fields of IT, pharmaceuticals, agriculture, and renewable energy. In the last decades, it has successfully positioned itself as one of the primary trading partners for Morocco, Egypt, and Algeria, ranking among their top six trading partners.⁶⁰ At the forefront of these trade relations lies Egypt, as India represents the seventh-largest trading partner and the fourth major importer of Egyptian goods. In addition, the recent state visit of Indian Prime Minister Modi to Egypt, and the signature of a new Strategic Partnership testify to that.

Energy also constitutes an important axis of Indian engagement in North Africa. Currently, India's energy collaboration with the region is mainly centered around hydrocarbons. However, there is a noticeable inclination towards renewable energy sources, as indicated by various initiatives and the pace of investments in recent years. As a part of this shift, India and France launched the International Solar Alliance (ISA) in 2015, aiming to provide a platform for cooperation among solar resource-rich countries and utilize solar diplomacy to cultivate stronger trade and political relationships with developing nations.^{61,62} Moreover, owing to their high renewable energy potential and their proximity to European markets, North African countries are also increasingly leveraging Indian energy companies' financing capacity. ReNew Energy, one of the largest Indian renewable energy companies, has recently announced an investment of \$8 billion in a green hydrogen project in Egypt's Suez Canal, and is exploring the prospects of producing green hydrogen and methanol in Morocco.

Finally, it is safe to say that when it comes to the geopolitical sphere, while certain patterns have remained the same, new shifts are becoming apparent in the aftermath of the international energy crisis. The emphasis on energy security in order to curb short-term economic and social challenges has reinforced the existing North-South energy paradigm, and maintained the non-integration pattern between North African countries. Yet the energy transition imperative that many North African countries have met with ambitious targets and concrete actions is slowly inducing a new geopolitical order characterized by competition over renewable energy achievements, especially in light of the growing energy demand and the EU's decarbonization plan. On the other hand, and mirroring shifts in the international system, diversifying energy and economic partners is also proving to be one of the main outcomes of the international energy crisis. This is reflected in a growing rapprochement between North African states and major emerging markets such as China and India, hinting at new energy partnerships, spheres of influence, and nexus of supply chains that connect Europe, Africa and the Middle East.

⁵⁹ Geopolitical Monitor, New Trade Routes, Old Challenges: India's Diplomatic Milestone at the G20, 2023, Available at: <https://www.geopoliticalmonitor.com/new-trade-routes-old-challenges-indias-diplomatic-milestone-at-the-g20/>

⁶⁰ Policy Center for the New South, North Africa's Invisible Partner: Exploring India's Political and Economic Influence in the Region, 2023

⁶¹ ECPDM, The geopolitics of African renewable energy European and Chinese investments in a global green transition, 2022

⁶² The ISA counts 114 signatory countries and 92 members countries as of today. It has mobilized more than USD 83million, received concept proposals for a total of more than 9.4 GW of solar energy projects, implemented training activities for more than 2974 personnel and has demonstration projects in pipeline for 27 LDC & SIDS Member Countries, among which 3 commissioned projects.



High voltage electricity pylons in Algeria
Photo Credit: GettyImages/ Fares Makrouf



Part 3

From Energy to Electricity Security in North Africa: Building resilience for a secure energy transition

The world is in a critical decade to keep the global temperature limit of 1.5°C within reach and to take action on a global scale to achieve a secure, affordable and sustainable energy transition. While the international energy crisis has once more highlighted the vulnerability of our current energy system, some consider it a turning point towards a cleaner and a more secure one. Indeed, the crisis has amplified structural weaknesses that have been years in the making and impacted all three dimensions of the energy trilemma. Due to disruptions in the energy supply, energy security and sustainability were put to the test as certain countries have had to postpone their plans to phase out coal, increase investments in conventional energy infrastructure, or seek new hydrocarbon assets. Simultaneously, the elevated energy prices highly impacted the affordability pillar in many countries, especially for economically-disadvantaged communities and households.

On the other hand, and instead of derailing the energy transition, these challenges have actually built a new momentum for its acceleration in many regions. According to the International Energy Agency, new policies in major energy markets indicate that annual clean energy investments increase to more than USD 2 trillion by 2030 in the stated policies scenario. By 2030, the US is projected to see a 2.5-fold increase in solar and wind capacity additions and a seven-fold increase in electric car sales thanks to the Inflation Reduction Act. China's clean energy expansion leads to the peak of coal and oil consumption by the end of the decade. In the European Union, renewables and efficiency improvements reduce natural gas and oil demand by 20% and coal demand by 50%, while India aims to progress towards its 500 GW domestic renewable capacity target, meeting two-thirds of its rising electricity demand through renewables.⁶³ As for North Africa, the variable renewable energy (VRE) installed capacity reaches 72 GW by 2040 according to the Stated Policies Scenario, with 34 GW of new PV capacity and 34 GW of wind capacity being developed between 2020 and 2040.

With their ambitious renewable energy targets, North African countries could capitalize on this momentum to be able to deliver on all three aspects of the energy trilemma. In terms of energy security, diversifying the energy mix reduces their dependence on fossil fuels which are finite resources and often subject to geopolitical tensions and price volatility. In contrast, renewable energy sources such as solar, wind, are abundant and widely distributed in the region, allowing for a greater local generation. Moreover, in countries that are already grappling with economic hardships, the energy bill weighs heavy on national trade balances. Renewable energy sources, such as solar and wind, have seen significant cost reductions in recent years, making them more economically competitive. By adopting these clean technologies, North African countries can benefit from long-term price stability, thus a greater strategic planning in the energy sector. This affordability aspect benefits consumers and contributes to sustainable economic growth. As for the sustainability pillar, North Africa is considered to be a climate change hotspot, which poses unprecedented challenges to its energy systems, food systems

⁶³ IEA, World Energy Outlook, 2022



and economies. By shifting from fossil fuels to renewable energy sources, the region can significantly reduce greenhouse gas emissions and contribute to global efforts to mitigate climate change. Finally, the energy transition in North Africa offers opportunities for increased regional cooperation, trust, and shared infrastructure. Countries in the region can collaborate on renewable energy projects, such as large-scale solar and wind farms, and develop interconnected energy grids. Shared infrastructure allows for the efficient distribution and sharing of renewable energy resources, improving energy access and reliability across borders. Such cooperation has the potential to foster regional integration, to strengthen diplomatic ties, and promote sustainable development.

However, energy systems in transition must be steered on many levels. In a context of climate emergency and increased occurrence of poly-crises, building a more sustainable future in North Africa requires a comprehensive and enduring approach that is able to address complex challenges while preserving resilience. Especially in times of crisis, governments will naturally prioritize short-term actions to address the energy crisis and maintain social stability, but it is crucial for them to simultaneously maintain their long-term strategic direction.

The main short-term challenge lies in the need to address socio-economic impacts and refrain from costly and regressive subsidies on fuel prices. Fiscal resources should be allocated to the most cost-effective measures, while international energy prices should be able to be passed on gradually in order to preserve fiscal room for maneuver; this is particularly important for oil importers, given the risk of world commodity prices rising for a long time to come.

Looking ahead, it becomes imperative to bolster resilience against potential shocks in commodity prices and to foster economic diversification for sustained long-term growth. Following the energy crisis, the immediate focus in many North African countries has leaned towards macroeconomic stability and inflation control, often overshadowing other critical objectives. It is essential to recalibrate these priorities, placing a higher emphasis on the imperative of achieving sustainable economic recovery. Implementing structural policies is pivotal in this context, as they can effectively address limitations on the supply side, stimulate productivity, and enhance overall competitiveness. Additionally, there is a pressing need to concentrate efforts on the resilience of energy systems to ensure long-term, sustainable energy security.

Although no one-size-fits-all model exists for the energy transition, international experience underscores the importance of several key enablers⁶⁴:



Diversifying the energy mix:

North African countries should diversify their energy sources and reduce their reliance on fossil fuels in a synchronized way. Commodity-exporters must prioritize economic diversification and structural transformation to mitigate vulnerability to international market price fluctuations. On the other hand, commodity importers in the region should harness their substantial renewable energy potential to diversify their energy mix and mitigate the impact of soaring international energy prices passed on through imports.

⁶⁴ IRENA, Policies and Finance for Renewable Energy Deployment, (2023)



Prioritizing renewable energy production for domestic energy needs:

As the energy transition presents new opportunities for trade with old and new partners, North African countries must ensure that renewable energy production to meet domestic energy needs takes priority over directing surplus production towards export. A focus on export-oriented energy sectors may not yield the desired development benefits and employment opportunities for the majority of the population, especially the youth, who constitute more than half of the population in the region.



Promoting Energy efficiency:

In addition to structural economic reforms, there is a significant imperative to enhance energy efficiency to mitigate overconsumption and energy waste. The maintenance of artificially low domestic energy prices, largely due to subsidies, can introduce distortions that promote excessive energy consumption, hinder investments in energy efficiency improvements, and create opportunities for arbitrage and smuggling. Consequently, alongside the gradual phase-out of fuel subsidies, transitioning towards greener and more efficient energy usage would ultimately diminish energy dependence and effectively mitigate vulnerability to fluctuations in oil prices.



Introducing a reform of energy subsidies coupled with safety nets:

A pivotal structural reform entails the comprehensive overhaul of energy subsidies in conjunction with strengthening social safety nets. Despite substantial reductions in explicit energy subsidies over the past years, the current level of subsidies in North Africa remains notably high. Restructuring these broad energy subsidies will not only open up fiscal room for enhancing public services but also enhance equity. Consequently, the reform of safety nets and energy subsidies should be synchronized efforts. A more robust safety net would provide precisely targeted compensation, facilitated by subsidy reform, which enables a more effective transmission of adjustments to domestic energy prices. Simultaneously, the fiscal leeway generated through subsidy reform can be allocated to expanding safety net coverage and other growth-oriented capital investments.



Safeguarding the most vulnerable segments:

In the short term, where countries cannot rapidly implement well-targeted programs, measures to protect vulnerable households could be considered, such as uniform flat-rate rebates on utility bills or targeted subsidies addressed to people with low incomes. Reference tariffs for electricity could also be considered if designed progressively. In short, countries should strive to break the unsustainable cycle of untargeted, ineffective social protection and widespread subsidies by implementing cost-effective measures to protect those in need while building resilience to future shocks, notably by completing the as yet unfinished reform of energy subsidies.



Incentivizing self-consumption from renewables:

Self-consumption from renewables promotes energy security by diversifying energy sources, decentralizing energy generation, enhancing grid stability, fostering energy independence, and improving resilience in disasters. Adopting an enabling regulatory framework for self-consumption, and setting up an incentive scheme for small-scale PV self-consumption are crucial. This includes measures such as the adoption of a net-metering, feed-in-tariff, and net billing schemes.

Supporting green industrialization and green hydrogen:

Green hydrogen could represent a solution for hard-to-abate industries and contribute to energy security and North Africa's industrialization goals. The green hydrogen industry in North Africa is currently in its early stage of growth, but it holds significant promise to emerge as a global player thanks to its abundant renewable energy potential. Together with the design of a National Roadmap for green hydrogen, implementing transparent policies and regulatory frameworks, would allow the creation of bankable contracts and reduce investment risks.⁶⁵

Fostering Regional integration:

The coordination and harmonization of the institutional and regulatory framework for the planning, operation and development of the regional electricity market would help lead to smoother regional integration. Bringing North African countries closer together also holds the potential to improve the bargaining position and the trade agreements with international partners.

Promoting public to private dialogue between energy stakeholders from the region:

Promoting energy dialogue can be beneficial for sharing knowledge, exchanging best practices, and fostering regional cooperation in the energy sector in North Africa. This includes the establishment of regional energy forums, supporting joint capacity-building and technical assistance, and encourage the establishment of diplomatic channels and agreements that promote cross-border energy collaboration.

⁶⁵ RES4Africa Foundation, Towards a Green Hydrogen Ecosystem: Policy priorities and Implementation Strategies for Morocco and Egypt, (2023)



Keeping the lights on: An electricity security paradigm for North Africa

Electricity has become the cornerstone of all modern economies. Today, many critical sectors of the economy such as healthcare, banking and finance, transportation, industry and communication depend on it.

While electricity only accounts for a fifth of total final energy consumption today, its share is poised to grow in the next decades and according to the IEA, electricity could become the main energy source by 2040, surpassing oil. In addition, electricity demand increases by 50% in all the World Energy Outlook scenarios between 2020 and 2040, with a concentration of this growth in emerging and developing economies.⁶⁶ This electricity demand will be driven by sectors ranging from industry and buildings to transport. In North Africa, where climate change is already having cascading effects, the electricity demand will also be prompted by activities that will require a higher electricity input such as increased cooling needs, agricultural irrigation, seawater desalination and green hydrogen production.

It thus becomes of a great importance for North African governments and policymakers to consider electricity security. Defined by the International Energy Agency as the electricity system's capability to ensure uninterrupted availability of electricity by withstanding and recovering from disturbances and contingencies, electricity security is an increasingly adopted paradigm that fully leverages the advantages of the energy transition. This paradigm shift to electricity security is twofold: on the one hand, the deployment of renewables is substituting fossil fuels, and on the other hand, we see the development of digitalization and new technologies like energy storage, smart grids and green hydrogen as a new *modus operandi* to ensure an adequate availability of dispatchable resources and guarantee a reliable power system.

The need for a consistent and uninterrupted supply of electricity has always been crucial to maintain stability in power systems, even at very short time intervals. However, with the increasing complexity of power systems and the growing presence of variable energy sources like wind and solar photovoltaics, as well as the rising electricity demand, the need for power system flexibility is expected to increase significantly in the future. To that end, and to ensure the security of electricity supply in future power systems, new tools and approaches are necessary to address these changing dynamics.

Grids

In order to keep up with the growing electrification and the rapid deployment of renewable energy sources, significant improvements to the grid infrastructure are necessary. This includes the establishment of new transmission lines to connect large-scale wind and solar PV projects to demand centers. The expansion of distribution lines is also crucial to accommodate the increasing electricity demand and the rapid growth of distributed solar PV capacity. Moreover, deploying smart grid technologies enables the grid to monitor, control, and optimize electricity generation, distribution, and consumption in real-time. Smart grids employ advanced communication and automation systems, allowing for better load management, fault detection, and self-healing capabilities. This enhances grid reliability, minimizes downtime, and improves overall electricity security.

⁶⁶ IEA, Power Systems in Transition: Challenges and Opportunities Ahead for Electricity Security, 2020



Flexibility measures

Today, most of the flexibility required is met through dispatchable thermal plants and hydropower. Moreover, the primary factor driving the need for increased short-term flexibility is the rapidly growing proportion of solar PV in energy generation. While wind power exhibits less short-term variability, it can fluctuate significantly over weeks or seasons, making it a significant driver of seasonal flexibility requirements as its presence in power systems expands globally.⁶⁷

As far as short-term flexibility is concerned, demand response and battery technologies are expected to play an increasingly important role. The increasing adoption of electric heat pumps, air conditioners, and electric vehicles (EVs) introduces more variability in demand, but it also presents additional possibilities for demand-side response. Batteries are becoming increasingly important for offering short-term flexibility in conjunction with demand-response initiatives. The capacity of utility-scale battery storage is projected to grow significantly in the STEPS scenario, reaching over 2 terawatts (TW) by 2050.⁶⁸

Electricity interconnections

Electricity interconnections between countries and regions are important to reduce the reliance on alternative flexibility sources and facilitate the integration of potential flexibility providers. These measures are vital for ensuring a reliable and efficient electricity grid system in the face of evolving energy needs and the transition to clean energy sources. Furthermore, in interconnected and renewables-rich markets, trade offers access to a significant balancing area that can effectively manage fluctuations in supply and demand. This understanding is gaining importance in the context of electricity security, as it allows for the efficient management of the grid and the integration of renewable energy sources. To this end, the promotion of regional integration within the energy sector is paramount.

Clean energy supply chains

For a rapid and secure energy transition, an important factor is the progress on supply chain diversification. Clean energy technology supply chains have made significant advancements since 2015, driven by factors like government responses to the global energy crisis, and increasing commercial and geopolitical competition. Manufacturing, particularly for solar panels and batteries, has seen rapid progress due to standardization and short lead times, with a growing number of announced manufacturing projects. If all these projects materialize, the combined global output of solar PV modules would surpass the deployment needs of the NZE Scenario in 2030, and the requirements for EVs and grid storage batteries would be nearly fulfilled as well.⁶⁹ Moreover, in order to circumvent the issue of technology supply chain concentration, which could leave countries vulnerable to the consequences of individual country policies, corporate choices, natural disasters, or technical failures, a higher degree of supply partner diversification is needed. In addition, the potential of circularity and recycling should be tapped through end-of-life-batteries, solar panels and wind turbines recycling, and enabled with the right policies and incentives.

⁶⁷ IEA, World Energy Outlook, 2023

⁶⁸ Ibid

⁶⁹ IEA, World Energy Outlook, 2023



Cyber resilience

Another important element to factor in for secure transitions is cybersecurity. Cyberattacks on electricity systems have had minimal impact compared to other causes like storms, equipment failure, or operational errors. While the complete prevention of cyberattacks is unachievable, enhancing the cyber resilience of electricity systems is possible through design and adaptation, ensuring critical infrastructure operations continue uninterrupted. It is an exercise that requires collaboration among policymakers, regulators, system operators, and industry stakeholders across the electricity value chain. Therefore, embedding cyber resilience in the power system by enhancing preparedness and implementing a robust risk management and recovery strategy is fundamental.⁷⁰

Climate resilience

Climate change can have adverse effects on electricity infrastructure, namely through the increased occurrence of climate hazards such as extreme weather events, wildfires, and natural disasters. This in turn affects power generation by reducing efficiency and altering the availability and potential of both thermal and renewable power plants. Additionally, transmission and distribution networks can experience increased losses, changes in capacity, and physical damage. Temperature rise also impacts electricity security as the rising demand for cooling in many countries due to climate change is expected to drive the need for additional generation capacity. Here again, climate resilience can be integrated in long-term energy and climate policies through measures that protect critical infrastructure, ensure rapid recovery, and maintain essential services during emergencies.

Capacity building

The energy transition is a systemic transformation that needs to be matched with new skills and fields of expertise. As electricity grids incorporate more renewable energy sources and distributed generation, capacity building is needed to enable seamless integration and management of these diverse resources. Similarly, with the increasing complexities and risks to electricity systems, enhancing climate and cyber resilience planning becomes crucial. This involves training professionals who can assess vulnerabilities, identify potential threats, and design robust systems. Last but not least, equipping policymakers and energy planners with policy and regulatory expertise to manage increasingly complex systems is essential.

Economies that are heavily dependent on fossil fuels are facing critical choices during energy transitions. The shift towards a more diversified economic structure and sustainable energy mix has long been acknowledged, including by the producer economies themselves. However, the urgency of net-zero transitions adds an extra layer of time constraint, with profound implications for energy importers and exporters.

North Africa has abundant renewable energy resources, including ample solar irradiation and wind, yet today the electricity mix is still dominated by fossil fuels. By harnessing renewable energy sources, the region can reduce its dependence on imported fossil fuels and enhance its electricity security. Indeed, domestically produced clean energy can provide a reliable and resilient energy source, especially in times of geopolitical

⁷⁰ IEA, Power Systems in Transition: Challenges and Opportunities Ahead for Electricity Security, 2020



stress. On the one hand, it reduces vulnerability to global energy market disruptions for importers and helps exporters decouple their development model from fossil fuels in a sustainable manner. At the same time, while the scale-up of variable renewable energy sources will alleviate the traditional energy security challenges encountered by North African countries, shifting the paradigm to electricity security will require timely investments in grid networks and flexibility measures, as well as building up cyber and climate resilience. Ultimately, a successful and orderly energy transition can only occur when both energy importers and exporters in the region collaborate in a united effort, acknowledging their mutual benefits. In this regard, international cooperation with other actors will also be needed to make this shift the least conflictual possible for the different regional actors.



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RES4Africa Foundation
Via Ticino 14, Rome, Italy
Telephone: +39 06 8552236
info@res4africa.org
www.res4africa.org
Twitter: @RES4Africa