

ECONOMY

Research article

RENEWABLES IN COUNTRIES OF NORTH AFRICA: PROBLEMS AND PROSPECTS OF USE

© 2024 L.V. Shkvarya

SHKVARYA Lyudmila Vasilievna, Dr.Sc. (Economics), Head, R.I. Khasbulatov Laboratory of International Economic Relations; Professor, Department of World Economics, Plekhanov Russian University of Economics, Moscow, Russian Federation. ORCID: 0000-0001-6653-939X. E-mail: destard@rambler.ru

Abstract. The article examines the approach of the North African countries to the development of renewable energy sources (RES). It is shown that there are a number of factors that reinforce the need for the development of renewable energy in the region, including the unstable macroeconomic situation, population growth and urbanization, climate change, the EU policy on geographical diversification of energy suppliers, and the EU's reorientation to alternative energy sources. At the same time, energy transfer carries significant risks both for the functioning of energy systems and for the economy. The development of green energy requires large investments, often inaccessible to African countries, and access to technology; at the same time, the inclusion of renewable energy in energy systems makes the latter less stable due to the emergence of dependence on weather changes. In addition, the countries of North Africa have their own hydrocarbon resources, and the refusal to use them is simply illogical. When it comes to costs, green energy is more expensive than traditional energy. In this regard, unconditional adherence to the EU's energy policy and climate agenda cannot be considered an optimal scenario for the countries of the region. The study showed that the countries of North Africa, having announced overly ambitious goals for the development of renewable energy, faced the inability to implement plans. In this regard, the task of developing green energy should not be more significant than the task of maintaining the functioning of the energy industry as a whole, and renewable energy sources should not replace but only complement traditional energy.

Keywords: renewable energy sources (RES), Africa, North Africa, socio-economic development, climate, climate agenda, traditional energy, energy consumption, energy efficiency

DOI: 10.31132/2412-5717-2024-69-4-121-132

For citation: Shkvarya L.V. (2024). Renewables in Countries of North Africa: Problems and Prospects of Use. *Journal of the Institute for African Studies*. № 4. Pp. 121–132. <https://doi.org/10.31132/2412-5717-2024-69-4-121-132>

INTRODUCTION

The modern world energy sector is still dominated by fossil fuels, which are necessary for its development and normal functioning. The share of oil, gas, and coal in global energy consumption is 77%, according to 2023 data, while nuclear power accounts for 4%, and traditional biomass (firewood) for 6%. The shares of renewable energy sources (RES) are: hydropower, 6%; wind power, 3.3%; solar, 2.3%; modern biofuels, 0.7%; other renewable energy sources, 1.3% [Ritchie, Rosado 2020]. At the same time, in 2023, the growth in new capacity additions in renewables outpaced some conventional energy sources, notably gas, coal, and nuclear. The classification by type was as follows: oil, 1337 terawatts; solar, 818 terawatts; coal, 696 terawatts; wind, 545 terawatts; nuclear, 120 terawatts; gas, 15 terawatts [Ritchie, Rosado 2020]. In other words, the importance of RES is gradually increasing.

In recent decades, scientific thought has increasingly turned to the problems of the impact of fossil fuels on planetary climatic conditions. Approaches to the introduction of renewable energy technologies are being developed [Soloviev et al. 2021], approaches to understanding the essence of RES [Beloborodov et al. 2021] and their role as a segment of the energy sector are being formulated [Popel 2011]. The world experience in the field of renewable energy and the possibilities of its application in different countries and regions is being analyzed [Al-Qteishat 2022].

The majority of Western approaches imply the need to expand the application of RES, including in African and Asian countries, to ensure stable growth of national economies. At the same time, there are fundamental works that substantiate the prioritization of socio-economic development—economic growth, poverty alleviation, education and healthcare development [Porfiriev 2019]—rather than climatic tasks in global development. In our opinion, socio-economic objectives should prevail over the climate agenda, and not vice versa. This should also be taken into account when analyzing RES development in North African countries, because, on the one hand, there is a preponderance of Western studies promoting the priority of the climate agenda, but, on the other hand, it would be a mistake to underestimate the role of traditional energy for the stable functioning of the economy. In addition, the reorientation towards renewables also contains risks for the energy systems (and therefore, for the economy).

The UN defines renewable, or clean, energy as energy derived from natural sources that are recovered faster than they are consumed¹. The definition proposed by Russian authors echoes this definition: “In contrast to fossil energy resources, RES represent an energy resource that is constantly renewed by nature independently of humans” [Kaplienko, Gabaraev 2023: 131]. It is worth noting that the idea of using “green” energy sources is not new [Siebold 1905], but it is in recent decades that their introduction into energy systems has been intensified.

The growth of RES utilization is important in the context of the climate change problem and the role of such sources as so-called “clean” sources, allowing to reduce the carbon footprint of the world economy. The experts note that “although the degree of human influence on the climate is assessed differently by different experts, there is no doubt that the generally accepted climate trend to reduce carbon dioxide emissions is correct. It has a direct impact on energy production and consumption in different countries” [Tutnova 2021: 140–141].

¹ What is renewable energy? UN. <https://www.un.org/en/climatechange/what-is-renewable-energy> (accessed: 22.10.2024)

The experience of different countries in the field of renewable energy varies, and its study can provide an opportunity to better assess the pros and cons of expanding the use of alternative energy. In this article, the experience of North African countries will be considered².

It should be noted that two countries in the region, Libya and Sudan, have a complicated security situation (Libya has been through a war and lacks a unified center of government; Sudan is in the midst of hostilities). This also affects the possibilities for economic analysis, so this article mainly focuses on Algeria, Egypt, Morocco, and Tunisia. The statistics available for Sudan are limited to 2018, for Libya to 2019. However, it would be wrong to claim that these countries, which also have oil reserves, are not implementing RES policies at all due to difficult domestic political conditions. Libya adopted a National Strategy for Renewable Energy and Energy Efficiency in 2023³, in which an aim is declared to reach 4,000 MW of solar and wind power generation.

Compared to the plans of neighboring countries, this figure cannot be considered overly ambitious—it is roughly on par with current renewable energy production in Morocco and one and a half times lower than current renewable energy production in Egypt—but Libya's plans should be seen in the context of the fact that renewables have not been developed at all in the country in the past.

In the case of Sudan, with the secession of South Sudan in 2011, oil reserves fell by 75%, which could be an incentive for developing alternative energy sources, but with the ongoing war, the government is not in a position to produce a centralized renewable energy strategy. At the level of individual Sudanese states, attention to renewables dates back to the 2000s, when solar, wind, hydropower, and biomass facilities were planned, but there is no detailed up-to-date information on the fate of these projects [Khayal, Suleiman 2022]. There is evidence that in Sudan, 61% of energy demand is met by biomass (the bulk of which is firewood) [Khayal, Suleiman 2022].

MAIN FACTORS OF TRANSITION TO RENEWABLE ENERGY

1. **Demographic growth.** Energy demand in North Africa is growing both in absolute terms and per capita. At the same time, a number of experts [Borisov 2018; Bouyghrissi Berjaoui, Khanniba 2021] have expressed the view that in the long term, traditional energy may become an obstacle to accelerated economic growth due to such factors as, first, the need to introduce new capacity and, consequently, the growing costs of energy imports (while these costs are already a burden on importing countries), and, second, changes in economic regulation in foreign markets—in particular, the introduction of trade restrictions by the European Union (EU) on goods with high carbon footprints. Economic development and demographic growth influence the need for new capacity. According to forecasts, the population of the region may double between 2000 and 2050 (Fig. 1), and this process will be accompanied by further urbanization. As experts note, “population growth and rising living standards determine a high demand for

² According to UNCTAD's classification, North African countries include Algeria, Egypt, Libya, Morocco, Sudan, and Tunisia.

³ Zaptia S. Libya launches National Strategy for Renewable Energies and Energy Efficiency 2023–2035. *Libya Herald*. 12.12.2023. <https://libyaherald.com/2023/12/libya-launches-national-strategy-for-renewable-energies-and-energy-efficiency-2023-2035/> (accessed: 20.11.2024)

energy,” and it is growing at a faster rate than the population [Khismatullin, Valiev 2018: 46]. In this regard, the need to develop RES seems to be increasingly important.

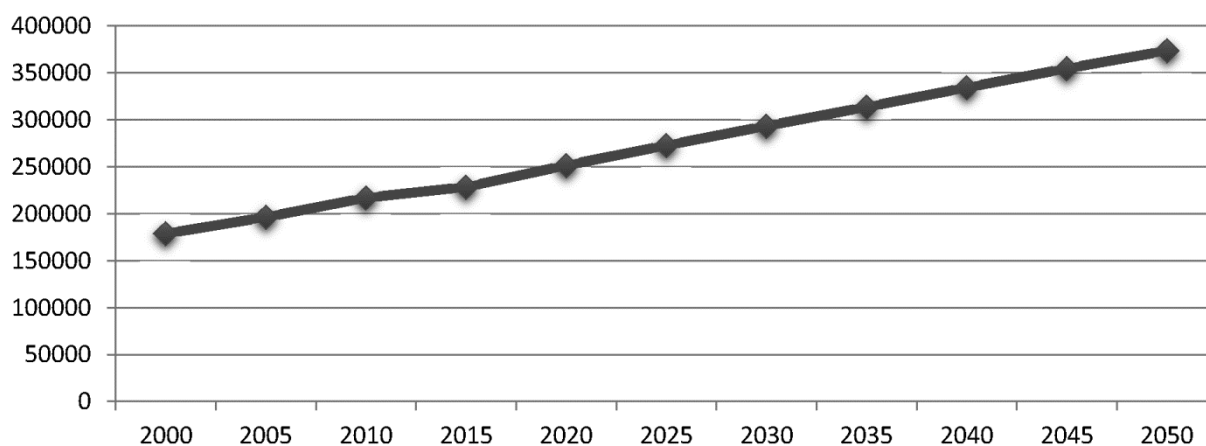


Fig. 1. Population changes in North Africa in 2000–2020 and forecast to 2050 (in thousand people).

Source: compiled by the author on the basis of UNCTAD data.

2. Climate change: North African economies, which are heavily dependent on agriculture and tourism, are heavily influenced by climate change, and this dependence will not only continue but also increase in the future [Ngaira 2007]. Climate change is projected to lead to extreme weather events, as well as reduced rainfall and weather predictability in North Africa, which will negatively impact the food security of the region as well [Lewis, Monem, Impiglia 2018]. Climate change is also affected by the development of traditional energy. The International Energy Agency (IEA) notes: “North Africa has been identified as one of the regions of the world most vulnerable to climate change. This vulnerability means that planning for the region’s energy infrastructure must be climate resilient and regionally integrated to ensure energy security” [IEA 2020: 8].

An important motivation for renewable energy development in North Africa, as elsewhere, is the need to reduce climate change and pollution. According to the IEA, people in the region often still use non-environmentally friendly energy resources for cooking, such as wood, waste, and other fuels, with adverse health effects.

At the same time, in our opinion, the solution to climate and social problems can be found not only—and not primarily—through the introduction of renewable energy sources. As world experience and a number of theoretical developments [Avdokushin, Kuznetsova 2023; Glinskaya 2009] show, other aspects of the “green economy,” such as the circular economy, the sharing economy, and digitalization [Petrov 2011], play an important role in providing this segment of the energy sector. Furthermore, it is not only the climate agenda that is important to the people of North Africa, but also the very pressing issues facing the region, such as unemployment, poverty, hunger, security, which are outside the scope of energy policy but obviously need to attract attention and investment. Thus, climate change and energy transition cannot be seen as dominant issues in the economic development of the region’s countries.

3. Climate regulation by the EU. A significant circumstance from the point of view of RES development in North Africa in the 2020s is the need to diversify the energy supply for Western Europe; therefore, international cooperation with the EU [Beneking,

Ellenbeck, Battaglini 2016], other developed countries, and international organizations is an important aspect in the implementation of RES projects in North Africa. According to experts, North African countries have significant natural and climatic potential for RES development [Wai 2014], such as wind and especially solar energy. According to IRENA⁴, based on the existence of significant RES potential that can be exploited at low costs, and due to the geographical proximity of the region to the EU, where demand for RES and/or clean hydrogen is steadily increasing, North African countries have already concluded a number of agreements with foreign partners, including private companies focused on exploring the establishment of pilot projects for the production and export of clean hydrogen⁵. There are prospects for exporting electricity to Europe (e.g., from Morocco) or establishing export-oriented industries using low-carbon footprint energy sources, which will require the development of North African generation capacity and power grids [IEA 2020]⁶.

4. Access to energy resources. North African countries are currently experiencing a process of turbulence in the economy, social sphere, and digital transformation [Shkvarya 2022]. The GDP dynamics of North African countries remains unstable (Fig. 2), which reflects persistent internal problems and the impact of negative external factors.

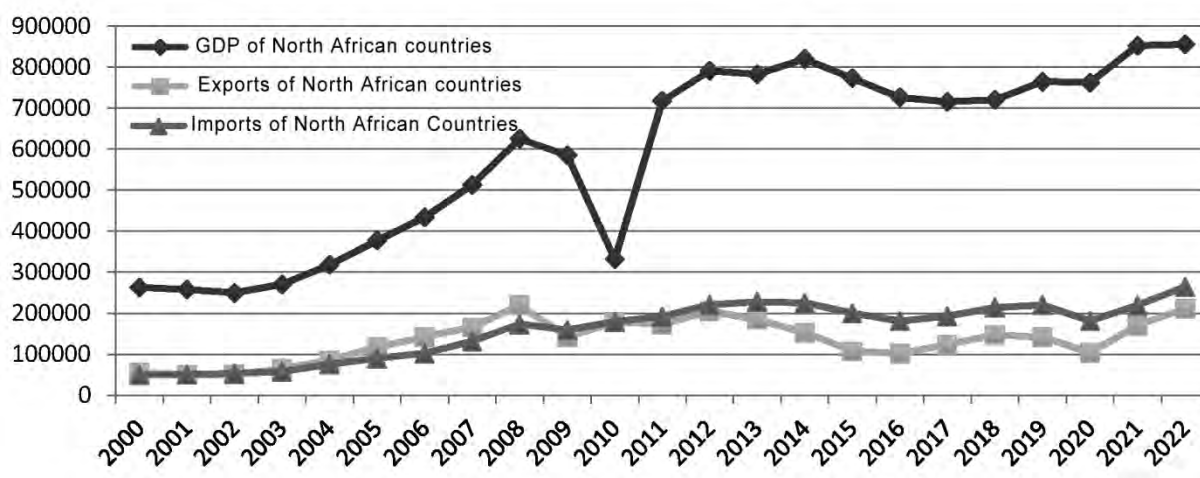


Fig. 2. Dynamics of GDP, exports, and imports of North African countries in 2000–2022 (in million dollars).

Source: compiled by the author on the basis of UNCTAD data.

As Figure 2 shows, North Africa's aggregate GDP in 2022 reached an all-time high in value terms. At the same time, the period of rapid growth in 2000–2008 was replaced by a period characterized by significant fluctuations. A number of factors had a negative impact on the dynamics of GDP and foreign trade. Among them are the events of the Arab Spring in 2011, changes in world prices for energy and other commodities, and the cost of food.

⁴ The International Renewable Energy Agency (IRENA) is an intergovernmental organization founded in 2009 to support the use of all forms of renewable energy.

⁵ North Africa's Renewable Potential and Strategic Location Reinforce Its Role in Energy Transition. IRENA. 26.02.2024. <https://irena.org/News/articles/2024/Feb/North-Africa-Renewable-Potential-and-Strategic-Location-Reinforce-Its-Role-in-Energy-Transition>(accessed: 20.11.2024)

⁶ Access to electricity. IEA. <https://www.iea.org/reports/sdg7-data-and-projections/access-to-electricity>(accessed: 20.11.2024)

In terms of the possession of energy resources, North African countries are divided into two groups. Libya, Algeria, and, for many years, Sudan are exporters of mineral fuels (Table 1). Egypt, Morocco, and Tunisia are net importers (with Egypt and Tunisia both exporting and importing hydrocarbons in significant quantities).

Table 1. North African hydrocarbon exports and imports, in billion USD, 2023 (unless otherwise specified)

	Morocco	Algeria	Tunisia	Libya	Egypt	Sudan
Export of hydrocarbons, total	0.52	33.82 (2017)	1.24	27.65 (2019)	7.37	0.53 (2018)
<i>incl. oil</i>	0	12.72 (2017)	0.79	24.18 (2019)	2.55	0.43 (2018)
petroleum products	0.48	6.45 (2017)	0.43	0.85 (2019)	1.84	0.1 (2018)
gas	insignificant	14.07 (2107)	0.02	2.61 (2019)	2.73	insignificant
Imports of hydrocarbons, total	12.0	1.93 (2017)	4.65	2.06 (2019)	12.65	1.34 (2018)
<i>incl. coal</i>	1.38	0.02 (2017)	insignificant	insignificant	0.59	0.02 (2018)
oil	0	insignificant	0.51	0 (2019)	1.91	0.05 (2018)
petroleum products	7.6	1.6 (2017)	2.1	2.0 (2019)	6.45	1.2 (2018)
gas	2.36	insignificant	1.66	0 (2019)	3.33	0.67 (2018)

Source: compiled by the author from statistics of the International Trade Centre⁷.

North African countries' renewable energy policies seem to be largely influenced not by climate considerations (despite the rhetoric to that effect) but by energy availability and dependence on imports. For example, the countries with significant hydrocarbon reserves—Algeria and Libya—have not yet, by and large, started to develop renewable energy sources. As it follows from Table 2, Algeria's share of RES in electricity consumption is 0.27%, and Libya has practically no RES (6 MW of capacity for 2022, see Table 3), although it has adopted, as noted above, a program to create 4,000 MW of capacity by 2035.

The situation is different in Egypt, Morocco, and Tunisia, which are net importers of hydrocarbons. For Tunisia, for example, net hydrocarbon imports accounted for more than 3.5% of GDP and 53% of the total trade deficit⁸. Morocco meets about 90% of its primary energy demand through imports of coal and oil.

⁷ InTraCen. <https://www.intracen.org/about-us> (accessed: 20.11.2024)

⁸ A virtuous cycle of green, affordable, and financially viable energy production. Brief. *World Bank*. 25.01.2024. <https://www.worldbank.org/en/programs/teri/brief/green-affordable-and-viable-energy-production-tunisia> (accessed: 20.11.2024)

Morocco and Egypt started to develop wind power from 1999–2000 and solar from 2016. In Tunisia, 400 MW of solar power capacity was launched in 2022–2023⁹. As a result, the share of RES in electricity consumption was about 3% in Tunisia¹⁰, 6% in Egypt, and 8% in Morocco (Table 2).

Table 2. **Energy mix of Algeria, Egypt, and Morocco (2023), as a percentage of total electricity consumption**

	Fossil fuels in the energy mix			Nuclear energy	RES		
	Oil	Gas	Coal		Hydro power	Solar energy	Wind power
Algeria	99.73			0	0.27		
	33.79	65.67	0.27		<0.1	0.24	<0.1
Egypt	94.11			0	5.89		
	37.94	54.9	1.27		3.3	1.25	1.36
Morocco	91.56			0	8.44		
	58.42	3.27	29.86		0.2	2.02	6.27

Source: compiled by the author from [Ritchie, Rosado 2020].

In general, the dynamics of RES launching by country and year is shown in Table 3. Comparison of data from Table 2 and Table 3 shows that the dominance of hydrocarbons in the energy mixes of the North African countries remains; however, the RES capacity is increasing rapidly: in Algeria, Egypt, and Morocco it has increased approximately twofold in ten years.

Table 3. **Total renewable energy in 2013–2022, maximum capacity (MW)**

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Algeria	253	266	329	568	662	686	686	667	587	599
Egypt	3457	3457	3658	3681	3802	4793	5690	5934	6258	6322
Libya	5	5	5	5	5	5	5	5	6	6
Morocco	1837	2143	2307	2417	2539	3272	3272	3522	3638	3725
Sudan	1536	1538	1541	1547	1557	1740	1761	1798	1817	1871
Tunisia	642	653	661	669	671	675	680	683	683	683
Total	7730	8062	8501	8887	9236	11171	12094	12609	12989	13206

Source: compiled by the author from [IRENA 2023].

PROSPECTS FOR RES DEVELOPMENT IN NORTH AFRICAN COUNTRIES

The development of RES in individual North African countries in recent years is as follows. Egypt has announced extremely ambitious plans to achieve a 42% RES share by

⁹ Yearly information was taken by the author from the statistics of the Energy Institute, *Statistical Review of World Energy* [Energy Institute, 2024].

¹⁰ A virtuous cycle of green, affordable, and financially viable energy production. Brief. World Bank. 25.01.2024. <https://www.worldbank.org/en/programs/teri/brief/green-affordable-and-viable-energy-production-tunisia> (accessed: 20.11.2024)

2040. Cairo aims to become, firstly, an exporter of electricity generated in the country to the EU countries and, secondly, to develop into a regional hub that would re-export energy generated by other neighboring countries. The Egyptians see potential in increasing nuclear, solar, and wind power generation. A noteworthy project is the construction of a nuclear power plant being implemented by Rosatom in El Dabaa (Egypt) with a design capacity of 10 GW of electricity. This project can also be seen as a historical strategic continuation of Russian-Egyptian cooperation in the power industry, including non-oil power: the Aswan hydroelectric power plant built by the Soviet Union in 1971 once produced half of the electricity generated in Egypt. At the time of its completion, the Aswan hydroelectric project was providing half of Egypt's electricity to the grid (2.7 GW, of which 2.1 GW was from the Upper Aswan Dam¹¹); it is still in operation today, resulting in more than 3% of Egypt's energy mix coming from green hydropower.

Morocco is implementing a number of large-scale solar power generation projects. The world's largest concentrated solar power (CSP¹²) plant, the Noor Solar Complex in Ouarzazate, is in operation. It has a capacity of 510 MW and can provide electricity to about 2 million consumers in the country, and its launch has also led to a reduction of 800,000 tons of CO₂ emissions per year starting in 2019. Noor Midelt I and II projects are also underway. Wind power is expected to expand by around 200–500 MW per year, with several projects and megaprojects underway¹³.

In 2024, Algeria intended to launch a solar power plant with a capacity of 4 GW per year. By 2030, the country intends to generate 13.6 GW of solar electricity through the solar power plants that are being set up¹⁴.

Tunisia has announced plans to increase RES capacity in the electricity sector from the current 3% to 35% by 2030, then to meet 50% of its electricity needs from RES by 2035, and 100% by 2050. With financial support from the World Bank, the country is currently implementing a 2 GW alternative energy project, as well as a 220 km, 600 MW export transmission line between Tunisia and the island of Sicily (Italy)¹⁵.

The prospects of North African countries achieving their targets within the planned timeframe are debatable. For example, realization of Tunisia's targets would mean that in just six years, by 2030, one third of the energy sector would be based on RES, starting from almost zero. Egypt has changed the target and the years of realization several times during 2023–2024. In 2023, for example, it was stated that renewable energy would achieve a 42% share of electricity generation in 2030¹⁶, then research was published,

¹¹ Zatsarin I. Infrastructure on loans and for profit. On the anniversary of the Upper Aswan Dam. *History.RF*. <https://histrf.ru/read/articles/infrastruktura-v-dolgh-i-v-pribytok-k-46-lietiiu-vierkhniei-asuanskoi-plotiny> (accessed: 22.11.2024). (In Russ.)

¹² CSP (*Concentrated Solar Power*) is a type of solar power plant that uses mirrors or lenses to concentrate large amounts of sunlight into a small area.

¹³ Morocco aims for front runner status in green hydrogen (GH₂) production. *African Energy Newsletter*. Issue 472. 14.11.2022. <https://www.africa-energy.com/news-centre/article/morocco-aims-front-runner-status-green-hydrogen-gh2-production> (accessed: 20.11.2024)

¹⁴ Shetty S. Algeria Revealed Plan to Utilize 4GW Solar Plant by 2024. *Solarquarter*. 29.05.2020. <https://solarquarter.com/2020/05/29/algeria-revealed-plan-to-utilize-4gw-solar-plant-by-2024/> (accessed: 20.11.2024)

¹⁵ A virtuous cycle of green, affordable, and financially viable energy production. Brief. *World Bank*. 25.01.2024. <https://www.worldbank.org/en/programs/teri/brief/green-affordable-and-viable-energy-production-tunisia> (accessed: 20.11.2024)

¹⁶ Minister: Egypt updated NDC plan to increase electricity generated from renewables to 42% by 2030. *Egypt State Information Service*. 15.07.2023. <https://beta.sis.gov.eg/en/media-center/news/minister-egypt-updated-ndc-plan-to-increase-electricity-generated-from-renewables-to-42-by-2030/> (accessed: 20.11.2024)

claiming that it was possible to reach a 53% share of RES by 2030 [IRENA 2018: 14]. However, in October 2024, the Egyptian authorities changed the target for both the share and the timeframe: 40% by 2040¹⁷. In addition, the emphasis was not on RES but on gas utilization.

The reasons for this revision lie both in the financial and technological spheres and are also related to a certain detachment of the declared plans from reality: the terms stipulated were too short, and the target indicators implied not just the development of RES but a fundamental change in the structure of the electric power industry. In fact, we are talking here about ensuring the energy transition, while at present, there are still unresolved technological limitations at the level of the global energy sector as a whole: fluctuations in RES generation depending on the weather, inability to store energy, etc. In addition, Egyptian representatives stated at the 29th Conference of the Parties to the UNFCCC¹⁸ in Baku that the country's plans could not be realized without foreign financial support.

In the case of Morocco, there is not just a situation of *greenwashing*¹⁹ but also the provision of inaccurate information. In 2023, high-ranking representatives of this country, speaking at the Davos Forum, announced that the share of RES in the energy mix is 38% and announced a target of 50%²⁰. However, the 38% figure cannot be confirmed, because statistical data, including those cited above, show the share of RES in Morocco's energy mix at 8.44% in 2023.

CONCLUSIONS

To summarize, there are two aspects to the prospects for RES in North African countries. The first is that the overly ambitious and too rapidly pursued goals declared by these countries are hardly realistic. But the second, and extremely important, aspect is that the policy of actively implementing RES has already been launched, large capacities are being built and planned, and although RES will not dominate the energy mix in the foreseeable future, their share will increase rapidly.

At the same time, in our opinion, it is important for North African countries to form their own RES policies, both at the country and regional levels, within the framework of the Arab Maghreb Union²¹ integration, to ensure energy security and overcome energy gaps. RES are not an alternative but an additional opportunity for North African countries to develop their energy systems. Expanding the RES potential requires, firstly, appropriate technologies and equipment, secondly, financial expenditures for the implementation of relevant projects, and thirdly, consistent governmental efforts in the institutional sphere.

¹⁷ Levesque E. Egypt slashes renewables target to focus on natural gas. *AGBI*. 22.10.2024. <https://agbi.com/energy/2024/10/egypt-slashes-renewables-target-to-focus-on-natural-gas/> (accessed: 20.11.2024)

¹⁸ The United Nations Framework Convention on Climate Change (UNFCCC) is an international climate agreement to jointly combat the effects of human interference in natural systems that has caused global climate change. The Convention was adopted and signed by representatives of 154 governments at the Earth Summit in Rio de Janeiro in 1992. The UNFCCC entered into force on 21 March 1994.

¹⁹ «*Green washing*»: this term, widely used in Western investment circles and the media, is applied to cases where actors declare altruistic environmental policies but, in reality, pursue other goals.

²⁰ Mekky Sh. Morocco targeting 50% renewable use by 2030, PM tells Davos. *ArabNews*. 18.01.2023. <https://www.arabnews.com/node/2234721/middle-east> (accessed: 20.11.2024)

²¹ The Arab Maghreb Union is a pan-Arab organization aimed at economic and political unity in North Africa. The members of the Union are Algeria, Libya, Mauritania, Morocco, and Tunisia.

At the same time, a complete reorientation from the commissioning of new capacities of traditional energy to the commissioning of RES in the context of demographic growth is questionable since traditional energy, although considered “dirty,” is familiar, stable, and economically efficient. The same is true for nuclear power. It appears that a full-scale energy transition to renewable sources will become beneficial only when two prerequisite conditions are met. Firstly, alternative energy must become cheaper in terms of initial implementation and operational costs (and later, also in the costs of modernization and utilization); secondly, it should be possible to achieve technological stability of RES for the functioning of energy systems as a whole since currently only energy generation based on traditional resources and nuclear fuel is stable and predictable. Alternative energy, on the other hand, depends on clouds, wind, and other unpredictable factors, and as its share in energy systems grows, so does their dependence on weather conditions.

REFERENCES

- Al-Qteishat A.S.A. (2022). Renewable energy sources and the government strategy for developing energy sector in Jordan. *RUDN Journal of Public Administration*. Vol. 9. № 4. Pp. 456–465. <https://doi.org/10.22363/2312-8313-2022-9-4-456-465>
- Avdokushin E.F., Kuznetsova E.G. (2023). Regenerative Economy as a Component of the New Economic System. *International Trade and Trade Policy*. Vol. 9. № 1 (33). Pp. 6–21. (In Russ.). <https://doi.org/10.21686/2410-7395-2023-1-6-21>
- Beloborodov S.S., Gasho E.G., Nenashev A.V. (2021). *Renewable Energy Sources and Hydrogen in the Energy System: Problems and Advantages*. Saint Petersburg: Naukoemkie Tekhnologii.
- Beneking A., Ellenbeck S., Battaglini A. (2016). Renewable energy cooperation between the EU and North Africa: Findings of a SWOT analysis. *International Journal of Energy Sector Management*. Vol. 10. № 3. Pp. 312–336. <https://doi.org/10.1108/IJESM-11-2014-0005>
- Borisov M.G. (2018). Alternative Energy: A New Factor of Economic Growth in the Middle East and North Africa. *Eastern Analytics*. № 1–2. Pp. 71–80. (In Russ.)
- Bouyghrissi S., Berjaoui A., Khanniba M. (2021). The Nexus Between Renewable Energy Consumption and Economic Growth in Morocco. *Environmental Science and Pollution Research*. Vol. 28. Pp. 5693–5703. <https://doi.org/10.1007/s11356-020-10773-5>
- Glinskaya M.V. (2009). Foreign Interests of Person, Community and State in Energy Policy of Russia. *Vestnik RUDN. International relations*. № 2. Pp. 55–62. (In Russ.)
- IEA. (2020). *Clean Energy Transitions in North Africa*. Paris: International Energy Agency.
- IRENA. (2018). *Renewable Energy Outlook: Egypt*. Abu Dhabi: International Renewable Energy Agency.
- IRENA. (2023). *Renewable Energy Statistics 2023*. Abu Dhabi: International Renewable Energy Agency.
- Kaplienko A.V., Gabaraev B.A. (2023). Renewable Energy Sources: Panacea for Global Power Industry or Not? *Observer*. № 3 (398). Pp. 131–144. (In Russ.). https://doi.org/10.48137/2074-2975_2023_3_131
- Khayal O., Suleiman O. (2022). Prospects of Renewable Energy in Sudan. *Global Journal of Engineering Sciences*. Vol. 10. № 4. Pp. 1–10.
- Khismatullin R.M., Valiev R.N. (2018). Analysis of the Dependence of Energy Demand on Population Growth. *Science and Education: New Times*. № 6 (29). Pp. 46–49.
- Lewis P., Monem M.A., Impiglia A. (2018). *Impacts of climate change on farming systems and livelihoods in the Near East and North Africa*. Rome: FAO.
- Ngaira J.K. (2007). Impact of climate change on agriculture in Africa by 2030. *Scientific Research and Essays*. Vol. 2. № 7. Pp. 238–243.
- Petrov E.S. (2011). Application of System Analysis Methodology in the Construction of Risk Management Model of Industrial Companies with the Use of IT Solutions. *Vestnik of Kazan State Financial and Economic Institute*. № 3 (24). Pp. 49–51. (In Russ.)
- Popel O.S. (2011). Non-Traditional Renewable Energy Sources: A New Sector of Modern Energy and Results of Works of the Institute for High Temperatures RAS. *Energy: Economy, Technology, Ecology*. № 2. Pp. 11–21. (In Russ.)

- Porfiriev B.N. (2019). The Climatic Factor of the Development of the Russian Economy in the Medium Term: Imperatives and Effectiveness of Adaptation. *Economic Revival of Russia*. 2019. №2 (60). Pp. 24–28. (In Russ.)
- Ritchie H., Rosado P. (2020). Energy Mix. *OurWorldinData.org*. <https://ourworldindata.org/energy-mix> (accessed: 20.11.2024)
- Shkvarya L.V. (2022). North African Countries: Economic Development and Readiness for Digitalization. *International trade and trade policy*. Vol. 8. № 2(30). Pp. 105–117. (In Russ.). <https://doi.org/10.21686/2410-7395-2022-2-105-117>
- Siebold F.I. (1905). Role of Underground Dew in the Water Supply of the City of Feodosia. *Works of Experimental Forestries*. № 3. Pp. 387–412. (In Russ.)
- Soloviev A.A., Nefedova L.V., Rafikova Y.Y., Soloviev D.A., Zaichenko V.M. (2021). *Perspective Directions of Development in the Field of Energy Technology Economics and Risk Assessment of Renewable Energy*. Moscow: Energia. (In Russ.). <https://doi.org/10.5281/zenodo.5525761>
- Statistical Review of World Energy*. (2024). Energy Institute. https://www.energyinst.org/__data/assets/pdf_file/0006/1542714/684_EI_Stat_Review_V16_DIGITAL.pdf (accessed: 20.11.2024)
- Tutnova T.A. (2021). Renewable energy sources and nuclear power in the carbon-free strategy of China. *Society: Philosophy, History, Culture*. № 12. Pp. 140–147. (In Russ.). <https://doi.org/10.24158/fik.2021.12.22>
- Wai M.H. (2014). An Analysis of North Africa's Capacity to Achieve Renewable Energy Development. *Topics in Middle Eastern and African Economies*. Vol. 16. № 2. Pp. 231–250.

ВОЗОБНОВЛЯЕМЫЕ ИСТОЧНИКИ ЭНЕРГИИ В СТРАНАХ СЕВЕРНОЙ АФРИКИ: ПРОБЛЕМЫ И ПЕРСПЕКТИВЫ ИСПОЛЬЗОВАНИЯ

© 2024 Л.В. Шкваря

ШКВАРЯ Людмила Васильевна, доктор экономических наук, заведующий, лаборатория Международных экономических отношений имени Р.И. Хасбулатова; профессор, кафедра мировой экономики, Российский экономический университет имени Г.В. Плеханова, Москва, Российская Федерация. ORCID: 0000-0001-6653-939X. E-mail: destard@rambler.ru

Аннотация. В статье рассматривается подход стран Северной Африки к развитию возобновляемых источников энергии (ВИЭ), являющихся составной частью продвигаемой Западом повестки так называемой «зеленой энергетики». Показано, что существует ряд факторов, усиливающих необходимость развития ВИЭ в регионе, в том числе неустойчивое макроэкономическое положение, рост населения и урбанизация, климатические изменения, политика Евросоюза, направленная на географическую диверсификацию поставщиков энергии и переориентация западных стран на альтернативные источники энергии. Вместе с тем энергопереход несет в себе значительные риски, как для функционирования энергосистем, так и для экономики. Развитие «зеленой энергетики» требует крупных, зачастую недоступных африканским странам инвестиций, получения ими дорогостоящих технологий; при этом включение ВИЭ в энергосистемы делает последние менее стабильными из-за зависимости от погодных изменений. Кроме того, страны Северной Африки обладают собственными углеводородными ресурсами, отказ от использования которых просто нелогичен. По себестоимости «зеленая энергетика» дороже традиционной. В этой связи безусловное следование в фарватере западной энергетической политики и климатической повестки не может считаться оптимальным сценарием для стран региона. Исследование показало, что страны Северной Африки, объявив об излишне амбициозных целях по развитию ВИЭ,

столкнулись с неспособностью выполнения планов. В этой связи задача развития «зеленой энергетики» не должна быть более значимой, чем задача поддержания функционирования энергетической отрасли в целом, и ВИЭ должны не замещать, а только дополнять традиционную энергетику.

Ключевые слова: возобновляемые источники энергии (ВИЭ), Африка, Северная Африка, социально-экономическое развитие, климат, климатическая повестка, традиционная энергетика, энергопотребление, энергоэффективность

DOI: 10.31132/2412-5717-2024-69-4-121-132

Для цитирования: Шкваря Л.В. Возобновляемые источники энергии в странах Северной Африки: проблемы и перспективы использования. *Ученые записки Института Африки РАН*. 2024. № 4. С. 121–132. <https://doi.org/10.31132/2412-5717-2024-69-4-121-132>