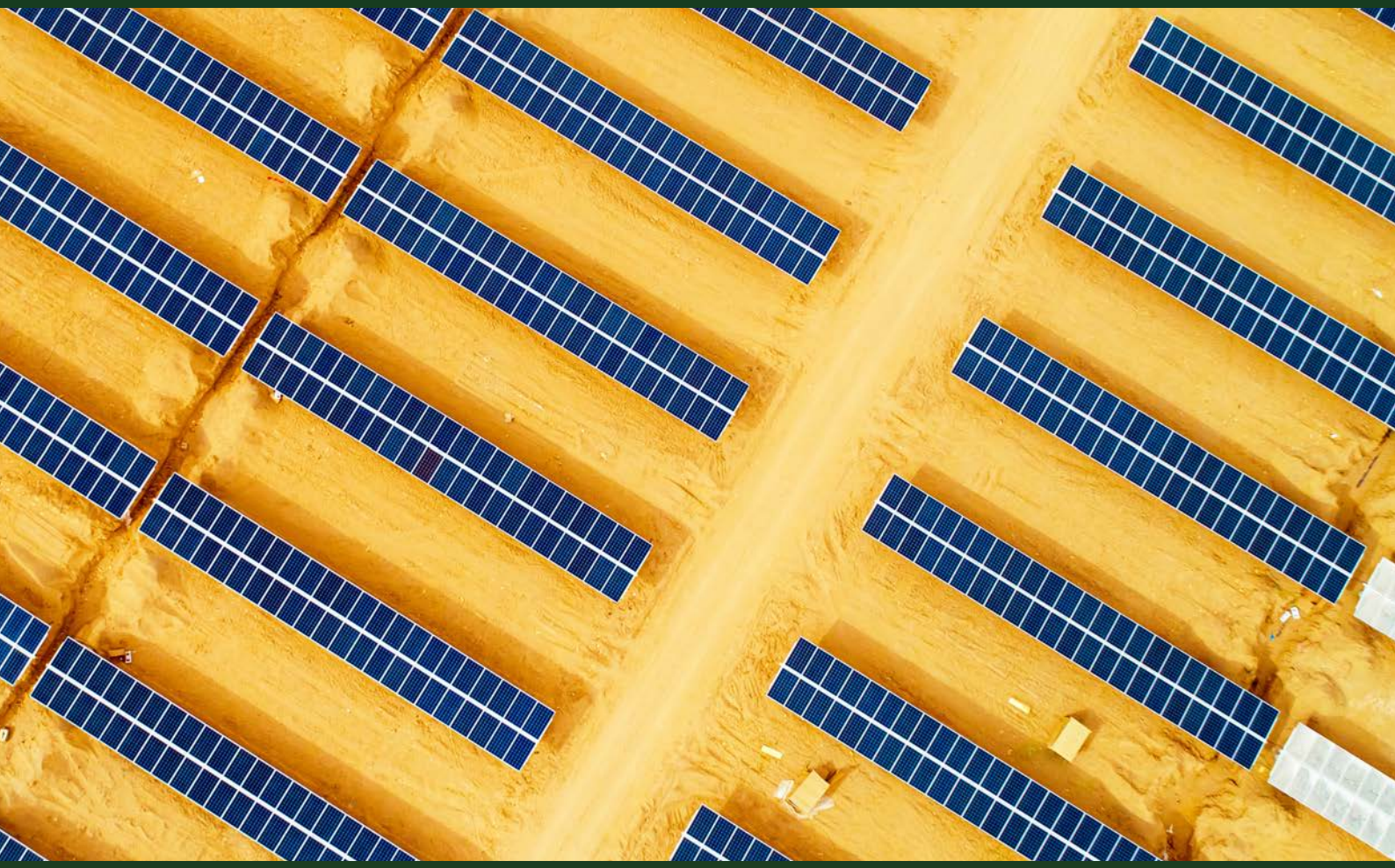
SolarPower Europe

Morocco

Solar investment opportunities



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Project information: The SolarPower Europe Global Markets Workstream was launched in March 2018 and has since then become an active working group with more than 150 experts from more than 70 companies. The objective of the Workstream is to identify opportunities for business and cooperation and thereby contribute to the energy transition in emerging markets outside Europe.

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Foreword

Morocco has emerged as a key player in the renewable energy sector, especially in solar. This report explores the numerous investment opportunities within Morocco's solar sector, highlighting market dynamics, regulatory frameworks, as well as concrete recommendations.

Morocco aims to increase its share of installed electricity capacity from renewable energy sources, to at least 52% by 2030. As the country continues its energy transition, the solar sector, in particular, is undergoing a consistent growth, offering investors a chance to contribute to a sustainable future while achieving attractive returns.

In this report, we are proud to present our findings on solar investment opportunities in Morocco. The report provides an overview of Morocco's business environment, and major macroeconomic trends, while analysing the regulatory framework and infrastructure network of the country. It maps the Moroccan energy sector, including the energy mix, key stakeholders, and the policy and legislative framework governing renewable energy, and solar more specifically. Finally, the recommendations reflect the evolving dynamics of the energy sector in the country.

SolarPower Europe's Global Markets Workstream aims to identify new avenues for business and cooperation globally, and contribute to the global energy transition. The workstream comprises over 160 experts from more than 70 companies, with a significant portfolio of investment reports on emerging markets around the world.

The Morocco report continues a series of SolarPower Europe market reports that include: Mozambique, Senegal, Côte d'Ivoire, Myanmar, Kazakhstan, India, Tunisia, Latin America, Algeria, the Middle East, Vietnam, and Oman. These reports have enabled fruitful discussions between SolarPower Europe's members and key energy sector stakeholders in these respective countries, including public and private sector representatives as well as international organisations. All the reports can be downloaded from www.solarpowereurope.org, free of charge.

In addition to the market reports, in the past year, the workstream has produced a number of input papers for the European Commission, as well as in the context of the Global Gateway Business Advisory Group. Moreover, we often participate in high-level political meetings with EU and international actors to put forward the views, needs and challenges of the Workstream and the solar sector in general. We are also cooperating with the International Renewable Energy Agency (IRENA), the International Solar Alliance, the Global Solar Council, and cooperation programmes such as GET.invest, to support the scale-up of solar energy in emerging markets.

If you would like to join our activities, discover new solar business opportunities, and have a say in shaping EU global policy, join SolarPower Europe's Global Markets Workstream.

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TABLE 1 GENERAL INFORMATION

Category	Data
Official Language	Arabic, Tamazight (Berber), French, (English also spoken unofficially)
Capital	Rabat
Currency	Moroccan Dirham (MAD)
Surface area	710,850 km^2
Population (September 2024)	36,828,330 inhabitants
Population density (September 2024)	51.8 inhabitants/km^2
GDP (April 2024)	USD 152.38 billion (EUR 138.89 billion)
GDP per capita (April 2024)	USD 4,080 (EUR 3,719)
GDP growth (2023-24)	3.1%
Access to electricity (2022)	100% of population
Internet connection (2021)	88% of population

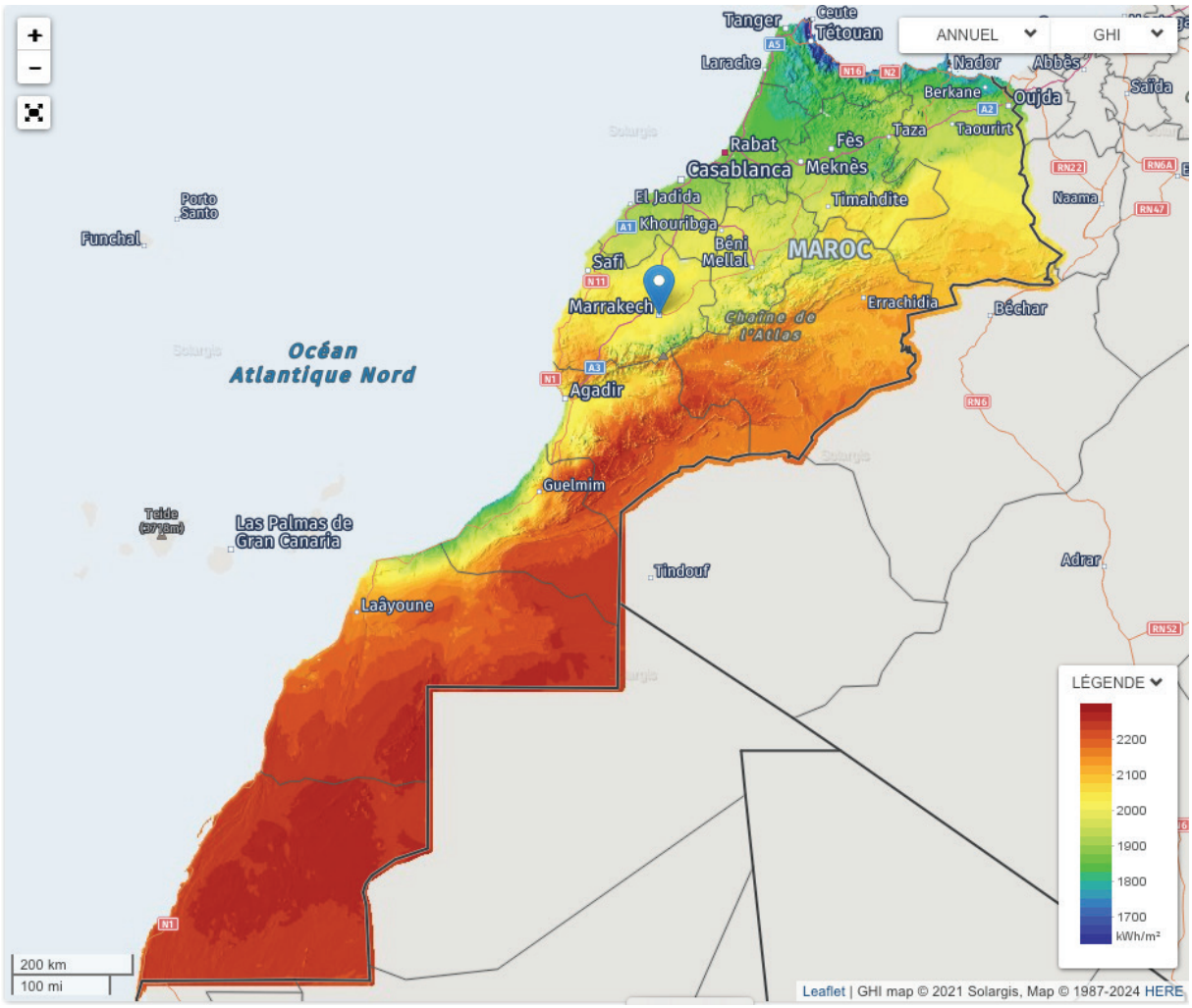
Source: Haut-Commissariat au Plan, 2024; International Monetary Fund, 2024; United Nations, 2024; World Bank, 2021, 2022, 2023.

1.1. Energy geography

Morocco is located in northwestern Africa, in the Maghreb region and shares land borders with Spain to the north, Algeria to the east, and Mauritania to the south. The country has maritime borders with Algeria, Spain, and Portugal as well and is situated at a strategic crossroads for maritime trade, sharing access to the Strait of Gibraltar with Spain. Morocco is one of the few countries, along with France and Spain, on either side of the Mediterranean to have coasts on the Atlantic Ocean as well.

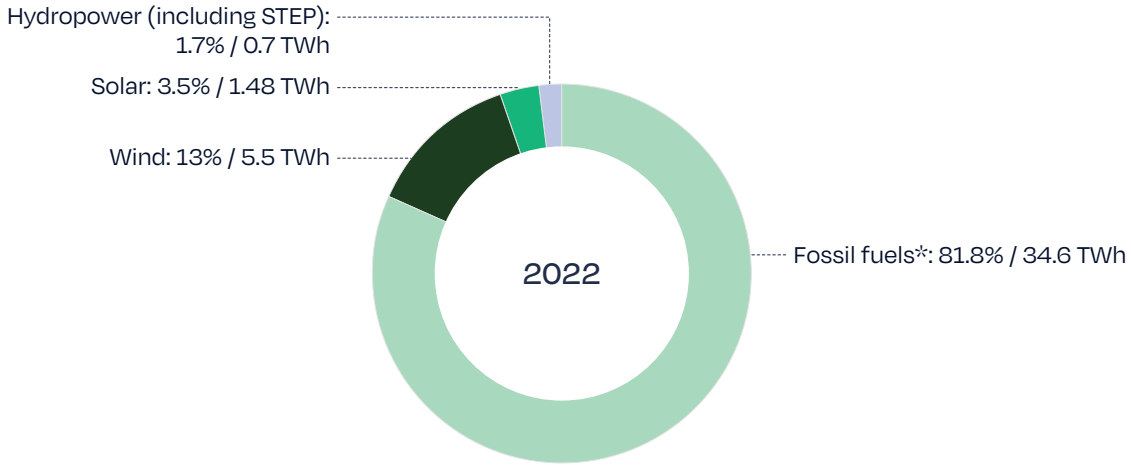
Morocco imports around 90.51% of its energy needs (Ministère de la Transition Énergétique et Développement Durable, 2022), with energy consumption increasing around 5% per year since 2004. Traditionally, this has been in the form of gas exports from Algeria, via the Maghreb-Europe Gas Pipeline. However, the countries cut diplomatic ties in late 2021 and Algeria immediately halted gas exports, forcing Morocco to procure gas from international spot markets. In an attempt to reduce its dependency on imported fossil fuels, Morocco has been looking to take advantage of the enormous renewable energy potential at its disposal. The country has a global horizontal irradiation (GHI) of 1,753 kWh/m^2/year (4.8 kWh/m^2/day) on average in the northern coastal regions of Tanger-Tetouan-Al Hoceima and Oriental-Rif. GHI reaches as high as 2,264 kWh/m^2/year (6.2 kWh/m^2/day) on average in the regions of the Western Sahara (including, Guelmim-Oeud Noun, Laayoune-Boujdour-Sakia Al Hamra, and Ed Dakhla-Oued Eddahab), as well as in Drâa-Tafilalet and Souss-Massa (IRESEN, 2022).

FIGURE 1 ANNUAL GLOBAL HORIZONTAL IRRADIATION MAP OF MOROCCO



Source: Moroccan Agency for Sustainable Energy (MASEN), 2024.

FIGURE 2 MOROCCO'S ELECTRICITY PRODUCTION BY SOURCE
(Including the solar component of Ain Béni Mathar)

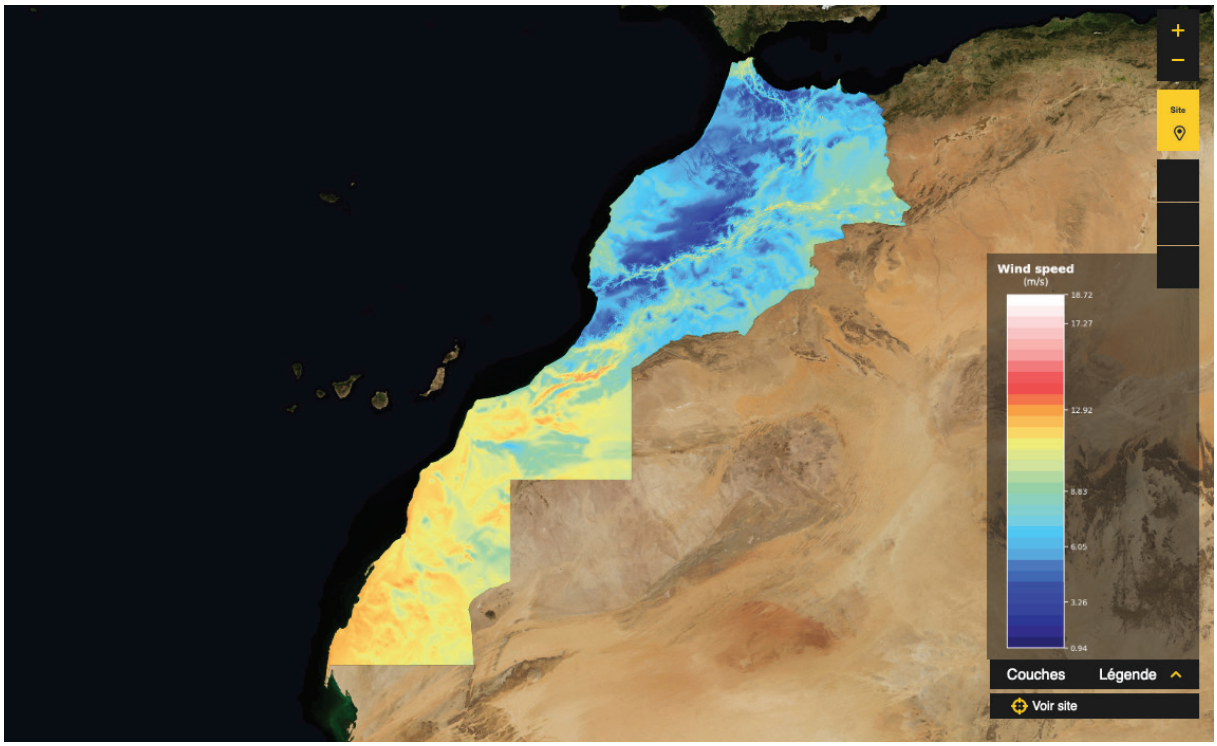


*: Including natural gas, coal, oil and diesel, and others.
Source: National Authority for the Regulation of Electricity (ANRE), 2022.

Morocco's energy mix is largely made up of fossil fuels, which represent almost 90% of the total primary energy supply (TPES) and around 80% of the electricity supply, with renewables accounting for the remaining 20% of electricity generation. Morocco's production of oil or natural gas is currently very weak, making it highly dependent on imported fossil fuels. The natural gas production was around 110 billion cubic meters (BCM) in 2021, covering around 11% of the annual consumption (APA News, 2021).

In 2009, Morocco adopted the National Energy Strategy, which was still mainly relying on fossil fuels. It was also aiming at fostering renewables, primarily through the development of wind and solar energy, that also led to the publication of the Moroccan Solar Plan (2009) and the Moroccan Wind Plan (2010). The Moroccan Solar Plan is aiming to generate 3,000 MW by 2025 and 4,000 MW by 2030. The country has significant potential for renewable energy, the exploitation of which will make it possible to cover a substantial proportion of its growing needs by replacing fossil fuels. Morocco is currently at increasing the share of renewable energies in installed electricity capacity to more than 52% by 2030. The renewable installed capacity share was around 38% by the end of 2022, 41% in 2023, and approximately 45% as of today (National Office for Electricity and Drinking Water ONEE, 2024). Solar energy (PV and concentrated solar power - CSP) covers 20% of the total renewable installed capacity (National Electricity Regulatory Authority ANRE, 2022).

FIGURE 3 AVERAGE WIND SPEED AT 100M



Source: Institut de Recherche en Energie Solaire et Energies Nouvelles (IRESEN), 2022.

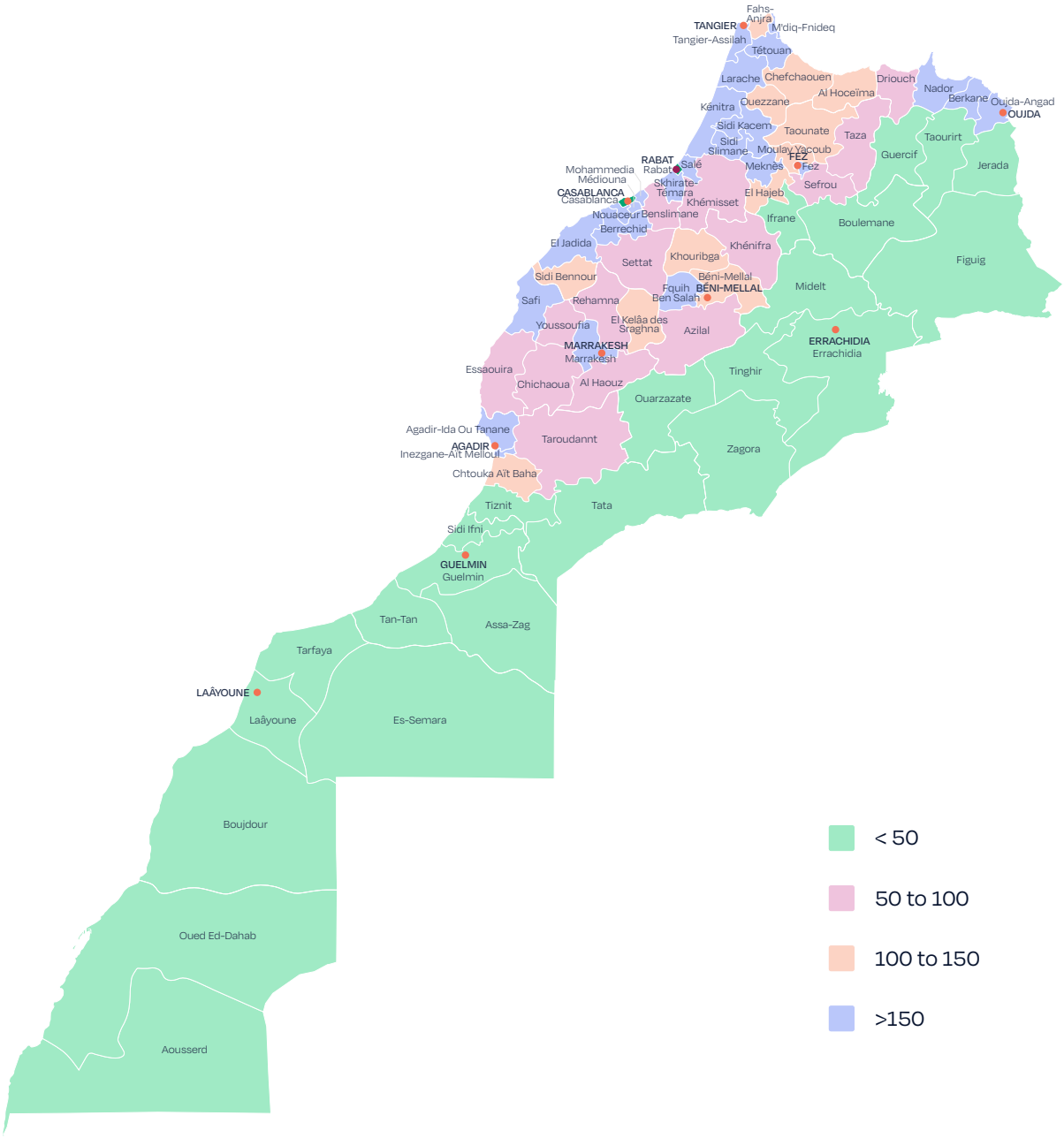
Morocco also has strong wind power potential, with the following particularly windy areas: the far north of the country (Tanger, Tetouan) and the Essaouira region where winds reach an average speed of 7m/s, and the southern Atlantic zone from Tarfaya to Lagouira (Western Sahara) where the average wind speed is estimated to be 10m/s (IRESEN, 2022).

1.2. Demographics

The population of Morocco reached 36.83 million inhabitants as of 1st September 2024, according to the results of the 2024 population census, published in November 2024. The average annual growth rate of the population attained 0.85% in the period 2014-2024, against the 1.25% of the previous decade (Haut-Commissariat au Plan, 2024). The median age is 29.56 years and life expectancy at birth is 75.4 years (database.earth, 2024). Morocco has seen a steady decrease in its population fertility rate, from 7 children per woman in the 1960s to about 2.3 in 2021 (World Bank, 2022), which can be linked to urbanisation, improvements in women's access to education and their increased participation in the labour market.

Morocco has a population density of 51.8 inhabitants/km^2 in 2024, with 63% of the population living in urban areas (Haut-Commissariat au Plan, 2024). The population is not equally spread among the country, as almost 75% of it is concentrated in the regions along the Atlantic and the Mediterranean coast, namely Grand Casablanca-Settat, Rabat-Salé-Kénitra, Marrakech-Safi, Fès-Meknès and Tanger-Tetouan-Al Hoceima.

FIGURE 4 POPULATION DENSITY BY REGION (2014)



Source: : Haut-Commissariat au Plan, 2024.

1.3. Macroeconomic context

Morocco is characterised by a liberal market economy. The State is a major player in the country's economic emergence through national strategies and as an investor.

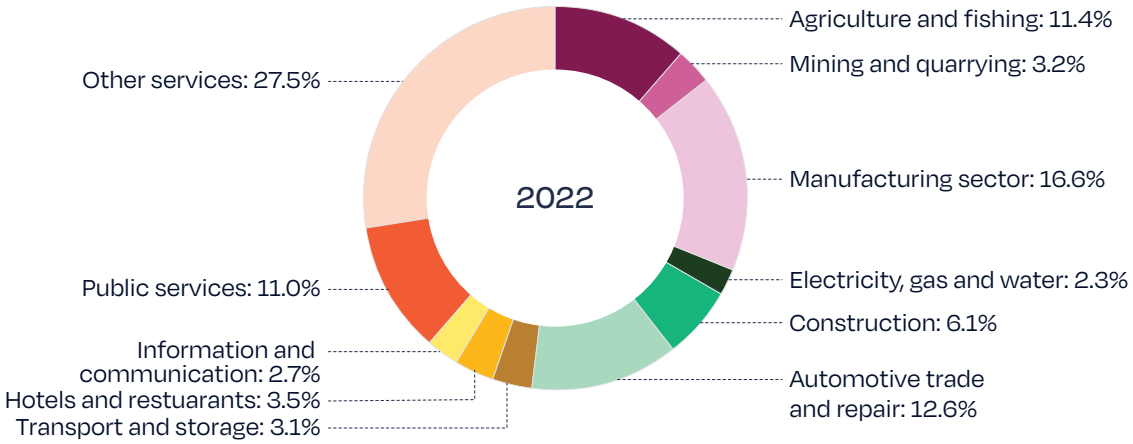
Morocco has had a strong economic growth in the last 25 years (1998-2023), with an average annual GDP growth of 3.72%, reaching a GDP of USD 152.38 billion (EUR 138.89 billion) as of April 2024 (United Nations, 2024).

Agriculture usually amounts to approximately 13-14% of GDP but due to an exceptional drought in 2022, the value added in the agricultural sector contracted by -15% in the same year. A rebound has been seen in 2023, but the production level is still 15% lower than the average in the 2018-2022 period (HCP, 2023). The forecast for the agricultural sector in 2024 is not very optimistic, due to increasingly frequent and intense hydric stress (African Development Bank Group, 2024).

The share of the industrial sector is still growing up to around 28% of the GDP in 2022. The profitable business of phosphate and fertilisers, managed by the public company OCP (Office Chérifien des Phosphates), is still an important part of Moroccan industry, often considered as its engine. Morocco is the world's 2nd largest phosphate producer after China, holding around 70% of the world's reserves.

In recent years, the Moroccan economy has been severely affected by a series of internal shocks (earthquake in 2023, repeated droughts) and external shocks (tensions on global commodity prices). This led to a limited GDP growth of 1.2% in 2022 and 2.4% in 2023, as well as inflationary pressures ranging from 8.6% in 2022 to 7.7% in 2023 (Ministry of Economy, Finance and Industry, 2023). In the second quarter of 2024, the labour market continued to be negatively affected by the recurrent droughts, especially in the agricultural sector. In fact, the unemployment rate reached about 13.1% at the national level, 16.7% in urban areas and 6.7% in rural areas. The rate remains higher among young people aged 15-24 (36.1%), graduates (19.4%) and women (17.7%) (HCP, 2024). However, Morocco has demonstrated resilience and control over its macroeconomic balances. Due to higher-than-expected tax revenues, Morocco reduced its budget deficit in 2023 to 4.9%, compared to 5.2% in 2022, 6.0% in 2021 and 7.1% in 2020. The consolidation is expected to continue, with a projected deficit of 4.0% in 2024, according to the International Monetary Fund (IMF). Despite a significant increase during COVID, Morocco's debt remains viable in the medium term due to controlled

FIGURE 5 GROSS DOMESTIC PRODUCT BY SECTOR IN 2022



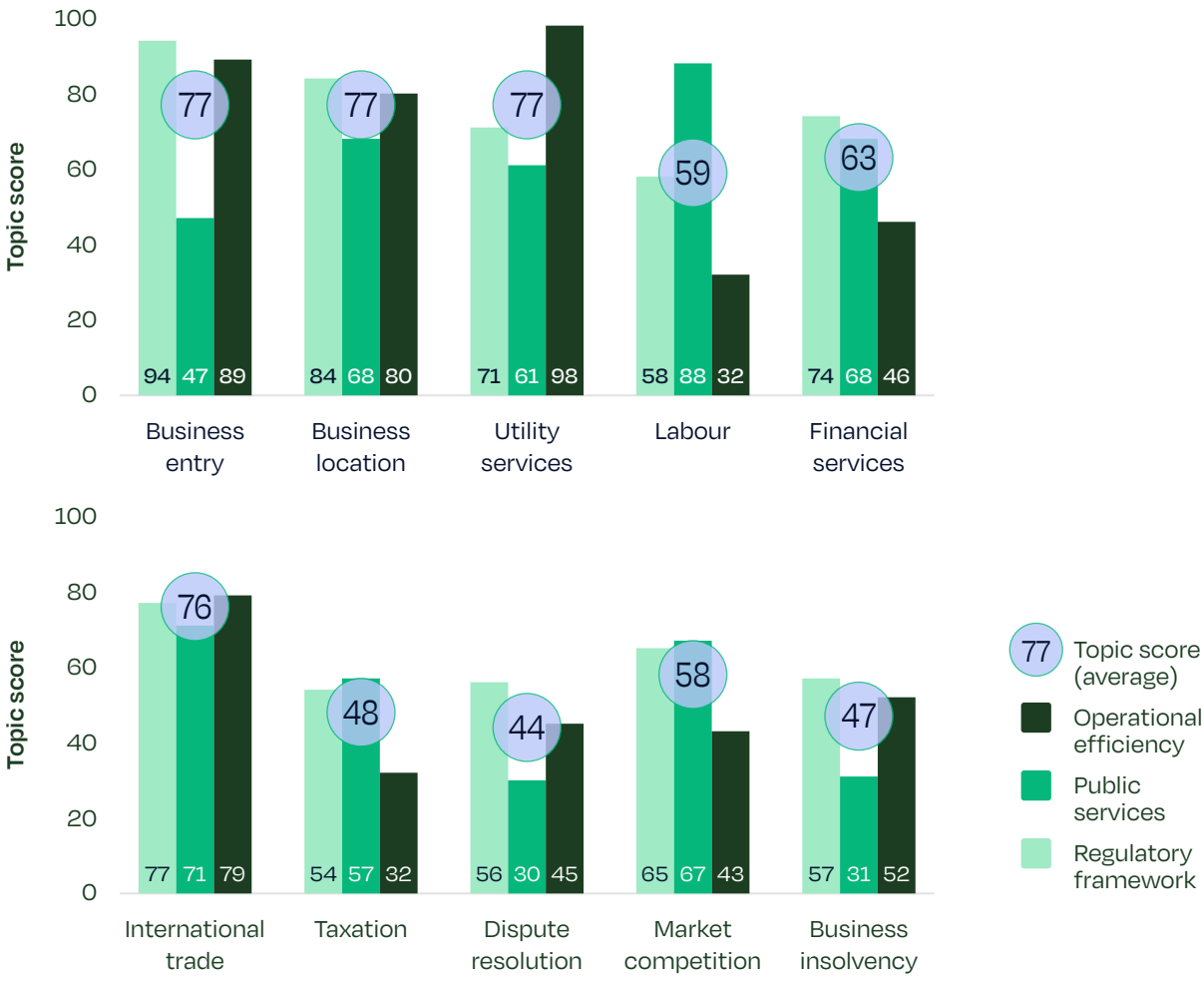
Source: : Haut-Commissariat au Plan (HCP), 2023.

ratios (debt at 69.7% of GDP in 2023 according to the IMF) and factors that mitigate the impact of rising interest rates (i.e. a substantial number of long-term domestic institutional investors and a large share of concessional external debt). While Morocco primarily finances itself on the domestic market, its strong fundamentals ensure privileged access to international financing. This financing capacity will be called upon to meet the challenges of the future: post-earthquake reconstruction, social reforms, energy transition and the 2030 FIFA World Cup. According to the IMF, Morocco's GDP is expected to grow by an average of 3.3% per year between now and 2028. The economy is expected to be strongly driven by public investments, particularly the Mohammed VI Investment Fund. It aims at supporting major projects and companies operating in strategic areas, especially in the energy and digital sectors.

1.4. Business environment

Business Ready (B-READY) 2024 report by the World Bank Group assesses the regulatory framework and public services directed at firms, as well as the

FIGURE 6 EVALUATION OF THE BUSINESS ENVIRONMENT IN MOROCCO



Source: World Bank Group, 2024.

efficiency with which regulatory framework and public services are combined in practice. These three pillars were taken into account in the evaluation of ten topics (see Fig. 6 below) related to the business environment in the analysed countries.

According to the report, Morocco reached the highest scores in Business Location, Business Entry, and Utility Services. This translates into transparent information on building permits, zoning, and land use, business entry for foreign firms is not restricted, and presence of regulations for efficient deployment of electricity connections and the quality of their supply. Morocco scores lowest in Dispute Resolution, Business Insolvency, and Taxation. Within these areas, the economy lags in procedural certainty for court litigation, does not have a public registry of insolvency practitioners, and has not implemented environmental taxes.

1.5. Political and social context

Morocco is a monarchy, whose reins of power are mainly concentrated in the hands of King Mohammed VI, who became the head of state in 1999, at the same time, the highest Islamic authority in the country.

In 2011, King Mohammed VI embarked on a programme of modernisation which started with the adoption of a new constitution, containing for the first time ever a list of fundamental rights and emphasising the country's pluralist identity. Since then, several other significant reforms have been undertaken of the electoral system, human rights, judiciary sector and women's rights.

The current Prime Minister is the liberal Aziz Akhannouch, leader of the National Rally of Independents (RNI), which narrowly won the elections in September 2021, ousting the conservative Islamist PDJ party that had led governments for a decade (between 2011 and 2021, it lost 90% of its seats). The current government coalition is constituted by the liberal RNI, the Authenticity and Modernity Party (PAM) and the conservative Istiqlal. The three parties share a common focus on economic and social reforms and the desire to reduce the budgetary deficit.

Since 2023, the country has been facing high unemployment and high cost of living, exacerbated by recurring droughts. Additionally, the country was still recovering from COVID-19 crisis when a major earthquake struck the Atlas and Marrakech regions, killing 3,000 people and leaving more than 5,500 people injured (UNICEF USA, 2023). Moroccan authorities launched a 5-year reconstruction plan, allocating MAD 120 billion (EUR 11.18 billion). The budget was divided into two main pillars: MAD 22 billion (EUR 2.05 billion) for emergency assistance to households and infrastructure rebuilding, and MAD 98 billion (EUR 9.13 billion) earmarked for the recovery of the High Atlas region (Policy Centre for the New South, 2024).

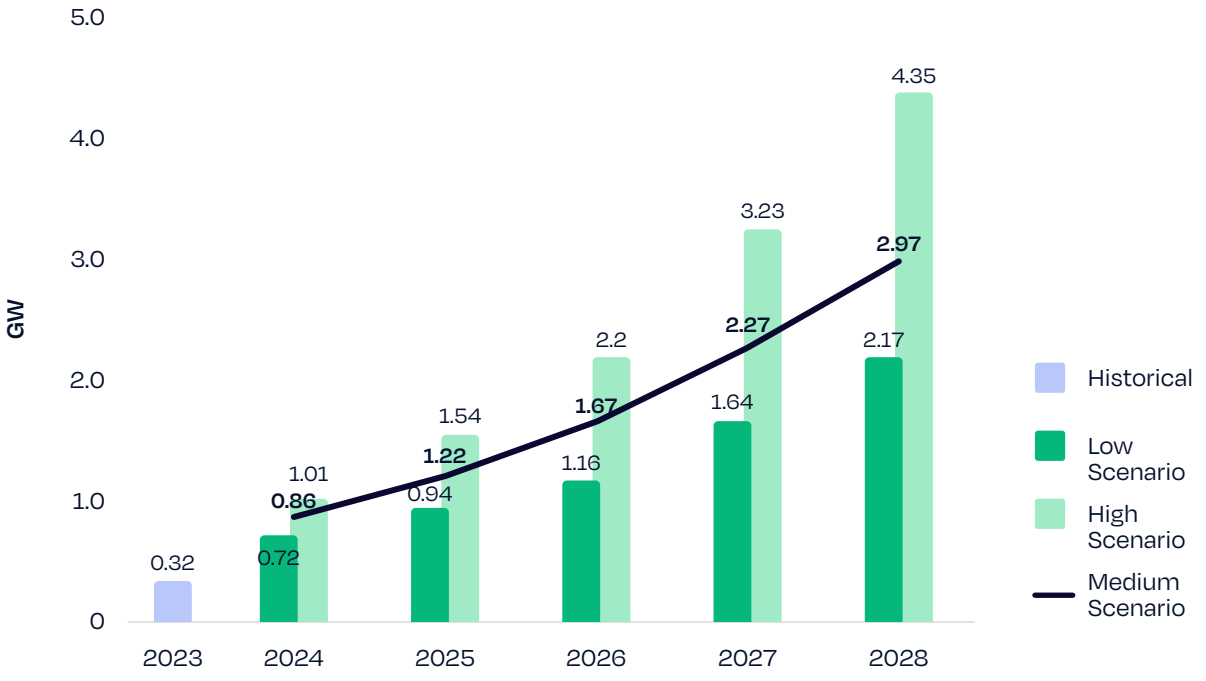
2.1. Energy sector overview

To reduce dependency and enhance energy security, Morocco has created an ambitious strategy to diversify its energy mix, focusing on the development of renewable energies, particularly solar, wind, and hydropower. More specifically, Morocco aims to reach at least 52% of renewable energy installed capacity by 2030, positioning itself as a regional leader in the energy transition in Africa.

The goal is part of Morocco's broader strategy to reduce greenhouse gas emissions and contribute to global efforts in tackling climate change.

Solar PV, together with wind energy, is at the core of Morocco's National Strategy for Sustainable Development. Thanks to its solar exposure and to the land available, the country has excellent potential in the PV sector.

FIGURE 7 CUMULATIVE PV CAPACITY DEVELOPMENTS IN MOROCCO, 2023-2028



According to SolarPower Europe's analysis, based on the latest data from ONEE, the PV cumulative capacity in Morocco reached 0.32 GW in 2023. In terms of future developments, under the medium scenario developed by SolarPower Europe, the growth trajectory estimates a steady increase, reaching 2.27 GW of cumulative installed capacity by 2027 and peaking at 2.97 GW in 2028. While the high scenario projects a more rapid expansion, with capacity potentially rising to 4.35 GW by 2028.

Despite Morocco's targets for renewable energy, the progress in achieving these goals has been uneven. The moderate development of the PV sector in the country could be attributed to several factors, such as the higher focus on CSP, delays in the development of PV projects, as well as grid integration challenges. As a result, the full potential of PV remains underdeveloped.

The energy sector in Morocco has been undergoing a deep reform process in recent years, opening up much of the market to private participation. From the political and institutional point of view, a more detailed overview of the main actors involved in the energy sector can be found in Table 2 below.

TABLE 2 ACTORS INVOLVED IN THE ENERGY MARKET IN MOROCCO

Key Institutions	
National Office for Electricity and Water (ONEE)	ONEE is a state-owned vertically integrated utility that has traditionally held a predominant role in the electricity market of Morocco. Besides the relevant role it still plays in generation (29% of the total generation), in 2024 ONEE has focused its core activities on energy transport and distribution, mainly due to the growing presence of independent power producers and rapid deployment of renewables. ONEE, in fact, is the owner of the transmission network and still operates approximately 50% of the energy distribution. Besides ONEE, the remaining part of the distribution network is managed by Regional Multi-service Companies (RMC), that have recently been introduced to replace the Régies (local public management companies) and the Gestionnaires Délégués (private delegated management companies).
Regional Multi-service Companies (RMC)	In light of the ongoing re-organisation of the electricity distribution sector, a transition towards the RMC is currently taking place. This restructuring aims to streamline energy distribution (and water services) under regional entities, providing better coordination and efficiency. In this context, on 16th April 2024, the Minister of the Interior published Decree No. 990.24, specifying the model of the management contract to be concluded between the service owner and the RMC. The Decree was issued in application of Law No. 83.21 of 12th July 2023, which recommended the gradual transition to these companies in replacement of the Régies. In August 2024, the Ministry of the Interior set the dates for the entry into force of the RMC in four key regions of Morocco. The new entities will be responsible for the management of water, electricity and liquid sanitation. This first phase of the creation of the RMC, in accordance with Decree No. 2.23.1033, set the entry into force of each management contract between October and November 2024 for the following RMCs: Casablanca-Settat Regional Multi-service Company, Souss-Massa Regional Multi-service Company, Marrakech-Safi Regional Multi-service Company, Oriental Regional Multi-service Company.
Moroccan Agency for Sustainable Energy (MASEN)	MASEN is a state-owned company created in 2010 under Law 57-09 to coordinate the National Integrated Project for Solar Electricity Production (later extended to all Renewable Energy Sources (RES) technologies). MASEN is responsible for leading and managing the development of renewables at a technical, economic and financial level, and coordinating activities through a one-stop-shop. MASEN plays a key role as a driving force and facilitator of the development of private investments in renewable energy in the country. MASEN is also the Focal Point of the Morocco Green Hydrogen Offer.

Source: RES4Africa, 2023; IEA, 2022.

TABLE 2 ACTORS INVOLVED IN THE ENERGY MARKET IN MOROCCO *continued*

Moroccan Agency for Energy Efficiency (AMEE)	AMEE is a public institution established in 2008 to promote energy efficiency in Morocco. The agency aims to reduce energy consumption, lower greenhouse gas emissions, and ensure sustainable energy development. AMEE works to achieve this goal by implementing several programmes and initiatives, including energy audits, labelling and standards, capacity building, and awareness campaigns. It also plays a key role in developing and implementing Morocco's energy efficiency policies and strategies.
National Electricity Regulatory Authority (ANRE)	ANRE is responsible for regulating the open and competitive segment of the electricity sector. It was legally established in 2016 but only held its inaugural meeting in late 2020. Its responsibilities include regulating the grid fees and surplus tariffs, network access regulation, the definition of transmission and medium-voltage grid tariffs, as well as ensuring market efficiency and handling disputes.
Institute for Research into Solar and Renewable Energy (IRESEN)	IRESEN is responsible for identifying, implementing and financing research priority projects in the fields of renewables and energy efficiency.
Energy Engineering Company (SIE)	SIE is a public energy investment company that supports national RE projects and energy efficiency as a lender, investor or project co-developer.
Ministries	
Ministry of Energy Transition and Sustainable Development	It is primarily responsible for Morocco's overall energy policy, managing the low-carbon transition and safeguarding the security of supply. It is in charge of setting rules for energy markets and authorising and supervising energy projects.
Ministry of Economy and Finance	Responsible for price and competition policy in Morocco and regulating the electricity and fuel prices (before final approval, proposed tariffs are reviewed by an inter-ministerial tariff committee that includes the Ministry of Energy Transition and Sustainable Development.
Ministry of Industry and Trade	The Ministry oversees the regulatory framework for the electricity sector, promoting competition and ensuring fair market practices. Additionally, it supports local industry development in the renewable energy sector, fostering job creation and technological innovation.
Ministry of Interior	Responsible for the organisation, policy and oversight of the public municipal water and electricity distribution companies, as well as the private ones, the delegated authorities and the RMC.
Private sector representation	
Cluster ENR	The Cluster ENR is dedicated to accelerating the country's energy transition by creating a competitive industrial sector for renewable energies. The Cluster ENR provides valuable services such as capacity building, networking, and facilitating collaboration between businesses, institutions, and researchers.
Moroccan Energy Federation	The Moroccan Energy Federation (FEDENER) is the association representing the players of the energy sector in Morocco. It aims to promote sustainable energy development in the country by advocating for an ambitious development of renewables, fostering dialogue between stakeholders, and contributing to the development of a competitive energy market.
Institute for Renewable Energy and Energy Efficiency (IFMEREE)	The IFMEREE is a Moroccan educational entity specialised in training for renewable energy and energy efficiency professions. It aims to train highly qualified technicians to meet the growing needs of Morocco's energy transition.

Source: RES4Africa, 2023; IEA, 2022.

When it comes to electricity prices and taxes, Morocco is one of the African countries with the lowest electricity price. Since 2017, the average electricity price in Morocco has been constantly fluctuating, going from USD 108.48/MWh (EUR 100.62/MWh) in 2021 to USD 97.54/MWh (EUR 90.18/MWh) in 2022, surging again to USD 121/MWh (EUR 111.71/MWh) in 2024 (World Population Review, 2024). According to the 2024 Finance Act, electricity prices were subject to a Value Added Tax (VAT) rate of 16% in 2024. The VAT rate related to 2025 is 18%, which will converge to 20% in 2026. While electricity generated from Renewable Energy Sources (RES) had a rate of 12% in 2024, which is reduced to 10% starting from 2025 (PwC, 2024).

2.2. Regulatory framework

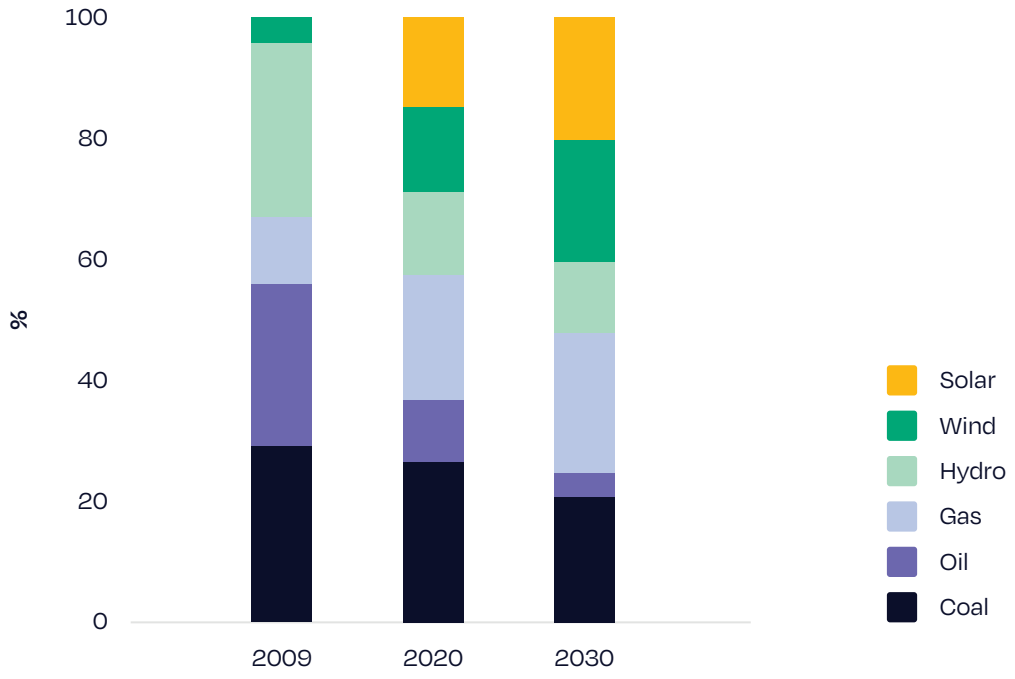
Overview of the main commitments at national and international level

Morocco started to implement its **National Energy Strategy for 2030** in 2009 and updated it in 2015. The strategy sets key goals to ensure energy supply security together with three additional objectives: securing affordable energy for everyone, fostering energy efficiency and providing environment protection. The Strategy defines an ambitious renewable energy plan by setting the target to extend the share of renewable electricity capacity to 42% by 2020, 52% by 2030 (made up of 20% solar, 20% wind and 12% hydropower) and 80% by 2050.

The National Strategy for Sustainable Development is also complemented by the **Energy Efficiency Strategy for 2030**, published in 2013 and updated in 2020. This strategy focuses on reducing the needs and consumption of energy in the country, setting an overall objective of -20% energy consumption by 2030. In order to achieve this goal, key strategic sectors of action were identified: transport, industry, buildings, agriculture and public lightening should see a reduction of 24%, 22%, 14%, and 13% respectively.

The country also committed to reducing greenhouse gas emissions by 18.3% compared to Business as Usual (BAU) by 2030, under the unconditional target, as part of the **Paris Agreement**. The conditional target has been set to a 45.5% reduction compared to BAU by 2030.

FIGURE 8 TARGETS OF THE ELECTRICITY MIX IN MOROCCO BY 2030



Source: Ministry of Energy Transition and Sustainable Development, 2024.

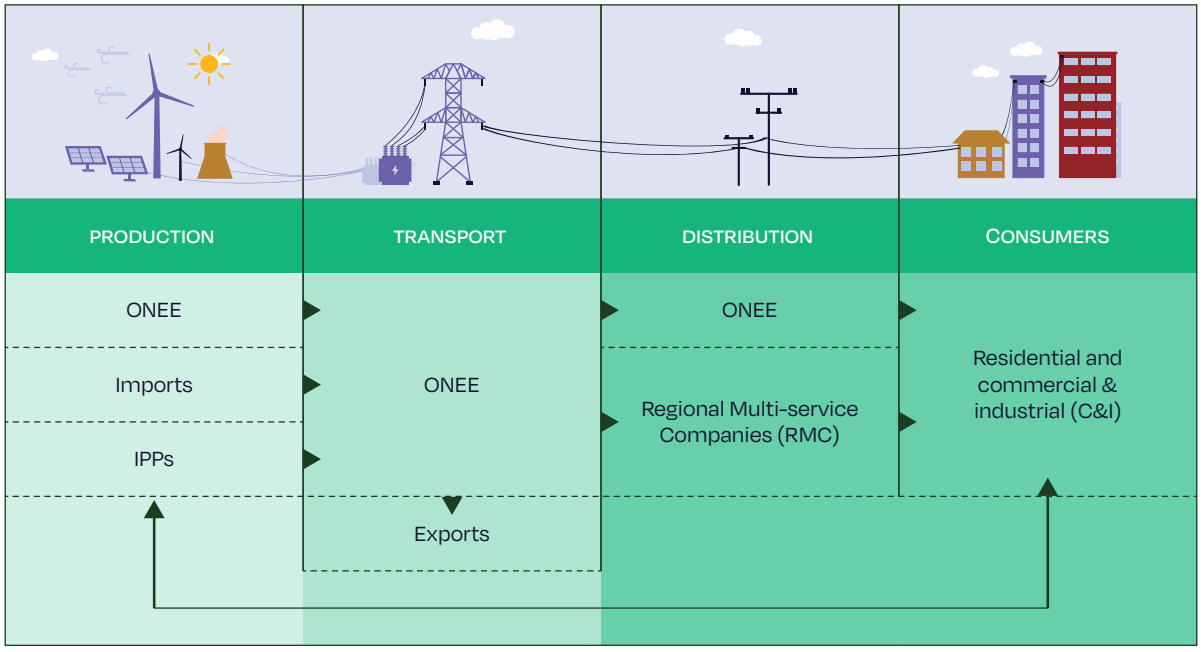
Moreover, in 2021 Morocco also approved the **Low Carbon Development Strategy for 2050**, outlining strategic directions for the national economy and society until 2050 and presenting the country's climate efforts.

Regulation related to the generation of renewable electricity

Regarding the generation of renewable electricity, the main reference piece of legislation is **Law 13-09** (2009). In Morocco, Private-Public Partnerships (PPPs) are increasingly used for renewable energy projects. Under this model, the government partners with private entities to co-develop projects and therefore share responsibilities and benefits. This model helps spread project risks and attract international investment. Tenders are usually planned and launched by ONEE and MASEN according to a procurement programme based on a competitive bidding process. Winners of the auctions get long-term PPAs with either ONEE or MASEN for 20 to 25 years.

In 2016, Law 13-09 was amended by **Law 58-15**, which opened the market to Independent Power Producers (IPPs) and granted access to the grid to sell electricity. The legislator differentiated between sales on the medium voltage (MV) network, on the high voltage (HV) network and on very high voltage (VHV) network. IPPs connected to a MV network can sell electricity produced from renewable energy sources (RES) to consumers connected to the MV network. The excess can be sold to Distribution System Operators (DSO), with the limit of 20% of the electricity produced. IPPs connected to the MV, HV and VHV grids can sell electricity to the transmission system operator ONEE and to the distribution system operators at a regulated tariff, within the limit of 40% of the total energy supplied to customers located in their respective area of competence. The terms and commercial conditions of purchase are set by the ANRE on the proposal of the national transmission system operator (TSO), represented by the ONEE. Moreover, IPPs connected to the HV and VHV can also sell electricity directly to corporate off-takers via PPAs and using the national grid.

FIGURE 9 STRUCTURE OF THE MOROCCAN ELECTRICITY SUPPLY SECTOR



Source: RES4Africa, 2022.

Furthermore, the abovementioned law, together with **Law 40-19**, grants the possibility for renewable energy generators to develop direct transmission lines and to export electricity. All export operations of RES-based electricity are controlled by the ANRE and managed by the national TSO, represented by ONEE. Thanks to this favourable environment, the role of IPPs has significantly increased in the course of time, leading Morocco to be one of the key countries for RES in Africa.

Law 40-19, which revises and adds to Law 13-09 (previously updated by Law 58-15), was approved on 1st July 2021. It promotes greater transparency, improves access to information on investment prospects, and simplifies authorisation processes. These reforms aim to make the renewable energy sector more appealing to both domestic and international investors and to accelerate the growth of the national renewable energy sector.

To support new renewable energy projects, the government launched several supporting programmes. Winners of the auctions would get a 25-year PPA with MASEN. A financial guarantee was required at the time of financial closure and bidders were responsible for meeting financial close under the PPA. MASEN also secured concessional low-interest loans from international finance institutions in order to fund the PPA and mitigate the costs for the country.

The government also offers several incentives for investments in the country by means of the main supporting tool as well as other specific supporting tools. The main supporting tool for renewable energy projects consists of a bonus equal to 5% of the investment, according to the following eligibility criteria:

1. Projects worth more than MAD 50 million (EUR 4.7 million) and creation of at least 50 jobs;
2. Creation of at least 150 jobs.[1]

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1 Cri-Invest Maroc, 2023.

2 Moroccan electricity market / continued

Regulation related to the electricity sector

In 2016, **Law 48-15** established the National Electricity Regulatory Authority (ANRE), which is an independent energy regulator. ANRE is the entity in charge of ensuring that the Moroccan electricity sector functions smoothly, setting tariffs for the use of the transmission and distribution grids, arbitrating disputes, and imposing sanctions in cases of proven violations. In 2021, the National Authority for Electricity Regulation (ANRE) unanimously approved the Code of the National Electric Transport Network (CRENT), the first one in the region (ESI Africa, 2023). This initiative was supported by the European Bank for Reconstruction and Development (EBRD). The CRENT came into force on 3rd January 2022 and set, in a non-discriminatory manner:

- the technical requirements relating to connection and access to the national electricity transport network, including interconnections;
- the rules concerning the planning and operations of the network;
- the methods of data exchange and collaboration between the TSO and all network users.

In terms of licencing, the CRENT established the following differentiation:

- Small-scale plants (≤ 2 MW): simplified declaration process;
- Medium-scale plants (2 MW – 50 MW): formal licence required, together with technical grid studies;
- Large-scale plants (> 50 MW): full regulatory approval, comprehensive studies, and stricter connection requirements.

In 2024 ANRE also published the tariffs for the use of transmission network and system services, as well as the grid capacity. The period taken into account is 1st March 2024 – 28th February 2027. In particular, the Tariff for the Use of the Transmission Network (TURT) has been set at 6.39 cents per kilowatt-hour (EUR 0.0061 per kilowatt-hour) for the year 2024, while the Tariff for System Services (TSS) has been established at 6.35 cents per kilowatt-hour hour (EUR 0.006 per kilowatt-hour) for the same year. These tariffs will be annually adjusted during the entire regulatory period based on the inflation rate to reflect economic condition. These decisions represented an important point to attract private investments in the future, as they improve transparency of the energy sector. For 2024, ANRE calculated an average reduction of 38% of the tariffs compared to 2023 (ANRE, 2024).

Regulation related to self-generation of electricity

Law 82-21 (2023) establishes new requirements for self-generation of electricity based on the installation's capacity and its connection to the grid, providing a framework for accessing the electricity grid and transporting electricity from production to end-use sites (see table 3 below). In particular, installations with a capacity of 5 MW or more must obtain prior approval from the relevant grid operator. Self-generators connected to the grid must pay system service fees determined by the ANRE and may sell up to 20% of their excess energy to the national grid operator at a price set by the same authority. The law also allows self-generators to obtain a certificate of origin confirming the renewable source of their electricity and to construct energy storage facilities, with specific conditions to be defined by the implementing regulations. On 12th September 2024, the Government Council adopted draft decree No. 2.24.804, implementing the provisions of Law 82-21, particularly concerning the introduction of smart meters, presented by the Minister of Energy Transition and Sustainable Development. The Government Council also approved draft decree No. 2.24.761 related to the certificate of origin of electricity from renewable energy sources. It aims to implement the provisions of article 6 bis of Law 13-09 and of article 16 of Law 82-21 related to the self-production, specifying the terms and conditions for granting certificates of origin of electricity from renewable energy sources, and defining the body responsible for issuing these certificates. The decrees will most likely enter into force in the upcoming months, after their publication on the Official Bulletin.

TABLE 3 OVERVIEW OF LAW 82-21

Type of project	Capacity	Requirement
Off-grid self-generation projects	All capacities	Must provide a prior declaration to the Moroccan Ministry of Energy Transition and Sustainable Development.
Self-generation projects connected to the electricity grid	Below a specific threshold, still to be defined by the implementing regulations of the Law	Requires a prior declaration to the distribution system operator (DSO).
	Equal or above a specific threshold (still to be defined by the implementing regulations) but under 5 MW	Requires prior approval for grid connection from the DSO.
	5 MW or higher	Requires prior authorisation from the Moroccan Ministry of Energy Transition and Sustainable Development, after obtaining a technical opinion from the national electricity grid operator; if connected to a medium-voltage network, it also requires a technical opinion from the relevant DSO.

Source: Ministry for Energy Transition and Sustainable Development, 2023.

Renewable hydrogen

The country is also working to establish itself as a hub for green hydrogen production, with the aim of becoming a privileged partner country for Europe. It is for this reason that in 2021 the Moroccan government published a **Green Hydrogen Roadmap**, announcing the willingness to create a "Moroccan Offer". It applies to integrated projects both upstream (from the generation of electricity from renewables and electrolysis) and downstream (transformation of green hydrogen into ammonia, methanol, synthetic fuel as well as the associated logistics). The first phase of the plan has been implemented in March 2024, when the Ministry of Energy Transition and Sustainable Development published the first measures aimed at supporting the development of the green hydrogen thanks to financial incentives, research of partnership opportunities, etc. Moreover, one of the main points to leverage the industry is also land allocation, granting 1 million hectares of public land to private companies through a competitive bidding process. The initial phase consists of an allocation of 300,000 hectares of the identified land. Around 100 national and international investors have already expressed their interest in the offer to MASEN.

Industry decarbonistion

Morocco has also recently started putting in place policies to support industrial decarbonisation. In particular, the Ministry of Industry and Trade adopted the **Tatwir Green Growth programme** in 2021. It aims to foster the development of new green industry sectors and reduce industrial pollution by supporting micro, small and medium sized enterprises (SMSE). Eligible projects include:

- energy transition projects centered around energy efficiency and renewable energy sources;
- start-up projects in the green industry sector (e.g. production of solar boilers);
- research and development of products with a negative carbon footprint (e.g. products made from recycled materials);
- integration of clean technologies in manufacturing processes. (IEA, 2021).

2.3. Electricity infrastructure

The infrastructure network of Morocco has been developed by taking advantage of the fossil fuel resources of neighbouring countries. In the last years, however, with the increasing role played by renewable energy sources, the government and the ONEE (national TSO) have been working in order to upgrade generation facilities and grids.

In terms of electricity generation, according to MASEN's latest data, the installed capacity reached 11,987 MW (2,120 MW hydro, 6,676 MW thermic, 2,360 MW wind and 831 MW solar, including both PV and CSP in 2024.

A project that is worthy of particular attention is Noor Ouarzazate, the biggest Concentrated Solar Power (CSP) in the world with 510 MW of installed capacity (with additional 72 MW for solar PV). The project was delivered in four phases commissioned between 2016 and 2018, and is managed by MASEN.

In terms of transmission and distribution, ONEE manages a network of 29,105 km of VHV/HV lines, 99,021 km of MV and 249,788 km of LV (ONEE, 2023).

However, due to the increasing role that renewable energy sources are playing in the current and foreseen energy mix of the country, ONEE has embarked in an ambitious investment plan that aims at reinforcing the national grid. This will result mainly in investments in the north-south connection, since the main sites of production of energy are located in the south and the centres of consumption are in the north. More specifically, ONEE is planning a 3 GW of VHV grid between Oued Lekraâ (near Dakhla, in the south of Morocco) and Médiouna (in the Casablanca region, in the centre-northern of the country). The project is expected to become operational in two steps: the first one with a link of 1,500 MW of capacity by 2026, and a second one with an additional 1,500 MW by 2028. On 21st August 2024, ONEE launched a call for tenders for the development of topographical studies related to the project. The studies aim to determine the optimal routes of the VHV lines in order to anticipate geographical constraints, as well as identify the sites for the terminal stations in the south and the centre-north (Le360, 2024).

To complement the **National Energy Strategy for 2030**, the Moroccan government also adopted the Natural Gas roadmap, launched in 2021, covering the period 2021-2050. Morocco relies heavily on natural gas imports, surpassing its domestic production levels. In 2022, domestic production stood at 2,451 terajoules (TJ), while imports soared to 5,565 TJ (IEA, 2023). The electricity generation from gas reached 686 GWh in 2022, according to IEA.

In 2018, the Moroccan government signed an agreement with Nigeria to establish a Nigeria-Morocco Gas Pipeline (NMGP). The project is promoted by Morocco's National Office of Hydrocarbons and Minerals (ONHYM) and the Nigerian National Petroleum Company (NNPC) and the final investment decision is expected in December 2024. The NMGP project envisages a 5,600 km gas pipeline with a capacity of 3 bcf/d (31 bcm/year), connecting 13 countries, including Nigeria, Benin, Togo, Ghana, Côte d'Ivoire, Liberia, Sierra Leone, Guinea, Guinea Bissau, Gambia, Senegal, Mauritania and Morocco. The USD 25 billion (EUR 22.9 billion) project is supposed to provide gas from Nigeria to the West African countries up to Morocco and subsequently to Europe. If the project is approved, commissioning could happen in the 2040s.

When it comes to electricity exchanges with third countries, ONEE is the authority in charge of the matter.

In 2016, Morocco and four EU member states including Spain, Portugal, France and Germany signed the Sustainable Electricity Trade (SET) Roadmap, committing to trade renewable electricity via green corporate cross-border PPAs, with Morocco acting as an exporter.

In October 2022, Morocco and the European Union consolidated their cooperation on energy, climate and environment with the launch of the EU-Morocco Green Partnership. It was the first Green Partnership the EU signed with a partner country. The purpose of the initiative is to work across three main thematic axes: climate and energy; the environment including marine and maritime issues; and the green economy. One of the most relevant projects is the trans-Mediterranean digital connectivity "MEDUSA" project. It consists of a submarine cable system with 16 landing points interconnecting four North African countries (Morocco, Algeria, Tunisia, and Egypt) with five European countries (Portugal, Spain, France, Italy, and Cyprus). The new system was supported with an EU grant of EUR 40 million and should be operational by 2026.

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Morocco is currently connected to the European grid by two HV cables to Spain, each with a capacity of 700 MW. A third cable of the same capacity is planned by 2030 and is currently under study. According to ONEE, thanks to this interconnector, Spain benefited from importing 1.85 TWh in 2023. In December 2023, the government also signed a Memorandum of Understanding (MoU) with the Portuguese government envisaging a new interconnection between the two countries. The project is based on an HVDC link, with a capacity of 1,000 MW and a total length of approximately 265 km. At present, a feasibility study for the project is under development.

Moreover, the government of the United Kingdom has expressed its support to the British start-up Xlinks® for its Morocco-UK Power Project. It consists of a new electricity generation facility entirely powered by solar and wind energy combined with battery storage technology. The project is expected to generate 11.5 GW of clean energy. The facility would be located in the Moroccan region of Guelmim Oued Noun, and it would be connected exclusively to Great Britain via 4,000 km of HVDC sub-sea cables. An agreement has been reached with the British National Grid for two 1.8 GW HV interconnectors in Devon. As of April 2024, the project's developer Xlinks First Ltd has raised more than GBP 50 million (EUR 60 million), with GBP 5 billion (EUR 6 billion) of equity finance lined up, in addition to the initial seed funding of GBP 30 million (EUR 36 million). In April 2024, Xlinks® also communicated a raise in the estimated construction cost, which is currently as high as GBP 22-24 billion (EUR 26.4-29 billion).

2.4. New developments for solar power

The country has recently started bold actions to incentivise the development of solar energy in the country.

To put into practice the Moroccan Solar Plan, MASEN launched a tender for the **Ouarzazate Solar Power Station** (also called **Noor**), an energy facility with an installed capacity of 582 MW (510 MW of CSP and 72 MW of PV). The project was completed in four steps and represents one of the biggest CSP facility in the world.

- Noor Ouarzazate I was commissioned in February 2016. It has a generation capacity of 160 MW of CSP and is coupled with a three MWh thermal storage technology. The ACWA consortium won the bid with an average price of MAD 1.6/kWh (EUR 0.17/kWh). The winning consortium was composed by the Arabian Company for Water and Power Development (ACWA Power) (Saudi Arabia), Aries Ingeniería y Sistemas (Spain), TSK Electronica y Electricidad (Spain) and Acciona (Spain).
- Noor Ouarzazate II was commissioned in 2018. The project has a capacity of 200 MW and is also linked to a thermal storage system with a seven MWh capacity. ACWA Power and Aries managed to win the bid once again, together with SEPCO III (China). The electricity price agreed with the winning consortium was MAD 1.36/kWh (EUR 0.13/kWh).
- Noor Ouarzazate III (2018) has a capacity of 150 MW of CSP and a thermal storage system with seven MWh capacity. ACWA Power, Aries and SEPCO III secured their role as developers once again. The electricity price agreed with the winning consortium was MAD 1.42/kWh (EUR 0.13/kWh).
- Noor Ouarzazate IV (2018) has an installed PV power capacity of 72 MW. The winning consortium was once more the one managed by ACWA Power. The electricity price agreed with the consortium was MAD 0.46/kWh (EUR 0.04/kWh). (Costex Corporation, 2022).

In 2018 MASEN launched the plans for the construction of **Noor Midelt**, a three-step project that should reach a capacity of 1,600 MW of CSP-PV energy.

- In May 2019, the tender for the construction and management of the project's first phase (Noor Midelt I) was concluded, requiring a capacity of 800 MW and a storage capacity of five MWh. This ambitious project has a competitive electricity price of MAD 0.68/kWh (EUR 0.06/kWh). The project is being developed by Abu Dhabi Future Energy (Masdar), EDF Renewables and Green Of Africa. EDF Renewables, Abu Dhabi Future Energy, MASEN and Green Of Africa have ownership stakes of 35%, 30%, 25% and 10% respectively (Masen, 2019).

- The second step (Noor Midelt II), consists of a 400 MW PV plant connected to a battery storage with 460 MWh capacity.
- In August 2023, MASEN published the tender for the construction and operation of the final step (Noor Midelt III), tendering the construction of a facility with 400 MW of PV capacity and 400 MWh of battery storage. In December 2024, the winners of the bids for the development of the two projects were announced. The team leader of both sites is the utility developer and investor ACWA Power (Saudi Arabia), which partnered with the local company Nareva. The team proposed a tariff equal to MAD 0.32/kWh (EUR 0.03/kWh).

The Ministry of Energy Transition and Sustainable Development together with MASEN worked to launch the multi-site solar programme **Noor PV** I, which comprises Noor Boujdour and Noor Laayoune I. The Noor Boujdou project has a PV capacity of 370 MW divided in two projects of 20 MW and 350 MW respectively. The former project was commissioned in 2018 and is managed by ACWA Power. The construction of the latter project is likely to commence in 2025 and is expected to enter into commercial operation in 2027. The Noor Laayoune I project (85 MW) was commissioned in 2018 and is managed by ACWA Power.

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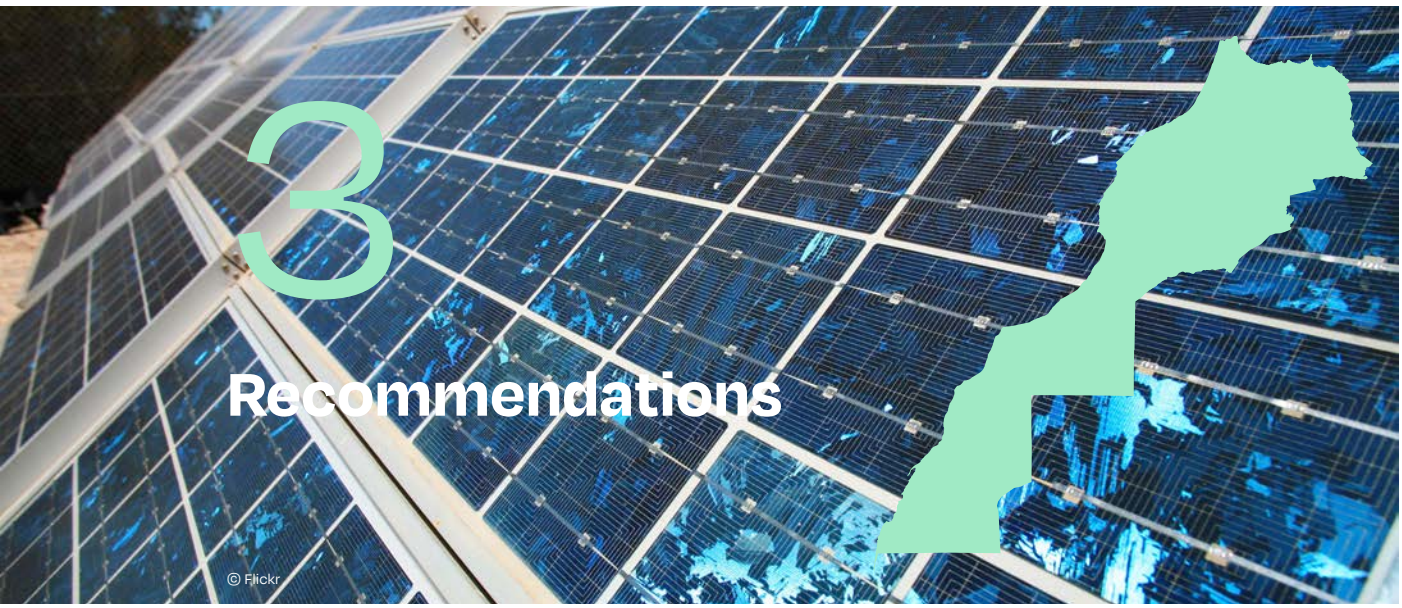
In January 2020, a Call for Expression of Interest (CEI) for the first phase of Noor PV II (400 MW) was launched. This first phase will be developed on 7 sites in the form of small and medium-sized projects to allow small and medium-sized businesses to participate in its implementation, with the aim of strengthening the national industrial fabric and create new job opportunities at local level. The qualified sites are the following: Ain Bani Mathar, El Hajeb, Bajaad, Sidi Bennour, Kalaa Sraghna, Taroudant, Guercif. The Noor PV Bejaad Solar PV Park II has a capacity of 48 MW and is managed by Enel Green Power (Italy). The Noor PV Taroudant Solar PV Park II and the Noor PV El Hajeb Solar PV Park II have a capacity of 36 MW each and their project developer is AMEA Power (UAE). The Noor PV Sidi Bennour Solar PV Park II and Noor PV Kelaa Sraghna Solar PV Park II have a 48 MW capacity each, located in the Casablanca area and are both managed by TAQA Morocco. The Noor PV Guercif Solar PV Park II has a 48 MW capacity. The Noor PV Ain Beni Mathar Solar PV Park II is the biggest project among all seven, with a capacity that reaches 69 MW. Both projects are located in Oriental and are managed by Voltalia Maroc (Power Technology, 2024).

Since 2022, MASEN is also in charge of the following solar projects, which were previously managed by ONEE:

- **Noor Tafilalet**, which consists in three facilities (in Zagora, Erfoud and Missour) with a total capacity of 120 MW;
- **Noor Atlas** project, that has a capacity of 200 MW distributed in 8 facilities with a power capacity of 30-40 MW each. The facilities are currently developed in Boudnib, Bouanane, Outat El Haj, Enjil, Ain Bni Mathar, Tata, and Tan Tan.

Morocco's significant solar potential has been recently attracting not only European developers but also European solar manufacturing equipment providers. An example is the recent expansion of a 500 MW PV module assembly production line installed in 2018. The new installation, which scales the module production line up to a combined 1 GW, was conducted between July and October 2024. It is considered the largest solar manufacturing facility in the region, and the modules are sold in both African and global markets. Competitive labour costs and incentives to attract foreign investments are encouraging the establishment of manufacturing facilities, which may lead Morocco to become a regional PV manufacturing hub.



Morocco should continue on the path of electricity market liberalisation, in order to attract more private investments and enable companies to sustain the efforts made so far on the renewable energy front. This is mainly reflected in the need to enact the necessary secondary legislation that implements the reforms approved in recent years. In particular, the PPAs market (on which projects developed under Law 13-09 rely) should receive more support, e.g. by enacting the opening of the medium voltage grid segment with the necessary implementing decrees. Expanding the market for corporate PPAs will require clearer legal frameworks and incentives to make these contracts more accessible and financially viable for companies. This could be done for instance by creating a public guarantee mechanism to improve PPAs bankability, or introducing tax incentives or carbon tax mechanism. Encouraging energy-intensive industries to participate in this market would significantly contribute to Morocco's renewable energy targets. Moreover, self-generation, particularly for industries with high energy demand, can play a crucial role in achieving cost savings and reducing carbon footprint.

As Morocco continues to ramp up its solar capacity, the country's grid infrastructure must evolve in tandem. In particular, strengthening the north-south grid connections is of paramount importance. Solar energy is predominantly generated in the southern regions of Morocco, which have high solar irradiance, but the major demand centres are located in the north. Significant investment in these transmission networks is essential to ensure that solar power can be efficiently delivered to where it is needed most, thereby optimising the energy mix and improving grid stability. Moreover, a focus on grid modernisation and flexibility would further enhance the resilience and efficiency of the energy distribution network.

While substantial progress in storage has been made, **further investments and incentives are needed to scale up battery storage technologies and flexibility, such as demand-side management and grid digitalisation.** These measures would not only stabilise energy output but also enable greater penetration of renewables into the grid, helping Morocco to meet its ambitious energy transition goals. Incentivising storage deployment, particularly for industrial and commercial users, could provide an additional buffer for peak load periods and improve overall energy security.

Streamlining permitting processes is critical to accelerating the deployment of solar energy projects. By simplifying the approval timelines and reducing administrative bottlenecks, Morocco can unlock faster growth and ensure that new projects are operational in a timely manner. Additionally, creating a more transparent and efficient permitting process would enhance Morocco's attractiveness to international investors, who are looking for certainty and agility in project execution. A "one-stop-shop" approach, coordinated by institutions like MASEN, could help centralise and expedite approvals, thereby reducing lead times for project developers.

To attract more investment in solar energy, it is recommended that Morocco enhance its fiscal and financial incentives. This includes implementing VAT exemptions on solar equipment and tax reductions for investments in solar infrastructure. Additionally, offering tax credits for research and development in solar technologies is advised. Morocco should also promote innovative financing mechanisms such as green bonds and low-interest loans, and create dedicated funds for renewable energy in partnership with international financial institutions to facilitate access to long-term financing.

To effectively integrate Moroccan solar energy into international markets, it is recommended to develop regulations and mechanisms to facilitate the export of solar electricity to neighbouring countries. This includes establishing competitive export tariffs and negotiating bilateral agreements. It is also advised to invest in the necessary infrastructure for energy exports, such as interconnections with neighbouring countries, to ensure that export capacities align with sector development goals.

In order to ensure greater coordination between public action and the needs of businesses, a strengthening of public consultations in the policy-making process and greater dialogue between government and the private sector should be encouraged. This would allow public authorities to make more effective decisions that would help Morocco's attractiveness in the renewable energy sector to be strengthened, as well as help businesses to contribute to the country's energy transition.

The recent efforts to become a green hydrogen hub, particularly for the European market, are much appreciated. However, Morocco should work to develop the sector further, relying especially on solar PV technology. The country's vast solar potential positions it as an ideal location for producing green hydrogen at competitive costs. To unlock this potential, there needs to be a coordinated policy push to support the development of this emerging sector. This includes incentives for pilot projects, infrastructure development, and international partnerships. A roadmap for green hydrogen production, aligned with the European Union's decarbonisation goals, would not only create new demand for solar energy but also place Morocco at the forefront of the global green energy transition. Furthermore, collaborating with key stakeholders across the green hydrogen value chain could attract significant foreign investment and technology transfer. Finally, integrating the renewable hydrogen production and PV energy with seawater desalination plants, would provide a highly sustainable solution for water and energy needs.

It is also recommended to establish specialised training programmes for Moroccan engineers and technicians focused on solar technologies and photovoltaic systems. These programmes should be developed in collaboration with universities and training centres to meet industry needs. Additionally, promoting partnerships between international companies and local institutions to facilitate technology transfer and local skills development is advised. These measures aim to create a skilled workforce and foster innovation in the solar energy sector.

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SolarPower Europe won 'European Association of the Year' at the International & European Association Success Awards 2024

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