Policy Brief
June 2021, PB-21/18

Morocco's Decarbonization Pathway
Part I: Introduction to A Joint Study[1]

By Berahab Rim, Chami Abdelilah, Derj Atar, Hammi Ibtissem, Morazzo Mariano, Naciri Yassine, Zarkik Afaf, with the technical support of AFRY.

I. The Context

During the 2015 Paris Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC), governments pledged to limit the global temperature increase to well below 2°C above pre-industrial levels, to peak emissions as soon as possible, and to achieve carbon neutrality in the second half of the century. Yet, even assuming full implementation of the commitments made by governments in Paris, the global concentration of greenhouse-gas (GHG) emissions will lead to a 2.7°C increase in the global average temperature, which will not meet the 2°C target. Therefore, more urgent action is needed to further strengthen the ambitions of the parties as expressed in theit Nationally Determined Contributions (NDCs), and to accelerate the transition to a low-carbon economy.

In this context, it is fundamental that the decarbonization process is accompanied by a 'just transition', which is a concept recognized by the Paris Agreement itself. The energy transition must, indeed, be sustainable from a socio-economic point of view, thus ensuring that 'no one is left behind'. The right policy approaches must therefore be identified to mitigate the negative effects of the transition and green growth. Employment and industrial competitiveness must be preserved, even in the short term, bearing in mind that the transition will ultimately create new jobs and new industries while transforming other jobs and industries, or eliminating them completely.

Morocco's economy has grown by nearly 4% on average per year for the past three decades[2], relying mainly on services, industry, and agriculture. This development has brought with it a 3.2% yearly increase in GHG emissions during the 1990-2016 period, a rate higher than that of the North African and Middle Eastern countries combined, which is estimated at 1.7%[3]. In 2016, Morocco's total GHG emissions stood at 86127.7 gigagram of carbon dioxide equivalent (Gg CO2-eq). The energy sector was responsible for 66% of total GHG emissions, followed by agriculture and land use (23%), industrial processes (7%), and waste (6%). Within the energy sector, electricity generation and transportation are the largest GHG emitters, accounting respectively for 26% and 20% of total GHG emissions from the energy sector in 2016[4].

1. The technical component of the study pertaining to modeling was carried out by AFRY, under the strategic and policy directions of the Policy Center for the New South and Enel Green Power Morocco.

2. Between 1990 and 2019. The World Bank, 2021a.

3. The World Bank, 2021b and the ministry of Energy, Mines and the Environment, 2019. Latest year available.

4. Ministry of Energy, Mines and the Environment, , 2019.

As part of its overall vision of sustainable development, Morocco intends to continue its efforts to combat climate change in order to ensure the transition to a low-carbon development model that is resilient to the negative impacts of climate change. In line with this vision, Morocco has made the fight against climate change a national priority and has transformed this constraint into a lever for building a green economy. This vision guides public action at sectoral, national, and local levels. As the energy sector is responsible for most of Morocco's GHG emissions, accelerating the energy transition is a key element in the country's decarbonization process.

In 2020, Morocco like everywhere else was hit by the COVID-19 pandemic. This pandemic, in addition to its disastrous health repercussions, has had a considerable negative impact, in the short term, on the Moroccan economy, with a severe contraction of 7% in 2020, mainly because of lockdown measures and the drastic decrease in foreign demand[5]. Even though economic activity is expected to rebound in 2021, the COVID-19 crisis has also revealed the fragility of our economic systems and has shown, once again, the urgency of building a more sustainable future that ensures both economic development and environmental preservation. The notion of economic resilience is thus becoming a key concept to protect against future crises, such as that we are experiencing today. Given these considerations, and since decarbonization is a lengthy process, it is, therefore, essential to develop a long-term approach based on a thorough sectoral analysis of various decarbonization scenarios, so that decision-makers can be informed today about the appropriate actions to take.

To this end, Policy Center for the New South and Enel Green Power Morocco, with the support of consult group AFRY, carried out an energy transition study, in collaboration with local stakeholders including government, regulators, business and civil society, which aims to contribute to the ongoing work on phasing out GHG emissions by 2050. This Policy Brief, the first in a series of four, introduces this joint study. It first presents the Moroccan energy context in terms of adopted energy strategies, and provides a brief assessment of the achievement of the energy sector. It also presents the objective of the study and outlines the issues to be addressed in subsequent policy briefs.

5. Ait Ali et al. 2020.

II. The Energy Strategy

Morocco is pursuing an ambitious climate change policy based on an articulated policy package, consisting of the Climate Change Policy, adopted in March 2014[6], the National Sustainable Development Strategy passed in November 2017[7], and the Nationally Determined Contribution (NDC) submitted to the UNFCCC when Morocco ratified the Paris Agreement on September 21, 2016. These policies are grounded in the National Energy Strategy adopted in 2009, which has been rolled out into roadmaps with short- and medium-term objectives, and accompanied by a clear vision of legislative, regulatory, and institutional reforms.

The 2009 National Energy Strategy was based on two main axes: the strengthening of power generation capacity and energy efficiency. Consequently, the 2009-2013 period saw the publication of the National Priority Action Plan (PNAP), intending to restore the balance between electricity supply and demand by acting, on the one hand, on the reinforcement of production capacities with the creation of an additional 1400 MW of power and, on the other hand, on the rationalization of energy use. For the medium term, the objective set for 2020 was to increase the share of renewable energy to 42% of installed electrical power. To achieve this objective, integrated programs aimed at installing 6000 MW of renewable sources from wind, solar and hydro were launched. An evaluation of the implementation of the first phase of the strategy yielded very encouraging results and has triggered several strategic changes[8].

Morocco has also committed to curtailing GHG emissions across the entire economy by 17% below business-as-usual levels accounting for the activities of Agriculture, Forestry and Other Land Use and has pledged to reduce them by an additional 25%, conditional on international support, by 2030[9]. Given these ambitious goals, it is necessary to accelerate the decarbonization of the energy sector and avoid locking in other carbon-emitting assets. Morocco is also endowed with high renewable energy potential, among the highest in the world, which provides scope for significant further development and growth, with a strong need to increase deployment

6. Loi cadre N99-12 portant charte nationale de l'environnement et du développement durable, MEME, 2014
7. Stratégie nationale de développement durable, MEME, 2017
8. Ministry of Energy, Mines, and the Environment, 2021.
9. Data from 3rd Communication to UNFCCC, Moroccan Government.

beyond power and into heating and transport sectors. Morocco planned, therefore, to increase the share of renewables in its power generation mix to 42% by 2020 and 52% by 2030.

A full framework comprised of a series of legislative, regulatory, and institutional provisions, was implemented to accompany this strategy, including:

- Law n°. 13-09[10] on renewable energy, which allowed the private sector access to the production and marketing of electricity produced from renewable sources. At time of writing, an amendment process of law no. 13-09 (law 40-19) is under consideration, aiming to ensure effective liberalization of the market and the possibility for independent power producers (IPPs) to access high voltage and medium voltage markets.
- Law n°16-08[11] on Self Production, and its amendment (Law n°54-14) that allows any public, private, or physical person to produce their own electricity.
- Law n° 86-12[12] related to Public-Private Partnership contracts. This law was published in 2014 with the purpose of helping to define a unified and incentivizing framework conducive to the development of infrastructures in Morocco and the increase the visibility of infrastructure opportunities to foreign and local investors[13].
- Law n° 46-18 amending and supplementing law n° 86-12 relating to PPP contracts. In addition to the implementation of the legal framework at a practical level, the amendments made by law 48-18 aimed to make the procedures regarding PPPs more flexible, and to strengthen the performance of the public and private sectors so that all market players can contribute to the socio-economic development of the country[14]. Act n° 37-16[15], amending and supplementing Act 57-09 that created the Moroccan Agency for Sustainable Energy[16] (MASEN), aimed, in particular, to extend the prerogatives of the Agency to the deployment of all current and future renewable energy sources projects[17], aimed at the stability of the electricity grid and projects developed under Act 13-09.
- Law n°48-15[18], relative to the regulation of the electricity sector and the creation of the National Authority for Electricity Regulation.

Moreover, a new industrial plant for the production of wind turbine blades was opened by Siemens Gamesa Renewable Energy in 2017 with a total investment of about 1 billion dirham[19]. This pioneering project was a positive step inthe development of a renewable energy industry ecosystem, which underpins the strategic choices of Morocco, while boosting the economic fabric, by creating more than 600 direct jobs and an estimated 500 auxiliary jobs[20].

Furthermore, Morocco adopted an energy efficiency strategy in 2011, based on a national ambition of reducing energy consumption by 15% by 2030, later amended to 25%. This strategy is expected to have positive economic, environmental, and societal impacts, including an increase in GDP growth, a reduction in the national energy bill, a decrease in CO_2 emissions, an improvement in the quality of life and health of the Moroccan population, and the creation of thousands of direct or indirect jobs.

In 2014, Morocco adopted a Climate Change Policy (PCCM) to support the realization of its national vision of ensuring the transition to a low-carbon development model, and that intended to capitalize on the measures and actions already implemented to achieve maximum synergies. More recently, in 2019, Morocco issued its 2030 National Climate Plan[21]. This Plan confirms the climate objective set under Morocco's Paris Agreement pledge and lays out measures to enhance climate governance, notably by creating a National Commission on Climate Change, improving inter-sectoral coordination, and involving non-governmental organizations in decision-making.

10. Ministry of Energy, Mines and the Environment, 2010.
11. Supertaqa & Agence Marocaine pour l'Efficacité Energétique, 2021.
12. Ministry of Economy and Finance, , 2015.
13. PPP legal resource center, World Bank
14. Ministry of Economy, Finance and Administration Reform, Morocco
15. Ministry of Energy, Mines and the Environment, 2016a.
16. Previously named the Moroccan Agency for Sustainable Energy.
17. Except for Pumped Storage Power Stations.
18. Ministry of Energy, Mines and the Environment, 2016b.
19. Ministry of Industry, Trade and the Green and Digital Economy, 2017.
20. Siemens Gamesa, 2017.
21. Ministry of Energy, Mines and the Environment, 2019

III. The Assessment

The current Moroccan energy policy framework has been scrutinized in order to identify its strengths and weaknesses. These have been grouped into three distinct segments, namely regulatory, infrastructure, and market, which when properly planned and implemented, guarantee a successful energy transition plan. An additional assessment of Morocco's climate actions is included.

1. Infrastructure

Infrastructure is the backbone of any energy-transition strategy. To support the broader development, economic, and climate agenda, the power system must first be relatively well developed, flexible, able to meet the load of additional and variable energy sources, and able to integrate new regional and cross-border interconnections.

1.1. Significant Progress in Electrification

Morocco has experienced the greatest increase in rural electrification on the African continent. To ensure continued economic growth, it became imperative to upgrade the country's electricity transmission and distribution infrastructure. Therefore, in 1996, the Moroccan government launched a 15-year rural electrification program aimed at increasing the rural electrification rate from 18% in 1995 to 80% by 2010. This program surpassed its targets by reaching the 80% mark in 2005, and, as of 2020, coverage had reached 99.78%[22] for a total investment of 23.8 billion dirhams (about 2 billion euros)[23]. This high rate of electrification is proof of the importance Morocco places on energy as a factor in social development. Moreover, given the annual increase in electricity consumption and the greater distances between electricity generation sites—particularly in the case of major wind and solar power projects—and consumers, the Office Nationale de l'Eau et de l'Electricité (ONEE), Morocco's national utility, is now making considerable efforts to develop and modernize the national electricity transmission network.

22. Office National de l'Electricité et de l'Eau Potable, 2021.

23. Ministry of Energy, Mines and the Environment, 2017.

1.2. Increased Power Interconnection with Europe

Regional power interconnections between Morocco and Europe are well developed. New cross-border electricity interconnections are being studied. In particular, Morocco and Portugal plan to build a new 220 km long interconnection line, with a capacity of 1,000 MW. Morocco is also planning to reinforce its interconnection with Spain with a third line, with a capacity of 700 MW. However, cross-border electric transmission lines remain capital intensive: for instance, the Moroccan-Portuguese line will require around 500 million euros (5.4 billion dirhams) in investment[24] according to the Minister of Energy, Mines, and the Environment.

However, until recently, actual electricity exchanges between Morocco and Europe were limited and as such, provide an opportunity to capitalize on the integrated network to improve grid reliability and reduce production costs. Maintaining the attractiveness of Morocco's energy sector for private investors, notably for distributed generation, requires the full implementation of grid access, tariff setting, trading of electricity, and network planning. This would also further support Morocco's ambitions of greater regional integration into the EU and Mediterranean power markets.

In terms of electricity exchanges, Morocco's imports from Europe decreased by 93.5% between 2018 and 2019[25]. This decrease, in conjunction with a significant increase in exports, allowed Morocco to become a net exporter of electricity for the first time in 2019. This situation resulted from two main factors: (i) the inauguration of several power generation projects, notably the Safi thermal power plant and other solar energy stations, which increased Morocco's production capacity[26]; (ii) The implementation of daylight savings, which contributed to the reduction of national electricity consumption. In 2020, Morocco's export of electricity decreased significantly as a result of depleting economic activity because of the COVID-19 pandemic, and Morocco became a net importer again.

24. MAP Economie, 2018.

25. World Integrated Trade Solution of the World Bank, 2021.

26. The Safi coal-fired thermal power plant, opened in December 2018, has a production capacity of 1,386 megawatts (MW) and can cover 25% of the national electricity demand.

1.3. Grid and Network Efficiency

The efficiency of the Moroccan network at the high voltage level is not published, but generally, the losses are estimated between 4% and 6%, versus 2% to 2.2% for the French network, for instance. Efficiency changes significantly at medium and low voltage levels. In addition, the possibility of major power outages always exists, as in other countries' grids. There is a need for existing networks to continue to function in extreme conditions, even with over distances.

New Challenges Brought by Renewable Energy Sources
Despite Morocco's substantial efforts in deploying renewable energy, it fell short of its 2020 target, with only 36.8% of renewable energy capacity being installed compared to the 42% target[27]. Furthermore, while supporting socio-economic development, the increased penetration of renewable energy in the grid brought new infrastructure challenges that Morocco has yet to overcome. Indeed, meeting Morocco's growing demand requires substantial investment in transmission and distribution infrastructure. Additionally, the integration of large amounts of intermittent renewables capacities with different load types will be challenging in terms of maintaining grid stability, power balancing, and reliability of supply. With rapid economic growth and urbanization, concerns have been increasingly emerging about the grid's capacity to absorb the increasing renewable energy load.

1.5. Other Infrastructure Challenges

Despite increased access to electricity thanks to the Global Rural Electrification Program, the southern part of the country, which offers significant wind potential (among the best in the world after Mauritania), is thought to be the least connected to the national grid. Additionally, as vast parts of the network are aging and outdated, renewable energy sources projects take time to receive grid access authorizations, which are usually granted in permitting stages. While the Autorité Nationale de Régulation de l'Electricité (ANRE) has been tasked with preparing a multi-annual grid investment plan, its ongoing start-up could help to foster grid planning and increase investors' confidence.

2. Market Conditions

Market requirements for energy transition include the organization of a liberalized electricity market, which provides the necessary transparency to negotiate future RES and interconnection contracts, accompanied by the unbundling of the generation, transmission, distribution, and retail activities. A liberalized and unbundled market can boost investments by reducing risk.

2.1. Morocco's Electricity Market Organization

The electricity market is usually comprised of four different segments: production (generation from power stations), trade (power trade through different marketplaces conducted using either short-term trades or long-term agreements), transmission (the movement of electrical energy from the generation site to substations where voltage is transformed), and distribution (delivery to final customers).

Morocco's electricity reforms over the past two decades have entailed gradual participation of the private sector limited to the generation segment, which is shared between a mix of independent power producers, ONEE, and MASEN. ONEE has remained a strong and vertically integrated public utility operating as a single buyer (purchasing all the power produced through long-term power purchase agreements) and transmission system officer (TSO). ONEE also owns part of the distribution network and delivers around 58% of total electricity[28], while the remaining electricity is distributed by 11 entities: seven municipal utilities and four private concessions, which take the legal form of transferred management or 'gestion déléguée'.

2.2. Production: Patchy Growth Of Utility-Scale Renewable Energy

The evolution of the existing energy system to modern renewable energy systems will not be without drastic transformations. Morocco has been an African pioneer in renewable energy power generation, but the focus on large-scale solar power and the difficulties encountered with distributed solar power systems reinforce the trend toward mega energy projects led and managed by large public enterprises (ONEE and MASEN) instead of small-scale local decentralized projects. This is generally the

27. Office National de l'Electricité et de l'Eau Potable, 2021.

28. International Energy Agency, 2019.

case in emerging economies, where the growth of agile, small-scale, distributed grid installations has been slowed due to regulatory gaps (discussed below).

2.3. Distribution and the Gestion délégué Model

The privatization of electricity distribution utilities that began in Morocco in the 1990s takes the legal form of transferred management or gestion déléguée. In 1997, the French Lyonnaise des Eaux (LYDEC) took control of the municipality-owned distribution utility in Casablanca. By signing this 30-year concession agreement, the local authority assigned to the private sector the task of investment, construction, and operation of the necessary infrastructure in order to deliver the public services of supply of electricity, water, and sewerage to the urban area of Casablanca.

The privatization of electricity distribution utilities with the gestion déléguée model brought complaints from private companies and from public stakeholders. Instead of relieving the stress experienced by the network, the privatization of distribution utilities through the gestion déléguée model exacerbated the financial burden faced by the sector while creating a disconnect between public and private suppliers and consumers. Increased tariffs caused social unrest, leading to concerns in the private sector about realistic recovery of their investments.

2.4. An Electricity Pricing That is Not Cost-Reflective

Electricity prices in Morocco do not reflect real costs: they are below average costs of production and transport. This is a major obstacle to the development of an open and competitive energy market. The practice of subsidization or cross-subsidization of electricity is, therefore, becoming a major problem. The current electricity tariff structure is set by a central government department and is designed with the dual objective of keeping the cost of energy low for a wide range of consumers (social tariffs), while ensuring financial returns to distributors regardless of their size, region, or type of client. While subsidies in Morocco have for a long time been relatively lower than in other countries in the region, they nevertheless are a major strain on the national budget. Since 2012, the Moroccan government has been working towards reforming the country's 'Caisse de Compensation', which serves to subsidize several food and energy commodities. In 2014, Morocco saw the phase-out of all car fuel subsidies, as well as a partial increase of electricity tariffs. The latter, however, remains below overall costs.

3. Regulatory Framework

Regulatory requirements broadly refer to a proper legal framework conducive to an energy transition trajectory. In the energy sector, regulations can span a broad set of measures, including setting out the responsibilities and prerogatives of different institutions and entities within the ecosystem (ONEE, MASEN, SIE[29], ANRE, AMEE, MEME[30]), the legal framework for the development of renewable energy projects (such as law n° 13-09, law n°58-15, draft law 40-19, etc.), the grid code (grid access, grid access fees, grid management, surplus energy sale, etc.), a regulatory framework for renewable energy certificates or a national guarantee of origin, etc.

3.1. A Missing Grid Code

The absence of a grid code jeopardizes the implementation of the awarded renewables projects and undermines the trust of private investors. A grid code represents the basis for setting transparent rules on the management of transmission and distribution grids. It should anticipate all the necessary information to curtail investment risks by providing clear grid-access rules, setting out all possible fees and tariffs, and making energy purchasing prices public.

In Morocco, third-party access to the grid is still limited. Law 13-09 introduced the possibility for independent power producers (IPPs) to develop renewable energy projects and sell electricity generated via power purchase agreements. Grid access for IPPs spanned extra-high voltage, high voltage, and medium voltage, although, in practice, access to medium-voltage grids has not been implemented. Grid permitting is still managed by ONEE, depending on the IPP's project compatibility with the grid. Two issues arise from this: lack of transparency and conflict of interest.

Currently, technical parameters for connections are not published, nor are the grid codes and technical specifications available. Amidst the increasing deterioration of the Moroccan power grid, few are the projects that receive approval from ONEE, and those

29. Société d'Investissement Energétique.

30. Ministry of Energy, Mines and the Environment .

that do must pay the costs of upgrading or building their own transmission lines. Distributors will need to invest significantly in grid performance to ensure the adequacy and reliability of the grid to accommodate higher levels of power from renewables, but no clear remuneration scheme is currently defined by the Regulator to stimulate such investments. Moreover, connection fees and commercial terms are not public and are currently negotiated bilaterally between the applicant and the system operator (i.e. ONEE), which is also a supplier.

The absence of unbundling between distributors and suppliers also implies that incumbent operators have no incentive to give access to their grids to producers as this automatically reduces their market share. In light of these challenges, Morocco is undertaking a series of additional legislative and regulatory amendments to improve project-development conditions, thanks to its commitment to scale up renewables through increased private sector participation.

3.2. An Evolving, Yet Slow Paced, Institutional Environment

Although the Government of Morocco is working to create a Regulatory Authority, under the Provisions of law 48-15 approved in 2016, implementation has been slow. The reform is further complicated by political considerations mainly related to territorial planning and development. The current institutional setting of the sector has not been conducive to rational planning, investment, or operation, despite the country's willingness to transform the sector. Coordination is particularly essential in the areas of investment planning and load forecasting, standardization of equipment, and network management, and lack of coordination results in substantial inefficiencies in the overall management of the sector. The ANRE, Morocco's electricity regulatory authority, held its first board meeting in 2020 to define its strategy, and appoint three new directors[31]. Yet, the operationalization of the ANRE remains a key challenge for the coming years, as the new version of the 13-09 Law will give the ANRE a key role in setting the rules of the market.

31. EcoActu, 2020.

3.3. Slow Process Of Implementing Existing Laws

Morocco has strengthened its position as a leader in renewable energy development over the past five years and is now considered a much better place to do business than five years ago. Yet several barriers to private investment remain, related to the slow process of implementing existing laws. These stem primarily from insufficient or inadequate enforcement of existing laws[32]. Although the main laws are in place, the lack of secondary legislation still prevents effective opening of the electricity market. Many laws refer to implementing regulations which, months and sometimes years after the adoption of laws, have not been defined.

Also, lack of transparency is a key issue in Morocco. Tariffs do not reflect costs, and the procedures for obtaining and accessing the grid or IPPs' markets are viewed as opaque and not sufficiently predictable. Indeed, obtaining a permit is an additional related hurdle: as mentioned in section 3.1, investors must receive positive feedback from ONEE, on top of the standard authorization procedures, regarding the compatibility of their project with the national grid. Moreover, amendments processes[33] are very slow with no visibility on timing for the investors.

4. Encouraging Progress in Climate Action

The Nationally Determined Contribution of Morocco appears to perform very well on several measures, considering the high level of ambition of the conditional commitment. While Morocco's unconditional NDC pledge would begin to curb the growth of emissions, Morocco conditionally proposes to go much further by halting the growth in GHG emissions. Morocco's NDC submission includes detailed information on activities currently being implemented and planned measures to achieve its unconditional and conditional NDC targets.

Despite the upward trend in emissions in the power sector due to the large share of coal in the energy mix, Morocco's Paris Agreement target is within the range of what is considered a '1.5°C compatible' fair share of the global effort. This means that Morocco's unconditional

32. RES4Africa, pwc, 2021.

33. Particularly that of the 13-09 Law which started end 2019 and is still not completed.

Paris Agreement climate commitment in 2030, even while allowing the country's total emissions to increase, is still consistent with holding warming well below 2°C and limiting warming to 1.5°C, based on Morocco's historical responsibility and its capability. Morocco's conditional climate commitment would stabilize greenhouse gas emissions, and requires increased international financial support to implement this target. Climate Action Tracker[34] has assessed in detail the impact of mitigation actions currently being implemented by Morocco. Morocco is very close to meeting its unconditional NDC targets under current policies because of the ambitious extension of solar, wind, and hydro energy capacity. However, Morocco needs to implement additional policies to reach its conditional NDC target by 2030.

IV. The Study and the Next Steps

The achievements so far of the energy transition in Morocco, while important, need to become more ambitious to sustain the economic development of the country and to unlock the full socio-economic potential of an efficient and sustainable energy system. The current barriers to further transition are not merely about technology or cost, but about the low flexibility of the existing power-system structure. Moreover, although the reforms implemented by the government during the last twenty years have improved the conditions of access to energy, and have considerably reduced the risk of acute power shortages, the energy sector continues to face severe recurring financial challenges, while experiencing significant delays in key investments.

Although beneficial for the environment, the energy transition raises additional challenges in terms of industrial competitiveness and distributional effects. On the former, countries that embark on the energy transition may initially face reductions in industrial production linked to thermal technologies. These countries will also have to position themselves on a new technological production value chain from renewables, while ensuring adequate levels of investment. This may lead to a skills mismatch and difficulty in integrating the workforce if education and training aspects are not addressed at an early stage. On distributional effects, countries must ensure social assistance and support for people who may be negatively affected by the transition, guarantee equal access to the benefits, avoid unfair distribution of costs, and create cost-reflecting and efficient energy markets.

The energy transition must therefore comprise four essential elements in order to address these challenges. First, it must promote the conversion of existing value chains to electric technologies, through the promotion of national energy clusters on electrification technologies, the adoption of innovative financing programs for mature technologies, and community outreach. Second, it must prioritize the easing of job losses and opportunities by providing social measures for workers, increasing employment opportunities, and addressing the issue of retraining and upgrading of skills within communities. Third, it must address energy poverty. Citizens must have access to electricity at a fair price according to their income. In this sense, social tariffs and subsidies could be provided to low-income households. Fourth, it should take into account the issue of fair cost redistribution. The costs of the energy transition must be redistributed fairly and energy bill items must be revised accordingly, by removing unjustified taxes and levies.

Therefore, accelerating the energy transition in order to decarbonize the Moroccan economy requires a long-term vision, grounded in evidence-based analysis, and the involvement of all energy-sector stakeholders. To this end, the Policy Center for the New South and Enel Green Power Morocco, closely working with AFRY consultants, have developed energy scenarios up to 2050, in collaboration with all local stakeholders, including government, regulators, business, and civil society. The aim of this research is to to identify policies to enable the decarbonization of the Moroccan economy. The resulting study is divided into three parts: first, a modeling of decarbonization scenarios for Morocco has been carried out to identify the possible decarbonization pathways for the 2030 and 2050 horizons; second, a cost-benefit analysis of the different transition paths has been done; third, a set of measures is proposed to ensure the effectiveness of policy measures and move further towards climate goals.

The decarbonization scenarios were modeled to support the definition of government policies needed to achieve decarbonization goals with different levels of ambition. Scenario development started from the analysis of current government policies to identify the main policy levers and related technologies. Current policy levers have been overlaid with additional technological

34. Climate Action Tracker, 2020.

solutions suggested based on a technology-maturity and cost assessment, such as electric and green hydrogen technologies. Decarbonization scenarios have been developed combining government policy levers with the additional technological levers in order to reach more ambitious decarbonization targets. Scenario building resulted in the identification of ways in which policies can be enforced and incentives defined in order to accommodate new technologies and ensure the effectiveness and cost reliability of decarbonization targets.

This Policy Brief, the first in a series of four, introduced this joint study and its objectives. The second Policy Brief of this series presents the results of the three decarbonization scenarios and their implications in terms of GHG emissions and the energy mix of Morocco, at the national level and by sector, namely, the transport, the residential, the agriculture, the industry, the tertiary and the power sectors. The third Policy Brief discusses the results of the national and sectoral cost-benefit analysis, identifies technological levers, estimates the global economic benefits of the modeled scenarios, and analyses the evolution of direct system cost and investment cost for each sector, under the decarbonization scenarios. The fourth Policy Brief addresses the barriers that still hold back the energy transition in each sector, and proposes short-term and long-term recommendations to sustain decarbonization, including financial and non-financial policy measures.

References

- Ait Ali, A., El Aynaoui, K., El Hossaini, F & Mandri,B. 2020. Impacts de la Covid-19 sur l'économie marocaine : Un premier bilan. [Online]. Retrieved from : https://www.policycenter.ma/publications/impacts-de-la-covid-19-sur-economie-marocaine-un-premier-bilan. Accessed on 20 May 2021.
- Climate Action Tracker. 2020. Morocco : Country Summary. [Online]. Retrieved from : https://climateactiontracker.org/countries/morocco/. Accessed on 11 May 2021.
- EcoActu, 2020. L'opérationnalisation effective de l'ANRE va bon train. [Online]. Retrieved from: https://www.ecoactu.ma/anre/. Accessed on 20 May 2021.
- International Energy Agency. 2019. Energy Policies Beyond IEA Countries- Morocco.
- MAP Ecologie. 2018. Le Maroc veut réussir la transition énergétique mondiale, en jouant un « rôle très actif » en Afrique. [Online]. Retrieved from : http://mapecology.ma/actualites/maroc-veut-reussir-transition-energetique-mondiale-jouant-role-tres-actif-afrique-m-rabbah/. Accessed on 06 May 2021.
- Ministry of Economy, Finance and Administrative reform. 2015. Dahir n° 1-14-192 du 1er rabii 1 1436 (24 Décembre 2014) portant promulgation de la loi n° 86-12 relative aux contrats de partenariat public- privé.
- Ministry of Economy, Finance and Administrative reform, Morocco. 2020. Law No. 46-18 on Public-Private Partnership contracts passed by the House of Representatives, [Online]. Retrieved from: https://www.finances.gov.ma/En/Pages/detail-actualite.aspx?fiche=4705. Accessed on 20 May 2021.
- Ministry of Energy, Mines and the Environment, Environmental Department. 2014. Loi cadre N99-12 portant charte nationale de l'environnement et du développement durable
- Ministry of Energy, Mines and the Environment, Environmental Department. 2017. Stratégie Nationale de Développement Durable, Novembre 2017.
- Ministry of Energy, Mines and the Environment. 2019. Deuxième rapport biennal actualisé dans le cadre de la convention cadre des Nations Unies sur les changement climatiques.
- Ministry of Energy, Mines and the Environment. 2021. Stratégies des énergies renouvelables. [Online]. Retrieved from : https://www.mem.gov.ma/Pages/secteur.aspx?e=2. Accessed on 06 May 2021.
- Ministry of Energy, Mines and the Environment. 2010. Loi 13-09 relative aux énergies renouvelables.
- Ministry of Energy, Mines, and the Environment. 2016a. Note de présentation du projet de loi n°37-16 modifiant et complétant la loi n°57-09 portant création de la société « Morocan Agency for Solar Energy ».
- Ministry of Energy, Mines and the Environment. 2016b. Note de présentation du projet de loi relative à la régulation de l'électricité.
- Ministry of Energy, Mines and the Environment. 2017. Bilan des réalisations perg à fin décembre 2017. [Online]. Retrieved from: https://www.mem.gov.ma/Pages/secteur.aspx?e=1&sprj=20. Accessed on 28 April 2021.
- Ministry of Industry, Trade and the Green and Digital Economy. 2017. Siemens Gamesa inaugure la première usine de pales d'éoliennes en afrique et au Moyen-Orient. [Online]. Retrieved from: https://www.mcinet.gov.ma/fr/content/siemens-gamesa-inaugure-la-premi%C3%A8re-usine-de-pales-d%C3%A9oliennes-en-afrique-et-au-moyen-orient. Accessed on 04 June 2021.
- Moroccan Government. 2016. Nationally Determined Contribution Under the Unfccc. [Online]. Retrieved from: https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf. Accessed on 28 April 2021.

- Office National de l'Electricité et de l'Eau Potable. 2021. Bilan à fin des réalisations de l'ONEE : L'ONEE maintient son rythme élevé pour relever les challenges. [Online]. Retrieved from: http://www.one.org.ma/fr/doc/Communication/Dossier%20sp%C3%A9cial%20ONEE_29_01_2021%20fran%C3%A7ais.pdf . Accessed on 28 April 2021.
- RES4Africa & pwc. 2021. Assessing investment risk in renewable energy: A survey on Southern and Eastern Mediterranean Countries.
- Secrétariat d'Etat auprès du Ministre de l'Energie, des Mines et du Développement Durable, chargé du Développement Durable. 2019. Plan Climat National à Horizon 2030.
- Siemens Gamesa. 2017. Siemens Gamesa inaugurates the first blade plant in Africa and the Middle East. [Online]. Retrievec from: https://www.siemensgamesa.com/newsroom/2017/10/siemens-gamesa-inaugurates-the-first-blade-plant-in-africa-and-the-middle-east. Accessed on 20 May 2021.
- Supertaqa & Agence Marocaine pour l'Efficacité Energétique. 2021. Lois favorables aux ENR et à l'EE. [Online]. Retrievec from: http://supertaqa.ma/fr/astuce/lois-et-reglementations/#:~:text=La%20loi%2016%2D08%20sur,%C3%A9ventuel%20directement%20%C3%A0%20l'ONEE. Accessed on 20 May 2021.
- The World Bank. 2021a. GDP (constant 2010 US$) – Morocco. World Development Indiactors. [Online]. Retrieved from: https://data.worldbank.org/indicator/NY.GDP.MKTP.KD?locations=MA. Accessed on 28 April 2021.
- 2021b. Total greenhouse gas emissions (kt of CO2 equivalent) - Morocco. World Development Indiactors. [Online]. Retrieved from: https://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE?locations=MA. Accessed on 28 April 2021.
- The World Bank . 2021. Public Private Partnership legal resource center. [Online]. Retrieved from: https://ppp.worldbank.org/public-private-partnership/library/new-moroccan-ppp-law-summary. Accessed on 20 May 2021.
- World Integrated Trade Solution of the World Bank. 2021. Database. [Online]. Retrieved from: https://wits.worldbank.org/. Accessed on 28 April 2021.

About Enel Green Power Morocco

Enel Green Power was founded in December 2008 inside the Enel Group to develop and manage power generated from renewable resources worldwide.

The company is present in 32 countries across 5 continents and has over 1,200 plants. It has around 49 GW of installed renewable capacity generated from a mix of resources, including wind, solar, hydroelectric and geothermal. Enel Green Power is playing a fundamental role in the energy transition, as it is one of the world's leading renewable energy companies. Its goal is to accompany the planet into a new era in which everyone has access to sustainable, decarbonized energy.

Enel Green Power is also a founding member of RES4MED, Renewable Energy Solutions for the Mediterranean and Beyond, an association created in 2012 to promote renewable energy and the infrastructures needed to deliver the generated electricity throughout the Mediterranean area.

About Policy Center for the New South

Policy Center for the New South, is a Moroccan policy-oriented think tank based in Rabat, Morocco, striving to promote knowledge sharing and to contribute to an enriched reflection on key economic and international relations issues. By offering a southern perspective on major regional and global strategic challenges facing developing and emerging countries, the Policy Center for the New South aims to provide a meaningful policy-making contribution through its four research programs: Agriculture, Environment and Food Security, Economic and Social Development, Commodity Economics and Finance, Geopolitics and International Relations.

Read more

POLICY CENTER FOR THE NEW SOUTH
THINK • STIMULATE • BRIDGE

Policy Center for the New South

Suncity Complex, Building C, Av. Addolb, Albortokal Street,
Hay Riad, Rabat, Maroc.
Email : contact@policycenter.ma
Phone : +212 (0) 537 54 04 04 / Fax : +212 (0) 537 71 31 54
Website : www.policycenter.ma