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Advances in Managing Energy and Climate Risks

Financial, Climate and Environmental
Sustainable Strategies

Lecture Notes in Energy

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Preface

The energy sector is complex and characterized by a radical uncertainty. It combines geopolitical, economic, environmental, technological and social dimensions. The overlapping of decisions at the international, national and local levels contributes to the complexity of energy systems. Under these conditions, implementing an ideal policy combining security of energy supply, industrial competitiveness, and the fight against global warming while preserving the purchasing power of consumers is a real puzzle. In addition, there are endogenous (economic and financial crises) or exogenous (health crisis such as the COVID-19) shocks to the economy which can postpone detrimentally the implementation of sustainable energy policies.

The role of economic researchers is to provide sound policy recommendations through economic analyses, case studies and applied modelling to guide public and private decision makers for relevant and sustainable energy and climate policies.

This is the purpose of this book which brings together a dozen of researchers who work on topics notably related to climate change resilience.

Several aspects of energy and climate risk management are analyzed, notably the exogenous crisis of COVID-19. What are the determinants of an effective green energy development strategy? What are the impacts of COVID-19 on renewable energy projects? What are the effects of oil price volatility and COVID-19 on power companies? How the volatility of oil and gas prices affects CO₂ emissions? What is the impact of energy price regulation on energy consumption and efficiency? Do smart grids have a sufficient impact to contain CO₂ emissions?

To answer these questions, the authors carried out case studies in several countries (USA, India, and MENA countries) and made international comparisons (USA, Japan, China). This book contributes to characterize several major energy risks, particularly in periods of crisis. This risk characterization is a prerequisite before implementing sustainable energy and climate policies.

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Renewable Energy in the MENA Region: Key Challenges and Lessons Learned



Fateh Belaid, Elias Boukrami, and Razan Amine

Abstract Many pieces of evidence showing that investments in energy transition can boost GDP and create jobs. Further, national and regional energy transitions can help build resilient economies and societies. Therefore, linking short-term actions to medium- and long-term strategies is vital to achieving the Paris agreement on climate change the Sustainable Development Goals (SDGs). In this context, this analysis aims to explore the key challenges and lessons learned regarding the development of renewable energy. The setting of the current study is the MENA countries, as examples of growing economies, most of them experiencing extensive economic and energy reforms. First, we briefly review the demand for renewable energy and the resources available, before examining some of the challenges that need to be addressed to meet deployment targets. Second, we present some case studies to show what is at stake in some countries, the challenges, and the lessons learned. Aggressive RE policies seem to be vital to achieving key energy-policy goals, and the so-called “multiple benefits” of RE in the MENA region, such as addressing climate change and air pollution, improving energy security, and increasing energy access. Policies should be more ambitious to address national challenges and targets and strengthen climate commitments. However, securing strategic financing, investing in transition-related infrastructure, diverting investment from fossil fuels, and making bailouts conditional on climate action should be a cornerstone of national strategies.

Keywords Renewable energy · Economic development · Economic growth · Sustainability · MENA

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1 Introduction

Energy is an indispensable catalyst for economic activity and a source of comfort and well-being for every individual in the World. In recent years energy demand experiencing a steady increase, well below the usual traditional increase that the world economy has witnessed the last five decades. As a result, reducing energy consumption has been placed on the political agenda of most countries around the world. Demand almost doubled over the period 1990 to 2014 (BP 2017). This demand is driven mainly by economic growth, with an average growth of 2.5%, and significant population growth, which rose from 5.3 billion in 1990 to 7.3 billion in 2014 (BP 2017).

The current trajectory of global economic development is not without consequence on our planet and this is alarming. According to a recent report,¹ anthropogenic emissions of greenhouse gas as a result of human activities are responsible for almost 95% of global warming. In the absence of a reinforcement of the international action in favor of the climate, the rise of the average global temperature could reach 2 °C resulting in even more natural disasters (floods, droughts, degradation of the agricultural yields, accelerated melting mountain glaciers, and polar ice caps, rising sea levels, etc.) and irreversible effects on ecosystems.

To address the underlying problems, the global energy sector is experiencing profound and rapidly accelerating change. Accordingly, investment patterns are changing as a result of a multitude of factors, including changing consumer preferences, technological change, and policy measures. Policies affecting change in this sector are driven by a series of objectives. Besides the high consideration given to climate change, energy policy-makers over the World focus on other priorities, including (i) enhancing energy security; (ii) warranting affordable energy supply; and (iii) ensuring universal access to energy and enhance environmental quality.

The traditional fossil energy system is in deep crisis. Centuries of dependency on fossil fuels have led to severe environmental damage and centralized generation, distribution, and power structures from which only a few countries that benefit. Energy transformation should be part of a fundamental paradigm shift towards a sustainable development model. Socially acceptable and ecologically sustainable solutions have to be sought to improve the energy supply, the overall industrial production, the transport, and the heating sector.

Various ways have been identified to reach a low carbon development path (see Fig. 1), including (i) changing individuals practices and behaviors; (ii) improving energy efficiency; (iii) improving carbon sinks by reducing deforestation and increasing the use of bioenergy with carbon capture and storage; and (iv) enhancing the use of low carbon and non-carbon energy.

The latest instrument, renewable energies, can offer a sustainable, development-promoting, and cost-effective alternative to the current fossil energy system (Tiba and Belaid 2020, 2021; Mongo et al. 2021). In addition, the possibility of creating wealth

¹IPCC. (2018). Global warming of 1.5 Degrees. Retrieved from https://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf.

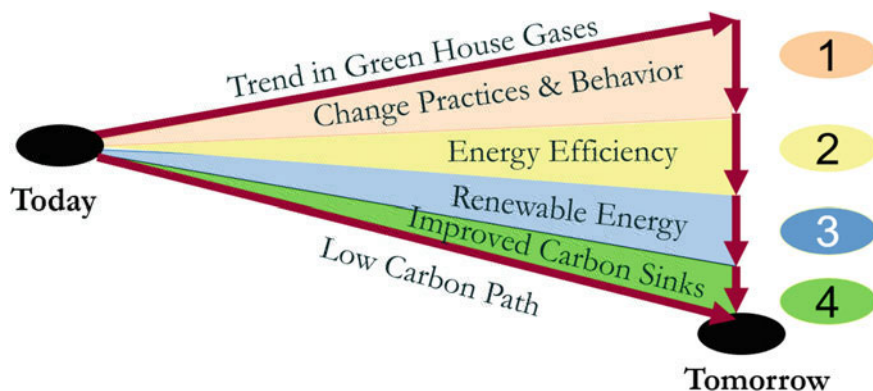


Fig. 1 Key instruments for achieving a low carbon development

and jobs is extremely important, especially as some countries in the Middle East and North Africa (MENA) region have already been struggling with high unemployment for a long time. Moreover, most of the MENA countries if not all of them are rent-seeking economies, with most of the rent is driven and generated by the sale the fossil energy natural resources. On a more complex paradigm, the MENA countries failed to develop a strong industry that takes advantage of the existence of cheap and accessible fossil energy.

In recent years, energy demand in the MENA countries has increased sharply. This trend is mainly due to steady population growth, socio-economic development, and urbanization, driven by both growth-oriented policies and oil and gas revenues.

In recent years, there has been a commitment to stimulating an unprecedented deployment of renewable energy in (MENA) countries. Nevertheless, despite the efforts made and investments in renewable energy, at present, renewable energy sources make a minor contribution to the energy mix, about 0.4%, to the total primary energy in the region (Belaïd and Zrelli 2019; Belaïd et al. 2020; Aghahosseini et al. 2020; Omri and Belaïd 2021).

Based on this conjecture, this chapter aims to explore the key challenges and lessons learned in the MENA region regarding the development of renewable energy. First, we briefly review the demand for renewable energy and the resources available, before examining some of the challenges that need to be addressed to meet deployment targets. Second, we discuss the role of Small and Medium-sized Enterprises (SMEs) in driving greed and sustainable inclusive growth in the MENA region.

This chapter will be structured as follows: After an introduction and research background, Sect. 2 provides a brief literature review. Section 3 highlights the potentials and challenges of renewable energy production and challenges in the MENA region, further, this section discusses the situation of some MENA countries and the analysis of their renewable energy policies (Morocco, Lebanon, and Egypt). Section 4 concludes the chapter and provides some policy implications.

2 Literature Review

The investment in renewable energy in the MENA region is a major contributor to setting the region on a path of overall socio-economic and environmental development. The motivation behind increasing renewable energy generation in the MENA region is the improvement of a wide range of sectors in each country's economy. The environmental drivers include limiting pollution by curbing down green-house gas emissions and establishing a secure sustainable source of energy for the region. In terms of economic drivers, the expansion of renewable energy diversifies the economy's sectors will result in the creation of new jobs thus reducing unemployment (Bélaïd et al. 2019; IRENA 2020a, b, c, d, e). A positive economic push is the reduction of technology costs (Smart Energy International 2020).

Renewable energy production capacity installed in the MENA region is approximated to be around 28 GW, 75% of which is hydropower. Nonetheless, renewable energy comprises only 7% of the region's capacity for power generation (Smart Energy International 2020). The most cost-effective and competitive renewable energy resources in the MENA region are solar photovoltaic (PV) and wind energy (Zafar 2020). Energy demand in the MENA region is anticipated to increase steadily at a rate of 1.9% annually (Boyd Anderson 2019). The MENA region has the capacity to expand its renewable energy generation that can comprise 45% of the potential generation for renewable energy in the world (Ramin Jalilvand 2012).

The goals set by governments, in the MENA region, for renewable energy for the next 30 years are ambitious. For example, Dubai's government aims to raise the energy generated from clean sources to 75% of the total energy produced by 2050. The World Future Energy Summit held at the beginning of 2020 in Abu Dhabi confirmed Dubai's new target in massively shifting from unsustainable to sustainable sources of energy (Smart Energy International 2020).

Aghahosseini et al. (2020) investigate whether it is possible for the renewable energy system in the MENA region to constitute 100% of the energy sector by the end of 2030. In the proposed scenario, the Levelized Cost of Energy (LCOE) is estimated to be between 40.3 and 52.8 €/MWh, where the proposed system proves to be 67% on average more affordable than a BAU strategy (Aghahosseini et al. 2020). Future well-being depends on the capacity of the finite resources left for consumption and future generations have, but more importantly on the progress in renewable energy development (Sakmar et al. 2011).

There are several countries in the MENA region that set good examples in the progress towards renewable energy development. Jordan and Egypt have revealed consistent advancement. But Morocco is considered to surpass most other countries in the MENA region, as its government has achieved remarkable progress towards the goal it set: 2 GW for solar PV and 2 GW for wind power by the end of 2020, in accordance with the Nour-1 solar project (Zafar 2020). Moreover, UAE has achieved Dubai's solar park in 2013 and the 100 MW Shams CSP plant is in use since 2014 as well (Zafar 2020). Furthermore, Saudi Arabia's vision for 2030 in the development of renewable energy is promising.

There is no doubt that the MENA region's governments have to overcome a number of challenges, in the transition to more sustainable clean sources of energy. One of the biggest challenges is the reformation of the regulations and the amendment of a wide range of policies. For example, the process of merging photovoltaic solar power into the power grids requires a certain degree of flexibility of the grids, installment of advanced technologies, and setting up well-structured business models. Another challenge is that electricity and water generation are widely linked in the utilities of the MENA region. To successfully expand a system of renewables, this link must be detached (Smart Energy International 2020). In addition, a study revealed that internalizing the externalities (for example, environmental costs like air pollution) that result from using non-renewable energy sources will double the price of electricity for oil and coal (Ramin Jalilvand 2012). Nonetheless, internalizing the negative externalities to be reflected in the cost of electricity of non-renewables is a political obstacle and needs time as well as institutional reform to happen (Ramin Jalilvand 2012).

The governments must increase efficiency in developing renewable energy sources by setting sufficient financial budgets to minimize the LCOE, promoting the infrastructure, and removing fuel subsidies in order to increase incentives to shift toward renewables. There are two types of instruments that the governments can implement to achieve the goals they have set for renewable energy generation: incentivizing renewable energy and disincentivizing non-renewable energy. In other words, subsidizing renewable energy generation instead of non-renewable energy generation is a crucial step that most governments of the MENA region ought to take to move faster on the path of renewable energy development. To incentivize renewable energy, the MENA region governments should pave the way to private organizations to join the renewable energy market by reducing regulative barriers to entry (Abdelrahim 2019). Another tool is price-based subsidies, known as the feed-in tariff would allow access to electricity grids for carriers of renewable energy. Furthermore, a reduction in after-sale tax for producers of renewable energy, easier access to research and development, and lower investment taxes allow producers to earn higher profits thus promoting the expansion and increased generation of renewable energy. To disincentivize non-renewable energy, governments can impose increased tariffs on non-renewable energy and increase investment and sales taxes on non-renewable energy generation (Ramin Jalilvand 2012).

3 Overview of Renewable Energy in the MENA Region: Resources and Potentials

The Middle East and North Africa (MENA) region is considered to be a highly diverse region, with a heterogeneous group of countries, in terms of abundance of distinct resources, trade relations with international countries, technological capabilities, among other features that give each country its unique profile. Compared

to the rest of the world, despite the existing wealth of the MENA region in various resources, it is considered still lagging behind the fast progress of renewable energy development. However, there are positive signs that are promising regarding the future of renewable energy expansion in the MENA region, including the availability of technologies and their respective industrial technology providers.

Although the shares of renewable energy are still relatively low compared to countries in other regions, the future of renewable energy seems promising given the optimistic targets set by the various governments in the MENA region. Approximately 80% of non-hydro renewables corresponds to only four countries, making a total of 6% for the renewables out of the total energy generation. But, the fast progress of investment and planning creates optimistic forecasts for the future of renewable energy. For example, across the Arab region, the investment made to renewable energy development increased from USD 1.2 billion in 2008 to USD 11 billion in 2016. According to the established national plans, Variable Renewable Energy (VRE) will contribute to the major part of this development. It's worth mentioning that forecasting international models in local countries is a misleading way of setting targets.

There are several advantages that make the investment in renewable energy a very worthy one. To begin with, the higher is the share of renewable energy of the total energy consumption, the higher proportion of the fuel is saved; this bolsters the countries' energy resources and weakens the risk of facing shortages while meeting the rising demand. Diversifying the energy sources amplifies the energy security and the independence of countries. In addition, renewable energy reduces pollution, particularly greenhouse gas emissions, thus enhancing environmental protection. Besides, this socio-economic growth generates job opportunities and enriches exports.

The key players in the process of renewable energy expansion are ministers, the private sector, transmission system operators (TSOs), utilities, regulators, among other interrelated players. Countries across the MENA region are at different stages in their development process of renewable energy, yet several countries have common concerns. Around six to eight countries in the MENA region are working on orienting the cost projections for the VRE to become better suited to specific corresponding local contexts, by assessing the capacity credits of the VRE of their systems. In addition, some countries are interested in providing flexibility in evaluating the expansion of VRE in terms of costs and progress. Other common concerns include taking action towards the sustainability and stability of the VRE development, seeking improvements in data acquisitions, institution management, and staff training.

Although some targets are common between the countries and many countries welcome cooperation and exchange of plans in developing renewable energy sources, each country still begs specific attention that is best specialized for their respective contexts. Relative to the rest of the MENA countries, Jordan has made good progress regarding the renewable energy development given its relatively high shares of renewable energy infrastructure facilities installed. The National Energy Strategy 2025, which was then amended to 2050 by the National Renewable Energy Action Plan (NREAP) has set a target of 20% for the generated renewable energy out of the total energy generated. Jordan has approximately a current 15.7% of installed renewable