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ANALYSIS

Assessment of selected energy efficiency and renewable energy investments in the Mediterranean Partner Countries

Sophie Jablonski [a,*], Mohamad Tarhini [b]

[a] *European Investment Bank (EIB), Energy Efficiency and Renewables Division, 98-100 boulevard Konrad Adenauer, L-2950, Luxembourg*
[b] *Tajdeed, 14 Rue du 8 Mai 2945, 60340 St Leu D'Esserent, France*

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A B S T R A C T

This article presents an assessment of selected energy efficiency (EE) and renewable energy (RE) investments planned by nine *Mediterranean Partner Countries* (*MPCs*) over 2011–2020. The investments looked at focus on: (1) urban energy efficiency and small-scale renewables ("demand-side"), and (2) large-scale renewable power generation ("supply-side"). The article also discusses the implications of deploying such projects in terms of potential energy saved or produced and economic impacts. The main findings of this article are: (1) the MPCs need to identify more EE and RE investments and accelerate the development process of the identified ones in order to fulfil their national targets; (2) the full deployment of EE and RE investments identified towards the achievement of the envisaged 2020 targets require significant investment costs and some subsidies; (3) significant (mostly) financial and organizational barriers still hinder the implementation of the examined EE and RE investments. Insights generated by this article can be useful regional messages for energy policy leaders in the MPCs to accelerate the development of the selected EE and RE investments.

1. Introduction

1.1. Context

Energy consumption is rapidly increasing in the Mediterranean Partner Countries[1] (MPCs) due to growing population, increasing urbanization and economic development. This increase, particularly influenced by high energy subsidies, is characterised by inefficient use of energy in the various sectors [1,2]. Meeting the energy demand growth would require major investments in energy infrastructures in the coming years. Energy efficiency (EE) and renewable energy (RE) investments could be significant contributors, if adequately supported by policy measures.

The Mediterranean Solar Plan (MSP), a priority initiative by the Union for the Mediterranean[2] (UfM), aims at coping with the challenges posed by energy demand increases, security of supply and environmental sustainability in the Euro-Mediterranean region by boosting EE investments and developing RE sources (mainly solar and wind). Such investments could also lead to increased economic competitiveness and local employment opportunities.

1.2. Main objectives

This article presents a preliminary assessment of the EE and RE investment projects as identified in the MPCs' existing national plans to be implemented by 2020.

First, it aims at identifying and assessing EE and RE projects proposed in the national plans to be implemented over 2011–2020. Second, it intends to assess the economic and financial profitability of the identified projects, and quantify the main implications of the total or partial implementation of these projects. These implications cover more specifically (i) the expected energy savings and RE production by 2020, (ii) the necessary investment volume, and (iii) the subsidies[3] required for the deployment of the identified projects by 2020.

* Corresponding author.
E-mail addresses: s.jablonski@eib.org (S. Jablonski), mohamad.tarhini@gmail.com (M. Tarhini).

[1] Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Syria, Tunisia, and West Bank/Gaza.

[2] The creation of the UfM in 2008 in Paris started a new form of cooperation between the two shores of the Mediterranean Sea. This union was built on the experience of the Barcelona process, launched in 1995 [16].

[3] In the context of this article, "subsidies" were defined as the additional financial support required by non-profitable technologies to become economically justified.

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The work presented here is of particular interest since as of today, research specific to the MPC region in the fields of EE and RE projects' identification and economic implications has remained limited.

1.3. Brief literature review

A review of identified literature and specific sectoral studies has been undertaken. Most of the literature has focused on RE resources and suggests that the MPCs possess substantial potentials in terms of wind and solar power [3]. Number of sources qualify the MPC region's solar potential as exceptional and mention significant wind resources [4,5]. Less has been published on EE and small-scale RE in the MPCs. Nevertheless most sources concur that large gains could be achieved from improved energy efficiency with relatively high investment returns in the short and long term [6]. The main source of the potential energy savings is the inefficient energy consumption patterns reflected by high energy intensities in the main energy consuming sectors [7]. In particular, significant energy savings potential exist in the urban environment; i.e. both residential and tertiary sectors, due to growing urban population and expansion of new dwellings and cities in the region[4] [8].

Despite these significant potentials, there is still limited research on the assessment of deployment potentials of EE and RE projects in the region. In fact, clean energy investments in the Middle East and North Africa (MENA) represented only 1% of such global new investments made in 2011; going down from 2.2% of global clean energy investments in 2010 [9]. The deployment of EE and small-scale RE technologies is still limited in the MPCs compared to the potential; for instance less than 20% of residential households in the region have already adopted EE measures and technologies [10]. Similarly, the current installed capacities for onshore wind, concentrated solar power (CSP), and photovoltaic (PV) technologies are small in comparison with their potentials in the MPCs. On the contrary, most of the hydropower economic potential has already been developed [11].

2. Methodology overview

The clean energy technologies focused on in this article were selected on the basis of the types of projects identified in the national energy plans. Technologies were looked at in two main categories[5]: (1) supply-side technologies; i.e. large-scale RE power technologies (such as wind, solar and hydro); and (2) demand-side technologies; i.e. energy efficiency (such as efficient lighting, building envelope, electric appliances, etc.) and small-scale RE technologies (such as solar water heating and roof-top photovoltaic). Other EE technologies in the industry, transportation or rural sectors as well as other RE technologies (biomass, geothermal, etc.), and which were seldom mentioned when reviewing MPC energy plans, were not covered in this analysis.

A summary of the approach for the two technology categories is provided in Table 1.

The starting point for the analysis was to look at national energy plans to build a regional overview, including identifying the EE and RE targets set for 2020 and listing the projects envisaged by different countries in the next ten years (the so-called "projects' pipeline"). Such a bottom-up assessment was mostly desk-based research, but it was enriched at several stages through chosen stakeholders' interviews.

Table 1
Methodology overview.

Steps	Description/Notes	
	Demand-side technologies	Supply-side technologies
Selection of technologies	EE (efficient lighting, electric appliances, building envelope) and small-scale RE (solar water heater and roof-top PV).	Large-scale RE power: solar (CSP and PV), wind and hydro.
Identification of set targets	Identify set targets for energy savings and planned RE capacity from the national energy plans in each of the MPCs by 2020.	
Identification of projects pipeline	Identify EE and RE projects proposed by the MPCs' national plans and assess the energy saved/produced and investment costs related to the development of the identified projects.	
Profitability modelling	Perform simplified assessment of the economic and financial profitability of the selected technologies in each of the MPCs.	Calculate the Levelized Electricity Cost (LEC) for solar and wind technologies and compare with conventional (fossil) power generation costs.
Development of deployment scenarios	Develop two scenarios i.e. "partial deployment" and "full deployment" related to the results of profitability assessment and progressive market penetration for each assessed technology by 2020.	Develop two scenarios i.e. "partial deployment" and "full deployment" related to the maturity level of the identified project proposals in each of the MPCs by 2020.

A simplified model was then set-up to assess the economic and financial profitability of the selected technologies. Financial and economic indicators (internal rate of return, payback period, net present value, etc.) were calculated for each of the modelled technologies. The economic analysis took into account the economic benefits from the energy saved or produced without energy subsidies or taxes and including some external environmental benefits (e.g. benefits from avoided CO_2 emissions and other pollutants mainly related to electricity generation). The financial analysis, on the other hand, was based on actual energy prices in the different MPCs. Financial and economic discount rates[6] of 10% were considered for the analysis to account for the risks involved in the development of EE and RE projects in the MPC region. Whether a given technology would be considered economically and/or financially profitable was then determined based on comparing the respective economic and financial internal rate of return with the discount rate values (i.e. 10%).

Using the results of the profitability analysis, scenarios of technology deployment (Table 2) were developed ("Partial deployment" – scenario#1 and "full deployment" – scenario#2) over 2011–2020 to assess how much (and at what cost) of the envisaged 2020 targets could

[4] Starting from a current 44 million existing dwellings in 2010, it is estimated that additional 22.5 million new residential dwellings would be constructed in the MPC region over 2011–2030 representing a regional annual growth rate of 2.2%. The majority of these new dwellings would be in urbanised areas [10].

[5] This chosen "technology split" is in line with how sustainable energy projects are presented by MPCs in their national plans. This also conceptually aligns with the often-used classification of sustainable energy technologies into two groups: supply side technologies (e.g. large scale renewable power production) versus demand-side technologies (e.g. energy efficiency in residential sector).

[6] A discount rate of 10% was chosen in line with that used by EIB operations when looking at the economic and financial viability of EE and RE projects in the MPC region.

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