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Renewable Energies And Sustainable Development In The Mediterranean: Morocco And The Mediterranean Solar Plan

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The main objective of this policy brief is to analyze the policy implications of building Concentrated Solar Plants (CSP), Photovoltaic (PV) and Wind farms (WP) installation in Morocco over the next 30 years. In order to assess the effect of RES deployment on Moroccan economic growth and development we analyze several policy alternatives for future renewable electricity generation mixes in Morocco, comparing their economic effects related to the electricity demand forecast by different agencies and research projects. Our results shed light on the economic consequences in terms of GDP, value added and employment in Morocco for several plausible policy scenarios concerning investment in solar and wind energy.

Renewable Energies (RES) have become an identifying feature of the EU's energy policy. The promotion of RES is one of the energy policy responses to climate change, and the emphasis made by the European Commission and some Member States on its deployment has helped to position the EU as a world leader in the sector. However, the contribution of renewable energies has remained marginal in the southern Mediterranean energy mix. The Union for the Mediterranean (UfM) has launched the Mediterranean Solar Plan (MSP) to support RES deployment in the region, and Morocco has shown its interest in participating in the initiative. This will enable the country to exploit their important solar and wind potential, increase energy supply, reduce energy dependency and diversify its energy mix.

The purpose of this FEMISE policy brief is to reflect on whether the MSP has the potential to become a driver for Moroccan development and to determine the policy implications. The MSP would help Morocco to supply its internal electricity markets with RES while exporting the surplus to the EU; thus benefiting from the new green energy trade scheme provided by the new Directive 2009/28 article 9, which sets the national objectives for the 2020 RES contribution to the gross total energy consumption fixed by the EU.

These targets are challenging for several EU countries, requiring cross-border RES flows (physical or virtual) among the EU, but probably also from third countries, a possibility that is explicitly addressed by the Directive's article 9 and more recently by the September 2011 Communication on energy cooperation.
For green electricity imported from third countries, the conditions are less flexible than for Member States: they do not allow statistical transfers, only physical electricity transfers; and to ensure "additionality", only new installations, starting operations after the entry into force of the Directive, can be considered in the fulfilment of RES national objectives. Member States can implement joint projects with third countries, including in their national objectives the green electricity imported. These restrictions can however be relaxed in the absence of existing (but projected) operative interconnections, and more importantly the Directive de facto offers such countries the opportunity toof joining the Energy Community Treaty.

The MSP should also reach the UfM's objectives inherited from the Barcelona Process of achieving a shared space of peace and prosperity. These were reassessed by the recent Joint Communication from the Commission and the High Representative, "Un partenariat pour la démocratie et une prospérité partagée avec le sud de la Méditerranée" (March 8, COM (2011) 200 final) to include the deployment of RES as a channel for Euro-Mediterranean cooperation. In this regard, the MSP should also be conceived of as a driver for economic development for MPCs in **at least five key aspects**:

1. **To provide part of the energy required by MPCs' economic growth.**
2. **To contribute to the supply of the modern energy services required by economic development.**
3. **To contribute to eradicating energy poverty.**
4. **To use solar and wind energy resources to generate new economic activities, new jobs and new incomes.**
5. **To provide technical cooperation, training and technology transfers in order for MPCs to be able to reap the benefits of RES deployment.**

The project discusses seven scenarios of simulation according to **two important policy drivers:**

1. **Exports:**
   - No exports are considered: Business as usual (BAU) and Smart scenarios
   - Additional RES generation is installed to allocate 20% of Moroccan RES generation for green electricity exports: Export, Smart Export, Export-CSP, Export-PV and Export-Wind scenarios.

2. **Ratio of investment filtered to equipment imports:**
   - There is no reduction in the import content of RES investments, simulating that the Moroccan RES industry is not able to achieve a learning curve, and no technological nor training catch up happens to increase the local content of RES components: BAU and Export, Export-CSP, Export-PV and Export-Wind.
   - Morocco is able to catch up with technological transfers, cluster development, specialized training and technological cooperation. As a result the import content of RES investments becomes gradually half of the BAU scenario over the whole period: Smart and Export Smart scenarios.

The BAU scenario is a baseline at which there are no exports and there is no catching up. **The Export scenario** reflects a situation where an additional 20% of Moroccan RES-generated electricity is exported after supplying

domestic demand using the mix of RES technologies set by the government. The Export-CSP, Export-PV and Export-Wind scenarios simulate attaining such additional generation capacity (20%) exclusively with each of the technologies: CSP, PV or wind. **The Smart Export scenario** seems to be the more attractive in combining both technological and industrial catching up to attain the benefits of exporting Moroccan RES-generated electricity surplus. Taking into account the current state of investment in Morocco and the MASEN plans, probably the economic impact will be very concentrated in the latter years of the current decennium (2011-2020).

The results of the simulations for each scenario can be summarized as follows:

- In the BAU scenario the value added global average annual effect on the Moroccan economy resulting from the installation of renewable energy starts at about 0.18% of GDP in 2010 and reaches 1.17% in 2040. The corresponding impact on employment would be about 36,000 new jobs in 2010 and around 265,000 at the end of the forecasting period.

- In the Export scenario, 20% of additional RES electricity that is installed has the capacity to export. fFor scenario III, the effect of exports is relatively small: at the end of the period, the whole value added impact is about 1.41% on GDP, compared with 1.17% at the baseline, and the number of jobs created would be around 319,000.

- In the “Smart Scenario”, reducing the dependence on imported components, increases the value added impact up to 1.6% at the end of the period providing an additional impact of around 0.4% compared with the baseline; and increases employment creation by up to 401,000 around 140,000 more than at the baseline).

- In the “Smart Exports Scenario” (the optimum scenario) the combined impact of RES, reducing dependence on imports and exporting a 20% surplus is equal to 1.9% (in terms of value added) and 482,000 employees.

- The remaining scenarios (concentrating the exports in just one technology) allow us to make a ceteris paribus comparison on the differential economic impact due to the selection of each one of the three RES technology alternatives.

- The results of scenarios for “export with CSP” and “exports with PV” indicate that both have similar consequences in terms of economic effect on the Moroccan economy, only slightly higher in the case of CSP: the impact on GDP would be about 0.05% higher with CSP than in the photovoltaic.

- In contrast, the “wind farm exports” scenario makes a clear difference: the impact would represent 1.8% of GDP in 2040 compared to 1.25% average of the two alternative sources; and, regarding employment, the use of this alternative would lead to about 415,000 jobs in the economy, 140,000 jobs more than the BAU scenario. This comparative advantage comes from the lower dependency on imports for the installation of new Wind Power technology in Morocco. In addition, due to the lower relative cost of wind technology in comparison to CSP and PV, the ratio of the Value Added Impact / Cost supports the conclusion in favor of wind technology. However electricity production and security of supply using windmills is strongly restricted by unpredictable wind-blow conditions.

The general conclusion is that RES deployment entails significant economic opportunities for Morocco in terms of GDP and employment. In the proposed scenarios, the figures for economic impact on GDP vary from 1.17% to 1.9% at the end of the period (2040), with employment figures for full-time equivalent direct and indirect effects on the economy between 267 and 482 thousand jobs. Our results conclude that the RES that produces more benefits in terms of GDP and employment growth is the installation of wind energy, whatever the framework of exports and imports contemplated.

Our results also show that policy decisions regarding exports and improving local capacities are crucial in order to gain the highest profitfrom the opportunities that RES deployment offers to Morocco. The best economic performance is attained in the Smart Export scenario. But even in the absence of catching up, significant employment and GDP figures result from the Export-Wind scenario, which represents a less ambitious approach.

These results focus on some policy dilemmas concerning RES deployment patterns in Morocco and the southern shore of the Mediterranean. The first one relates to the choice of whether or not to export green electricity to the EU. Theexport scenario, with 20% of green electricity for exports, tends to obtain better results in terms of economic growth.

A second policy choice relates to technology: the wind export scenario gives better comparative results, especially concerning job creation. It is important to nuance this policy implication: technological diversification generates externalities and helps to hedge against technological uncertainties, effects that are difficult to capture. Technological preference implies a balanced RES mix, which should include all technologies, while respecting the merit order regarding Moroccan policy priorities like job creation.

Finally, our results show that in order to maximize economic gains from RES deployment, Morocco needs to **participate more fully in the industrial dimension of the initiative.** This means improving its absorption capacity at the industrial level, integrating the RES sector in a comprehensive industrial policy, and upgrading infrastructures and regulation. For the EU, it is important to highlight the significance of supporting the country's absorption capacity at every level related with RES deployment through technical co-operation programs, including training, twinning, scientific exchanges, networking, etc..

All this involves significant policy challenges that go well beyond energy policy if the private sector is going to invest the big money needed to put such an ambitious plan into action. With consideration of the present economic distress affecting the European economy as well as the deployment of RES, EU support would be needed to maintain such a long-term commitment.

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