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Employment from renewable energy and energy efficiency in Tunisia – new insights, new results

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Abstract

The MENA region is facing economic and social challenges such as creating job opportunities especially for the youth. It also exhibits vast potential for renewable energy and energy efficiency (RE&EE) and tapping this potential can create economic benefits and jobs. This paper analyses the economic impacts of RE&EE support for Tunisia. In Tunisia, RE&EE legislation is in force since 2009 with the Tunisian Solar Plan (PST). For the economic impact analysis of the PST, a team of German and Tunisian researchers developed an economic model based on Tunisian statistical data and in sync with the methodology suggested by international agencies such as IRENA or IEA-RETD. The approach is based on Input-Output-Analysis, which allows for an analysis of impacts in different sectors e.g. machinery, metal industry etc. The paper will present the methodology and give an outlook on new results from an ongoing update.

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1. Introduction

Strategies to increase the contribution of renewables to the energy supply and to enhance energy efficiency of industries and households belong to the agenda of many countries. The motifs are manifold: governments wish to

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decrease energy dependence and increase energy security, to improve access to energy and to contribute to the mitigation of climate change. Utilities wish to improve energy supply and billing efficiency. Enterprises see new areas of activities and opportunities for business. Overall, there is increasing evidence that the support of new technologies will accelerate industrial development and support economic growth and competitiveness. Moreover, from literature ([1], [2]) it is clear how, given the respective policy support[1], renewable energy and energy efficiency may entail positive effects on the labour market, on qualification and innovation.

However, most research on the subject has been carried out for industrialized countries. Early examples include 0 for the US, 0, [5], [6] for Germany or 0, [8] for the EU 27, in addition to the Greenpeace Energy [R]evolution studies. Developing countries often fear that they have to import expensive technologies and the benefits stay with the industrialized countries who produce these technologies. If own industrial production exists in a developing country, the effects are similar – or even better – than for industrial countries. The International Agency for Renewable Energy (IRENA) launched several studies on these issues, other institutions and regulatory authorities followed [9].

The modelling approach recommended by international bodies for this type of analysis is challenging in terms of knowledge and data. IEA-RETD recommends to base analyses on the economic Input-Output Approach 0. The strength of this approach is that it measures direct and indirect jobs. Direct jobs are created in the production industries, which produce the PV modules, the wind generators or the solar water heaters. Indirect jobs occur in the respective industries which produce the materials needed for the production or the services needed for the design, the installation or the construction of the technologies. Both direct and indirect jobs are subsumed under the headline “gross employment”, and give an estimate of the overall economic effect of additional investment in renewables and energy efficiency.

Modelling these effects for developing countries creates new challenges in terms of data availability, suitability of models and the choice of the overall approach. The country studied in the following is Tunisia. In Tunisia, RE&EE legislation is in force since 2009 with the Tunisian Solar Plan (PST)[11]. Therefore, legislation to support the energy transitions towards green technologies and to decrease electricity consumption has been in place for quite some time. In addition, World Bank together with Tunisian researchers and stakeholders developed a support scheme called Program Solaire (PROSOL) which promotes solar water heaters (SWH). The solar water heaters eligible for promotion are built in Tunisia, thus creating local value and local jobs.

Tunisia has the statistical data for an economic approach called Input-Output-Analysis (IO Analysis), since the so-called IO-tables are provided by the Statistical Bureau of Tunisia (see method section below). Detailed data on the energy system and on the success of the PROSOL scheme were collected by the Tunisian research partners from the company Alcor and with support from ANME, the regulatory authority in the electricity sector. The ex-post analysis shows that jobs have been created in particular in the SWH sector and by increasing energy efficiency in buildings. For the future, different scenarios were developed by the German Wuppertal Institute, together with Alcor 0. These scenarios in physical units (Megawatt, MW) were translated into investment paths and direct and indirect employment was estimated along these paths. Knowledge about global employment factors and cost structures in the production of renewable energy systems was contributed by the German partner (for details see 0). The results are promising in two ways: firstly, the method developed for industrialized countries / OECD countries has been applied successfully in a developing country/ emerging economy and secondly the results show that additional investment in renewable energy and energy efficiency creates jobs across all economic sectors. Sensitivities with different local content requirements are included in the analysis. The presentation will give an overview of the method, the results and latest development in the RE&EE sector in Tunisia.

[1] The policy mix should contain instruments which stringently set consistent targets for RE and EE. A target for the shares of renewables in a particular year depends crucially on total energy demand and thus on the target for energy efficiency.

2. Methods

Employment from the Tunisian Solar Plan is analysed ex-post, i.e. employment already created in Tunisia since 2005 and ex-ante, i.e.e projections of jobs from RE and EE under different scenarios. For the ex-post analysis, data on direct employment from ANME and ALCOR are supplemented with calculation and estimation of indirect jobs by using Input-Output-Tables for renewable energy technologies. These tables have been developed for the German industry. However, new technologies globally exhibit a very similar cost and input structure, because they are produced the same way in any country. For instance, PV is produced with German production facilities in China, Malaysia or Germany. Indirect employment is calculated using this structure for each of the following technologies: biogas, wind, solar water heaters and PV. For the efficiency sectors, desk research showed which sectors are concerned. Mainly, energy efficiency relates to the construction sector, light bulb production, production of electrical appliances and efficient vehicles. For each sector, import quota were determined with the Tunisian partners and stakeholders.

For the ex-ante analysis, we applied an adjusted Input-Output approach embedded in a small economic model of Tunisia. Additional investment in EE&RE was calculated based on a scenario study on the future electricity generation capacities 0. Prices for the respective RE&EE measures were taken from international data and adjusted to the Tunisian situation after discussion with local experts. The resulting tool for the simulation of future employment effects is programmed in C++ and has a user-friendly interface which enables the user to create their own scenarios.

The most important scenario parameters are investment in renewable energy and efficiency, as well as the share of domestic production for domestic and international installation. Domestic production creates domestic demand for further inputs, following the domestic production structure given in the Tunisian input-output tables, while imports will also create jobs and value added in the producer countries. Employment impacts therefore hinge on the productions structure of the respective country, the capacity level and the skills of the workforce as well as the potential for energy efficiency and renewable energy.

3. Results and discussion

As pointed out, employment effects from renewable energy and energy efficiency increase hinge on investment and domestic production structure. The economic results are obtained through the comparison of different scenarios. The baseline scenario does not include any additional renewable energy or energy efficiency investments. If Tunisia released local content requirements for international investors, as China did, or includes these in e.g. a tendering procedure for wind installations as Portugal did, the import quota will be less than currently assumed.

With the given structure, the Tunisian Solar Plan will lead to more than 10,000 additional jobs in Tunisia. In the following, this scenario will be called S1: ER+EE (renewable energy + energy efficiency).

The shape of the curve reflects the investment paths and productivity growths. The employment effect is rather small initially, because large shares of the new systems will be imported. Only small inputs are locally produced.

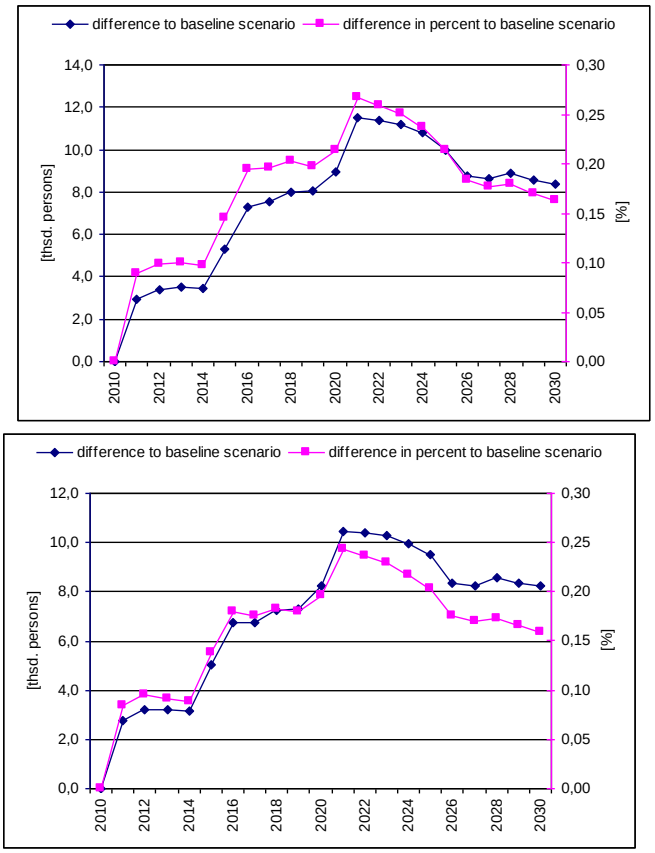

Fig. 1. Additional employment from the Tunisian Solar plan. Source: GWS, Alcor, WI – own calculation.

Fig. 2. Employment effects with high domestic integration for wind energy, imports are lowered to 10%. Source: GWS, Alcor, WI – own calculation.

A sensitivity analysis assuming higher industrial integration illustrates the effect. When imports are extremely lowered to 10%, employment can rise to more than 20,000 people or more than 0.6 percent of overall employment.

This is a very extreme case and can be considered as the maximum attainable employment from the given investment path. Again, towards the end of the simulation horizon, productivity gains decrease the amount of labour necessary per MW.

More realistically, the Tunisian Solar Plan gives an estimate for domestic integration of production for the wind industry. If we simulate employment effects using the suggested 43% of integration starting in 2011, the results shift from the original 10,000 jobs to a new total of more than 12,000 jobs (Figure 3). This shows the possible benefits of a successful integration strategy.

If we consider exports in the wind sector and if we assume that Tunisia exports from 2021 until 2030 around 800million TD2011, we find aggregate employment even further increased. The new scenario shows that employment will be further stimulated with around 200 persons. Figure 5 shows the development of employment between the scenario of the Tunisian Solar Plan (S1) and the scenario S$ which considers additional export opportunities for wind energy (French eolien).

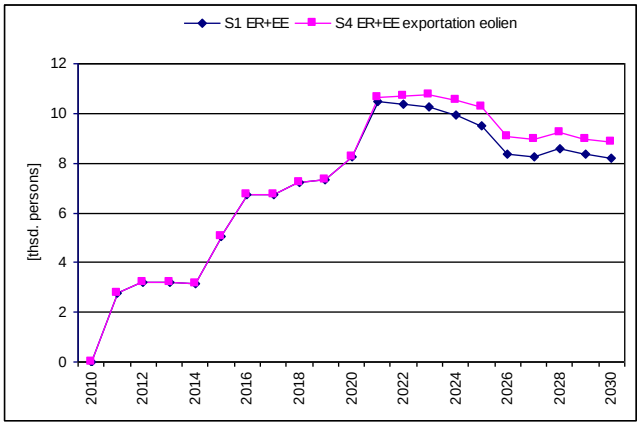

Fig. 3. Employment from additional exports in the wind sector, difference to baseline scenario (S1 ER+EE and S4 ER+EE exportation eolien). Source: GWS, Alcor, WI – own calculation.

4. Conclusion

The question of impacts of renewable energy plans and policies becomes increasingly important for developing countries. In this paper we suggest a science-based and theory-oriented methodology, which can be applied to many developing countries. Only few data requirements have to be fulfilled. On the policy level, the results help the Tunisian government to design the renewable energy and energy efficiency policy according to different policy goals. Concerning the renewable energy mix in Tunisia, what can we learn from our exercise? The answer to this question is not as straightforward as one might hope, because it depends on a variety of factors. From comparison of employment generated per 100 million Dinar investments, energy efficiency in buildings generates the most employment, followed by solar water heaters and PV installations. Wind energy and CSP follow. However, these results were obtained given a certain import structure of the respective industries. Solar water heaters have been successfully implemented under the PROSOL framework and lead to the second largest employment/ 100 million Dinar. Tunisia benefits from falling PV prices and will realize the employment opportunities in installation and in the production of electric and electronic components of PV systems. Wind energy does not contribute as many jobs as the first three technologies but provides chances for technology development, therefore could reach a more sustainable path. The results and recommendations will be updated in the light of the development from 2013-2014 and the latest changes in legislation, such as the updates in Legislative 2015-12 from 05.11.2015.

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