Mitigation Enabling Energy Transition in the MEDiterranean region

Together We Switch to Clean Energy

PROVIDING TOOLS TO MEASURE THE IMPACT OF INVESTMENTS IN EE AND RE PROJECTS ON LOCAL ECONOMIC GROWTH AND JOB CREATION

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Regional Center for Renewable Energy and Energy Efficiency

المركز الإقليمي للطاقة المتجددة وكفاءة الطاقة

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The meetMED project is a two-year project funded by the EU and jointly carried out by the Mediterranean Association of the National Agencies for Energy Management (MEDENER) and by the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE). Its main goal is to reinforce regional cooperation aimed at fostering the energy transition in Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine and Tunisia under the umbrella of the UfM REEE platform.

The meetMED team in Brussels coordinates the project partners and experts in implementing the project activities, in the following areas of work: assessing EE and RES strategies and policies; advancing vocational training and public awareness; attracting sustainable RE and EE investments; supporting the UfM Renewable Energy and Energy Efficiency Platform.

The meetMED activities target and benefit a wide range of stakeholders, including policy makers, public authorities, investors and financial institutions as well as local communities and final customers. meetMED supports regional cooperation by building the technical capacity and raising the public awareness necessary to implement RE and EE projects and solutions, while creating synergies with other initiatives targeting energy transition in the Mediterranean region.

MEDENER is an international non-profit organization gathering agencies from the northern and southern Mediterranean countries in charge of implementing public policies on energy efficiency and the promotion of renewable energy sources, by implementing regional projects facilitating the sharing of know-how and best practices among its members and international partners, as well as accelerating the transfer of skills, methods and technologies in the field of energy efficiency and renewable energy.

RCREEE is an intergovernmental organization aiming at enabling the adoption of renewable energy and energy efficiency practices in the Arab region. RCREEE brings together regional governments and global organizations to initiate and lead clean energy policy dialogues, strategies, technologies and capacity development in order to increase Arab states' share of tomorrow's energy. Its key work areas are capacity development and learning, policies and regulations, research and statistics, and technical assistance.

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This meetMED proposal has been developed in the framework of the meetMED work package on “REEE Sustainable Growth and Investments”. The proposal collects the results of questionnaires, interviews and desk research on the main tools and methodologies suitable for the measurement of employment in the SEMCs. In this proposal, the meetMED experts have investigated all the possible approaches for the creation of a regional impact assessment tool to calculate employment for RE and EE projects.

The data were collected and elaborated thanks to an intensive desk research along with several scoping and validation missions in the three target countries, namely Egypt, Tunisia and Lebanon, conducted by the RCREEE team and coordinated by Rana El-Guindy with the support of Mirna AlSharief and Mahmoud Bououd.

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Executive Summary

During the last decade, the Southern and Eastern Mediterranean Countries (SEMCs) have demonstrated the political will and commitment to deploy innovative green energy alternatives. The main drivers are the growing population with an increasing energy demand and the respective vision for the transition towards a sustainable economy (IRENA, 2016). The region shows vast potential for Renewable Energy (RE), as it is well located for wind and solar energy projects thanks to its characteristics. On the other hand, energy efficiency (EE) is becoming increasingly interesting because large shares of public budgets are currently allocated to keeping the costs of energy use down. Increasing energy efficiency will lead to providing the same services (i.e. cooling, water heating, domestic as well as public lighting etc.) at lower energy costs.

Since the SEMCs are oriented to implement RE and EE projects and are facing unemployment in the respective economies, a lot of studies have been conducted to measure its socio-economic impact. For instance, Egypt, Morocco, Tunisia, Lebanon and Algeria have conducted studies in the recent years to calculate the employment effects of RE and EE.

It is worth mentioning that the studies, applied on the previously mentioned countries, have used customized national tools, in order to meet their objectives by using the available data and resources. However, there are no previous studies that have been interested in measuring such an impact comprehensively and comparably at the regional level. Hence, a regional impact assessment tool is needed in order to be used in future studies to get accurate regional numbers that can serve as a basis for comparison.

This proposal aims at investigating the possibility to create a regional impact assessment tool to calculate employment for RE and EE projects. This tool would be able to measure the net employment as well as the qualitative and quantitative assessment of the industrial, technological and professional qualifications and capacities needed in the SEMCs.

The proposal starts by illustrating the reasons why the region needs to create such a tool. In doing so, the literature review summarizes the existing tools and methodologies that have been used over the years to calculate the employment effects of RE and EE in different regions. The proposal focuses then on the chosen methodology based on the research and the results of the scoping missions and identifies the necessary indicators to assess employment from a regional perspective. After defining the indicators, the proposal provides an overview of the available indicators in each country and where to find them. Finally, it highlights the information gaps at the different national levels to create such a tool.

1. Introduction

In the last years, SEMCs have been interested in finding energy alternatives to fuel their economies. For instance, in Egypt and Tunisia the austerity measures have forced the fossil fuel prices to go up, and this has motivated governments to invest more in renewable energies and energy efficiency techniques. In addition, some countries are relatively poor in terms of traditional energy resources: water, gas and petrol. This means that not only governmental expenditures and consumption levels are affected but also the trade balance and the foreign currency reserves. As a response, all SEMCs have sustainable development strategies and they are building new RE installed capacities, especially in wind and solar energy.

By 2030, more than two hundred thousand jobs will be created in the solar industry and more than fifty thousand in wind industry (RCREEE, 2019). In fact, 54% of those jobs will be generated in the Egyptian economy for both industries, followed by Algeria (22%) and Morocco (10%). Nevertheless, Palestine only has a share of 0.5% (RCREEE, 2019). It is worth noting that these numbers were calculated based on a simplified methodology using the national plans in each of the countries till 2025 and 2030. An average employment factor was estimated based on the national, regional and international benchmarks and then these numbers were multiplied by the national targets.

According to predictions, 300,000 new jobs will be created in RES technologies in Egypt by 2030 (RCREEE, 2019). In addition, Tunisia has one of the biggest projects to develop thermal applications and PV electricity production in the region, which is the PROSOL program (GIZ, 2016). It targets residential, industrial and services sectors and it is estimated that 3,815 MW will be installed by 2030 (RCREEE, 2019).

Table 1 : Renewable Energy targets in SEMCs, per each technology. Source: (IRENA, 2016)

Country	Wind	PV	CSP	Biomass	Geothermal	Target Date	% Electricity	Target Date
Algeria	1,01	3	-	360	5	2020	40%	2030
Egypt	7,2	2,3	-	-	-	2022	42%	2035
Jordan	800	800	100	50	-	2020	20%	2020
Lebanon	400	150-100		-	-	2020	12%	2030
Libya	1	844	375	-	-	2025	7%	2020
Morocco	4,2	4,56		-	-	2030	42%	2020
Palestine	44	45	20	21	-	2020	10%	2020
Tunisia	1,755	1,51	460	-	-	2030	30%	2030

The SEM countries could learn from each other's experiences and use these as benchmarks for their own incentives and policy design. To this end, employment effects from RE and EE should be measured according to some standard procedure and methodology. The easiest approach would be to develop a shared tool at regional level, which can be updated for single countries and jointly. The results will be based on national data from each of the SEMCs by focusing on their economic contexts but using a common approach.

In order to identify the most suitable model to measure employment levels in the region, the analysis of related studies and literature review are introduced, together with an explanation of the most appropriate identified model and the indicators availability in each of the countries to determine the applicability of the model.

2. Literature Review

In order to study the impact of RE and EE projects on employment, many approaches can be followed, whether at the national or regional level. Based on the available literature, there are five main methodologies to assess the employment effect of RE and EE projects, at a regional level. Nevertheless, and before analysing the relevant methodologies to be applicable in the region, it is important to define the different types of employment that could be induced by those projects.

In fact, when calculating employment, there is a need to differentiate between direct, indirect and induced employment. Direct employment is generated in the same RE or EE industry, while indirect employment refers to jobs created in industries connected to the industry in question, inasmuch as they supply and assist the RE or EE industry with goods or services (Breitschopf, Nathani, & Resch, 2011). Beyond that, there are induced effects, meaning jobs induced by the increased income, in both direct and indirect industries (GIZ & RCREEE, 2017 and Breitschopf, Nathani, & Resch, 2011).

While investigating a tool to evaluate the regional impact of RE and EE projects on employment, it is important to mention that comprehensive studies analysing the impact of RES and EE projects on employment do not exist for all SEMCs. Only Egypt, Tunisia, Lebanon, Algeria and Morocco have created tools to measure the effect of RES and EE projects, in each country, based on their national context.

2.1. Morocco National Tool

Morocco has a scenario-based approach, on different profitability estimations of PV projects of low tensions (GIZ, 2017). The study authors used an Excel tool to build a financial profitability approach inspired by a cash-flow analysis previously done in a study for Tunisia (GIZ & ANME, 2015). It estimates the PV market potential and the value created by the industry, including impact on employment, under the real situation of the Moroccan economy. Then, the authors start to set several scenarios for different levels of subsidies offered for the PV industry, whether in the commercial or residential sector. They found that PV industry will generate 669 jobs in 2021, in case no subsidies are offered, which is the base scenario.

2.2. Egypt National Tool

In 2017, a study was conducted on Egypt, whose main objective was to measure the socio-economic impacts of RE and EE projects. At the time of the study, the installed capacity was 1,040 MW of wind power and around 484 MW of solar power, either under construction or in the process of being planned and commissioned (GIZ & RCREEE, 2017). The developed tool was based on the "Input-Output (I-O)" model, taking into consideration different scenarios, using Excel and VBA codes. Hence, it measures the impact of employment for the current situation, in addition to different scenarios concerning future costs, labour productivity, new technology and share of local content in the total production (GIZ & RCREEE, 2017). According to the study, in 2016 8,823 people were working in RE and EE industries, which is an increase of 6% compared to 2015.

2.3. Tunisia National Tool

In Tunisia, the same I-O approach was followed in a study conducted in 2016, also using Excel (GIZ, 2016). The number of direct jobs created was estimated at 2874 in 2015. In SWH, 1,465 jobs were created, including 1,200 installers, 52 suppliers and 7 local manufactures, in the framework of the PROSOL project. In 2022, it is expected that 11,200 direct jobs will be created, due to the installation of 1,120 MWp of solar PV (GIZ (2016) and Missaoui (2019)). In the Tunisian study, and based on the data gathered at the ground level in the country, the employment numbers were calculated by technology (RE and EE) as well as per labour intensity within the supply chain to identify which part requires more jobs in each of the identified technologies, i.e. supply, installation, operation and maintenance.

2.4. Lebanon National Tool

In Lebanon, a full study to calculate renewable energy and energy efficiency employment in the country was done in 2018 (UNDP CEDRO (2019)). According to the study, direct jobs were estimated to use employment factors, while indirect jobs were estimated to use input-output tables. A value chain assessment was done, based on optimistic and conservative scenarios for solar, wind and bio technologies. According to their findings, the installation phase for solar PV technology is the most labour intensive for creating more than 50% of direct jobs and more than 60% of indirect jobs, for the period 2015-2017.

2.5. Algeria National Tool

In Algeria, a study was published in 2019, measuring the effect of RE projects on the local economy. In their study, (Lehr & Baning, 2019) used a full economic model, based on two different scenarios. By 2030, the share of RE will be 37%, in the total installed capacity, reaching 18,585 of cumulative installed capacity. Therefore, it will constitute 27% of total electricity production. This is the first scenario, which is the base scenario. The second scenario is based on the declarations of the government in 2018. According to those, RE sources will contribute to 2,000 MW of electricity production by 2020. This amounts to 2,014 MW, cumulative capacity in 2020, compared to 4,010 MW in the base scenario for the same year. According to the first scenario, by 2020 and 2030, 61,708 and 137,928 new jobs will be created respectively. By contrast, the second scenario predicts that 41,060 and 113,185 new jobs will arise by 2020 and 2030, and most of the jobs will be created in the wind energy industry.

3. Methodologies to Calculate Employment

3.1. Employment Factor

The employment factor is the first methodology that can be used to calculate employment at the regional level. Most of the studies conducted in SEMCs use this methodology to measure the number of direct jobs created that is calculated by multiplying the capacity installed by the number of workers and it is expressed in physical units, for instance jobs/megawatt for electricity generating technologies (GIZ & RCREEE, 2017). It is a straightforward method to use, since the necessary data to calculate it, consist of the two previously mentioned variables (Jenniches , 2018). Nevertheless, this method highly depends on the productivity level and economies of scale that can be induced after gaining experience in the industry (Llera Sastresa et al., 2009). In addition, the availability of this information is important to be known all over the supply chain of the project (construction and manufacturing, operations and maintenance, and supply), as this will enable the researcher to estimate the quality of jobs created (Jenniches , 2018).

3.2. Input-Output Model

The second methodology is the Input-Output (I-O) models. This is a commonly used method when it comes to studies with regional scopes (de Vet, Roy, Schneider, Thio, & Bork, 2010). It is compulsory to have national I-O tables to build such models. I-O tables show the flow of goods and services in the region, including those between different industries, sectors and with the rest of the world (Lehr, 2008). The idea of an I-O model is that it measures the economy's response to a change in the final demand, taking into consideration the inter-industry goods and services' exchanges, by using a number of multipliers and calculated using the I-O table (Aass & Hatlelid, 2016). They are intensive consumers of data. However, they can measure direct, indirect, induced jobs created (Weisbrod & Weisbrod, 1997). The European Union apply reference models in energy studies, e.g. PRIMES, GREENX and ASTRA (Blanco & Rodrigues, 2009). Then, they measure the impact on employment by I-O modelling (Commision of the European Communities, 2006). Consequently, this methodology is the most applicable one to regional studies.

3.3. Full Economic Models

The "Full Economic" models are known as the third approach adequate for regional studies. In these models, macroeconomic top-down models are linked to the detailed results of sector models or bottom-up models. The interdependencies of different economic sectors are described in I-O tables. Using the national accounts together with the input output data can determine the sectoral impacts as well as the second-round effects of new measures and instruments.

The two most popular full economic models are the "Computable General Equilibrium (CGE)" and the "Econometric I-O" models. Both are built on I-O tables, but the econometric I-O models do not require the economies to be in equilibrium. The models are constructed by using several economic equations, describing the whole economy (Aass & Hatlelid, 2016). They are better than the static I-O models, as they are dynamic models. This means that they determine structural changes in the economy, for instance impact on wages, taxes, business costs and productivity (IRENA and CEM, 2014 and Weisbrod & Weisbrod, 1997). They can also capture the full impact on the economy when investment in fossil fuels is crowded out as a result of increasing RE production. In addition, they capture changes in trade schemes, for instance if Egypt increases its electricity generation from RES, it will utilize the excess of production of oil and gas in exports (Lehr, 2019). They are the best model to apply, especially to measure long-term economic impacts (Aass & Hatlelid, 2016). However, it is hard to conduct a full economic model in a regional perspective, since it requires specific trade data (Aass & Hatlelid, 2016). According to our research, few studies apply this type of model to assess the effect of RE and EE projects on employment.

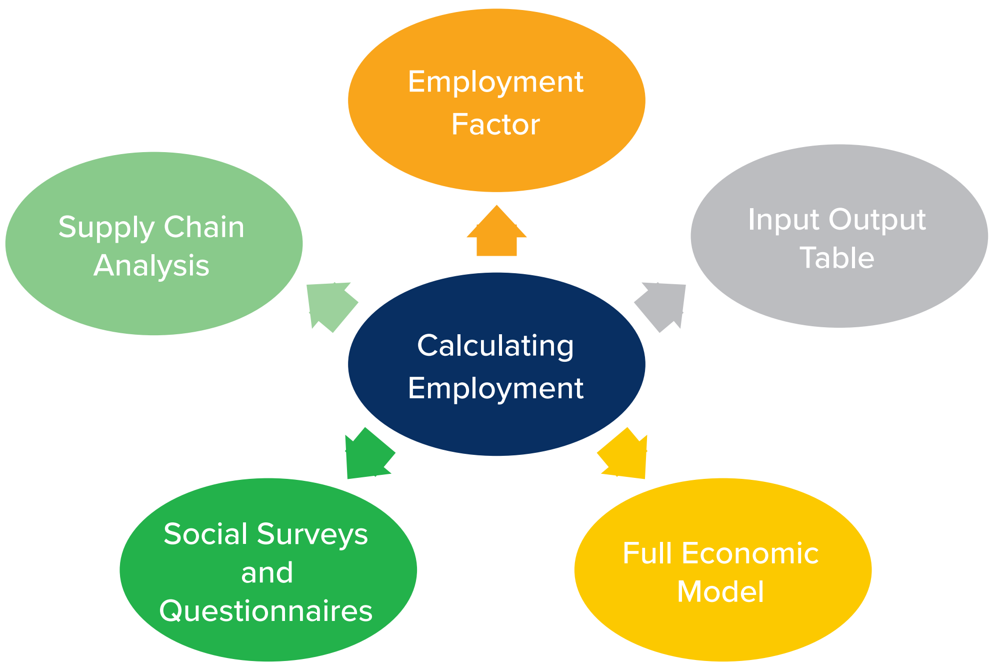
3.4. Social Surveys and Questionnaires

Social surveys and questionnaires could also be used as a method to determine that effect. They only measure direct effect on employment and they require qualified statisticians to identify the type of survey, conduct the questionnaires and analyse them (Blanco & Rodrigues, 2009). However, we can see that it costs money and time, in order to ensure a representative result, but we will only get informed about direct employment.

3.5. Supply Chain Analysis

Acoording to the literature review, another applied methodology is the supply chain analysis and it has been only used for case studies related to Germany (Jenniches , 2018). In the European Union, they adopt the MultiReg model, in order to calculate direct and indirect jobs created in the renewable energy industry (Duscha, et al., 2014). The methodology stands for calculating the demand for cost of investment and production, all over the supply chain of the RES project. Those numbers are then used as inputs in the MultiReg model, and productivity growth rates are also included to take into account changes in productivity.

Figure 1: Different methodologies used to calculate employment on a regional level



3.6. Suggested Methodology to Calculate the Regional Employment Effect in the SEMCs

Based on the literature review, on the scoping missions conducted by the study team in Lebanon, Tunisia and Egypt, and on the outcomes of the regional conference that was held in November 2019 in Cairo, I-O modelling constitutes the best suited methodology. This methodology can be used for the creation of a regional tool to calculate employment in the SEMCs region. It is worth highlighting that this modelling system is the most used to calculate regional employment figures in studies on the energy sector in the European Union, the United States of America and Germany. Hence, based on the data availability and applicability in the region, these models are adequate to be used in regions gathering heterogeneous countries.

Moreover, the main set of data that is required for the I-O method is the I-O table itself which luckily, as will be seen in the coming sections of this proposal, is already available and not extremely outdated for most of the countries in the region. Since renewable energy is relatively a new sector, original I-O tables may not integrate related data separately. Hence, there are some data requirements to construct new tables. Information on important inputs, sub-suppliers, production plan, imports of inputs and exports are crucial to collect. Data related to components and engineering are also important to capture the full picture of this new sector (Lehr, 2019). Expertise and stakeholders' opinion and predictions shall be taken into consideration in terms of employment and development of the energy sector.

Furthermore, going back to the intensity of effects that are taken into account in the measurement of the employment figures, it is worth noting that the I-O method offers the possibility of calculating the direct, indirect and induced employment impact assessment.

3.6.1. Factors Essential for the Construction of a Regional Tool

In general, the model must integrate renewable energy technologies as well as their interactions with other industries in the economy. Data on manufacturers and sub-component manufacturers for renewable energy technologies are necessary, in addition to those for all companies that generate and distribute electricity from renewable energy sources (Blanco & Rodrigues, 2009). Moreover, data related to the value chain of RE projects must also be included, by involving companies working on the measurement and sitting of renewable energy, assessment of its environmental impact and its installation and construction. The tool must include also the employment per sector data as well as the labour workforce survey inputs. Finally, technology prices as well as their respective projections must also be available for the construction of such tools. These prices might come from the international benchmarks or the regional and national numbers, should they exist.

4. I-O Models

First, in order to be able to understand the particularity of their structure, it is important to demonstrate the construction of an I-O table for an impact analysis on renewable energy and energy efficiency industries. As mentioned above, the I-O table presents the interconnection between industries and also among the different steps of the value chains.

Table 2: Simplified Input-Output Table. Source: (Anca & Burcea, 2014)

Branch	Intermediary Consumption				Final Consumption	Capital Formation	Exports	Output
	Agriculture	Manufacturing	Services	Total				
Agriculture	X11	X12	X13	Y1	Y11	Y12	Y13	X1
Manu-facturing	X21	X21	X23	Y2	Y21	Y22	Y23	X2
Services	X31	X32	X33	Y3	Y31	Y32	Y33	X3
Gross Value Added	Z1	Z2	Z3					
Output	X1	X2	X3					

As shown in table 2, the I-O table incorporates all industries, consistent with the structure of the economy. In the rows, the table indicates how the total production of a branch is distributed between intermediate and final demand. The intermediate demand is the purchase of goods and services by different branches of the economy, while the final demand is divided into final consumption, capital formation by households, governments and non-profit institutions serving households and exports (United Nations: Department of Economic and Social Affairs, 1999). In the columns, the added value of each industry is calculated as total inputs minus outputs. Since these tables represent the aggregate economic activity and the interconnection between different industries, RE and EE technologies must be integrated into the table. This is because they are cross-cutting activities and require inputs from other branches, all over their value chain, the manufacturing, installation, and operation (CEDRO-UNDP, 2019).

Table 3: Example for Simplified Input-Output Table

Sector (Branch)	Intermediary Consumption			Total	Final Demand	Output (Production)
	Agriculture	Manufacturing	Services			
Agriculture	5	2	15	22	78	100
Manu-facturing	10	4	30	44	156	200
Services	20	8	5	33	267	300
Gross value added	65	186	250			
Output (production)	100	200	300			

In order to apply an I-O model, it is critical to make sure that it includes renewable energy industries. If it does not exist, new vectors for RE technologies are to be added into the I-O table or technical coefficients of these industries, to be directly inserted in the Leontief inverse matrix (Blanco & Rodrigues, 2009). The rationale behind this is to include all the interactions of the renewable energy technologies with other industries at the national level (Lehr, 2008).

When it comes to the regional level, in order to apply the I-O table methodology, some technical modifications to the national technical coefficients are essential in order to capture regional specifications and characteristics (Miller & Blair, 2009).

Besides the national I-O tables, there are also the so-called regional I-O tables. However, this proposal does not recommend using tools, such as the multi-region input-out (MRIO) table or the RIMS II[(1)] models for the SEM region.

4.1. Applicability in the SEMCs

An input-output table for each country shall inevitably be designed to use the I-O SEMC model. The table below identifies the institutions that calculate and occasionally publish the I-O table in each of the SEMCs. The most up-to-date available tables go back to 2014-2015 for Algeria and Egypt. Additional statistical information can exist for other countries, but they are not available online.

(1) RIMS II is one of the models that can be used on a regional level to capture the change in the demand for inputs of the industry under question, regardless the impact on the production of other industries. It uses several multipliers, to assess the regional impact and they reflect changes in final demand and direct effects. For more information, please refer to (Analysis, 2019)

Furthermore, some countries do not calculate I-O tables, but they rely on the Social Accounting Matrix (SAM) instead, i.e. Morocco. Since SAM can be derived from the I-O table [(2)], statistical institutions will not have any difficulties in calculating the indicators necessary for I-O tables.

For Palestine, it was hard to find any statistics on this. That is why the Palestinian Central Bureau of Statistics – PCBS has been identified only as the potential institution that is eligible to calculate such data.

Table 4 : Availability of input output table across SEMC

Country	Source National Input Output Table	Latest I-O Table Available
Egypt	CAPMAS/ Ministry of planning	2014/2015 CAPMAS
Lebanon	Central Administration of statistics	2004
Libya	-	N/A
Tunisia	Institut National de la Statistique	Yes (2008)
Morocco	Haut-Commissariat au plan - HCP	N/A
Palestine	Palestinian Central Bureau of Statistics - PCBS	Potential institution
Jordan	Department of statistics - DOS	2006
Algeria	Office National des statistiques - ONS	2015

In fact, additional indicators are required for each country in order to create the regional tool: The total employment, employment per gender and per industry are essential to calculate the effect on employment. Such information cannot be found in the I-O table because it is expressed in monetary values and not in physical values.

The World Bank calculates these data for each country. These are available in the World Development Indicators (WDI) database for all SEMCs countries, and the latest data are those for 2018.

It is worth noting that in order to harmonise the monetary unit for all countries and facilitate comparison among them, I-O tables must be converted from local currencies into one internationally recognised currency, which for SEMCs would be the American dollar (USD). Hence, the exchange rate between the local currency and the USD is crucial to be obtained. Central banks identified per country in Table 7, are responsible to calculate exchange rates.

(2) For more information about the linkage between the SAM and I-O table, please refer to (Stahmer, 2004)

Another important data to build the I-O model tool are the employment factors for each technology and for each part of the supply chain. As previously mentioned, this information already exists for Egypt, Lebanon, Tunisia and Morocco (see Table 7 where the correspondent studies are reported). As for the rest of the countries, employment factors can be calculated, under the condition that the number of direct jobs created in the supply chain, per technology and the installed capacity per technology are given.

Table 5 : Required indicators

Required Indicators	Source
Employment, total, per gender, per industry	WDI
Exchange rate local currency/USD	Central banks
Input vectors/employment factors of every technology per supply chain	Previous studies and available data
Installed capacity per technology	IRENA

The information on installed capacity per technology are available on International Renewable Energy Agency (IRENA) website and in the National plans and it can be found in the governmental yearly publication or in the annual reports of the institutions mentioned in Table 6. Nevertheless, direct jobs can be only known through surveys and questionnaires of the concerned stakeholders.

Table 6: Main RE and EE institutions to provide data on the installed capacities in the countries

<table>
<tr><th colspan="3">Institutions</th></tr>
<tr><td>Egypt</td><td>National Renewable Energy Authority</td><td>NREA</td></tr>
<tr><td>Lebanon</td><td>Lebanese Center for Energy Conservation</td><td>LCEC</td></tr>
<tr><td rowspan="2">Jordan</td><td>Department of Statistics</td><td>DOS</td></tr>
<tr><td>National Energy and Research Centre</td><td>NERC</td></tr>
<tr><td rowspan="2">Morocco</td><td>Moroccan Agency for Sustainable Energy</td><td>MASEN</td></tr>
<tr><td>Moroccan Agency for Energy Efficiency</td><td>AMEE</td></tr>
<tr><td>Tunisia</td><td>The National Agency for Energy Management</td><td>ANME</td></tr>
<tr><td>Algeria</td><td>National Agency for the Promotion and Rationalization of Energy Use</td><td>APRUE</td></tr>
<tr><td>Libya</td><td>Renewable Energy Authority of Libya</td><td>REAOL</td></tr>
<tr><td>Palestine</td><td>Palestinian Energy and Environment Research Centre</td><td>PEC</td></tr>
</table>

Since currently RE and EE sectors are dynamic and governments are constantly updating their goals for achieving sustainable development, data for these sectors must be updated on an on-going basis. In order to deliver accurate results, I-O tables must contain the most recent information on capacity installed in real time and not based on announced targets. Therefore, every country must keep its renewable energy and energy efficiency data updated and this job must be assigned to certain institutions responsible of renewable energy and energy efficiency regulations or monitoring. In Table 6, certain institutions that are eligible to take this assignment are suggested. It is recommended that these data are updated annually and reviewed on a quarterly basis.

Table 7 : Detailed information for each country

Indicator	Country	Source
Local and foreign share of investment in USD per technology	Egypt	National statistical as well as national renewable energy and energy efficiency institutions in each of the countries. Further information can be estimated based on data coming from implemented projects in the previous years.
	Lebanon	
	Libya	
	Tunisia	
	Morocco	
	Palestine	
	Jordan	
	Algeria	
Direct jobs (total, permanent and/or part time)	Egypt	(RCREEE, 2017)
	Lebanon	(UNDP-CEDRO, 2019)
	Libya	National estimations based on the real jobs created
	Tunisia	(Lehr, Mönnig, Ben Salem, Missaoui, & Marrouki, 2016)
	Morocco	(Lohse, 2016)
	Palestine	National estimations based on the real jobs created
	Jordan	National estimations based on the real jobs created
	Algeria	(Lehr & Baning, 2019)
Employment factors in the supply chain	Egypt	(RCREEE, 2017)
	Lebanon	(UNDP-CEDRO, 2019)
	Libya	Regional benchmarks/Future national studies
	Tunisia	(Lehr, Mönnig, Ben Salem, Missaoui, & Marrouki, 2016)
	Morocco	(Lohse, 2016)
	Palestine	Regional benchmarks/Future national studies
	Jordan	Regional benchmarks/Future national studies
	Algeria	(Lehr & Baning, 2019)

Indicator	Country	Source
Employment total, per gender, per industry (economic activity)	Egypt	WDI/CAPMAS
	Lebanon	WDI/Central Administration of statistics
	Libya	WDI
	Tunisia	WDI
	Morocco	WDI/ HCP
	Palestine	WDI
	Jordan	WDI
	Algeria	WDI
Exchange rates USD / local currency	Egypt	Central Bank of Egypt – CBE
	Lebanon	Banque de Liban – BDL
	Libya	Central Bank of Libya – CBL
	Tunisia	Banque Centrale de Tunisie – BCT
	Morocco	Bank ElMaghreb
	Palestine	Palestine Monetary Authority
	Jordan	Central Bank of Jordan
	Algeria	Banque d'Algérie
Labor Productivity	Egypt	CAPMAS/ Ministry of planning
	Lebanon	Central Administration of statistics
	Libya	-
	Tunisia	Institut National de la Statistique
	Morocco	Haut-Commissariat au plan – HCP
	Palestine	Palestinian Central Bureau of Statistics - PCBS
	Jordan	Department of statistics – DOS
	Algeria	Office National des statistiques – ONS
Technology prices	Egypt	They can be based on international prices or estimated regionally or nationally if the information exists. Projections exist at the international level.
	Lebanon	
	Libya	
	Tunisia	
	Morocco	
	Palestine	
	Jordan	
	Algeria	

Conclusions

By monitoring the current situation in the SEMCs, it is now clear that a regional tool is needed in the near future to enable capturing the regional effects of the renewable energy and energy efficiency projects on employment. Despite the fact that five of the eight SEMCs currently have national accurate numbers regarding the jobs created, it is essential to have one regional platform to calculate these effects in order to be able to use it as a basis for comparison since the same indicators will be used across all the countries.

Nevertheless, before discussing the regional tool, it is advisable for the remaining countries that did not have any study/tool to calculate employment to establish them. This will not only facilitate the establishment of a regional benchmark but will also help all the countries to have accurate national numbers to be used in the development of the regional tool.

In creating any regional tool, two options can be considered. The first one is to have for each of the countries separate sheets including all the national economic data and just sum up the results at the end in order to get the regional numbers. The second and more complex option is to set regional economic indicators as benchmarks. The second option seems more tempting as it can better capture trade flows among the countries, which are the main elements that will accurately mirror the actual interaction between the SEMCs. By assessing the impact of trade in the regional tool, some countries will be more motivated to increase their local manufacturing. Hence, they will be able to export also to neighbouring countries and increase their local direct and indirect jobs in the RE and EE sectors. This will also help capture the spill-over effect.

In effect, the proposed regional tool for SEMCs requires a combination of the two options. First, a user-friendly graphic interface with linear equations should enable the users from one country to easily obtain results for his/her own country, by exploring different assumptions in future scenarios. Typical indicators to set these scenarios should include pathways for the installation of renewable energy technologies and for increasing energy efficiency, the degree of industrial integration and, thus local production and manufacturing, and prices of renewables and energy efficiency appliances. On the other hand, an important indicator is trade. Thus, the inclusion of trade between the SEMCs will make the respective analyses show the benefits of being part of a regional hub for certain technologies or components. Furthermore,

more information should be gathered on the data collection plan and on the ownership status of the tool in order to ensure the tool is efficiently updated over the years.

With regard to the methodology to be followed, and based on the research conducted, the scoping missions as well as the regional conference results, it is clear that the Input-Output methodology appears to be the best methodology to assess the regional impact of renewable energy and energy efficiency projects on employment. This is due to the type of the data available in the region. Most of national institutions supply their governments with Input-Output tables, which are needed for national accounting. However, Input-Output models measure the impact on final demand only and do not provide a full analysis of the economy. On the other hand, full economic models can evaluate which economic aggregates will be affected by that change and how that change has to occur.

Nevertheless, the full economic models are data and time consuming. Hence, in order to ensure its efficiency, national institutions in the SEMCs region should provide all information needed, including social accounting matrixes, and update them regularly, especially if they aim to measure the full impact on the economy, which favours the usage of the Input-Output tables.

Concerning the effects that should be captured by the regional tool, gender and youth participation are of utmost importance: The tool should be able, even if using qualitative dummy variables, to present an overview of the gender and youth participation in the renewable energy and energy efficiency job markets. Moreover, it would be very interesting to capture the qualifications as well as the level of education of the people working in these fields across the region.

Finally, a regional model requires compatibility between data of all concerned economies. This is why the availability of updated data is necessary to acquire reliable results.

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