Impact on employment and trainings of development in rational use of energy and renewable energy sources in SEMCs

Report

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Summary

The implementation of strong scenarios for the development of renewable energy sources and the promotion of energy efficiency will have multiple socio-economic consequences. This study seeks to quantify and qualify these impacts on employment and training based on a breakdown energy scenario for SEMCs.

We developed a method on the basis of the data available. This highlighted the difficulties associated with a regional approach and the heterogeneous nature of the data available for each production sector.

We set out the challenges and opportunities for employment by sector, focussing especially on the construction industry. We attempt to quantify new jobs created and offer several avenues for refining this research to the local situation and industrial sector.

Keywords: SEMC - Employment – Training – Energy efficiency – Renewable energy

Glossary

In the text

ACAA: Agreements on Conformity Assessment and Acceptance

AFD: *Agence Française de Développement* (French development agency)

AMISOLE: *Association marocaine de l'industrie solaire et éolienne* (Moroccan association for the solar and wind energy industry)

ANAPEC: *Agence nationale de promotion de l'emploi et des compétences* (Moroccan agency for the promotion of employment and skills)

ARENE: *Agence régionale de l'environnement et des nouvelles énergies* (Paris region agency for the environment and new energies)

ATFP: *Agence tunisienne de la formation professionnelle* (Tunisian vocational training agency)

BAC Pro: Vocational baccalauréat qualification

BEP: *Brevet d'études professionnelles* (Vocational diploma)

BTS: *Brevet de technicien supérieur* (Post secondary professional training certificate)

BWEA: British Wind Energy Association

CAP: *Certificat d'aptitude professionnelle* (vocational training certificate)

CAPEB: *Confédération de l'artisanat et des petites entreprises du bâtiment* (French confederation of small constructors and tradesmen)

CDER: *Centre de développement des énergies renouvelables* (Moroccan centre for the development of renewable energy)

CENAFFIF: *Centre national de formation de formateurs et de l'ingénierie de formation* (Tunisian centre for instructor training and training engineering)

CETIME: *Centre technique des industries mécaniques et électriques* (Tunisian mechanical and electrical industries technical centre)

CFL: Compact fluorescent lamps

CNIF: *Centre national de formation de formateurs* (National centre for instructor training)

CRT: *Centre de ressources technologiques* (Technological resources centre)

CRW: Non-Specified Combustible Renewables and Waste - includes industrial waste & non-renewable waste

CSP: Concentrated Solar Power

CTMCCV: *Centre technique des matériaux de construction de la céramique et du verre* (Tunisian technical centre for ceramics and glass construction materials)

DSM: Demand-side management

FFB: *Fédération française du bâtiment* (French construction federation)

FTE: Full-time equivalent

EU: European Union

GPEC: *Gestion prévisionnelle des emplois et des compétences* (Jobs and skills management planning)

GTZ: *Deutshe Gesellschaft für Technische Zusammenarbeit*, German partner organisation

GW: Gigawatt

ICE: *Industrielle de contrôle et d'équipement* company

IMEDER: *Institut méditerranéen des énergies renouvelables* (Mediterranean renewable energy institute)

INSEE: *Institut national de la statistique et des études économiques* (French national institute for statistics and economic studies)

ISTA: *Institut spécialisé de technologie appliquée* (Moroccan Institute of applied technology)

IUP: Vocational university institute

MASEN: Moroccan Agency for Solar Energy

DSM: Demand side management

MEMEE: *Ministère marocain de l'Énergie, des Mines, de l'Eau et de l'Environnement* (Moroccan Ministry for Energy, Mines, Water and the Environment)

Mtoe: Million tonnes of oil equivalent

MW: Megawatt

NACE: Statistical Classification of Economic Activities in the European Community

O&M: Operations and Maintenance

ONE: *Office national de l'électricité du Maroc* (Moroccan electricity board)

PACA: Provence-Alpes-Côte d'Azur region in France

SME: Small and medium enterprises

UNEP: United Nations Environment Programme

PPP: Public-private partnerships

PREMIO: *Production répartie, EnR et MDE, intégrées et optimisées* (Integrated and optimised distributed power generation, renewable energy sources and DSM)

R & D: Research and Development

RE: Renewable Energy

RUE: Rational use of energy

SEMC: Southern and Eastern Mediterranean countries

SIE: *Société d'investissements énergétiques* (Moroccan energy investment company)

STEG: *Société tunisienne de l'électricité et du gaz* (Tunisian Gas and Electricity Company)

ICT: Information and Communication Technologies

VAT: Value added tax

TWh: Terawatt-hour

UfM: Union for the Mediterranean

In the tables

ANME: Tunisian National Agency for Energy Conservation

BTP : *Bâtiment et travaux publics* (Building and Public Work)

CAD: Computer-aided design

CADD: Computer-aided design and drafting

CC: *Certificat de compétence* (Skills certificate)

CFA: *Centre de formation d'apprentis* (Apprentice training centre)

CFMA: *Centre de formation des métiers d'art* (Trade training centre)

CFP: *Centre de formation professionnelle* (Vocational training centre)

CFPTI: *Centre de formation et de promotion du travail indépendant* (Centre for training and promotion of self-employment)

CITP: *Centre industriel technique professionnel* (Vocational technical industrial centre)

CPEP: *Centre privé d'enseignement professionnel* (Private vocational teaching centre)

CQPAT: *Centres de qualification professionnelle des arts traditionnels* (Traditional trade vocational qualification centres)

CSF: *Centre sectoriel de formation* (Sector training centre)

DU: *Diplôme universitaire* (University degree)

DUT: *Diplôme universitaire de technologie* (Bachelor of technology degree)

EPM: *École pratique des Mines* (Mines practical training institution)

ESGT: *École supérieure des géomètres et topographes* (Higher institution for surveyors and topographers)

FST: *Faculté des sciences et techniques* (Faculty of science and technology)

GCCD: Global Control Center Design

ICF: *Institut central de formation* (Central training institute)

IFPRO: *Institut de formation professionnelle* (Vocational training institute)

IFT: *Institut de formation technique* (Technical training institute)

IFTP: *Institut de formation technique professionnelle* (Vocational technical training institute)

INARGEC: *Institut d'architecture et de génie civil* (Architecture and civil engineering school)

ISET: *Institut supérieur des études technologiques* (Higher technological studies institute)

ISSAT: *Institut supérieur des sciences appliquées et de technologie* (Higher institute of applied sciences and technology)

IT: *Institut de technologie* (Technology Institute)

ITA: *Institut de technologie appliquée* (Applied technology institute)

ISTA: *Institut spécialisé de technologie appliquée* (Specialist institute of applied technology)

OFPPT: *Office de la formation professionnelle et de la promotion du travail* (Moroccan vocational training and work promotion office)

QSE: Quality, safety, environment

SWH: Solar Water Heater

I. Introduction

1. Expectations of this study

This study is part of the work performed by Plan Bleu with the support of the EIB (European Investment Bank) under the Mediterranean Strategy for Sustainable Development.

In accordance with the terms of reference, it is based on the breakdown scenario hypotheses produced by Plan Bleu and the OME[1] for Southern and Eastern Mediterranean countries[2] and serves to qualify its "jobs and skills" section in order to:

- put a figure on the economic and social changes and opportunities involved in the breakdown scenario (job creation and destruction, etc.)
- characterise these jobs: Which activities and which segments of the value chain will be affected? What are the opportunities for diversification, industrialisation, etc.? What qualifications will be impacted?
- assess training requirements to achieve this scenario.

The breakdown scenario hypotheses are therefore taken as input data. We briefly restate their main conclusions in Part I, but do not examine in detail the hypotheses set by Plan Bleu and the OME with the support of their network of experts.

We cover the following sectors:

- from the perspective of energy supply: primary energy (gas, oil) and power generation (from conventional and renewable energy sources) (see II);
- from the perspective of energy demand: transport, industry and construction. This study devotes special attention to the latter due to its importance for SEMCs economies (see III).

We have endeavoured to provide an overall figure for all SEMCs, despite the fact that this presents significant methodological difficulties and makes it a challenge to represent the precise industrial situation of the economies studied and the specific nature of their training systems. All the results pertaining to this geographical scope are presented in the main part of the study. It is built on specific country studies for Tunisia, Morocco, Egypt and Turkey which are presented in the Appendices available on the Plan Bleu website.

2. Methodology

2.1. Method adopted for putting a figure on the employment impact of the breakdown scenario

Strictly speaking, putting a figure on the impact of an energy scenario on employment requires a detailed understanding of the reality of the main industrial sectors affected in each of the countries covered by the study.

Relationships between industries (flow of intermediate consumption from one industry to another), the penetration rate (proportion of products and services produced locally or imported) and the work productivity of supply sectors are, in particular, key parameters for understanding the possible impact of changes in the energy mix on employment.

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[1] The breakdown scenario is an application of the OME reference model (based on 2007 data) with strong hypotheses for the penetration of renewable energy sources and energy efficiency. The development of such a scenario also depends on the implementation of the objectives and undertakings taken by countries at a national level.

[2] By analogy with the EU Climate package (20/20/2), the breakdown scenario could be termed a 30/30/30 scenario. Its 2030 outlook involves raising energy efficiency by 27%, the share of renewable energy sources in primary energy over 23% and lowering CO_2 emissions by 35%.

Take, for example, the construction of a power plant:

- how many jobs will this investment generate in the local economy?
- in terms of construction work, engineering work, equipment manufacturing, installation, operation and maintenance, once the plant is built. It depends entirely on the volume of purchases made from other sectors (equipment goods, etc.), the work content of these productions and the proportion of equipment or services imported / provided locally at each stage of the investment process.

This **approach** - which may be referred to as a "**bottom-up approach**", in the sense that it is based on local realities – **is very demanding**, both in terms of statistical data to be collected and time to be devoted to analysing it. It depends on sufficiently accurate knowledge of the area to make up for the limits of the statistical system, which comes up against the difficulty of taking into account the informal economy, highly developed in SEMCs.

In this case, these difficulties are magnified by:

- The number of countries to cover in order to provide an overall figure for all SEMCs;
- The fact that construction[3] is one of the sectors to focus on.

These difficulties were partially anticipated by the terms of reference, which anticipated a focus on four countries (Tunisia, Morocco, Egypt and Turkey) and combination with a "top-down" approach extrapolating the results from these focus countries and previous research carried out by Syndex (on the impact on employment) and Fondaterra (on the impact on skills).

Trips were organised to two of the four countries concerned (Tunisia and Morocco) in order to gather the material necessary for a bottom-up approach on these 4 countries.

These trips were very useful in a number of ways: they involved meeting decision-makers, gathering information on the energy and construction industries, strategy data and analysis of the key players, etc.

However, they did not provide an opportunity to collect the statistical data required for a bottom-up analysis of the breakdown scenario's impact on employment in the countries in question. Despite meetings with the bodies responsible for publishing this data, we were unable to obtain the statistics required for implementing this approach. In Tunisia, regime change has obviously made it difficult to collect this data.

These trips were used for specific country studies of Tunisia, Morocco, Egypt and Turkey, which are presented in full in the Appendix.[4]

Due to the difficulties encountered in collecting the information required, **more significance had to be given to the top-down approach** than initially envisaged.

We have been unable to piece together the technical ratios for the four economies that are being specifically studied on the basis of national statistics, and have used ratios (full-time equivalents per €1000 of investment or turnover, or per MW for electricity) produced on the basis of studies previously carried out by Syndex and/or other reference bodies and corrected in order to take into account the specific nature of the economies in question.

This approach should therefore be supplemented later with further data collection work in order to develop more of a bottom-up approach.

The details pertaining to the method adopted for each sector are given in the methodology report in Appendix 1 below and in the first section of the Appendices on the Internet.

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[3] The construction sector raises particular difficulties due primarily to: 1) the size of the informal economy associated with it; 2) the diversity of sectors that it uses: construction materials (cement, glass, ceramics, composite materials requiring chemical skills), construction, distribution, trade, property development, as well as heating, air conditioning, household appliances, electronics, compact fluorescent lamps, etc.

[4] available on the Plan Bleu website, http://www.planbleu.org/publications/energie_cc_batimentFR.pdf

2.2. Method adopted for estimating training requirements

With regard to skills assessment, the goal of the study was to get an overview of existing training and an assessment of the gaps to be filled in order to meet training requirements created by the breakdown scenario.

The existing training offer can only be assessed country by country, and on the basis of data collected by meeting with key players in the initial training and continuing professional development system.

This analysis was carried out for Tunisia and Morocco and is given in the Internet Appendices which show the specific country analyses.

The strategic workforce planning parts of this study, which bring together the analyses of the South and Eastern Mediterranean region as a whole, are based on the analysis of requirements arising from the breakdown scenario, and they cannot be compared to the existing situation.

II. Breakdown energy scenario hypotheses: outlook to 2030

Nota Bene: The results from the energy scenarios used in this study are based on work carried out by Plan Bleu and the Observatoire méditerranéen de l'énergie (OME). Data were established in 2009-2010. An upcoming publication (June 2012) will present an updated version of the breackdown scenario.

1. The business-as-usual scenario

We shall first restate the results of the business-as-usual scenario developed by the *Observatoire méditerranéen de l'énergie* (OME). The results of this business-as-usual scenario are detailed in the OME's publication "Mediterranean Energy Perspectives", printed in December 2011, which covers a geographical area of all the Mediterranean countries. Data comes from national and international sources and companies that are members of OME. The reference year is 2007 for Northern Mediterranean countries (NMCs) and 2009 for Southern and Eastern Mediterranean countries (SEMCs). Business-as-usual scenario forecasts are based on projects and objectives that already exist and/or are already in progress. Results are broken down by sub-sector and energy source.

In the business-as-usual scenario, primary energy demand in the Mediterranean is set to grow by 43% between 2007 and 2030, reaching approximately 1,416 Mtoe in 2030, with hydrocarbons continuing to dominate the energy mix. For SEMCs, energy demand is set to double between 2009 and 2030, reaching approximately 610 Mtoe in 2030, against 311 Mtoe in 2009, and electricity demand should almost triple over the same period, from 556 TWh in 2009 to 1,500 TWh in 2030 (with additional capacity to be constructed of + 193 GW, of which + 72 GW from renewable energy sources, by 2030).

2. Hypotheses adopted for the SEMCs breakdown scenario

A brief definition of the breakdown scenario would be to say that it is a 30/30/30 scenario comparable to the proactive 20/20/20 scenario of the Northern countries and the EU (as part of the Climate and Energy package).

Combined results for the entire Mediterranean give the following for 2030:

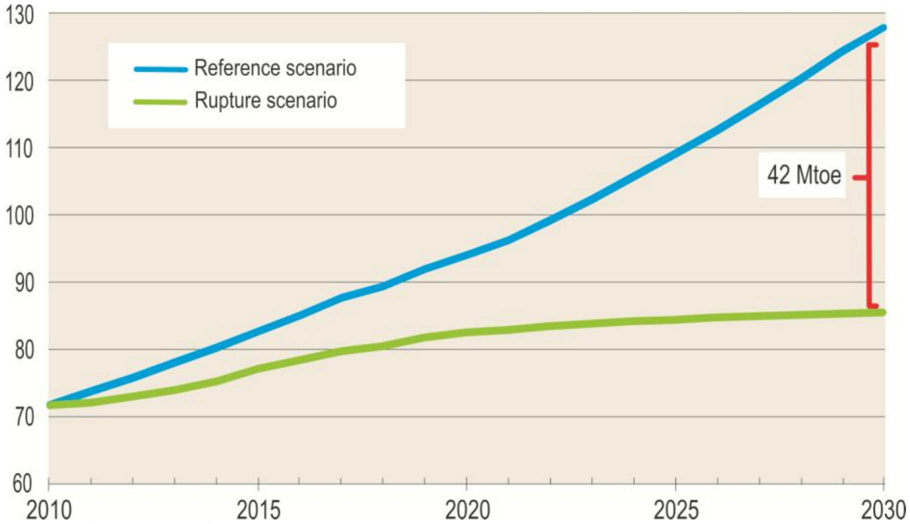
- **23 %** penetration **of renewable energy sources** in the primary energy sector (and 37% in power generation),
- approximately **27 % in energy savings from increased energy efficiency**,
- **35% reduction in CO_2** emissions.

2.1. Controlled energy consumption

By 2030, SEMC energy demand should be down by approximately 25% in the breakdown scenario (compared to the business-as-usual scenario), saving approximately 150 Mtoe for SEMCs (equivalent to total current consumption across North Africa, from Morocco to Egypt). The residential construction sector alone should contribute to approximately 42 Mtoe of savings in 2030, a 29% reduction compared to the business-as-usual scenario.

The electricity sector will contribute huge energy savings to the breakdown scenario (estimated at over – 270 TWh), thanks to power generation from renewable sources, but also from actions to improve energy efficiency in the various consumption sectors, starting with construction (savings of over 158 TWh of electricity by 2030 if efficient buildings are constructed).

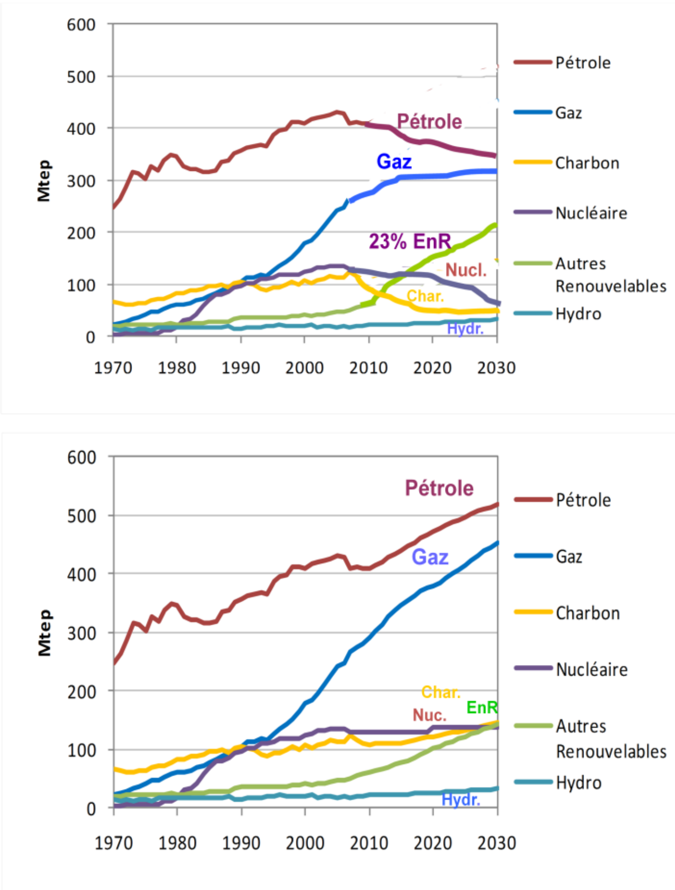
Figure 1 - Final energy consumption curves for SEMC residential sector according to the scenario



Source: From Plan Bleu construction sector study - 2010

In this breakdown scenario, the Plan Bleu sector studies (like those on energy efficiency in the construction industry[5]) were used to produce the hypotheses. The approach for the other sectors has not, however, been analysed in as much detail as the construction industry.

Figure 2 - 2030 business-as-usual scenario and breakdown scenario

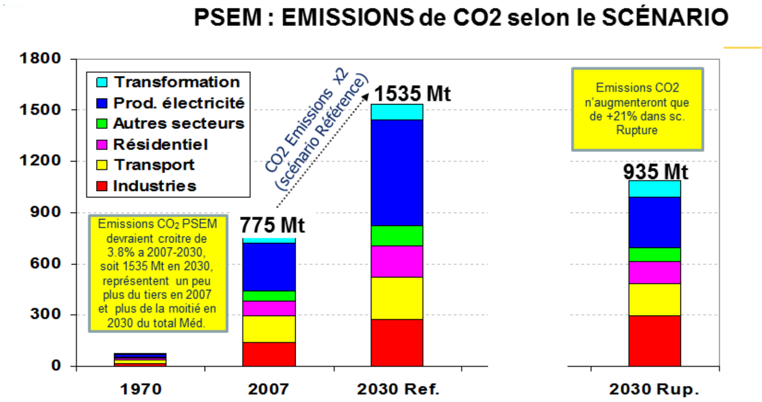


Source: OME, Plan Bleu

[5] See regional report available at www.planbleu.org

CO_2 emissions in SEMCs will therefore drop significantly in the breakdown scenario, with a reduction of a third by 2030 compared with the business-as-usual scenario (-31% to be precise).

Figure 3 - SEMCs: CO_2 emission as per scenario



Source: OME, Plan Bleu

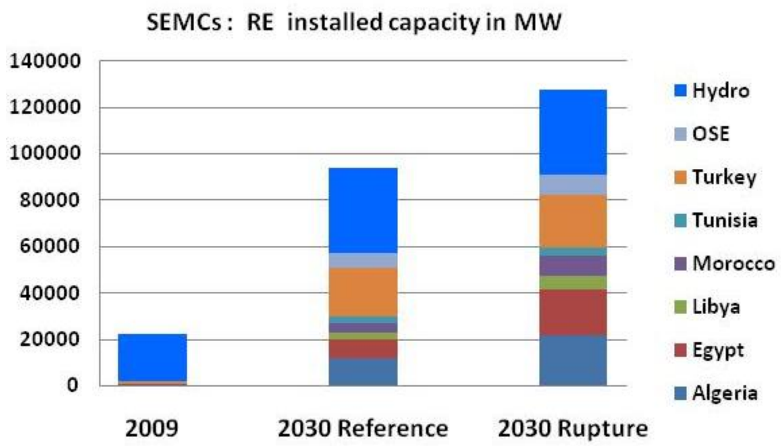
2.2. Energy offer: strong development in renewable energy sources

With regard to renewable energy sources, the latest large-scale projects set up in SEMCs include three hybrid solar power plants with a total capacity of 772 MW (with a little over 70 MW from solar energy) which were commissioned between 2009 and 2011 - one in Ain Beni Mathar (Morocco) in 2009, one in Kurimat (Egypt) in 2010 and one in Hassi R'Mel (Algeria) in July 2011[6].

In 2009, total renewable energy capacity of installations in SEMCs was 22,513 MW (of which 91% was hydroelectric). Plan Bleu's breakdown scenario estimates that 132,700 MW could be deployed (36,700 MW from hydroelectricity and 96,000 MW from other renewable energy sources), involving additional construction of 110,000 MW of new renewable energy capacity, as opposed to 72,000 MW in the business-as-usual scenario, five or six times the amount in the current Mediterranean Solar Plan (20 GW).

The breakdown scenario therefore predicts that renewable energy sources will represent 44% of power generation capacities for SEMCs in 2030.

Figure 4 - Power generation capacities of renewable energy installations according to the scenarios



Source: OME, Plan Bleu

However, examination of national development plans for renewable energies in the SEMCs shows that countries currently have ambitious forecasts:

[6] See the photos of the three plants recently commissioned in Algeria, Egypt and Morocco at the end of this section.

- Four countries (Algeria, Egypt, Morocco and Turkey) alone generate over 51,000 MW.
- Algeria was the last country to publish its new renewable energy programme in March 2011 which forecasts 12,000 MW by 2030 (nearly 40% of the anticipated power plant fleet) and also additional development of 10,000 MW, if European countries express import needs.
- For Morocco, the solar plan forecasts 4000 MW (2000 MW from solar energy and 2000 MW from wind energy). The call for tenders for the construction of the first solar power plant at Ouarzazate has already been issued and constructors are currently being selected.
- Egypt forecasts over 7,200 MW from wind energy and Turkey 20,000 MW from wind energy.

At the end of this section, a few photos showing actual constructions show the progress in the construction of Concentrated Solar Power (CSP) plants in the SEMCs and CSPs already in service in Spain. Spain now has installations producing over 20,000 MW from renewable energy sources.

This breakdown scenario could be realised via the European project 'Paving the Way for the Solar Mediterranean Plan' (PWMSP) led by the European Commission, or other projects that complement the PWMSP such as the Desertec project (an initiative by private industrial companies, especially from Germany) or MedGrid (which aims to develop power grids, and particularly tie lines).

This Mediterranean Solar Plan is one of the six priorities of the Union for the Mediterranean (UfM).

In performing this energy outlook study for 2030, Plan Bleu wishes to show that all Mediterranean countries seem to be committed to a breakdown scenario in which renewable energy sources and energy efficiency policies will make a real difference and which should contribute to making the Euro-Mediterranean area a platform for exchange where peoples on both shores and future generations are able to prosper, while paying careful attention to the conservation of their energy resources and environment.

Figure 5 – CSP – Gas hybrid plant of Ain Beni Mathar (Morocco)

Figure 6 – Solar - Gas hybrid plant of Hassi R'Mel (Algeria)

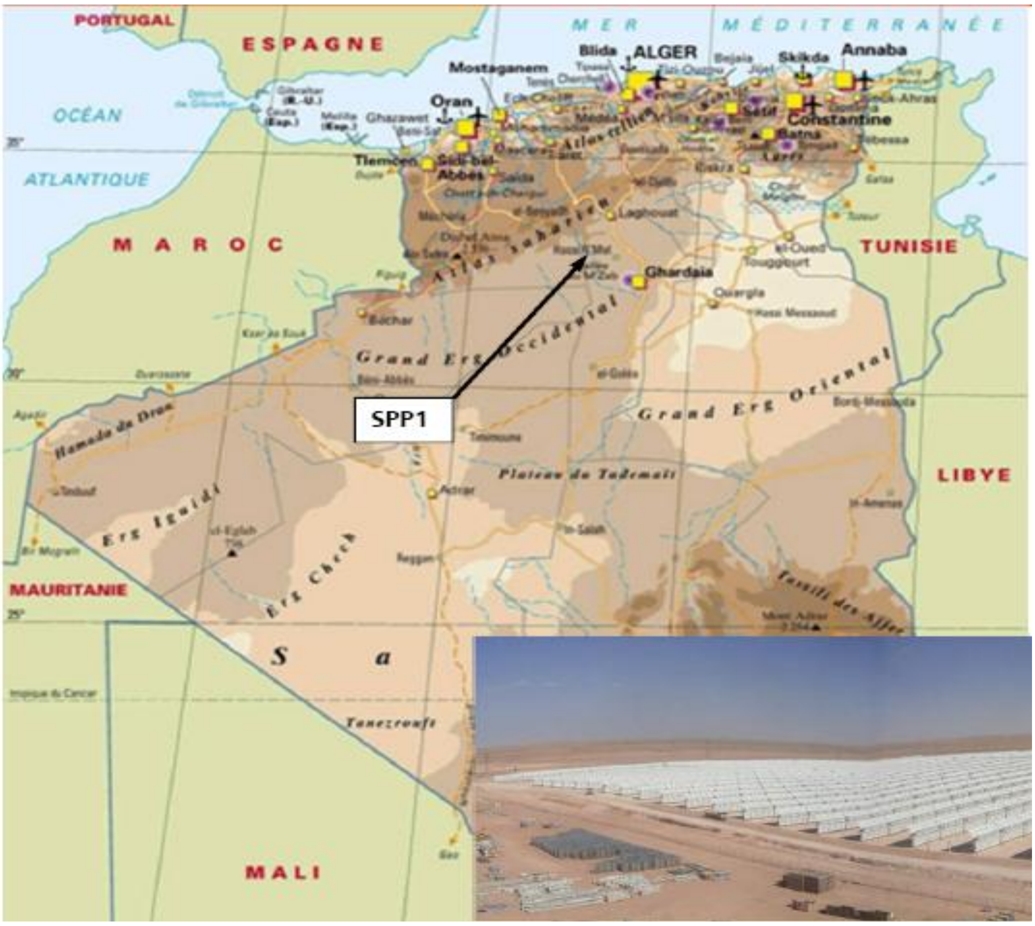


Figure 7 – Solar plants PS 10 and PS 20 in Sevilla (Spain)

Figure 8 – Solar plant in Solnova (Spain)

Figure 9 – Wind farm of Zafarana (Egypt)

III. Employment impact of the breakdown scenario on energy production sectors

This part presents changes in employment resulting from the breakdown scenario hypotheses for the energy offer. Of course, the size of the energy offer is partly correlated to changes in demand (Part 3).

1. Changes to the primary energy offer

1.1. The strategic role of SEMCs in the supply of oil and gas to NMCs

The Mediterranean region holds 5% of world oil and gas reserves, and they are concentrated in the South. Mediterranean countries, and especially the SEMCs, have proven reserves of around 8,600 million tonnes (Mt) of oil and approximately 9,000 billion m^3 (Gm^3) of gas. Most of these reserves of gas and oil are concentrated in Libya, Algeria, Egypt and Syria. These four countries have well developed infrastructure for the production of oil and gas and for exporting hydrocarbons, primarily to Europe[7].

At current production levels, known oil reserves have a lifetime of roughly thirty years, with fifty years for gas reserves. There are approximately 9 billion tonnes of coal reserves in the region, concentrated in Greece and Turkey.

Table 1 - Oil and gas reserves and production in the Mediterranean (2007)

	Oil			Natural Gas		
	Reserves (Mt)	Production (Mt)	R/P Ratio (years)	Reserves (Gm^3)	Production (Gm^3)	R/P Ratio (years)
Algeria	1545	95	16	4580	86,5	53
Egypt	600	34,6	17	2170	55	39
Libya	5700	91,8	62	1540	15,9	97
Syria	409	19,8	21	360	5,5	65
Tunisia	90	4,2	21	97	2,7	36
Italy	99	5,2	19	120	8,4	14
Other countries	128			137		
Mediterranean	**8571**	**256**	**33**	**9004**	**178**	**51**

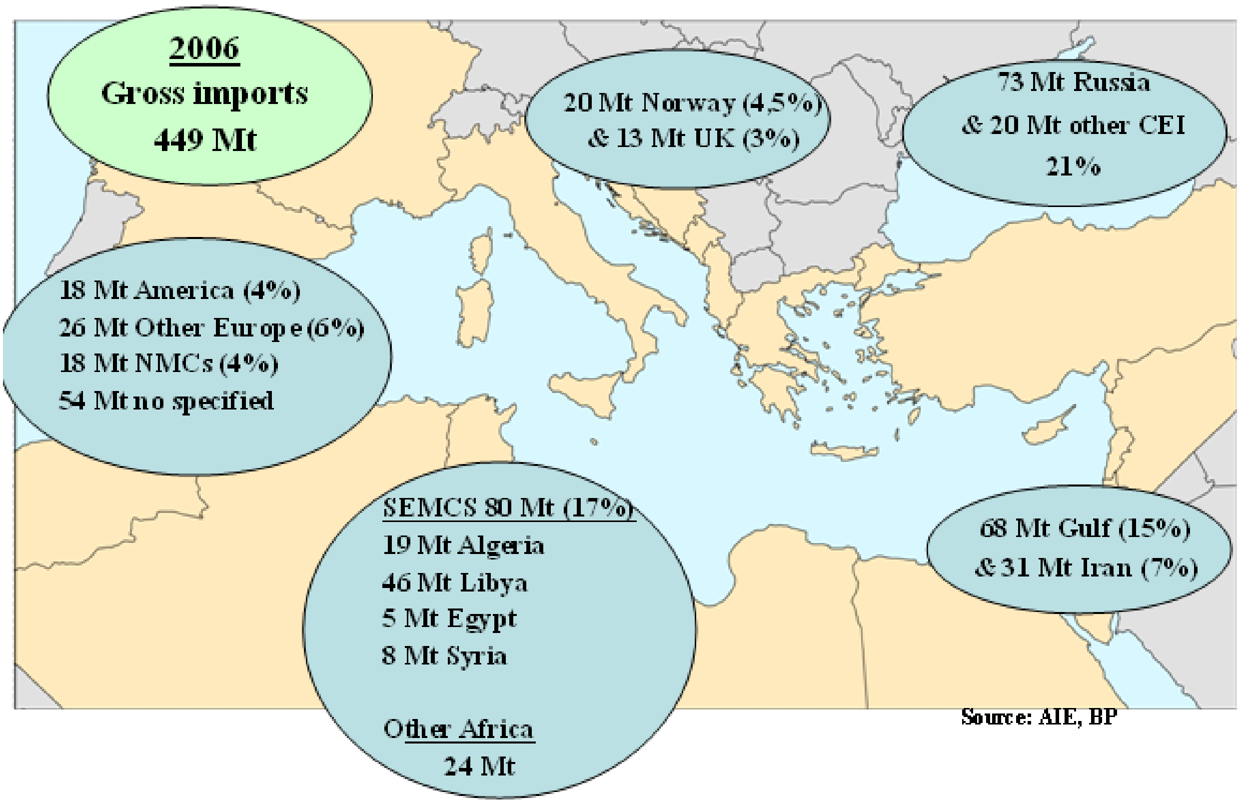
Source: Plan Bleu papers, No. 6

Annual hydrocarbon production in the SEMCs is 245 Mt of oil, more than 165 Gm^3 of natural gas and approximately 12 Mt of LPG. Refining capacity is approximately 500 Mt per year (more than 11% of global capacity) for the 89 Mediterranean refineries of which 34 are located in the SEMCs and have a capacity of 152 Mt per year. This infrastructure makes for an export level of 170 Mt of crude oil per year. It should also be noted that a large proportion of the oil exported by countries in the Gulf and Caspian Sea regions passes through Egypt and Turkey.

[7] Plan Bleu papers, No.6: Infrastructures and sustainable energy development in the Mediterranean: outlook 2025, El Habib El Andaloussi.

1.1.1. Inadequate regional trade between SEMC countries, with more trade between SEMCs and NMCs

Figure 10 - Mediterranean oil supply in 2006



Source: *Plan Bleu papers,* No. 6 – data from IEA, BP

The SEMCs produce roughly one hundred million tonnes of crude oil and supply over 25% of the requirements of Southern European countries (France, Greece, Italy, Portugal and Spain) and over 44% of natural gas requirements in France, Italy, Spain, Portugal, Greece and Slovenia.

As for oil, Mediterranean countries depend on twenty-six countries, including four in the Mediterranean region (Algeria, Egypt, Libya and Syria). The largest sources in 2006 were Russia, Saudi Arabia, Libya, Iran, Norway, Algeria, the UK and Nigeria. They imported 22% from the Mediterranean region itself, followed by CIS countries (21%), the Middle East (15%, 9% of which came from Saudi Arabia), Europe (13%, 5% from Norway and 3% from the UK), the Caspian Sea region (11%, including 8% from Iran), and Africa (5%, including 3% from Nigeria).

With regard to natural gas, Mediterranean countries depended on fourteen exporting countries in 2007, including three in the Mediterranean region (Algeria, Egypt and Libya). The three exporting countries in the Southern Mediterranean produced more than 73 Gm^3 in 2007, and supplied over 35% of gas requirements in France, Italy, Spain, Greece, Slovenia and Turkey. The main sources were Russia (29%), followed by Algeria (26%), Norway (13%), Nigeria (8%), the Netherlands (7%), Iran (3%) and the Middle East (2%). Algeria exported 54 Gm^3 within the Mediterranean (out of a total of 59 Gm^3 in 2007). Libya exported exclusively within the Mediterranean (Italy and Spain). Half of Egypt's exports (8 Gm^3) were delivered within the Mediterranean. Lebanon started to receive its first gas imports via Syria before the end of 2009. In 2007, leading importers were Italy (approximately 75 Gm^3), France (47 Gm^3), Spain (35 Gm^3) and Turkey (35 Gm^3), together representing 93 % of total imports within the Mediterranean.

This situation results in an interdependence in the Mediterranean energy system with regions within and outside the Mediterranean and between the North and the South, between importer and exporter countries.

1.2. What are the consequences for employment of reducing growth in primary energy demand in the SEMCs and increasing supply to the NMCs?

1.2.1. Growth in primary energy production in the SEMCs

For all Southern Mediterranean countries, the breakdown scenario has primary energy production increasing between 2007 and 2030 at an annual rate of 1.89%, due to:

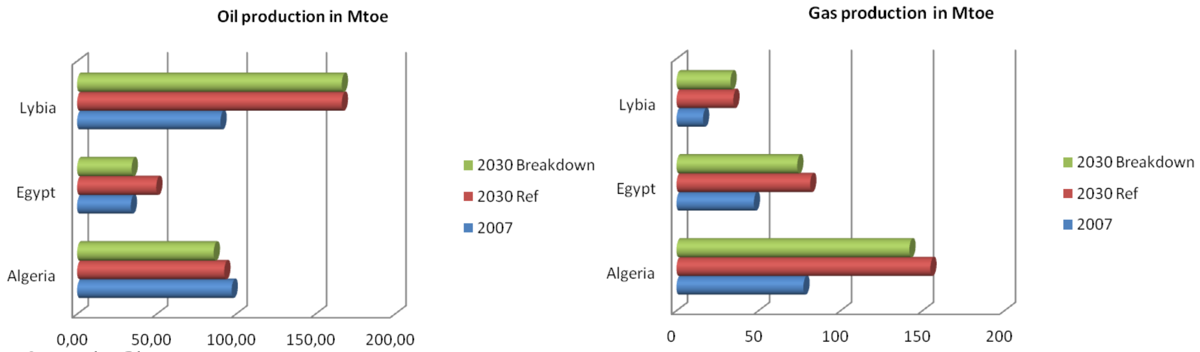
- an increase in primary energy demand: + 1.92 % per year;
- and an increase in net exports.

Table 2 – Progressions of primary energy production

Primary energy production SEMCs (Mtoe)	2007	2030 Reference	2030 Breakdown	2007/2030 Ref	2007/2030 Breakdown
Nets Imports/Exports	126	107	191	-0,73%	1,82%
Primary energy total demand	299	609	463	3,14%	1,92%
Primary energy production	425	716	654	2,29%	1,89%

Source: OME, Plan Bleu

Figure 11 – Progressions of Oil and gas production



Source: OME, Plan Bleu

In 2007, 85% of primary energy production was concentrated in just three countries: Algeria, 41%; Libya, 25%; and Egypt, 19%.

By 2030, the breakdown scenario has these three countries representing nearly 90% of primary energy production for SEMCs, with 35% for Algeria, 35% for Libya and 19% for Egypt.

For Algeria and Egypt, growth of primary energy production is led by gas while crude oil production would drop slightly, stabilising at its 2007 level at best. Libya would be the only country in the Southern Mediterranean to see an increase in oil and gas production.

Algeria, Libya and Egypt are not the only SEMCs to see their primary energy production increase, under the combined effect of their exports and final energy demand. Turkey sees its primary energy production double over the same period under all scenarios.

For Turkey, this growth in production is not linked to primary energy exports but the development of renewable and nuclear energy. Overall, renewable and nuclear energy are set to represent half of primary energy production by 2030 in the breakdown scenario (and the business-as-usual scenario). Coal remains the second contributor to primary energy production, while other fossil fuels (oil and gas) are all imported.

Table 3 - Primary energy production in SEMCs

Primary energy production Morocco *(Mtoe)*	2007	2030 Ref	2030 Breakdown	2007/2030 Ref	2007/2030 Breakdown
Net Imports/Exports	-14	-37	-23	4,16%	2,05%
Primary energy total demand	15	41	29	4,56%	3,03%
Primary energy production	0	4	6	13,69%	15,82%

Primary energy production Algeria *(Mtoe)*	2007	2030 Ref	2030 Breakdown	2007/2030 Ref	2007/2030 Breakdown
Net Imports/Exports	138	167	169	0,85%	0,88%
Primary energy total demand	37	83	66	3,60%	2,56%
Primary energy production	175	250	235	1,58%	1,29%

Primary energy production Tunisia *(Mtoe)*	2007	2030 Ref	2030 Breakdown	2007/2030 Ref	2007/2030 Breakdown Rupt
Net Imports/Exports	2	-6	-6	-204,8%	-204,8%
Primary energy total demand	9	18	15	2,8%	1,9%
Primary energy production	11	12	9	0,2%	-1,2%

Primary energy production Lybia *(Mtoe)*	2007	2030 Ref	2030 Breakdown	2007/2030 Ref	2007/2030 Breakdown
Net Imports/Exports	86	167	167	2,90%	2,90%
Primary energy total demand	20	35	34	2,45%	2,29%
Primary energy production	107	202	201	2,82%	2,79%

Primary energy production Egypt *(Mtoe)*	2007	2030 Ref	2030 Breakdown	2007/2030 Ref	2007/2030 Breakdown
Net Imports/Exports	15	22	22	1,70%	1,70%
Primary energy total demand	69	122	103	2,50%	1,76%
Primary energy production	84	144	125	2,37%	1,75%

Primary energy production OSE *(Mtoe)*	2007	2030 Ref	2030 Breakdown	2007/2030 Ref	2007/2030 Breakdown
Net Imports/Exports	-25	-50	-50	3,13%	3,13%
Primary energy total demand	51	83	58	2,15%	0,61%
Primary energy production	26	33	8	0,99%	-4,87%

Primary energy production Turkey *(Mtoe)*	2007	2030 Ref	2030 Breakdown	2007/2030 Ref	2007/2030 Breakdown
Nets Imports/Exports	-73	-157	-88	3,36%	0,78%
Promary energy total demand	98	228	158	3,73%	2,08%
Primary energy production	25	71	70	4,66%	4,60%

Source: Plan Bleu, OME

1.2.2. Employment impact in oil and gas production

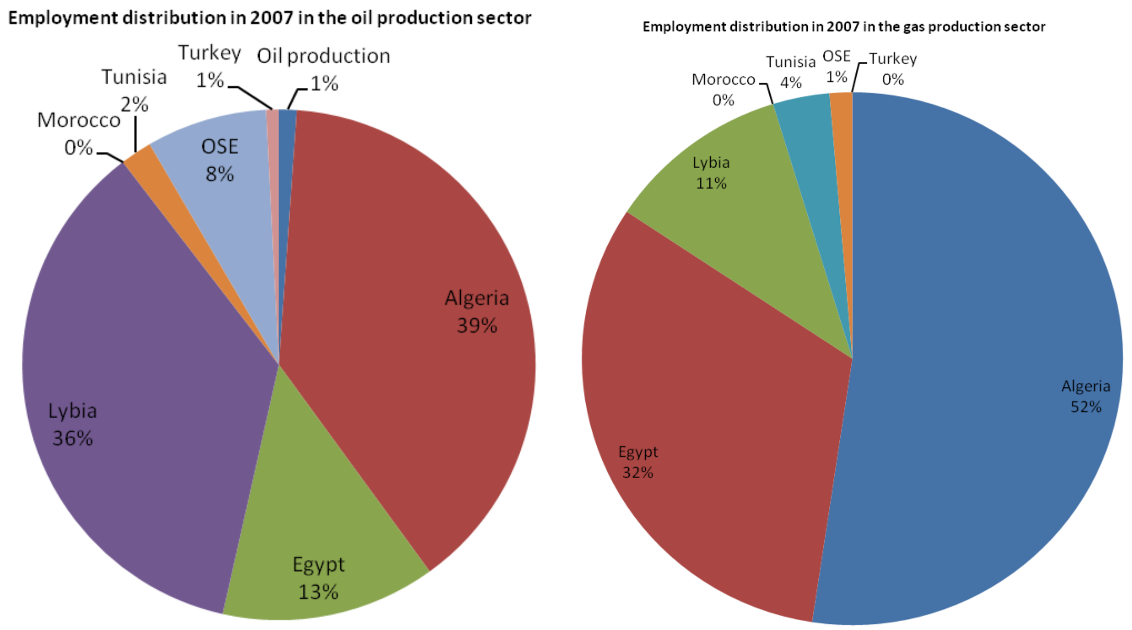
There are few statistics for the SEMCs which give insight into employment in the oil and gas industries in each country that can be used to properly examine the employment situation in extraction, refining and petrochemistry, let alone throughout the downstream sector and especially in the distribution of oil products or in port logistics and transport of oil products and gas. However, by using data from the ILO, Eurostat and BP[8], we can get an idea, albeit imperfect, of employment in the oil extraction and refining sector.

Employment in oil and gas production could be estimated at roughly 300,000 FTE jobs in 2007, with 59% of that in the oil production sector, and 41% in the gas production sector. These workforce numbers do not take into account logistics.

For oil production, jobs are concentrated in the three main producing countries: Algeria, 40% of the workforce; Libya, 37% of the workforce; Egypt, 14% of the workforce. In the gas sector, 52% of jobs are concentrated in a single country: Algeria.

[8] ILO, *Le dialogue social et les relations professionnelles dans l'industrie du pétrole* (Cross-company dialogue and professional relations in the oil industry), Geneva, 2009. Eurostat: Energy: a key sector for the Mediterranean partner countries, 57/2009. BP, Statistical review, June 2011.

Figure 12 - Employment distribution in oil and gas sectors



Source: Syndex

According to the breakdown scenario, by 2030, employment in the oil and gas production sector in the SEMCs could rise to 422,000 FTE jobs, distributed as follows:

- Oil: 208,000 FTE jobs (as opposed to 241,000 for the business-as-usual scenario)
- Gas 215,000 FTE jobs (as opposed to 242,000 for the business-as-usual scenario)

Table 4 – FTE employment

Oil production	2007	2030 REF	2030 Breakdown	Breakdown 2007/2030
Algeria	70 000	66 665	61 890	-0,53%
Egypt	24 319	35 862	24 698	0,07%
Lybia	64 942	119 906	119 906	2,70%
Morocco				
Tunisia	3 600	3 129	1 069	-5,14%
OSE	13 680	15 994	33	-23,06%
Turkey	1 440			
SEMCs	177 981	241 556	207 596	0,67%
Gas production	2007	2030 REF	2030 Breakdown	Breakdown 2007/2030
Algeria	65 000	130 019	119 270	2,67%
Egypt	39 609	68 468	61 839	1,96%
Lybia	13 600	29 101	27 652	3,13%
Morocco				
Tunisia	4 199	2 850	2 030	-3,11%
OSE	1 680	11 758	4 095	3,95%
Turkey				
SEMCs	124 089	242 197	214 885	2,42%

Note: "OSE" other south east
Source: Syndex

In the oil production sector for all SEMCs, employment is set to grow slowly across the period at a medium annual rate of less than 1%. That said, if productivity is taken into account, employment is set to decrease, except for Libya where employment should virtually double over the period.

Conversely, in the gas production sector, employment should grow by 72% over the period according to the breakdown scenario, at a rate of 2.4% per year.

1.2.3. Employment impact in the refining sector

Employment in SEMCs refineries in 2007 can be estimated at approximately 22,000 FTE jobs.

Depending on the scenarios, forecast changes in employment vary a great deal:

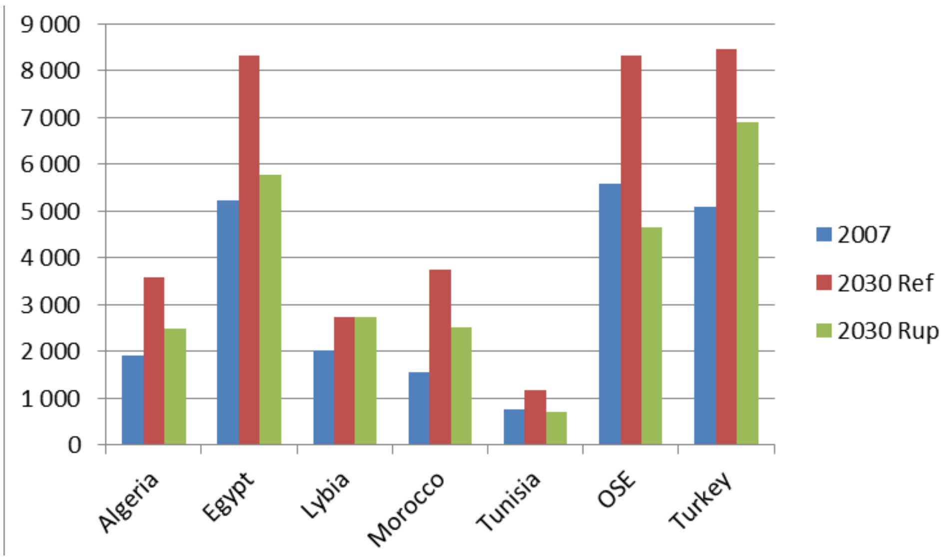
- for the business-as-usual scenario, strong growth in demand for oil products, especially in the transport sector, leads to sustained growth in the refining sector;
- in the breakdown scenario, the penetration of more efficient vehicles contains demand in the transport sector.

Table 5 – FTE employment

Raffinage	2007	2030 Ref	2030 Breakdown	2007/2030 Ref	2007/2030 Breakdown
Algeria	1 924	3 574	2 476	2,73%	1,10%
Egypt	5 226	8 326	5 760	2,05%	0,42%
Lybia	2 019	2 738	2 738	1,33%	1,33%
Morocco	1 558	3 741	2 526	3,88%	2,12%
Tunisia	760	1 166	693	1,88%	-0,40%
OSE	5 577	8 310	4 642	1,75%	-0,80%
Turkey	5 091	8 446	6 898	2,23%	1,33%
	22 155	36 301	25 731	2,17%	0,65%

Note: "OSE" other south east
Source: OME, Plan Bleu

Figure 13 - Jobs in the refining sector (FTE)



Source: Syndex

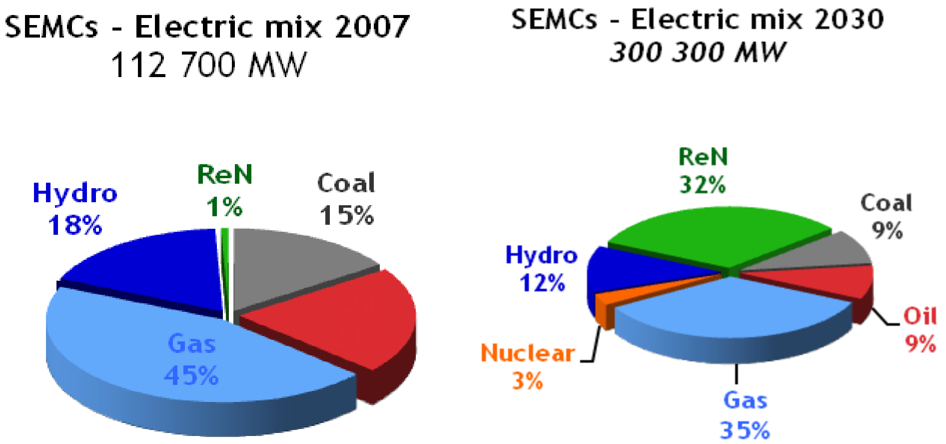
From the perspective of employment, if demand stays at its 2007 level in the breakdown scenario, growth in the SEMCs refining sector workforce will slow towards 2030, with a medium annual growth of 0.65%, unless other factors arise.

Overall, refineries for all SEMCs are lacking investment. Achieving the breakdown plan objective requires significant investment for facilities to be able to deliver refined products compatible with new and more efficient engine technologies which pollute less and release less CO_2.

2. Employment impact in power generation

2.1. Changes in the electricity mix by 2030

Figure 14 – Progression of the electric mix by 2030



Source: OME, Plan Bleu, breakdown scenario (capacity of installations)

The breakdown scenario forecasts that the capacity of current installations in Southern Mediterranean countries will rise from 112 GW in 2007 to approximately 300 GW in 2030. This corresponds to 12 GW less than business-as-usual scenario forecasts due to energy efficiency.

In 2007, renewable energy was the 3rd electrical energy source in the region, after gas (45%) and oil (21%). It came primarily from hydro power (18%), especially in Turkey (where it accounted for 20 GW). Other renewable energy sources (0.7%) concentrated primarily on wind energy (0.6%).

In 2030, the breakdown scenario forecasts that renewable energy sources (including hydro power) will represent the leading source of power generation in SEMCs, accounting for 44% of installations' capacity, followed by gas (36%). This increase in renewable energy sources is set to be covered primarily by wind energy (accounting for 18% of the overall mix) and solar thermal plants (13%).

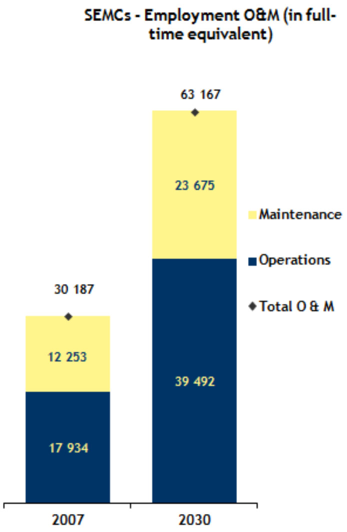
2.2. Estimated number of jobs created in power generation

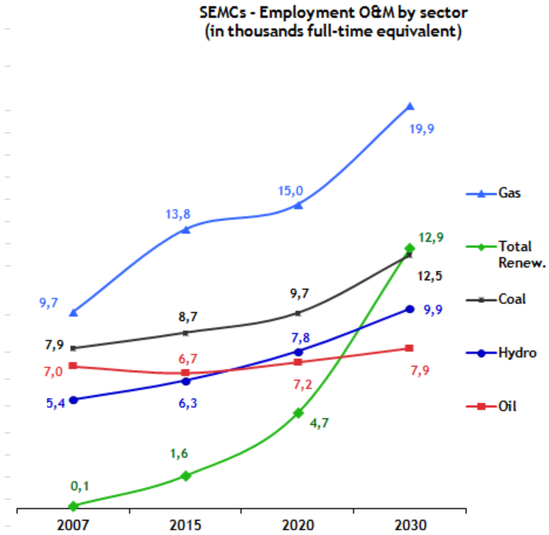
The method used for assessing the impact of power generation on employment is detailed in Part 1 of Appendix 1.

We will first present changes in jobs in plant operations and maintenance (O&M), which are direct permanent jobs for the period of the scenario. Then, we will estimate the temporary indirect jobs associated with the construction of new plants and the renovation of obsolete plants.

2.2.1. Jobs in power plant operations and maintenance

Figure 15 – Distribution of employment in operation and maintenance by sector





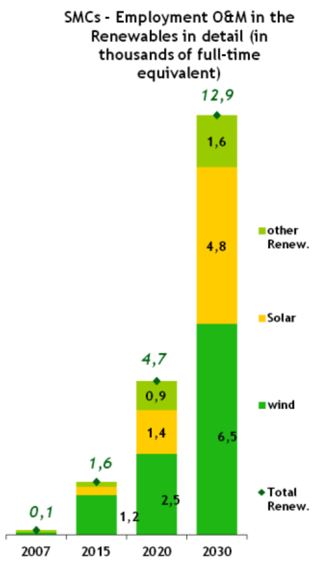
Source: Syndex estimates

Note: We assume here that obsolete fossil fuel power stations will be replaced by gas power stations and that Operations and Maintenance jobs in these two types of plants are similar (requiring short training time) and can therefore substitute one another. In other words, the job destruction resulting from some fossil fuel plants not being renovated will be compensated by job creation in new gas power plants.

According to the breakdown scenario forecasts, approximately 33,000 jobs would be created in operations and maintenance of electricity power stations between 2007 and 2030 in Southern Mediterranean countries, i.e. 11,000 fewer FTE jobs than in the business-as-usual scenario[9].

In the breakdown scenario, these jobs would be created primarily in renewable energy sources (+12,800 FTE jobs, including 6,500 FTE jobs in wind energy) and jobs associated with the operation of plants as such (two thirds of new jobs). Renewable energy sources would thus become the second employer in the power generation sector, after gas power plants (+10,200 FTE jobs).

Figure 16 – SMCs – Employment O & M in the Renewables in detail (in thousands of full-time equivalent)



Source:

[9] The 11,000 fewer potential FTE jobs in the breakdown scenario correspond to 15,000 fewer FTE jobs in conventional plants, only partially compensated by the additional 4000 FTE jobs in renewable energy sources (mainly in solar power plants).

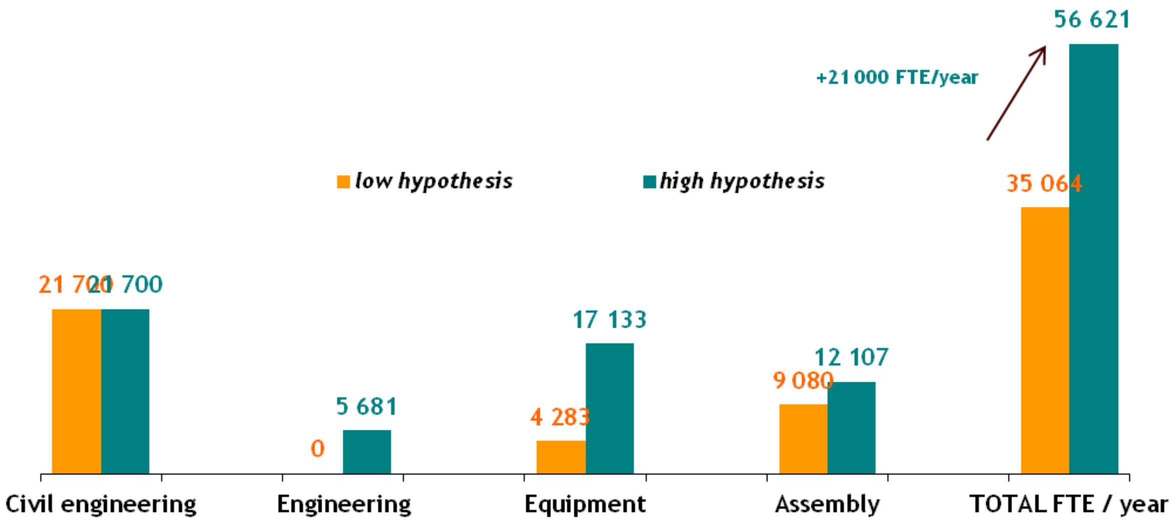
2.2.2. Jobs in power plant construction (new build and renovation)

We had to estimate the proportion of obsolete power plants to be renew between now and 2030 in addition to new build requirements in all Southern and Eastern Mediterranean countries. In Morocco, Tunisia or even Egypt, this applied to 40% of the fleet in place in 2007. We do not have suitable comprehensive data on the age of power plants for all of the countries in question, and have applied a medium by plant type, calculated on the basis of the situation in Tunisia, Morocco, Egypt and Turkey. This suggests that 32%[10] of the SEMCs fleet would require renovation by 2030.

Total construction requirements (85% for new plants and 15% for renovations) are converted into an annual medium value in order to take into account the temporary nature of this activity, which is limited to the power plant construction period. **Corresponding jobs are therefore expressed in average full-time equivalent jobs per year[11], and calculated across the 2007-2030 period.**

In addition, construction jobs associated with geothermal power (in Turkey only) have not been taken into account, due to a lack of available ratios. However, geothermal power represents less than 1% of average annual construction requirements.

Figure 17 – SEMCs – Annual average employment in electric plants building between 2007 and 2030 (in full-time equivalent/year)



Source: Syndex estimates

In the current state of the industry in the Southern Mediterranean countries, according to our estimates, **the construction of new power plants should create an average of 35,000 FTE jobs per year** between 2007 and 2030, i.e. 2,300 more FTE jobs than the reference scenario[12]. **Approximately two-thirds (69%) of construction jobs created would be associated with renewable energy.** In addition, most of them would be civil engineering jobs (an average of 21,700 FTE jobs per year).

However, due to the apparent will of some governments, such as the Moroccan Government, to benefit from growth in the renewable energy sector to **develop their industry**, we have worked with a **high hypothesis**, on the basis of which the number of construction jobs created could reach an average of 56,000 FTE jobs per year. This corresponds to 21,000 more FTE jobs than the low hypothesis, with opportunities for growth residing primarily in the equipment and engineering industry.

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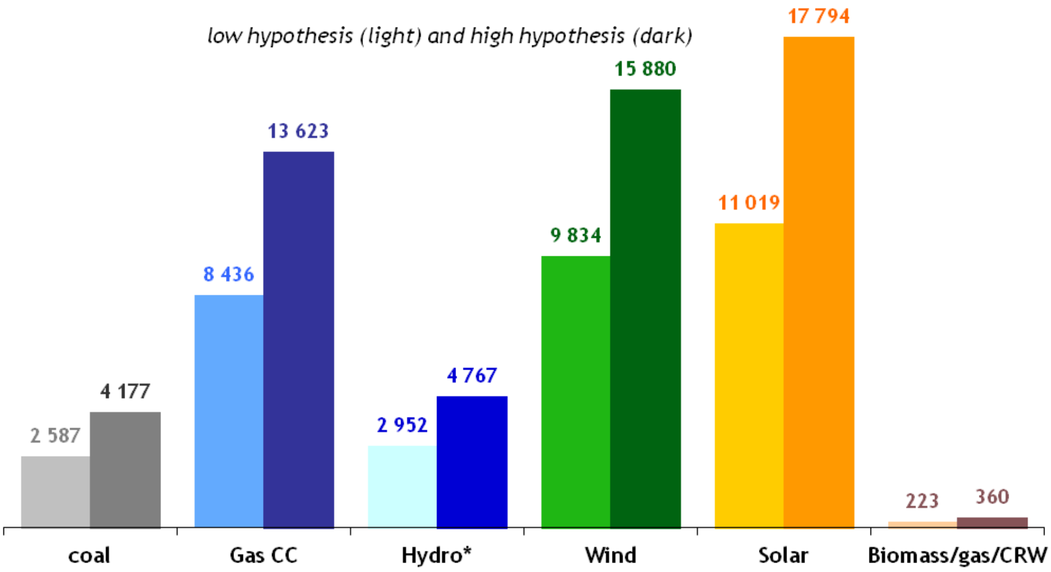
[10] A previous Plan Bleu study estimates the proportion of old electric power stations to be renovated in the SEMCs at 29% (this percentage varies between 18% and 59% depending on the country).

[11] Note: This method significantly smoothes construction activity; it does not take into account peaks in activity associated with the various phases in the construction of a power station, or the scheduling of the various projects.

[12] Compared to the business-as-usual scenario, the breakdown scenario would create fewer jobs (- 6,500 FTE jobs) in the construction of conventional power plants, but more in the construction of renewable energy power plants (+ 8 800 FTE jobs), producing mainly solar and wind energy.

Figure 18 – SEMCs – Annual average employment in building sector by plants types between 2007 and 2030 (in full-timme equivalent/year)



* Note: The number of jobs in hydro power is an overestimate, since the lifetime of a dam is over 40 years (see methodology detail, Appendix 1.2. Construction jobs)
Source: Syndex estimates

In the low hypothesis, two thirds of construction jobs (21,076 FTE jobs per year on average) would be in the renewable energy sector, primarily in wind energy and solar thermal and hybrid gas / CSP plants.

Technology transfer and the development of local industry could lead to the creation of an additional 13,000 FTE jobs per year on average in this renewable energy sector.

2.3. Breakdown of skills and training requirements in the field of power generation

The qualitative approach aims to identify and process questions around skills and related training in the field of electricity. It is therefore relevant on a national level, which is why it was performed for each country (Tunisia and Morocco) and not for the SEMCs as a whole.

Nevertheless, we restate here the primary hypotheses and results of the employment impact assessment of the breakdown scenario in the power generation sector. This overview can be used to gain an understanding of the different jobs, and therefore the skills, in this sector:

Table 6 - Electricity – Hypothesis on jobs decomposition

				local integration	
Jobs types	activity	jobs (FTE) high hyp.in 2030	jobs decomposition	Low Hypothesis (2007)	High Hypothesis (2030)
O&M *(permanents)*	Exploitation	40 000	33%	100%	100%
	Maintenance	23 000	19%	100%	100%
	sub-total O&M	***63 000***	***53%***	***100%***	***100%***
Plants construction *(temporary : FTE / year)*	Civil engineering	21 700	18%	100%	100%
	Engineering	5 681	5%	0%	30%
	Equipments	17 133	14%	10%	40%
	Assembling	12 107	10%	60%	80%
	sub-total construction	***56 621***	***47%***		
TOTAL	**Total electricity**	**119 621**	**100%**		

2.3.1. The example of the wind energy sector

Table 7 - Training associated with wind energy jobs

Wind energy jobs	Training required	Fields
Project Manager	Postgraduate general engineering degree; Academic (with a technical, geography, urban planning or environment specialty)	Development
Design Engineer (waterproofing, foundations, earthworks, logistics, electrical connections)	General engineering schools with a specialisation in energy/environment; IUP industrial systems engineering. Economics and Energy	Development
Specialist engineer (Risk Consultants, Economists, Environmental Engineers, Meteorologists, Computer Scientists)		Development
Support roles (legal, communication, financial, accounting/consolidation, HR)		Development
Technical sales representative (sale of industrial goods, technical sales offer, lending packages, contracts and insurance, trading)	Business Manager (postgraduate qualification). Technical or sales higher education)	Wind turbine construction (manufacture and installation)
Technical sales representative (purchasing subcontracting, metal, welded and machined parts)	BTS technicians in electromechanics or electrotechnics with good English	Wind turbine construction (manufacture and installation)
Design and product manufacturing jobs (mechanical and electrotechnical skills: Mechanical or Electrical Engineers)	Site Foremen or Works Managers (graduate or postgraduate qualification).	Wind turbine construction (manufacture and installation)
Quality system jobs (relationships with clients, suppliers, production)	Technical higher education diploma (engineering) or BTS with significant site management experience	Wind turbine construction (manufacture and installation)
Construction, civil engineering and electrical engineering jobs for power plant construction - R&D (adaptation of machinery to specific market requirements), - Development and Sale of machinery (Managing Engineer job), - Maintenance and operation of fleet	Construction sector, civil engineering and electrical engineering jobs	Wind turbine construction (manufacture and installation)
Primarily mechanical, assembly, machining jobs (mechanical components manufacturing),	Electrotechnical Engineers, Mechanical technicians	Component manufacturing
Mechanical Engineer		Component manufacturing
Metal-working and electrotechnical jobs (manufacture of motors and generators, electronic components, converters, etc.)		Component manufacturing
Plastics processing jobs (design and manufacture of rotor blades made of composite materials)		Component manufacturing
Operations Manager (monitoring and inspection of production, improvement of performance and optimisation of fleet operation)	Engineers for Agency Managers. General or electromechanical training at a specialist engineering school with significant operational experience (5 to 10 years), in a power generation plant	Operation and Maintenance
Maintenance Technician	Bac Pro; BTS/DUT for Maintenance Technicians. Numerous recruitment opportunities for local workforce with Bac or some higher education.	Operation and Maintenance

Source: ALPHÉE Study

2.3.2. Example of the Concentrated Solar Power (CSP) sector

The local development of CSP plants requires the support of research and development, technological innovations and the use of alternative materials. The local construction of CSP plants requires high quality components (especially mirrors) and should be associated with the implementation of comprehensive training and teaching programmes to train engineers, highly skilled workers and industrial employees in the relevant sectors.

Training and teaching are among the conditions required for improving the local manufacture of CSP plant components. Training and instruction will focus on the following main areas:

- The installations;
- Engineering, procurement and construction;
- Mirrors (flat and parabolic);
- Grid connections;
- Storage systems,
- Electronic equipment.

(Source: The World Bank MENA Assessment of the Local Manufacturing Potential for Concentrated Solar Power (CSP) Projects)

Companies play a major role in training their own workers. Ties between industry, research centres, Universities and CSP experts need to be strengthened significantly in order to transfer detailed knowledge of the technologies.

Training of highly skilled workers:

Universities could teach CSP technology to engineers and qualified high-level technicians of companies who would attend training courses (instructor training) and teach their knowledge to the potential workforce.

Training of low skilled workers:

Low skilled workers are needed for civil engineering work, installation and set-up (metallurgy, mechanics, electrical or thermo-dynamics engineering, etc.) and to a lesser extent for operations and maintenance (for example for mirror cleaning). Specific training in these areas is essential to mastering the critical stages of implementing CSP technologies. For example, this type of training could considerably reduce the risks of poor system installation.

2.3.3. The main types of training associated with power generation in SEMCs

The main fields of vocational training are as follows:

- Electronic design, manufacturing and production;
- Industrial maintenance;
- Industrial servicing electricity, industrial maintenance electricity, industrial electricity and electronics, electronic maintenance of automated systems;
- Electromechanics, electromechanics of automated systems;
- Electricity or electronics;
- Industrial mechanics;
- Automation and industrial instrumentation and control;
- Industrial heat containment.

The main fields of university training are as follows:

- Civil engineering;
- Electrical engineering;
- Industrial engineering;
- Electromechanical engineering, mechanical engineering;
- Electronics or electrotechnical engineering;
- Industrial maintenance, electromechanics;
- Energy engineering, energy management;
- Industrial energy engineering;
- Process engineering;
- Physics, material physics;
- New and renewable energy technologies and their applications;

- Energy resource chemistry;
- Natural, urban and industrial risk management;
- Quality, safety, environment.

The main fields of continuing professional development are as follows:

- Mechanical engineering;
- Industrial maintenance;
- Thermal engineering;
- Electronics.

Training and skills will focus on the following:

- developing sectors associated with power generation to improve the employment rate;
- improving the clarity and awareness of jobs and training in power generation, wind and solar energy sectors;
- adapting training methods (primarily associated with the "energy management" dimension);
- retraining and employability;
- consolidating initial training and improving continuing professional development;
- adapting company skills (in initial training and continuing professional development);
- supporting research and development and technology innovation in energy efficiency in order to help these technologies reach markets.

3. Summary

Table 8 – Synthesis of the breakdown scenario employment impact

	Number of jobs			Creation of jobs		Jobs net variations			
						Breakdown/ reference scenario			
In Full Time Equivalent (FTE)	2007-2008	2030 reference	2030 breakdown	Reference scenario	Breakdown scenario	Medium	%	Low hypothesis	High hypothesis
Production	254070	625700	558000	+271630	+203930	-67700	-25%		
Primary energy	324070	519000	449000	+194930	+124930	-70000	-36%		
Oil	177981	241000	208000	+63019	+30019	-33000	-52%		
Gas	124089	242000	215000	+117911	+90911	-27000	-23%		
Raffinage	22000	36000	26000	+14000	+4000	-10000	-71%		
Electricity	30000	106700	109000	+76700	+79000	+2300	3%		
O &M	30000	74000	63000	+44000	+33000	-11000	-25%		
Plants construction (FTE/year)		32700	46000	+32700	+46000	+13300	41%	2300	24300

IV. Employment impact of the breakdown scenario in energy use sectors

1. Employment impact in the construction sector, a sector with potential to create jobs

Population growth in Southern and Eastern Mediterranean countries is higher than in Northern Mediterranean countries. In these countries where demographic transition is not complete, the population growth rate remains high, at over 2%, with some countries in the Middle East like Libya and Syria still being at over 3% growth per year. Population here is therefore still growing. The population is young, and these young people will need to find a place in the job market.

Rampant urbanisation also affects countries in the Southern Mediterranean, as over three quarters of the SEMCs population will be urban in 2030, which increases the pressure on agglomerations and demand for housing. The standard of living is also on the rise in SEMCs. Demand for quality housing is high and household equipment is on the up.

The renovation, or rehousing of people still living in unhealthy accommodation is an important issue. The combined effects of housing demand and energy demand are therefore major issues for regional balance in the years ahead and require the rapid implementation of public energy efficiency policies in construction and other sectors.

Public Rational Use of Energy (RUE) policies for housing need to be ambitious in terms of funding, regulation and control. The additional costs generated by energy efficiency work in housing are high and exceed households' ability to fund them. There is also an important issue associated with the implementation of suitable thermal regulations and their observance by key players.

There are a range of architectural challenges prior to construction of buildings. Technical choices made upstream by architects and design offices should be appropriate for the conditions of the diverse climate zones in SEMCs. Traditional construction techniques and local know-how often take into account local climatic conditions and are more suitable than technical solutions imported from Northern Mediterranean countries. In some SEMCs, there is a return to traditional construction techniques which are more suitable, especially with regard to the building envelope, and therefore insulation, than modern imported techniques.

Energy efficiency in construction requires a technical choice. Two technological options may produce the same energy saving, but the impact on employment will be different and depend on whether or not the sector already exists in the area.

The most appropriate architectures and techniques may not yet exist: innovation and adaptation will be central to energy efficiency solutions for SEMCs buildings.

Box 1 – Suggestion of climate zones in the Mediterranean

- Z1 - Coastal zone (example: Beirut, Lebanon). The climate is of a wet moderate Mediterranean type, characterized by rainfall concentrated in the winter and early spring, and hot and dry summers, with a fairly high relative humidity.
- Z2 – Mountain zone (example: Marrakech in Morocco, or High-Plateaux in Algeria). The climate tends to be arid, characterized by high seasonal and daytime temperature ranges. This zone presents a significant rainfall deficit in the summer. In the winter, night-time temperatures are cool. On the other hand, in the summer, the temperatures are scorching hot.
- Z3 – Desert zone (example: Gafsa in Tunisia). In this zone, the climate is very dry and hot. There are, on the other hand, quite significant differences in temperature between day and night.
- Z4 – Continental zone (example: Ankara in Turkey). The summers are sunny in the day and cool in the night. The winters are cold, with rain and snow.

Source: Plan Bleu

If SEMCs place sustainable housing and urbanisation at the heart of the key issues, the construction sector needs to be structured for the implementation and management of an ambitious development policy. The construction sector requires the development of various complex industrial sectors, which must be supported. If they are not, there is a high risk of seeing some production located abroad and having a negative impact on the trade balance of SEMCs.

These countries currently have a high proportion of informal economy in their economic fabric in general, and this is particularly significant in the construction industry. The structuring of competitive industries, which follow the objective of implementing an energy efficiency policy and meeting the challenges of the years to come, involves taking into account this informal characteristic in SEMCs.

RUE in residential housing therefore involves the development of sectors, but also the acquisition of new skills by employees in the sector throughout the complex production chain in the construction sector.

The challenge of this part is to assess the consequences of the ambitious RUE policies on employment in the construction sector put in place by Governments. This sector has been the subject of a detailed Plan Bleu study "Energy, climate change and the building sector in the Mediterranean: regional perspectives" published in June 2011, which serves as a basis for our analysis of the employment part. This study examines the impact on employment in the residential housing sector only (as opposed to non-residential construction such as public, commercial, tourist and industrial buildings, etc.) The advantage of examining the building sector in particular is that jobs in this sector will primarily be local. Although many industrial sectors can be located elsewhere, the very activity of construction, the production of construction materials, the installation and maintenance of buildings and equipment require local jobs.

Unlike other sectors of activity, where energy efficiency incentive policies might have more of a tendency to cause job destruction rather than creation, the construction sector generally creates jobs, and losses associated with changes in the industry are marginal.

Several trades and associated jobs and skills will be affected by the creation of new jobs:

- **professionals in engineering, design offices and construction inspection** work on the energy consumption of buildings and their integration into the urban or rural environment right from the design phase. Energy saving will be at the centre of their activity in the future;
- **manufacturers of construction materials** have the responsibility to innovate and create new and better insulating products while generating less CO_2 emissions during the manufacturing process;
- **structural work and light work** must implement energy efficient techniques;
- **players in property development and project ownership** have both quantitative and qualitative duties in terms of creating housing, or renovating existing housing. They must meet high demand but also build and maintain buildings that combine comfort and energy efficiency;
- **the efficient equipment sector,** which produces equipment that consumes less energy and can be developed by implementing national or regional industrial policies;
- **the energy services sector** whose mission to ensure the optimisation and maintenance of grids which are indispensable for the energy efficiency of buildings, is as yet still poorly developed in SEMCs.

First of all, it seems necessary to re-examine the process for implementing an energy efficiency policy in the construction sector and the instruments required for achieving these objectives.

We will then detail the current specific characteristics of the construction sector in SEMCs which will affect whether or not the objectives in the breakdown scenario are achieved. The complexity of the construction sector and the industries involved in the construction or renovation of energy-efficient housing must also be underlined in order to understand the dynamics of the sector and assess the impacts of these various industries on employment.

Finally, the method adopted by Syndex for quantitative assessment of jobs generated will be developed using the hypotheses adopted by Plan Bleu i.e. additional investment to be made in order to achieve the breakdown scenario objectives through five technical measures.

1.1. On the need to avoid neglecting the impact of self-builds and the informal sector

The informal sector is often considered negatively, but needs to be seen as a basic element of the construction sector in SEMCs. The dynamics connecting the formal and informal sectors in SEMCs, the responses given by the informal sector to demand that it cannot fulfil alone, and the impacts on employment of population categories that would otherwise be out of work force us to consider its causes and effects in more depth.

1.1.1. The informal sector is one concept with varied manifestations

The World Employment Programme study on employment policy in Kenya in 1972 defines the criteria of the informal sector: ease of access to activities, use of local resources, family ownership of companies, limited scale of operations, use of labour-intensive techniques, qualifications acquired outside the school system and official training and markets which avoid regulations and openness to competition.

A study carried out by the Kingdom of Morocco entitled "*Étude sur le secteur immobilier informel en milieu urbain : capacité de production et intégration*" (Study of the informal property sector in towns: production and integration capacity) from April 2006 defines the different levels on which the informal sector operates:

- the informal sector in non-regulated housing. This is the construction of illegal housing in inappropriate areas where land is not owned or construction is not authorised;
- the informal sector in self-builds. Households obtain building permits on land with all mains services, but have limited financial means and use the informal sector for construction because it is cheaper;
- the informal sector in the organised property development sector. This involves the use of informal workers on construction projects run by "formal" developers;
- the informal sector in housing renovation, refurbishment and extensions. Work of this kind by the informal sector often does not comply with building regulations.

1.1.2. Three-quarters of buildings in SEMCs are self-builds…

The proportion of self-builds is estimated at approximately 70% in Tunisia and 80% in Morocco. Self-builds can involve new housing, with or without a building permit, but also extension or renovation work. This mode of construction is often chosen by households lacking financial means that are experiencing difficulties in purchasing new builds.

Construction of this type of housing may take several years – construction materials are purchased gradually, as money is available, and work is performed by a member of the family or someone with recognised construction skills that is hired without a contract.

In these conditions of low income and uncertain qualification of staff, energy efficiency criteria for construction may not be a priority.

1.1.3. …but this should not necessarily be considered in a negative light

In Southern Mediterranean countries, the informal system is sometimes described as the only way of offering housing production mechanisms adapted both to households' purchasing power and local know-how.

The informal system allows households with low resources to find a housing solution, and an under-qualified section of the population to access employment. However, this mode of construction does not follow environmental and building regulations and makes it impossible for a genuine energy efficiency policy to be implemented in construction, even if informal workers can be taken on as sub-contractors for formal companies.

These "black market" workers have significant difficulties in accessing training, which slows down the implementation of RUE policies in housing.

At the same time, the importance of local know-how and skills should not be overlooked. Often, traditional construction techniques take into account the climatic conditions in the area. These techniques could be developed as part of a formal sector.

Approaches that view self-builds as an obstacle to the implementation of a housing energy efficiency policy therefore need to be balanced. Employed workers can work on jobs outside the legal framework of their company, and so promote the use of more efficient techniques in which they have been trained within their company. Or informal sector workers can work on sites operated under a legal framework and therefore gain awareness of energy efficiency techniques.

Finally, self-builds could be viewed in some cases as an ally to public urban planning or urban renewal policies. The support of private players in the redevelopment or renovation of old districts is vital when public funds are insufficient.

The size of the informal sector makes it clear that energy saving training systems that are able to influence these builders who are lead contractors for the majority of residential buildings need to be put in place.

1.2. Housing energy efficiency policy implementation instruments must take into account sector characteristics in SEMCs

Table 9 – Population evolution by 2030

	Population (in millions)				Number of housing (in thousands)		Additional housing
	2007	2030	% /year	% /year	2007	2030	2007-2030
			1971-2007	2007-2030			
Turkey	73,0	92,5	2,0%	1,0%	23550	38528	14979
Algeria	33,9	44,7	2,4%	1,2%	6045	11468	5423
Egypt	80,1	104,1	2,2%	1,1%	19338	27387	8049
Libya	6,2	8,4	3,1%	1,4%	919	1760	841
Morocco	30,9	39,3	2,0%	1,1%	4748	7904	3156
Tunisia	10,2	12,5	1,9%	0,9%	2494	3188	694
Israel	7,2	9,2	2,4%	1,1%	2087	3053	966
Palestine*	3,8	7,3		2,8%	480	1220	740
Jordan	5,7	8,6	3,6%	1,8%	1199	2516	1317
Lebanon	4,1	4,9	1,4%	0,8%	889	2463	1574
Syria	20,5	29,3	3,2%	1,6%	3989	7917	3928
SEMCs	**275**	**361**	**2,3%**	**1,2%**	**65737**	**107404**	**41667**

Source: Plan Bleu

New housing and renovated housing needs are significant in SEMCs. Plan Bleu estimates the need at 42 million new housing units by 2030.

In addition to the construction of housing required to meet population growth, there is a genuine public health issue involved in housing the many people who still live in slums or other similar accommodation, where basic infrastructure like access to water, electricity and transport is not in place. The authorities place great emphasis on their social housing construction programmes. It is essential that this new housing be low cost. The use of low-cost energy efficient construction solutions is absolutely essential. Technical and economic feasibility studies need to be put in place and construction methods, techniques and technologies must be selected, given the social housing construction programmes planned by some countries, like Morocco.

Another solution of governments to rampant urbanisation is the construction of new towns. Once again, the feasibility of constructing efficient towns is a significant challenge, such that energy efficiency solutions can be envisaged from right from the design phase, as part of an overall system.

1.2.1. Building regulations are important, but are not enough to guarantee results...

Not all countries have thermal regulations or a Building Code. Many SEMCs are in the process of developing[13] a legal framework for quality and energy consumption in construction, often based on the European model, e.g. the European Energy Performance Directive of December 2002 or the thermal regulations of 2012. The first measures they are focussing on relate to new buildings and public buildings, which serve as examples. However, setting up a legal framework does not guarantee results in energy efficiency in construction as long as control of its application is not automatic or transparent.

Table 10 – Thermal regulation in SEMCs

Countries	State of Regulatory
Algeria	Regulation Technical Document (DTR) in 1996 Obligatory since 2000
Egypt	Standard thermal insulation required in 1998 EE Code in buildings for residential mandatory in 2003 EE Code in buildings for tertiary volunteer in 2005
Israel	Thermal Standard Residential 1986 Office 1998 Mandatory Implement. Good Green Buildings code 2005 volunteer. Implement: Low
Jordan	Standard thermal insulation 1990 EE Code in buildings required (being adopted)
Lebanon	Standard insulation in 2005, revised in 2010
Morocco	Current regulations; Cf National Program for EE in the building that is the introduction of a Building Energy Code. The year 2010 saw the development of the technical elements of the proposed thermal building regulations in the residential / tertiary sectors.
Syria	EE Code in buildings required in 2008
Tunisia	Thermal regulations required for office in 2008 Thermal regulations mandatory for collective residential buildings in 2009
Turkey	Standard thermal insulation 2000 Mandatory standard

Source: Plan Bleu, A. Mourtada (Lebanon) and R. Missaoui (Tunisia); Med-Enec

1.2.2. …especially given that they primarily target public buildings and not residential construction

The Plan Bleu scenarios include the construction sector from the point of view of energy savings that residential housing could contribute. The breakdown scenario envisages energy savings that could be achieved if part of the growing demand for new build or renovated housing involved taking into account building standards which would save energy. This study examines the consequences and impacts of such a policy on employment.

First of all, it is important to note that the construction sector does not only produce residential buildings. Other types of construction may indeed be more appropriate for developing energy efficiency techniques, thanks to the financial capacity of backers and their desire to achieve a particular level of comfort.

These could be public buildings (Government ministries, educational establishments, hospitals, etc.), but also tourism buildings, offices or shopping centres. The size of these buildings and the requirements and financial means of backers (Governments, private companies, high-income households, etc.) are why there is more possibility to build and absorb the cost of buildings designed according energy efficiency standards. Public buildings in particular can encourage the development and use of efficient technologies by stimulating some sectors and therefore developing employee skills. In the long-term, this makes room for

[13] See review of introduction of energy efficiency regulations in construction "Energy, climate change and the building sector in the Mediterranean", Plan Bleu, June 2011, p.19.

economies of scale and means that technologies can be developed for the residential sector, whether this involves collective housing (social or private) or individual housing. And these buildings will encourage R&D and the development of skills around energy efficiency.

The companies that design and build public, corporate or tourist buildings may also work on residential projects. So the skills developed in the construction of efficient buildings will, in the long-term, be implemented for residential housing, if its lack of funds does not slow down this process.

1.2.3. In order to affect as many housing units as possible, the support of public policies is vital

SEMCs leaders that we met during our study trips underlined that energy efficiency policies in housing were hindered by households' limited financial resources for investing in work and/or more efficient equipment. Beyond investment, household borrowing capacity is low, and some of them are not even able to access the banking system. Without a financial commitment on the part of the government working together with financial bodies, only households with financial resources will be able to invest. This support could take the form of subsidies, borrowing guarantees or tax measures. It is also important for the procedure to be simple and for there to be as few contractors as possible, as shown by the experience of PROSOL II in Tunisia.

1.2.4. Confusion over the concept of energy saving for households

While standards of living rise and housing standards improve, talking about energy saving could be associated with the loss of conveniences newly gained by SEMCs inhabitants, which households do not want to let go of. It is therefore important to raise awareness of energy management.

It is thus interesting to show households the benefits of energy efficiency techniques in housing, which could direct their choice of materials or technologies, in order to reduce their energy bill.

1.2.5. The construction sector is not very attractive for employees, which can be an obstacle to the promotion of skills

Although the construction sector has been *growing rapidly* over recent years, and new projects are continually coming through, qualified workers are rare. In Morocco, masons, or *bénaya*, are paid 70 Dirhams a day (€ 6.2). This level of salary makes few young people want to enter a career in construction. New employees are trained on the job, so the training quality is somewhat below par. Workers who are trained would rather change sector in order to increase their salary. Improving training levels, and therefore salaries, would meet the demand of a fast-growing sector.

1.3. Complexity of the sector and development of new industrial sectors

The development of energy efficient technologies and techniques in the housing sector does not just concern construction/building businesses and jobs. Several activity sectors are concerned: building materials (cement, ceramics, glass, composite materials requiring chemistry skills, etc.), the electrical and electronics industries (heating and air conditioning systems, compact fluorescent lamps, household appliance industries, etc.), distribution and trade, property development and other sectors that will be discussed later.

The sector is complex, making it more difficult to evaluate its impact on employment. Even though statistics record construction sector jobs, it is difficult to estimate the proportion involved in public works and the proportion in the building sector. Furthermore, the same statistics exist for mining industries or the electrical and electronics industries but here again, it is difficult to identify the proportion of jobs contributing to the development of products used in buildings. Disaggregated data is certainly recorded with the statistics departments of each country with the corresponding jobs, however it is not public.

Various trades and professions are involved in the design, construction and operation of buildings. First the various fields of the sector must be defined. Then the integration of the field into the local economy of

SEMCs must be analysed on a case by case basis, and finally, the potential for job destruction, creation or adaptation must be evaluated.

In most cases there will not be any job destruction but rather an adaptation of the jobs and skills in each sector. There are considerable concerns when it comes to the attractiveness of the sector and worker training. Job destruction is most likely to come into play in the production of equipment (appliances and incandescent lamps). The creation of new jobs depends on the additional work time required for the construction quality of a sustainable building compared to a "conventional" building.

1.3.1. The construction materials sector

The cement sector

The production of materials depends on the existence of quarries supplying raw materials in each country. As material transport is costly and produces high CO_2 emissions, the industrial logic of the sector is to bring production as close as possible to the consumer.

The cement industry, which relies on the limestone industry, comprises seven trade families: purchasing-storage, use, electrical maintenance, mechanical maintenance, laboratory work, shipping and management-administration.

In terms of R&D and energy efficiency, there are different qualities of cement depending on the mix of raw materials used. Eco-cements are developed by major companies in industrialised countries but it is difficult to assess their additional production cost. The initiative of industrial companies in the North is essential to the development of sectors in Europe as well as in SEMCs. These industrial companies do not necessarily have the desire to develop materials that would force them to invest heavily and completely re-evaluate their production process.

The largest companies in the sector include the following groups: Italcimenti (Italy), Lafarge (France), Holcim (Switzerland), Orascom Construction Industries (Egypt).

The tile, brick, marble and ceramics sector

Just as for other construction materials, tile and brick production is a local industry due to the difficulty and cost of transport. As with sanitation and decoration fittings, this is a two-speed market in Southern Mediterranean countries: there are large local businesses focussed on satisfying the domestic market and potentially some export, with products of varying quality. However these countries also rely on importing from European countries such as Italy for higher-end products. The terra cotta sector could be a future sector as it contains both the thermal properties that meet the climatic needs of SEMCs and the potential for local production.

The insulation materials sector

Depending on the countries and geographic areas, the challenge of insulation is not so much heating, but rather maintaining cool air within dwellings. The explosion of electrical energy consumption from the installation of air-conditioning systems attests to the need to insulate buildings in SEMCs. Insulation involves ventilation, which is essential to maintaining the performance of insulation materials. Window glazing is also important for insulation. R&D on insulation materials is concentrated with industrial companies in industrialised countries but this kind of development is slow, and significantly increases building costs. Just as for construction materials, it is not easy to transport insulation materials and industrial companies prefer producing close to the consumer. In SEMCs, these sectors are poorly developed. Job creation as part of an incentive policy can therefore have a significant impact.

Distribution and trade

The intermediaries in the sale of building materials and supplies represent a significant share of jobs within the sector, especially since self-builds represent a large proportion of it. This involves transport, handling and sales jobs and the field can represent up to 15% of jobs in the sector. It is a local sector that can play a key role in spreading technologies and even in training employees in the sector.

1.3.2. The electrical and electronics sector: heating, air conditioning, appliances and electronics

There are two main sources of jobs in the electrical sector: manufacturing, and installation and maintenance. Some countries are major producers, such as Turkey and Egypt. They are therefore responsible for a large portion of manufacturing jobs. For other countries, products are mainly imported and the local jobs are primarily in installation and maintenance.

There is much to be gained from identifying the products manufactured domestically and the sectors that could be developed locally, if the market reaches a critical size and if production costs are competitive. There are jobs in electrical or electronic components manufacturing and product assembly. The issue of integrating sectors is therefore an important factor in job creation.

Another concern is certifying appliances for labels in order to limit electricity consumption. This has virtually no impact on employment: there are few certification jobs and manufacturing efficient appliances requires greater adaptation of the production chain and capital investment rather than creating new jobs.

However producing appliances that are more efficient than older generation appliances relies more on the components or the performance of the production system, i.e. capital investments, rather than investments that include the "work" factor. Furthermore, the appliance distribution and installation sector already exists along with related jobs.

In an ongoing trend moving towards increasing household equipment due to strong population growth and increased standard of living, household appliances and air conditioning should significantly increase job numbers by 2030.

The household appliance market is oligopolistic. The largest corporations are western-owned: Fagor (Spanish), Bosch and Siemens AG (German), Whirlpool (American), and Electrolux (Swedish). There are some SMEs or larger companies, but their futures are uncertain due to competition from products produced in Asia at a lower cost.

Southern Mediterranean countries are in competition with other geographic areas. Expansion of the European Union and the resulting free trade agreement has created an area that has become strong competition for SEMCs: new members have lower production costs, a more qualified labour force, generally low energy costs, and a larger domestic market that is therefore stronger and favours economies of scale.

SEMCs mainly have convertible or split air-conditioners that provide both heating and air-conditioning. Turkey produces a large number of units but SEMCs generally import this equipment from China, the world's largest exporter. This type of product is also dominated by Asian giants (Daikin, Hitachi, Toshiba, Mitsubishi Electric, Sanyo Electric Works, and Panasonic out of Japan and the Korean company LG).

The location of the major international manufacturers' production units depends on economic variables that play against some SEMCs. Existing local manufacturing units are therefore only maintained if the government puts protectionist mechanisms in place (customs duties) and industry will only develop with strong industrial incentive policies. Raw materials and networks of local sub-contractors (components manufacturing) must exist in the country to support this industry, which is not the case in all SEMCs. If the country is not competitive enough, local manufacturers will become importers and industrial jobs will be almost completely eliminated. On the other hand, if support policies are implemented with an aim towards exporting, the industrial fabric could develop and create jobs.

In conclusion, it is our opinion that job creation related to this measure is not the result of the distribution of efficient appliances, but the increase in household equipment, which is an underlying variable in the region. We therefore consider that the breakdown scenario has almost no impact on job creation in this sector.

<u>Compact fluorescent lamps</u>

Some countries such as Morocco and Tunisia have specific government programmes and financial instruments aimed at equipping buildings with imported compact fluorescent lamps. The impact on employment will depend on whether countries decide to import massive amounts of lamps or to encourage the creation of manufacturing companies.

It should be noted that in 2010, China was the largest conventional incandescent lamp producer. It has not missed out on the switch to compact fluorescent lamps, and is now singlehandedly responsible for 80% of worldwide production. Multinationals such as Philips, Osram or General Electric subcontract to Chinese factories.

Solar thermal water heaters

These systems are experiencing strong development in some Southern Mediterranean countries. The impact on job creation is seen on various levels:

- hot water tank manufacturing;
- sensor manufacturing;
- installation and maintenance.

This sector requires government financial incentives in order to develop. Employee training is also crucial for the development of the sector. The objectives put forward by some SEMCs are ambitious. The PROSOL programme, implemented by the Tunisian Government, is a simple turnkey solution for households. It appears to be an interesting model that could be adopted by other countries in the region.

Design, project ownership and technical supervision

This field mainly comprises high qualification jobs (architects, engineers, urban planners, thermal design offices, etc.). There is strong potential for job creation that will depend on regulations put in place and the willingness of lending institutions to invest in energy efficiency and training efforts made in the area of environmental engineering and building thermal engineering.

One of the major challenges in using new, more efficient materials is training designers and main contractors so that material characteristics and possibilities are taken into account during design, construction and operation of the building without neglecting the needs and comfort of users. Qualified engineers need regular training on the new possibilities that come out of industrial R&D. Furthermore, these innovative materials are not necessarily produced in SEMCs and the cost of importing them will play out negatively on whether these solutions are chosen when buildings are designed.

It is also essential that the traditional know-how in countries be re-appropriated when it comes to choosing construction materials. The frequent error of copying the design of buildings from European models when weather conditions are not the same must also be avoided. This know-how must be developed locally.

Designers in SEMCs must gain new skills in sustainable development (installation of new materials and equipment, etc.). Innovation will be the key to energy efficiency solutions in buildings in SEMCs.

The impact on employment will be twofold:

- the training required by building designers, often qualified engineers in design offices;
- the creation of positions for project managers or site foremen who are capable of communicating and coordinating between the various building trades involved in the design of the building in order to ensure the synergy required to install new and complex technologies.

1.3.3. Other sectors

There is strong potential for job creation with earthworks businesses and general construction companies in the light of SEMC needs. This attests to the dynamics of the industry in both the public and private sector.

The private and public property development sector will be active in the ability to implement energy efficiency policy while complying with standards. Financial institutions will also play a role.

Finally, the promotion of energy efficiency programmes in the construction sector, along with awareness campaigns geared towards professionals and the general public will also create a few new jobs.

The trade sector is diverse and the ability of public policies to provide training for this category of key trades in the construction sector will determine whether or not objectives of the breakdown scenario are met.

The organisation of the sector and coordination between the various players based on the pursuit of energy efficiency objectives are essential and must be defined by each country in addition to providing economic, financial and organisational support.

Implementation of energy efficiency policies would require support for construction sectors

The development of sectors corresponding to the rational use of energy in buildings is one of the major issues in terms of employment in Mediterranean countries. Some construction materials or equipment are imported, though in theory, local sectors could be developed for the domestic market and even for export. The challenge is to develop sectors of a critical size where Mediterranean countries do not end up in direct competition with each other.

In addition, the challenge around developing industrial sectors is technology transfer. Mediterranean governments use attractive conditions to draw in foreign direct investment (FDI), or they negotiate development partnerships with European companies.

A vicious circle can be created, especially in economies where the domestic market is quite small, such as in Tunisia or Lebanon: domestic companies do not want to invest without the support of a foreign partner, and foreign partners do not want to invest unless local stakeholders have had a go at the experience and tested the market's potential. Government support is therefore vital. Governments have financial issues that force them to target their investments. They will often embark on projects to develop sectors with the support of an international lender, whether it is the European Union, the World Bank, the UNEP, the AFD or the German GTZ. Political will is therefore essential to developing new industrial sectors.

Without this development, some RUE measures in housing will not benefit the national economy as products such as compact fluorescent lamps, efficient appliances or insulation materials will be imported.

1.4. Estimation of job potential in the construction sector according to the five Plan Bleu measures

1.4.1. The five measures of the breakdown scenario

Plan Bleu estimated the amount of investments required for the construction of efficient buildings compared to investments made for the construction of "conventional" buildings[14].

Direct FTE job creation ratios by type of work were applied to these additional investments. The ratios and hypotheses made by Syndex are detailed in the appendix to this report. To compare the consistency of estimates made by Syndex, two types of approaches were used: a macroeconomic approach evaluating the proportion of the economically active population of countries and particularly the economically active population working in the construction sector represented by these new jobs, and a microeconomic approach examining the study's four focus countries using an analysis by activity sub-sector. A detailed description of the method used, as well as the hypotheses can be found in the Appendix.

[14] See report on Building, Energy and climate change, Plan Bleu, 2010

Table 11 - Investment needs for EE measures by country (in € billions)

Measures	Total investment needs over 20 years	Algeria	Egypt	Israel	Jordan	Lebanon	Libya	Morocco	Palestine	Syria	Tunisia	Turkey
Mainstreaming of efficient envelopes for new buildings	**132**	16.5	37.2	3.5	2.2	1.6	3.0	15.1	2.1	9.6	1.2	40.2
Thermal renovation of buildings (insulation of roofs and walls and changing windows)	**49**	6.1	13.8	1.3	0.8	0.4	1.1	5.6	0.8	3.5	1.4	14.1
Gradual elimination of incandescent lamps from the market and distribution of CFLs/LEDs	**3**	0.4	0.8	0.1	0.1	0.1	0.1	0.4	0.0	0.3	0.0	0.8
Distribution of efficient household appliances and heating and air conditioning equipment	**40**	5.3	11.5	1.2	0.7	0.4	0.9	4.8	0.6	3.1	0.5	11.2
Distribution of solar water heaters	**38**	5.0	11.0	1.0	0.6	0.3	0.9	4.4	0.6	2.8	0.5	11.0
TOTAL	**262.0**	**33.3**	**74.3**	**7.0**	**4.5**	**2.8**	**6.0**	**30.3**	**4.1**	**19.2**	**3.6**	**77.2**

Source: estimates of the study's group of experts /Plan Bleu

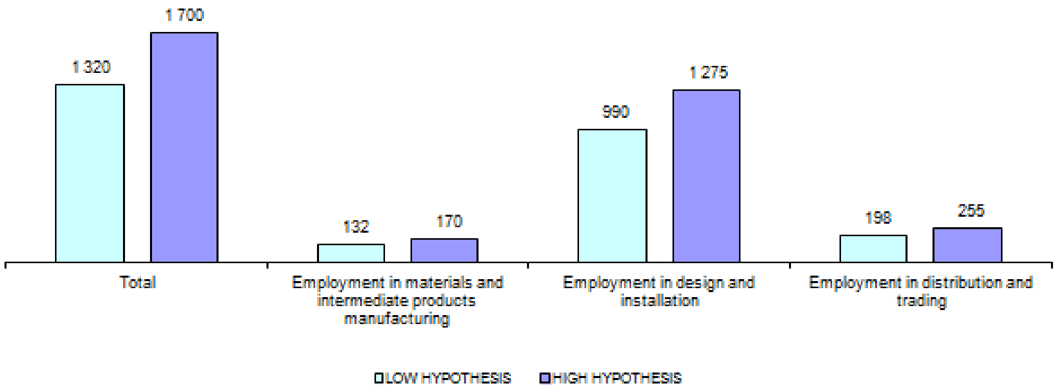
Measure 1: Mainstreaming of new building envelopes

The mainstreaming of new building envelopes includes the insulation of the building envelope (roof, walls and windows) and installation of efficient heating and air conditioning equipment. If the building envelope is efficient, equipment required will be auxiliary equipment. It is expected that financing these measures in new buildings will represent € 132 million over 20 years.

Plan Bleu estimates the additional cost per 100 m² housing unit at € 3,300, i.e. a 7 to 20% increase in the cost of construction and energy equipment.

The additional costs are distributed with 70% as initial additional investment in the construction and 30% as additional investment related to energy efficient equipment, including replacement and maintenance.

Figure 19 – Employment creation impact in the SEMCs by 2030 (in thousands)



Source: Syndex estimates

The first measure has the potential to create 1,320,000 to 1,700,000 jobs by 2030 for the 11 countries studied in the Southern and Eastern Mediterranean.

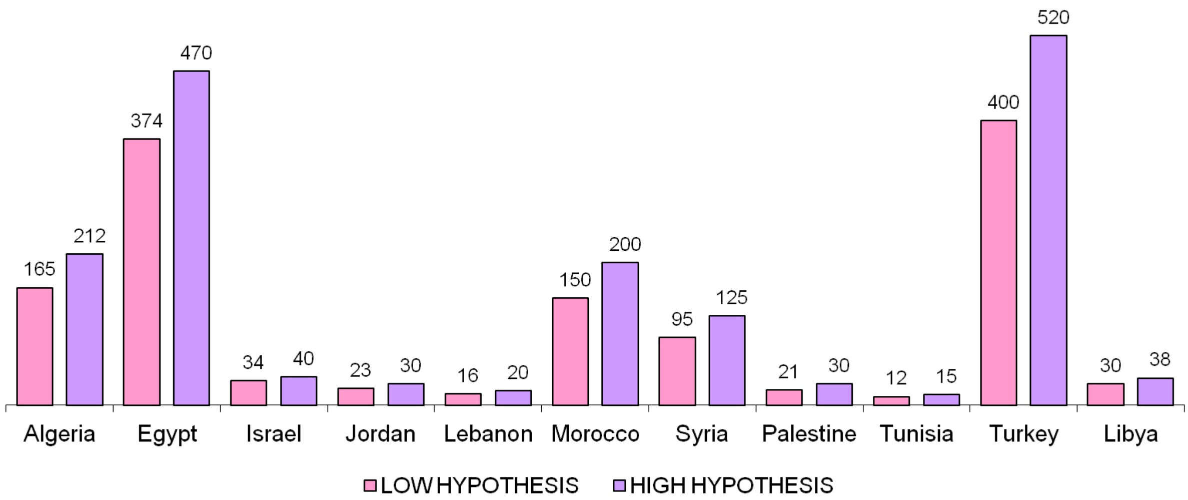
The share of jobs related to the manufacturing of intermediate goods is estimated at roughly 10% of total jobs. 132,000 to 170,000 jobs are likely to be created in the manufacturing of construction materials and intermediate goods (windows, doors, etc.). These jobs are also the most likely to be located elsewhere. There are risks of job destruction, particularly in the production sectors of some materials, intermediate goods and equipment depending on the extent to which sectors are integrated, their productivity compared to international competition, available technologies, investments made and workforce training. The implementation of incentive industrial policies is essential to eliminating these risks.

990,000 to 1,275,000 jobs would be created in the design and construction of buildings: this would involve jobs in engineering, project ownership, structural work, masonry, roofing, plumbing, electrical installation and maintenance of thermal equipment (heating and air conditioning), etc. In principle, these jobs are local but they are also the most susceptible to informal employment. Therefore, it can be assumed that approximately 40% of jobs created will fall under the informal sector. 400,000 to 510,000 FTE jobs will thus be created in the formal employment sector. For this category of employment, there are lower risks of job destruction: the various trades remain the same, however knowledge, skills and practices must be adapted to sustainable construction techniques.

198,000 to 255,000 FTE jobs would be created in the distribution and trade sector, i.e. intermediary jobs between the quarry or factory and the completed building.

This sector has much at stake in the spread and promotion of construction techniques and materials that are the most suited for the regional climate in which the building is constructed.

Figure 20 – Impact on employment from the generalization of new housing efficient envelopes by country by 2030



Source: Syndex estimates

The table above outlines the potential for job creation through measure No. 1 by country. The four countries that should see the most significant job creation by 2030 are Turkey, Egypt, Algeria and Morocco according to the population and level of investment required to implement breakdown scenario objectives and demand for new housing.

Table 12 - Job potential related to the mainstreaming of new building envelopes by 2030 – Summary table

Measure n ° 1 : generalization of efficient envelopes for new buildings	Total jobs created by 2030 (in thousands)	Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Syria	Palestine	Tunisia	Turkey	Libya
HIGH HYPOTHESIS	1 700 000	212 000	470 000	40 000	30 000	20 000	200 000	125 000	30 000	15 000	520 000	38 000
Employment in materials and intermediate products manufacturing	170 000	21 200	47 000	4 000	3 000	2 000	20 000	12 500	3 000	1 500	52 000	3 800
Employment in design and installation	1 275 000	159 000	352 500	30 000	22 500	15 000	150 000	93 750	22 500	11 250	390 000	28 500
Employment in distribution and trading	255 000	31 800	70 500	6 000	4 500	3 000	30 000	18 750	4 500	2 250	78 000	5 700
low hypothesis	1 320 000	165 000	374 000	34 000	23 000	16 000	150 000	95 000	21 000	12 000	400 000	30 000
Employment in materials and intermediate products manufacturing	132 000	16 500	37 400	3 400	2 300	1 600	15 000	9 500	2 100	1 200	40 000	3 000
Employment in design and installation	990 000	123 750	280 500	25 500	17 250	12 000	112 500	71 250	15 750	9 000	300 000	22 500
Employment in distribution and trading	198 000	24 750	56 100	5 100	3 450	2 400	22 500	14 250	3 150	1 800	60 000	4 500

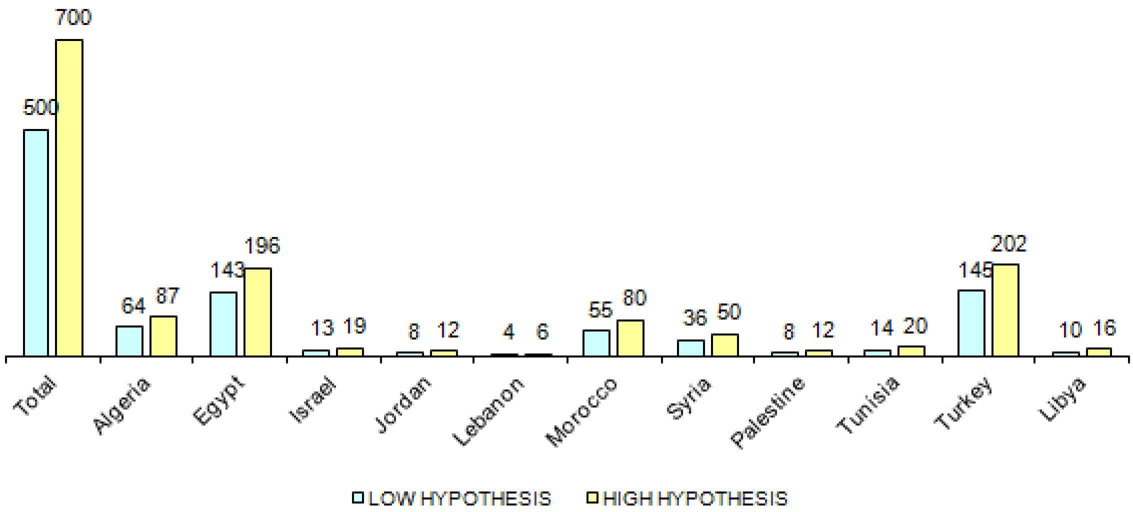
Source: Syndex estimates

Measure 2: Thermal renovation of existing buildings

The second measure focuses mainly on the insulation of walls and roofs and changing windows in the renovation of older existing buildings. Financing these measures in buildings is expected to cost €49 billion over 20 years. As existing housing is mainly comprised of collective housing, the additional costs to the buildings will be less than for new housing units. Furthermore, Plan Bleu estimates that there will be little replacement of single glazed windows with double glazed windows in coastal areas, hence a relative additional cost of approximately EUR 2,500 in an older 100 m² housing unit.

Renovation work is not necessarily carried out by the same people involved in the construction of new housing. While renovations are mainly carried out by tradesmen in the masonry, roofing, plaster, insulation, joinery, electrician trades, etc., new construction projects will mainly call on national or international construction specialists and major property developers. Renovation work performed by tradesmen is essentially local. There are real challenges in training these types of workers and finding solutions for adapted and accessible training modules. Materials, intermediate goods and equipment (insulation materials, glass, wood, windows, etc.) could potentially be manufactured out of country.

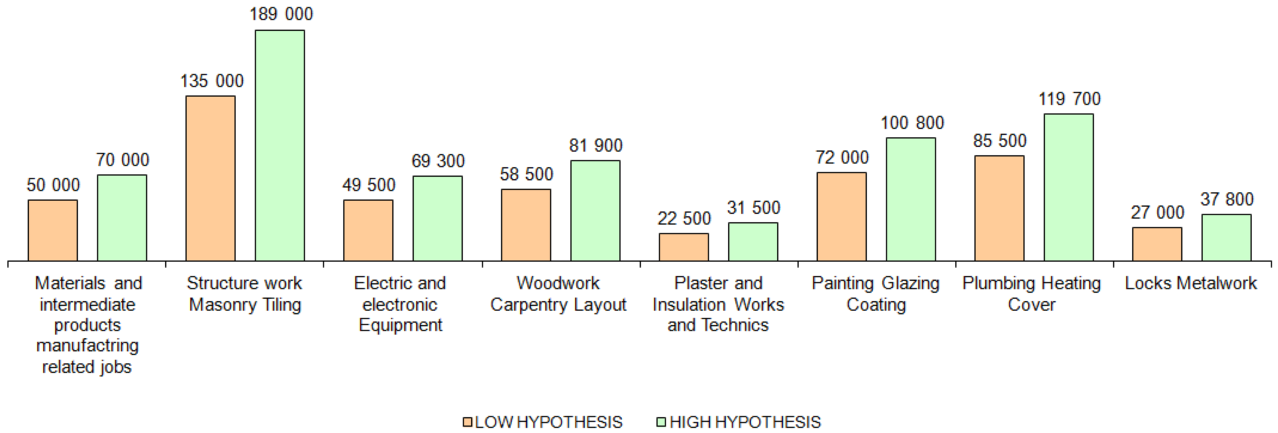
Figure 21 – Potential of jobs creation related to buildings thermal renovation by country by 2030



Source: Syndex Estimates

The job creation potential associated with the second measure – thermal renovation of buildings – is 500,000 to 700,000 full time equivalent jobs by 2030, including 300,000 to 400,000 for Egypt and Turkey alone. Just like the first measure, a significant share of these jobs will be generated in the informal employment sector. Based on the hypothesis of 40% informal employment, approximately 300,000 to 420,000 new formal jobs would be created.

Figure 22 – Creation of jobs related to buildings renovation by 2030, by job types



Source: Syndex estimates

Similar to the first measure, it is estimated that jobs in intermediate materials and goods manufacturing would represent 10% of jobs associated with the thermal renovation of buildings. The trade that will generate the most jobs is masonry, followed by roofing, then glazing/painting.

Table 13 - Job potential related to the thermal renovation of buildings by building trade by 2030 – Summary table

Measure n°2 : buildings thermal renovation (walls and roof insulation and windows replacement)	Total jobs created by 2030	Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Syria	Palestine	Tunisia	Turkey	Libya
LOW HYPOTHESIS	500 000	64 000	143 000	13 000	8 000	4 000	55 000	36 000	8 000	14 000	145 000	10 000
Materials and intermediate products manufactring related jobs	50 000	6 400	14 300	1 300	800	400	5 500	3 600	800	1 400	14 500	1 000
Structure work Masonry Tiling	135 000	17 280	38 610	3 510	2 160	1 080	14 850	9 720	2 160	3 780	39 150	2 700
Electric and electronic Equipment	49 500	6 336	14 157	1 287	792	396	5 445	3 564	792	1 386	14 355	990
Woodwork Carpentry Layout	58 500	7 488	16 731	1 521	936	468	6 435	4 212	936	1 638	16 965	1 170
Plaster and Insulation Works and Technics	22 500	2 880	6 435	585	360	180	2 475	1 620	360	630	6 525	450
Painting Glazing Coating	72 000	9 216	20 592	1 872	1 152	576	7 920	5 184	1 152	2 016	20 880	1 440
Plumbing Heating Cover	85 500	10 944	24 453	2 223	1 368	684	9 405	6 156	1 368	2 394	24 795	1 710
Locks Metalwork	27 000	3 456	7 722	702	432	216	2 970	1 944	432	756	7 830	540
HIGH HYPOTHESIS	700 000	87 000	196 000	19 000	12 000	6 000	80 000	50 000	12 000	20 000	202 000	16 000
of which materials and intermediate products manufacturing related jobs	70 000	8 700	19 600	1 900	1 200	600	8 000	5 000	1 200	2 000	20 200	1 600
Structure work Masonry Tiling	189 000	23 490	52 920	5 130	3 240	1 620	21 600	13 500	3 240	5 400	54 540	4 320
Electric and electronic Equipment	69 300	8 613	19 404	1 881	1 188	594	7 920	4 950	1 188	1 980	19 998	1 584
Woodwork Carpentry Layout	81 900	10 179	22 932	2 223	1 404	702	9 360	5 850	1 404	2 340	23 634	1 872
Plaster and Insulation Works and Technics	31 500	3 915	8 820	855	540	270	3 600	2 250	540	900	9 090	720
Painting Glazing Coating	100 800	12 528	28 224	2 736	1 728	864	11 520	7 200	1 728	2 880	29 088	2 304
Plumbing Heating Cover	119 700	14 877	33 516	3 249	2 052	1 026	13 680	8 550	2 052	3 420	34 542	2 736
Locks Metalwork	37 800	4 698	10 584	1 026	648	324	4 320	2 700	648	1 080	10 908	864

Source: Syndex estimates

Measures 3 and 4: Gradual replacement of incandescent lamps on the market with CFLs/LEDs and the distribution of efficient household appliances and heating and air conditioning systems

Although both these measures are related to the optimisation of energy consumption in buildings, they do not rely on the construction sector, but rather equipment industrial sectors, which are more capital-intensive and subject to productivity and international competition constraints.

The majority of jobs created are in manufacturing. Jobs in distribution will not be very affected by the spread of more efficient appliances. Some jobs in marketing could be created but these are marginal.

It can be assumed that the billions in investment will be used to purchase equipment that could be imported from third-party manufacturing nations. In this case, there will be no impact on employment in SEMCs. This could be a first hypothesis.

A second hypothesis consists in the idea that factories producing “conventional” equipment will adapt their industrial facilities and labour skills to “more efficient” products. In this case there is also practically no impact on job creation.

It is also possible that “conventional” equipment production facilities currently exist in SEMCs but that the investment required to adapt production lines to new equipment is not made based on a choice of location by major international corporations or due to less demand for “conventional” equipment in SEMCs. This would therefore lead to job destruction.

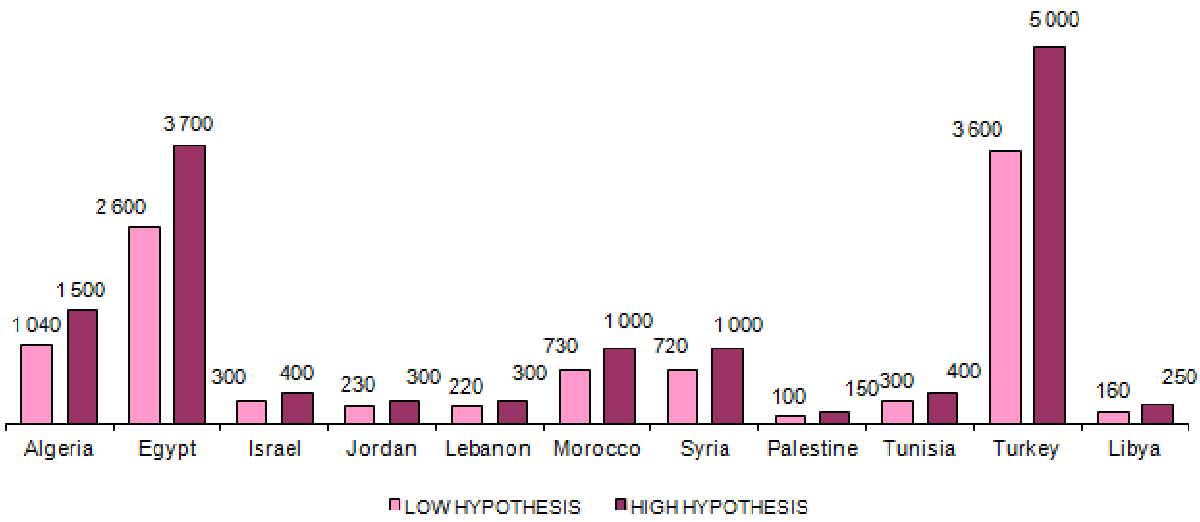
However, in the case of the breakdown scenario and its ambitious targets, we adopted an equally ambitious impact approach to employment to measure the job creation that could be generated by the domestic appropriation of skills and know-how domestically by supporting innovative SMEs or the ability to convince major international groups to locate to these countries.

Measure 3: Gradual elimination of incandescent lamps from the market and distribution of compact fluorescent lamps

Plan Bleu considers that 100% distribution of efficient lighting by 2020 represents an additional investment of €3 billion. According to our calculations, this corresponds to a need of approximately 900 million compact fluorescent lamps by 2030 (the detail of this calculation can be found in the Excel software tool for applying the method in the appendix to the study).

The jobs created are those in the manufacturing of lamps and to a very small degree in the set-up of lamp distribution programmes, their installation and replacement.

Figure 23 – Potential of jobs creation related to the dissemination of LBC/LED by 2030, by country



Source: Syndex Estimates

The job creation potential associated with the manufacturing of compact fluorescent and LED lamps therefore represents between 10,000 and 14,000 jobs for SEMCs. The low hypothesis represents the number of jobs needed to manufacture lamps with an assumed trade integration rate of 70% and the higher scenario corresponds to an assumed trade integration rate of 100%.

These estimates represent the number of jobs required to produce the lamps. Unfortunately, we lack information that would allow an evaluation to be made of the job destruction related to the manufacturing of "conventional" lamps. To do so, a clear perspective of all the production companies and associated jobs in each country is required. These numbers are to be taken with the measure required as the number of jobs that already exist in lamp production must be deducted.

Moreover, these estimates do not take into account any potential activities involved in the exporting of lamps abroad either.

Table 14 - Job potential related to the gradual elimination of incandescent lamps by 2030

Measure 3 - Progressive elimination from the market of the filament lamps	Total jobs created by 2030	Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Syria	Palestine	Tunisia	Turkey	Libya
LOW HYPOTHESIS	10 000	1 040	2 600	300	230	220	730	720	100	300	3 600	160
HIGH HYPOTHESIS	14 000	1 500	3 700	400	300	300	1 000	1 000	150	400	5 000	250

Source: Syndex Estimates

Measure 4: distribution of efficient household appliances and heating and air conditioning systems

The production of appliances and systems that are more efficient than older generation equipment is based mainly on the components or performance of the production facilities, i.e. capital investments rather than investments that include the "work" factor. In addition, the appliance distribution and installation sector, and related jobs, already exist. Finally, appliances are usually installed by households themselves.

In conclusion, we believe that job creation associated with this measure does not stem from the distribution of efficient appliances, but rather the increasing equipment level in households, which is an ongoing trend in the region. We therefore consider that within the framework of this study, there is almost no job creation in this case.

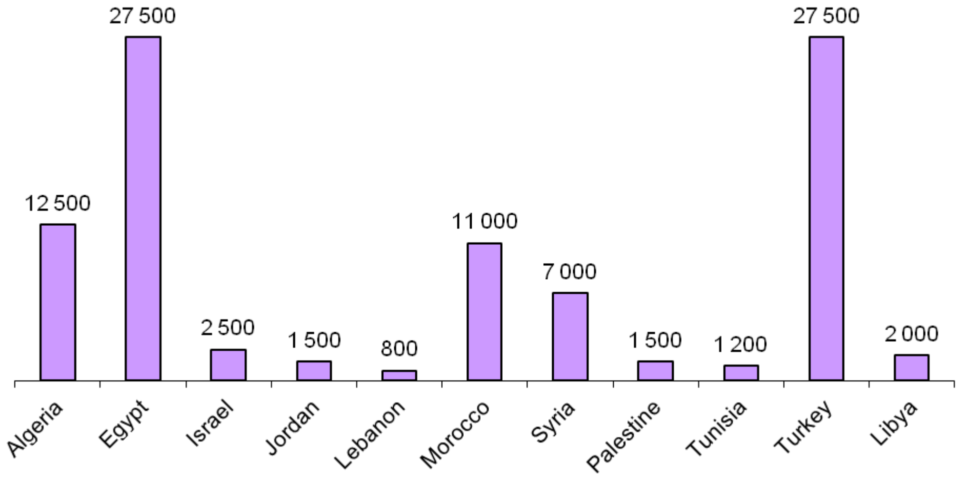
Measure 5: Distribution of solar water heaters

The hypotheses selected by Plan Bleu for 2030 are an equipment level of 30% for new buildings and 35% in existing buildings. These targets are ambitious and each country is at a different level in the development of this sector. The estimated investment required to reach these objectives is € 38 billion.

Jobs are created in the manufacturing of tanks and sensors, which can be manufactured domestically or abroad, in installation and maintenance, where jobs are mainly local, and finally in the development of the sector. We estimate that 50% of jobs will be in manufacturing and 50% of jobs in installation and maintenance.

We based our job number estimates on a ratio taken from the experience of the Tunisian PROSOL programme.

Figure 24 – Potential of jobs creation in solar water heater dissemination by 2030, by country



Source: Syndex estimates

The distribution of solar water heaters in SEMCs for 2030 would potentially create 95,000 jobs, with half being in equipment manufacturing (possibly located abroad) and half in installation and servicing/maintenance.

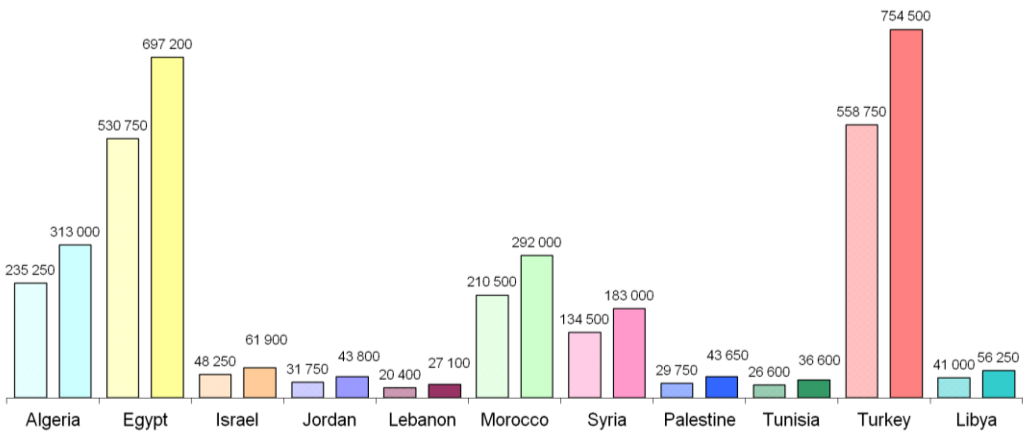
Table 15 - Job potential related to the distribution of solar water heaters by 2030

Measure n° 5 : Solar water heater dissemination	Total jobs created by 2030	Algerie	Egypt	Israel	Jordan	Lebanon	Morocco	Syria	Palestine	Tunisia	Turkey	Libya
GLOBAL	95 000	12 500	27 500	2 500	1 500	800	11 000	7 000	1 500	1 200	27 500	2 000
Equipment manufacturing related jobs	47 500	6 250	13 750	1 250	750	400	5 500	3 500	750	600	13 750	1 000
Equipment installation and maintenance related jobs	47 500	6 250	13 750	1 250	750	400	5 500	3 500	750	600	13 750	1 000

Source: Syndex estimates

1.5. Impact of the five measures on employment - Summary

Figure 25 - Total potential job creation in SEMCs through energy efficiency measures in the residential sector by 2030 (high and low hypotheses)



Source: Syndex estimates

Table 16 - Total potential job creation in SEMCs through energy efficiency measures in the residential sector by 2030 (high and low hypotheses)

UPPER RANGE	TOTAL	Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Syria	Palestine	Tunisia	Turkey	Libya
Generalization of efficient envelopes for new buildings	1 700 000	212 000	470 000	40 000	30 000	20 000	200 000	125 000	30 000	15 000	520 000	38 000
buildings thermal renovation	700 000	87 000	196 000	19 000	12 000	6 000	80 000	50 000	12 000	20 000	202 000	16 000
SUB-TOTAL	2 400 000	299 000	666 000	59 000	42 000	26 000	280 000	175 000	42 000	35 000	722 000	54 000
progressive elimination from market of filament lamps	14 000	1 500	3 700	400	300	300	1 000	1 000	150	400	5 000	250
Dissemination of efficient household, heating and air-conditioning appliances	0	0	0	0	0	0	0	0	0	0	0	0
dissemination of solar water heater	95 000	12 500	27 500	2 500	1 500	800	11 000	7 000	1 500	1 200	27 500	2 000
SUB-TOTAL	109 000	14 000	31 200	2 900	1 800	1 100	12 000	8 000	1 650	1 600	32 500	2 250
TOTAL	2 509 000	313 000	697 200	61 900	43 800	27 100	292 000	183 000	43 650	36 600	754 500	56 250

LOWER RANGE	TOTAL	Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Syria	Palestine	Tunisia	Turkey	Libya
Generalization of efficient envelopes for new buildings	1 320 000	165 000	374 000	34 000	23 000	16 000	150 000	95 000	21 000	12 000	400 000	30 000
buildings thermal renovation	500 000	64 000	143 000	13 000	8 000	4 000	55 000	36 000	8 000	14 000	145 000	10 000
SUB-TOTAL	1 820 000	229 000	517 000	47 000	31 000	20 000	205 000	131 000	29 000	26 000	545 000	40 000
progressive elimination from market of filament lamps	0	0	0	0	0	0	0	0	0	0	0	0
Dissemination of efficient household, heating and air-conditioning appliances	0	0	0	0	0	0	0	0	0	0	0	0
dissemination of solar water heater	47 500	6 250	13 750	1 250	750	400	5 500	3 500	750	600	13 750	1 000
SUB-TOTAL	47 500	6 250	13 750	1 250	750	400	5 500	3 500	750	600	13 750	1 000
TOTAL	1 867 500	235 250	530 750	48 250	31 750	20 400	210 500	134 500	29 750	26 600	558 750	41 000

MEDIUM RANGE	TOTAL	Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Syria	Palestine	Tunisia	Turkey	Libya
Generalization of efficient envelopes for new buildings	1 510 000	188 500	422 000	37 000	26 500	18 000	175 000	110 000	25 500	13 500	460 000	34 000
buildings thermal renovation	600 000	75 500	169 500	16 000	10 000	5 000	67 500	43 000	10 000	17 000	173 500	13 000
SUB-TOTAL	2 110 000	264 000	591 500	53 000	36 500	23 000	242 500	153 000	35 500	30 500	633 500	47 000
progressive elimination from market of filament lamps	7 000	750	1 850	200	150	150	500	500	75	200	2 500	125
Dissemination of efficient household, heating and air-conditioning appliances	0	0	0	0	0	0	0	0	0	0	0	0
dissemination of solar water heater	71 250	9 375	20 625	1 875	1 125	600	8 250	5 250	1 125	900	20 625	1 500
SUB-TOTAL	78 250	10 125	22 475	2 075	1 275	750	8 750	5 750	1 200	1 100	23 125	1 625
TOTAL	2 188 250	274 125	613 975	55 075	37 775	23 750	251 250	158 750	36 700	31 600	656 625	48 625

Source: Syndex Estimates

In the end, the five measures combined would help create 1.9 to 2.5 million new jobs in SEMCs by 2030.

The low hypothesis contains more conservative assumptions in terms of equipment manufacturing by SEMCs, whereas the high hypothesis contains assumptions of equipment and intermediate goods production by SEMCs, particularly for compact fluorescent and LED lamps, and solar water heaters.

It is also important to take into account an essential characteristic of SEMCs in understanding these estimates, which is the informal nature of the economy. Specialists estimate that informal employment represents between 20 and 40% of employment in SEMCs with the construction sector being particularly concerned. Therefore, in general, for an informal employment rate of 40%, 1.1 to 1.5 million formal FTE jobs would be created. Thus, for an informal employment rate of 20%, 1.5 to 2 million formal FTE jobs would be created.

1.6. Consistency of employment impact analyses with projections of the active population in SEMCs

After having estimated the impacts of the breakdown scenario in a forecast approach, they must now be compared with a reference business-as-usual scenario, i.e. if the implementation of energy efficiency measures did not alter current trends. This also involves putting into perspective the significant potential job creation outlined above.

In 2008, the economically active population of SEMCs working in the construction sector represented approximately 7.2 million workers. This sector has created jobs in most SEMCs over the last ten years.

Table 17 – Portion of labour force working in the construction sector

	Labour force	Population working in the construction sector	% of labour force working in the construction sector	Reference year
Algeria	7 798 100	967 600	12,4%	2004
Egypt	22 507 000	2 268 000	10,1%	2008
Israel	2 776 700	150 700	5,4%	2008
Jordan	1 878 300	120 211	6,4%	2008
Lebanon	1 118 400	62 627	5,6%	2007
Morocco	10 189 000	903 800	8,9%	2008
Syria	4 946 000	735 900	14,9%	2007
Palestine	875 000	95 375	10,9%	2008
Tunisia	3 698 200	465 973	12,6%	2008
Turkey	21 194 000	1 242 000	5,9%	2008
Libya	2 294 900	199 656	8,7%	2008
TOTAL	79 275 600	7 211 843	9,1%	
France	25 193 000	1 860 000	7,2%	2008
Espagne	20 257 000	2 404 000	11,9%	2008

Source: LABORSTA, instituts statistiques nationaux

Based on data on the economically active population and the economically active population working in the construction sector gathered from the LABORSTA database, which is available from national statistics institutes, we came up with projections for the change in the economically active population by 2030.

For the countries that the study focuses on (Tunisia, Turkey, Morocco and Egypt), where more precise data is available, we applied a medium growth rate for the economically active population based on the growth rates observed over the last 5 to 10 years. With regard to the economically active population involved in the construction sector, we applied a medium ratio for net job creation observed over recent years.

For the other countries an economically active population growth rate of 2.5% was applied up to 2020 and 2% from 2020 to 2030. The same method was applied for the outlook related to the number of employees working in the construction sector (3% growth between 2010 and 2020, and 2.5 % growth between 2020 and 2030), with the goal of obtaining the number of employees in the construction sector in 2030 in a business-as-usual scenario.

Table 18 – Evolutions of labour force in the construction sector with and without energy efficiency measures

	Labour force 2030	Population working in the construction sector 2030 WITHOUT EE	Population working in the construction sector 2030 WITH EE	% of labour force working in the construction sector Prospects 2030 Without EE	% of labour force working in the construction sector Prospects 2030 With EE
Algeria	12 411 645	1 540 056	1 814 181	12,4%	14,6%
Egypt	46 441 318	4 578 000	5 191 975	9,9%	11,2%
Israel	4 419 463	239 858	294 933	5,4%	6,7%
Jordan	2 989 548	191 331	229 106	6,4%	7,7%
Lebanon	1 780 073	99 679	123 429	5,6%	6,9%
Morocco	19 597 269	2 164 500	2 415 750	11,0%	12,3%
Syria	7 674 494	1 141 864	1 300 614	14,9%	16,9%
Palestine	1 392 671	151 801	188 501	10,9%	13,5%
Tunisia	5 866 662	812 200	843 800	13,8%	14,4%
Turkey	24 783 493	2 802 000	3 458 625	11,3%	14,0%
Libya	3 652 618	317 778	366 403	8,7%	10,0%
TOTAL	131 009 253	14 039 066	16 227 316	10,7%	12,4%

Source: Syndex estimates
Note: EE = energy efficiency measures

Therefore, according to a business-as-usual scenario, there would be 14 million people in the economically active population working in the construction sector by 2030. There would be 16.1 million people based on average estimates if breakdown scenario measures are implemented. The economically active population in the construction sector would represent 10.7% of the economically active population, all other things remaining equal, according to a business-as-usual scenario, and 12.3% of the economically active population, all other things also remaining equal, if the breakdown scenario is implemented.

In the end, the implementation of energy efficiency measures in the building sector would generate between 12 and 14% new jobs in the construction sector.

The challenge is therefore not just to train the 1.9 to 2.5 million new FTE jobs that result from the implementation of energy efficiency measures, but also to train the 14 million employees who will be working in the sector by 2030.

This analysis has one limitation: the jobs generated in the building sector are not only jobs in the construction sector under national counting methods, but also jobs in the construction materials sector, the equipment sector, the electronics sector and the distribution and trade sector. The aim is to give general markers to support the analysis, as we do not have specific enough data for a detailed analysis for each of the 11 countries.

In order to provide an order of magnitude, in 2005, the FEMISE, a network of economic research institutes, evaluated the need to create 22.5 million FTE jobs in SEMCs by 2020 in order to maintain the ongoing situation with respect to employment (i.e. constant employment and unemployment rates)[15].

The potential creation of 1.9 to 2.5 million new jobs in the construction sector seems to be the opportunity to address three major issues in the Mediterranean region at the same time: job creation, energy dependency and the opportunity to build sustainable towns and cities.

1.7. Breakdown of skills and training requirements in the construction sector (five Plan Bleu measures)

The qualitative approach aimed at identifying and addressing the issues of skills and training is relevant on a national scale. This is why it is conducted country by country (Tunisia and Morocco) and not at an overall SEMCs level.

In this part, the ratios from French studies (CAPEB, CCCA-BTP, ARENE, ICE) will be used to break down jobs into more precise value chains and establish a relationship between jobs, types of training and levels of training.

1.7.1. Mainstreaming of efficient envelopes for new buildings

The types of training required will be associated with trades related to industrial equipment, construction materials, and materials transport for equipment manufacturing (efficient insulation, heating and air conditioning equipment). As shown in the part "estimating job potential according to the five Plan Bleu measures" outlined in part 3.2.3, the manufacturing of this equipment will represent a small share of the jobs from measure No. 1. In addition, a large portion of these jobs could be imported. Therefore, the potential for training required to develop these jobs will depend on the incentive policies implemented by governments.

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[15] "*Méditerranée 2030: pour une vision commune de l'avenir de la Méditerranée, les perspectives sectorielles*" (Mediterranean 2030: towards a common vision of the future of the Mediterranean. Sector perspectives). Article by Frédéric Blanc, Secretary General of the FEMISE, 2005.

Table 19 - Training associated with equipment manufacturing jobs

Jobs	Training required	Fields
Mechanical Engineer	Postgraduate qualification in mechanical engineering	Production
Production Technician	Production Technician higher qualification	Production
Automated Systems Operator	Bac, Bac Tech, Bac Pro in Systems Maintenance	Production
Power Plant Technician	Bac, Bac Pro, Bac Tech in Automated Systems Management	Production
Scheduler	Bac in Technical Logistics	Production
Mechanical Construction Drafter	Bac Pro in Industrial Drafting	Production
Prefabrication worker	CAP, BEP in Prefabrication	Production
Machine Operators / Drivers	CAP, BEP in Machine Operation	Production
Assembly and Set-Up Worker	CAP in Industrial Systems	Production
Maintenance Technician	BTS, Bac Pro in Industrial Maintenance	Maintenance
Mechanical Technician	Bac Pro in Equipment Maintenance	Maintenance
Automatic Control Technician, or Automatician	Bac Pro in Industrial Equipment Maintenance	Maintenance
Mechanical Technicians, Electricians and Boiler makers	CAP, BEP in Installation Maintenance	Maintenance
Site Machinery Mechanical Technician	CAP, BEP in Equipment Maintenance	Maintenance
Maintenance Electro-mechanical Technician	CAP in Electrical Systems	Maintenance
Laboratory Technician / Quality Controller	Higher qualification in laboratory sciences and technology	Quality
Process Technician	Higher qualification in physical measurements	Quality
Safety Manager	Higher qualification in health, safety & environment	Environmental safety
Technical Sales Rep	Higher qualification in Management	Sales
Administrative Employees	Higher qualification in Administration	Administration

Sources: the French Organisme Paritaire Collecteur Agréé (OPCA) website for the five industrial sectors: Quarries and construction materials, Ceramics, Cement, Tiles and bricks, Lime; www.lesmétiers.net (Île-de-France).

A second part of required training will focus on structural work and light work for the insulation of building envelopes (roof, walls and windows).

The qualifications required to work in these trades are also needed in order to define levels of training. The table below shows the various production trades in the construction sector and the levels of qualification required for them.

Table 20 - Qualification level for production jobs in the construction sector

Production jobs	Low qualifications level VI	Qualifications level V,IV(1/4)	High qualifications level IV(3/4)
Mason	30%	41%	29%
Frame Worker / Carpenter	35%	41%	24%
Plasterer / Plasterer, Ornamental Plasterer / Plasterer, Plasterboard Craftsman	35%	37%	28%
Roofer	33%	40%	27%
Electrician / Electronics Engineer	28%	41%	31%
Air Conditioning, Insulation, Heating Installers / Heating Specialists / Thermal Installer	26%	41%	33%
Plumber / Sanitation Installer	31%	39%	30%
Joiner	30%	43%	27%
Locksmith / Metalworker	33%	43%	24%
Glazer, Painter	30%	41%	29%
TOTAL	31%	41%	28%

Source: CCCA-BTP study

A final part of required training will relate to plumber, electrician and heating specialist trades in order to install and maintain energy-efficient equipment such as efficient heating and air-conditioning, as well as to replace old equipment.

1.7.2. Thermal renovation of buildings

A first part of required training will relate to equipment manufacturing. However, just like the previous measure, the volume of training required to develop these equipment manufacturing jobs (such as insulation materials, glass, wood and windows) has not been estimated. As shown in the section "estimating job potential according to the five Plan Bleu measures" outlined in part 3.2.3, there is low job creation potential and therefore little related training. A large part of these jobs could also be imported.

A second part of required training will relate to renovation work. The table below breaks down the sectors associated with construction trades and shows the relative share of each of the trades on a construction/renovation site.

Table 21 - Proportion of production jobs within the construction/renovation sector

Production jobs		(source: CAPEB Study)	(source: FFB Study)	(source: INSEE Construction Committee)
Structural work jobs	Mason	27%	30%	31%
	Frame Worker / Carpenter	3%	3%	4%
	Plasterer / Plasterer, Ornamental Plasterer / Plasterer, Plasterboard Craftsman	5%	5%	5%
	Roofer	5%	7%	6%
Light work jobs	Electrician / Electronics Engineer	12%	11%	14%
	Air Conditioning, Insulation, Heating Installers / Heating Specialists / Thermal Installer	6%	5%	5%
	Plumber / Sanitation Installer	8%	7%	6%
	Joiner	10%	10%	12%
	Locksmith / Metalworker	5%	6%	5%
	Glazer, Painter	18%	16%	12%
	TOTAL	100%	100%	100%

Source: CAPEB study, CCCA-BTP study, INSEE, ratios: Union des Caisses de France for 2007

The table below correlates the Table 12,Table 13 and Table 21 which include numbers and percentages on production trades in the renovation sector.

Table 22 – Portion of production jobs within buildings renovation

Production jobs (building renovation)		Type of job (thermal renovation of buildings)	
Mason	30%	Structural work, Masonry, Tiling	30%
Frame Worker / Carpenter	3%	Carpentry, Joinery, Layout	13%
Plasterer / Plasterer, Ornamental Plasterer / Plasterer, Plasterboard Craftsman	5%	Plaster and Insulation Jobs and Techniques	10%
Roofer	7%	Roofing, Plumbing, Heating	14%
Electrician / Electronics Engineer	11%	Electrical and Electronic Equipment	11%
Air Conditioning, Insulation, Heating Installers / Heating Specialists / Thermal Installer	5%	Plaster and Insulation Jobs and Techniques	
Plumber / Sanitation Installer	7%	Roofing, Plumbing, Heating	
Joiner	10%	Carpentry, Joinery, Layout	
Locksmith / Metalworker	6%	Locksmithing Metalwork	6%
Glazer, Painter	16%	Painting, Glazing, Coverings	16%
TOTAL	100%	TOTAL	100%

Source: CCCA-BTP Study

By integrating technical functions and worksite management, as well as other functions (administrative and sales), the table of production trades can be extended to the following table:

Table 23 - Proportion of production and supervisory jobs within the construction/renovation sector

Production trades	
Mason	20%
Structural Worker / Carpenter	2%
Plasterer / Plasterer, Ornamental Plasterer / Plasterer, Plasterboard Craftsman	3%
Roofer	5%
Electrician / Electronics Engineer	7%
Air Conditioning, Insulation, Heating Installers / Heating Specialists / Thermal Installer	3%
Plumber / Sanitation Installer	5%
Joiner	7%
Locksmith / Metalworker	4%
Glazer and Painter	11%
Technical and site supervisory roles	
Site Foreman 2006	3%
Works Manager	2%
Surveys and Topography	1%
Technician	7%
Engineer	1%
Other Roles	
Administration	17%
Sales	2%
TOTAL	100%

Source: CCCA-BTP study

The table below shows the levels of training required for building and management jobs in the construction sector.

Table 24 - Training level for construction and supervisory jobs in the construction/renovation sector

Training level	
I and II: Engineers	4%
III: DUT	5%
III: BTS	7%
IV: Bac in Technology	4%
IV: Brevet de technicien (Technician diploma)	1%
IV: Bac Pro	8%
IV: Brevet professionnel (Vocational diploma)	3%
V: BEP	19%
V: CAP	29%
VI: Unqualified workers	20%
TOTAL	100%

Source: Grenelle building committee

The training related to the main production trades break down as follows in France.

Table 25 - Initial training in production jobs (France)

Percentage in initial training	
Mason	15%
Frame Worker / Carpenter	3%
Plasterer	2%
Roofer	3%
Electrician	27%
Heating specialist	16%
Plumber	8%
Joiner	18%
Metalworker	7%
TOTAL	100%

Source: CCCA-BTP study

This table highlights that the training offered in France corresponds fully to the national demand for training. However some disparities can be noted: a lack of training opportunities for the painter, heating specialist, and electrician trades, and an excess of training offered for masonry. Nonetheless, these small disparities can be justified by several variables (the market, employee seniority and turnover, untrained workers, etc). This observation means we can assume that recommendations to be made in terms of training opportunities will correspond to the estimated demand associated with job creation potential.

A last part of necessary training will relate to the installation of equipment and the maintenance of older buildings.

1.7.3. Gradual elimination of incandescent lamps and distribution of compact fluorescent lamps

The manufacturing of compact fluorescent lamps (CFL) will have little impact on employment. The switch from incandescent lamps to compact fluorescent lamps is a technological change that requires few changes in skills for employees in the manufacturing sector.

Programmes to promote, distribute and install compact fluorescent lamps for users will have little impact in terms of training as the general public can install these new devices themselves.

The low job potential to be developed will be accompanied by the following types of training:

- training for technical sales representatives, retailers, distributers (purchase and sale of CFLs);
- training in communication in order to promote CFLs;
- training for technical operators (in installation and maintenance) in order to install lamps in residential and potentially tertiary sector buildings (offices, businesses, hotels, etc.).

1.7.4. Distribution of efficient household appliances and heating and air conditioning systems

The types of training that need to be developed will be those associated with industrial trades that are directly related to the design and manufacturing of products, or machine maintenance. They will aim to offer training in the manufacturing of electronic components and materials for the production of white goods, as well as in the distribution, installation and maintenance of these appliances.

Table 26 - Efficient household appliance and heating and air conditioning system manufacturing, production and maintenance jobs

Jobs	Training required	Fields
Industry Technical Engineers	Higher qualification in chemistry, plastics processing, metallurgy or mechanics	Production
Process Technicians	Higher qualification in physical measurements	Production
Mechanical Technicians	Bac Pro in computer-integrated manufacturing and mechanics, BEP	Production
Electricity and Electronics Technician	Bac Pro in equipment and electrical installations	Production
Metal Removal or Forming Workers	CAP, BEP, Bac in electricity or electronics	Production
Electricity and Electronics Workers	CAP, BEP, Bac in electricity or electronics	Production
Mechanical Technician Workers	CAP, BEP in mechanics	Production
Process Workers	CAP, BEP, no specific qualification	Production
Maintenance Technicians	BAC Pro in automated mechanical systems maintenance	Maintenance
Maintenance Workers	CAP, BEP, Bac, BTS in industrial maintenance	Maintenance
Engineers, Research-Design-Testing Managers	Postgraduate engineering qualification	Designs

Source: STUDYA (training and career orientation portal)

Jobs associated with the distribution, installation, servicing and repair of household appliances:

- household appliance maintenance technician (appliance repair technician);
- maintenance electrician;
- heating specialist.

1.7.5. Distribution of solar water heaters

As shown in the section "estimating job potential according to the five Plan Bleu measures" outlined in part 3.2.3", jobs relate to the manufacturing of hot water tanks and sensors (depending on whether or not they are manufactured within the country), installation and maintenance and other jobs supporting the sector. Training is important for the support and development of the solar water heater and solar heating sector. The following main types of training are involved in the sector:

Table 27 - Training associated with solar water heater distribution jobs

Jobs	Training required
Solar thermal installation design	Postgraduate qualification in thermal engineering
(Individual and Collective) Solar Water Heater Installer and Maintainer	BTS in fluids energies & environments, BEP in energy and air conditioning systems installation
Thermal Solar Energy Technical Sales Advisors	Higher qualification, BTS in fluids, energies & the environment

Source: Fondaterra

The main types of training associated with the construction sector within SEMCs are listed below:

- The main fields of vocational training are as follows:
  - General masonry;
  - Building joinery, aluminium joinery, steel joinery, metal joinery, wood joinery;
  - Steel construction;
  - Wood technology;
  - Plumbing, sanitation;
  - Iron work, welding;
  - Plasterer;
  - Painter, glazier;
  - Topography;
  - Drafter, quantity surveyor;
  - Civil engineering, rehabilitation, works manager, construction coordinator, site foreman;
  - Building electricity, installation electricity;
  - Structural work/carcassing;
  - Air conditioning engineering;
  - Thermal and sanitary installer, air-conditioning;
  - Refrigeration assembly and repair technician;
  - Household appliance repair.
- The main areas of university training are as follows:
  - Urban planning and development;
  - Architecture;
  - Land development and urban planning, land use strategy;
  - Civil and urban engineering;
  - Construction or site management;
  - Building networks, fluids, energy.

- The main areas of continuing education are as follows:
  - Civil engineering;
  - Construction, land development and urban planning;
  - Energy and renewable energy management.
- Training and skills will focus on the following:
  - developing building and construction-related sectors to improve employment rates;
  - improving the clarity and awareness of building, eco-construction and renewable energy jobs;
  - adapting training methods (mainly associated with the "energy management" dimension);
  - retraining and employability;
  - consolidating initial training and improving continuing professional development;
  - adapting company skills (in initial training and continuing professional development);
  - supporting research and development and technology innovation in energy efficiency in order to help these technologies reach markets.

1.8. Summary

Table 28 - Summary of the employment impact of the breakdown scenario in the construction sector

	Number of jobs			Creation of jobs		Jobs net variations			
In Full Time Equivalent (FTE)	**2007-2008**	**2030 reference**	**2030 breakdown**	**Reference scenario**	**Breakdown scenario**	**Breakdown/ reference scenario**			
						Medium	**%**	**Low hypothesis**	**High hypothesis**
Demand	**7 157 000**	**14 039 066**	**16 227 066**	**+6 882 066**	**+9 070 066**	**+2 188 000**	**32%**		
Building	7 157 000	14 039 066	16 227 066	+6 882 066	+9 070 066	+2 188 000	32%	1 867 500	2 509 000
New buildings insulation			1 510 000	+0	+1 510 000	+1 510 000		1 320 000	1 700 000
Old buildings insulation			600 000	+0	+600 000	+600 000		500 000	700 000
Efficient lamps and appliances, water-heater programmes			78 000	+0	+78 000	+78 000		47 500	109 000
TOTAL	**7 511 070**	**14 664 766**	**16 785 066**	**+7 153 696**	**+9 273 996**	**+2 120 300**	**30%**		

Source: Syndex Estimates

The breakdown scenario could potentially generate **1.9 to 2.5 million new FTE jobs in the construction sector by 2030, across formal and informal sectors**. These jobs would be in addition to the 14 million jobs generated by the business-as-usual scenario applied to the construction sector.

There are greater challenges in terms of training and skills management as the issue is not just to train individuals whose jobs were created directly as a result of energy efficiency measures, **but also** those whose jobs result from the ongoing growth in the number of FTE jobs in the sector.

The challenge is to come up with the most suitable training methods based on the organisation of sectors in the various countries: training within large corporations, through players in the distribution and trade sector, public training, training offered by associations and networks of local tradesmen.

The assessments above were based on a large set of hypotheses. Appendix 1 - Part 2.5 contains a series of proposals to further develop this work and go beyond the limitations encountered.

2. Employment impact in the transport sector

2.1. Diagnosis and troubling trends

Changes in the transportation sector remain closely tied to urban development and planning issues .

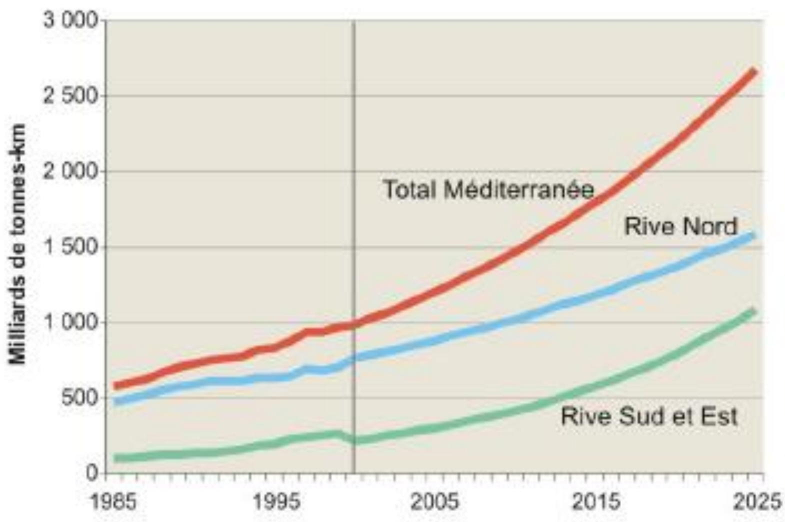
The elements of the regional diagnosis were raised and processed in various Plan Bleu research projects and publications, and particularly in "Urban mobility and sustainable development in the Mediterranean: regional diagnostic outlook", 2010, and "The Blue Plan's sustainable development outlook for the Mediterranean", 2008.

The following observations can be made of the situation:

- **a constant increase in the demand for travel** resulting from urban sprawl and the decoupling of work from home;
- **widespread congestion** along main thoroughfares, and consequently, a drop in travel speed, particularly significant in Cairo and Istanbul;
- **a mass vehicle ownership movement** encouraged by the opening up of markets and the introduction of consumer credit loans, which are dominant in the South and East;
- **recurrent shortcomings in public transportation provision,** in terms of servicing, level of service, dilapidation of fleets, as well as intermodality;
- **a constant rise in greenhouse gas emissions from the transport sector,** mainly from road transport, which depends heavily on fossil fuels.

The business-as-usual scenario predicts a significant increase in pressures for 2025: 2.6 times the amount of inland freight traffic (figure 17), 3.7 times the amount of ocean freight traffic, almost double the amount of passenger traffic. Mass car ownership will be widespread in the South before 2025. This exponential change will have major impacts on traffic congestion, noise pollution, greenhouse gas emissions and local pollution.

Figure 26 - Freight traffic (road, air and rail): change and business-as-usual scenario for 2025

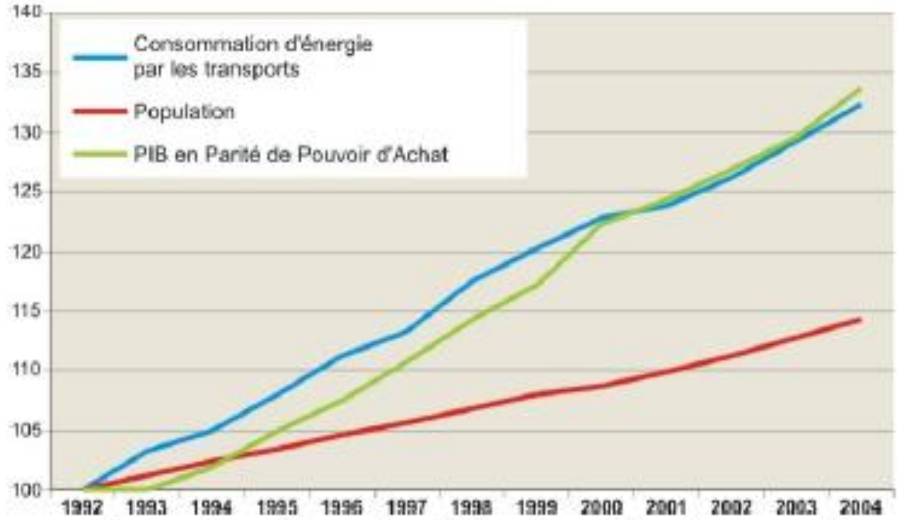


Source: ECMT, Ministries of Transportation, national statistics institutes, Plan Bleu outlook

Since 2000, the increase in energy consumption from transportation remains much higher than population growth, which is a cause for concern in a difficult energy context.

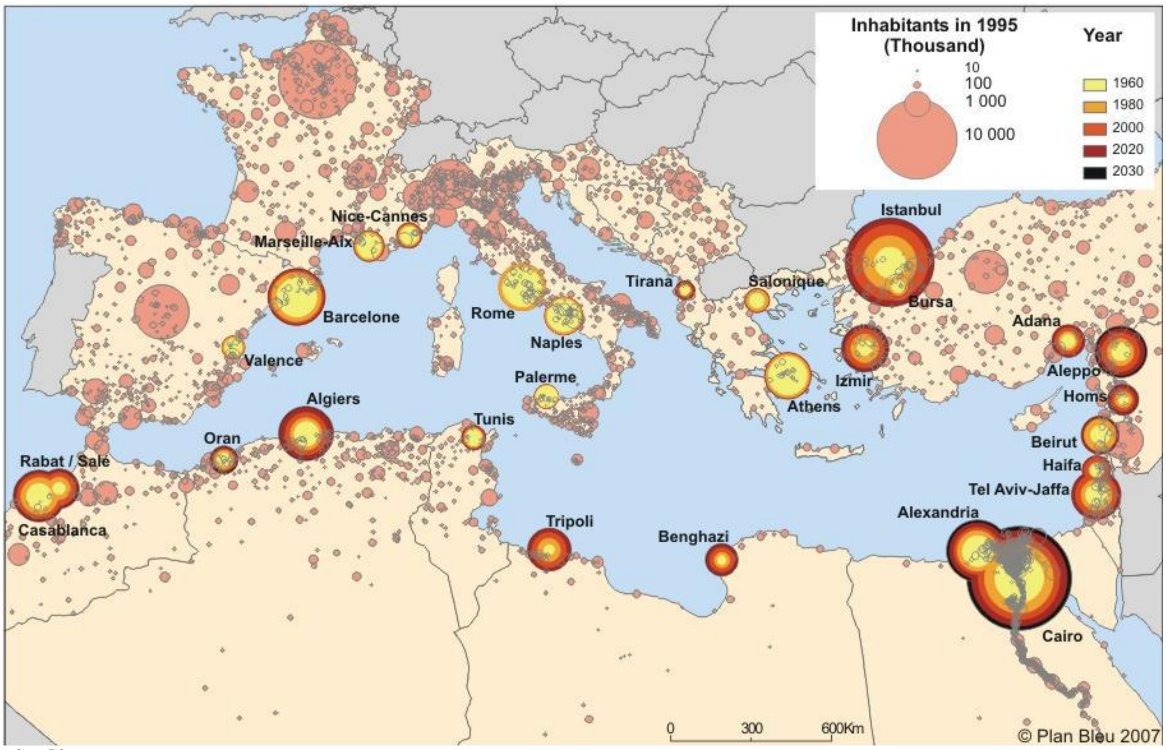
Although energy consumption data accounts for an improvement in engine performance, the pace of change in energy consumption from transport in the Mediterranean is close to that of economic growth. Significant effort must therefore be made to initiate the decoupling required to change the scenario.

Figure 27 - Change in transport energy consumption, population and GDP for all Mediterranean countries (starting at 100 in 1992)



Source: Observatoire méditerranéen de l'Énergie (Mediterranean Energy Observatory), World Development Indicators 2007 – World Bank

Figure 28 - Urban population distribution



Source: Plan Bleu

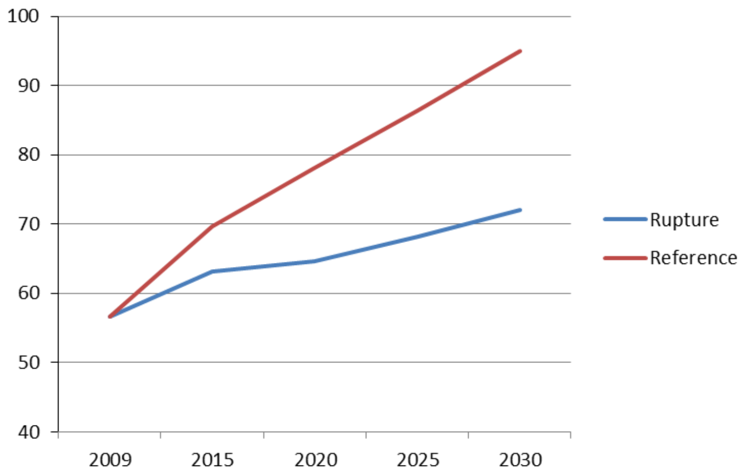
The following points can be noted in this context:

- Urban travel reflects urban sprawl and phenomena related to the development of urban hubs
- Urban mobility is still limited but increasing
- Car ownership rates are still relatively low and vary from country to country
- There is a decline in the use of public transport...in favour of cars
- There is a high proportion of small-scale public transportation
- Specialised employee shuttle transport services are maintained or developed

- The authorities are responsible for urban transport: predominant role of national governments and explosion of responsibilities
- Varying investment in mass transport
- Public policy initiatives still in favour of automobiles, etc.

Although the solutions for curbing these trends are well-known, the conditions for implementing them have not yet been developed and adapted to each situation. From an energy standpoint in the region, hypotheses for reducing energy demand in the types of transport included in the breakdown scenario lead to a slower increase in demand, mainly for petroleum products. The use of electricity and gas as fuels is predicted on a small scale for 2030.

Figure 29 - Forecast energy demand for transport: business-as-usual scenario and alternative scenario



Source: Plan Bleu, OME, 2010

2.2. Qualitative information on employment

It is not currently possible to study the employment impact of energy improvement scenarios for the transportation sector in the region. An essential first step would consist in defining the expected and observed impacts based on a typology of actions using local research.

Comparable data is not available in terms of tonnes of goods per km for freight transport or number of passengers per km for passenger transport, by transport mode.

However, in general, by using previous Syndex research in the European Union, we can simply state that policies and measures aimed at readjusting the transport methods in favour of rail transport for both freight and passengers, would lead to overall employment growth in the countries studied.

In order for these positive effects on employment to become concrete, policies and measures must be implemented through an integrated approach. It must combine regulatory, economic and market mechanisms, R&D, management of transport demand, available alternatives, the improvement of working conditions in the road and maritime sector, investment in training and social dialogue, as well as policies aimed at developing career mobility.

The Plan Bleu alternative scenarios also involve qualitative changes to employment in the transportation sector.

The improvement of labour conditions in the road transport sector will also be an essential factor in changing transport modal distribution within the framework of a greenhouse gas emissions and energy consumption management policy in the transport sector. The competitiveness of rail transport and especially intermodal transport compared to road transport will be improved through the effective implementation of legislation on work hours and rest time in the road transport sector.

The modal shift in a port or logistics hub and in the transport industry as a whole would require organisational changes in order to meet international efficiency standards. Negotiations on labour conditions on a national government level is important in helping to make the most of opportunities in terms of employment and social cohesion resulting from readjusting transport in favour of rail and public transportation.

In a proactive scenario aiming to manage the volume of road transport, dialogue on labour conditions could contribute to the establishment of social policies supporting career mobility in the sector towards rail transport activities or other transport modes (maritime). Job creation in maritime transport in the countries studied requires compliance with fundamental ILO conventions for seafarers and vessels in good condition to ensure the health and safety of workers and the environmental integrity of marine ecosystems.

Another vital element is the creation of a national transport infrastructure plan. This plan integrates road, rail and maritime transport and is essential to rationalising the transport of goods. It must include a CO_2 emissions avoided value in tonnes and a discount rate with takes into account the gravity of global warming. This scheme must be integrated into a medium- and long-term programme.

For this purpose, strategic workforce planning tools must be developed and implemented in order to plan for job flows in the various transport modes. These tools must also be used to create ways of defining the bridges between the different professions and various branches in the transport sectors, and to create job security, particularly through professional development programmes.

Many factors come into play in the assessment of employment and notably the current job structure depending on the transport mode, population pyramids and available training. This is therefore the situation in the construction of a social contract on the mobility of goods and people. This contract must stimulate negotiations on labour conditions and acceptance of the plan by the population.

Available energy sources must also be taken into account for the various types of transport.

3. Impact on employment in the industry sector

3.1. Development of energy efficiency implies modernization of production systems to generate increased productivity

Industrial activities account for nearly one third of global energy demand and almost 40% of worldwide CO_2 emissions. Most of these emissions stem from primary industry for materials: chemical and petrochemical products, iron and steel, cement, pulp and paper and aluminium. Curbing worldwide CO_2 emissions to 450 PPM requires a significant reduction in energy consumption from industry on an international level.

Although industrial energy efficiency has improved and carbon intensity has decreased significantly in many sectors over the last few decades, this progress has been more than outbalanced by the increase in industrial production on a global scale. Consequently, total industrial energy consumption and CO_2 emissions have continued to increase. The IEA[16] predicts that over the next forty years, demand for industrial materials will double or even triple in most sectors, which will likely result in a strong increase in energy consumption and CO_2 emissions. Therefore best available technologies (BAT) must be made available at a faster rate along with the rollout of a range of new technologies such as CCS (Carbon Capture and Storage). This technological transition is urgent. Industrial emissions must reach their peak in the coming decade.

To remain in line with the 450 PPM target, governments and industries must work hand in hand in the research, development and rollout of promising technologies that have already been identified, but also to find and advance new processes that reduce CO_2 emissions.

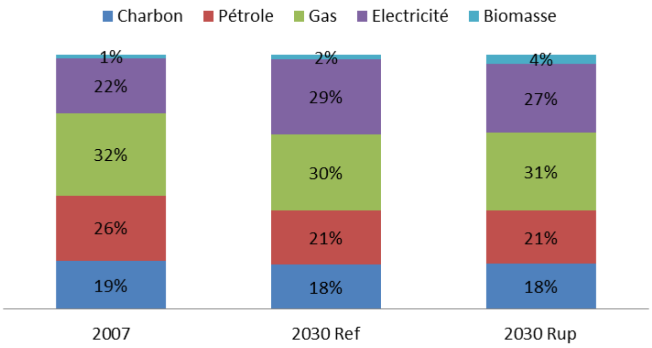
All technologies relating to energy efficiency in industry have a key role in this context. Of course energy efficiency in industry in the North has improved considerably over the last decade, however additional

[16] IEA – ETP 2010

improvements can still be made by implementing best available technologies (BAT). The implementation of BATs in industry could reduce current emissions by 12% to 26%. However, there is much greater potential for all industries in SEMCs to reduce emissions due to production systems that are relatively outdated compared to Northern Mediterranean industries.

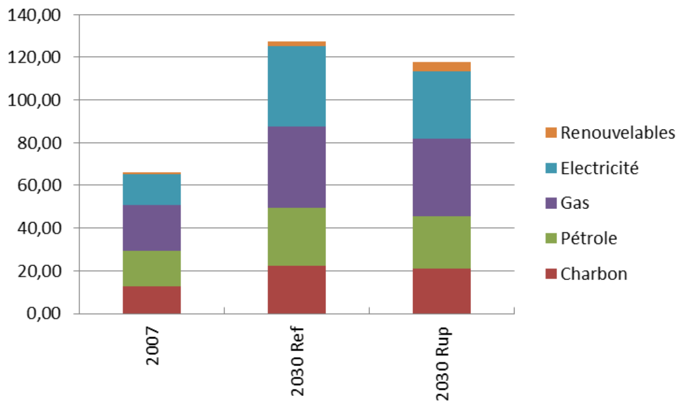
The breakdown scenario includes the assumption of 118 million tonnes of oil equivalent (Mtoe) in primary energy consumption by 2030 for the industrial sector, compared to 127 Mtoe in the business-as-usual scenario, i.e. a 7% reduction in energy demand in the industrial sector in SEMCs, which is much less than that projected for Northern Mediterranean countries.

Figure 30 – Industry energy demand (in %)



Lower than the business-as-usual scenario, energy demand for 2030 in the breakdown scenario includes a change in the industrial energy mix, particularly with a decrease in demand for petroleum products in favour of biomass and gas.

Figure 31 – Energy mix depending on scenario by 2030



The development of energy efficiency in SEMCs requires modernisation of production systems, which, with the use of best available technologies, should gradually improve work productivity to reach the level of the manufacturing sector in the North.

Overall, in SEMCs, the industrial sector suffers from work productivity that is lower than in industries in the Northern Mediterranean: a difference that is estimated at over 50% of the medium productivity of industry in the North[17].

Compared to the business-as-usual scenario, the breakdown scenario ultimately introduces a change in trend for work productivity. Therefore, from the standpoint of employment dynamics, growth in the industrial sector in the breakdown scenario leads to fewer jobs than in the business-as-usual scenario.

Thus, for growth in the sector that is hypothetically equal to the medium annual GDP of 3.2%:

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[17] IPEMED – *Méditerranéen 2030, panorama et enjeux géostratégiques humains et sociologiques* (The Mediterranean by 2030 – panorama and human and sociological geostrategic challenges) - 2009

- in the business-as-usual scenario, medium annual job growth is at 2.6% for 0.6% in medium productivity per year;
  - based on a 2007 evaluation of SEMC employment in industry of 17 million FTE jobs, employment in the business-as-usual scenario would increase to 30.8 million FTE jobs;
- in the breakdown scenario, medium annual job growth is at 1.5% for 1.6% in medium productivity per year, including productivity related to energy efficiency evaluated at 0.4% per year.
  - based on a 2007 evaluation of SEMC employment in industry of 17 million FTE jobs, employment in the breakdown scenario would increase to 24.1 million FTE jobs.

The breakdown scenario leads to fewer jobs and requires a significant effort in terms of investment in human capital, in addition to considerable investments in productive capital.

At this level, the anticipation of changes in jobs and the implementation of training needed by workers play an essential role in reaching energy efficiency targets for SEMCs. Even without the breakdown scenario, jobs in industry will inevitably be deeply reformed from the effect of BATs on productivity.

The underlying hypothesis in this case is the stability of the industrial sector in SEMCs. Any change in the integration of the manufacturing system on a world scale (for instance, selective specialisation in technological industries) would result in a real break-away from the current manufacturing system. From an employment dynamics perspective, this would raise the issue of social transition with certain careers becoming obsolete in favour of others.

3.2. Promoting energy efficiency in SEMCs industries has several functions and is in need of conditions

The first concerns promoting the competitiveness of business in that whatever the primary energy sources, they will inevitably be increasingly used, at different paces of course, depending on the reserves of these sources (coal, oil, gas, uranium, etc.).

An industry's ability to be competitive will hinge on the right choice of energy in the long term, the use of technological investments in higher resource efficiency and increased productivity.

The energy efficiency of industries in SEMCs is an important concern as a mechanism for reducing costs and improving the competitiveness of businesses located in these countries, as well as on a national level for reducing their energy dependency and compensating the deterioration of their balance of payments.

Another function is to engage in the necessity to fight global warming and reduce greenhouse gas emissions. For an industry to be more efficient, a carbon footprint must be established.

Finally, these energy efficiency measures for industry create jobs and new skills, (particularly energy auditors, production process analysts).

This implicates new governance of businesses, with greater involvement on the part of employees and their representatives, and the implementation of appropriate tools and systems (strategic workforce planning, vocational training, etc.).

This also requires ensuring funding for energy efficiency investments in industry in SEMCs by relying not just on funds from European and international financial institutions (EIB, EDF, World Bank, etc.), but also innovative financial instruments (Green climate funds ratified at the Cancun COP, CDM (Clean Development Mechanism), carbon tax, tax on international financial transactions, etc.)

V. Synthesis

Table 29 – Synthesis of the breakdown scenario employment impact

	Number of jobs			Creation of jobs		Jobs net variations			
							Breakdown/ reference scenario		
In Full Time Equivalent (FTE)	2007 - 2008	2030 reference	2030 Breackdown	Scenario Reference	Scenario breackdown	Medium	%	Low hypothesis.	High hypothesis
PRODUCTION	**354 070**	**625 700**	**558 000**	**+271 630**	**+203 930**	**-67 700**	**-25%**		
Primary energy	324 070	519 000	449 000	+194 930	+124 930	-70 000	-36%		
Oil	*177 981*	*241 000*	*208 000*	*+63 019*	*+30 019*	*-33 000*	*-52%*		
Gas	*124 089*	*242 000*	*215 000*	*+117 911*	*+90 911*	*-27 000*	*-23%*		
Raffinage	*22 000*	*36 000*	*26 000*	*+14 000*	*+4 000*	*-10 000*	*-71%*		
Electricity	30 000	106 700	109 000	+76 700	+79 000	+2 300	3%		
O&M	*30 000*	*74 000*	*63 000*	*+44 000*	*+33 000*	*-11 000*	*-25%*		
Plants construction (FTE/year)		*32 700*	*46 000*	*+32 700*	*+46 000*	*+13 300*	*41%*	*2 300*	*24 300*
DEMAND	**7 157 000**	**14 039 066**	**16 227 066**	**+6 882 066**	**+9 070 066**	**+2 188 000**	**32%**		
Energy Efficiency									
Industry									
Transport									
Building	7 157 000	14 039 066	16 227 066	+6 882 066	+9 070 066	+2 188 000	32%	1 867 500	2 509 000
New buildings insulation			*1 510 000*	*+0*	*+1 510 000*	*+1 510 000*		*1 320 000*	*1 700 000*
Old buildings insulation			*600 000*	*+0*	*+600 000*	*+600 000*		*500 000*	*700 000*
Efficient lamps and appliances, solar water-heater programmes			*78 000*	*+0*	*+78 000*	*+78 000*		*47 500*	*109 000*
TOTAL	**7 511 070**	**14 664 766**	**16 785 066**	**+7 153 696**	**+9 273 996**	**+2 120 300**	**30%**		

VI. Appendix 1: Methodology

1. Estimating employment impacts in the power generation sector

Two areas of employment have been taken into account in this study:

- jobs in power plant operation and maintenance;
- jobs associated with the construction of new power plants and renovating obsolete plants.

We shall assume that jobs in the transmission, distribution and marketing of electricity will not significantly change up to 2030, because power grids now almost fully cover the countries involved. The only exception to this assumption concerns the projects for tie lines between the various Southern Mediterranean countries and with Europe (*MedGrid in particular*), which have not been included in our estimates.

Furthermore, the nuclear projects planned for between 2020 and 2030, mainly in Turkey and Egypt, have not been taken into account for potential jobs. Indeed, we assume that, if they do take place, these projects will happen after the scope of the study (2030), given two major events that have occurred during the study: the Arab Spring and the Fukushima accident.

1.1. Operation and maintenance jobs

To calculate jobs for each type of power station, ratios (in FTE/MW) have been applied to the respective installed capacities assumed under the breakdown scenario.

These ratios were calculated from employment data collected in Tunisia and Morocco or, failing that, were estimated from the European ratios given in the Syndex study "*Climate change, new industrial policies and exiting the crisis*".

Table 30 – O & M employment ratios

	ratios used in the study		*Comparison*				
Plant type	**FTE / MW**	**source**	**EU (Syndex)**	**Poland 2030 (Syndex)**	**Greenpeace[1]**	**UNEP 2011[2]**	**World Bank[3]**
Oil	0,30	Tunisia	0,25				
Gas	0,19	Tunisia	0,20	0,23	0,05	0,70	
Coal	0,45	EU	0,45	0,31	0,10	0,74	
Nuclear	0,34	EU	0,34	0,34	0,32		
Hydro	0,27	Tunisia	0,18	0,18	0,22		
ReN							
wind	*0,12*	*Tunisia & Morocco*	*0,25*	*0,21*	*0,59*	*0,27*	
solar	*0,12*	*EU*	*0,12*	*0,12*	*0,30*	*1,20*	*1,31*
biomass / bioga / CRW	*0,23*	*EU*	*0,23*	*0,21*	*3,10*	*0,38*	
geothermal	*1,40*	*EU*	*1,40*				

1. Greenpeace et EREC, Working for the Climate, Renewable Energy & the green Job Revolution, 2009
2. UNEP, Towards a Green Economy, Pathways to Sustainable Development and Poverty Eradication, 2011
3. World Bank, Ernst&Young, Fraunhofer, MENA Assessment of the Local Manufacturing Potential for CSP Projects, 2010

1.2. Construction jobs

The construction of new power plants and the renovation of obsolete plants will temporarily generate employment. To estimate the number of jobs, we have taken into account:

- the increase in capacity planned for 2007-2030 under the breakdown scenario, from which the power (in MW) of **new power stations** can be estimated (per fuel type);

- an analysis of the age of the current fleet, to determine the **capacity (in MW) to be renovated by 2030**: for the assumptions adopted in this study, this corresponds to the sum of installed power station capacity over 40 years old (all types together including dams[18]).

The total construction requirement thus obtained has been converted into an annual medium value to take into account the temporary nature of this activity, limited to the construction phase of the power stations. The corresponding jobs are expressed as full-time equivalents per year[19] generated over the period 2007-2030.

These direct construction jobs[20] have been estimated on the basis of:

- **medium investment costs** per power-station type, from data collected in Tunisia and Morocco or, failing that, estimated by Syndex;
- a **breakdown of the value chain** into four sectors[21]: civil engineering (20%), other engineering (15%), equipment (50%) and installation (15%).
- an **estimate of the local share** (in €) for each of these sectors, currently and also as a function of the opportunities for future industrial developments up to 2030;

Table 31 – Local integration by sector

Sector	Low hypothesis (2007)	High hypothesis (2030)
Civil engineering	100%	100%
Engineering	0%	30%
Equipment	10%	40%
Assembly	60%	80%

Source: Syndex hypotheses

- a **FTE / turnover (in millions of Euros) ratio** for each sector[22]. The NACE codes used were:
  - NACE Groups 28.2 and 28.3 - Manufacture of boilers, metal containers and steam generators;
  - NACE Group 28.1 - Manufacture of structural metal products;
  - NACE Groups 28.6 and 28.7 are referred to as "Miscellaneous fabricated metal products manufacturing";
  - NACE Group 29.1 - Manufacture of machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines;
  - NACE Division 31 - Manufacture of electrical machinery and equipment;
  - NACE Group 45.3 - Building installation;
  - NACE Group 45.2 - General construction (building of complete constructions or parts thereof; civil engineering);
  - NACE Groups 74.2 and 74.3 - Architectural & engineering activities; technical testing & analysis.

[18] Note that this assumption is not realistic for dam renewal, as such installations are planned for longer service lives.
[19] Note: This method significantly smoothes construction activity; it does not take into account peaks in activity associated with the various phases in the construction of a power station, or the scheduling of the various projects.
[20] They do not take into account employment associated with investment in transmission and distribution systems or indirect employment associated with the intermediate consumption of companies involved in power-station construction (such as steel, transport, financial services and training).
[21] From *World Energy Council* (2009).
[22] *European Business Facts and Figures 2007*, Eurostat.

2. Methodology for employment impact analysis used for the construction sector

2.1. Background

The technology selected for insulation and construction materials in each country will strongly impact the results in terms of employment. The ability of local industry to produce high-quality materials and products at competitive prices and in sufficient quantities is a vital factor for job creation. The breakdown scenario assumptions do not cover this choice of technology. Neither is it the purpose of this employment impact analysis to specify technology choices. Consequently, the impacts on employment from the implementation of breakdown scenario measures are overall impacts.

Furthermore, the economic diversity of the countries covered in the study makes the application of overall employment ratios less relevant. A more detailed country-by-country analysis would give more accurate results.

The construction sector in SEMCs is characterised by high demand for housing, leading to "rushed" construction with problems regarding low-quality materials (leading to importing materials and the risk of job losses) and low-quality implementation (and inadequate training of workers). The additional costs associated with the time spent on implementing this new higher quality represent additional investment and associated jobs.

2.2. Aspects of the method

Syndex has instruments for both types of approach to assessing the employment impact of applying energy efficiency measures to buildings: an overall approach associated with the additional investments required to meet targets and a per-sector approach based on turnover, added value and number of jobs in the sector.

The main difficulty encountered in this work was access to data. The interviews carried out on the field in Tunisia and Morocco were not in themselves sufficient: the per-sector approach requires access to precise statistical data, broken down by NACE code, with associated turnovers and employment figures. This would provide ratios specific to countries and sectors, and a more detailed understanding of the economies of the countries and their ability to create jobs. However, this data is not made public in sufficient detail in Southern countries and we have not been able to obtain it through our interviews in SEMCs.

For this reason, we used an overall approach, which consists of applying a ratio of direct job creation per million Euros of additional investments required. Data on the additional investments required have been estimated by Plan Bleu in the document "Energy, climate change and construction in the Mediterranean: regional perspectives", a draft document dated October 2010.

Table 32 – Investments needs for the EE measures of the breakup scenario, by country (in billion euros)

Measures	Total investments needs over 20 years (in billions)	Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Syria	Palestine	Tunisia	Turkey	Libya
TOTAL	262	33,3	74,3	7	4,5	2,8	30,3	19,2	4,1	3,6	77,2	6
Generalization of efficient envelops for new buildings	132	33,3	37,2	3,5	2,2	1,6	15,1	9,6	2,1	1,2	40,2	3
Buildings thermal renovation	49	6,1	13,8	1,3	0,8	0,4	5,6	3,5	0,8	1,4	14,1	1,1
Gradual elimination of light bulbs from the market	3	0,4	0,8	0,1	0,1	0,1	0,4	0,3	0	0	0,8	0,1
Dissemination of efficient household , heating and air-conditioning appliances	40	5,3	11,5	1,2	0,7	0,4	4,8	3,1	0,6	0,5	11,2	0,9
Dissemination of solar water heaters	38	5	11	1	0,6	0,3	4,4	2,8	0,6	0,5	11	0,9

Source: Estimations of the study's experts group/Plan Bleu

Syndex has gathered existing ratios regarding housing-based energy efficiency work and programmes, and has produced hypotheses based on the ratios available. These ratios are mainly based on Northern-European studies, especially French studies.

Where possible, data from Southern countries has been collected and "Southern" ratios produced. Wherever a "Southern" ratio existed, it was given priority in the hypotheses.

We worked on the basis of ratios produced by:

- the consultants in charge of the French Government's recovery plan (May 2009), based on French experience;
- French engineering consultants ICE, for the ARENE study dated December 2006: "*Étude prospective sur le développement des activités et des emplois dans les secteurs de l'efficacité énergétique et des énergies renouvelables en Île-de-France" (Planning study for the development of activities and employment in the energy conservation and renewable energy sectors in the Paris region*). This was based on various Northern-European experiences and on statistical ratios from the 2004 report of French Government economic statistics body DAEI-SES: "*Enquête annuelle d'entreprises*" (Annual business survey).
- French renewa*ble energy body DGEMP/Observ'E*R, for solar water heaters;
- Tunisian experience with the PROSOL programme, for solar water heaters in Tunisia;
- Moroccan experience with the company Electromel, which produces compact fluorescent lamps;
- Syndex, using INSEE data on turnover and employment by sector (mean for 2007-2008 and outlook for 2012).

2.3. Table of existing ratios by measure

Syndex has performed various employment impact analyses on the basis of a combination of the above ratios. This has produced ranges of potential job creation estimates for SEMCs.

Measure 1: mainstreaming of current building envelope technologies on new builds: quantitative aspects

- **Hypothesis 1:** where 70% of the investment corresponds to a mean ratio from the number of jobs created (per million Euros of investment) in the installation of thermal equipment (heating and air conditioning) and the number of jobs created by insulation work **and** 30% corresponds to the additional investment associated with energy efficient products alone.
- **Hypothesis 2:** where 70% of the investment corresponds to a mean ratio comprised of the number of jobs created (per million Euros of investment) in the installation of thermal equipment (heating and air conditioning), the number of jobs created by insulation work and the number of jobs created by roofing work **and** 30% corresponds to additional investment associated with energy efficient products alone.
- **Hypothesis 3:** where 70% of the investment corresponds to the ratio for miscellaneous construction work **and** 30% corresponds to the additional investment associated with energy efficient products.
- **Hypothesis 4**: low hypothesis for job creation for constructing new high energy performance buildings.
- **Hypothesis 5**: high hypothesis for job creation for constructing new high energy performance buildings.
- **Hypothesis 6**: medium hypothesis for job creation for constructing new high energy performance buildings.
- **Hypothesis 7**: investments only in building roofing (50%) and insulation (50%).

On the basis of the results of these seven hypotheses, the largest and smallest potentials for job creation were excluded. The next two hypotheses (highest and lowest) constitute the high and low hypotheses for our estimates. Finally, the results were rounded.

The detail of the estimates as a function of the various hypotheses is available in the Excel software tool supplied for applying the method.

Table 33 - Measures 1 and 2: mainstreaming of current building envelope technologies on new builds and thermal renovation of existing buildings (roof and wall insulation, window replacement)

Types of works	Range	FTE/million of investment	Sources	Countries
Development constructions		11,6	Recovery office of the French government	France
Energy efficiency work		14,2	Recovery office of the French government	France
Single-family homes construction		9,2	DAEI-SES, Annual company investigation 2004	France
Other buildings construction		8,5	DAEI-SES, Annual company investigation 2004	France
Coverage realization by components		12,1	DAEI-SES, Annual company investigation 2004	France
Sealing works		8,8	DAEI-SES, Annual company investigation 2004	France
Carpentry works		11,4	DAEI-SES, Annual company investigation 2004	France
Electrical installation work		10,9	DAEI-SES, Annual company investigation 2004	France
Insulation work		8,8	DAEI-SES, Annual company investigation 2004	France
Thermal equipment installation		11,4	DAEI-SES, Annual company investigation 2004	France
Built related programmes (insulation and substitution heating)	MIN MAX MEDIUM	10 16 13	ICE office based on ratios pool	France UK France, UK, Quebec
Energy improvement programme of heating systems	MIN MAX MEDIUM	8 14 11	ICE office based on ratios pool	UK France UK and France
Bioclim or HPE buildings programme	MIN MAX MEDIUM	10 20 15	ICE office based on ratios pool	Germany, Netherlands, UK UK Germany, Netherlands, UK
Roofs insulation Works employment ratio Materials employment ratio OF WHICH FACTORY OF WHICH DISTRIBUTION	TOTAL	18,8 11,0 3,9 2,2 1,7	Syndex, based on INSEE data on turnover and employment by sector (medium 2007/2008 and prospects 2012)	France
Openings insulation Works employment ratio Materials employment ratio OF WHICH WINDOWS OF WHICH GLAZING	TOTAL	33,0 23,9 5,7 3,0 0,4	Syndex, based on INSEE data on turnover and employment by sector (medium 2007/2008 and prospects 2012)	France

Source: BCG, DAEI – SES, ICE, Syndex

Measure 1: mainstreaming of current building envelope technologies on new builds, qualitative aspects

As a second step, and with the aim of deepening the qualitative understanding of the jobs created, the following ratios have been applied to the results of the quantitative step; these ratios are from the *In Numeris* study for ADEME, Situation 2007-2008, Outlook for 2009, from France.

Equipment manufacture	11 %
Design and Installation	76 %
Distribution	13 %

We have no access to similar data for SEMCs.

Measure 2: thermal renovation of existing buildings (roof and wall insulation, window replacement), quantitative aspects

- **Hypothesis 1:** where 100% of investment is in insulation work.
- **Hypothesis 2:** where 50% is in insulation work and 50% in roofing.
- **Hypothesis 3:** where 50% is in roofing insulation, and 50% in openings insulation (Syndex).
- **Hypothesis 4:** where 100% is in energy efficiency work.

On the basis of the results of these four hypotheses, the largest and smallest potentials for job creation were excluded. The next two hypotheses (highest and lowest) constitute the high and low hypotheses for our estimates. Finally, the results were rounded.

The detail of the estimates as a function of the various hypotheses is available in the Excel software tool supplied for applying the method.

Measure 2: thermal renovation of existing buildings (roof and wall insulation, window replacement), qualitative aspects

Renovation work is not necessarily carried out by the same people involved in the construction of new housing. While renovations are mainly carried out by tradesmen in the masonry, roofing, plastering, insulation, joinery, electrician trades, etc., new construction projects will mainly call on national or international construction specialists and major property developers. Renovation work performed by tradesmen is essentially local. The materials, intermediate goods and equipment (insulation materials, glass, wood, windows, etc.) could potentially be manufactured out of country.

On the basis of this hypothesis, a more qualitative analysis of the type of job created has been developed on the basis of figures from a study by French construction-industry training body CCA-BTP.

Table 34 - French figures for construction industry employment and training, June 2008

Structural work, Masonry, Tiling	30 %
Electrical and electronic equipment	11 %
Frames, Joinery, Layout	13 %
Plastering and insulation	5 %
Painting, Glazing, Coverings	16 %
Roofing, Plumbing, Heating	19 %
Locksmithing, Metalwork	6 %

Source: CCA -BTP

Measures 3 and 4: Gradual replacement of incandescent lamps on the market with CFLs/LEDs and the distribution of efficient household appliances, and heating and air conditioning systems

Although both these measures are related to the optimisation of energy consumption in buildings, they do not rely on the construction sector, but rather equipment industrial sectors, which are more capital-intensive and subject to productivity and international competition constraints.

The majority of jobs created are in manufacturing, and jobs in distribution will not be very affected by the distribution of more efficient products for an existing use. Some jobs in marketing could be created but these are marginal.

It can be assumed that the billions of Euros will be invested in purchasing equipment that could be imported from third-party manufacturing nations. In this case, there will be no impact on employment in SEMCs. This could be a first hypothesis. A second hypothesis consists in the idea that factories producing "conventional" equipment will adapt their industrial facilities and labour skills to "more efficient" products. Again there is practically no impact on job creation.

It is also possible that "conventional" equipment production facilities currently exist in SEMCs but that the investment required to adapt production lines to new equipment is not made based on a choice of location by major international corporations or due to less demand for "conventional" equipment in SEMCs. This would therefore lead to job destruction.

In the case of the breakdown scenario and its ambitious targets, we adopted an equally ambitious impact approach to employment to measure the job creation that could be generated by the domestic appropriation of skills and know-how domestically by supporting innovative SMEs or the ability to convince major international groups to locate to these countries.

It is necessary to know the employment levels required for the manufacture of "conventional" products and the employment levels required for the manufacture of efficient lamps. We do not have access to this data.

It is also necessary to know the source of the electrical components used to make the equipment.

Finally, it is necessary to know the service life of energy-saving products compared with "conventional" products.

2.3.1. Estimate of the need for CFL/LED lamps by 2030

Plan Bleu's hypothesis assumes that 100% of homes are fitted with energy-saving lamps from 2020, for a total of 107,404,000 homes in 2030.

Syndex assumes:

- a current rate of CFL use in homes of 10%;
- 5 lamps per home;
- a service life of 10 years, i.e. for lamp renewal after initial installation.

From our calculations, there is a need for 900 million CFL lamps by 2030 (details of the calculations are found in the Excel tool given in the Appendix).

2.3.2. Estimate of the employment to CFL ratio based on the experience of SARL Electromel in Morocco

SARL Electromel has 25 employees and produces 8,000 lamps per day, i.e. 2,360,000 per year (on the assumption of 295 production days per year: in Morocco, there is 1 rest day per week + 18 days paid leave). The trade integration rate of the business is 70%, i.e. 30% of components are imported.

Table 35 – Employment/CFL ratio, Moroccan experience

Works types	RANGE	Ratios types	Sources	Countries
Appliances and lighting improvement programmes	MIN MAX MEDIUM	7 FTE/millions investments 14 FTE/millions investments 10,5 FTE/millions investments	ICE office based on a pool of ratios	UK France, Spain, Netherlands, UK France, Spain, Netherlands, UK
Manufacture of low energy consumption lamp		94 400 lamps manufactured by on FTE job/year	Ratio based on the Algerian experience from the Electromel company	Morocco

Source: ICE, Syndex Estimates

Measure 4: distribution of efficient household appliances and heating and air conditioning systems

The production of appliances and systems that are more efficient than older generation equipment is based mainly on the components or performance of the production facilities, i.e. capital investments rather than investments that include the "work" factor. In addition, the appliance distribution and installation sector, and related jobs, already exist.

In conclusion, we believe that job creation associated with this measure does not stem from the distribution of efficient appliances, but rather the increasing equipment level in households, which is an ongoing trend in the region. We therefore consider that, in the context of the employment impact of the breakdown scenario, there is almost no job creation in this case.

Measure 5: distribution of solar water heaters, quantitative aspects

- **Hypothesis**: 35% of existing homes fitted and 30% of new housing fitted, i.e. a market for 630,000 solar water heaters per year, i.e. approximately 1,900,000 m² of cells annually. We determined the number of cells to install annually on the basis of Plan Bleu investment targets.

Table 36 – Surface and CES investments by country

Measure n° 5 : Solar water heater dissemination	Total jobs created by 2030	Algeria	Egypt	Israel	Jordan	Lebanon	Morocco	Syria	Palestine	Tunisia	Turkey	Libya
m^2 cell to install by country	1 900 000	249 344	548 556	49 869	29 921	14 961	219 423	139 633	29 921	24 934	548 556	44 882
Investments needed	38 100	5 000	11 000	1 000	600	300	4 400	2 800	600	500	11 000	900

Source: Syndex Estimates

Next, we used Tunisian experience as a basis, where the sector employs 4,000 FTE to install 80,000 m^2 per year.

Table 37 – Ratio of employment related to CES development

Work types	Ratios types	Sources	Countries
CES Programmes	20,7 FTE/millions investments	DGEMP/ Ratio Observer	France
CES Programme	0,05 FTE/m^2 installed cells	Ratio based on the Tunisian experience PROSOL	Tunisia

Source: Observ'er, DGEMP, Prosol

2.4. Trend predictions based on published data for the active population and the active population working in the construction sector

To assess the relevance of the results, the estimates were compared with figures published by countries and by the ILO on the economically active population in general, and the construction sector in particular.

Based on data on the economically active population and the economically active population working in the construction sector gathered from the LABORSTA database, which is available from national statistics institutes, we came up with projections for the change in the economically active population by 2030.

For the countries that the study focuses on (Tunisia, Turkey, Morocco and Egypt), where more precise data is available, we applied a mean growth rate for the economically active population based on the growth rates observed over the last 5 to 10 years. With regard to the economically active population involved in the construction sector, we applied a mean ratio for net job creation observed over recent years.

For the other countries an economically active population growth rate of 2.5% was applied up to 2020, and 2% from 2020 to 2030. The same method was applied for the outlook related to the number of employees working in the construction sector (3% growth between 2010 and 2020, and 2.5 % growth between 2020 and 2030), with the goal of obtaining the number of employees in the construction sector in 2030 in a business-as-usual scenario.

2.5. Limits of the analysis and avenues for further research

The employment impact of energy efficiency investments in buildings in SEMCs is a subject which has been little broached in national or international published research. To our knowledge, very few ratios have been published, which complicates the task.

The analysis runs up against several obstacles:

- the plurality of sub-sectors that comprise the construction sector. The many sub-sectors involved in building construction (such as cement, concrete, tiles and bricks, ceramics, steel, glass, marble, distribution, trade, structural work, light work, project ownership, engineering, energy auditing, domestic appliances, heating and air conditioning equipment, property development, finance and maintenance);
- the diversity of climate zones in the SEMCs, which vary from drought-prone areas to cold areas, with highly varied needs;

- the structure of businesses in the sector which varies between countries, with large domestic or international corporations, small to medium-sized businesses that may or may not be involved in exports and a large number of independent tradesmen;
- a sector where self-build and informal work are significant and hard to assess, with the formal sector itself using informal workers;
- the technology selected in each country, which will strongly impact the results in terms of employment;
- the trade integration of sub-sectors, i.e. the ability to locally produce high-quality materials and products at competitive prices and in sufficient quantities. There exists a real challenge to develop high-quality industrial sectors at the local level.
- The choices that countries make regarding the development of various industry sectors will affect the employment impact. The development of sub-sectors at the regional level, and the choices made by neighbouring countries will also have an impact. Sectors could also develop for export;
- The difficulty of obtaining sufficient, accurate data to produce ratios. It is necessary to break the construction sector down into sub-sectors. We requested data broken down by sub-sector for Morocco and Tunisia, but this data was not sent. This would involve obtaining per-sub-sector data on production capacities, turnover, added values and employment, from which we could calculate employment ratios for SEMCs which we could then extrapolate to 2030, based on housing needs. However, to obtain a meaningful employment impact, it would be necessary to propose hypotheses for technology choices and the per-country development of industrial sectors. These hypotheses could even help countries make their industrial policy decisions;
- the difficulty of estimating the number of jobs created by energy efficiency compared with those created by the undeniable increase in demand for housing in SEMCs;
- measures focused on insulation and the replacement of heating systems. The choice of insulation must be specified: replacing construction materials or strengthening the building envelope by new insulating layers, which would have different impacts on employment and skills. Furthermore, large investments are required to install efficient heating systems, given the very low cost of the systems that are currently in widest use, i.e. electric convectors and split-system inverter reverse-cycle air-conditioners, imported from Turkey or Asia.

Producing general ratios can make the analysis less relevant. The consequence of these obstacles is that, while employment impact analysis is not impossible, it does have limitations at such a general level.

3. Strategic workforce planning

A transition support strategy is required to manage the changes associated with the employment potential of the breakdown scenario and the relevant skills and training courses. This must be produced on the basis of an analysis of the synergies and interactions between the various components. The main components are: the energy efficiency and renewable energy sectors, the industrial fabric and industrial strategy of the countries, competitiveness clusters and technology clusters, the legal and regulatory framework and training bodies.

3.1. Background and purpose of the qualitative analysis

The qualitative analysis provides an estimate of potential job creation associated with the primary energy offer, energy conservation and the development of renewable energies. It also means that recommendations can be proposed with regard to the need for changes in qualifications and jobs with a view to strategic workforce planning.

This analysis aims to describe the ability of the SEMCs to adapt to meet the challenges of implementing the breakdown scenario. Therefore, this analysis consists of identifying the requirements on the basis of the hypotheses for changes in the sectors under the scenarios (estimates of jobs maintained or created, descriptions of job type, qualifications and profiles). Initially, a quantitative analysis was performed. It quantified the job creation potential associated with implementing the breakdown scenario in SEMCs. The challenge for the qualitative approach is to cover the following themes: the labour market; the industrial fabric of the countries; initial and continuing training; professional development and assessing the durability of training systems.

For each of the countries studied, these themes are combined via an analysis of the sectors associated with power generation and construction, support for these sectors and the incentive and regulatory frameworks.

From this analysis, proposals can be formulated for avenues for a strategic planning policy regarding jobs and skills. The challenge will be to specify the targets to be met, given the hypotheses, scenarios and employment impacts. It will also consist of defining the potential for developing training and skills, training requirements and the type of training courses associated with the energy efficiency of buildings, the rational use of energy and the renewable energy sources to be installed.

From this analysis, recommendations can be proposed for supporting and improving the training courses associated with potential jobs in Tunisia and Morocco.

This study aims to ground employment issues in the real situation and policies of the countries concerned. It also aims to take into account technology transfer, so that these countries can manage its use. This study should be considered as a transition support measure for identifying emerging trades – niches in renewable energies, power generation and building trades – and for improving the training courses required. These will be associated with renewable and sustainable energy sources (photovoltaic, thermal solar and wind), energy sectors, construction and energy demand management (reducing national energy consumption).

3.2. Limits of the approach and hypotheses

Application of the strategic workforce planning approach required a certain number of hypotheses. The approach also highlighted limits associated with the data gathered.

3.2.1. Hypothesis on the presentation of construction and power generation jobs

The jobs specified are associated with the construction and power generation sectors. However, in Tunisia, there is no baseline documentation that details jobs that are specific to energy management. Nevertheless, jobs are associated with construction and climate engineering. There is baseline documentation specific to energy management in Morocco: installation of photovoltaic systems and solar water heaters; design, sale and distribution of photovoltaic and thermal solar systems and insulation; sale and distribution of compact fluorescent lamps. Thus, jobs in direct relation with the training courses offered in the countries are given in this study.

3.2.2. Limits on the breakdown of skills and training requirements

The results obtained in the quantitative part, in terms of employment associated with measures, have been used to break down skills and training requirements. The skills and training requirements have been refined by field on the basis of ratios from French studies (CAPEB, CCCA-BTP, ARENE and ICE).

3.2.3. Hypothesis on training offers

A survey was made of training offers associated with the construction and power generation sectors in Morocco and Tunisia. However, this list is not comprehensive. Indeed, the figures given in the study represent the data to which we had access. This data identifies training courses available in these fields in the two countries.

3.2.4. Hypotheses used for processing data regarding training courses and for comparing the current training offer and the future offer to be developed

To process the data and compare the existing training capacities with the training capacities to be developed under the breakdown scenario, the hypothesis has been used that training courses involve 30 people. Thus, it has been possible to make a comparison by taking the number of establishments found in the survey for each job category associated with construction and power generation, and by using the employment potential estimated in the quantitative phase to obtain the number of additional training courses produced by applying the breakdown scenario. Another hypothesis consists of considering that, generally, people working in a sector associated with the energy efficiency of buildings or electricity production have already been trained in the country.

3.2.5. Training courses found in the survey and additional training courses

Training courses are each represented by one unit on the graphs shown in the specific country analyses summary (Section 1, Part 4 for Tunisia and Section 2, Part 4 for Morocco) and in the Internet appendices (Part 2, Sections 1, 4.3 and 4.6 and Part 2, Sections 2, 4.2 and 4.4). Each training course involves 20 to 60 people for the courses in the survey and 30 people for the additional courses. The additional training courses are those to be developed in the context of the breakdown scenario, under the hypothesis used of training courses involving 30 people. Thus, 3,000 forecast jobs (see quantitative analysis) over twenty years represent five additional training courses which must be implemented and maintained over twenty years. Furthermore, the “high and low hypotheses” given in the quantitative part have been maintained on the graphs representing the additional training courses.

3.2.6. Hypotheses regarding the content of the training courses, in association with energy demand management

Within the training courses covered in the survey, little information is available on modules associated with the energy efficiency of buildings and energy demand management. The existence and adequacy or otherwise of such modules has been substantiated on the basis of available data and reports on interviews performed in the countries.

3.2.7. Strategic approach of the country regarding industrial sectors and associated training

This part was based on the country’s reports and strategic studies and on interviews with economic and political figures in the countries.

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- Mme Maya AHERDAN, Directeur de l'observation et de la programmation, MEM
- Mme Fatiha MACHKOURI, Chef de service évaluation de projets énergétiques, MEM
- Mme Amina OUATTASSI, Chef division développement institutionnel et compétitivité, MEM
- Mme Laurence JACQUOT, Attachée commercial, chef secteur énergie, industrie et TIC, Ambassade de France au Maroc

Réunion plénière avec :

- Mme Maya AHERDAN, Directeur de l'observation et de la programmation, MEM
- Mme Fatiha MACHKOURI, Chef de service évaluation de projets énergétiques, MEM
- Mme Amina OUATTASSI, Chef division développement institutionnel et compétitivité, MEM
- M. Abdelkader BOUDI, Responsable prospectives division Institutionnel et compétitivité, MEM
- Mme Zohra ETTAIK, Responsable de la division EnR et efficacité énergétique, MEM
- M. Ilias HAMDOUCH, MASEN
- Mme Laila ELRHILASSI, Chef de service des secteurs primaire et secondaire, Ministère de l'emploi et de la formation professionnelle
- Mme Latifa LAKFIFI, Ministère de l'environnement, Département de l'Eau
- Mme Laila OULHACHA, Ministère de l'Environnement, Département de l'Environnement
- Mme Amina CHIKHI et Mme Fatima OUTMOULAIT, Haut commissariat au plan
- M. Hartwig BRETERNITZ, Conseiller technique, Programme de gestion et de protection de l'environnement, GTZ
- M. Bendahmane EL MAHOUD, Direction Générale des Collectivités Locales
- M. Mohamed HAMADA et M. ZERIOUH, Ministère de l'Emploi et de la Formation Professionnelle
- M. Rachid EL BOUAZZATI, Ministère de l'Industrie, du Commerce et des Nouvelles Technologies

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Réunion **ONE** avec :

- M. Mohammedi ALLACH, Directeur général adjoint, pôle finance et commercial, ONE
- M. Mohammed FADILI, Directeur du pôle développement, directeur du pôle industriel par intérim, ONE
- Ministère de l'Energie, des mines, de l'eau et de l'environnement, 6 janvier 2011 (Rabat)
- Réunion de debriefing avec :
- Mme Maya AHERDAN, Directeur de l'observation et de la programmation, MEM

- Mme Fatiha MACHKOURI, Chef de service évaluation de projets énergétiques, MEM
- Mme Amina OUATTASSI, Chef division développement institutionnel et compétitivité, MEM
- Mme Laurence JACQUOT, Attachée commercial, chef secteur énergie, industrie et TIC, Ambassade de France au Maroc
- Pr Jean-Marie HORNUT, Conseiller de coopération et d'action adjoint, Enseignement supérieur – Recherche, Ambassade de France au Maroc

Tunisia

Entretiens individuels, 10 décembre 2010

Chambre nationale syndicale des Energie renouvelables (Tunis) : M. Tahar ACHOUR, *Président*

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- M. Hichem ELLOUMI, Président de la fédération nationale d'électricité et d'électronique
- M. Béchir BOUJDA, Président de la fédération nationale des industries mécaniques

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Ministère de l'Enseignement supérieur et de la Recherche scientifique (visite de l'IUT) : Pr. Mohamed Manef Ben Abderrabba, directeur général de*s études technologiques*

Cabinet Alcor (Tunis) – Déjeuner avec : M. Rafik MISSAOUI, *consultant*

Réseau ISET, Ministère de l'Enseignement supérieur et de la Recherche scientifique : Dr Moncef GOSSA, *Directeur ISET Radès, Directeur de l'unité de recherche C3*

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