Study programme 2009-2012 Energy

Final report

Ferdinand Costes

Plan Bleu
UNEP/MAP Regional Activity Centre

Sophia Antipolis
June 2012

Report carried out under the direction of Hugues Ravenel, director of Plan Bleu.

Authors
El Habib El Andaloussi and Ferdinand Costes (starting on 1 October 2011) based on various studies and reports commissioned or drawn up by Plan Bleu and experts and consultants.

Review
Dominique Legros

Realization
Layout: Sandra Dulbecco.

The study is financed under the FEMIP Trust Fund. This Fund, which was established in 2004 and has been financed - to date - by 15 EU member States and the European Commission, is intended to support the development of the private sector via the financing of studies and technical assistance measures and the provision of private equity.

This study also benefited from the support of:

The analysis and conclusion expressed in this report do not necessarily reflect the view of the European Investment Bank.

CONTENTS

Introduction

1. Objectives

The "*Climate Change and Energy in the Mediterranean"* study carried out in 2008 by Plan Bleu with the support of the European Investment Bank (EIB), gave a broad sweep of the region's energy issues. It allowed Plan Bleu and the EIB to identify six key challenges to work on in more detail with regard to energy and adapting to climate change. Plan Bleu and the EIB agreed to continue to work together on a programme for 2009-2012 covering the six issues presented below:

- **Adapting the water-energy system to climate change**: water is the vector through which climate change will have the most marked economic, social and environmental impact. Adaptation measures will have a direct impact on energy consumption (desalination, transfers, treatment, irrigation etc…). At the same time, electricity production will need to adapt to the new climate and could benefit from investment aimed at limiting the damage caused by extreme events. Developing hydropower, on various scales, is also a way forward for generating carbon-free electricity. The situations in Morocco and Syria were specifically studied.
- **Adapting buildings**: this sector is booming in the countries to the south and east of the Mediterranean (SEMCs) and is closely tied in with urban development and growing needs of the population. The construction sector emits high levels of CO_2, and offers significant potential in terms of energy savings. Choices made on this front will have a marked and lasting impact on both energy consumption and CO_2 emissions. A regional study, and three case studies (on Lebanon, Morocco and Tunisia) measured energy efficiency potential, costs and associated implementation conditions.
- There is a clear need for business-as-usual or "reference" and alternative **scenarios** for 2030 and/or 2050 for sectors such as water or construction, where change occurs slowly. The business-as-usual scenarios will be compared with alternative ones including low emission adaptation options. The investment needed in order to roll out alternative scenarios will be estimated so that cost/benefit analyses will be conducted as far as possible. An energy forecast for 2030 using strong assumptions for energy efficiency and the development of renewables was produced in partnership with the OME (Mediterranean Energy Observatory), to produce a "breakdown" scenario.
- **The employment impacts** of energy policies are presented as important potential co-benefits. Employment is a crucially important socio-economic issue in the SEMCs. In the alternative scenarios, some jobs will be destroyed, others will be created. This could lead to net job creation because low-carbon technologies tend to have a higher labour requirement. Such periods of "creative destruction" are often associated with innovation, training and growth. This question has been analysed by quantifying the net effect on employment of policies aimed at achieving sustainable energy objectives compatible with adaptation measures and will make for better understanding of the benefits on the employment front and the socio-economic changes needed.
- Energy efficiency measures play a key role. In the SEMCs there are currently no energy efficiency indicators broken down by sector and comparable with those which exist on the northern shores. This is a glaring omission when it comes to quantifying scenarios, as well as for introducing and monitoring policies at national and regional level. A specific project working with national institutions and expert bodies has taken a first step towards identifying, calculating and harmonising relevant indicators in partnership with the Regional Center for Renewable Energy and Energy Efficiency (RCREEE).
- The **rise in sea level**, as induced by climate change, is a key issue in the Mediterranean, due to its potential impacts on coastal areas, the economic activities based there and the infrastructures located in such areas. An inventory of existing models and available data was made. This contributes to identifying the impacts of the rise in sea level on coastal infrastructure, and the cost of these impacts and adaptation measures compared to the cost of not taking action.

Studies carried out relate to the SEMCs (Southern and Eastern Mediterranean countries).

2. Observations and recommendations

Significant structural changes are being made in the Mediterranean energy balance, but it still relies heavily on carbon resources. The fossil fuel consumption rate is of 80% in the SEMCs. They are bringing their energy policies increasingly into line with overall changes in this sector around the three pillars of securing supply, developing energy efficiency and developing renewable energy.

Each country has a range of specific responses using regulatory and financial tools selected, in particular, on the basis of whether it is a fossil fuel producer or importer. These different strategies are aimed at common issues (industrial challenges, funding, etc.).

Energy markets are on the rise, both between SEMC countries, and between SEMC countries and the European Union. Official framework agreements for cooperation are being developed, as are big renewable energy investment projects, such as the Mediterranean Solar Plan. These projects are taking centre stage and represent another way of exploiting natural resources in Mediterranean countries. Development of a clean supply (for example, electricity) also underlies relationships between Northern and Southern Mediterranean countries, especially in projects intended for export to Europe including associated industrial development, technology transfer, etc.

Large-scale renewable energy projects must not, however, obscure the fact that the **primary vector for changing energy balances** resides in **wide-ranging actions** which modify the structure of energy demand: energy efficiency, optimisation of existing infrastructure, especially at city planning level, construction and transport. Renewable energy production and energy efficiency projects must also be seen as major contributors to the balance of supply and demand for the energy system, and for electricity in particular.

A new energy economy?

The investment required for both renewable energy projects planned for between now and 2030 and the application of energy efficiency measures is huge (between $80 and $200 billion for the renewable projects and around €260 billion for energy saving in the construction sector), but they differ in terms of how this investment is implemented. For energy efficiency measures, it relies on a whole range of actions, depending on the technological, organisational and institutional contexts. The economic impact of these energy efficiency actions could make a big difference to expenditure on or revenue from energy. They could save a total of around 2.7 Gtoe by 2030, representing 7 years of savings for the SEMCs.

Both rising energy prices and anticipating and managing carbon restrictions require an evaluation of the costs of taking and not taking action. The source and timescale of associated investments will remain to be determined. The redistribution of, especially public, funds, should represent a significant share of investment, particularly in the construction sector where investment support should be defined in connection with the requirements of the local population and opportunities for industry associated activities. The resultant socio-economic changes (growth in energy charges, new jobs, etc.) will be more or less significant depending on the level of integration into local industry.

These dynamics lead us to consider the implementation of new business models which exploit innovative funding or appropriate subsidies, revenue strategies and more. New relationships between players are being created and need to be monitored and supported: partnerships between Northern and Southern Mediterranean countries, creating and running networks of players in the sectors concerned, local applications, etc.

Increasing interaction between energy and climate

Climate change will have known consequences on demand (heating and cooling needs) both in active (e.g. air conditioning in the residential sector) and passive (e.g. insulation) systems. In terms of supply, the exploitation of energy resources, especially hydropower and power plant cooling, is already being impacted.

Climate change has been studied in relation to construction sector and the interaction between water and energy. The results show that not taking into account this factor as of now will increase future adaptation costs, and even, render some infrastructure obsolete.

Energy transition and socio-economic impacts

While it is accepted that energy is an underlying factor in a significant proportion of a society's key issues, it is important to increase understanding of the interactions and social and economic consequences of changes in the energy sector.

Investment in renewable energy and energy efficiency will interact with and/or be included in existing economies or industries. This is an opportunity to redirect whole sections of the economy (materials, electrical appliance, construction industries, etc.) and promote the emergence of new activities.

These industrial opportunities, potentially jobs-creating, will depend in large part on:

- Levels of integration of local industry,
- Industrial threshold effects which could limit the relocation or development of an industry, at a local level,
- Strategic decisions and partnerships between key players in industry, both in the Southern Mediterranean and other regions (Europe, Asia, etc.).

A net positive impact on activity and employment can be expected.

Towards a more detailed understanding of the factors that determine the energy issue, in order to take the issue forward

Lack of access to data for analysing the energy situation at a local level is still a real problem in the SEMCs. This often leads to focussing on a top-down approach, usually by extrapolating national, or even international, data, and makes a more detailed understanding which more closely mirrors reality, harder to obtain.

In general, the bottom-up approach of determining energy demand needs to be developed on a regional scale adapted to sectors and themes studied. This should make for a better connection between forecasts and current and potential local developments. A multi-player, multi-sector approach is required for each energy consumption sector to get to grips with the energy issue. It also requires the involvement of technical intermediaries for each sector and region, to maintain and provide the data required for determining demand. For example, in the residential sector, detailed understanding of the factors that determine energy consumption (type of housing, construction characteristics, use, etc.) is an advantage for improving the design of actions in line with social, environmental and economic criteria. It also makes it possible to simulate the impact of programmes and bring them as close as possible to reality. Similar approaches need to be developed in other diverse sectors like transport.

Policymakers require reliable, homogenous, up-to-date and updatable data and values on geographical scales consistent with the spheres of action of the institutions and players concerned in order to formulate, monitor and assess public policy. This allows them to respond with precision to changes in energy supply and demand. Which is all the more necessary in that it is now essential for public policymakers to prioritise actions by efficiency and potential performance.

Quality tools for monitoring and evaluating the energy situation are therefore required. In addition to the insight it gave on the energy situation for various countries, the energy efficiency indicators project provided a draft of a standardised, permanent, updated and recognised national and regional framework. The implementation of an institutional approach (e.g. creation or appointment of an organisation responsible for coordinating actions associated with energy) in the SEMCs must be continued. Regional cooperation can contribute to improving the consistency of methods and sharing efficient actions (sharing experience, best practice, etc.) Standardisation of indicators is also essential for countries to be able to use international energy efficiency support mechanisms. Institutions and bodies responsible for defining, collecting, processing and analysing energy indicators need to be networked together better. In the short term, it will be very important to define methodologies and increase capacities. Convergence and consistency still need to be achieved via activity and space planning, which rely on initial diagnostics requiring data and indicators.

Promotion of regional approaches

The majority of studies carried out in this programme have been produced by experts associated with national authorities. Recommendations (associated with regulations, economic issues, etc.) will be implemented in part by local actions. The connection between national and local levels has to be strengthened.

Local partnerships will require interface roles, especially in areas where decentralisation processes are still weak or non-existent. These interfaces will be required for preparing and supporting wide-ranging investments. For energy policies, this interface role could be fulfilled via existing organisations, be they national-level institutions (Government ministries, agencies, etc.) or key regional or local players (regional authorities, energy providers, professional bodies).

One of the challenges of the regional approach is also to meet the needs of local people (housing, employment, energy security, etc.) This approach could be a first step in setting up projects that bring together energy needs and resources in a region, with a view to creating overall socio-economic and environmental value (local jobs, training, cottage industries, industrialisation of some processes, associated distribution and logistics chains, etc.).

Structurally, a number of "regionalisation" processes are underway. For example, the Moroccan National Agency for the Development of Renewable Energy and Energy Efficiency (ADEREE) has signed agreements with five regions (Meknes-Tafilalet, Tadla-Azilal, Souss-Massa-Draa, the Oriental and Rabat-Salé-Zemmour-Zaer).

The recommendations of the various studies carried out will be applied at more local levels. This dynamic will require significant training for decision-makers and local players (local officials, administrative services, civil society, etc.) Networking could meet this need, especially for specific thematic input (planning methods, construction and energy, transport, etc.). Applications could be made to national and international investment programmes to meet these needs.

3. Outlook

Plan Bleu and its partners could strenghten their partnerships, prioritising the following objectives:

1) Continue forecasting

- The primary focus of studies carried out is forecasting. This could be continued in order to:
- **Improve the sectoral hypotheses** used. This could be achieved using the OME and Plan Bleu networks, and other energy forecasting projects working in the Mediterranean. Carrying out sector studies to analyse the actual capacity of energy efficiency and renewable energy to penetrate markets would refine assumptions for analysis (by country, by industry, etc.) The construction and transport sectors should be prioritised;
- Set up a **regular update process** for the various scenarios;
- Implement the latest results of the breakdown scenario in the tools developed to model employment impact;
- Improve some sector sections of the breakdown scenario using more detailed approaches (as with the construction sector).

2) Strengthen the network for permanent monitoring of efficiency indicators

Maintaining a network of experts and national advisors would strengthen capacity to monitor and assess public policies. This network needs to be actively pursued and strengthened as part of existing partnerships in connection with the Mediterranean Action Plan. The goal would be to develop a permanent regional information system, supported by Governments and involving the sharing of homogenous data. Creating and deploying tools to support decision-making and simulate the impact of renewable energy and energy efficiency projects would also make it easier to implement sector funding and to access international funding (Clean Development Mechanism – CDM – type).

3) Supplement research with a territorial and operational approach

Implementing the various recommendations at a regional and operational level is the next stage for energy policies. The assumptions and objectives used for the national and regional scenarios should be compared with reality via regional breakdowns, using approaches which evaluate energy **resources and needs** for each region. This would require developing methods, in particular for the tools for planning energy actions at a local level. Case studies representative of the regional types should be carried out. These could also be used to test the recommendations of the studies completed. Using the European Union's Neighbourhood Policy would make it possible to develop homogenous methods that have been tested on the basis of experience in the Northern countries.

These regional approaches would also promote **taking the energy issue into account across the board.** Interfaces between energy policies and the following sectors could be studied in more detail: **urban** (planning of

construction, public spaces and communications, connections between living areas, integration of renewable energy in urban environments), **tourism** (reducing energy consumption in buildings, penetration of renewable energy production, collective optimization of resources at tourist centres, etc.)

4) Propose new business models

All studies carried out show the need for very significant levels of funding. New **business models** will be required, in particular with regard to **the range of investments** in the energy efficiency sector, especially in construction. Studies could be carried out both in the new build sector and the renovation sector in order to test the best economic tools for associated investment in categories such as type of work or occupancy. This approach should also deal with energy security issues.

5) Continue and extend regional cooperation on energy

The role of observing the regional energy situation should be coordinated and shared with a view to regional cooperation on energy. Research carried out has been supported by the OME and the RCREEE. Other avenues for cooperation could be set up, both at an institutional (Mediterranean Action Plan, Government Energy Ministries, Energy Agencies via Medener - Mediterranean Association of the National Agencies for Energy Conservation) and a local economic and industrial level.

Other potential avenues identified

- The huge growth of the **electricity sector in the SEMCs** requires continuing specific research into this area. The impact of rolling out renewable energy and energy efficiency measures on the management of the electrical system needs to be worked on together with transmission and distribution system operators. The development of new processes requiring electricity, like desalination, may be an opportunity to consider connections with renewable energy. Solutions based on energy storage and, more broadly, the optimisation of load curves should be studied for relevant electricity grid sizes.
- Hydro, solar and wind power are renewables with a significant place in research and future investment. **Regional assessment of the potential** of renewable ocean energy and biomass (producing heat and electricity) could be a next stage in terms of achieving an overall vision of the region's renewable resources.
- **Climate change** needs to be continued to be taken into account across the board. A first stage has been achieved with the study on the sensitivity of the water and construction sectors to climate change. Additional work to identify the vulnerability of energy infrastructure (transformers/switchgear, generation facilities, transmission and distribution infrastructure) would make it possible to specify the adaptation measures required.
- **The economic and social aspect** of the energy issue is key. The impact on countries' economies, whether they are importers or exporters, will depend in large part on actual industrial integration levels. The development of renewable energy and energy efficiency may create significant **logistical and industrial dynamics**. Sector and geographical zone studies would make it possible to assess these dynamics better. Priority needs to be given to the construction and renewable energy production sectors. This more detailed knowledge will also make it possible to improve the models developed to assess **the impact on employment and training** of the various energy scenarios. Sharing infrastructure and industry between Southern Mediterranean countries could be simulated in order to highlight potential avenues for cooperation.

Organisation of the study programme

The study programme ran from March 2009 to June 2012. Schedules had to be adapted to external events (in particular the Arab Spring), which led to the postponement of some meetings and workshops and a lack of availability of experts and national institutions. Studies were carried out by national experts and through partnerships with other key players in the Mediterranean region.

1. Steering and monitoring of the programme

As per usual at Plan Bleu, an international steering committee has been set up for each activities.

The steering committee met twice in May 2010 and June 2011, in Marseille, France. It was made up as follows:

- Institutions:
  - European Investment Bank (EIB), represented by Mrs Agnès MOREL, Mr Eugène HOWARD and Mr Mohamad TARHINI,
  - French Development Agency (AFD), represented by Mr Arthur HONORE and Mr Thierry LATREILLE,
  - Spanish International Cooperation Agency for Development (AECID), represented by Mrs Maite MARTIN CRESPO,
  - REAOL (Renewable Energy Authority of Libya), represented by Mr Fathi ABU GARAD,
  - UN-ESCWA, represented by Mr Walid AL DEGHAILI (Head of Energy Department, Lebanon),
  - European Commission (EC, Directorate-General for Energy), represented by Mr Olivier SILLA,
- Qualified individuals recognised in the Mediterranean area for their scientific, technical or institutional expertise:
  - Professor Mladen BORŠIĆ (Croatian Energy Agency),
  - Mr Abdenour KERAMANE (Director of the Medenergie review, Algeria),
  - Mrs Lisa GUARERRA (OME, France),
  - Mrs Florentine VISSER, Mr Klaus WENZEL, (Medenec, Cairo/Tunis),
  - Mr Rafik MISSAOUI (ALCOR, Energy and Environment Expert, Tunisia),
  - Mr Adel MOURTADA (ECOTECH, Energy and construction expert, Lebanon).

The following schedule restates the main activities of the programme.

2009

- Plan Bleu/OME's preliminary meeting in order to implement the works and ensure the scientific and thematic support as regards energy development compatible with the objectives of the sustainable development. Paris, July, 15 th 2009.
- Agreement signed between Plan Bleu and OME associating them in the realization of common studies on the possible energy futures in the Mediterranean region.
- Workshop of the North/South Experts co-organised with OME, Paris, November, 12th, 2009.

2010

- Klimades Conference on climate and housing in Mediterranean countries, Montpellier, 4-5 February 2010,
- First meeting of the Energy Steering committee of the Plan Bleu held on the 4th of May 2010 in Marseilles,
- Workshop "End use energy efficiency: national plans for regional energy challenges", Tunis, 26-27 July 2010,
- MEDENER Experts' meeting, Paris, 14 September 2010,
- Cooperation agreement between Plan Bleu and RCREEE, signed in December 2010.

2011

- First Workshop and Launch of the project on energy conservation indicators in the countries of southern shore of the Mediterranean, Tunis, Tunisia 6-7 January 2011,
- MEDENER working group meeting on energy efficiency indicators, Rabat, January 24-25, 2011,

- 2nd Workshop of the Project on energy conservation indicators in the countries of southern shore of the Mediterranean, Cairo (Egypt), 6-7 April 2011,
- 2nd Meeting of the Energy Steering Committee's program of activities, Marseilles, 17 June 2011,
- Third workshop on the "Project of energy conservation indicators in the Southern Mediterranean and MENA", Sophia Antipolis, France, October 6-7, 2011.

2012

- Regional seminar "Challenges and opportunities for renewable energy development and energy efficiency in the Mediterranean", and fouth workshop on the "Project of energy conservation indicators in the Southern Mediterranean and MENA"Marrakech, Morocco, April 16-19, 2012;
- Regional seminar on the "Project of energy conservation indicators in the Southern Mediterranean and MENA" in partnership with RCREEE and League of Arab States (planned on June, 28 , 2012 and postponed).

2. Partnerships

Several themes covered in this study programme connected with work being done by other institutions and networks of Mediterranean players.

Partnerships were specifically established with:

- The Mediterranean Energy Observatory (OME), www.ome.org

The OME is a not-for-profit organisation founded over twenty years ago that brings together 30 energy companies from 14 Mediterranean countries. The organisation is the reference think-tank for energy data and outlook in the Mediterranean. Its main mission is to promote regional cooperation in the energy sector. The OME carries out studies and analyses of the energy profiles of countries and the region as a whole. The production of the breakdown scenario (energy forecast for 2030 using strong assumptions for energy efficiency and the development of renewable energy) led to two partnership agreements with the OME in 2009 and 2012.

- Regional Center for Renewable Energy and Energy Efficiency (RCREEE), www.rcreee.org

The RCREEE was founded in 2008, and is an independent body made up of the various States in the Southern Mediterranean and neighbouring countries (Jordan, Bahrain, Tunisia, Algeria, Sudan, Syria, Iraq, the Palestinian Territories, Lebanon, Libya, Egypt, Morocco and Yemen). It is intended to support the development of energy efficiency and renewable energy as part of the public policies of its members. It started to work with Plan Bleu on the energy efficiency indicators project. The focal points of the RCREEE, in the various Government ministries and/or agencies, were set in connection with Plan Bleu experts. This contributed to giving a stronger institutional value to the work carried out. The research was published, distributed and promoted with the help of the Arab League as part of this partnership.

In addition, other bodies involved in the energy issue in the Mediterranean were involved in this work:

- MEDENER, a network of Mediterranean energy agencies, in particular on the issues surrounding indicators,
- The projects supported by the European Commission, and especially:
  - MEDENEC, on the issue of energy in buildings and energy efficiency indicators,
  - Paving the way for the Mediterranean Solar Plan, PW-MSP, on renewable energy forecasting.

Other Plan Bleu partners were also involved, in particular the AFD/AECID fund.

3. Report seminar

TRAD:http://www.planbleu.org/SeminaireEnergieMaroc/accueil_EnergieMarocUk.php

In addition to the various workshops, a report seminar was organised by Plan Bleu, on 17 – 19 April in Marrakech, Morocco. It was structured around five sessions:

- Energy prospects in the Mediterranean by 2030 (in partnership with the "Observatoire Méditerranéen de l'Energie")

- Mediterranean energy policies' monitoring tools: towards shared energy efficiency indicators (in partnership with RCREEE)
- Sectoral development : Energy, climate change and construction sector in the Mediterranean and Interaction water /energy/climate by 2030
- Which employment and training's perspectives and issues within the SEMC's for ambitious renewable energy and energy efficiency programmes?,
- Prospects and recommendations

The seminar included around 60 participants:

- representatives of national authorities in charge of energy (ministries and agencies)
- institutional structures concerned by the energy issue on the scale of the Mediterranean basin
- experts' network mobilized for the realization of regional and national studies
- local authorities' representatives
- representatives of professional structures concerned by the studies presented (renewable energies, energy efficiency, building, water,…)
- international funders...

The seminar was held in partnership with the Moroccan Ministry for Energy, Water and the Environment (represented by Mrs A. Haddouche, the Ministry's Technical Advisor) and the ADEREE.

All the presentations given can be viewed on the Plan Bleu website http://www.planbleu.org/SeminaireEnergieMaroc/accueil_EnergieMarocUk.php (login : energie, password : maroc2012).

Studies carried out

The programme produced the following studies:

Table 1 - List of studies carried out

Object of study	Deliverables	Authors	Publication date
Breakdown scenario	Presentation	OME - Plan Bleu	June 2012
Breakdown scenario	Regional report	OME - Plan Bleu	June 2012
Water-Energy-Climate	Morocco Report	M. El Badraoui	May 2011
Water-Energy-Climate	Syria Report	M. Kordab	August 2011
Construction	Regional report	S. Pouffary, R. Missaoui, A. Mourtada	October 2010
Construction	Lebanon case study	A. Mourtada	June 2010
Construction	Morocco case study	N. Lahlou	June 2010
Construction	Tunisia case study	R. Missaoui	June 2010
Employment-Training	Regional report	Syndex-Fondaterra	December 2011
Employment-Training	Appendices	Syndex-Fondaterra	December 2011
Energy efficiency indicators	Regional report	Alcor	June 2012
Energy efficiency indicators	Algeria	APRUE	June 2012
Energy efficiency indicators	Egypt	M. Elsobki	June 2012
Energy efficiency indicators	Jordan	W. Shahin	June 2012
Energy efficiency indicators	Lebanon	G. Dib	June 2012
Energy efficiency indicators	Libya	M. Ekhalat	June 2012
Energy efficiency indicators	Morocco	M. Hmamouchi	June 2012
Energy efficiency indicators	Palestine	M. Aqel	June 2012
Energy efficiency indicators	Syria	M. Kordab	June 2012
Energy efficiency indicators	Tunisia	ANME	June 2012
Energy efficiency indicators	Yemen	A. Al-Ashwal	June 2012
Rising sea level	Literature overview	Plan Bleu	April 2011

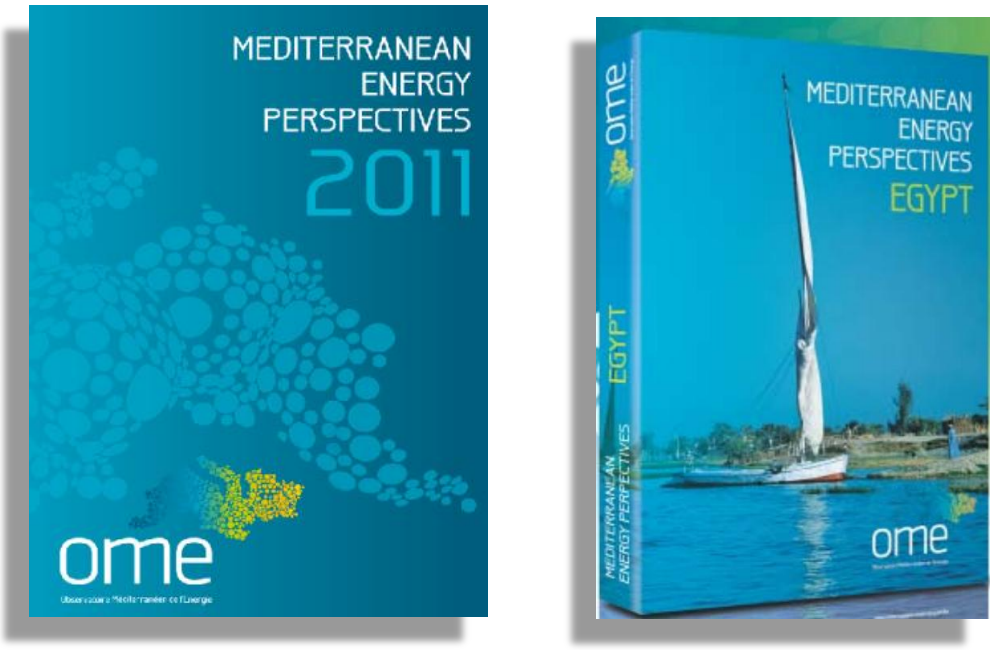
I. 2030 energy forecasts for the Mediterranean

Plan Bleu produces analyses and forecast studies at a regional level to help construct visions of the future and support decision-making. In this capacity, it provides various scenarios for the use of resources and their impact on development and the environment. With regard to the energy issue, increasing implementation of energy efficiency and use of renewable energy are parameters that can be used to transition towards a low carbon energy approach with high local involvement. Various forecasts were performed in 2005 and 2009, in particular as part of the publication on the state of the environment in the Mediterranean. A specific study "Infrastructures and energy sustainable development in the Mediterranean: Outlook 2025", produced in 2009-2010 by Plan Bleu with the support of the AFD, analysed two scenarios (the business-as-usual scenario and the alternative scenario) for 2025.

Analysis of the business-as-usual energy scenarios clearly shows growth in energy needs and unsustainable impacts across the Mediterranean region. Alternative, or even breakdown, scenarios with increased use of energy efficiency and renewable energy were also created.

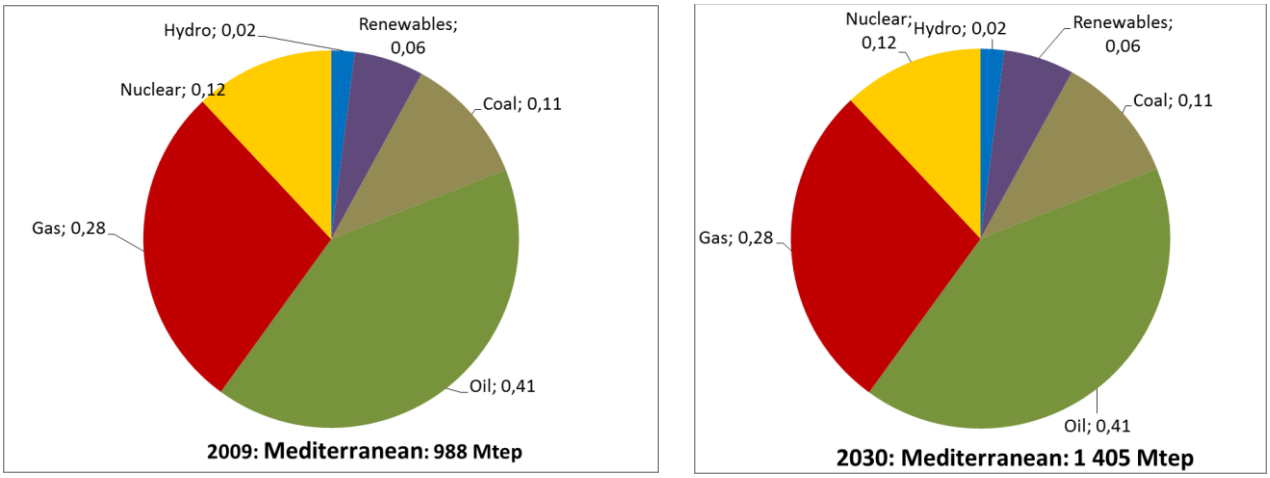
The OME regularly produces forecasts on changes in the energy situation in the Mediterranean as a whole and by country. Its last publication on this subject, *Mediterranean Energy Perspectives* (MEP), was issued in late 2011. This publication presents possible trends of the energy situation as two scenarios for 2030: a *Conservative Scenario* and a *Proactive Scenario*. Both scenarios are considered achievable in the light of the energy policies being implemented in the Mediterranean region.

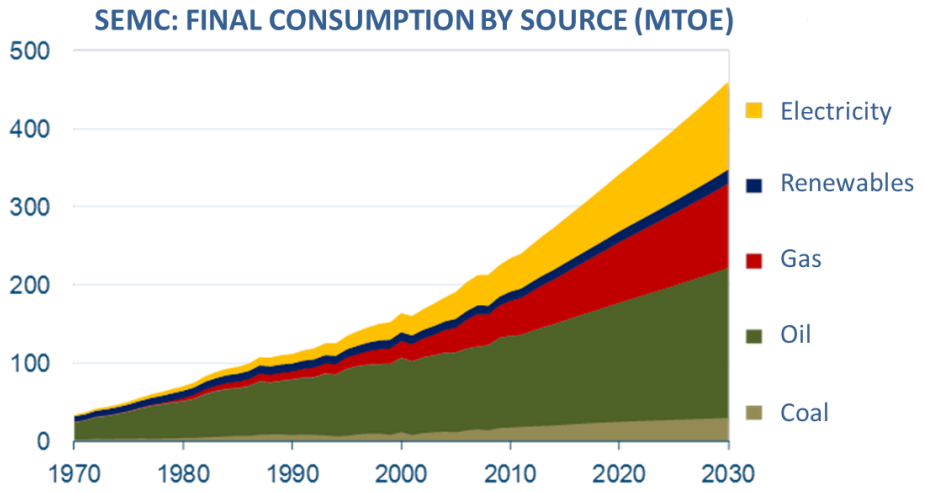
Figure 1: OME publications



The business-as-usual Conservative scenario takes into account past trends, policies and projects underway but adopts a prudent approach with regard to the implementation of new projects, measures and policies. This scenario does not include the implementation of large-scale energy efficiency programmes, or significant effort for energy conservation.

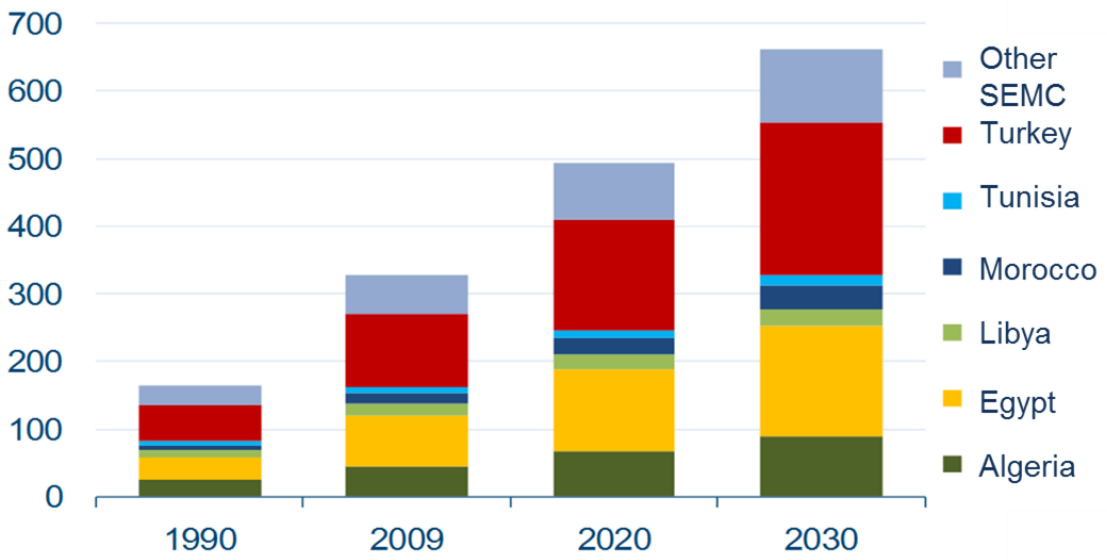
Figure 2: Business-as-usual scenario 2012 – final SEMCs consumption





Source: OME, 2012

Figure 3: Business-as-usual scenario – energy demand by country for 2030



Source: OME, 2012

A survey of all objectives and projects relating to energy in the Mediterranean region and existing energy efficiency and renewable energy potential substantiate ambitious assumptions for energy efficiency and renewable energy in existing forecast models.

A Proactive scenario which assumes effective achievement of the ambitious energy efficiency and renewable energy programmes is developed by the OME in MEP 2011. Comparing the Conservative and Proactive scenarios shows that:

- Most energy advances (in terms both of supply, via renewable energy, and demand, via energy efficiency) will only be achieved between 2020 and 2030, in the light of the slow pace at which is action is being taken,
- An ambitious breakdown scenario could have multiple benefits: reduction of the energy bill, less dependency, job creation, etc.

All the countries have also adopted strategies which deal with these questions.

Table 2: Solar targets and plans in the SEMCs - 2012

Country	Photovoltaic (PV) capacity (2009)	PV targets	Concentrated solar power (CSP) targets
Algeria	3 MWp	800 MWp by 2020 3000 MWp by 2030	1200 MW by 2020 7000 MW by 2030
Egypt	10 MWp	1000 MWp by 2020 (est.)	
Tunisia	2 MWp	15 MWp in buildings 0.5 MWp for street lighting + several other projects	100 MW by 2016
Israel	20 MWp	15-30 MWp by 2020	250 MW
Jordan	1 MWp	300-600 MW by 2020	
Libya	1.5 MWp	150 MWp	7000 MW
Morocco	10 MWp	2000 MW (mostly CSP)	

Source: OME, 2012

The energy outlooks of the MEP's Conservative, business-as-usual scenario and Proactive scenario show that there is still room to reduce strong tensions and move increasingly towards a more sustainable energy situation. In this context, Plan Bleu and the OME came together to define another, even more optimistic, scenario than the MEP's Proactive scenario.

The work included several stages:

- The first step was completed in 2009 and 2010 and involved surveying several "breakdown" hypotheses, by sector, and implementing them in the MEP 2008 model developed by the OME.
- Note: These breakdown scenario values were used for studies on the construction sector and employment and training impacts.
- The new model, MEP 2011, showed that it was reasonable to implement these hypotheses again in order to have up-to-date data that could be used to compare the MEP scenarios (Conservative and Proactive scenarios) and the breakdown scenario.

Work to produce the breakdown scenario focused on the following key points:

1. Formulation of input hypotheses for the "breakdown" scenario

The hypotheses are based on those produced by a panel of experts between 2009 and 2010, adjusted in accordance with changes in the national and regional context, and are as follows:

The hypotheses of the MEP Proactive scenario are maintained for the Northern Mediterranean countries.

In terms of supply:

- In 2030 nuclear energy will not yet be part of the energy mix in the Southern Mediterranean countries,
- Overall, the proportion of renewable energy will develop in accordance with the following table

Table 3: Hypotheses for the proportion of renewable energy in the "breakdown" scenario

Part of renewables (RE)	Breakdown scenario					
	Mediterranean		SEMC		NMC	
	2020	2030	2020	2030	2020	2030
RE part of the primary energy demand	15%	18%	10%	14%	17%	21%
RE part of the electric production	31%	37%	22%	30%	35%	42%
RE part of the final energy consumption	9%	10%	7%	9%	9%	10%

Source: Plan Bleu, OME, 2012

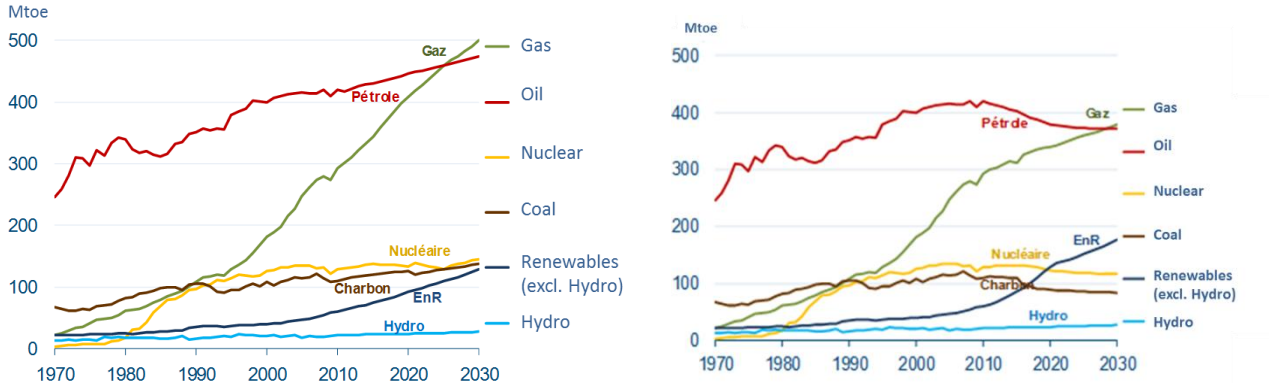
In terms of demand:

- In the construction sector:
  - Potential energy savings of around 40% for new builds in the SEMCs in comparison with the "business-as-usual" scenario and 10% to 15% for old buildings,
  - Double the number of housing units by 2030,
  - Increased control of demand for household appliances and in terms of changes in behaviour and building codes for new housing,
- In the transport sector:
  - Potential energy savings of 15% for the SEMCs (based on the most efficient technologies and increased public transport),
- In the industry and services sector:
  - Progress towards stricter standards.

2. Assessment of costs and energy data corresponding to a breakdown scenario

Breakdown hypotheses were implemented in the OME model used for MEP 2011 in order to produce energy tables in an identical format to the scenario tables presented in MEP 2011.

Figure 4: Changes in demand by product - business–as-usual and breakdown scenario



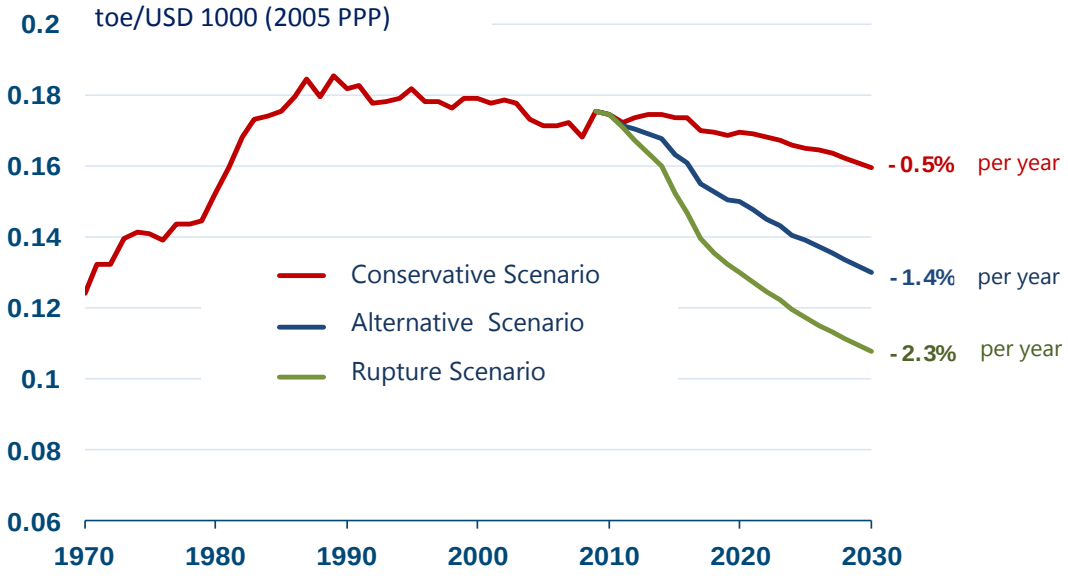
Business-as-usual scenario

Breakdown scenario

Source: OME, 2012

The breakdown scenario would lead, in 2030, to 20% lower demand (32% for the SEMCs) compared with the business-as-usual scenario. The energy mix for the breakdown scenario relies increasingly on gas and renewable energy.

Figure 5: Changes in energy intensity according to the scenarios

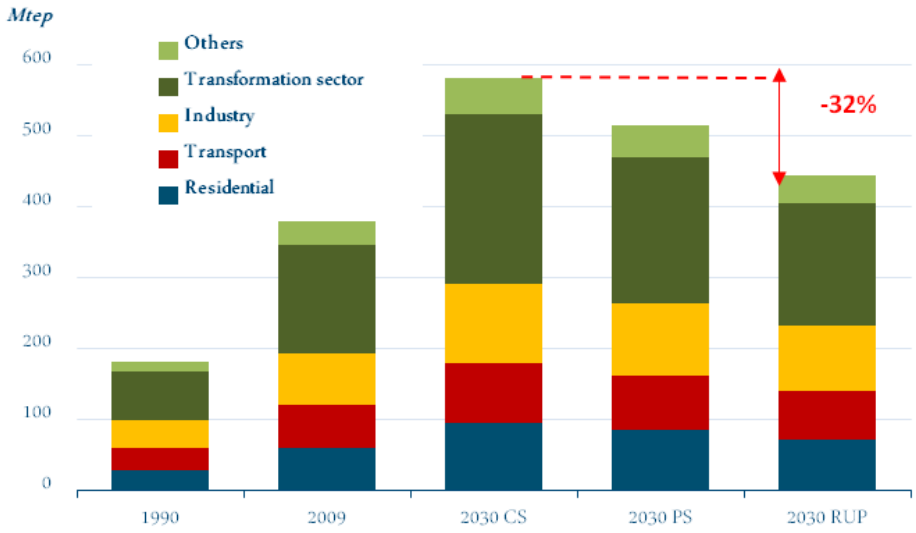


Source: OME, 2012

It should not be forgotten that the Mediterranean Strategy for Sustainable Development (MSSD) objective depends on a decrease in energy intensity of between 1% and 2%, which corresponds to a range between the Proactive scenario, and the breakdown scenario.

3. Comparison of key points between the results of the breakdown scenario and the MEP 2011 Conservative and Proactive scenarios

Figure 6: Changes in demand by scenario



Source: OME, 2012

In the business-as-usual scenario, energy demand in the SEMCs is set to grow around 3.4% per year between 2009 and 2030 reaching 661 Mtoe, as opposed to growth of 3.7% between 1990 and 2009. The breakdown scenario has it 32% lower by 2030. This represents a saving of 214 Mtoe in 2030, and a total saving of 2.3 Gtoe, or **7 years of energy consumption in the SEMCs**.

Incentive policies must therefore be designed in line with organisational models which facilitate these savings in energy resources. They represent a monetary total in the region of 2.3 x 7.6 x $100 billion, that is around $90 billion per year for the SEMCs, and are directly linked to Governments' fossil fuel import and export strategies. In addition to the energy savings generated, replacing power sources is also envisaged, in particular via the introduction of solar power into the construction sector for heating. This could lead to changes in associated infrastructure (distribution networks).

Exploiting local renewable resources generates wealth for all the SEMCs. Producer and importer countries will implement different strategies:

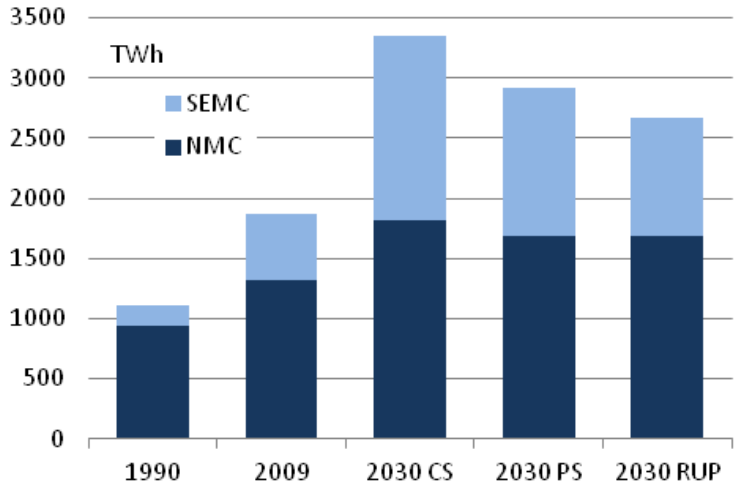
- Increasing revenue generated for countries exporting oil;
- Exploitation of new resources for importing countries which could contribute to an increase in energy autonomy and some export capacity.

Strong growth in energy efficiency and renewables is therefore likely to change the balance of some relationships, both between the SEMCs, but also between the SEMCs and the Northern Mediterranean countries.

Changes in electricity production

Despite significant savings in the breakdown scenario, electricity production would need to almost double in the SEMCs between now and 2030, leading to significant investment needs in the electricity sector (133 additional GW in the SEMCs to supply electricity demand). The breakdown scenario would nevertheless save over 100 GW in total, and 68 GW in the SEMCs compared with the business-as-usual scenario.

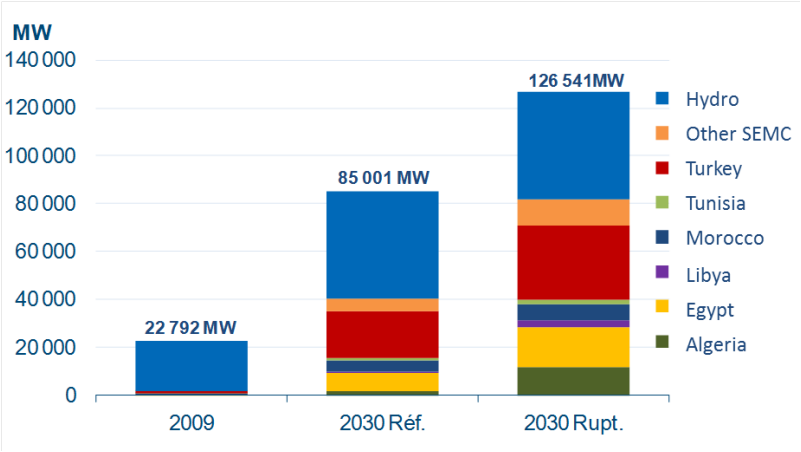
Figure 7: Electricity production by region and scenario



Source: OME, 2012

The renewable energy offer is growing rapidly. Without taking into account hydropower, the equivalent of between 2 and 4 Mediterranean Solar Plans could be achieved. Turkey, Egypt and Algeria have the highest renewable energy potential (apart from hydropower) in the SEMCs. These three countries alone would account for nearly half of installed renewable energy capacity in 2030. Over 30% of electricity would be produced by renewable energy.

Figure 8: Installed renewable energy capacity in the SEMCs by country

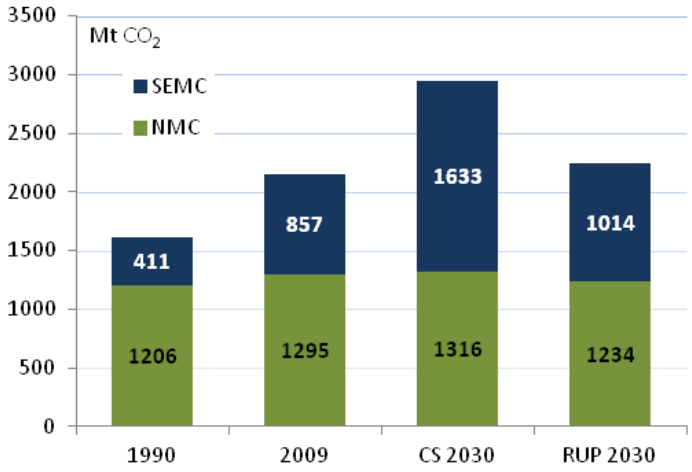


Source: OME, 2012

CO_2 emissions

Modelling has determined CO_2 emissions for the energy offer and the structure of demand. The breakdown scenario would see CO_2 emissions stabilise in 2030 at their 2009 level, a saving of 160 Mt compared with the business-as-usual scenario.

Figure 9: CO_2 emissions due to energy consumption



Source: OME, 2012

4. Limits and main recommendations

The following **restrictive hypotheses** were used:

- Uniform application of the sector hypotheses across the region, especially in the construction sector (see section II.2),
- The impact of climate change was not taken into account, which could have a particular impact on hydropower production.
- The interaction between water and energy was not taken into account, especially with regard to energy needs for desalination.

The hypotheses used, especially sectoral hypotheses, need to be refined in the light of the opinions of the various national and regional partners. A permanent consultation and monitoring process needs to be formalised, centring on the existing partnership networks of both the OME and Plan Bleu. This will constitute a first stage for the permanent organised monitoring of data reporting necessary for updating a breakdown energy scenario.

This **data reporting** could be achieved by:

- Organising a network of organisations that produce the data required for energy forecasting, at a national and sector level. This approach should be carried out in connection with energy efficiency indicator monitoring (see section IV) which requires the collection and updating of some of the same data required for forecasting.
- Taking into account the heterogeneous nature of the structure of the energy demand by country and sector, including the type of urbanisation, housing, industry, agriculture, etc.

More specific models which provide better understanding of the factors that determine demand should be created especially in sectors and processes which have high energy conservation potential: tourism, development of new information and communication technologies, etc.

A major breakdown scenario for a later date?

The breakdown hypotheses used in the work carried out are extremely ambitious. They aim for major improvement in countries' existing energy systems. But the scenario is realistic from the point of view of technologies used. Another approach could be used to anticipate breakdown technologies by simulating the deployment of new energy sources (e.g. hydrogen), new management modes (intelligent power grids, energy storage) and associated business models. This approach could be tested using specific case studies (especially in urban environments).

II. Sector outlooks

Two sector issues were specifically studied:

- The interaction between water, energy and climate, in the light of the high tensions and challenges around water resources in the Mediterranean and its sensitivity to climate change;
- Construction, due to the growing need for housing, the number of property and city planning projects underway and associated social issues.

1. Water and Energy: connections and interaction with climate change

This issue is worth studying in the light of:

- Increasing interaction between water-energy and climate, heightened by the growth in water demand associated with certain practices and the impact of climate change on tensions around resources;
- Essential changes in the water exploitation structure (optimisation, losses);
- Trade-offs between the exploitation of water resources for energy and energy resource for water.

The study programme focussed on Morocco and Syria. Egypt was initially supposed to be studied, but could not be covered due to unavailability of the expert body.

The extreme vulnerability of the water-energy system to climate change underlines the necessity of setting up national integrated water and energy resource development strategies. The work carried out by Plan Bleu on "Water, Energy and Climate Change in the Mediterranean" aims to provide evaluation and analysis for 2030 and 2050:

- of future energy needs to meet increased demand for water,
- of future water needs for energy production and the tensions that could be generated around energy production and water resources,
- of the vulnerability of the water-energy system to the impact of climate change,
- of the possible options and discussions in progress in the countries to adapt the water-energy system to the restrictions imposed by climate change, without increasing greenhouse gas emissions.

The approach adopted for the studies was to:

- Take stock of the state of knowledge on water needs for energy production, on the one hand, and on energy needs for water production and mobilisation, on the other hand, in Syria;
- Take stock of the forecasts carried out by the country to evaluate future water needs (for energy production) and energy needs (for water production), and this, while mainstreaming the "climate change" factor;
- Identify the lacking data and information for an evaluation of water and energy needs, both present and future;
- Analyse the Water-energy-climate change nexus until 2030;
- Estimate required investments to supply energy and water needs until 2030 (without and with taking into account the impacts of climate change);
- Organize a sharing of experiences among Mediterranean countries around the topic of "water/energy/climate change" interactions.

In both cases, the decrease in exploitable electricity potential raises questions about the capacity of the available power stations but also using hydropower as a resource that can be exploited quickly in order to manage load curves.

Improving energy use in water processes also features in energy efficiency strategies. This focus may converge with attempts to save water, especially in the areas of transfer, pumping and irrigation. New energy production tools also generate new potential interactions and synergies (water requirements for Concentrated Solar Power (CSP), interaction with intermittent renewable sources and pumping water for storage, desalination).

1.1. Morocco case study

Key messages of the study are as follow.

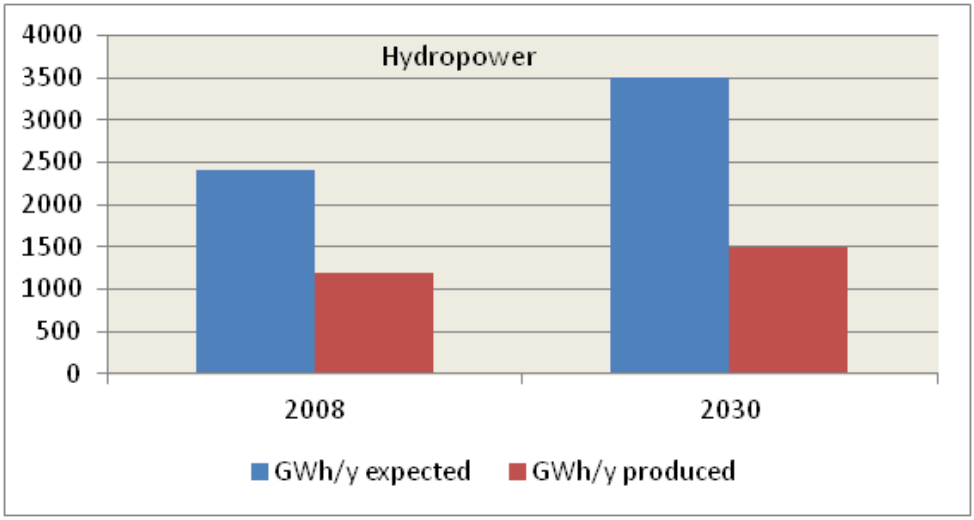
Climate change has become a reality in Morocco:

- The significantly lower rainfall levels recorded over the last thirty years have seriously curtailed dam inflow rates, resulting in low dams water levels. This is reflected in limited agricultural intensification, with the result that capital invested in water infrastructure is not particularly profitable and that groundwater is more heavily abstracted, leading to its over-exploitation.
- Energy production has been clearly affected by the impact of climate change, reflected in decreased water reserves and smaller heads in all dams. It has been estimated that production amounts to barely 50% of the expected objective established by studies relating to integrated water resource development plans. This decrease means that the water sector consumes more energy than it produces.
- The forecasts are not optimistic. Models relating to climate change indicate that rainfall may well have decreased by over 20 % by 2050 whilst evaporation and variability are set to increase. This would further aggravate the water shortage situation in basins throughout Morocco.

The country has limited options for tapping into additional resources:

- Virtually all run-off into the country's rivers is already accounted for, with 128 large dams and several smaller structures. The additional volume of water stored following the construction of 59 planned dams will be very limited;
- When account is taken of the future impact of climate change, which is expected to reduce water input by almost 30% (due to a 15% drop in rainfall) as well as increased evaporation, this may well further reduce the potential contribution to be made by dams and water transfer programmed projects.

Figure 10: Forecast changes in hydropower potential and energy yield



Source: Plan Bleu – Morocco water-energy report, 2011

With regard to changes in access and use of water resources

If the business-as-usual scenario for water resource management, which consists of continuing efforts to mobilise resources, over-exploiting groundwater and conducting programmes to protect and enhance water resources (clean-up, water savings, development of catchment basins…..) continues to be applied at the low rate of recent years, this will negatively impact economic and social development in Morocco as well as its natural environment.

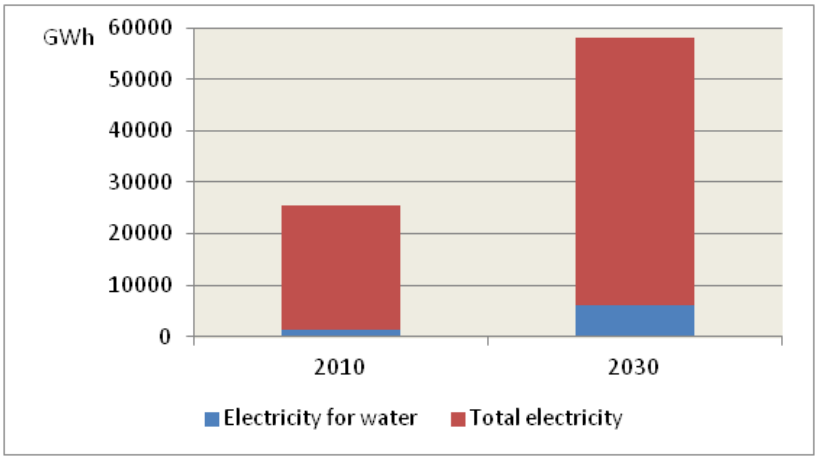
The likely result of this scenario remains limited in terms of increase in exploitation and access to water resources, in terms of both quantity and quality. The main challenge which Morocco will be called upon to address over forthcoming decades will be adapting to a decrease in renewable water resources.

Mobilising non-conventional water resources will constitute a key component of future water policy. Seawater desalination could become a new strategic source of water in urban areas close to the coast and the reuse of

treated sewage could boost the amount of water available locally for irrigation in tourist centres and possibly in agriculture. These new technologies, however, will not suffice to bridge the growing divide between supply and demand, hence the pressing priority to manage demand. All things considered, whether for the purpose of irrigation or for drinking water, water savings represent the most economical resource.

- Developing non-conventional resources and managing water demand would further drive up energy consumption in the water sector, which would account for almost 10% of the country's consumption (from 1 450 GWh in 2010 to 6 145 GWh in 2030) and should be included in the country's energy demand as of now.

Figure 11: Energy needs for water as a proportion of total energy needs (2030)



Source: Plan Bleu - Morocco water-energy report, 2011

- The widespread use of modern irrigation systems is likely to lead to surging energy needs in the agricultural sector. Switching towards currently available and efficient technological options would make for major savings of both water and energy. Moreover, the revolution in renewable forms of energy (wind, biomass and solar) can help curb the consumption of fossil energy for driving pumping stations.

Water needs for energy

Investment forecasts for the production of electrical energy will require the equivalent of the water consumed by a population of about 3 to 4 million inhabitants in 2030 in order to meet the cooling needs of thermal power stations inland. When returned to the environment, the quality of this water has been impaired through heating. More concerted planning and action will consequently be required between the water and energy sectors if further aggravation of the water deficit is to be avoided.

Morocco's energy strategy aims for an achievable energy efficiency potential of 12%, to be reached by 2020, and a share of renewable energy in the national energy balance of between 15% and 20%. Potential water savings and needs still need to be integrated into this plan.

Water requirements in the phosphates sector will rise from the current level of 66 Mm^3/yr to over 158 Mm^3/yr in 2030. The OCP (Cherifian Office for Phosphates) Group's development strategy takes account of this demand.

The cost of alternatives to offset the reductions due to climate change is in the region of 70 billion dirhams.

	Quantity (Mm^3/yr)	Cost (billion dirhams)
Surface water exploited	1,700	15
Sea water desalination	500	12
Wastewater reuse	300	3
Surface water savings	2,500	40
Total	5,000	70

1.2. Syria case study

The study surveyed several scenarios for changes in water and energy supply and demand by 2030 using existing national strategies. The first stage involved comparing these scenarios to highlight the main points of interaction between them. Climate parameters and their impact on resources were then taken into account.

The key messages are as follows:

High sensitivity to climate change

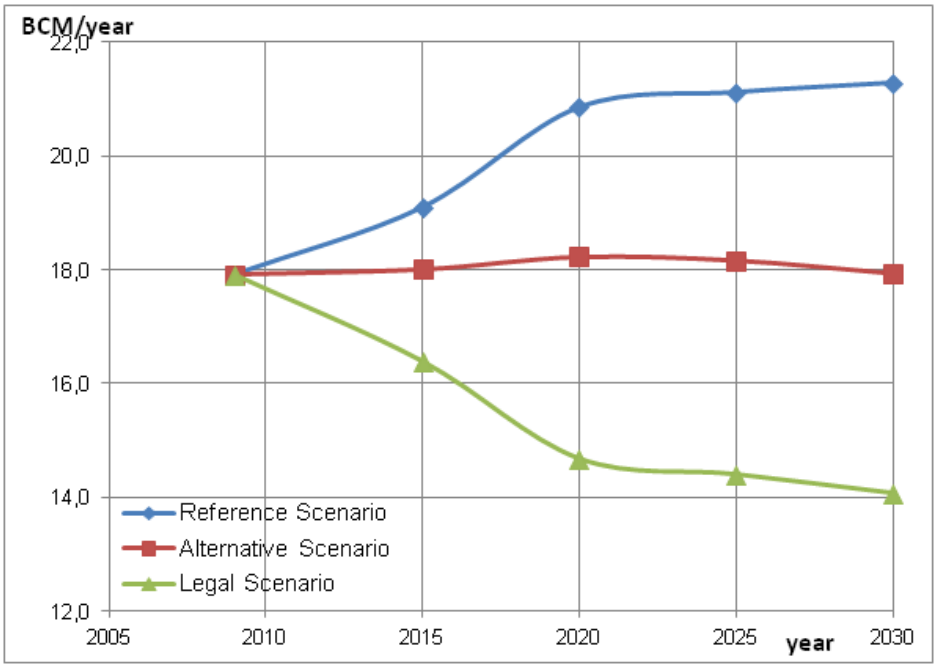
As in Morocco, climate change is a reality in the Syrian Arab Republic (SAR), resulting in a significant decrease in precipitation and its consequences (deterioration of surface water resources, groundwater reservoirs low filling rates…).

The scenarios allow for a decrease in precipitation which could be as much as around 30%. This will have a significant impact on the availability of water for energy and increase energy needs for access to water in the light of current operating and technological conditions.

Changes in drinking water demand and associated shortfall

Three scenarios were produced with regard to changes in demand: a business-as-usual scenario (here called "Reference scenario"), based on an approach following the trend of current water use, an alternative scenario, including the introduction of efficiency measures and optimisation of use for drinking water, and a "legal" scenario which assumes the targets set in the legislation on water are achieved (i.e. adequate resource to supply demand).

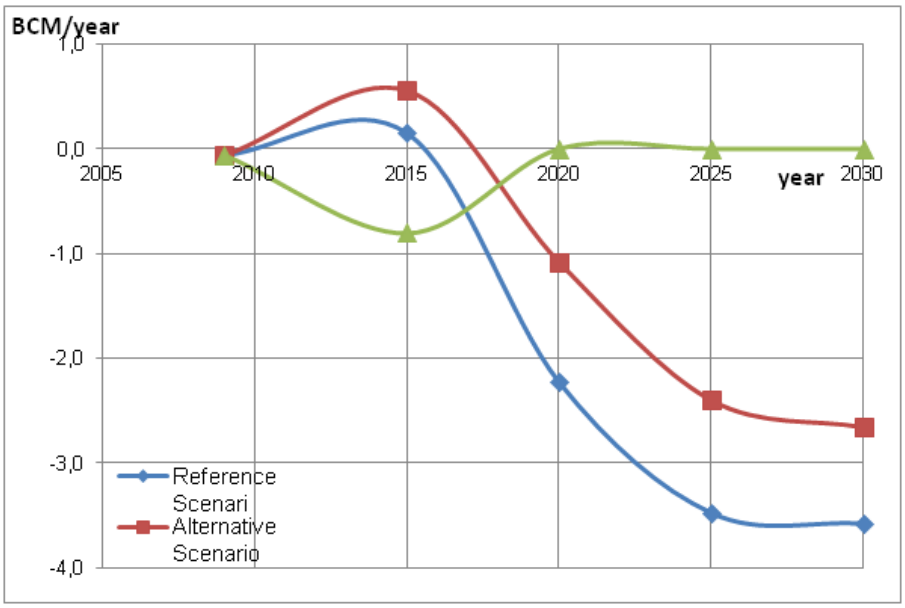
Figure 12: Scenarios for changes in demand by 2030



Source: Plan Bleu - Syria water-energy-climate report, 2011

The water deficit in this demand projection is as follows:

Figure 13: Water deficit by 2030

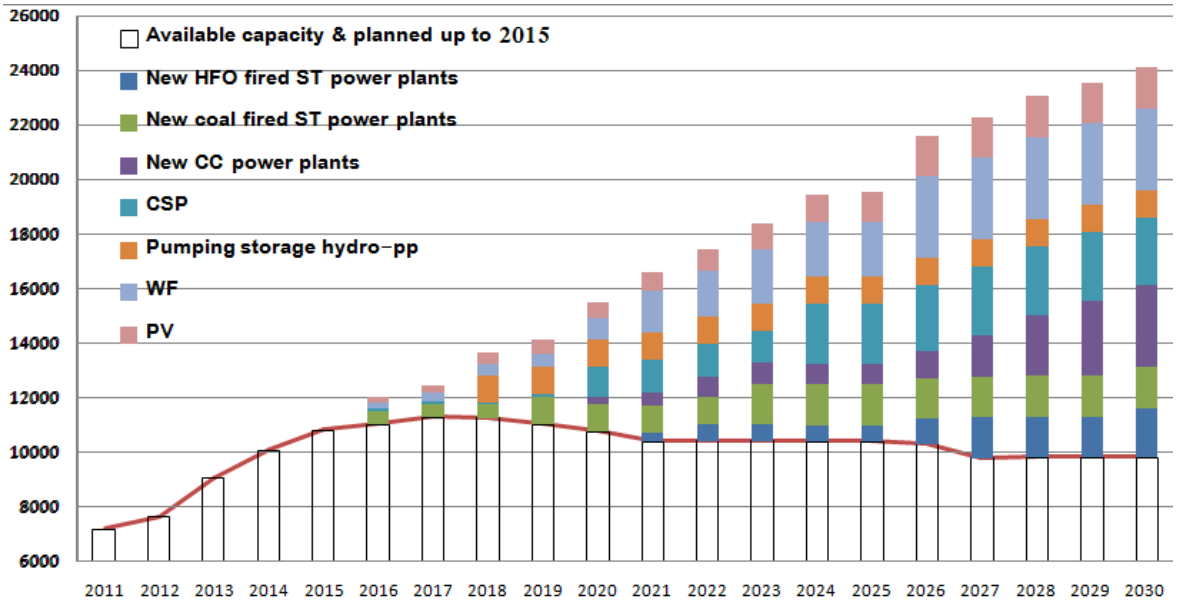


Source: Plan Bleu - Syria water-energy-climate report, 2011

Changes in the energy situation

The energy strategy for Syria will lead to energy saving of 12% and the contribution of renewable energy in the national energy balance of 20% in 2030. New projects will therefore be planned for electricity production. This will require more water for thermal power plants cooling. This requires planning and more concerted action between water and energy sectors to prevent any worsening of the deficit in water.

Figure 14: Changes in the electricity production mix by 2030 (energy efficiency scenario) - MW

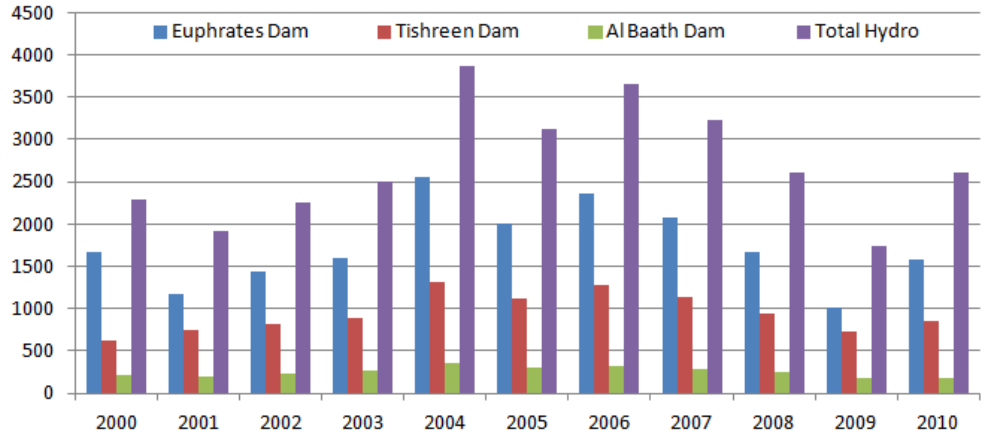


Source: Plan Bleu - Syria water-energy-climate report, 2011

Water needs for energy production

Hydroelectric power generation has already been significantly affected by decreased water resources as illustrated by the change in energy yields of Syria's large dams.

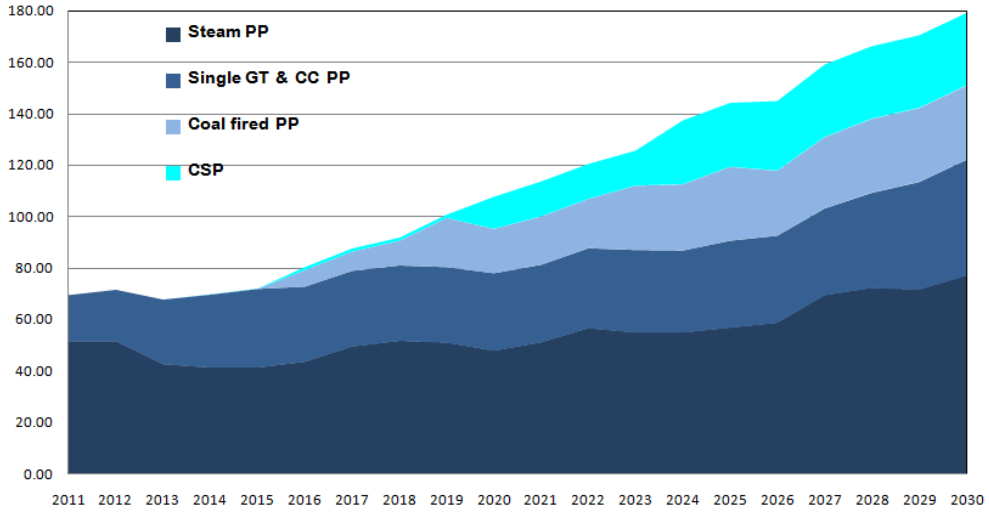
Figure 15: Hydroelectric power generation 2000-2010 - MWh



Source: Plan Bleu - Syria water-energy-climate report, 2011

Water needs include water for cooling both existing and new power plants. Needs associated with the development of new gas-fired and concentrated solar power production facilities are therefore going to increase.

Figure 16: Water consumption for thermal electricity generation (conventional and renewable) – energy efficiency scenario for 2030 - MCM



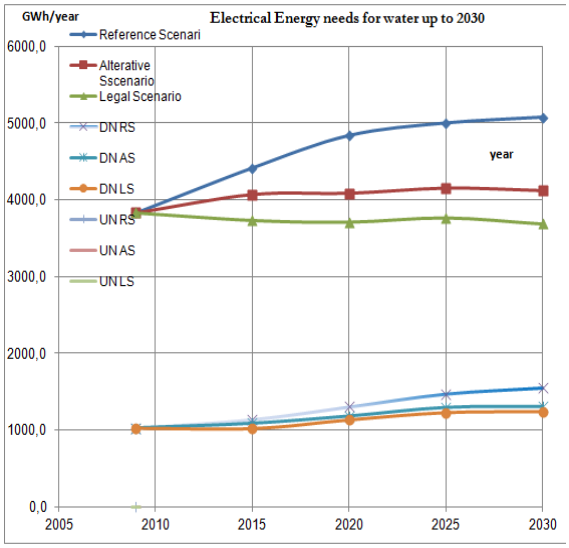
Source: Plan Bleu - Syria water-energy-climate report, 2011

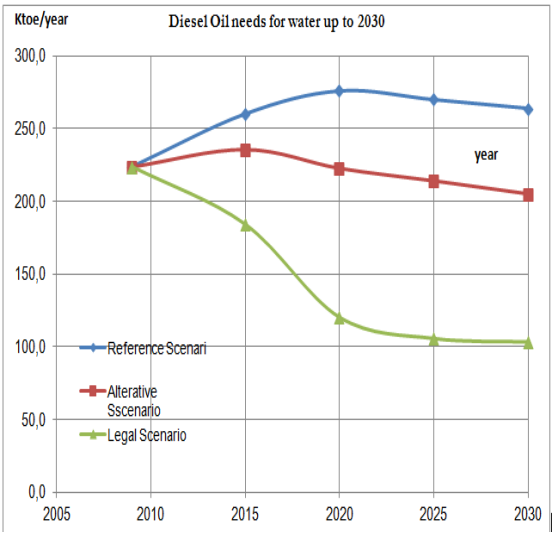
Energy needs for the water system

Energy needs for water, in particular for modern irrigation techniques and non-conventional water uses, are going to increase. Energy efficiency in these processes must be improved and renewable energy (wind and solar power) must be used to limit energy needs, especially for energy sourced from fossil fuels.

Electricity needs for transporting and distributing water (e.g. the Euphrates River is over 100 km from Aleppo) are growing; only the legal scenario sees electricity demand stabilise at 2008 levels by 2030. Diesel requirements grow until 2020, and then decrease. These targets could be reached by improving irrigation techniques through renovation of pumping infrastructure in order to improve energy efficiency.

Figure 17: Energy (electricity and diesel) required for water supply by 2030





Source: Plan Bleu - Syria water-energy-climate report, 2011

Planning water and energy needs

Planning needs to be carried out together with the institutions responsible for water and energy. Allocating a financial value to water used for energy needs should allow for better conservation of the resource and regulate its use. Projects bringing together energy and water based on an efficient use of water and exploitation of renewable energy could be developed in Syria.

Financial implications

A **financial approach** was developed to assess the investment necessary in both sectors and according to the various scenarios. This investment is based on sector cost assumptions described in the study.

Table 4: Forecast of Capital Cost for Expansion of Power Generation Plants up to 2030 for the RS & ESS* (Million U.S. dollar)

Million $US	Capital cost	2010-2015	2016-2020	2021-2025	2026-2030	Total
Reference Scenario (RS)	Total	2097	8325	8411	8504	27336
	Of it Renewable	172	172	172	86	429
Energy saving Scenario (ESS)	Total	2477	2477	2477	10214	35245
	Of it Renewable	1024	1024	1024	3787	11739

Source: Plan Bleu - Syria water-energy-climate report, 2011

III. Energy, construction and climate change in the Mediterranean

The construction sector is a priority strategic issue in the SEMCs. It combines the social issues of housing and urbanization, is particularly sensitive to climate change, and a significant provider of business and jobs.

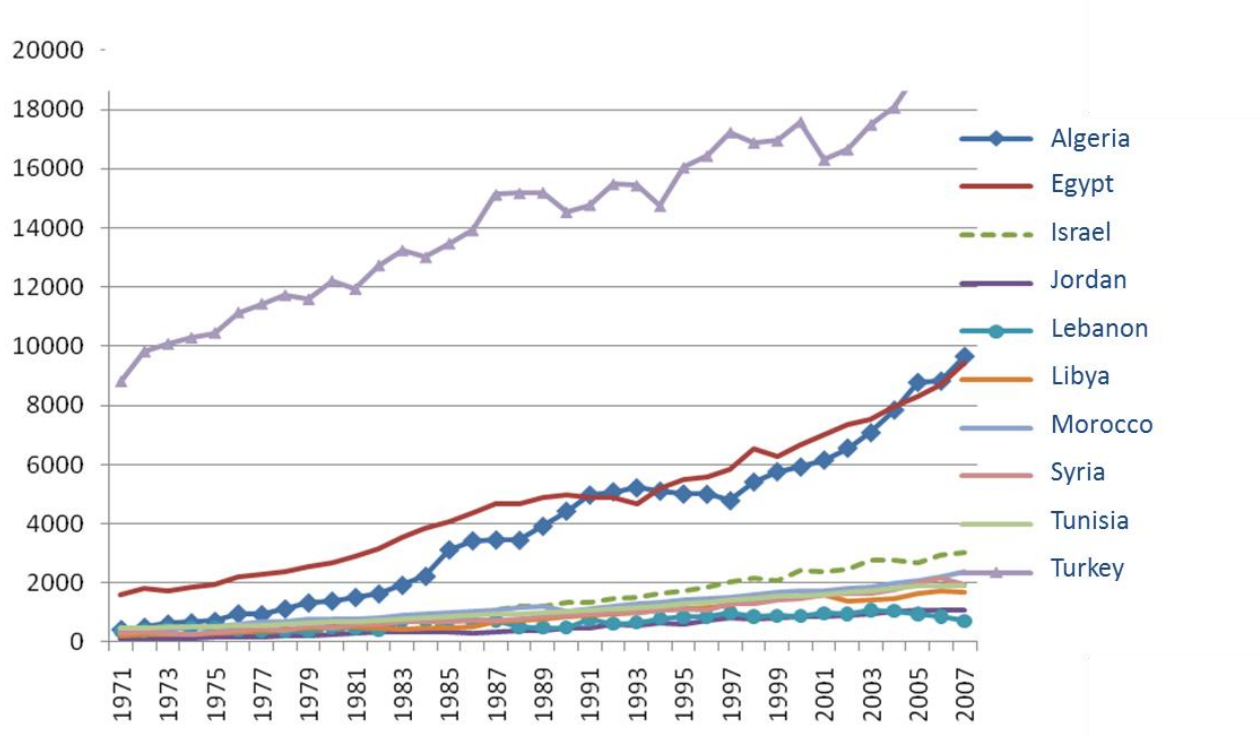
The research carried out from October 2008 to March 2010 involved three national studies (Lebanon, Morocco and Tunisia) and a regional study. These studies did not aim to analyse the construction sector in detail. The goal was to assess the issues around mass deployment of a range of technical solutions corresponding to ambitious energy targets.

The period between 2008 and 2012 saw an increased willingness on the part of some Governments to address issues of energy efficiency in the construction sector. Plans for regulations, institutional changes and the setting up of financial instruments were initiated. This is an initial response to reaching the objectives proposed in this study.

Our studies suggest that population increase, which is increasingly urban-centred, and the decrease in the number of occupants per residence over time will have an impact on demand for housing. The SEMCs currently have a population of around 280 million. If current trends continue, by 2030 their population will rise by around 80 million, of which 25 to 30 million will be on the coast. That makes for the equivalent of 20 additional cities with a population of over a million along the Mediterranean coast within 20 to 30 years. Over three quarters of the population in SEMCs will be urban in 2030. The study predicts **a nearly 42 million need in additional housing units compared to today**.

At a time when housing needs are high and accommodation is crucial for meeting population needs, it is essential to act as promptly as possible so as not to miss this opportunity and, thus, run the risk of witnessing a hasty development of poorly designed and high energy-consuming buildings. This goal of mass deployment must be balanced with issues of costs and availability of resources to finance them. These two criteria need to be optimised at the risk of seeing excellent but isolated projects set up.

Figure 18: Changes in energy consumption in the residential sector (Ktoe)



Source: Plan Bleu, Medstat, IEA

In the light of this significant quantitative issue, the study focussed on **new residential builds in the formal sector.** Work involved simulating the impact of actions leading to decreased energy demand at housing unit level, in order to be able to meet the need to slow growth in demand across the sector.

Two scenarios have been examined with regard to the evolution of consumption of the construction sector for 2030. The first is a business-as-usual scenario which assumes continuation of the recent trends observed. The second scenario, considered as a breakdown scenario (also called "Rupture scenario"), is an alternative proactive energy efficiency scenario.

It assumes a massive implementation of energy efficiency measures that are, today, the most technically and economically mature for a large-scale dissemination. In more explicit terms, these measures are the following:

i) Generalization of efficient shells for new buildings;
ii) Gradual elimination of incandescent lamps from the market;
iii) Thermal renovation of buildings (roof insulation);
iv) Dissemination of efficient electric household appliances;
v) Dissemination of solar water-heaters

The assumptions selected for penetration of these measures for 2030 are as follows.

Table 5: Rate of penetration of EE measures in the residential - Horizon 2030

	Existing residential			New residential		
Large-scale disseminated measures	**2010**	**2020**	**2030**	**2010**	**2020**	**2030**
Large-scale dissemination of efficient shells for new buildings				13%	50%	80%
Thermal renovation of existing buildings	1%	10%	30%			
Efficient lighting	20%	100%	100%	20%	100%	100%
Dissemination of efficient electric household appliances, heaters and air-conditioners	10%	50%	100%	10%	50%	100%
Dissemination of solar water heaters	7%	20%	30%	5%	25%	35%

Source: Plan Bleu - regional study on energy efficiency in the construction sector, 2010

The use of traditional techniques (bioclimatic principles) which bring together simplicity, robustness and rapid implementation while making good use of material resources and local know-how is also prioritized.

The construction sector, which represents the first electricity consumer sector and the second for fossil fuels is a sector with high stakes.

Using the work done a national level, the study considers that the construction sector acts both on demand (energy efficiency measures) and supply (by integrating renewable energy).

So putting together the measures adopted and taking into account the assumptions of progressive spread into existing and new housing in the energy efficiency scenario, consumption in the residential sector should reach around 88 Mtoe in the DSM (Demand-Side Management) scenario in 2030, as opposed to 130 Mtoe in the business-as-usual scenario.

The energy saving potential is thus estimated in this breakdown (or energy efficiency) scenario as around 42 Mtoe (of final energy) by 2030, compared to the business-as-usual scenario.

and the annual reduction in CO_2 emissions would be in the region of 63 Mt in 2030. The investment needs for implementation of the MDE measures over 20 years are therefore estimated at **€262 billion, and the average cost per tonne of CO_2 avoided would be €41.5.**

The implementation of the breakdown scenario, requires the deployment of diversified instruments which must be designed and used in a complementary and consistent manner.

Four types of instruments seem to be essential:

vi) Legal instruments,
vii) Incentive instruments,
viii) Sector capacity building and coaching instruments,
ix) Institutional and organisational instruments.

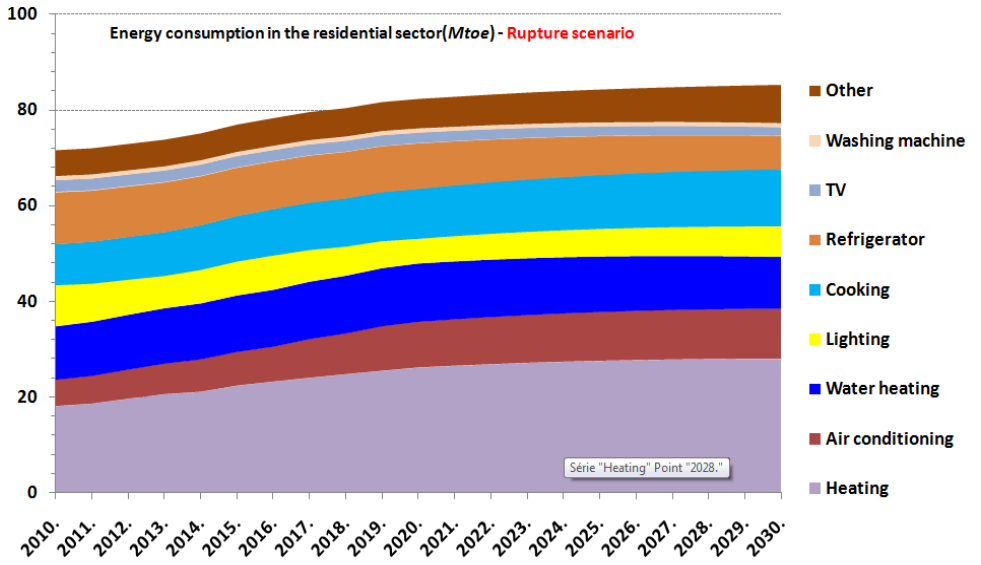
In the specific context of the SEMCs, where much remains to be done in terms of structuring the sector, the implementation, support and running of a **joint action between the various stakeholders** will foster the emergence of a lasting market for sustainable construction.

Table 6: SEMC's- Energy consumption in the residential sector by use(in Mtoe)

(in Mtoe)	Heating	A.Conditioning	Water Heating	Lighting	Appliances	Others	TOTAL
Business-as-usual scenario	58,0	19,6	11,5	8,9	14,4	15,8	128
Breakdown scenario	26,2	8,4	10,8	4,7	9,5	26,0	86
Reduction	-55%	-57%	-6%	-47%	-34%	64%	-33%

Source: Plan Bleu - regional study on energy efficiency in the construction sector, 2010

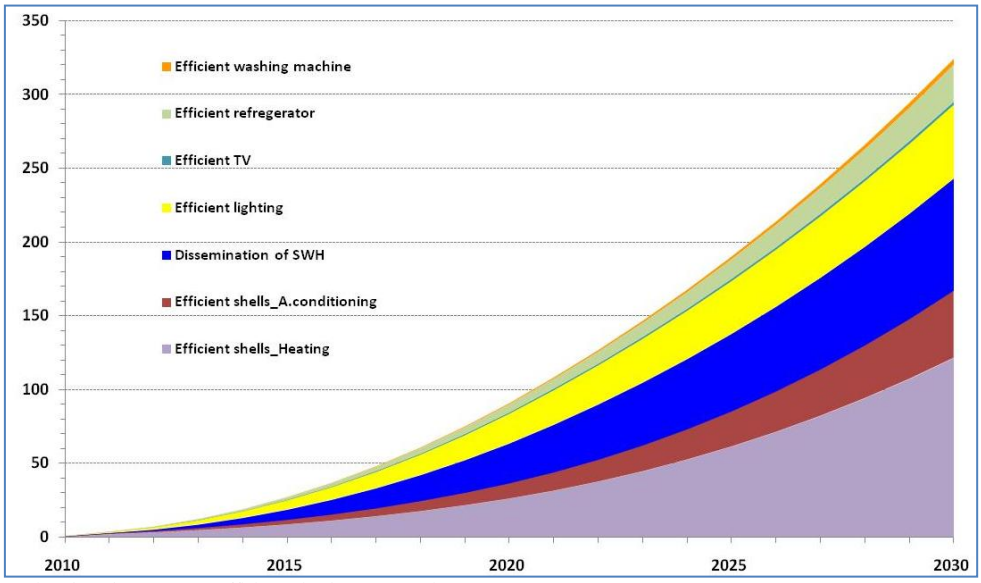
Figure 19: SEMCs – Final energy utilization in the residential sector – breakdown scenario



Source: Plan Bleu - regional study on energy efficiency in the construction sector, 2010

Overall demand will be managed both by reducing some existing appliances (e.g. cooking, heating, cooling) and minimizing new requirements, especially for electricity (air conditioning, appliances).

Figure 20: Aggregate final energy savings of the residential sector of the SEMCs –Breakdown scenario vs business-as-usual scenario (between 2010 and 2030, in Mtoe)

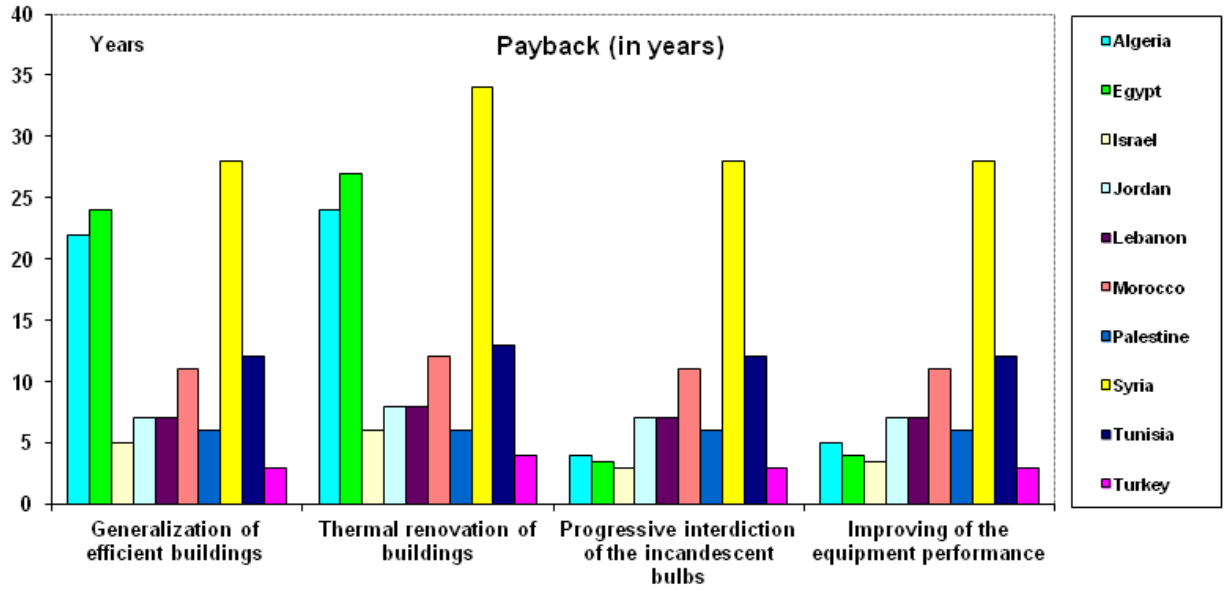


Source: Plan Bleu - regional study on energy efficiency in the construction sector, 2010

Together, these savings represent a total of over 300 Mtoe between now and 2030, which is something in the region of €200 billion of energy savings over 20 years across the SEMCs. Distribution of these savings varies depending on countries' **energy pricing** choices.

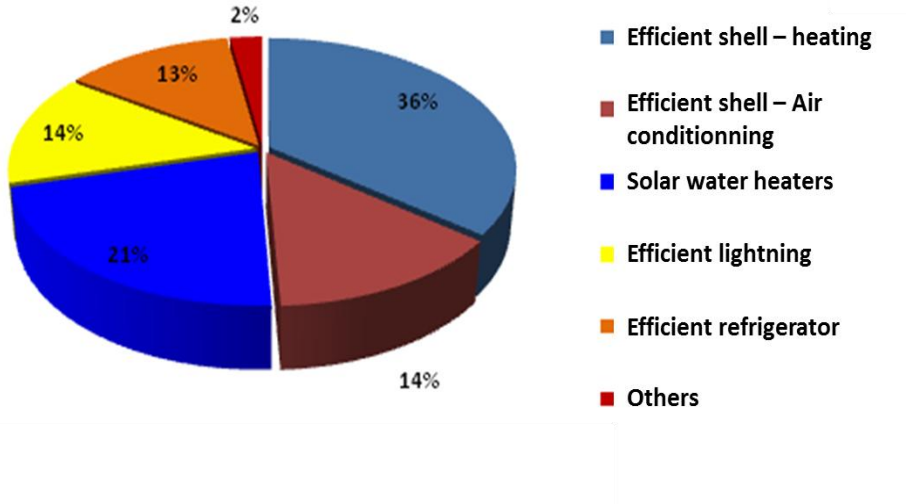
The pricing of energy is a key factor. The diagram below represents the different periods it takes for consumers in different countries to start getting a return on their investment for the same measure.

Figure 21: Payback time for the consumer, by country



Source: Plan Bleu - regional study on energy efficiency in the construction sector, 2010

Figure 22: Breakdown of energy efficiency measures in the construction sector



Source: Plan Bleu - regional study on energy efficiency in the construction sector, 2010

Generic cost assumptions were applied to the housing construction forecasts for each country and action. This gives a total overall figure for investment required which is presented in the table below. These estimates should be considered to give an order of magnitude, especially with regard to the associated energy savings (42 Mtoe per year).

Table 7: Investment needs for the measures of the breakdown scenario, per country

Measures	Total investment needs over 20 years	Algeria	Egypt	Israel	Jordan	Lebanon	Libya	Morocco	Palestine	Syria	Tunisia	Turkey
TOTAL (in billion €) of which:	262.0	33.3	74.3	7.0	4.5	2.8	6.0	30.3	4.1	19.2	3.6	77.2
Large-scale dissemination of efficient shells 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 (roof and wall insulation, 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 dissemination of ELB/ ELD	3	0.4	0.8	0.1	0.1	0.1	0.1	0.4	0.0	0.3	0.0	0.8
Dissemination of efficient electric household appliances, heating and air-conditioning	40	5.3	11.5	1.2	0.7	0.4	0.9	4.8	0.6	3.1	0.5	11.2
Dissemination 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

Source: Plan Bleu - regional study on energy efficiency in the construction sector, 2010

At a regional level, costs of emissions avoided for each measure are in the following orders of magnitude:

Table 8: Cost of the tCO_2 avoided of each measure

Measures	Investment needs over 20 years in billion €	Cost of the tCO_2 avoided over the lifecycle of the measure* in €/tCO_2
Large-scale dissemination of efficient shell of new buildings	132	38
Thermal renovation of buildings	49	42
Large-scale dissemination of efficient lighting	3	9
Dissemination of efficient electric household appliances, and heating and air-conditioning equipment	40	39
Dissemination of solar water heaters	38	120
Total	262	41.5

*The lifecycle of the measures with regard to buildings is taken as 50 years.
Source: Plan Bleu - regional study on energy efficiency in the construction sector, 2010

These results should be compared with the costs of not taking action associated with climate change. Due to the impact on heating and air-conditioning needs, the energy balance for the residential sector would see an increase in primary energy consumption of 8% and of capacity to be installed of 12% compared with the business-as-usual scenario not taking into account climate change.

Recommendations of the study on the development of the sustainable construction market in the Mediterranean and outlook

Indeed, it seems essential to design a breakdown focused approach, and only the political authority has the capacity to initiate such an approach: breakdown in the political options via a dedicated legal framework accompanied by means of control and implementation in an effective way, breakdown in the technical options to be promoted via a tailored support system, and, finally, breakdown in the manner of encompassing the building right from its design through to its construction, without forgetting the impact of its operation during its lifecycle.

The following limits and reservations should be noted:

- Cost assumptions for the 5 technical measures were applied homogenously at a regional level. This approach is useful in terms of giving an idea of orders of magnitude, but needs to be refined according to the real costs of projects by country, type of industry used, etc.
- The technical solutions proposed should be applied in more detail by climate zone, territory and according to the industrial and organisational capacity of the construction sector.

- The study only deals with the formal new residential build sector, which raises a basic question about whether it is possible to take into account recommendations including the informal sector, which could represent up to 70% of the construction market. This discrepancy represents one of the study's main limitations. There are, however, crossover effects between the formal and informal sectors, in particular for the materials supply chain, and transfer of training practices, etc. This point was worked on in more detail in the study of impact on employment and training presented in section III.
- The existing construction sector remains to be studied, especially with regard to potential interactions and the pooling of ideas that comes with changing practices in the new build sector.

The following recommendations are made:

- A bottom-up approach based on collecting data which reflects the reality of operations and confirms or otherwise some assumptions. This approach could be rolled out across a number of selected regions and operations, providing representative categories of current new build projects in the SEMCs. This approach would also evaluate needs in terms of materials, products, infrastructure, etc. for each project category and so assess the impact and costs of energy efficiency actions on the industries operating in the construction sector.
- The following recommendations could provide a framework for improving energy efficiency in the construction sector:
  - Set out a binding, cross-cutting legal framework and control its implementation
  - Set out a tailored and sustainable institutional support. Most countries have now appointed a permanent body responsible for energy efficiency with authority to coordinate governmental programmes
  - Adapt and modify energy pricing policies. A complete review of energy subsidies should encourage the production of redistribution systems to support the development of renewable energy and energy efficiency. This requires incentivised pricing which promotes consumption management rather than consumption. This would also limit the collective budget (notably that of Governments) for supporting fossil fuels.
- Finance sustainable building
  - Enlist bank participation and tailor credits to give access to initial capital to allow investment in energy efficiency;
  - Develop Public-Private Partnerships (PPPs);
  - Facilitate access to international funding .
- Ensure a lasting sustainable building market
  - The State to lead by example;
  - Quality of infrastructure and developments must be controlled and the professionals trained.

Outlook

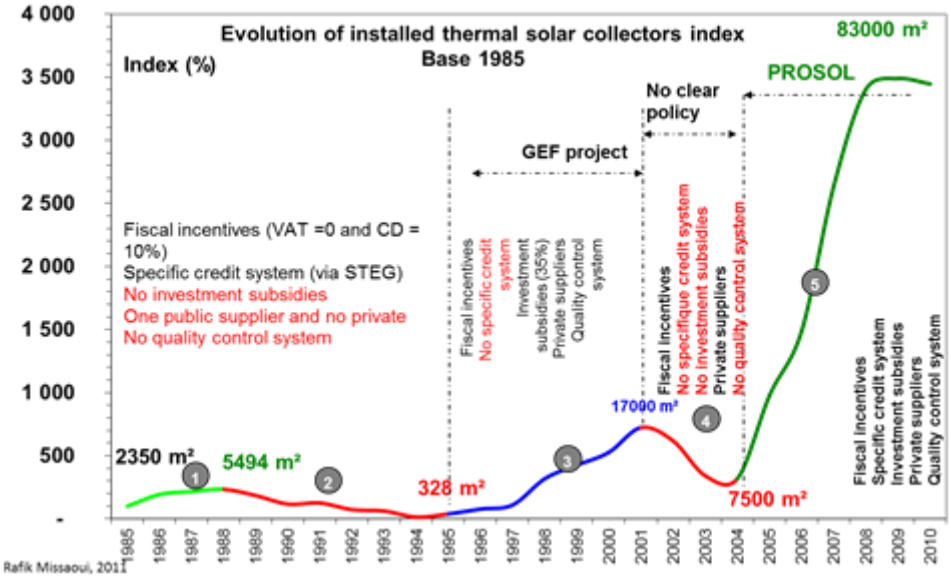
More generally, the discussions on the issue of buildings and energy efficiency show the necessity of continuing studies on the following points:

- Integrating the "sustainable" building issue into the reality of the construction sector and studying it in parallel with the development of various industries (materials, equipment, etc.) and construction sectors (public, private and social buildings in urban, rural and other contexts). Detailed knowledge of the key players in construction should be encouraged at a local level. A survey would make it possible to evaluate potential synergies between players working on the same product in the same region;
- Comparing this survey with an assessment of potential sources of energy saving using the bottom-up approach described above will give an indication of the potential of underlying markets;
- A qualitative approach by project type and local industry could be carried out to survey challenges and opportunities for players in the construction sector. Depending on the differences between needs and supply, avenues for adaptation should be formulated;
- The connection between improving energy efficiency and its impacts in terms of comfort, planning and economic benefits still needs to be qualified precisely by population category and type of region. The correlation between standard of living and energy consumption needs to be studied in detail via sociological and cultural analyses in order to be able to make policies of restraint easier to accept.
- In terms of implementing ways forward, several business models should be tested based on:

- Micro-financing trials, investment funds offering services and construction work, collaborative projects with dedicated project ownership, use of carbon finance mechanisms;
- Methods for redistributing energy savings between consumers and technical solution providers.

Experiments carried out in Tunisia, especially under the PROSOL programme, illustrate the market's responsiveness to some well-selected support measures (consumer subsidies, loans paid back through the electricity bill, cooperation with the energy supplier, upstream infrastructure quality control system).

Figure 23: Changes in the solar water heater market in Tunisia



Source: Plan Bleu - regional study on energy efficiency in the construction sector, 2010

Details of measures implemented are given in detail in Appendix.

IV. The impact of rational use of energy and development of renewable energy on employment and training

The implementation of strong assumptions for the development of renewable energy and promotion of energy efficiency will have numerous socio-economic consequences. The study focussed on quantifying and qualifying the impact of a breakdown energy scenario on employment and training in the SEMCs.

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 and based on MEP 2008.

- 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.
- The approach used was based on work carried out by the European Union, especially by Syndex.
- We set out the challenges and opportunities for employment by sector, focussing especially on the construction industry. We attempted to quantify new jobs created and offered several avenues for refining this research to the local situation and industrial sector.

This study serves to qualify the "jobs and skills" section of the breakdown scenario.It should, however, be noted that:

- 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.
- 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.

Research carried out therefore aimed 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 covered the following sectors:

- from the perspective of energy supply: primary energy (gas, oil) and power generation (from conventional and renewable energy sources);
- 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

We 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. It is built on specific country studies for Tunisia, Morocco, Egypt and Turkey.

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[1] is one of the sectors to focus on.

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.

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 (cf. 0).

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.

The Morocco, Tunisia, Turkey and Egypt case studies were based on data collection and study projects (Morocco and Tunisia).

1. Key results

Primary energy

Work carried out evaluated changes in employment in the oil and gas sectors, in exploration, exploitation and refining.

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 the evolution of the 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.

In the refining sector, maintaining demand at its 2007 level in the breakdown scenario will lead to stagnation in workforce numbers in the SEMCs at around 25,000 FTE jobs by 2030.

Electricity generation

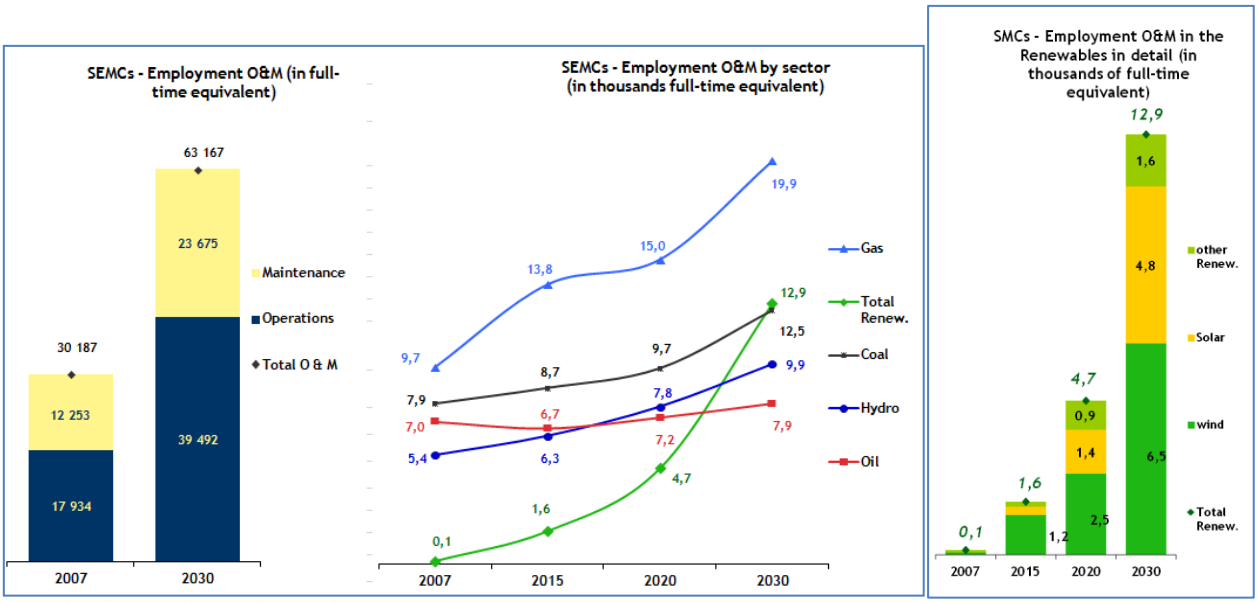
The breakdown scenario forecasts that the capacity of current installations in Southern Mediterranean countries will rise from 112 GW in 2007 to approximately 300 GW in 2030. This corresponds to 12 GW less than business-as-usual scenario forecasts due to energy efficiency.

Operations and maintenance of electric plants

Jobs in plant operations and maintenance (O&M) are direct permanent jobs for the period of the scenario. The graphs below show the results of simulated changes for 2030.

[1] 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.

Figure 24: SEMCs' Distribution of employment in operation and maintenance by sector for 2030



Source: Plan Bleu – Syndex, employment impact reports, 2011

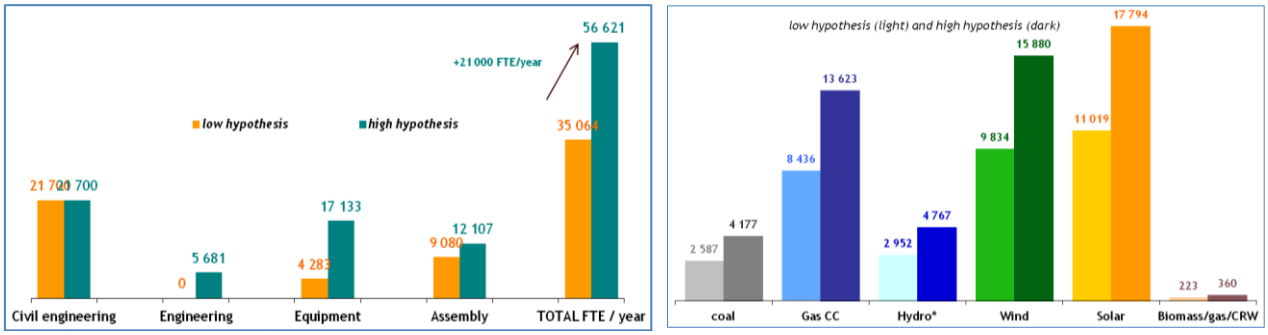
Jobs would be created primarily in renewable energy sources (+12,800 FTE jobs, including 6,500 FTE jobs in wind energy) and jobs associated with the operation of plants as such (two thirds of new jobs). Renewable energy sources would thus become the second employer in the power generation sector, after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

Power plant construction (new build and renovation)

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 business-as-usual scenario. In comparison with the business-as-usual scenario, the breakdown scenario would create less jobs (–6,500 FTE) in the construction of conventional power plants, but more in the construction of renewable energy plants (+8,800 FTE), primarily solar and wind power plants. 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).

These values depend on the local industrialisation level for the various pieces of infrastructure. In the event of a high hypothesis, the number of construction jobs created could reach an average of 56,000 FTE jobs per year

Figure 25: SEMCs – Annual average employment in electric plants building between 2007 and 2030 (in full-time equivalent/year)



Source: Plan Bleu – Syndex, employment impact reports, 2011

Construction sector, a sector with potential to create jobs

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.

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. It seems essential to provide support and investment for research and innovation into these themes by, for example, providing measures to help innovative SMEs.

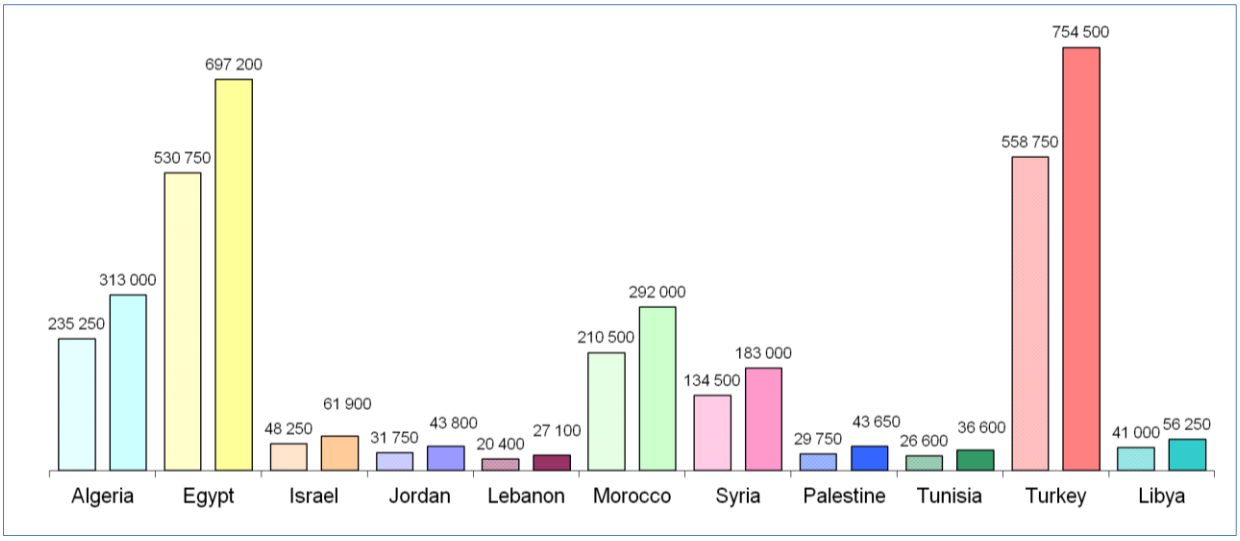
On the need to avoid neglecting the impact of self-builds and the informal sector

The informal sector (3/4 of construction projects – including, new build, extension and renovation in the SEMCs) 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.

The study analyses the characteristics of the informal sector, its advantages, interactions and risks for the implementation of energy efficiency policy. 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 study highlights quantitative trends for employment breakdown in accordance with ratios defined in the method.

Figure 26: Total potential job creation in SEMCs through energy efficiency measures in the residential sector by 2030 (high and low hypotheses)



Source: Plan Bleu – Syndex, employment impact reports, 2011

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 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.

It also seems to be important to find ways of spreading skills to informal sector workers in order to have an impact on the significant self-build sector.

Work also needs to be carried out to improve the image of the construction industry, characterised by low incomes for employees, a prevalence of unskilled labour and an on-the-job training process.

The cost of not adapting to the new requirements will also be significant and will lead to:

- An increase in the primary energy bill and greenhouse gas emissions,

- Imports of materials, intermediate products, equipment and therefore skills from outside, with the risk of job destruction.

2. Training and skills

The study aimed to:

- Assess training and skills requirements using data on changes in employment (in connection with the quantitative section and the breakdown scenario),
- Produce an overview of training and skills by identifying training organisations including vocational training, university courses and professional development,
- Analyse the SEMCs' strategy for different industrial sectors and associated training (with a focus on Tunisia and Morocco),
- Propose ways forward to support development and improvement of training associated with potential jobs (with a focus on Tunisia and Morocco)

A survey was carried out of existing training and evaluation of courses to be created from scratch, or existing courses to be improved. The goal is not only to train people whose jobs have been directly created by energy efficiency measures, but also people whose jobs are the result of rising FTE numbers in the sector.

The challenge is to find out what are the most suitable types of training for the way these sectors are organised in the various regions. This involves both developing new skills for new "green jobs" and training and adapting the skills of current employees, especially via retraining.

3. Employment impact synthesis

The following table offers a comparison between the employment impacts of the two energy scenarios.

Table 9: Summary of the breakdown scenario employment impact

	Number of jobs			Creation of jobs		Jobs net variations			
In Full Time Equivalent (FTE)	2007 – 2008	2030 Business-as-usual	2030 Breakdown	Business-as-usual scenario	Breakdown scenario		Breakdown/ business-as-usual scenario		
						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%		
Refining	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	+7,000	+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: Plan Bleu – Syndex, employment impact reports, 2011

The most important sources of job creation are clearly in the improvement of demand-side energy efficiency.

4. Limits and reservations and main recommendations

4.1. The issue of local industrialisation

Two hypotheses were adopted for this study. They are key to assessing a project's employment impact in detail.

Table 10: Hypotheses relating to the breakdown of jobs in electricity production

				Intégration locale	
Type d'emploi	**activité**	**emplois (ETP)** hyp. haute en 2030	**décomposition des emplois**	**Hypothèse basse (2007)**	**Hypothèse haute (2030)**
O&M *(permanents)*	Exploitation	40 000	33%	100%	100%
	Maintenance	23 000	19%	100%	100%
	sous-total O&M	***63 000***	***53%***	***100%***	***100%***
Construction de centrales *(temporaires : ETP / an)*	Génie civil	21 700	18%	100%	100%
	Ingénierie	5 681	5%	0%	30%
	Equipements	17 133	14%	10%	40%
	Montage	12 107	10%	60%	80%
	sous-total construction	***56 621***	***47%***		
TOTAL	**Total électricité**	**119 621**	**100%**		

Source: Plan Bleu – Syndex, employment impact reports, 2011

The ratios used for estimating employment impact are general and determine FTE jobs created directly per million Euros of extra investment. More detailed analysis for each country would be more relevant but would require very detailed access to national accounts. Knowing the proportion of jobs associated with imports and exports in order to determine industrial integration levels would also make it possible to refine results by country.

Specific analysis of the capacity of existing industries to meet future needs should also be carried out. For example, the presence of a chlorine industry is essential for the manufacture of photovoltaic units. This type of heavy industry should also be developed for other requirements in order to achieve threshold effects compatible with investment and operating costs. Key players in business and industry need to come together with contract-givers and energy policymakers in order to optimise and mobilise and/or adapt existing industrial resources as best as possible.

4.2. Other sectors (industry, transport, agriculture, etc.) and crossover points between sectors

The study focuses specifically on the electricity generation and construction sectors. The industry, transport and agriculture sectors have yet to be studied in detail. One of the main difficulties will lie in modelling interactions between sectors, especially on questions of transport, which interact with city planning, economic development zones, etc.

The measures adopted in this study involve investment. Some improvement in energy efficiency will also come from better demand management thanks to behavioural changes in energy use. These changes will require human support at all levels. For example, deployment of flow economies, like those existing in European countries, could, with adequate training, generate activity that would provide local jobs.

4.3. Training

The recommendation regarding the development of instructor trainers and networking them together will be adopted. This could be performed as part of existing cooperation actions between Europe and the SEMCs, but also as part of thematic networks within the SEMCs. This training offer could be associated with public policies relating to energy as well as private industrial initiatives (training for specific products, etc.) For example, joint public – research – private projects, like the National Solar Energy Institute (INES) in France, can contribute to the development of shared training reference frameworks and processes.

5. Publication of the study

The results of this study were also presented at the "Shifting to a Green Economy in the Mediterranean Region" conference organised by the Marseille Center for Mediterranean Integration (CMI) and the Office of Economic Cooperation for Mediterranean and Middle East (OCEMO) on 23 and 24 May 2012, in Marseille. http://green-economy-in-med.com/

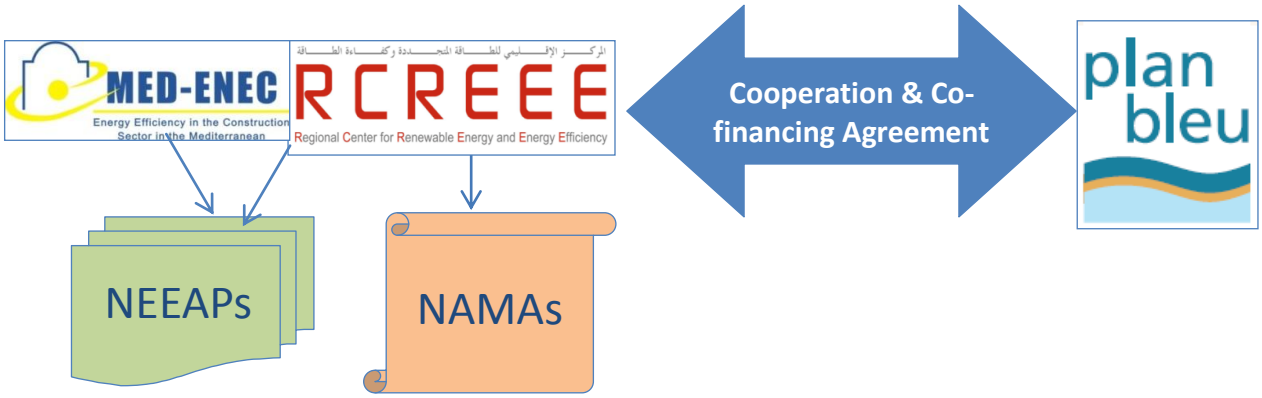
The study's results were also presented at the Rio + 20 conference on 17 June 2012, as part of a parallel event in the French pavilion, "Transition requires more dialogue," organised by Syndex and the French centre for documentation on work and training (CDFT).

V. Energy efficiency indicators in the SEMCs

The design, the implementation, the monitoring or the evaluation of any energy conservation policy in a country, at the national or sectoral level, require relevant indicators reflecting the reality of the socio-economic activities' energy performances.

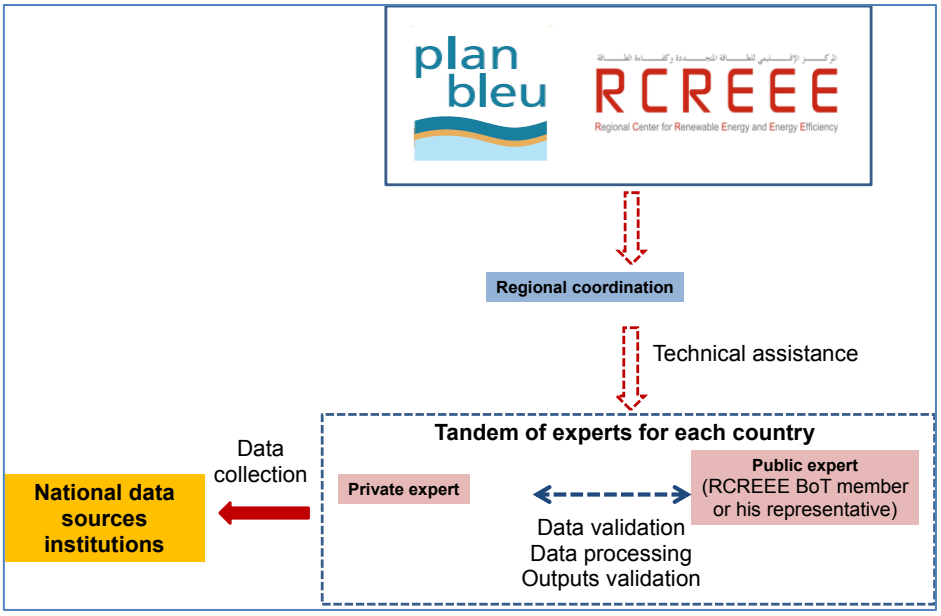
In addition, for the developing countries in general and those of the southern shore of the Mediterranean sea in particular, the implementation of information systems for energy conservation indicators and those corresponding to the greenhouse gas emissions, is a key condition not only for the development of NAMAs in the framework of the current negotiations on climate change, but also for the National Energy Efficiency Action Plans, that are under development as part of the Arab Energy Efficiency Directive. Energy conservation indicators are essential for these plans' follow-up and assessment.

For this reason Plan Bleu, in partnership with RCREEE, launched this work on 10 MENA region and south Mediterranean countries, namely: Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Yemen.



The implementation of this project is based on 10 national experts contributions, designed by Plan Bleu, whose primary mission is collecting data and developing indicators in each target country, in close collaboration with the focal points of RCREEE.

Figure 27: Organisational structure of the energy efficiency indicators project



The main objective of this work is to develop energy efficiency indicators and to interpret them for the whole region. The indicators will be, as far as possible, similar to those developed in the European Union countries (based on projects like Odyssee).

The project was organized as follows:

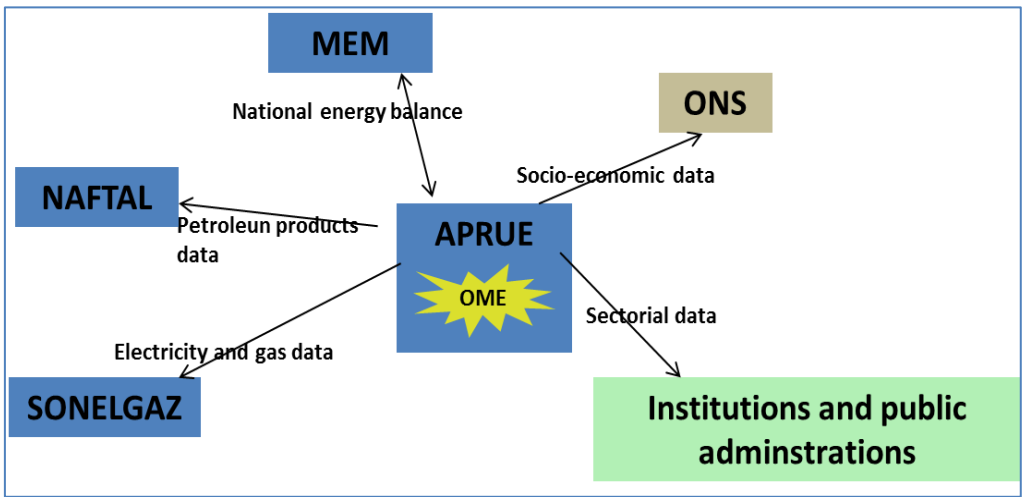
- Kick-off workshop with the 10 national experts and the 10 focal points from national institutes and structures in charge of energy statistics (Tunis, January, 6-7, 2011).
- Preparation of an Excel database (February 2011).
- Data collection by national experts and focal points in each country
- Helpdesk and hot line for the national expert by the regional coordinator.
- A second, mid-term workshop for assistance to the teams and workgroup, (Cairo on 6-7 April 2011)
- A third workshop for the validation of data and indicators calculation (Plan Bleu-Sophia Antipolis, on 6-7 October, 2011).
- A fourth workshop for the restitution and valisation of calculated indicators and nation reports (Marrakech on 16-17 April, 2012
- Organisation of a final report seminar for regional policymakers (planned for 28 June 2012, at the Arab League headquarters in Cairo, Egypt, but then postponed).

Work involved setting up a discussion network between private experts and members of national institutions responsible for energy (agencies, Government ministries). Deliverables include national reports (with a common framework and associated source database) and a regional report for initial comparisons.

1. Main recommendations

Producing indicators requires improving data collection, production, processing and publication processes. The project highlighted heterogeneous data for different countries and sectors. Several areas of good practice have been identified and are set to be shared at a regional level via common data collection tools, training processes, etc. Overall, the production of energy efficiency indicators requires, and is therefore dependent on **homogenous up-to-date contextual data** (on current housing, transport, industries, etc.) Producing relevant and reliable indicators is a process that includes several data producers, beyond energy specialists. It involves working across sectors with good coordination between data-holders (authorities, statistics institutes, energy operators, etc.) The organisation of data flows in Algeria illustrates the interface and coordination role of the National Agency for Promotion and Rationalisation of Use of Energy (APRUE).

Figure 28: Example organisation of data collection – Algeria, APRUE



Source: APRUE

This contributes to the setting up of a permanent, continually updated system based on the contributions of all data producers: institutes, energy operators, etc.

Support for the organisation of institutions must be continued as part of the technical cooperations, training courses and joint projects between countries. The development of homogenous data systems could lead to methods developed being taken up permanently. On a regional level, these indicators could be viewed and fed into databases for monitoring the energy situation in the Mediterranean.

This could be based on better convergence with regional statistics cooperation projects, especially involving:

- The organisation of data: this involves structuring data according to standards like the one adopted for the European Union's ODYSSEE programme;
- Formalisation: making the development and use of indicators a professional task through the use of metadata.

The actions undertaken by the MSSD and the Medstat project are examples of this.

Despite the lack of some data, an initial series of indicators was used to perform a comparison between the countries:

- Changes of the same indicator over time were compared to anticipate forthcoming trends;
- Differences in energy use (quantity, cost, carbon intensity, etc.) across the same sector were highlighted;
- Energy use and organisation of the countries' energy system were linked (producer/importer countries, regulatory and tax framework for energy, etc.).

The brochure, in Appendix, gives an overview of the main results of this project by country.

Further work could be focussed on priority sectors like construction and transport. These sectors are wide-ranging by definition, and require significant expertise to achieve an analytical and even semi-exhaustive perspective of the different sources of energy consumption. This could be performed as part of convergence with the project led by Medener (the association of Mediterranean energy agencies and sector projects like Medenec).

VI. Sea level rise

The existing models and data available on the impact of sea level rises were analysed. 17 projects dealing with this question for the Mediterranean and 5 databases were highlighted.

The following recommendations can be offered:

- It is important to consider potential strategies for adapting to climate change and rising Mediterranean sea levels. Since "much of the Mediterranean is in a transition zone between the temperate climate of central-northern Europe and the arid climate of Northern Africa, even relatively small climate changes can have important effects on the region's ecosystems, human activities and human security";
- It is important to act quickly because "the changes expected in the coming decades are special in the way that they will take place extremely rapidly" even if "the crucial question is about how much it will rise and how quickly." According to the models used in the IPCC Fourth Assessment Report (2007), for all SRES scenarios, the global average sea level will rise between 18 and 59 cm by 2100, while during the entire 20th century the Mediterranean has only experienced a rise between 11 and 13 cm. But some hypotheses predict a sea level elevation at the global scale of more than one meter during the current century, and up to tens of meters over longer time scales (Hallegate & al., 2009), because of the high uncertainty concerning the rate of ice melt;
- There will be a definite impact due to sea level rise along the Mediterranean coast even if "no solid estimation can be given for the Mediterranean Sea" (Hallegatte & al., 2007);
- In order to study the impacts of climate change, we need to predict changes on finer scales (regional). The sea level does not rise uniformly across local and regional areas due to the differing oceanographic responses to climate change and the local/regional phenomenon of land uplift and subsidence;
- Considering the high natural and socio-economic values that might be threatened or lost in coastal zones, it is important to identify the types and magnitude of problems that different coastal areas may have to face;
- An assessment of the costs of protection versus the costs of land loss for the OECD concludes it is optimal to protect nearly all harbors and cities and open coasts and beaches in densely populated areas;
- Concerning the Mediterranean, a 1m rise of sea level is the hypothesis kept in most of the vulnerability assessments. Small islands, deltas and coastal ecosystems are the most vulnerable.

Analysis and surveying of climate change projects and models enabled us to:

- Bring together the most advanced climate change models currently available for the Mediterranean basin which are "the only available tool to obtain a representation of future climates" ;
- Give some consideration to the model results because "for technical reasons of calculation capacity though, the models cannot be used to develop calculations for every point of the globe or the atmosphere: they use a grid of cells to map the earth". The downscaling process therefore represents a major methodological challenge for determining the future characteristics of the Mediterranean climate;
- A major limitation to such vulnerability assessments has been, among other things, the lack of appropriate computational resolution, the need of improvement of data collection and management and the lack of co-ordination between different modelling groups. These problems are tackled in Europe through the European Commission's Framework Programmes;
- Observe that most modelling seems to fail through a lack of input data: reliable data with regard to the oceans, long–term trends, the physical characteristics of coastal areas, etc. Several projects are working on improving access to reliable data and to organised, planned and coherent databases on the coasts.

List of figures

List of tables

Appendix 1: Studies and publications

Energy forecasts

Report

Presentation of the breakdown scenario

Construction, energy and climate change

Regional section

- Regional report
- Plan Bleu Notes no.18
- Futuribles Article, June 2011

Morocco case study

Lebanon case study

Tunisia case study

Interactions between water, energy and climate by 2030

Morocco case study (in French with UK summary)

Syria case study

Impact on employment and training

Regional study

Appendices: Country case studies for Morocco, Tunisia, Egypt, Turkey

Energy efficiency indicators

Regional report

National reports

Workshops and report seminar

Presentation brochure for studies completed

Sea level rise

Appendix 2: Project monitoring