Energy Efficiency Codes

Industry, Construction and Utilities in the Southern Mediterranean

February 2013

MED-ENEC

Energy Efficiency in the Construction Sector in the Mediterranean

This project is funded by the European Union

Jordan: *Residence in Aqaba (MED-ENEC-Pilot Projekt), built in 2009. Architect: Florentine Visser. The building, 420 m² in size, is designed for residential purpose with the option of use as guest researcher loggings/study center. Energy efficient construction, including shading, double wall insulation, double glazed windows, eco-friendly materials and passive solar design. The building needs 52 kWh/m2a achieving 85% energy savings.*

Table of Contents

1. Introduction 5

2. Energy consumption in the MENA region 6

3. Energy saving potentials in the MENA region 10

4. Why Energy Efficiency? Seven good reasons for policy makers to run for EE 12

5.a What to do? Intelligent Energy Measures - MED-ENEC lessons learnt 16

5.b Develop Energy Efficiency Action Plans 18

5.c Replacement of Energy Subsidies 19

5.d Strengthen institutions 21

5.e Adjust other relevant policies to support the EE business & development 22

5.f Sector Policies 23

5.g Reduce energy demand to avoid blackouts and to reduce governmental expenditures 25

6. Policy cycles, roadmaps, implementation and enforcement 26

7. What MED-ENEC can provide 28

8. Conclusions 29

9. Reference List 30

Photo Credits 30

List of Abbreviations, List of Figures, List of Boxes 31

Imprint 31

Tunisia: *DAR Hi*

Egypt: *Campus El Gouna*

Egypt: *Ezba el Tunis*

Tunisia: *Eco lodge near Nafta. Architect: Mohamed Nasr & Matali Crasset. Owner: Patrick Elouarghi & Philippe Chapelet. Date of building: October 2010. Square metres: 3000. EE specifications according to EU-standards. RE specifications such as PV, SWH, Geothermal.*

Introduction

Dr. Kurt Wiesegart
MED-ENEC Team Leader

The Arab world is in transition. This opens new opportunities and chances. Its economies demand cheap energy from fossil sources only on a short term perspective. For the long run, and to ensure a competitive business environment as well as increasing employment rates, energy efficiency and the increased use of renewable energies is essential.

Already, many countries in Europe and America have been advocating 'green growth' as an opportunity to provide a stable and sustainable economy following the economic crisis to create wealth and employment. Energy efficiency measures in particular have been the focus of economic stimulus packages with the US and Europe dedicating 12 % and 60 %, respectively, of their budget to energy efficiency and renewable Energy. The EU has set a target for the year 2020, which is to save 20 % of its primary energy consumption compared to projections. This demonstrates the growing realization that energy efficiency (EE) can provide wealth, jobs and innovation in times of economic crisis and transition.[x]

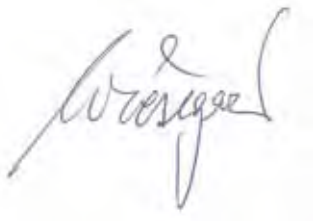
In the Middle East and North Africa (MENA) countries, National Energy Efficiency Plans have been developed, setting targets ranging from 8.3 % in Egypt by 2022 to 15 % in Yemen by 2025. Further targets will be set and fixed by each Arab state to be achieved by 2015 according to plans of the League of Arab States. With MENA having one of the world's highest energy intensities, these are ambitious, but accessible goals. The question to national Governments and political leaders, however, is: How will these goals be reached, how plans are implemented, and how the allocated measures are organized?

These are already questions of today as the population in most southern Mediterranean states is growing rapidly. More and more people are moving to cities in search of work and housing. Since 2000, primary energy consumption is increasing at a rate of 4.3 %, but the electricity consumption, mainly caused by private households and commercial/institutional buildings, is growing by 7.5 % annually (according to the World Bank), doubling in one decade. The EIB expects that 22.5 million additional residential dwellings will be built in the next 20 years in the MENA region. Not only is increasing urbanisation a problem, but also the changing of consumption patterns demanding energy consuming appliances, most importantly: Air Conditioning.

This brochure is to demonstrate that EE saving measures and technologies should be the first priority, as energy which was not consumed is the cheapest and most environmental friendly solution. They must be accomplished by replacing fossil resources with, for example, solar power plants, geothermal solutions, wind power and other measures.

This brochure is designed to support policy makers who aim to solve the energy supply problems on short and medium term basis. It focuses primarily on areas of action to improve energy efficiency, where policies have been successful. It highlights policy measures and potential fields of action in the MENA region. EE-measures in the transport sector have significant potential to reduce energy consumption; however, these are not the focus of the MED-ENEC project and, accordingly, are not discussed in this brochure.

Kurt Wiesegart



Energy consumption in the MENA region

Lebanon: *Beirut Skyline documents the mainstream of energy consuming constructions in the MENA region*

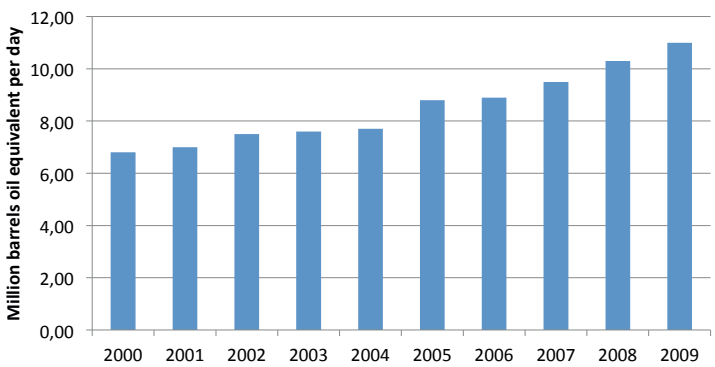
The International Energy Agency (IEA) claims that 17 % (or 82 EJ/year) of worldwide energy consumption can be saved by 2030 by implementing EE policies across multiple sectors including: industry, transport, energy services, and buildings. [xiii] Energy consumption in the MENA region has been rising steadily since 2000 with industry, buildings and power generation accounting for 69 % of energy consumption (Figure 1). Therefore, targeting efficiency measures at these sectors will result in high returns on investments in energy savings.

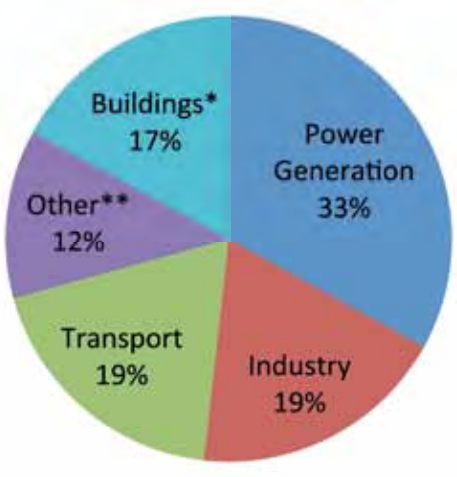
Between 2000 and 2009 the GDP in the Arab region grew by 50 %. Final electricity consumption grew in the same period by 91 %, mainly due to the increasing use of cooling, lighting and new devices in the electronic equipment.[ii] With 98 % of the region's energy use from fossil fuels, this has severe economic, environmental and health related impacts. Increasing demand for air conditioning in domestic housing is expected to push consumption further in coming years. Wasting such important resources is harming the economic and social development.

Balancing the need for energy with the environmental costs is a major challenge as the demand for energy is forecasted to rise by 50 % by the year 2025 worldwide. In the MENA region, due to a fast growing population, it is projected that a total of $4.3 trillion will be invested in housing and construction over the next decade. If governments will not counter steer, the demand for energy in the MENA region will be growing faster than the world average with negative impacts on market

Figure 1: Total Final Energy Consumption MENA 2009 (Mtoe)

*Source: AFED (2011) *Buildings (residential and services) **Other (agriculture and non-energy use)*





shares and job developments.

Other facts underline the importance of determined energy savings: Primary energy intensity (see Box 1) has improved in the last 20 years across the world, except in the MENA region where it has increased by 14 % since 1990 (Figure 2). Primary energy intensity in MENA countries is 40 percent above the world average except Israel (Figure 3) and some 60 percent higher than in OECD countries. This equates to higher energy costs for the same unit output and makes these economies more vulnerable and less competitive.

Several reasons account for this increase, including:

- Gas flaring in oil production (losses across the region of $1-2 bn pa),
- Increasing losses in electrical distribution and transmission (up to $5.5 bn pa),
- Rising energy consumption in residential and commercial buildings, and...
- High energy intensity in manufacturing and industry.[xiii]

Particularly, buildings account for 17 % of primary energy consumption in the MENA region, and energy intensity has increased by 40 % between 1990 and 2006, caused by growing population and the boosting demand for energy in electrical appliances and cooling.

Figure 2:
Change in Primary Energy Intensity by World Region 1990-2005

Source: World Energy Council (2008)

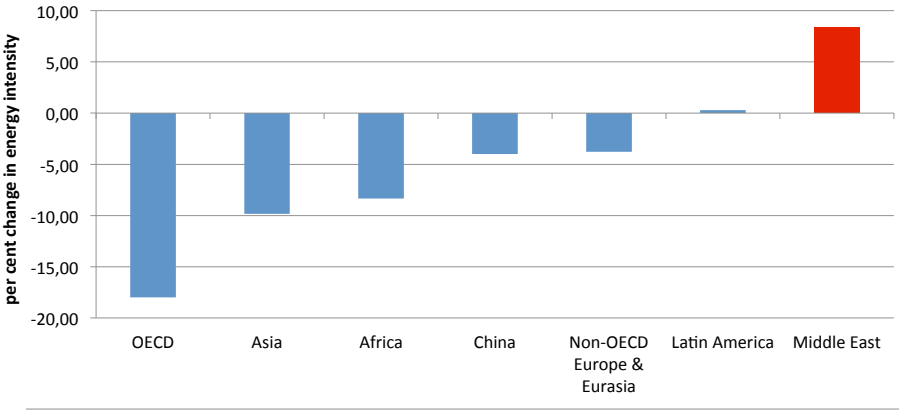
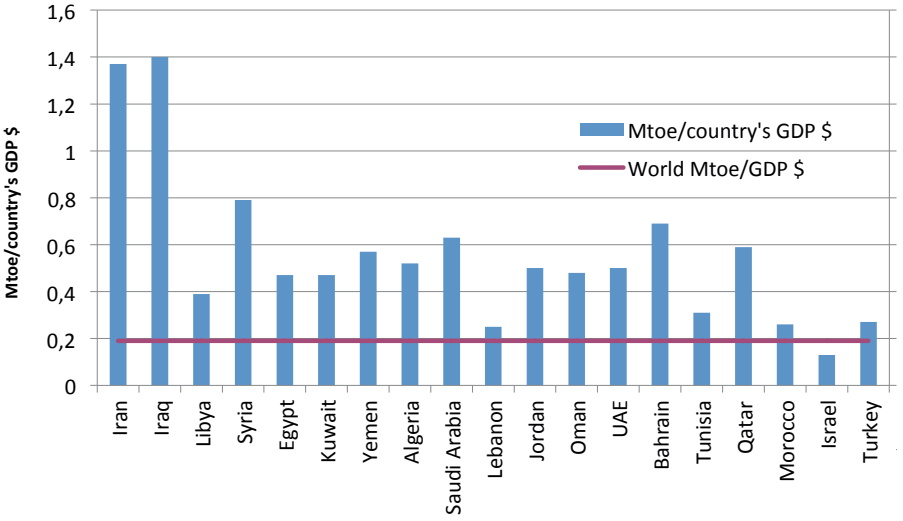


Figure 3: Primary Energy Intensity 2009

Source: IEA (2011)



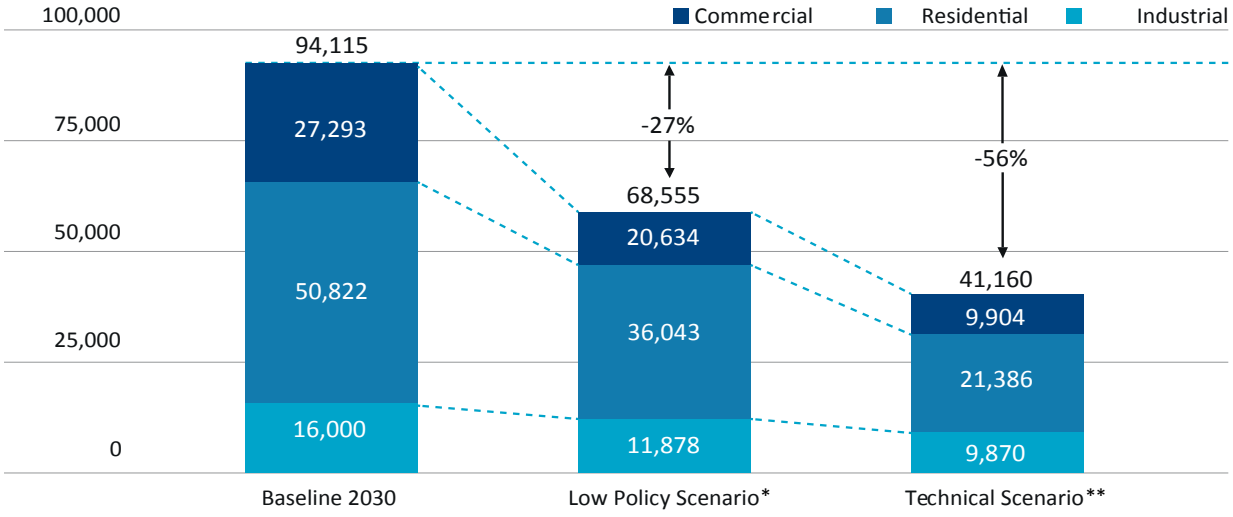
Box 1: Energy intensity

Energy intensity is the unit of energy used per unit of GDP, depending also on factors such as weather and economic structure. But the key factor is the efficiency with which energy is produced and consumed: the lower the intensity, the greater the efficiency. Or, high energy intensity is associated with higher energy costs to provide the same level of products or services.

Egypt: *The Central Institute "Campus El Gouna, Technische Universität Berlin", built in 2011. Basic planning by STAAB Architekten - Berlin, execution and facade planning by Ayman Arafa Architect, Egypt. Build up area: 10 000 m2. Energy-efficient design parameters: cavity brick walls with insulation, double glazed thermal windows, wooden screen window shadings, windows put back for shading.*

Figure 5: EE Potential in MENA by 2030. Primary Energy Usage in Kilotonnes of Oil Equivalent (ktoe)

** The low policy scenario assumes continued high barriers to EE, a limited policy effort to overcome these barriers and low discount rates for investments (low case).*
*** The technical scenario considers the maximum potential of currently available and reasonably accessible technologies (high case).*
Source: Study on the Energy Saving Potentials in EU Member States for the EU Commission, Economist Intelligence Unit, Saudi Interim Report, Oliver Wyman analysis (2012).



In contrast to the MENA region, China for example has decreased its energy intensity by over 50 % in the same period (see Figure 2 & Box 2). Although a direct comparison is not possible due to different economic potentials, political structures and geographical circumstances, China demonstrates a political will to enable significant reductions in energy intensity for saving resources whilst the economy is boosting. For this, China is using a suite of targeted measures with strong institutional support and clear evaluation, monitoring and enforcement: experiences which developing countries in many regions might benefit from.[xxiii]

Risks and costs of the dependency to fossil energy sources

Energy supply in MENA is predominantly covered by oil (over 50 %) which has associated environmental and health costs. The emissions not only contribute to the greenhouse effect, but also harm health. The World Bank[xxi] estimates that the health impacts of air pollution from fossil fuel emissions costs MENA region $5.3 bn annually which is 50 % higher than the world average.

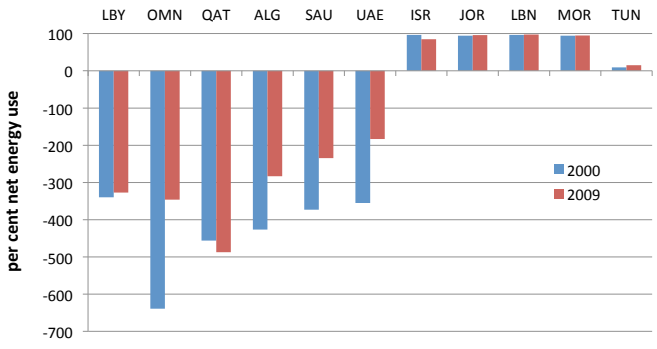
While the majority of countries in the MENA region have their own energy supply, some are dependent on imports. According to forecasts of decreasing oil resources, the dependency will even rise strongly over the next decades and countries will have to pay world market prices for imports. In Jordan, the net imports already account for 14 % of the GDP. How can the Arab countries meet these challenges?

Box 2: China reduces energy intensity

China has reduced energy intensity since 1990 by over 50%. It introduced various energy pricing reforms using four main indicators monitoring energy efficiency targets: energy intensity, rate improvement energy intensity, energy consumption per unit value added industry, and consumption per unit GDP. It has had an energy labelling scheme in place since 1998 and emissions standards for cars more stringent than those in the United States. China aims to reduce energy intensity by a further 40-45 % by 2015 announcing plans for a carbon tax and emissions trading scheme.

Figure 4: Energy imports, net (per cent of energy use)

Source: World Bank Statistics: 2012



Energy saving potentials in the MENA region

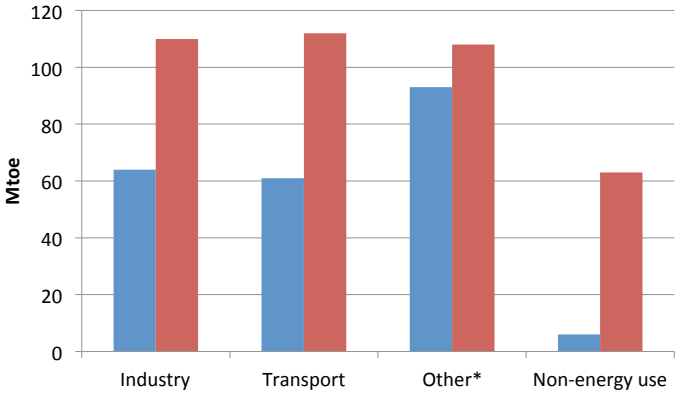
Economies or sectors that have lower energy intensities are more competitive as they have lower costs and more monetary resources to invest into infrastructure, future technologies and education. This is one of the reasons why countries and businesses across the world have been seeking to improve their EE performance and to decrease energy intensity. Low energy intensity can be achieved through engineering, auditing or manufacturing products.

Although the reasons why energy intensity in the MENA region has increased by 14 % during the last 25 years are diverse, it is evident that this increase is mainly caused by electricity generation and transformation, consumed by industry, transport, residential, commercial and public buildings. Total energy consumption in MENA has increased in all sectors from 1997 to 2009, but has even grown drastically in the industry and transport sectors by almost 50%. It has also increased significantly in non-energy use where fuel is used as raw material in different sectors.[xvi]

riers resulting in a lack of regulation and control, wrong or missing price signals, but also in a general lack of information and public awareness: There still is a widespread skepticism concerning the performance of EE measures and RE technologies and their reliability hampering the demand for products and services – with exceptions such as low energy lighting.[II]

Figure 6: Energy Consumption by sector 1997-2009

**Other: Residential, commercial and public buildings, agriculture and fisheries. Source: IEA (2000 & 2009) World Energy Outlook*



Residential and commercial buildings

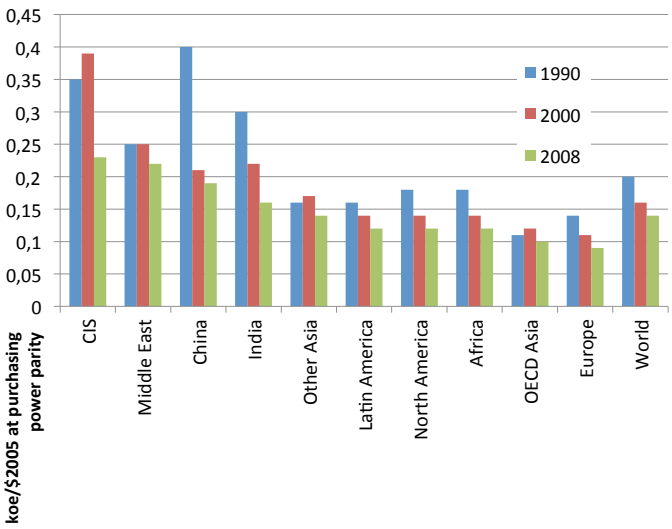
In the MENA region, the buildings sector is one of the highest consuming sectors with a share in the final energy consumption of around 17 %. Cooling appears to have a large share in the energy consumption of buildings, as well as quickly growing markets for electric and electronic appliances. Reasons are not only in changing consumption patterns and political bar-

Residential area in the MENA region: *Everywhere air conditioners*

Egypt: *Factory at the Nile*

Figure 7 Energy Intensity in Industry 1990 – 2008 (koe/$ 2005 at ppp)

Source: World Energy Council (2010)



Industry

Around 19 % of the energy in the Arab countries is consumed by the industry sector. The four most energy-intensive manufacturing industries with significant potentials for decreasing the EE are cement, steel, fertilizers, and glass. Manufacturing in 2007 accounted for 11% value added in GDP across MENA and 25 % of MENA's GDP in exports in 2009.

While Figure 2 shows how energy intensity across all MENA sectors has increased over the past twenty years, energy intensity in industry alone remained stable, but is still above world averages,[xxvii] and is more than double the energy intensity of Europe (see Figure 7). Higher energy intensity also equates to higher fixed costs making industry in the MENA region potentially less competitive than other world regions.

Energy utilities

The energy sector consists of electricity generation, transmission and distribution provided by utilities. It includes energy transformation and refining in the oil and gas industry. In the MENA region still 90 % of the electricity is generated by fossil Gas and Oil.xVI On the supply side, therefore, the strategy of de-carbonising electricity generation through renewable energy programs tends to decrease energy consumption and intensity.

On the demand side utilities and energy regulators can operate programs to help customers improve their energy efficiency. Governments in the region could oblige utilities to achieve certain annual energy savings among their industrial and household clients. Also, CHP obligations are an interesting support scheme for renewable electricity projects and can be used to design and incentivise renewable generation in the electricity production market lowering generation and transmission losses. A consequent reduction of flaring and venting in the oil and gas industry in MENA countries with resources and refinery should be enforced.

Conclusion

Studies estimate that the EE saving potential in the region could be as high as 56 % by 2030[xix]. As a rule of thumb, for every $1 invested in EE measures, $2 can be saved from avoided energy costs in the medium and long term. This could equate to savings of US$73bn annually in MENA.[ii]

Why Energy Efficiency? Seven good reasons for policy makers to run for EE

"EE is such a good idea, it should sell itself" (book authors Hansen/Langlois). Indeed, the general public will profit from various benefits as EE measures are proved to be the cheapest, quickest and most cost effective approach to reduce GHG emissions. However, taking initiatives for EE measures, needs more than the adaption of NEEAPs, legislation and incentives which several Arab countries have already introduced, even ambitious targets were decided (see Box 3) or are planning for the close future targeting industries and the housing sector.

Box 3: Energy Efficiency Targets in Arab countries

COUNTRY	SAVINGS	BY
Algeria	16 %	2020
Egypt	15 %	2030
Lebanon	5-10 %	2020
Morocco	12 %	2020
Palestinian Territories	10 % in various sectors	2020
Tunisia	20 %	2011

Egypt: *MED-ENEC pilot project in Sharm El Sheikh*

It will be just as important to overcome short term burdens, to persuade the public of the medium and long term advantages by implementing EE measures in various economic sectors. In addition, they offer many opportunities to relieve governmental budgets. Understanding and promoting benefits, policy makers will be able to reduce energy consumption meeting many expectations of their voters. Why?

Seven good reasons for policy makers to run for EE are:

1. Middle class voters appreciate indoor comfort that is specially connected to lower energy bills. This becomes even more important in times of rapidly climbing world market prices and inevitable shortages on public subsidies for electricity and fuel. Cooling appliances are particularly a financial burden for families with low income. Additional barriers must be overcome by improving regulations, as landlord-tenant arrangements mostly leave the burden of high operational energy costs to the tenants.

2. New markets open new opportunities for creative studios and business in the MENA countries. Examples for economic stimulations can easily be identified, e.g. local production of insulation materials and appliances such as solar water heaters. EE is nothing less than an approach to stimulate growth of local industry and services such as ESCO businesses. EE improves competitiveness in the economy by lowering energy costs, which needs quality control. In the industry EE specifically reduces operating costs and is boosting the cycle of innovations.

3. EE improvements are highly welcomed as an opportunity to cut state expenses. The state budget will benefit from pe

Box 4: Building in Islamic tradition – chances for more EE?

EE has an interesting background for those in Arab countries who appreciate traditional architecture and aesthetics. Hassan Fathy, considered as the most well-known Egyptian architect of the 20th century, pioneered the reintroduction of traditional materials and building techniques, particularly the use of mud brick. Fathy authored an acclaimed book called Architecture for the Poor, which celebrates the use of indigenous materials.

One of his followers is Abdel-Wahed El-Wakil who designed many traditional buildings celebrating Islamic culture, earning him the 2009 Driehaus Prize. El-Wakil believes that the solution to pollution, overcrowding and a homogenous building "culture" – lies in the undeveloped areas "going to the root of the problem" as El-Wakil says.

Traditional design approaches in Arab architecture are in many cases more responsive to energy savings. They should be adapted where relevant and appropriate. The MED-ENEC pilot projects in Algeria and Jordania demonstrate the relevance of traditional concepts, materials and building techniques to EE-potentials in suburban housing in rural and contemporary areas.

Algeria: *MED-ENEC pilot project – EE country house*

Egypt: *EE-architecture in Ezba el Tunis – 20 years old*

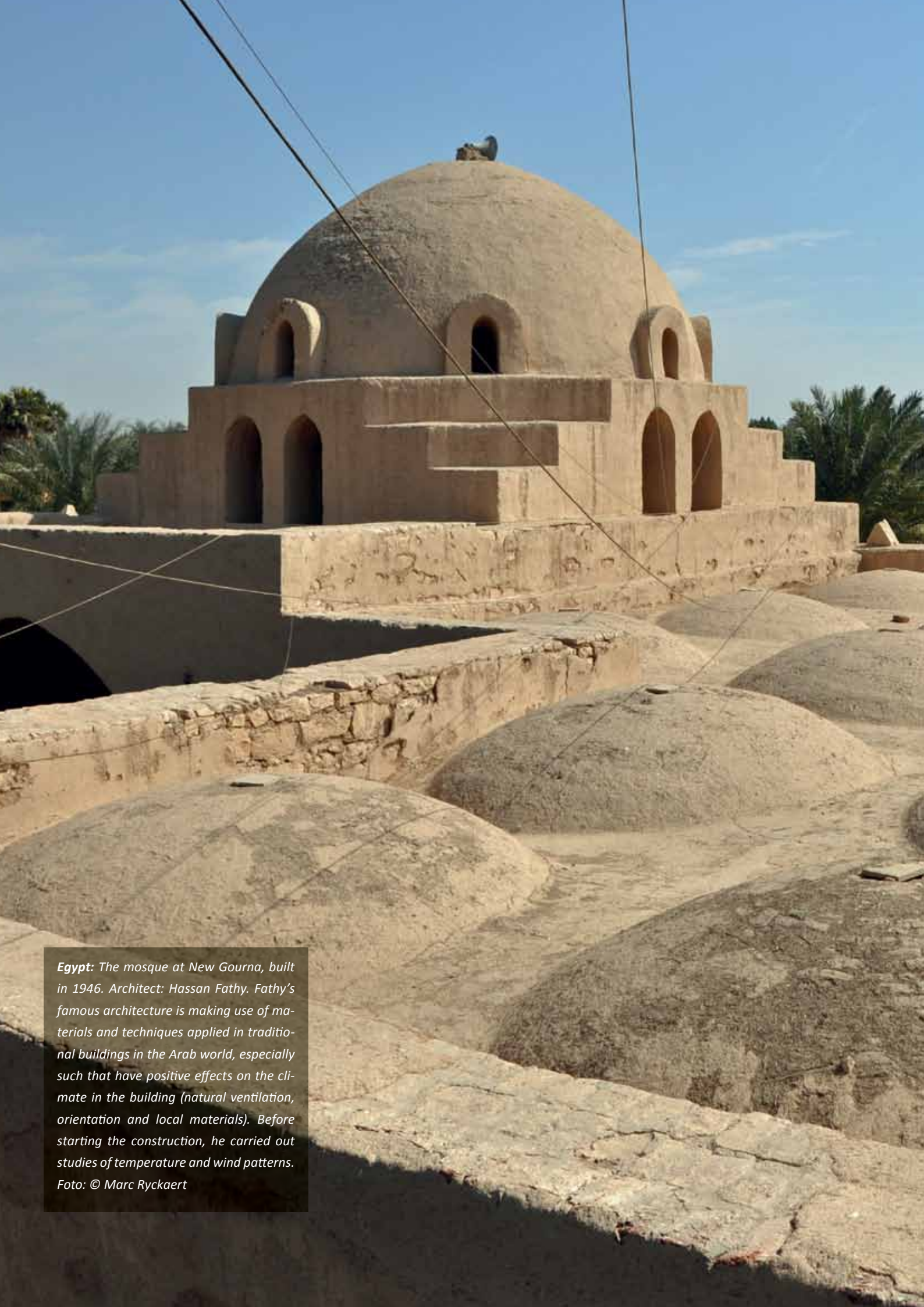
forming reduced subsidies, too. According to AFED a 25 % reduction in energy subsidies in the MENA region would free up over $34bn annually - plus additional taxes. Saved resources can be reinvested in suffering sectors such as education, research and health, or can be shifted to give incentives for investments in RE solutions. EE economies are not only more profitable but also creating hundred thousands of jobs, too (see Box 5).

4. Building owners benefit from longer lifespan and improved value of low energy buildings and "passive houses" – also called "substitution of energy by capital". However, governments and state administration will have to regulate this process by licensing and certification which also needs to be controlled (see pages 18 f). Households can even produce and sell energy by investing in PVs which requires open grids and feed-in tariffs.

5. Local EE actions have an important leverage effect saving enormous energy production capacities. Using less energy imposes also a significant increase in energy security as countries become less dependent on energy imports and blackouts will be avoided.

6. EE measures reduce GHG emissions and help governments meet international commitments, and at the same time improve air quality significantly. This includes environmentally critical substances such as SO2, NOx, ozone, fine dust and others harming wood shareholders as well as building owners.

7. EE brings health benefits and clean air opens essential living improvements, combating cancer and other health risks mentioned above. Also, the impact of heavy metals such as lead will be more and more avoided. Benefits are both local and global.



Egypt: *The mosque at New Gourna, built in 1946. Architect: Hassan Fathy. Fathy's famous architecture is making use of materials and techniques applied in traditional buildings in the Arab world, especially such that have positive effects on the climate in the building (natural ventilation, orientation and local materials). Before starting the construction, he carried out studies of temperature and wind patterns.*
Foto: © Marc Ryckaert

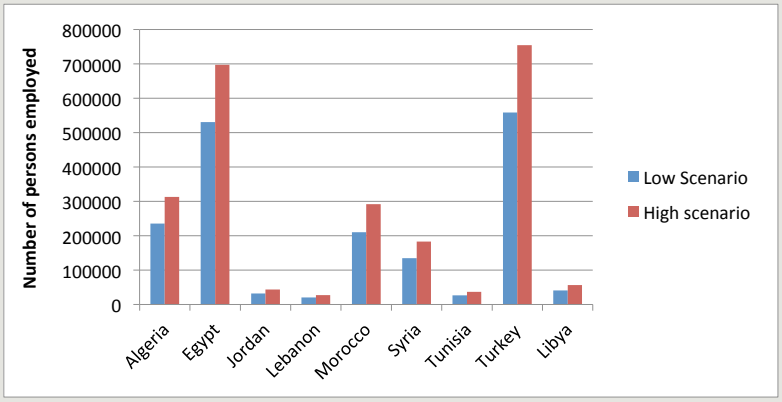
Box 5: Employment Growth in Construction in MENA Region

With investments in EE measures of €262bn by 2030 potentially one new job per ten can be created in the construction sector. Experts of think tank and Mediterranean Observatory, the Plan Bleu and UNEP identified 5 key measures which would lead to this growth in employment across manufacturing, design, construction, distribution and trade:

- Investment in efficient envelopes for new buildings
- Thermal renovation of buildings
- Elimination of filament lamps
- Distribution of efficiency air conditioning and heating equipment
- Installation program of solar water heaters

Figure 8:
Employment Potential in Residential Construction by 2030

Source: UNEP (2011) Plan Bleu: Impact on employment and trainings of development in rational use of energy and renewable energy sources in SEMCs

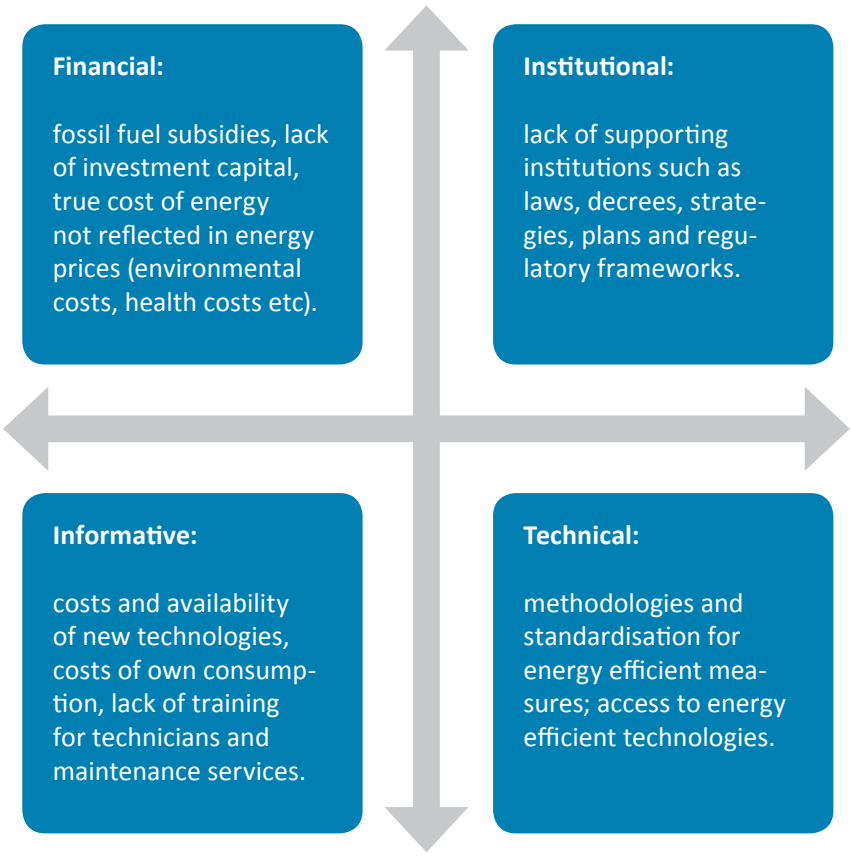


Conclusion: The basic idea is that private investments will be financed by reduced energy bills, and the public energy bill will be financed by growth. Or: "EE is making money while reducing pollution" (Hansen/Langlois). Recent macroeconomic studies indicate that the investments in EE will be compensated by saving potentials within a time frame of 20 years. These scenarios are based on realistic, true and not reduced energy prices. For private investors in general, pay back periods will be allocated within a much shorter, reasonable time period – if based on world market prices, not subsidised energy costs. (More about these MED-ENEC experiences in the next chapter). While EE practices can come about naturally through market competition, usually, the intervention of the government is needed to overcome barriers (see Figure 9).

These positive effects of EE need to be communicated to stakeholders to increase awareness in order to establish mandatory regulations and implementing building codes.

Figure 9: Barriers to EE investments

Source: UNEP (2011) Plan Bleu: Impact on employment and trainings of development in rational use of energy and renewable energy sources in SEMCs



What to do? Intelligent Energy Measures - MED-ENEC lessons learnt

Lebanon: *EE improved private hospital in Zgharta*

Palestine: *Residential villa in a larger building block at Ramallah / Al Bireh.*

Jordan: *EE designded residential villa in Aqaba*

MED-ENEC demonstrated 2006 – 2010 in ten pilot projects that there are many reasonable measures which can improve the energy balance of buildings today. For governments, it is important to understand and to support what private households as well as companies and institutions can immediately change. Furthermore, it is important to set good examples, as we also demonstrate in 6 examples in this brochure (see pictures).

1. EE-lighting technologies and products such as CFLs and LED bulbs are one of the most profitable approaches to save energy. Investments for CFLs pay back within months. But also modern low-energy appliances will replace inefficient air conditioning units, washing machines, dryers and vacuum cleaners, and support the implementation of governmental EE plans.

Box 6: Lebanon subsidizes Solar Water Heaters (SWH)

In 2010, the Ministry of Energy and Water in Lebanon launched the first SHW-program in the MENA region. It is providing financial support through a partnership with the Central Bank of Lebanon and commercial banks offering interest-free loans with a repayment period of up to five years. In addition consumers have access to grants also improving the market penetration of SWH. SWH systems - qualified by LCEC (the MED-ENEC Focal Point) - are eligible to benefit from a $200 grant. The overall budget of the campaign covers $1.5 million going in to the first 7.500 SWH.

2. Installations of solar water heaters (SWH) are becoming more and more popular in many regions in the Arab world. According to LCEC, the installations in Lebanon have reached 43,500 m2 in 2012 and are expected to quadruple by end of 2014 (see Box 6). Incentives and the abolishment of energy subsidies will make “technical” EE including roof-top-PV more interesting for end-users particularly as pay back periods are still too long in Algeria and Egypt.

3. Improving roof insulation is easy to manage and cost effective. Painting buildings and roofs in light colors reflects the sun in hot regions, also practiced in the MED-ENEC pilot project hospital in Zgharta/Lebanon.

4. Shading techniques have been used for centuries in the Arab world, keeping heat away by mashrabiyas, arcades, stain glass facades and other similar techniques. They are not only beautiful, but also easy to implement and inexpensive.

5. There are many intelligent and mostly inexpensive solutions for EE air circulation and cooling on the market. A modern advancement of malkavs, for instance, was used in one of the MED-ENEC pilot projects combined with traditional Arabic architecture.

6. For constructors, EE must be integral part of building design following concepts for atriums and courtyards, using load-bearing brick construction, better insulation, double glazed windows etc. This was practiced in many MED-ENEC pilot projects, e.g. in a "residential villa" in Aqaba/JOR (see page 2 and page 16 picture 3) and in Morocco.

7. Apart from specific measures, a more comprehensive urban planning is required. This allows not only higher EE performances of buildings (e.g. through implementation of district heating and cooling) but also includes transport related issues like "intelligent" EE public transport systems.

8. Last but not least: changing behavior and patterns might be difficult, but saving energy by switching off unused appliances, avoiding excessive cooling and heating, and respecting energy consumption as most important for buying decisions are cheap ways of lowering the bill and cutting the consumption without reducing quality of living. For these and many other activities it just needs awareness of EE in daily life.

Conclusion: investing in EE is a complex task. Generally a combination of various measures leads to a noticeable effect. Therefore EE projects need technical knowledge and cost-benefit assessments done by experts. Then savings up to 60 % can be reached and will pay back within two to eight years.

Syria: *Installation of insulating wall panels*

However, EE is still a hard to "sell" due to lack of public awareness, information and know-how. Politicians for this are challenged to launch campaigns, demonstrate best practice and inform about legal requirements and voluntary agreements such as labels (e.g. in cooperation with stakeholders such as utilities and private companies). Governmental institutions are appealed for launching EE-days, conferences, fairs or competitions, and offering information in special internet sites. In the medium term also business and research centers will boost entrepreneur initiatives and market development.

Box 7: Energy Efficiency in Algeria

Algeria's law n°99-09 of July 28th, 1999 introduced a legal framework for energy efficiency. The Government has recently launched a three year program targeting energy efficiency measures in industry, buildings and utilities. A National Fund for Energy Efficiency (NFEE) was established to finance appropriate investments, grant loans and submit guarantees to financial institutions.

To ensure economic benefits accrue to the national economy, the Algerian government has established an Institute for Renewable Energy and Energy Efficiency (IAER). The Institute provides training in engineering, safety and security, energy auditing and project management. The energy efficiency program includes:

Thermal insulation of buildings
In Algeria, the construction sector is the most energy intensive sector. It uses more than 42 % of the overall energy consumption. Proposed measures include the introduction of thermal insulation of buildings, reduced energy consumption, heating and cooling by about 40 %.

Solar water heating development
The penetration of solar water heaters in Algeria remains undeveloped but the potentials are significant. There are plans to develop the solar water heating system to gradually replace the conventional system, supported by the National Fund for Energy Efficiency (NFEE).

Spreading the use of low energy consumption lamps
Incandescent lamps in households will be gradually prohibited until 2020. The local production of low consumption lamps will be encouraged in particular through partnerships between local and foreign producers.

Introducing energy performance in street lighting
Street lighting is the most energy consuming sector in municipalities. The plan is to replace all mercury (energy consuming) lamps by sodium (low energy) lamps.

Promoting energy efficiency in the industrial sector
The industrial sector consumes about 25 % of the country's overall energy. For more energy efficiency, there are plans for co-financing energy audits and feasibility studies enabling companies to define technical and economical solutions for reducing energy consumption.

Develop Energy Efficiency Action Plans

There are multiple criteria needed for successful EE strategies and targets in a step-by-step approach. As a foundation, a regulatory framework is needed in adopting the Arab EE Guideline and in preparing National Energy Efficiency Action Plans (NEEAP) to be updated periodically. For implementation also sectoral programs with key indicators for monitoring and evaluation as well as a range of mandatory laws are demanded to be set on national and local level. Capacity building (see next chapter), governmental decrees and regulating standards will support this set of complementary and consistent policies. MED-ENEC has supported the NEAAPs for Lebanon, Palestine and Jordan. NEEAPs for Egypt, Libya and Sudan have been supported by RCREEE.

Egypt: *Energy Minister Mahmoud Saad Mahmoud Balbaa (EGY) announcing the NEEAP of Egypt on November 5, 2012*

A range of EE measures should be used targeting buildings, industry and energy utilities. These are e.g. EE building codes, appliance standards and labeling. Incentive schemes and standard programs are available indicating that they are reviewed regularly and enforced. Additionally, each country needs to tailor measures to their own internal conditions. Figure 10 shows the foundation and supporting steps needed for implementing policies on EE.

In the longer term, countries should enact an EE law to introduce targets and binding policies in sectors with the highest energy consumption. For utilities demand-side management programs and targets will be set in place. Energy Performance Contracting with stringent energy requirements is another measure to be monitored and enforced. The public sector should lead the way with

- energy leadership programs;
- energy pricing measures and financial incentives;
- education and training initiatives; and
- promotion of energy service companies (ESCO)

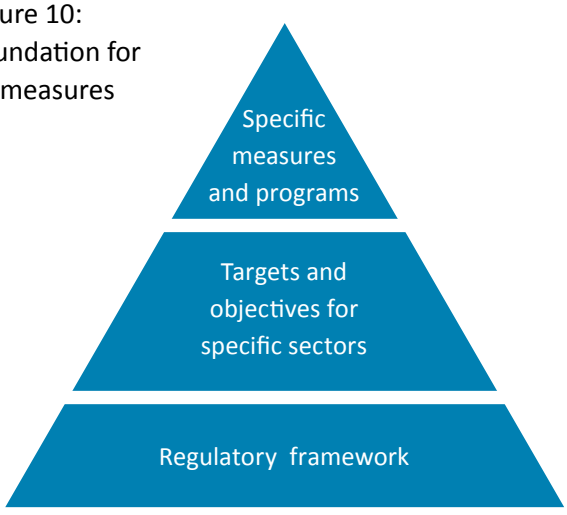
Most countries have found this to be useful after they have gained experience implementing EE measures. Supporting EE regulations and policies will ensure that laws are implemented across the targeted sectors.

Box 8: EE saving potentials in Europe

Europe has the lowest energy intensity as a world region. In 2006 the European Commission (EC) released its Energy Efficiency Action Plan which details 85 EE measures across 10 priority areas spanning several sectors: industry, transport, buildings, and utilities. The EU-EEAP can be used by MENA countries for identifying and evaluating possible actions.

In 1995 the EC had published its Green Paper on Energy Efficiency, followed by the Energy Services Directive for End-Users (2006) which requires all EU member states to submit NEEAPs demonstrating how they will reach a 9% increase in EE by 2016 and 20% by 2020. A ex-ante analysis estimates an energy saving between €100-150bn per annum with a net saving to end users of €107bn by 2020. This will create up to one million new jobs.[vii]

Figure 10: Foundation for EE measures



Replacement of Energy Subsidies

Without a doubt, expenses for modernizing equipment and buildings, and refurbishing energy efficiently are generally higher than energy inefficient measures. Contrariwise, energy efficient buildings offer considerable savings in energy bills over their lifetime compared to conventional, non-energy efficient constructions. Such investments will pay off by lower energy bills. When thinking about the right time and in what to invest, it is obvious that realistic, "true", nonsubsidised energy prices will stimulate the EE-process – the quicker, the better.

Box 9:
The Jordanian Energy Subsidy Reform

As a country with 95 % net imports of oil equating to 14 % of GDP, Jordan sought to address its subsidies on fossil fuels to support its EE Policy (2004) and National Energy Strategy 2007 - 2020 with a target of 10 % renewable energy by 2020. The Jordanian Government launched a gradual removal of subsidies for gasoline, diesel, fuel oil and kerosene in 2005. In February 2008, oil product prices were fully liberalized stimulating a market response on both improving EE and increasing the use of renewable energy, and more importantly, supporting a broader reform to make the overall economy more efficient and attractive for foreign investors. In particular, it is expected that the removal of subsidies will increase EE investments from the oil-producing countries in the region.

A committee formed of representatives from the Ministries of Finance, Energy and Trade, and from the Jordanian Petroleum Refinery Company adjusts the prices of petroleum products monthly, based on a formula that follows the changes in the price of brent crude oil during the previous 30 days.

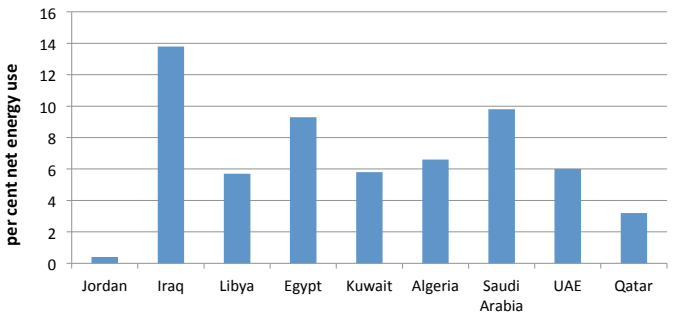
In January 2011 Jordan temporarily suspended its automated adjustment mechanism, owing to increased social and political pressure, and reduced prices and taxes on fuel. As a result of these reform efforts, the size of energy subsidies declined from 5.8 per cent of GDP in 2005, to 2.6 per cent in 2006, and 0.4 per cent in 2010.

Jordan: *Dead Sea Master Plan*

With respect to market developments - besides other negative impacts - energy subsidies on fossil fuels and electricity function as a barrier against EE. They are an obstacle for further "EE market" uptake. This is because heavy governmental subsidies prohibit high rates of market diffusion for EE products and services. Figure 11 reveals that in some countries subsidies are as high as 14 % of GDP.

Figure 11: Energy subsidies as per cent GDP

Source: IEA (2011) Key World Energy Statistics



These negative impacts need to be phased out step by step, respectively tailoring subsidies to specific purposes and time limits only – e.g. for selected social target groups, regions for sector development and large scale projects such as at the Dead Sea. In addition, compensation can be provided for disadvantaged groups to ensure no adverse affects. Several countries have already phased out oil subsidies or have plans to do so. One example is Jordania (see Box 9).

Lebanon: *Dar al Aytam al Islamiya School, built in 2012. Architects: Maha Nasrallah & Prime Design. 3,000 sqm. School building in Beirut, Lebanon. The project sets a good practice standard for the region by applying a wide range of cost efficient EE and RE measures, such as orientation and shape of the building, natural ventilation, shading, climatic buffer zones, air cavity walls, natural daylight, solar thermal water heaters, energy management and water saving devices.*

Strengthen institutions

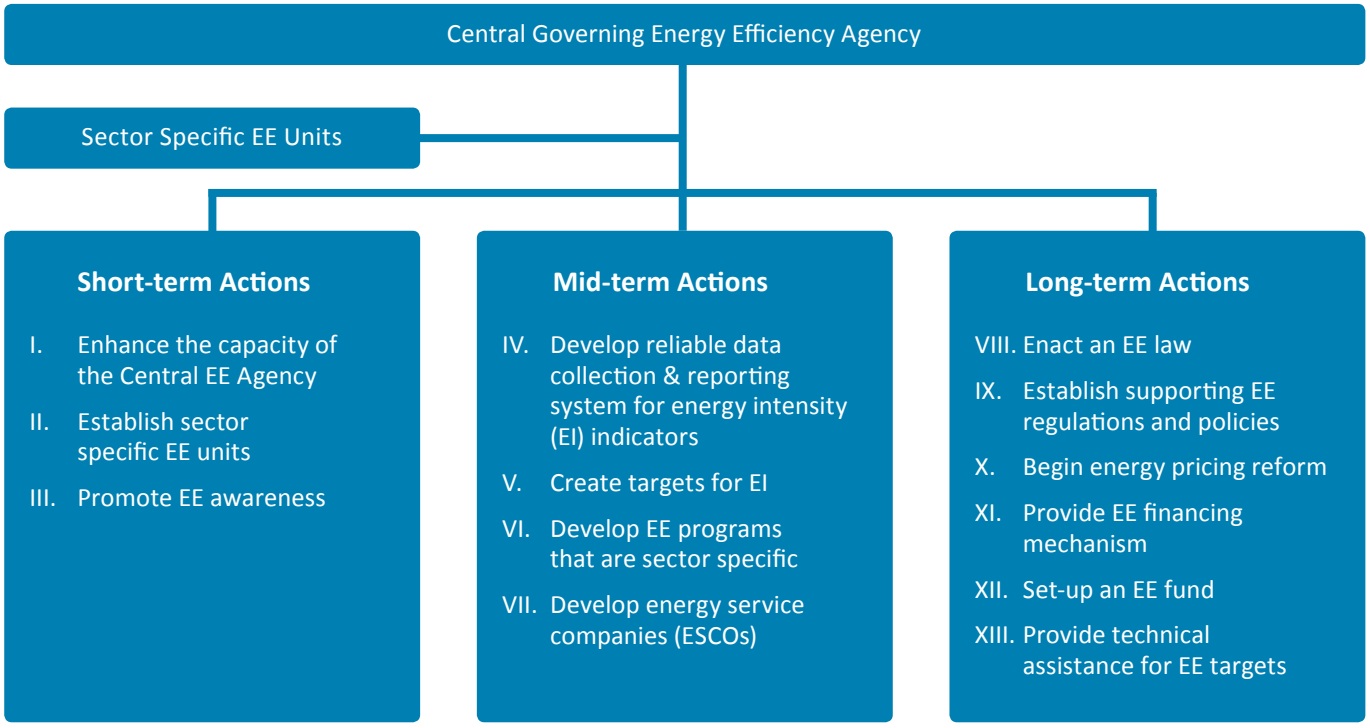
Weak legal and institutional frameworks are one of the most significant obstacles to overcome unsustainable energy policies in the Arab region. As governing bodies and institutions are essential for effective EE policies its important to follow a "top down" approach beginning with ministries and well staffed departments, followed by energy agencies on national and (according to size and structure of a country) also regional and local level, independent regulating institutions, and statistical bodies. In terms of "good governance" policy makers will create a regulatory framework for institutions providing the necessary technical, monetary and knowledge capacity to achieve EE targets and reduce energy intensity. Finally, it is important to practice "good governance" day by day conducting public affairs and managing resources in order to guarantee the realization of EE measures.

There is no one-size-fits-all structure that countries could adopt to enforce EE targets, plans and programs (see Figure 12). Therefore, implementing institutions might be state owned or private agencies or set up as a public private partnership. As an immediate action countries should establish a central EE governing agency supporting sector specific EE units based on defined responsibilities and resources. In the mid-term, EE units should develop measures and reporting systems for energy intensity, and establish targets within each sector for EE programs. Some countries have established frameworks for energy service companies (ESCOs) where private enterprises invest in EE measures where investments are recouped through energy savings.

Egypt: *Arab Forum on Renewable Energy and Energy Efficiency „Building Financing Partnerships", Cairo 2012*

Figure 12: Institutional Framework for ESCO

Source: World Bank (2011) Institutional Framework for Implementation of Energy Efficiency in Egypt



Adjust other relevant policies to support the EE business & development

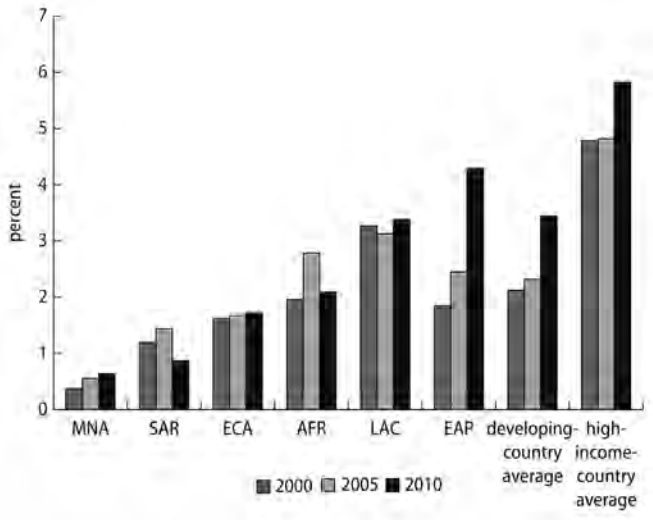
The world market for "cleaner" technologies such as measuring and monitoring equipment, patents, EE electronic appliances, materials, services and others, is estimated to be worth hundreds of billions of Euros - and is even expected to triple by 2030 according to the Fraunhofer ISI. This provides opportunities also for expanding MENA economies because of low labor costs and highly educated human resources – in case there is the associated political support, more research and improved coordination, as well as support of development projects and capacities. Only countries which invest in EE technologies and solutions today will be able to export into EE markets tomorrow. Important areas of political relevance are:

• Market regulation / deregulation: Competition puts businesses under constant pressure to offer the best possible range of goods at the best possible prices. In a free market, business should be a competitive game with consumers and beneficiaries. Competition policies ensuring free movement of goods and services will apply rules to ensure businesses compete fairly.

• Trade and EE policies are linked in important ways as businesses in the EE and RE sector are often dealing in and with global markets, using foreign technologies and know-how, and vice versa to search for new market opportunities. The development of trade - if properly managed - is an opportunity for additional economic growth, to create jobs and attract foreign investments. Customs for materials and technologies will be designed to foster integrated markets for EE in the MENA region.
Figure 13 reveals how MENA's potential for green exports is largely undeveloped compared to other world regions particularly high income countries.

Figure 13: Green exports in RE, transport & EE as percentage of all exports

Source: World Bank (2012). NOTE: AFR (Africa), EAP (East Asia and Pacific), ECA (Europe and Central Asia), LAC (Latin America and the Caribbean), MNA (Middle East and North Africa) and SAR (South Asia).



• The rise of emerging economies like in India, China and Brazil shows that trade-driven development is possible and that open markets can play a major role in generating growth. The EU for instance uses its trade policy to support measures that cut greenhouse gas emissions. Global environmental agreements can receive special tariff rate cuts when they export to the EU. As part of the Doha WTO trade negotiations, the EU has pushed for more open trade in environmental goods and services such as renewable energy products and energy efficient construction services to encourage the spread of these new technologies around the world.

• Development of research and education are essential for profiting from EE developments and creating jobs in the region. External programs and private initiatives need political support. As markets become more and more regional, free trade zones would be beneficial for inviting businesses in specialised niches to export.

Sector Policies

Sector specific policies are needed to drive EE in industry, buildings and utilities (see Figure 14). Several MENA countries already have EE building codes and other sector specific policies including Egypt, Jordan, Morocco and Tunisia. Energy auditing schemes have been developed for the industry in Algeria, for instance. It is of high importance that energy intensity indicators are used to measure the benefits of these policies and associated investment costs.

Egypt: *It took only six years to complete the "Campus El Gouna"*

Figure 14 Sector Policy Measures

Source: Ecofys own compilation adapted from IEA (2011) 25 EE Policy

Industry	• Energy management in industry (ISO 50001 / ISO14001) • High efficiency industrial equipment and systems (minimum energy performance standards (MEPS) for electric motors, transformers, compressors) • Policies to remove energy subsidies, internalise environmental costs (carbon tax), targeted incentives (best available technology (BAT), access to finance (tariff based systems, grants)
Buildings	• Mandatory building energy codes and minimum energy performance standards (u-values) • Aiming for net zero energy consumption/carbon emissions • Improving the energy efficiency of existing buildings (ESCO schemes, audits) • Building energy labels or certificates • Improved energy performance of building components (HVAC, pumps, motors, windows, building fabric, lighting, appliances)
Utilities	• Oblige utilities to provide energy efficiency measures to end user (white certificates) • Require energy suppliers to provide energy efficiency information to customers • Utilise tariffs for funding energy efficiency measures • Improvements in technologies used for generation, transmission and distribution networks (SMART networks)

Jordan: *Embassy of the Kingdom of the Netherlands in Amman, built in 2006 - 2009. Architect: Rudy Uytenhaak. Inspired by the traditional Jordanian architecture, thick walls are keeping the heat out at daytime. At night, these walls protect the building against the cold breeze. Heat storage is supported by a water basin. The Dutch Embassy is the first building in Jordan to receive the prestigious international LEED-certification for green building.*

Reduce energy demand to avoid blackouts and to reduce governmental expenditures

MENA electricity generation is projected to increase by 3.4 % per year on average in 2003 - 2030, reaching 1,800 TWh in case of doing business as usual. The region will need some 300 GW of new generating capacity, or about 6 % of the world total. This could cost the region up to $458 bn for generation, transmission and distribution. A more cost effective approach would be to reduce energy demand and decarbonise energy supply.[XVI]

On the supply side de-carbonising electricity generation through renewable energy programs will decrease energy consumption from fossil fuels. This increases energy security for energy importing countries, and reduces associated environmental and health impact costs. On the demand side, utilities and energy regulators can operate programs to help consumers improve their EE. This is demonstrated by a case example of actions in Morocco which has taken place in its utilities sector to reduce energy demand and de-carbonise energy supply (see Box 10).

By managing energy supply and demand, the following benefits are achievable:

- Decreased need for expansion of energy generation, transmission and distribution capacities.
- Reduced risks of blackouts when energy supply is not sufficient to cover demand from consumers.
- Reduced and limited destructive land use for generation, transmission and distribution infrastructure.
- Reduced dependencies on energy imports, increasing export profits, and improving long-term energy security.

Box 10: Energy Efficiency in Utilities, Morocco

To reduce energy demand, Morocco set up a regulatory body ADEREE in 2010 to manage its energy efficiency program. Its aim is to reduce energy consumption by 12 % by 2020 and 15 % by 2030 across buildings, industry and transport which represent 90 % of energy consumption nationally.

In addition, Morocco's energy company, ONEE, operates programs distributing low energy lamps to its customers and 20 % tariff reduction reward scheme for customers who use 20 % less energy than target. To reduce energy intensity of supply Morocco aims to have 42 % of its installed capacity from solar, wind and hydro power by 2020.

The African Development Bank has approved a loan of $336 million to the Moroccan Agency for Solar Energy (MASEN) to help finance the Ouarzazate solar power station projects which will have a solar generation capacity of 500 MW with all phases complete.

Morocco: *Ouarzazate solar power station*

Policy cycles, roadmaps, implementation and enforcement

Lebanon: *Mr. Piatoni explains how to certify and accredit ESCO at the MED-ENEC workshop in May 2012*

Egypt: *Highly interested audience at the Arab Finance Forum in April 2012*

Jordan: *First regional Workshop launching the establishment of NEEAPs in December 2010*

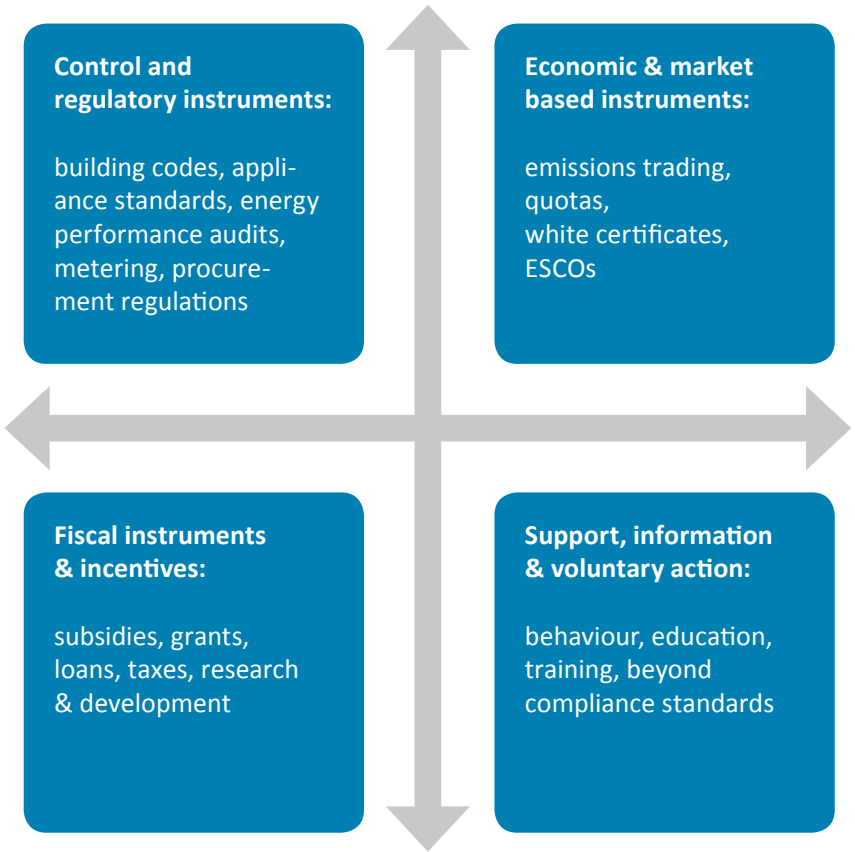
There are a variety of policy tools that can be used to achieve the EE objectives and plans effectively. These tools can be complementary, although careful design is needed to ensure policies are positively aligned (see Figure 15) as was discussed in the context of replacing energy subsidies by incentives highlighting EE measures and green energy solutions. The pricing and internalizing of environmental and social costs using fossil energy sources must be an integral part of the "package".

An effective design and implementation of a range of policy tools leads to a measurable reduction in energy consumption. However, measures need to be tailored according to a country's socio-economic and political conditions.

For effective EE policies and measures it is useful to follow the policy design cycle (see Box 11). This methodology ensures politicians to reach their intended goals. It provides a framework for structuring plans and implementation.

Figure 15: Policy response for EE

Source: AID-EE (2007) Success and Failure in Energy Efficiency Policies: Ex-Post Evaluation of 20 Instruments to Improve Energy Efficiency Across Europe



Box 11: Policy Design Cycle

Policy step	Purpose	Example
Definition of energy efficiency targets	Targets should be set with the country context in mind and should be SMART (specific, measurable, achievable, realistic, and time-framed).	Morocco has an EE target of 12 % by 2020 and 15 % by 2030. It set up an EE agency ADEREE to manage the program.
Strategy development	A national strategy plan should be developed detailing how the country will meet its targets.	The MED-ENEC program is supporting MENA countries to develop NEEAPs.
Concrete, specific measures	Consider a suite of measures that can be used across different sectors: industry, buildings, and utilities. Use best practice examples from other countries. Where no laws or regulations yet exist they should be put in place to support overall targets and strategy. Ineffective existing policies and plans should be reviewed or scrapped.	Energy performance standards for buildings or appliances; Mandatory targets/tradable permits for certified savings for energy companies; Financial / fiscal instruments such as soft loans, subsidy schemes, investment deduction schemes, rebates; Information / knowledge transfer / education / training; Labelling of appliances, cars, buildings; Energy audits
Enforcement & monitoring	Develop quantitative indicators that can measure the impact of the policy or measure at various levels: sector indicators (households, appliances, industry); macro-economic indicators (energy intensity, consumption, cost); country comparisons (track progress across regions). Laws and regulations should be designed so that there are consequences, either legal or financial or both, to enforce the measures in place.	China has four main indicators monitoring EE targets: energy intensity, rate improvement energy intensity, energy consumption per unit value added industry, and consumption per unit GDP.
Evaluation of compliance	High level impact assessments of costs and benefits of a policy or measure should be undertaken to evaluate its effectiveness. At the sector level energy audits could be undertaken in buildings, industry and appliances.	Several MENA countries have set up industry energy audits to assess energy use and suggest action to improve EE. This should be done across sectors and at national level.

Source: AID-EE (2007) Success and Failure in Energy Efficiency Policies: Ex-Post Evaluation of 20 Instruments to Improve Energy Efficiency Across Europe

What MED-ENEC can provide

Lebanon: *Energy Minister visiting the MED-ENEC Booth at the Beirut Energy Forum in September 2012*

Lebanon: *NEEAP Workshop participants, May 2012*

Egypt: *Press Conference at the Finance Forum with EU ambassador and League of Arab States representatives in April 2012*

MED-ENEC aims to boost energy efficiency and to increase the use of renewable energy systems in buildings in the southern and eastern Mediterranean countries. The project was established by the European Commission in 2006 across the southern (MENA) countries. MED-ENEC is part of the European Neighbourhood and Partnership Instrument (ENPI) whose key objective is to support the transition towards a market economy and to promote sustainable development.

The focus of MED-ENEC is the development of National Energy Efficiency Plans (NEEAPs) and the implementation of related measures by standardisation and training. For example National Appropriate Mitigation Actions (NAMAs) will support to reduce energy use and climate change impacts. As an example, MED-ENEC supports the development of energy services companies (ESCO).

MED-ENEC provides the following services:

- Assists the adoption of EE-Arab Guidelines in the MENA region and the implementation of developing building codes.
- Organizes training providing technical knowledge on EE and renewable energies;
- Supports zoning and planning of large scale construction projects;
- Organizes public awareness activities; and
- Supports large energy projects involving EE measures.

MED-ENEC promotes and informs about ongoing activities, studies, events and news in the field on its website www.med-enec.eu, on fairs and with various publications. The team is open to requests for know-how, technology transfer and other related support.

MED-ENEC I supported the construction of energy efficient buildings adapted to local economic and climatic conditions in ten countries. In addition, advice on legal framework and the development of favourable market conditions was provided.

MED-ENEC II is applying and distributing the experience made and lessons learned on larger scale.

Box 12: MED-ENEC partners

MED-ENEC aims to achieve energy partnership with the all MENA-countries across its partners and institutions including:

- League of Arab States
- Focal Points appointed by the relevant national ministries in each of the MENA-countries
- RCREEE
- Energy Agencies, related energy projects of other donors, universities, research centres
- Development partners in the EU, Germany & Denmark

Conclusions

The MENA region is heavily dependent on fossil fuels and spends a high proportion of its GDP on energy subsidies having a negative impact on its opportunity for growth in other sectors, including EE in buildings, industry and energy services.

As a region with one of the highest energy intensities in the world, it has vast potentials to make significant cost savings for its economy in improving EE across its sectors. By providing the right policy environment through targeted, complementary and well designed measures, it is possible for MENA countries to improve their competitiveness and provide employment opportunities for the growing number of unemployed.

By learning from best practice in neighbouring countries and regions, while considering the country's own particular socio-economic and political context, it is possible to make cost effective reductions in energy demand, securing energy supply and supporting industry and business.

The MED-ENEC partnership between Europe and North Africa aims to support countries in benefitting from improvements in EE. The aim of this brochure, therefore, is to provide examples of best practices across each region, and how EE measures can be applied to reduce energy intensity supporting growth in key sectors.

Egypt: *Windmill park in Souchna build by Siemens paving the way to RE*

Reference List

I. ADEREE: http://www.aderee.ma/index.php/fr/expertise/efficacite-energetique
II. AFED (2011) Arab Environment for a Green Economy: Sustainable Transition in a Changing Arab World
III. AID-EE (2007) Success and Failure in Energy Efficiency Policies: Ex-Post Evaluation of 20 Instruments to Improve Energy Efficiency Across Europe
IV. AID-EE (2007) From Theory Based Policy Evaluation to SMART Policy Design
V. APRUE: http://www.aprue.org.dz/PNME%202011%202013.html
VI. DECC (2012) Final Stage Impact Assessment for the Green Deal & Energy Company Obligation
VII. Ecofys & Fraunhofer ISI (2010) Energy Savings 2020: How to triple the impact of energy saving policies in Europe. Published by European Commission.
VIII. Energy Efficiency Watch (2011) Improving National Energy Efficiency Strategies in the EU Framework
IX. European Commission (2006) Doing More with Less: Green Paper on Energy Efficiency
X. European Commission (2006) Action Plan for Energy Efficiency: Realising the Potential – COM (2006)546
European Commission (2011) Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Energy Efficiency Plan 2011 – COM (2011)109 final (8.3.2011)
XI. HSBC (2009) A Climate for Recovery: The color of stimulus goes green
XII. IEA (2008) Worldwide Trends in Energy Use and Efficiency: Key Insights from IEA Indicator Analysis
XIII. IEA (2008) Energy Efficiency Requirements in Building Codes Energy Efficiency Policies for New Buildings
XIV. IEA (2011) 25 Energy Efficient Policy
XV. IEA (2011) Key World Energy Statistics
XVI. IEA (2005 & 2011) World Energy Outlook
XVII. IEA (2000 & 2009) World Energy Outlook
XVIII. Pierre Langlois & Shirley J. Hansen (2012) World ESCO Outlook 2012
XIX. Oliver Wyman (2012) Delivering on the Energy Efficiency Promise in the Middle East. Available at: http://www.oliverwyman.com/media/Energy_Efficiency_inMiddleEastFINAL.pdf
XX. ONE (2010) Rapport D'Activities. Available at: http://www.one.org.ma/
XXI. World Bank Group (2009) Tapping a Hidden Resource Energy Efficiency in the Middle East and North Africa
XXII. World Bank (2011) Institutional Framework for Implementation of Energy Efficiency in Egypt
XXIII. World Bank GDP statistics 2011 / http://databank.worldbank.org/ddp/home.do
XXIV. World Bank (2012) Inclusive Green Growth: The pathway to sustainable development
XXV. World Energy Council (2008) Energy Efficiency Policies around the World: Review and Evaluation
XXVI. World Energy Council (2010) Instruments and Financial Mechanisms of energy efficiency measures in building sector
XXVII. World Energy Council (2010) Energy Efficiency: A Recipe for Success
XXVIII. UNDP (2010) Promoting Energy efficiency in buildings: Lessons Learned from International Experience
XXIX. UNEP (2011) Plan Bleu: Impact on employment and trainings of development in rational use of energy and renewable energy sources in SEMCs
XXX. UNIDO (2011) Industrial energy efficiency and competitiveness
XXXI. UNDP (2012) Energy Subsidies in the Arab World

Photo Credits:

Title: *DAR HI Hotel - Room, © Jérôme SPRIET.*
Page 2: *Residential House in Aqaba, © Klaus Wenzel.*
Page 3, *photo at the top: DAR HI, © Jérôme SPRIET.*
Page 3, photo 2: Campus El Gouna, © Orascom.
Page 3, photo 3: EE House in Ezba el Tunis, © Marcel Seyppel.
Page 4: *DAR HI Hotel, © Jérôme SPRIET.*
Page 5: *Dr. Kurt Wiesegart, © Marcel Seyppel.*
Page 6: *Beirut Skyline, © Ecofys.*
Page 8: *Campus El Gouna, © Orascom.*
Page 10*, photo below: Residential area in the MENA region: Everywhere air conditioners, © Marcel Seyppel.*
Page 10, small photo: cooling system, © Michal Zacharzewski, SXC.
Page 11: *Factory on the Nile, © Simon Shokry, SXC.*
Page 12: *MED-ENEC pilot project in Sharm El Sheikh, © Klaus Wenzel.*
Page 13: *Algeria Landhouse, © Klaus Wenzel.*
Page 13, photo right side: EE House in Ezba el Tunis, © Marcel Seyppel.
Page 14: *The mosque at New Gourna, © Marc Ryckaert.*
Source: www.wikipedia.org
Page 16, *photo 1: hospital in Zgharta, © Klaus Wenzel.*
Page 16, photo 2: Palestine, © Klaus Wenzel.
Page 16, photo 3: residential villa in Aqaba, © Klaus Wenzel.
Page 17: *Installation of insulating wall panels © Klaus Wenzel.*
Page 18: *Mahmoud Saad Mahmoud Balbaa, © Marcel Seyppel.*
Page 19: *Dead Sea Master Plan, © Sasaki Associates*
Page 20: *Dar al Aytam al Islamiya School, © Mazen Jannoun.*
Page 21: *Arab Forum on Renewable Energy..., © Marcel Seyppel.*
Page 23: *Campus El Gouna, © Orascom.*
Page 24: *Embassy of the Netherlands, Lebanon © Pieter Kers, Embassy.*
Page 25: *Ouarzazate solar power station, © Stephan Sahm, Peter Gutierrez.*
Page 26, *photo 1: Mr. Oiatoni explains..., © Marcel Seyppel.*
Page 26, photo 2: Audience at the Arab Finance Forum, © Marcel Seyppel.
Page 26, photo 3: Workshop..., © Klaus Wenzel.
Page 28, *photo 1: Minister at the Beirut Energy Forum, © Marcel Seyppel.*
Page 28, photo 2: NEEAP Workshop participants, © Marcel Seyppel.
Page 28, photo 3: Pres Conference, © Marcel Seyppel.
Page 29: *Wind turbines in Souchna, © Marcel Seyppel.*

List of Abbreviations

ADEREE:	Agence Nationale pour le Développement des Energies Renouvelables et de l'Efficacité Energétique
AFED:	Arab Forum for Environment and Development
bn:	billion
CFL:	Compact Fluorescent Lamp
CHP:	Combined Heat and Power
CSP:	Concentrated Solar Power
EC:	European Commission
EE	Energy Efficiency
EIB:	European Investment Bank
EJ:	Exajoule
ESCO:	Energy Services Company
EU:	European Union
GDP:	Gross Domestic Product
GHG:	Greenhouse Gas
GW:	Gigawatt
IEA:	International Energy Agency
Ktoe:	Kilo tons of oil equivalent
LCEC:	Lebanese Center for Energy Conservation
LED:	Light-Emitting Diodes
MED-ENEC:	Energy Efficiency in the Construction Sector in the Mediterranean
MENA:	Middle-East and North Africa
Mtoe:	Mega tons of oil equivalent
NEEAP:	National Energy Efficiency Action Plan
OECD:	Organisation for Economic Co-operation and Development
ONEE:	Office National de l'Electricité et de l'Eau Potable
PPP:	Public Private Partnership
PV:	Photovoltaics
RCREEE:	Regional Centre for Renewable Energy and Energy Efficiency
RE:	Renewable Energy
SWH:	Solar Water Heaters
TWh:	Terawatt hours
WTO:	World Trade Organisation

List of Figures

Figure 1: Total Final Energy Consumption MENA 2009 (Mtoe)
Figure 2: Change in Primary Energy Intensity by World Region 2003-2011
Figure 3: Primary Energy Intensity 2009
Figure 4: Energy imports, net (% of energy use)
Figure 5: EE potential in MENA by 2030
Figure 6: Energy Consumption by sector 1997-2009
Figure 7: Energy Intensity in Industry 1990 – 2008 (koe/$2005 at purchasing power parity)
Figure 8: Employment Potential in Residential Construction by 2030
Figure 9: Barriers to EE investment
Figure 10: Foundation for EE measures
Figure 11: Energy subsidies as % GDP
Figure 12: Institutional Framework for ESCO
Figure 13: Green exports in RE, transport & EE as percentage of all exports
Figure 14: Sector Policy Measures
Figure 15: Policy response for EE

List of Boxes

Box 1: Energy intensity, Box 2: China reduces energy intensity, Box 3: Energy Efficiency Targets in Arab countries, Box 4: Building in Islamic tradition – chances for more EE? Box 5: Employment Growth in Construction in MENA Region, Box 6: Lebanon subsidizes Solar Water Heaters (SWH), Box 7: Energy Efficiency in Algeria, Box 8: EE savings potential in Europe, Box 9: The Jordanian Energy Subsidy Reform, Box 10: Energy Efficiency in Utilities, Morocco Box 11: Policy Design Cycle, Box 12: MED-ENEC partners

Imprint

This is a brochure of the MED-ENEC Project

Project ID: *ENPI/2009/224-969*

Date of publication: *February 2013*

Authors:
Dr. Kurt Wiesegart, Team Leader MED-ENEC
Dr. Marcel Seyppel, Events and Communication Expert MED-ENEC
Daniel Becker, Manager Policy Evaluation, Ecofys

Layout and design:
Christof Paschedag

Photo Credits: *see page 30*

Printed by: *Integrity, Cairo, Egypt*

Contact: *MED-ENEC II Project Office*
7 Tag El-Din El-Soubky Street, 11631 Heliopolis, Cairo, Egypt
Email: info@med-enec.eu
Phone: (+20 2) 24 18 15 78/9 (Ext.107)

Consortium Partners:
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, ECOFYS Germany, ADEME France

This project is funded by the European Union.

www.med-enec.eu