



Mitigation Enabling Energy Transition in the MEDiterranean region

Together We Switch to Clean Energy

ENERGY EFFICIENCY IN BUILDINGS



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

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

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



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



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

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This meetMED report is an important step by the network of meetMED experts towards reinforcing the capacity to implement measures for energy efficiency in the building sector at a national level and at the level of regional cooperation. Its policy recommendations define space for future action country by country and in the regional context for institutions, market players and civil society.

The preparation of the report was coordinated by the core team of experts from the Portuguese Energy Agency (ADENE), the Lebanese Association for Energy Saving and Environment (ALMEE) and the Regional Centre for Renewable Energy and Energy Efficiency (RCREEE), with the support of the French Environment and Energy Management Agency (ADEME), who prepared the country questionnaires, animated their discussion at the expert workshop in Tunis and took care of drafting the report.

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Acronyms

ADEME	French Environment and Energy Management Agency
ADENE	Portuguese Energy Agency
ALMEE	The Lebanese Association for Energy Saving & for Environment
AMEE	Moroccan Agency for Energy Efficiency
ANME	Tunisian National Agency for Energy Conservation
APRUE	Algerian National Agency for Energy Conservation
BREEAM	Building Research Establishment Environmental Assessment Method
CRES	Greek Centre for Renewable Energy Sources and Saving
EE	Energy Efficiency
EEBC	Energy efficiency building codes
ENEA	Italian National Agency for New Technologies, Energy and Sustainable Economic Development
EU	European Union
FTE	Energy Transition Fund
GDP	Gross Domestic Product
GEFF	Green Economy Financing Facility
GHG	Greenhouse Gases
GRASS	Green Recovery and Sustainable Solutions
HQE	High Quality Environmental standard
IDAE	Spanish Institute for Diversification and Energy Saving (Spain)
IMANOR	Moroccan Standards Institute
LEED	Leadership in Energy and Environmental Design
MEDENER	Mediterranean Association of National Agencies for Energy Management
meetMED	Mitigation Enabling Energy Transition in the Mediterranean Region
meetMED REN	meetMED Regional Experts Network
MEPS	Minimum Energy Performance Standards
MICR	meetMED Investment Country Reports
NEEAP	National Energy Efficiency Action Plan
NEEREA	National Energy Efficiency and Renewable Energy Action
NERC	Jordanian National Energy and Research Centre
NREA	Egyptian New and Renewable Energy Authority
NREAP	National Renewable Energy Action Plan
OME	Observatoire Méditerranéen de l'Énergie

PV	Photovoltaic
RE	Renewable Energy
RES	Renewable Energy Systems
RCREEE	Regional Center for Renewable Energy and Energy Efficiency
RSS	Royal Scientific Society (Jordan)
SEMCs	Southern Eastern Mediterranean countries
SME	Small and medium sized enterprises
SWH	SOLAR WATER HEATER
TSBC	Thermal Standard Building Compliance Tool
UfM REEE	Union for the Mediterranean Renewable Energy and Energy Efficiency Platform
VAT	Value added tax

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Executive Summary

Background

This meetMED report is part of the EE and RES policies and strategies work package of the project “Mitigation Enabling Energy Transition in the Mediterranean Region” (meetMED) and focuses on the ‘Energy Efficiency in Buildings’ policies implemented in the meetMED target countries: Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine and Tunisia.

The main objective of the report is to provide an overview of the current energy efficiency measures implemented in the building sector of the target countries, with a special focus on energy efficiency building codes. It also identifies the principal challenges encountered in the implementation of the measures and concludes with set of recommendations to encourage and promote the development and implementation of EE measures, but also the enforcement of the already existing policies.

This report is the result of the collective work of national experts of the EE in Buildings taskforce of the meetMED Regional Expert Network (meetMED REN) composed by experts appointed by the meetMED project partners from governmental energy agencies and the Ministries of Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine and Tunisia. The meetMED REN experts drafted country papers, which describe the energy efficiency policies adopted in the building sectors of the countries and identify the main barriers regarding the implementation and enforcement of EE measures, as well as potential initiatives for regional cooperation.

The country papers were then discussed at the meetMED workshop that took place on 18 June 2019 in Tunis, Tunisia and hosted by the Tunisian National Agency for Energy Management (ANME). This report is based on the country papers and discussions that were held among the meetMED REN experts.

National Policies and Measures for Energy Efficiency in the Building sector

The building sector is one of the largest energy consumer sectors of the meetMED target countries that, alongside the rapid demographic growth and urbanization of the countries, makes it one of the main targets of the existing National Energy Efficiency Action Plans (NEEAPs). Some countries like Libya still have no EE action plans in place, but the majority of the meetMED target countries have already implemented them and are currently either developing or implementing their second NEEAP, with a strong focus on the building sector.

These include, for instance, the implementation of insulation standards, the development of EE building codes and the creation of EE labelling systems for buildings. Capacity building at different levels must also be strengthened in order to further promote the implementation of these measures in the countries. All 8 countries have been working on these measures but namely Algeria, Egypt, Jordan, Morocco, Palestine and Tunisia have the most developed regulatory frameworks.

Energy efficiency measures are more effective if implemented during the early stages of the building project. It is therefore important to implement energy efficiency building codes (EEBCs) consisting in energy efficiency minimum standards for the design, construction and renovation of residential and tertiary buildings. Most of the countries have already developed the EEBC technical requirements while Lebanon is still finalising its own requirements, which will be based on the thermal standards currently in place at national level. Algeria, Egypt, Jordan, Morocco, Palestine and Tunisia have already established legal frameworks for the implementation of EEBC but only Jordan, Morocco and Tunisia have clearly defined entities responsible for their implementation. The enforcement and monitoring of EEBC is widely recognised as the weakest stage for the implementation of EEBC in the countries. Libya is the only country that still has not developed an EEBC.

The implementation of these building codes is only mandatory in Egypt, Jordan, Morocco and Tunisia. In Lebanon (planned), Jordan and Palestine, the implementation of the EEBC is entirely voluntary. The institutional set-up of the countries is also key to the success of EEBCs. In Algeria, Egypt, Jordan and Morocco the government is responsible for the implementation of EEBCs

while in Palestine, private companies are contracted to develop, implement and enforce them. In Tunisia, EEBC development, implementation and enforcement is a responsibility of the government, while their monitoring is carried out by the private sector.

EEBCs can be prescriptive or performance based. Prescriptive building codes are the most common in the meetMED target countries being implemented in Algeria, Egypt, Jordan, Morocco, Palestine and Tunisia, and already planned for Lebanon. Performance-based models have only been implemented in Egypt, Morocco, Palestine and Tunisia.

Regarding the scope of the EEBCs, the envelope component is addressed in every country since it strongly influences the buildings' energy consumption levels. The existing EEBCs also cover technical energy building systems, except for Lebanon, where they are already planned. Nowadays the concept of nZEB buildings is well known and is at the core of several EE strategies, but it is still not comprised in the EEBCs in the Mediterranean region, except for Tunisia (facultative) and Morocco, which has already planned their development.

However, establishing EEBCs is not enough to ensure the improvement in energy efficiency levels of both residential and non-residential buildings. Their enforcement and the existence of compliance tools is crucial in order to ensure its implementation. This enforcement is ensured by the government in Algeria, Egypt, Jordan, Morocco, Palestine and Tunisia. In Lebanon, it is guaranteed by third parties, while Libya has implemented self-certification models.

Energy performance labelling systems for buildings are also a good way to promote energy efficiency since they provide useful insights on what can be done to reduce energy consumption. Unfortunately, these types of labelling systems have not been implemented in most of the countries under examination. A positive exception is Tunisia, which developed a voluntary label for buildings with a high energy performance. Alternatively, other countries have implemented rating systems, such as TSBC, BREEAM, LEED, Green Star, Energy Pyramids, HQE, GRASS and ARZ. Morocco also developed a voluntary label for the energy and environmental performance of residential buildings, the "ECO-BINAYATE", supported by AMEE, the Moroccan Standards Institute (IMANOR), the Ministry of Housing and the Ministry of Energy. Tunisia also developed a label system, the ECOBAT system.

Challenges to the Implementation of Energy Efficiency Measures

The meetMED target countries face several challenges with respect to the implementation, enforcement and monitoring of the EE measures, such as EEBC, but also to the availability of and the accessibility to technical solutions and to investors and consumers' behaviours. Based on the information collected in the Country Papers, the main barriers to these countries are governmental, technical and information-related barriers. Table 1 presents the main challenges faced by the targeted countries.

Table 1: Main Challenges for EE promotion

Governmental	Technical	Information
Existence of non-mandatory measures	Low capacity for manufacturing efficient equipment	Low awareness from the population and investors
Low enforcement of regulatory frameworks	Low capacity for the implementation of efficient solutions	Low dissemination of EE benefits
Lack of institutional coordination	-	Lack of energy data
Lack of monitoring procedures (lack of energy data)	-	-
Lack of financing solutions	-	-

Recommendations to improve the implementation of Energy Efficiency Measures in the building sector

Several measures can be implemented to improve energy efficiency levels in the building sector in the Mediterranean region, including:

- Establishment of EE Building Codes (EEBCs)
- Development of national Energy Performance Certification systems / implement Green Rating Systems
- Implementation of a common regional Mediterranean green building rating system
- Establishment of MEPS in appliances
- Establishment of Labelling in appliances
- Phase-out of inefficient products and systems
- Assignment of responsibilities for the implementation of EE measures in the building sector
- Simplification of existing regulations and standards towards more clear and pragmatic rules
- Obligations on national authorities/companies as well as on final owners/occupants
- Energy prices reform
- Strengthening policy monitoring for decision making / Establish and improve data collection procedures
- Enforcement of measures through ex-ante and ex-post control
- Creation of additional financial incentives/instruments
- Capacity development
- Demonstration projects
- Raise awareness/develop studies on EE benefits

[See Table 25: Main recommendations for EE in Buildings promotion – page 46]

Regional cooperation and knowledge exchange among countries is also essential to strengthen the national tools that support EE implementation. The main points identified for regional cooperation between the meetMED partners are:

- Regionalisation of measures
- Development of cooperation programs to finance large scale projects
- Monitoring and benchmarking at the regional level
- Cross sectoral and multi-stakeholder dialogue at the regional level
- Raise awareness and dissemination of methods, tools, good practices, etc.

Besides general recommendations, which are transversal to every country, some others are specific for each country, such as:

Algeria

- Reforming Energy prices
- Strengthening institutional framework
- Capacity development
- Regulation enforcement
- Awareness raising campaigns

Egypt

- Establishing a dedicated and independent agency to consolidate national EE efforts.
- Clarifying institutional roles and delimit responsibilities for the implementation of EE in building programs
- Strengthening the legal and regulatory framework
- Enforcing buildings codes
- Reinforcing and expanding mandatory MEPS and setting up effective standard and label schemes
- Setting up a national database for EE in buildings
- Establishing attractive and innovative financing schemes and incentives
- Conducting certified capacity development programs
- Increasing awareness on EE in building

Jordan

- Developing policies for existing building retrofits
- Capacity building on the Jordanian codes
- Awareness campaigns
- Establishment of EE database and EE indicators.
- Developing a proper monitoring and evaluation mechanism

Lebanon

- Enforcing TSBL2010
- Promoting GRASSmed EE Building labelling systems
- Developing and approving MEPS
- Labelling standards need to be developed (recovering previous drafts) and approved

Libya

- Designing national strategies and action plans to enhance energy efficiency in all sectors
- Developing and enforcing a national energy code for buildings
- Establishing a sustainable EE in building data base
- Introducing monitoring and evaluation mechanisms to assess EE impacts at micro and macro level
- Creating financial schemes and incentive mechanisms to promote EE in building applications
- Implementing MEPs and label programs

Morocco

- Setting up an effective regulatory framework through the enforcement of relevant EE regulations
- Enforcing the existing buildings code, which is not mandatory yet
- Enforcing MEPs program and implement national building energy certification systems
- Developing financial instruments and economic models specific to EE in buildings design and evaluation
- Establishing a dedicated database for EE in buildings and a regular data collection mechanism

Palestine

- Enforcement of EE regulations and green buildings code
- Effective implementation of NEEAP recommended measures
- Integrating EE requirements and building code into the construction, inspection and maintenance stages
- Allocating specific responsibilities to relevant national stakeholders
- Introducing incentives mechanisms and attractive financing schemes to apply EE measures in buildings
- Setting up EE in buildings as well as a monitoring tool to follow up national achievements.

Tunisia

- Developing the regulatory framework for certification and energy labeling of household appliances
- Strengthening the market control system
- Accelerating the implementation of all elements of the “ecoBAT” labeling scheme
- Accelerating the implementation of the “PROMOISOL” mechanism
- Simplifying the procedures for granting financial incentives through the Energy Transition Fund “ETF”

Conclusions and Way Forward

All meetMED target countries have been working towards improving the energy efficiency levels in their building sector. However, the existing regulatory frameworks should be strengthened by establishing new and effective measures, such as EE Building Codes (for the envelope and for technical systems), Energy Performance Certification/Rating Systems, Minimum Energy Performance Standards and Labelling systems where they are still not in place. Having a clear understanding on which entities are responsible for the implementation of the measures is also very important. Furthermore, the policy requirement levels of the measures must be well defined since voluntary measures tend not to be implemented. Enforcement procedures for EEBC, MEPS and labelling systems must also be in place through ex-ante and ex-post control for the most important measures.

The key policy recommendations identified highlight the areas where EE policies could be strengthened. Regional cooperation and knowledge exchange are also crucial to facilitate energy transition in the meetMED target countries. Regional platforms and initiatives are therefore vital to encourage regional dialogue between stakeholders in order to achieve the regionalisation of standards, the development of cooperation programs, monitoring and benchmarking procedures at regional level, as well as a robust capacity of the market and the public awareness.

1. Introduction

1.1. Background of the report

This report is part of the Mitigation Enabling Energy Transition in the Mediterranean region (meetMED) project and focuses on “Energy Efficiency in Buildings”, particularly on the policies implemented in the meetMED target countries.

Due to the growing commitment to make the energy sector more sustainable and efficient, several initiatives have been developed in the meetMED target countries to promote the energy transition in the region through regional cooperation. The buildings sector is one of the main targets of these projects and several initiatives have already been put in place by different actors. The Union for the Mediterranean is one of them. This intergovernmental institution facilitates and promotes regional dialogue and cooperation as well as the development of concrete projects and initiatives in the areas covered by the Energy and Climate Action. The meetMED project contributes to the results of the UfM Renewable Energy and Energy Efficiency Platform (UfM REEE Platform), which aims to promote the deployment of renewable energy and energy efficiency measures, contributing to a sustainable energy transition.

Furthermore, the EU project MED-ENEC, Energy Efficiency in the Construction Sector, ran from 2006 to 2009 and supported ten Mediterranean countries in improving the legal framework conditions for energy efficiency and the use of renewable energy in buildings through capacity building, pilot projects and business development measures. It also aimed to improve energy security and reduce the impact of the growing energy consumption on the environment and the climate.

In 2016, the French Environment and Energy Management Agency (ADEME) also coordinated the World Energy Council technical service on Energy Efficiency Policies and Indicators, which resulted in the publication of the report “Case study on evaluation of energy building codes in emerging countries”, that compares the implementation of building codes in emerging countries. In force since 2017, the Programme for Energy Efficiency in Buildings (PEEB) is a

demand-oriented advisory project that combines the financial knowledge of the French Development Agency (AFD) with the technical knowledge of the German Corporation for International Cooperation GmbH (GIZ) and ADEME. It supports countries in the implementation of large-scale energy efficiency projects in the building sector.

There are also several platforms that promote energy efficiency in energy sector. The Global Alliance for Buildings and Construction (GlobalABC), for instance, is the leading global platform for governments, the private sector, civil society as well as intergovernmental and international organizations that aims at increasing action towards a zero-emission, efficient and resilient buildings and construction sector, through activities focused on education and awareness, public policies, market transformation, finance and building measurement, data and information. Both PEEB and Global ABC were present at the meetMED workshop on EE in Buildings that took place on 18 June 2019 in Tunis, Tunisia.

The League of Arab States also harmonizes a certain level of regional coordination between the countries and offers high-level convening power and long-term sustainability.

Another example of these initiatives is the Technical Assistance Facility for Sustainable Energy report “Stocktaking and Identification Mission on Energy Efficiency in Buildings and Products in the Neighbourhood South region” prepared by the EU, in 2018. This latter provides an in-depth assessment and analysis of the current EE policies and regulatory framework for buildings and appliances, existing in the eight Southern Neighbour countries with the aim to identify opportunities and challenges for a possible regional initiative and to formulate concrete recommendations to foster their deployment.

1.2. Methodology and approach of the meetMED Report on EE in Buildings

The report analyses the energy efficiency policies implemented in the buildings sector of each of the meetMED target countries and identifies recommendations that can help promote EE in the region. The study was developed by the meetMED Regional Experts Network (REN) and is based both on

policy papers prepared for each country and on the discussion held by the experts at the meetMED workshop on EE in Buildings that took place in Tunis in June 2019.

1.2.1. meetMED Country Papers

In order to evaluate the situation in the targeted countries, the meetMED REN experts were asked to complete a Country Paper that summarizes the energy efficiency policies implemented in the buildings sector in their countries and highlights the main existing incentives and barriers to the development and implementation of efficient measures, such as Energy Efficiency Buildings Codes (EEBC). The Country Papers also include examples of successful projects and recommendations. In total, the REN experts prepared 13 Country Papers, including Algeria, Egypt, France, Greece, Italy, Jordan, Lebanon, Libya, Morocco, Palestine, Portugal, Spain and Tunisia.

1.2.2. meetMED workshop on EE in Buildings

The Country Papers on EE in Buildings were presented and discussed at the meetMED workshop on EE in Buildings that took place on 18 June 2019 in Tunis, Tunisia. Hosted by the Tunisian National Agency for Energy Management (ANME), the meetMED workshop on Energy Efficiency in Buildings was co-organized by ANME (Tunisia), the Portuguese Energy Agency (ADENE), the French Environment and Energy Management Agency (ADEME), the Lebanese



Association for Energy Saving and for Environment (ALMEE) and the Regional Center for renewable Energy and Energy Efficiency (RCREEE). The meeting brought together the experts of the meetMED EE in Buildings taskforce of the meetMED Regional Expert Network (meetMED REN), a network composed by more than 60 energy experts from all the countries involved in the project.

The workshop gathered 27 experts coming from 11 countries of the Euro-Mediterranean region – Algeria, Egypt, France, Greece, Jordan, Lebanon, Libya, Palestine, Portugal, Spain and Tunisia - as well as representatives of RCREEE, the Global Alliance for Building and Construction (GABC) and the Programme for Energy Efficiency in Buildings (PEEB). During the first part of the workshop, the REN experts presented the country papers and their national experiences with respect to the main achievements and challenges in the implementation of national measures for the EE in buildings. The second part of the workshop focused on key issues and included discussions on behavioural changes, financing, awareness-raising activities and capacity building encountered at the national level. Besides presentations from the meetMED partners on existing instruments and success cases and on the status of the training market in the target region, the session included presentations from PEEB on the “Insights on financing of energy efficiency in buildings with a focus on the private sector” and from GABC on the “Global and National Alliances on EE in Buildings”. This session also included a roundtable where the experts discussed the main conclusions and policy recommendations to be implemented in the sector. At the end of the workshop, ANME General Director and the Secretariat of the Global Alliance for Buildings and Construction (GABC) signed the Tunisian Alliance for Buildings and Construction (TABC). This is the second national alliance for the building sector launched in the Mediterranean region (after the Moroccan alliance), and it is aimed at gathering the stakeholders involved in order to define a national action plan for energy efficient buildings and renovation in Tunisia.

The preliminary conclusions from the country sessions identified key areas of intervention and specific measures to be implemented, namely on:

- Strategy and regulation:
 - Enforcement of mandatory measures through ex-ante and ex-post control;
 - Obligations on national authorities/companies as well as on final owners/occupants;

- Tools:
 - Development of specific measures applicable to the stock of existing buildings (including those classified as cultural heritage);
 - Simplification of regulations and standards towards more clear and pragmatic rules;

- Enforcement:
 - Monitoring the results and the impact of national measures through collection and analysis of significant indicators;
 - Capacity building activities to overcome lack of experts for construction and renovation, control and inspections;

- Behavioural changes:
 - Public authorities leading by example regarding public buildings;
 - Disincentivizing low electricity prices and subsidies that make consumers' choices less economically rational;
 - Availability of specific financial instruments to encourage private owners/occupants;
 - Awareness-raising campaigns to disseminate existing programs and technologies to the citizens (essential focus on communication for all the actions on EE in buildings);
 - Reinforce awareness-raising and dissemination activities implemented by industrial associations and other stakeholders' platforms (such as the Tunisian Alliance for Buildings and Construction);

- Regional cooperation:
 - Network of national experts and exchange of experiences (such as meetMED);
 - Regionalisation of building standards, professional capacity and markets for construction materials and equipment;
 - Availability of development cooperation program;

2. Overview of the meetMED target countries

Although the rate of the GDP growth remains positive in some of the meetMED target countries, looking at the per-capita data, economic growth is almost stagnating due to a significant demographic increase. Table 2 provides the main socio-economic data and indicators for the targeted countries.

Table 2: meetMED target countries socio-economic numbers

	Unit	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales- tine	Tunisia
Population (2016)	thou- sand	40,606.05	95,688.68	9,455.80	6,006.67	6,293.25	35,276.79	4,816.00	11,403.25
GDP (2016)	million US\$	160,129.87	332,927.83	38,654.73	49,598	32,257.17	103,606.32	13,269.7	42,062.55
GDP per capita current US\$ (2016)	US\$ / capita	3,943.50	3,479.28	4,087.94	8,571.13	4,166.63	2,892.78	2,922.9	3,666.36

Source: World Bank; Palestinian Central Bureau of Statistics.

Despite the above mentioned social-economic difficulties, energy demand in these countries has been rapidly increasing in the last decades. This is due to a growing population but also to a change in behavioural patterns. In spite of the huge potential for renewable energy, these countries still depend on fossil fuels, such as oil and natural gas, to respond to their needs. Table 3 presents the main energy data and indicators for the targeted countries.

Table 3: meetMED target countries energy numbers

	Unit	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales- tine	Tunisia
Total Pri- mary En- ergy Supply (2016)	Mtoe	53.749	86.172	8.975	7.778	15.070	19.694	1.899	10.999
TPES/ population (2016)	toe/ capita	1.00	0.90	0.95	1.29	2.39	0.55	-	0.96
Total Final Consump- tion (2016)	Mtoe	37.787	58.049	6.080	4.986	9.964	15.508	1.674	7.997
Total elec- tricity con- sumption (2016)	TWh	60	171	18	17	29	32	5.289	17

Sources: IEA and Palestinian Central Bureau of Statistics.

2.1. Building sector in the meetMED target countries

The building sector is one of the largest energy consumers in the meetMED target countries. Table 4 presents the share of final and primary energy consumption of the building sector in the targeted countries.

Table 4: Energy consumption in the building sector in the meetMED partner countries

	Unit	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Palestine	Tunisia
Year of data:	Year	2017	2017	2017	2015	2016	2013	2017	2017
Share in total Final energy consumption	%	33.60%	50.5%	28.70%	40.20%	39.00%	33.00%	38.40%	27.00%
Share in total Primary energy consumption	%	-	-	20.10%	29.30%	-	-	34.00%	-

The table above shows that Egypt and Lebanon are the countries with the largest share of energy consumption in the building sector, while Jordan and Tunisia are the countries with the lowest share. This is a result of the status of the building stock (regarding its age and the types of materials and equipment used) and the existing measures to promote energy efficiency in the building sector in these countries (regarding the impact that these measures have in energy consumption). Despite this direct connection to the building stock and EE implemented measures, other factors, such as a low share of energy consumption in other sectors, can contribute to large shares of energy consumption in the building sector (e.g. as in Lebanon where there is a low consumption share of the industrial sector)

Being one of the largest consumers, and considering the rapid demographic growth and urbanization, the building sector is one of the main targets of the existing National Energy Efficiency Action Plans (NEEAPs) that promote stakeholders' engagement and contribute to the development of the energy sector legal framework. NEEAPs establishes indicative energy savings targets for each country, as well as policies and measures that should be implemented to overcome barriers and help reach these goals. Among others, NEEAPs depend on the strategic development of the countries, which means that they

can differ significantly one from another. While some countries like Libya have no EE action plans in place, the majority of the meetMED target countries have already implemented them and they are currently either developing or implementing their second NEEAP, with a strong focus on the building sector.

Table 5: meetMED target countries Energy Efficiency National Action Plans (NEEAPs)

	EE Action Plan	Target Sectors	ADOPTION
Algeria	Algerian Program for the Development of New and Renewable Energies and Energy Efficiency 2030	Buildings, Industry, Transport	Adopted in 2015
Egypt	2 nd NEEAP 2018-2021	Macro, Residential, Tertiary	Adopted in 2018
Jordan	2 nd NEEAP 2017-2020	Macro, Residential, Industrial, Water Pumping, Street Lighting, Commercial and Services	Adopted in 2017
Lebanon	2 nd NEEAP 2016-2020	Power, Building, Industry and Agriculture, Public	Adopted in 2016 by the Ministry of Energy and Water
Libya	N/A	N/A	N/A
Morocco	National Energy Efficiency Strategy 2030	Macro, Tertiary, Residential, Industry, Transports, Agriculture	Adopted in 2016
Palestine	2 nd NEEAP 2020-2030	Industry, Residential, Commercial and Services, Agriculture, Water Pumping, Distribution network losses	Foreseen
Tunisia	EE Strategy 2030 EE Strategy horizon 2050	Residential, Tertiary, Industry, Transports, Agriculture	Adopted in 2016 Foreseen

2.1.1. Characterization of the Building Stock in the meetMED target countries

In order to implement effective policies and to monitor whether implemented regulations and programmes meet the expectations, it is crucial to collect reliable and comprehensive data on the composition of the building stock. However, most countries have not in place mechanisms or entities, which are responsible for data collection on the results of the implemented measures for EE in buildings.

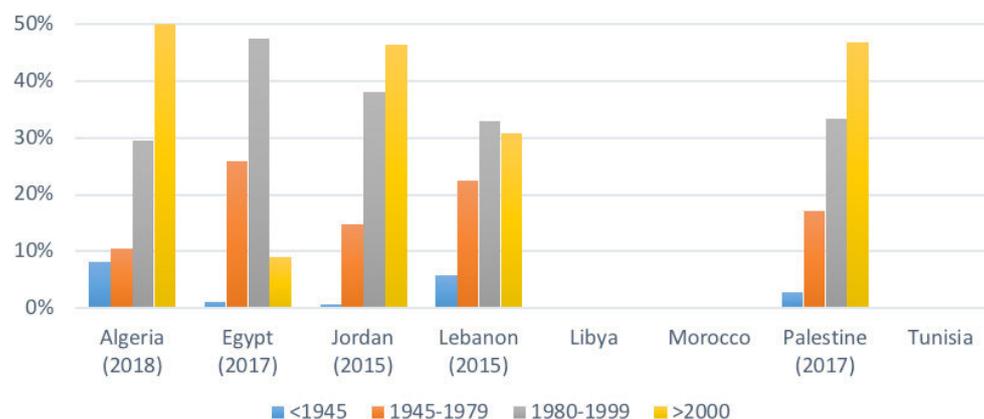
The features of the building stock are essential when discussing energy consumption and energy efficiency measures in the building sector. These are defined by the floor area breakdown by sector and the building typology for residential and non-residential. Table 6 presents the main indicators used to define the building stock of the SEM countries.

Table 6: Characterization of the Building Stock in the meetMED partner countries

	Unit	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Year of data:	Year	2018		2015	2015	2014	2014	2017	2014
Residential buildings									
Total number of buildings	Unit	9,934,377	13,467,333	684,718	461,500	1,050,000	7,307,912	495,833	-
Total number of dwellings/ units	Unit	8,934,377	41,485,816	2,350,490	135,000	-	-	129,264	3,289,900
Total area of construction	m2	-		387,830,850	235,000,000	-	-	-	-
Non-residential									
Total number of buildings	Unit	-	1,100,662	157,021	234,045	-	327,349	105,212	-
Total area of construction	m2	-		NA	81,750,000	-	-	-	-

The breakdown of buildings by construction period is also a relevant indicator when characterizing the building stock of a country. Figure 1 classifies all national building stocks by age.

Figure 1: Building stock by age



3. Energy Efficiency in Buildings

Effective regulatory frameworks are vital for the implementation of energy efficiency measures, as they establish guidelines on technical issues for different sectors and sometimes funds, which are essential to the development of EE policies.

The building sector is one of the most energy intensive ones in the meetMED target countries. Due to its growing population and urbanization rate, it is an essential sector where energy efficiency measures need to be implemented. For instance, these include the implementation of insulation standards, the development of EE building codes and the creation of EE labelling systems for buildings. Capacity building at different levels (decision making actors, technicians, general public) must also be strengthened in order to further promote the implementation of these measures in the countries.

All eight meetMED target countries have implemented policies to promote energy efficiency in this sector. Algeria, Egypt, Jordan, Morocco, Palestine and Tunisia have been acting on several aspects of it and have the most developed regulatory frameworks.

3.1.1. Thermal Performance Standards

Thermal performance standards (not mandatory) and regulations (mandatory) are the most common measures adopted in the region. Lebanon, for instance, has in place Thermal Standards for Buildings (not mandatory) that set the minimum requirements for the thermal performance of the buildings' envelope, the TSBL2010, whilst Thermal Regulations for Buildings have been implemented in Algeria and Tunisia.

Despite their diffusion, thermal performance standards and regulations are not enough to create more energy efficient buildings. In order to do that, the countries need to undertake long-term changes in the existing building regulations and, most importantly, they need to enforce them.

3.1.2. Energy Efficiency Building Codes

Energy efficiency measures are more effective if implemented during the early stages of the building project. While the energy consumption levels for appliances and other equipment can be subsequently addressed together with specific policies and programs, the energy load for heating and cooling of the spaces is more easily addressed during the design and construction phases of the building project.

It is therefore important to implement energy efficiency building codes (EEBCs) consisting in energy efficiency minimum standards for the design, construction and renovation of residential and tertiary buildings as well as establishing the baseline for the building's envelope, systems and equipment. From the elaboration of the EEBC requirements to their implementation, there are several stages. Table 7 summarizes the status of such stages of the EEBC implementation in the target countries.

Based on the information collected in the Country Papers, most of the countries have already developed the EEBC technical requirements. However, Lebanon is still finalising the requirements for its EEBC, which will be based on the thermal standards currently in place at national level. Algeria, Egypt, Jordan, Morocco, Palestine and Tunisia have already established legal frameworks for the implementation of EEBC. However, only Jordan, Morocco and Tunisia have clearly defined which entity is responsible for their implementation. Despite the improvements in the set-up of EEBC at the regional level, only Jordan, Morocco and Tunisia have currently implemented them. The enforcement and monitoring of the EEBC is widely recognised as the weakest stage for the implementation of EEBC in the countries. Only Tunisia has enforced measures that ensure the implementation of EEBCs. Libya is the only country that still has not developed an EEBC.

Table 7: EEBC Status

EEBC	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Technical Requirements								
Legal Framework								
Institutional set-up (clarity regarding responsibilities)								
Implementation								
Enforcement procedures								
Monitoring & Evaluation procedures								
							Existing	
							Planned	
							Not Existing	

3.1.2.1. Policy Requirement Level

Despite its importance in reducing energy consumption in the building sector, the implementation of these building codes is not mandatory in every country. Table 8 shows that their implementation is mandatory only in Egypt, Jordan, Morocco and Tunisia. Furthermore, in Algeria the EEBC is poorly used and mostly applied on a voluntary basis, although laws and regulations have been adopted. In Lebanon (planned), Jordan and Palestine, the implementation of the EEBC is entirely voluntary.

Table 8: EEBC policy requirement level

EECB policy requirement level	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Mandatory	-	X	X	-	Not applicable	X	-	X
Voluntary	-	-	-	X	Not applicable	-	X	-
Mixed	X	-	-	-	Not applicable	-	-	-

3.1.2.2. Institutional Set-up

The institutional set-up of the countries is key to the success of EEBCs. It is therefore crucial to have institutions with a clear mandate and specific responsibilities regarding the different stages of the EEBC, from their development to their implementation and enforcement. There are three different models for institutional set-ups: government set-up, third party or mixed models. In a government set-up, specific governmental bodies are accountable for all the aspects of the EEBC. As shown in Table 9, the government is responsible for the implementation of EEBCs in Algeria, Egypt, Jordan and Morocco. In the third-party models, private companies are contracted to develop, implement and enforce the EEBCs: this is the case of Palestine. In a mixed model, EEBC development, implementation and enforcement is a responsibility of the government, while their monitoring is carried out by the private sector, as happens in Tunisia. Lebanon still has no institutional set-up in place.

Table 9: EEBC Institutional set-up

EECB implementation is a responsibility of:	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Government	X	X	X	-	Not applicable	X	-	-
Third party	-	-	-	-	Not applicable	-	X	-
Mixed model	-	-	-	-	Not applicable	-	-	X

3.1.2.3. Types of EEBCs

EEBCs can be prescriptive or performance-based. Prescriptive building codes are based on threshold values for different building elements, including equipment, thus they refer to specific energy efficiency requirements that have been previously established. These types of EEBC are implemented and verified more easily since they follow clear guidelines. Nonetheless, they are not flexible and require frequent updates of the established thresholds. Prescriptive building codes are the most common in the meetMED target countries since they are currently implemented in Algeria, Egypt, Jordan, Morocco, Palestine and Tunisia, and already planned for Lebanon. Performance-based models only refer to the overall energy performance of the building itself, by taking into consideration the levels of energy consumption, fossil fuels used

and greenhouse gas emissions in buildings. These models are more flexible and ready to incorporate new technologies, but they are also more complex, as they require higher engineering skills. Several meetMED countries, including Egypt, Morocco, Palestine and Tunisia, have put in place these types of models. Lebanon is also planning to implement these models. Table 10 summarizes the types of EEBC implemented in each country.

Table 10: EEBC implemented in the meetMED target countries

Type of building code	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Prescriptive					Not applicable			
Performance based					Not applicable			
							Existing	
							Planned	
							Not Existing	

3.1.2.3.1. Building types covered by EEBC

Although some of the countries are already implementing energy performance requirements for new buildings, most have not applied them to the existing building stock.

In most meetMED target countries, the existing EEBC covers new residential and non-residential buildings, except for Egypt in this last case (Table 11). Renovation of existing buildings is usually more complex and expensive; thus, most of the EEBCs implemented in the region do not cover minor and major renovations in existing residential and non-residential buildings. However, there are some exceptions. While Egypt's codes cover minor and major renovations in residential buildings, Palestine's ones cover minor and major renovations in non-residential buildings. In its EEBC, Lebanon is planning to cover both new residential and non-residential buildings as well as major renovations in existing residential and non-residential ones.

Table 11: Types of buildings covered by EEBC

Building types covered by EEBC	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
New residential					Not applicable			
New non-residential					Not applicable			
Existing residential (major renovation)					Not applicable			
Existing non-residential (major renovation)					Not applicable			
Existing residential (minor renovation)					Not applicable			
Existing non-residential (minor renovation)					Not applicable			
							Existing	
							Planned	
							Not Existing	

3.1.2.3.2. SCOPE of the EEBCs

Energy efficiency building codes can focus on different technical areas, including the envelope, technical energy building systems and nearly-zero energy buildings (nZEB).

Table 12 identifies the technical areas covered by the EEBCs, which are in force in the meetMED countries. In every country, the envelope component is properly addressed in their EEBCs, since it strongly influences the buildings' energy consumption levels. Lebanon's planned EEBC will also include the envelope component. Technical energy building systems, such as space heating and cooling systems, water heating systems and appliances, are also an important factor for efficiency in buildings and are therefore crucial components of any EEBC. Every country also has in place building codes that cover these systems, except for Lebanon and Morocco - where they are already planned. Nowadays, the concept of nZEB buildings is well known and is at the core of several EE strategies, but it is still not comprised in the EEBCs in the Mediterranean region except for Tunisia (facultative) and Morocco which has already planned their development.

Table 12: Areas covered under existing EEBCs

EEBC areas	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Envelope					Not applicable			
Technical Energy Building Systems					Not applicable			
Nearly-zero energy buildings (nZEB)					Not applicable			
							Existing	
							Planned	
							Not Existing	

EEBC requirements for the envelope mainly refer to the U-values of the different envelope components structure, which represents the overall heat transfer coefficient assessing the performance of an element in conducting the heat. Table 13 identifies the envelope requirements, per country, included in the existing EEBCs.

Existing thermal standards in Lebanon already include the U-values and the EEBC plans to include them.

Table 13: EEBC envelope requirements

Prescriptive EEBC - Envelope requirements (when applicable)	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Airtightness					Not applicable			
U-value external walls					Not applicable			
U-value floors					Not applicable			
U-value doors					Not applicable			
U-value roofs					Not applicable			
U-value windows					Not applicable			
Windows/Glazing solar factor					Not applicable			
Skylight/Glazing solar factor					Not applicable			
Compliance Software					Not applicable			
							Existing	
							Planned	
							Not Existing	

The requirements for the technical energy building systems can differ from residential to non-residential buildings. Table 14 identifies the existing requirements for technical building systems for residential buildings. The table shows that only Egypt, Jordan, Morocco and Palestine have these requirements in place. Morocco, for instance, specifies the minimum performance for space heating and cooling according to the zone and type of building. Lebanon has already drafted these requirements.

Table 14: EEBC technical building systems requirements – residential buildings

Prescriptive EEBC - Technical building systems requirements - Residential	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Space heating	Not applicable	Existing	Existing	Planned	Not applicable	Existing	Existing	Not Existing
Space cooling	Not applicable	Existing	Existing	Planned	Not applicable	Existing	Existing	Not Existing
Domestic Hot water	Not applicable	Existing	Existing	Planned	Not applicable	Not Existing	Existing	Not Existing
Appliances	Not applicable	Not Existing	Existing	Not Existing	Not applicable	Not Existing	Existing	Not Existing
Lighting	Not applicable	Existing	Existing	Planned	Not applicable	Not Existing	Existing	Not Existing
Metering	Not applicable	Not Existing	Existing	Planned	Not applicable	Not Existing	Not Existing	Not Existing
On site energy generation	Not applicable	Not Existing	Existing	Planned	Not applicable	Not Existing	Not Existing	Not Existing
Compliance Software	Not applicable	Not Existing	Not Existing	Not Existing	Not applicable	Existing	Not Existing	Not Existing
							Existing	Existing
							Planned	Planned
							Not Existing	Not Existing

Table 15 illustrates the existing requirements for technical building systems in non-residential buildings. Algeria, Jordan, Morocco, Palestine and Tunisia already have in place these types of requirements. Morocco, for instance, specifies the minimum annual heating and cooling requirements. Lebanon has already drafted these requirements.

Table 15: EEBC technical building systems requirements – non-residential buildings

Prescriptive EEBC - Technical building systems requirements – Non-Residential	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Space heating					Not applicable			
Space cooling					Not applicable			
Domestic Hot water					Not applicable			
Appliances					Not applicable			
Lighting					Not applicable			
Metering					Not applicable			
On site energy generation					Not applicable			
Compliance Software					Not applicable			
							Existing	
							Planned	
							Not Existing	

Table 16 identifies the existing requirements for performance-based EEBC in residential and non-residential buildings. As shown, the existing requirements refer mainly to the energy use for heating and cooling, but also the existence of compliance software. Lebanon, Morocco and Tunisia are the only countries with these types of requirements.

Table 16: Performance based requirements

Performance based – EEBC – residential and non-residential	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Energy use for heating					Not applicable			
Energy use for cooling					Not applicable			
Energy use for hot water					Not applicable			
Energy use for lighting					Not applicable			
Energy use for ventilation					Not applicable			
Total primary energy use					Not applicable			
Non-renewable primary energy use					Not applicable			
Compliance Software					Not applicable			
							Existing	
							Planned	
							Not Existing	

3.1.2.4. EEBCs Enforcement

Establishing EEBCs is not enough to ensure the improvement in energy efficiency levels of both residential and non-residential buildings. Their enforcement is crucial in order to ensure their implementation. Furthermore, different actors may bear the responsibility to implement them, depending on the governance structure and existing funds in each country: the government, third-parties or self-certification. In the first model, local authorities are responsible for reviewing constructions plans, on-site inspections and issuing buildings and occupancy permits. In third-party models, private entities are responsible for the revision of the construction plans and on-site inspections. In this case, the government does simply sample checks to ensure that EEBC are being followed. Finally, in self-certification models, architects and construction managers issue a compliance statement to the government.

According to Table 17, EEBC enforcement is ensured by the government in Algeria, Egypt, Jordan, Morocco, Palestine and Tunisia. In Lebanon, this enforcement is guaranteed by third parties, while Libya and Jordan have also implemented self-certification models.

Table 17: EEBC enforcement responsibilities

EEBC enforcement is a responsibility of:	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Government	X	X	X	-	-	X	X	X
Third party	-	-	-	X	-	-	-	-
Self-certification	-	-	X	-	X	-	-	-

The levels of EEBC enforcement are very low in most of the countries, except for Jordan and Tunisia where the level is low and Morocco, where it is medium.

3.1.2.4.1. Compliance tools

Enforcement measures should be complemented with compliance tools ensuring the implementation of EEBCs, such as the revision of construction plans at the design stage or inspections during the construction and permitting phases. Table 18 lists the different types of compliance tools existing in the meetMED target countries. As shown, mechanisms to review the construction plans at the design stage of a project are in place in Egypt, Jordan, Palestine and Tunisia. Algeria, Jordan, Lebanon, Palestine and Tunisia also use a simplified compliance software at the design stage to ensure that EEBCs are being implemented. Inspections in construction sites are also a good compliance tool and are already implemented in Egypt, Jordan, Morocco and Palestine, whilst they are planned for Tunisia. Inspections as part of the occupancy permitting process are also effective. These are implemented in Egypt, Jordan and Palestine and planned for Tunisia.

Table 18: EEBC Compliance tools in the meetMED target countries

Compliance Tools	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Review of plans at design stage								
Simplified compliance software at design stage								
Inspection at construction site								
Building inspections as part of the occupancy permitting process								
							Existing	
							Planned	
							Not Existing	

In addition to these compliance tools, there are other supporting measures to enforcing the implementation of EEBC, such as issuing penalties for non-compliance and VAT exemptions. Table 19 lists the existing supporting measures in the meetMED target countries. Egypt, Lebanon, Palestine and Tunisia set incentives for the implementation of EEBCs in the building/occupancy permitting process (permitting approval linked to implementation of EEBC). Egypt, Morocco, Palestine and Tunisia have already implemented penalties for non-compliance. VAT exemptions and tax credits are also in place in Egypt, Jordan, Morocco and Palestine and foreseen for Tunisia.

Table 19: Existing supporting measures to EEBCs enforcement

Supporting measures to EEBC enforcement / incentives	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Incentives included in the building/ occupancy permitting process	Red	Green	Red	Green	Red	Red	Green	Green
Penalties for non-compliance	Red	Green	Red	Red	Red	Green	Green	Yellow
VAT exemptions / Tax credits	Red	Green	Green	Red	Red	Green	Green	Yellow
							Existing	Green
							Planned	Yellow
							Not Existing	Red

3.1.3. MEPS and Labelling for appliances

A large share of the total energy consumption in buildings is related to appliances commonly use in households and service buildings. It is therefore important to adopt Mandatory Minimum Energy Performance Standards (MEPS) to ensure the use of efficient equipment. Most countries have been working on the implementation of these standards, namely for refrigeration, air conditioning and lighting. As shown in Table 20, MEPS for lighting are already in place in Algeria, Egypt, Jordan, Lebanon, Libya and Tunisia. Regarding refrigeration and air conditioning equipment, Lebanon is still planning them whilst Libya and Palestine have not them at all. Washing machines are also a big energy consumer but MEPS for this type of appliance exist only in Jordan and are planned in Egypt and Tunisia. Solar water heaters are a good alternative to more conventional heaters but only Egypt, Jordan and Morocco adopted energy perfor-

mance standards. Small energy consuming appliances are normally not included in EEBC. However, HVAC systems are usually covered by EEBC.

Table 20: MEPS in the meetMED target countries

MEPS	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Lighting	Green	Green	Green	Green	Green	Red	Red	Green
Refrigeration	Green	Green	Green	Yellow	Red	Yellow	Red	Green
Air conditioning	Green	Green	Green	Yellow	Red	Green	Red	Green
Washing machine	Red	Yellow	Green	Red	Red	Red	Red	Yellow
Solar water heaters	Red	Green	Green	Yellow	Red	Green	Yellow	Red
							Existing	Green
							Planned	Yellow
							Not Existing	Red

Labelling standards for appliances should be implemented in order to promote the purchase by consumers of energy efficient equipment since they help consumers make more efficient choices. As shown in Table 21, Algeria, Egypt, Jordan, Lebanon, Morocco and Tunisia have already adopted labelling for refrigeration and air conditioning equipment. For lighting, labelling systems are in place only in Algeria, Egypt, Jordan, Lebanon and Tunisia. Washing machines are already labelled in Egypt, Jordan and Tunisia. In Morocco, AMEE has put in place energy performance labels for solar water heaters. Tunisia has planned labels for solar water heaters.

Table 21: Labelling in the meetMED target countries

Labelling	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Lighting	Green	Green	Green	Green	Red	Red	Red	Green
Refrigeration	Green	Green	Green	Green	Red	Green	Red	Green
Air conditioning	Green	Green	Green	Green	Red	Green	Red	Green
Washing machine	Red	Green	Green	Red	Red	Red	Red	Green
Solar water heaters	Red	Red	Red	Red	Red	Red	Yellow	Yellow
							Existing	Green
							Planned	Yellow
							Not Existing	Red

Despite their importance, the implementation of energy efficiency labels for appliances is not mandatory in every country. Table 22 identifies the labelling policy requirement level per appliance in each country. While Algeria, Egypt, Jordan, Morocco and Tunisia have mandatory requirements, Lebanon only has voluntary systems.

Table 22: Labelling Policy requirement level

Labelling Policy requirement level	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
Lighting	Manda-tory	Manda-tory	Manda-tory	Voluntary	-	-	-	Manda-tory
Refrigeration	Manda-tory	Manda-tory	Manda-tory	Voluntary	-	Manda-tory	-	Manda-tory
Air conditioning	Manda-tory	Manda-tory	Manda-tory	Voluntary	-	Manda-tory	-	Manda-tory
Washing machine	-	Manda-tory	Manda-tory	-	-	-	-	Manda-tory
Solar water heaters	-	Manda-tory	-	-	-	-	-	-

3.1.4. Certification and rating schemes

Energy performance labelling systems for buildings are also a good way to promote energy efficiency since they provide useful insights on what can be done to reduce energy consumption. Unfortunately, these types of labelling systems have not been implemented in most of the countries under examination. A positive exception is Tunisia, which developed a voluntary label for buildings with a high energy performance: the ecoBAT system.

Other countries have implemented alternative measures, such as rating systems. There are several voluntary rating systems that can be used to evaluate EE in buildings: among others, TSBC, BREEAM, LEED, Green Star, Energy Pyramids, HQE, GRASSmed and ARZ. Lebanon, for example, uses a voluntary tool for thermal standards evaluation, the TSBC software that can generate EPCs related to the envelope of the building. This is later used either to compare energy performance of the building envelope or as an input in the green rating systems to earn points. However, Lebanon is planning to implement energy performance certificates by 2020. On the other hand, Egypt adopted the LEED methodology and has currently certified 21 buildings. It also developed the Green Star Hotel initiative, a national green certification and capacity-building program that enables hotels operating in Egypt to be inter-

nationally recognized for raising their environmental performance and social standards while reducing their operational costs. In 2009, Egypt also developed an EE rating standard for buildings, the Green Pyramids Rating System. LEED and BREEM are the main implemented certification schemes in Lebanon, but the number of certified buildings is still very low. Lebanon also implemented GRASSmed, a Mediterranean Green Building Rating system that so far has certified more than 30 buildings and trained more than 50 assessors as well as the ARZ Building Rating System, a system designed to measure to what extent existing commercial buildings are consuming the right amount of energy and water, while having a low impact upon the natural environment. In addition, this rating system will stimulate building owners and facility managers to achieve ever-higher certification levels to attract discerning tenants and clients. Morocco also developed a voluntary label for the energy and environmental performance of residential buildings, the “ECO-BINAYATE”, supported by AMEE, IMANOR, the Ministry of Housing and the Ministry of Energy. Tunisia also developed a label system, the ECOBAT system.

Table 23 summarizes the implementation level of green building rating systems (in the buildings performance) in the meetMED target countries.

Table 23: Green Buildings Rating Systems

Green Buildings Rating Systems	Algeria	Egypt	Jordan	Lebanon	Libya	Morocco	Pales-tine	Tunisia
LEED	Red	Green	Green	Green	Red	Green	Green	Green
BREEM	Red	Red	Red	Green	Red	Green	Red	Red
Green Star	Red	Green	Red	Green	Red	Red	Red	Red
HQE	Red	Red	Red	Green	Red	Green	Red	Green
							Existing	Green
							Planned	Yellow
							Not Existing	Red

3.1.5. Barriers to EE in Buildings

The meetMED target countries face several challenges with respect to the implementation, enforcement and monitoring of the EE measures, such as EEBC, but also to the availability of and accessibility to technical solutions and to investors and consumers' behaviours.

Based on the information collected in the Country Papers, the main barriers to these countries are institutional and technical barriers. On the one hand, besides a lack of institutional coordination between the main institutional stakeholders, a lack of support from the governments in the enforcement of existing regulations and insufficient financing solutions has also been detected. On the other hand, there are technical barriers that include, for example, the higher costs of insulation materials and the lack of qualified human resources. The lack of awareness of the population and investors on these issues must also be tackled in order to increase EE in the sector. Table 24 presents the main barriers identified by the meetMED REN experts.

Table 24: Barriers to EE in buildings

Algeria	<ul style="list-style-type: none"> • Low prices of energy that minimize the impact of incentives • The political priority given first to resolving the housing crisis • Thermal regulation is not applied and controlled in the field • Lack of trained and skilled labour
Egypt	<ul style="list-style-type: none"> • Energy Supreme Council is the entity in charge of EE deployment in Egypt but there is no independent national agency in charge of EE programs coordination and follow up. • Enforcement mechanism needs to be strengthened, in fact: <ul style="list-style-type: none"> – Building Energy Efficiency Codes were developed and stated mandatory energy performance requirements for residential, commercial, and public buildings in three different code documents. However, these codes are not enforced. – A ministerial decree was issued by the Minister of Housing to make the installation of solar water heating systems in new governmental buildings in new communities' compulsory. However, the decree has not been enforced until now. • Lack of customer awareness and confidence. Buying households equipment is based mainly on the price and not on energy label or consumption. • No market monitoring and inspection for household's appliances. • Lack of published information and statistic linked to EE in building sector. • Lack of financial incentives for promoting implementation of EEBC. • High prices of raw materials used in insulation materials.
Jordan	<ul style="list-style-type: none"> • Lack of understanding the importance of implementing the buildings codes by buildings owners/operators or some cases the developers. • Unclear inspection procedures/responsibilities (enforcement of building EE Codes). • Extra cost of implementing EEBC that will be added to the original building cost. • Lack of incentive tools for applying building codes. • Fresh graduate engineers do not have enough knowledge about the international and national codes and who is responsible to monitor the implementation of the codes.

Lebanon	<ul style="list-style-type: none"> • Lack of enough capacity building for quantitative analysis of energy use in buildings. • Lack of awareness for some stakeholders involved the energy efficiency field efficiency aspects. • Lack of records and data about energy for simulation and evaluation. • No enforcement (no trained inspector, field instruments, Check list and Inspector Power) • No accreditation of testing labs (SHW, PV, etc.), fake certification of EE appliances (from Asia). • Lack of integrated governmental co-ordination in the fields of action plan for implementation of TSBL2010 and EEBC. • Lack of evaluation and monitoring mechanisms to evaluate the rate of implementation of TSBL2010 and EEBC. • Lack of governmental support to energy efficiency programs. • Lack of sufficient technical capacity in public sector. • There is a gap between the legislation and the reality faced by private sector. • Resistance to change the regulation, and to introduce environmental aspects in contract documents. • Lack of financing systems for EE in standard and social buildings • Subsidies in electricity. • Power black outs are a barrier for EE (appliances). • Social resistance for implementation EEBC.
Libya	<ul style="list-style-type: none"> • High political, security and governance risks. • Absence of national EE regulatory and institutional frameworks. • Low energy and electricity tariff specially for residential sector. • Absence of specialized national institution in charge of the rational use of energy. • Lack of national strategy as well as medium and long-term NEEAP. • Limited detailed and deep studies that highlight EE in building impact and which help the decision makers to adopt energy efficiency programs. In addition to the unavailability of national data and information. • Absence of buildings energy code. • Lack of dedicated EE financing mechanisms and incentives. • Limited access to EE technologies and information as well as limited national expertise and knowledge.

Morocco	<ul style="list-style-type: none"> • Enforcement of regulation and development of application texts: Thermal regulation for construction in Morocco is mandatory from November 2015. • The Moroccan Agency for Energy Efficiency (AMEE) was created in 2016 with the aim to promote and coordinate energy efficiency programs; however, the agency role have to be reinforced to lead EE sector and to enhance coordination between national actors. • Limited financial instruments, incentive measures and economic models specific for EE in buildings. Tax reduction on the importation of solar thermal systems and on the application of photovoltaics in buildings are the only incentives in place. • Need to improve national expertise and experience. In fact, public and private sector actors (Auditors, Consultants, Entrepreneurs...) are not sufficiently familiar with current regulations, EE standards and the new EE technologies. Practical experience in EE in buildings is also needed.
Palestine	<ul style="list-style-type: none"> • High energy dependence as most of the electricity is bought from neighbouring countries, whilst Palestine produce only 6.2% of the total electricity generation. • Enforcement of regulation and political commitment: The first draft for RE and EE law has been proposed and approved in May 2015. However, more efforts must be undertaken for its enforcement and more political commitment is needed to achieve the energy-saving targets. • Institutional framework and responsibilities delimitation: The Palestinian Energy and Natural Resources Authority (PENRA) currently oversees the implementation of the NEEAP for the period 2012 to 2020. Currently, no independent entity is in charge of EE in building in Palestine. • Limited data availability and absence of dedicated survey to access EE in building status and requirements, in addition to the implementation of a follow up and monitoring mechanisms to evaluate the impact of EE measures and programs. • Voluntary certification of household's appliances, MEPs: Mandatory MEPs and labels for appliances and equipment in common use in households, beginning with refrigerators and air conditioners is required to reduce building consumption in Palestine. • Public awareness: Palestine has the largest solar water heater penetration in the MENA region, however more awareness campaign is required for other EE measures including using energy-efficient appliances. • Knowledge and capacity of public and private stakeholders. • Market size and maturity.

Tunisia

- Lack of qualified human resources at the municipal level, in the field of EEBC.
- Legal gap regarding technical studies and technical control missions related to the application of the EEBC .
- Legal gap regarding the on-site technical control of building compliance with EEBC.

4. Financing for EE in Buildings

The existence and implementation of energy efficiency regulatory frameworks in the building sector deeply depends on the existence of supporting schemes and economic incentives. The absence of these incentives is one of the biggest obstacles to a successful implementation of energy efficiency measures and, consequently, to the reduction of energy consumption in the building sector. EE funds and fiscal incentives are the main incentives that can boost investment in energy efficiency measures.

Energy efficiency funds facilitate investment in EE initiatives promoting, among others, energy savings, awareness raising campaigns and encouraging market competitiveness. These funds can provide loans, grants or subsidies to the petitioner. Some of the meetMED target countries have already in place these types of incentives. NEEREA is a financial mechanism of the BDL (Banque du Liban) dedicated to green buildings candidate to LEED or to GRASSmed certification, together with the program LEEREFF, co-financed by EIB, and the program GEF, co-financed by the EBRD. The Lebanese Ministry of Energy and Water issued loans to the acquisition of 7500 solar water heaters (up to 10% of the total cost), while Tunisia developed programs to promote thermal insulation of roofs in private individual dwellings (Promoisol program) and the use of efficient lighting, natural gas, air conditioning and cold storage equipment. Tunisia has also a program to promote the energy rehabilitation of buildings (granted through the Energy Transition Fund). Tunisia and Morocco have a specific program for the promotion of energy efficiency in the building sector, the PEEB. This program combines financing for energy efficiency in large scale projects with technical assistance and was initiated by France and Germany in the context of the Global Alliance for Buildings and Construction (GlobalABC). PEEB supports partner countries on improving their policies and standards (for sustainable buildings and inter-institutional cooperation, for example), fosters expertise among professionals in the private and public sector and develops innovative financing solutions for large building projects.

Fiscal incentives are also a good alternative to promote energy efficiency in the countries. These types of incentives can include, for example, incentives

in the building permitting process, penalties for non-compliance, VAT exemptions/tax credits and tax reductions that reduce the overall costs of the projects. Besides the measures already identified in Table 19, Jordan also has in place custom duties and sales taxes exemption, while Tunisia has tax privileges for energy efficient products and equipment.

The boxes below contain examples of successful financing tools for EE projects, presented at the “meetMED workshop on EE in Buildings”. These projects are examples of good schemes that can be implemented in the countries.

A successful financial instrument designed to support investments in urban rehabilitation is the Portuguese IFFRU 2020. This project, described in Box 1, is a good tool that promotes energy efficiency in the Portuguese building stock.

Box 1: IFFRU 2020, Portugal

IFFRU 2020 - URBAN REHABILITATION AS AN INSTRUMENT FOR THE REVITALIZATION OF CITIES

Country: Portugal

Budget: Up to 1.400 million euros

IFFRU 2020 is a financial tool designed to support investments in urban rehabilitation in the Portuguese territory. It has various sources of funding to boost investment, both European funds from PORTUGAL 2020 and funds from other entities, such as the European Investment Bank and the Council of Europe Development Bank, combining them with commercial banking resources (50/50). This system has 2 types of financial products: loans and guarantees. While loans are provided by the financial entities selected to manage IFFRU 2020 (with maturities of up to 20 years and low interest rates), guarantees are associated with loans and provided by the same selected financial entities for projects that have not enough guarantees. IFFRU funds full rehabilitation projects of buildings with 30 years or more.

The Italian ECOBONUS system, presented in Box 2, is a tax deduction mechanism focusing on the renovation of existing buildings.

Box 2: ECOBONUS, Italy

ECOBONUS

Country: Italy

This mechanism addressed the energy renovation of existing residential buildings. In 2018, the Budget Law has further developed the incentives system by adding new deduction rates as appropriate, new interventions and new technical and performance conditions, as well as significant changes to credit transfer, which was extended to all taxpayers and for any project.

Since 2007, there have been over 3.3 million of incentivized actions, with total savings equal to 1.31 Mtoe/year.

PAREER is a successful financial programme developed in Spain in the last years aiming to promote the energy retrofitting of buildings at national level. Direct subsidies and loans are provided for eligible projects according to the EE improvements and social criteria.

Box 3: PAREER, Spain

PAREER

Country: Spain

PAREER is based on the improvement of the thermal envelope (insulation of facades, windows and roofs) and the introduction of renewable energy and efficient electric and thermal installations in the existing buildings. The Energy Performance Certificate (EPC) is used to verify the EE of the building before and after the energy retrofitting measures.

Thanks to PAREER, up to 42.000 dwellings in buildings have improved their EE in Spain during the last 8 years. Under the new NECP of Spain, it is foreseen that a total of 120.000 private dwellings and 3% per year of the existing public buildings will be retrofitted by 2030.

5. Training for EE in Buildings

As mentioned in Table 24, the lack of skilled experts is one of the biggest barriers to the implementation of EE measures in the buildings. One of the activities of the meetMED project focused on the development of a “meetMED Survey on Energy Efficiency and Renewable Energy Sources Professional Training”, which assessed the status on the training courses in each meetMED partner country.

Based on a self-certification analysis, the conclusions of this survey indicate that Algeria, Jordan, Libya and Palestine have lower quality courses/seminars on the integration of renewable energy sources and energy efficiency in buildings.

In Algeria, for instance, there are too many EE and RES courses with low-quality levels. In Jordan, there is no formal vocational and educational scheme for the training courses on EE and RE. Lebanon and Libya have less courses and a gap in practical trainings, namely on the installation and integration of technical systems and RES technologies in buildings. Morocco has good training offers but are too focused on solar energy topics. Palestine has official national structures for training courses, but there is no specific law governing the system and there is a gap in its legal framework.

6. Recommendations and implications for future research and policymaking

The analysis of the Country Papers highlights a clear need to improve the implementation of EE measures for the building sector in the meetMED target countries.

6.1 Policies and Tools for Energy Efficiency in Buildings

Several recommendations - at different levels with respect to institutions, market and civil society concerned - can improve the implementation and dissemination of energy efficiency levels in the building sector across the Mediterranean region.

At the institutional level:

- **Simplification of existing regulations and standards towards more clear and pragmatic rules** – Some of the existing standards and regulations are very complex which, together with a lack of skilled professionals, hinders their implementation and compliance. Therefore, it is important to make sure that the existing measures are clear and pragmatic to apply.
- **Assign responsibilities for the implementation of EE measures in the building sector** – Each country should identify at least an institution to be responsible for the execution of the measures, namely the EEBC. These responsibilities should be clear in order to avoid impasses in their implementation. In particular, countries should consider implementing adequate measures to improve energy efficiency in new and existing buildings (including those classified as cultural heritage):

- **Establish EE Building Codes (EEBC)** - EEBC for the envelope of the buildings should be developed in the countries where they do not exist since they are one of the most effective measures to promote EE improvement in the building sector. EEBCs for the building systems, namely HVAC and lighting, are also very important and mostly not existing or implemented in the target countries.
- **Develop Energy Performance Certification systems / implement Green Rating Systems** – The calculation of the energy efficiency level of a building is important to quantify the results of the implementation of the EE measures. Besides this, EPC and rating systems allow building owners to distinguish their building based on its level of efficiency, which can have different economic and social consequences. These types of systems can also be associated with fiscal benefits. A way to enforce its implementation, for example, is to link them to the real estate market.
- **Implement a common Mediterranean green building rating system**
 - For all the Southern Mediterranean region in parallel of their national green building rating systems. The Green BOOCC GRASS_{MED} (Green Building Open Online Courses and Certification) under development by ALMEE and APRUE, with the support of ADEME, could be extended to the entire region. It will create a space for exchanging institutional and professional players and sharing knowledge and skills on sustainable building.
- **Establish MEPS in appliances** – Appliances are responsible for a big part of the energy consumption in the building sector. In order to minimize energy consumption levels, it is important to establish minimum standards for appliances most-commonly used in households and businesses, such as HVAC systems.
- **Establish Labelling in appliances** - Energy labelling should also be developed where it does not exist, as it is a useful tool to compare energy consumption levels between appliances. It is also useful to help the consumer understand and choose low energy consumption appliances.

- **Enforcement of measures through ex-ante and ex-post control** – Developing the requirements and creating the measures is not enough. The countries should develop enforcement mechanisms in order to guarantee the compliance of the measures. This control should be made at different stages of the processes (before and after implementation of the measure).

- **Enforce the implementation of EE Building Codes (EEBC)** - In order to minimize energy consumption levels in the building sector, namely regarding the consumption of the building itself, it is important to enforce the existing EEBC since its implementation is not mandatory in every country. The development of a specific roadmap is a good way to promote this enforcement.

- **Enforce the implementation of MEPS in appliances** - Several countries have already developed minimum energy performance standards, but their implementation is not mandatory in many of them. To maximize their benefits, the countries should enforce and monitor the implementation of these standards.

- **Enforce the implementation of Labelling in appliances** - Energy labelling should also be enforced and promoted since it is a useful tool to help the consumer understand and choose low energy consumption appliances.

- **Strengthen policy monitoring for decision making / Establish and improve data collection procedures** – Data collection and its subsequent analysis is very important to evaluate the effectiveness of the implemented measures, allowing the monitoring and evaluation of the evolution of the building sector in the countries. This data collection should also be comparable between the countries by establishing common data collection frameworks and benchmarks. At the same time, the countries should also develop Energy Efficiency Indicators (EEI) at the national level. It is also very important to clarify roles and responsibilities when it comes to monitoring information.

At the market level, in relation to implementation and dissemination of EE policies:

- **Obligations on national authorities/companies as well as on final owners/occupants** – The developed standards and measures should be of a mandatory nature in order to have better results in the energy efficiency levels of the buildings. Voluntary schemes are helpful but, in many cases, not implemented due to several reasons, such as higher costs or lack of knowledge.
- **Phase-out of inefficient products and systems** – The countries should reduce the use (manufacturing, importation and sale) of inefficient products, such as incandescent bulbs. In this case, the phase-out process should take into consideration provisions for the management of used lamps as well as incentives to reduce the costs of efficient lighting. The countries should also promote the implementation of highly efficient lighting in the streets.
- **Energy prices reform** – Although efforts have been made to reduce energy subsidies, EE development in the region is hindered by low energy prices. A reform of the structure of energy prices is crucial since the higher the local energy prices, the higher are the values of the energy savings and, therefore, the easier is to finance investments (shorter payback periods with high energy prices). Low electricity prices also make consumers choices on energy efficient solutions less economically rational.
- **Create financial incentives/instruments** – The shortage of financial incentives is one of the main barriers to the dissemination of efficient practices in the building sector. The countries should therefore put in place programs to encourage private owners/occupants to implement energy efficiency measures, by establishing funds and fiscal incentives as well as by creating credit lines and green finance instruments (for example insulation, heating and cooling systems, solar water heating systems).
- **Capacity building** – Training and capacity building is essential to overcome the lack of experts for construction and renovation, control and inspections and therefore to the implementation and compliance of EE measures, namely EEBC, and to the development of an EE market. The

countries should therefore invest in training programs and in knowledge and experience exchange at the regional and international level, in order to enhance capacity in these areas.

At the level of the civil society:

- **Demonstration projects** – The countries should develop demonstration projects as examples of good practices to the population. Public authorities should lead with projects in public buildings.
- **Raise awareness/Develop studies on EE benefits** – As described before, the lack of awareness on EE benefits is also one of the biggest obstacles to the dissemination of good practices. It is therefore necessary to develop awareness-raising campaigns for the different players of the energy sector, including decision makers. In addition, studies could be done to emphasise the messages and positive results of EE measures in the building sector.

Table 26 summarizes the main recommendations identified for the implementation and dissemination of energy efficiency measures in the building sector of the meetMED target countries.

Table 26: Main recommendations for EE in Buildings promotion

Institutional	Market	General public
<ul style="list-style-type: none"> • Simplification of existing regulations and standards • Clarified responsibilities for the enforcement of EE measures (EEBC, MEPS, labelling and Green Rating Systems) • Strengthen data collection and monitoring procedures 	<ul style="list-style-type: none"> • Streamlining obligations for market players and institutions • Phase-out of inefficient products and systems and promote internal market for efficient products and systems • Energy price reform and/or financial incentives for EE measures • Building capacity of market players (designers, installers, energy managers and auditors) and of public authorities 	<ul style="list-style-type: none"> • Public authorities leading by examples in public buildings and in demonstration projects. • Raise awareness of the final users and occupants as to the benefits of EE in buildings • Develop studies on EE benefits

6.2 Country specific recommendations

Besides these general recommendations, which are transversal to every country, some others are specific for each country, as illustrated in the chapters below.

6.2.1. Algeria

In order to improve the energy efficiency levels of its building stock, Algeria needs to overcome several barriers, including lowering the costs of energy, overcoming the lack of trained and skilled labour, the weak institutional framework and the low priority given to the energy situation. Table 25 lists the recommendations identified for Algeria.

Table 27: Recommendations - Algeria

Algeria	<ul style="list-style-type: none"> • Energy prices reform. • Strengthen institutional framework. • Energy prices reform. • Capacity development. • Regulation enforcement. • Awareness raising campaigns.
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6.2.2. Egypt

Egypt still faces some challenges regarding the promotion of EE in the building sector. These challenges are mainly related to unclear responsibilities on the implementation of the measures, lack of enforcement policy tools, low public awareness, lack of market control, inexistent data collection on the sector (monitoring of the evolution of the sector) and lack of financial incentives. Table 26 lists the recommendations identified for Egypt.

Table 28: Recommendations - Egypt

Egypt	<ul style="list-style-type: none"> • Establish a dedicated and independent agency to consolidate national EE efforts. The lead entity will also coordinate the cooperation between involved national institutions and secure enforcement of the EE in building measures and programs. • Clarify institutional roles and delimit responsibilities for national actors involved in the implementation of EE in building programs. • Strengthening the legal and regulatory framework for promoting energy efficient in building through the development of enforcement mechanisms. • Enforce buildings codes. • Reinforce and expand mandatory Minimum Energy Performance Standard (MEPS) programs and set up effective standard and label schemes in order to ensure that the performance and quality of EE in building materials and appliances can meet consumers' expectations. • Enhance the cost and quality of national manufactures products including EE materials and household's appliances and create a national EE industry. • Develop procurement guidelines to take into consideration EE in building concepts in new construction projects. • Promote Solar Water heaters and small-scale PV in residential, governmental and commercial sectors. • Set up a national database for EE in buildings, including all relevant statistics and the energy consumption patterns for home appliances in Egypt. • Develop a market monitoring system and an impact evaluation processes of EE in buildings projects. • Establish attractive and innovative financing schemes and incentives to overcome the identified financing barriers and promote EE in building programs and measures. • Conduct certified capacity development programs for public authorities, national experts, auditors, energy managers and all relevant stakeholders. • Increase awareness and build consumers' confidence on the quality and potential cost saving opportunities of EE in building measures and disseminate pilot projects outputs to promote the sustainability and replication of the results of EE in buildings projects.
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6.2.3. Jordan

Challenges for energy efficiency in the building sector of Jordan are again mainly related to unclear responsibilities on the implementation of the measures, lack of capacity building and lack of compliance measures for the existing building codes. Table 27 lists the recommendations identified for Jordan.

Table 29: Recommendations - Jordan

Jordan	<ul style="list-style-type: none"> • Develop a specific policy, which defines EE targets for existing building retrofits. • Develop national guidelines for EE retrofits in existing buildings. • Municipalities and Jordan Engineers Association (JEA) shall be delegated by JNBC to have the legal authority to inspect the implementation of the Jordanian codes in new buildings. This can be accomplished by modifying the internal regulations/instructions and regulation to include the inspection in their scope of work. • Capacity building on the inspection and follow up on the Jordanian codes shall be provided to municipalities' existing staff, JEA, A/E Firms and Contractors. • Buildings permits from municipalities shall be linked to the inspection of the building codes implementation. • Penalties on the consultant and the project developer shall be created and applied in case they did not commit with the codes. • Awareness campaigns on the importance of the implementation of the Jordanian codes shall be conducted regularly by the responsible organizations targeting the buildings' owners and projects developers. • Use available local building materials to reduce construction and EE measures cost. • Enforcement of energy audit for buildings especially for large buildings or complexes. • Establishment of EE database and develop EE indicators. • Involve all relevant stakeholders when designing policies. • Develop a proper monitoring and evaluation mechanism/tool.
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6.2.4. Lebanon

Lebanon is currently developing its energy efficiency building codes but there are still several barriers to the promotion of energy efficiency in the building sector, starting with the insufficient capacity building, lack of accreditation labs, lack of integrated governmental co-ordination in the implementation of standards, social resistance and low awareness of the population, among others. Table 28 lists the recommendations identified for Lebanon.

Table 30: Recommendations - Lebanon

Lebanon	<ul style="list-style-type: none"> • Enforce TSBL2010 and EEBC • Promote ARZ and GRASSmed EE Building labelling systems. • Set a realistic budget, acceptable for majority of politicians, departments and public for the implementation of TSBL2010 and EEBC. • Develop an EEBC Enforcement strategy, and plan which entity will enforce what and how - use existing structures. • Develop an enforcement mechanism; use a smart mix of different enforcement actions from permitting to training. • Assign an independent entity for objective data gathering on TSBL2010 and EEBC implementation. • Evaluate TSBL2010 and EEBC compliance, energy consumptions and spin-off effects like jobs creation etc. • Take lessons learnt from evaluation results and update policies • MEPS need to be developed and approved. • Labelling standards need to be developed (recovering previous drafts) and approved. • Develop legislation for mandatory labelling and certification procedure for local and imported goods. • Make periodical analysis of the market.
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6.2.5. Libya

Libya is the least developed country with respect to the promotion of energy efficiency in the building stock due to several challenges, including high political, security and governance risks, absence of national EE regulatory and institutional frameworks and low energy and electricity tariffs especially for the residential sector. Table 29 lists the recommendations identified for Libya.

Table 31: Recommendations - Libya

Libya	<ul style="list-style-type: none"> • Develop and enforce national EE policies and regulation that will help to create the necessary conditions to • promote a sustainable program for EE in buildings. • Design national strategies and action plans with a fixed progressive target (medium and long-term NEEAP) to enhance energy efficiency in all sectors, particularly in buildings, where the highest rates of consumed energy are registered. • Support technically, financially and institutionally REAOL and strengthen its national role in implementing and coordinating EE in building projects. • Develop and enforce a national energy code for buildings. • Establish a sustainable EE in building data base (Statistics and indicators) as well as a stable analysis process to improve decision-making and monitoring. • Introduce monitoring and evaluation mechanisms to assess EE impacts at micro and macro level. • Set up a dedicated EE Fund, financial schemes and incentive mechanisms to promote EE in building applications. • Enhance information sharing and coordination between national stakeholders. • Improve energy performance of appliances and lighting systems through the implementation of label and standards and MEPs national program. • Supporting R&D, technology transfer and industrial development of EE in building technologies, available through bilateral, regional, and international cooperation and funding mechanisms. • Put more emphasis on enhancing national expertise and conducting qualified educational and capacity development programs on EE in buildings for a Sustainable Development in Libya. • Implement national awareness campaigns and widely disseminate all EE technologies, application, savings and impacts for the building sector.
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6.2.6. Morocco

Despite its high advancements on the implementation of energy efficiency measures in the building sector, Morocco stills needs to overcome some barriers, mainly when it comes to the enforcement of the existing regulations, the lack of national expertise and low public awareness. Table 30 lists the recommendations identified for Morocco.

Table 32: Recommendations - Morocco

Morocco	<ul style="list-style-type: none"> • Set up an effective and reliable regulatory framework through the enforcement of relevant EE regulations and the elaboration of application texts on the procedures for issuing authorisations and the additional documents to be supplied indicating their compliance with the thermal construction regulation in Morocco: Prescriptive sheet/ Site description/ Completion certificate. • Enforce the existing buildings code, which is not mandatory yet. • Enhance AMEE expertise and consolidate its human and financial resources in order to support and reinforce its role in the effective implementation of EE policy and in the successful achievement of the national EE goals. • Enforce MEPS program and implement national building energy certification systems as well as energy performance standards and norms for EE appliances, building materials and envelops. • Introduce more incentives to apply EE measures in buildings and assign a dedicated energy efficiency fund or a specific financial scheme for long term EE policy development and implementation. • Development of financial instruments and economic models specific to EE in buildings design and evaluation. • Establish a dedicated database for EE in buildings and a regular data collection mechanism as well as standards to ensure the sustainability of the database. • Set up an evaluation and follow up mechanism for the impacts and savings of the implemented programs on EE in buildings as well as a regular monitoring of the NEEAP progress. • Building a national industry dedicated to EE in buildings (Manufacturers of products, materials and high-performance equipment...). • Increase the involvement and expertise of local communities in the EE projects and national programs.
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- Reinforce and qualify national expertise and knowledge through the implementation of dedicated and certified capacity development activities in EE in building (Certified Energy manager and auditor training, EE architects and builders...).
- Strengthen EE knowledge by conducting awareness campaigns for all national stakeholders, including the banking sector and share and spread information on financing options for EE investments, cost effectiveness, available technologies.
- Promote R&D in EE for the building sector, since this represents an essential element for long-term mastery of technologies, the development of know-how and the improvement of EE performance.

6.2.7. Palestine

The relevant energy dependence from neighbouring countries on electricity availability, the weak enforcement of existing regulations and the low knowledge and capacity of public and private stakeholders are some of the existing barriers that Palestine still faces to successfully promote energy efficiency in the building sector. Table 31 lists the recommendations identified for Palestine.

Table 33: Recommendations - Palestine

Palestine	<ul style="list-style-type: none"> • Enforcement of EE regulations and green buildings code. • Effective implementation of NEEAP recommended measures with a great impact on energy saving namely: moving to efficient lighting, introducing more efficient fridge, substituting electricity heating by gas heating, thermal insulation. • Introduction and promotion of appropriate new technologies linked mainly to household's appliances, such as smart thermostat, metering and home appliances. • Enforcement of a mandatory labelling and certification initiatives as well as set up of high-quality standards performance and technical specifications programs for home appliances. • Integrate EE requirements and building code into the construction, inspection and maintenance processes. • Allocate specific responsibilities to relevant national stakeholders as well as build a network or cooperation scheme among the main actors by also involving local authorities in the process. • Introduce more incentives mechanisms and attractive financing schemes to apply EE measures in buildings. • Energy audit enforcement in the commercial and governmental buildings. • Increase public awareness and communication campaigns for market actors including decision makers, consumers and manufacturers. • Set up EE indicators and statistics linked to EE in buildings as well as a monitoring tool to follow up national achievements. • Regular review and evaluation of NEEAP implementation and definition. • Reinforce and qualification of national expertise and knowledge through the implementation of certified capacity development activities, consultants, energy managers and auditors, architects, etc.
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6.2.8. Tunisia

Tunisia also faces some challenges on EE promotion, including, for instance, the lack of qualified human resources at the municipal level, legal gaps in the existing regulations and a lack of compliance tools. Table 32 lists the recommendations identified for Tunisia.

Table 34: Recommendations - Tunisia

Tunisia	<ul style="list-style-type: none"> • Strengthen the institutional system by providing ANME with the necessary human and material resources to apply obligations to all buildings / construction projects that are subject to certain codes or by-laws • Accelerate the development and the promulgation of the regulatory framework for certification and energy labelling of the remaining household appliances. • Provide the Technical Center for Mechanical and Electrical Industries (CETIME) with the necessary laboratories to carry out the various tests to measure the energy performance of the household appliances concerned by the certification and labelling program. • Strengthen the market control system and take the necessary measures to limit the parallel trade in household electrical appliances. • Accelerate the implementation of all elements of the “ecoBAT” labeling scheme. • Accelerate the implementation of the “PROMOISOL” mechanism and ensure the quality assurance of the entire value chain and simplifying procedures for all stakeholders. • Simplify the procedures for granting financial incentives through the Energy Transition Fund “ETF” and continuously adjust the rates, ceilings and credits for the most cost-effective / promising EE measures and technologies.
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6.3. Recommendations for Regional Cooperation

Regional cooperation and knowledge exchange among countries is essential to strengthen the national tools that support EE implementation. Flexible and responsive regional cooperation could be established in task forces/technical platforms with a focus on: (i) promoting implementation and monitoring of national measures for EE in buildings; (ii) dissemination and awareness raising of EE in buildings measures among stakeholders and the general public; (iii) prudent proposals for short term harmonization to overcome differences in regulation among individual countries.

The main points identified for regional cooperation between the meetMED partners are:

- **Regionalisation** of building standards, markets for energy efficient construction materials and equipment, capacity building for public authorities and market players (energy managers, energy auditors, technicians);
- **Development of cooperation programs** to finance large scale projects (e.g. PEEB) at national and regional level
- **Monitoring and benchmarking EE at the regional level:** together with national policy monitoring and existing international and regional benchmarks, an established and harmonized practice to monitor and benchmark at the regional level could contribute to better define priorities and decision making. Building a common understanding of trends and evolutions could help countries to define their position in the international arena and to establish ambitions, scenarios and common visions;
- **Cross sectoral and multi-stakeholder dialogue at the regional level** for better coordination and efficiency (including technical and financial partners, ministries and public institutions, public and private sectors, experts, etc.): better understanding and knowledge of the building sector, as well as involvement of all concerned stakeholders in the dialogue could open new opportunities at the national, regional and international level. The regional level is the key bridge to improve coordination, synergies, mutual understanding and finally actions that thwart natural competition between stakeholders and organizations;

- **Raise awareness and dissemination of methods, tools, good practices,** etc.: communication on EE benefits shall be strengthened by addressing different targets, such as national and local decision makers, the private sector and civil society, including the simple citizens. The role of regional networks could be to develop strategies for better dissemination, awareness raising and communication on these dedicated topics providing guidelines, studies and tools.

7. Conclusions

Based on the country reports, the target countries of the meetMED project have overall improved their energy efficiency levels in the building sector through action plans and regulatory frameworks (Egypt, Jordan, Lebanon, Morocco and Tunisia having the strongest regulatory frameworks).

Several actions can be taken in order to improve energy efficiency in the building sector. First, the countries should strengthen their regulatory frameworks and tighten up institutional responsibilities for the enforcement of mandatory EE Building Codes, Energy Performance Certification/Rating Systems, Minimum Energy Performance Standards and Labelling Systems. Finally, data collection and monitoring at the national and regional level are essential to evaluate the effectiveness of existing policies and to plan ahead the achievement of the expected targets.

From a market perspective, low energy prices continue to discourage the adoption of energy efficient solutions. Energy prices reform and financial incentives are therefore key to support private owners/occupants to implement energy efficiency solutions in their buildings/units. Training and capacity building of designers, installers, energy managers and auditors shall overcome the lack in the market for the specialised expertise in energy efficient construction, renovation, control and inspections.

Finally, all these efforts and recommendations would be vain, if the civil society were not aware of the benefits associated to the implementation of energy efficient solutions in buildings. Awareness campaigns and pilot demonstration projects are among the instruments used to increase awareness on the benefits of integrating energy efficient solutions in their buildings.

In this context, regional cooperation should reinforce the technical capacity at all levels and facilitate the dialogue among stakeholders towards the harmonisation of standards, regionalisation of markets for goods and services, monitoring and benchmarking policies.

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