Mapping of the Building Sector in National Strategies of Egypt, Jordan, and Lebanon

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Acronyms and abbreviations

BAU	Business as Usual
CBO	Community-Based Organization
CIP	Capital Investment Programme (Lebanon)
COP	Conference of the Parties
COVID-19	Coronavirus Disease 2019
CO_2eq	Carbon Dioxide equivalent
GDP	Gross Domestic Product
GG-NAP	Energy Sector Green Growth National Action Plan (Jordan)
GHG	Greenhouse Gas
Gt	Gigaton
GWh	Gigawatt Hours
HBRC	Housing and Building National Research Center (Egypt)
IDG MATRIX	Integrated Development Group (Egypt)
IKI	International Climate Initiative
ISES	Integrated Sustainable Energy Strategy (Egypt)
Ktoe	Kiloton of oil equivalent
LCEC	Lebanese Center for Energy Conservation
LED	Light-emitting Diode
LEDS	Low Emissions Development Strategy 2050 (Egypt)
LEED	Leadership in Energy and Environmental Design
LEV	Lebanon Economic Vision
LT-LEDS	Long-Term Low Emissions Development Strategy (Egypt)
MENA	Middle East and North Africa
NAP	Climate Change National Adaptation Plan (Jordan)
NCCS	National Climate Change Strategy (Egypt)
NCAP	National Cooling Action Plan (Lebanon)
NCP	National Cooling Plan (Lebanon)
NCS	National Cooling Strategy (Jordan)
NDC	Nationally Determined Contribution
NEEAP	National Energy Efficiency Action Plan
NREAP	National Renewable Energy Action Plan for the Republic of Lebanon
NSS	National Standardization Strategy (Jordan)
PJ	Petajoule
RE	Renewable Energy
RSS	Royal Scientific Society (Jordan)
TWh	Terawatt Hours
UNFCCC	United Nations Framework Convention on Climate Change

Executive Summary

Improvements to the construction, daily operation, and maintenance of buildings are one of the most effective ways to enhance both climate change mitigation and adaptation. The building sectors in Egypt, Jordan, and Lebanon consume large shares of the countries' total energy and cause significant levels of greenhouse gas (GHG) emissions. To foster emission reductions and energy efficiency across sectors, all three countries have issued several national policies and plans.

Egypt, Jordan, and Lebanon have elaborated several comprehensive national strategies to combat climate change and adapt to its subsequent results on the people and economy. This - for example- includes Nationally Determined Contributions (NDCs), National Energy Efficiency Actions Plans (NEEAPs), and other national strategies. This report maps the building sector in those national strategies in Egypt, Jordan, and Lebanon and evaluates their coherence. In a first step, we identify relevant strategies including agendas for sustainable economic development, energy sector plans, and climate change commitments. Subsequently, we explain each of the strategies and the respective importance of the building sector. Next, we summarize the findings for each of the three countries. To conclude, we assess the coherence of policies and plans and the role of the building sector across countries and derive initial ideas on policy recommendations.

The report finds that building sector can be better covered in most of the strategies. Most documents do not explicitly target the building sector but refers to a related sector or a subsector if any, such as adequate housing or the residential sector. In line with this finding, a limited number of the national plans commit to targets for the building sector or states emission saving potentials. In terms of the outlined specific measures, the policies are coherent, but mostly do not set quantitative targets, costs, or timelines.

Based on the findings, we provide initial ideas on policy recommendations to boost efforts in the building sector through strategies and plans:

- Feature the building sector more prominently in national strategies.
- Commit to quantitative targets for the building sector in policies and plans.
- Explain the specific measures in more detail.
- Increase coherence between different strategies.

By incorporating these recommendations, the national strategies in the countries can ensure that the building sector is given the appropriate importance and coordinated with other relevant sectors. This is imperative, considering that construction and buildings are crucial for both climate change mitigation and adaptation.

1 Introduction

The Middle East and North Africa (MENA) region was at the center of international climate negotiations in 2022 and 2023, hosting the United Nations Climate Change Conference (UNFCCC) Conference of the Parties (COP)27 in Egypt and COP28 in Dubai. The importance of climate change mitigation for the MENA region aligns with the challenges the region is facing from rising global temperatures. As one of the most vulnerable regions to climate change in the world, it – already today – experiences extreme high temperatures with temperature increases twice the global average, precipitation variability leading to both droughts and floods, and sea level rise resulting in coastal erosion (The World Bank Group 2022; World Economic Forum 2023).

Governments have responded to these threats by introducing stringent climate policies and greenhouse gas (GHG) emission mitigation targets. These commitments ought to cover the building sector as well, as it significantly contributes to overall emissions and is expected to grow substantially over the next decades due to rapid urbanization (United Nations Environment Programme 2018).

This report will analyze the building sector in strategies of Egypt, Jordan, and Lebanon. It assesses national action plans and climate policies to determine if and how the building sector is covered. In addition, the report compares objectives and targets for the building sector as well as suggested measures to determine their coherence across strategies. To conclude, it will compare results between countries and provide policy recommendations to enhance the relevance of the building sector in national strategies.

1.1 The BUILD_ME project

This report was prepared by Guidehouse Energy, Sustainability and Infrastructure (Guidehouse ES&I) as part of the BUILD_ME project. BUILD_ME is financed by the International Climate Initiative (IKI) and aims to increase ambitions towards achieving climate-neutral building standards in the MENA region by providing technical assistance for pilot projects and facilitating policy dialogue. The main target countries are Lebanon, Jordan, and Egypt.

The project is divided into three main phases: Phase I from 2016-2018, Phase II from 2019-2021, and Phase III from 2022-2025. During the first project period, a comprehensive understanding of the barriers to invest in energy-efficient or renewable energy (RE) based heating and cooling systems in the region have been developed, which led to several recommendations to address these identified barriers. The second phase of the project focused on implementing, upscaling, and permanently adopting the recommendations developed in the first phase. Phase lll targets the roll-out of recommended policies and tools to reach implementation at all levels, such as the national building classification system.

Through a policy dialogue with relevant stakeholders, BUILD_ME aims to improve building code implementation and incorporate building sector specific targets into their national and local strategies.

1.2 The building sector in national strategies

The daily operation, maintenance, and construction of buildings contribute significantly to global warming, and their emissions are expected to increase further. The building sector includes services which require significant energy consumption such as heating and air conditioning

systems, ventilation, domestic hot water, and interior lighting, as well as all other equipment commonly used in buildings, e.g., electrical appliances, commercial and industrial cooling, and office technology. In 2022, buildings accounted for 26% of annual global energy related emissions and for 30% of final energy consumption (International Energy Agency 2023a). Both the emissions as well as the energy demand from buildings are expected to grow, with a predicted increase in final energy demand of around 50% by 2050 compared with 2015 levels. Reasons include a rapid urbanization witnessed in many countries and the doubling of the built surface area (United Nations Environment Programme 2018).

Even though much progress has been made regarding the energy demand of the building sector in the last years, more rapid changes are required. The use of efficient buildings technologies is accelerating and performance standards as well as building codes are increasing in scope across countries (International Energy Agency 2023a). Still, to remain below the temperature limits agreed on in the Paris Agreement, the decarbonization of the building sector need to be accelerated. This can be driven by stringent emission or energy demand reduction targets (United Nations Environment Programme 2018).

Countries set climate targets in policies such as NDCs under the Paris Agreement and National Energy Efficiency Action Plans (NEEAP). As of October 2023, 87% of NDCs – 168 out of 194 countries – include measures for the building sector. Most mention energy efficiency measures in design, such as building codes, followed by energy efficiency in appliances, RE, and building materials. However, only 18% of NDCs specify quantifiable targets (Programme for Energy Efficiency in Buildings 2023). Furthermore, even if countries commit to specific targets in the building sector, these might not be consistent with goals set in other climate strategies or mitigation potential defined elsewhere.

1.3 Study objectives

This study delves into targets, emission mitigation potential, and measures for the building sector in Egypt, Jordan, and Lebanon. It aims to:

I. Identify existing climate policies, national strategies, and ongoing actions,

II. Zoom into the relevance of the building sector in the identified documents,

III. And assess the coherence across national strategies per country.

For each country, the analysis will provide an overview of all the relevant strategies that cover sustainable development, climate action, and/or the building sector. For each of these, it will outline the recommended qualitative or quantitative climate actions – if any. A comparison of the different commitments and targets will allow to identify differences in approaches, calculations, and diverging assumptions. The main output is to provide an assessment of the coherence of targets and mitigation potentials for the building sector in policies in Egypt, Jordan, and Lebanon. The purpose of this report is not to compare the countries to each other, but to thoroughly analyze each country separately. Based on the findings, the report will outline opportunities to increase coherence and the importance of the building sector across strategies.

1.4 Methodology

The study builds on desk research and support from local institutions. In a first step, the authors gather background information about the case study countries and their building sector.

Subsequently, all relevant climate policies, action plans, and sector strategies are identified in collaboration with institutions from the respective countries. These institutions include the Integrated Development Group (IDG MATRIX) and the Housing and Building National Research Center (HBRC) in Egypt, the Royal Scientific Society (RSS) in Jordan, and the Lebanese Center for Energy Conservation (LCEC) in Lebanon.

After gathering all relevant documents, the authors screen them for mentions of construction and the operations of buildings, such as heating and cooling. We thereby identify Egypt's, Jordan's, and the Lebanon's targets, specified mitigation potentials, and measures for the building sector.

Based on the identified targets, actions, and mitigation potentials, a country-by-country analysis is conducted. For each country, the national context, the relevant strategies, and the building sector in the documents is outlined, followed by a sub-conclusion.

All strategies for each of the countries is entered into a matrix, highlighting the importance of the building sector in the respective document. The conclusion depicts the matrix to provide an overview of all documents and assess the overall coherence of government targets, not comparing the countries to each other, but rather considering all strategies across countries. Building on the findings, we provide policy recommendations to enhance the importance of the building sector in national strategies.

2 Country-by-country results

The results for Egypt, Jordan, and Lebanon are presented hereafter. For each of the countries, the chapter explains the respective country contexts and provides an overview of the relevant strategies. Subsequently, the role of the building sector in each of the documents is detailed. Lastly, the conclusion sections summarize the findings for each country.

2.1 Egypt

2.1.1 Country context

Egypt is a fast-growing country, both in terms of population and the economy. The population more than doubled in the last 40 years, reaching 112 million in 2023. The GDP likewise grew rapidly in the last decades, with an increase of 3.8% in 2023. The country's total GDP reached $395 billion, equaling a GDP per capita of $3,512. In the same year, inflation was at 33.9% (The World Bank Group 2024a). This steady growth exacerbates resource competition and the potential impact of climate change.

Already today, Egypt is highly vulnerable to climate change, mainly due to its geography. The vast majority of Egypt's population lives along the Nile or on the coasts. Climate change will on the one hand accelerate desertification and on the other put pressure on the coastal zones by rising sea levels and extreme weather events. In addition, the Nile Delta is considered one of the most vulnerable hotspots mega-deltas on earth (Intergovernmental Panel on Climate Change 2007).

Regardless of the threat posed by climate change, GHG emissions as well as energy consumption continues to increase. The total emissions from fuel combustion reached 207 Gt CO_2 in 2021, a 107% increase from the year 2000. The per capita emissions hit 1.9 t CO_2 in 2021, up 35% from 2000. The electricity production almost tripled since 2000, reaching 210 TWh in 2010. More than 80% is provided by fossil gas, with hydro, solar, and wind contributing only 11.5% (International Energy Agency 2023b).

The building sector has by far the largest electricity consumption of all sectors. Building appliances in residential, public, and government buildings account for approximately 50% of total electricity consumption. One of the reasons is that many of the existing buildings are not energy efficient as they are relatively old. Furthermore, more than a third of the population lives in informal, i.e., unsafe and unplanned, urban areas that provide little safety to climate change (Ministry of Planning and Economic Development, Egypt 2023).

To lower electricity consumption in buildings, the government has issued several actions, laws, and regulations over the past 8 years. The Decree No. 180 issued in 2003 for instance prescribes the mandatory application of energy efficiency standard specifications and labels for home appliances. The energy efficiency building codes for new residential, and commercial buildings were enacted by ministerial decrees issued in 2005, 2009, and 2010. A green building rating system for new buildings was introduced in April 2011. The provisions of Electricity Law No. 87 from 2015 and its executive regulations issued in 2016 include articles on energy efficiency improvement.

2.1.2 National strategies

In addition to the aforementioned laws and regulations, Egypt issued several strategies and plans related to sustainable buildings. These can be categorized into three distinct groups. The first focuses on the sustainable development of the economy, the second on energy and energy efficiency, and the third on climate change adaptation and mitigation.

The main strategy fostering sustainable development in Egypt is the National Agenda for Sustainable Development: Egypt's Updated Vision 2030. The original development strategy was published in 2016, the updated vision was issued in 2023. Egypt's Vision 2030 provides a clear direction for the country's efforts to achieve sustainable development across its economic, social, and environmental dimensions. A second policy is the Low Emissions Development Strategy 2050 (LEDS), also referred to as Long-Term Low Emissions Development Strategy (LT-LEDS). So far, it has not been published for public access and only a high-level summary of the content is available in the form of a presentation. According to the summary, the LEDS gathers all the national efforts in the field of climate change mitigation, such as from Egypt's Vision 2030, estimates investment costs for mitigation actions, and provides quantitative emission mitigation scenarios in all sectors.

Two strategies outline efforts in the energy sector: the National Energy Efficiency Action Plan (NEEAP) and the Integrated Sustainable Energy Strategy to 2035 (ISES). The 2nd NEEAP 2018/2019 – 2021/2022 builds on the first version and outlines pathways to achieve energy efficiency improvements across sectors without affecting growth or production rates in compliance with ISES. The 2nd NEEAP further aims at merging energy efficiency improvement policies into energy and environment policies and lays out a governance system for energy efficiency activities to ensure supervision, coordination, follow up, and data exchange among the relevant stakeholders. The ISES was published in 2015 and is an important guide for Egypt on how to produce, use, and conserve energy. It develops an energy mathematical model to inform on the best energy mix for the country. A third strategy, the National Cooling Action Plan, is currently under development.

Three documents govern Egypt's response to climate change. Egypt's National Strategy for Adaptation to Climate Change and Disaster Risk Reduction from 2011 aims at reducing climate change related disasters and at increasing the flexibility of the Egyptian community in dealing with the risks and disasters caused by climate change and its impact. The National Climate Change Strategy 2050 (NCCS) issued in 2022 lays down the directions and policies to be adopted by the country to fulfil its climate action aspirations while materializing the desired economic outputs. It can be viewed as a roadmap for achieving the objective of meeting the challenges of climate change in terms of adaptation and mitigation within the framework of the updated Egypt's Vision 2030. And finally, Egypt's Second Updated NDC from 2023 summarizes the country's mitigation and adaptation ambitions. It is aligned with other policies, including Egypt's Vision 2030, LEDS, and NCCS.

2.1.3 Relevance of buildings per strategy document

The National Agenda for Sustainable Development Egypt's Updated Vision 2030

The Vision formulates six strategic goals, such as Quality of Life and Living Standards, Social Justice and Equality, and Integrated and Sustainable Environmental System, each comprising several general goals. While none of the strategic goals is on the building sector, i.e., has buildings or housing in its title, some of the general goals touch upon buildings. For instance, the

general goal of Facing Climate Change Challenges calls for regularly updating environmental legislation and standards in the energy, industry, transportation, tourism, and housing sectors.

More explicitly, access to adequate housing is a general goal to improve Egyptians' quality of life. As part of this goal, at the individual level, the Vision strives to guarantee access to adequate housing for all Egyptians at affordable prices. At the societal level, the Vision aims to develop cities characterized by modern infrastructure and abundant green spaces. Most of the measures deal with access to safe drinking water and sanitation. Two measures touch upon energy usage in buildings. One aims at increasing the share of the population using clean cooking fuels and technology from 99.9% to 100%. The other measure aims at a percentage of buildings in new cities using RE of 75% in 2030, up from 25% in 2019.

Low Emissions Development Strategy 2050 (LEDS)

According to the available summary, the LEDS covers several sectors, such as the electric power generation sector, the industrial sector, the transport sector, and the building sector. For the building sector, it suggests one concrete measure, namely implementing energy efficient lighting in governmental buildings. The summary does not specify quantitative targets, costs, or a timeline.

Second National Energy Efficiency Action Plan (NEEAP) 2018/2019 to 2021/2022

Egypt's 2nd NEEAP aims at achieving energy efficiency in both the demand and the supply side. Concerning energy efficiency in terms of the demand side, improvement measures address the sectors of buildings, tourism, industry, public lighting, and education. The 2nd NEEAP is closely aligned with the ISES and echoes some of its measures.

One chapter explicitly covers energy efficiency procedures in the building sector. Proposed measures include a new mechanism for the distribution of LED lightbulbs for the residential sector, the introduction of energy efficiency specializations and labels, adjustments to the organizational frameworks of new buildings, and the activation and enforcement of energy efficiency building codes with a respective specialized committee.

Some measures are linked to quantitative targets and energy savings. The number of installed solar water heating systems for instance should reach 800,000. The number of initial buildings on which energy efficiency standards for instance for electric appliances are to be applied is 30,000. Replacing one million refrigerators would reduce electricity demand by 2,520 GWh by the end of 2021/2022.

Integrated Sustainable Energy Strategy (ISES) 2035, Volume 1

While the ISES does not explicitly feature the building sector as an own chapter, it details measures to achieve energy efficiency improvements, some of which target buildings. The energy mathematical model highlights that 20% energy savings can be achieved in the building sector by 2035, compared to the baseline scenario. To achieve those cuts, the strategy outlines a variety of different measures and tools.

These measures include energy refurbishment of existing buildings envelope and systems through financial support for energy efficient renovation and solar photovoltaic rooftop incentives. The gradual removal of energy subsidies and the distribution of vouchers should accelerate the replacement of existing electric appliances with energy efficient ones. Other

measures outlined include changing the behavior of building occupants, the introduction of energy performance certificates, improvements to thermal insulation and design to enhance efficiency of heating, ventilation, and air conditioning systems, as well as the effective introduction of building codes and standards. The only quantitative goal is the move towards compliance of 20 new buildings with low or zero carbon standards to set a precedent.

In addition, the ISES acknowledges that a wide scale national program needs to be developed and adopted. Although some efforts have been made to promote and increase the energy efficiency of buildings through projects, programs, and initiatives, they have been hampered by limited coordination of efforts and accumulation of gained experience. Also, the lack of adequate enforcement of building codes and appliance energy labelling program requirements hinders successful implementation. Thus, a joint approach across stakeholders is crucial to ensure effective and sustainable change.

Egypt's National Strategy for Adaptation to Climate Change and Disaster Risk Reduction

The strategy assesses the current situation in the coastal zone that intersects with the following other sectors: water resources and irrigation, agriculture, health, urban areas, housing and roads, and tourism. With respect to urban areas and population distribution, a detailed account has been given on land reclamation projects and the impact of climate change on population, housing, and roads. The main risk stems from natural disasters, especially on old buildings and structurally weak ones.

The document outlines several adaptation measures in the field of housing and buildings. It suggests initiating the replacement and renovation of old houses in urban and rural areas and providing temporary housing to their residents until their homes are strengthened. Other options include efficient energy utilization, use of environmentally friendly construction material, and issuing green architecture and energy codes.

For some measures the costs are explicitly stated. Evaluating the condition of houses and their suitability to resist climate change impact, especially houses in coastal areas, is estimated at 4 billion Egyptian pounds (around €75m, based on the exchange rate in August 2024). Reviewing present construction codes and developing them to be compatible with climate change in terms of energy, temperature, and water amounts to 50 million Egyptian pounds (€1m, based on the exchange rate in August 2024).

National Climate Change Strategy (NCCS) 2050

The NCCS does not explicitly target the building sector. However, it does outline two measures on buildings as part of its first main goal: achieving sustainable economic growth and low-emission development in various sectors.

The first measure includes the adoption, activation, and implementation of the local and global green building codes for new and existing buildings and communities. The second calls for improving energy efficiency in buildings in general. The costs for the housing and utilities mitigation program are estimated at $31m, without specifying the underlying measures and their respective costs.

Egypt's Second Updated Nationally Determined Contributions (NDC)

The NDC commits to GHG emission reduction of 37% compared to BAU in 2030. To achieve this target, measures across sectors are essential, such as in the sector of buildings and urban cities.

Specific measures on buildings for emission mitigation include rooftop solar photovoltaic panels for electricity generation, the installation of 5,300 solar water heater systems and expanding the use of LED lighting in the residential sector. In addition, energy efficiency codes for new buildings are to be activated and procedures for the renovation of existing buildings to meet energy performance standards to be adopted, along with voluntary green buildings guidelines.

On the adaptation side, the NDC commits to directing city planning and architectural design towards meeting the requirements of green architecture and climate resilience, thereby reducing the risks from climate change impacts, e.g., heat stress and floods. In addition, the policy calls for the renovation of old houses in urban and rural areas including informal housing.

Only one measure related to buildings and urban cities has costs attributed: Fostering energy efficient cooling in buildings is estimated at $250m. However, the NDC is subject to verification to get clear quantitative measurers towards application, hence more quantitative targets might follow.

2.1.4 Conclusion for Egypt

The conclusion sheds light on three aspects: the interconnectedness of strategies, the significance of the building sector, and tangible measures stated in the documents.

Egypt has issued a great number of strategies on energy, sustainability, and climate change. These policies are deeply intertwined and build on each other. For instance, the NDC update is aligned with Egypt's Vision 2030, the LEDS, the NCCS, and the National Strategy for Adaptation to Climate Change and Disaster Risk Reduction. The 2nd NEEAP echoes many measures that are featured in the ISES, and the NCCS can be viewed as a roadmap for achieving the objective of meeting the challenges of climate change within the framework of Egypt's Vision 2030.

While these strategies are well connected, it does not always become clear what exactly an alignment with other policies implies and what measures are taken from which policy. For instance, the 2nd NEEAP prominently features ISES, without clearly stating what measures are taken from ISES and which are introduced through the 2nd NEEAP.

In terms of the significance of the building sector, there is still room for improvement, as only four out of the seven analyzed strategies explicitly cover the building sector. Furthermore, even those that do feature the building sector do not use a coherent terminology or definition. The 2nd NEEAP and the LEDS explicitly refer to the building sector, the policy on adaptation to climate change has a section on Housing and Roads, and the NDC outlines measures for Buildings and Urban Cities. In line with different terminology, the suggested actions vary in scope, sometimes covering aspects such as city planning or road construction.

On a positive note, all seven strategies commit to measures targeting housing and buildings, even those policies and plans that do not explicitly consider the building sector. However, tangible measures are missing in most of the documents. The stated measures remain rather general, like implementing energy efficient lighting, without specifying what technology should

be used, the number of units installed, the timeline, the costs, and the energy saving and hence the GHG emission mitigation potential.

Overall, the strategies are a great foundation for sustainability measures in the building sector. They could benefit from enhanced interconnectedness, a clear focus on construction and buildings, and tangible, well-defined, and harmonized measures, for instance in the 3rd NEEAP.

2.2 Jordan

2.2.1 Country context

Jordan is a country with moderate growth rates of population and GDP. The population grew by about 0.5% in 2023 to a total of around 11.5 million, of which around 40% live in the capital Amman, the country's economic, political, and administrative center. The GDP grew by about 2.6% in 2023, reaching $50.8 billion or $4,482 per capita. In the same year, the inflation was 2.1% (The World Bank Group 2024b).

Most of the country's surface area is being taken up by desert and accordingly, the climate is generally very arid. It is characterized by long, hot, and dry summers and short, cool winters. The eastern part of the country, which is part of what is known as the North Arab Desert, receives the lowest rainfall throughout the year, averaging less than 50 millimeters annually (Ministry of Environment 2021). Congruently, Jordan is a very sunny country with a high number of sunshine days per month (up to 29.3 days in July) and sunshine hours per month (up to 390 hours in July), which contributes to the country's enormous solar potential (Alrwashdeh 2018).

Recently, Jordan has started to tap into its large solar potential, but still heavily relies on imports to meet its energy demand. The share of renewable energy consumption of total final energy consumption increased substantially, from 3.2% in 2015 to 11.5% in 2021 (The World Bank Group 2024d). Most of the country's energy demand is still met with fossil fuels from neighboring countries, resulting in import shares of around 93% of the country's total energy needs in 2018. Emissions were 1.9 t CO_2 per capita in 2020 (The World Bank Group 2024b). Both the emissions and the energy consumption are expected to increase significantly over the next decades.

Much of the energy consumption and the energy-related emissions can be attributed to the building sector. Lighting, cooling, and heating represent the largest share of energy consumption in Jordan, and residential buildings account for about 46% of total electricity consumption and 21.5% of total energy consumption. Furthermore, electricity usage in commercial and residential buildings is one of the primary sources of emissions in the country. Energy demand, electricity consumption, and emissions from the building sector show large growth rates (The World Bank 2020).

To limit the rise of energy demand of buildings, the country attempts to increase their energy efficiency. Various laws and regulations were passed in the last decades, including the Thermal Insulation Code (1998), the Energy Efficient Building Code (2010), the Solar Energy Building Code (2012), and the Mechanical Ventilation and Air Conditioning Code (2018). In addition, the Green Building Guideline of Jordan was issued by the RSS containing parameters and credits that are suitable for Jordan's climate, resources, legislation, and policies.

2.2.2 National strategies

In addition to the aforementioned laws and regulations, Jordan issued a number of action plans and strategies that touch upon the building sector. They can be categorized into three groups, similar to Egypt's strategies: energy, climate, and sustainable economic development.

On energy, the country focuses on energy efficiency and the development of the energy sector. The two NEEAPs 2012-2014 and 2018-2020 outline all efforts that are taken place to foster energy efficiency. The Prime ministry approved the third NEEAP 2024-2026 to be published and implemented by the Ministry of Energy and Mineral Resources in collaboration with responsible ministries. Another policy is the Energy Strategy 2020-2030, following the strategy for 2015-2025. It aims at ensuring a sustainable and reliant energy supply based on the inputs of multiple stakeholders, including from the industry. The National Cooling Strategy (NCS) 2024 promotes energy efficiency and serves as a roadmap for transitioning towards sustainable cooling practices.

Several climate-related strategies and plans were issued in the last years. Jordan's NDC was first submitted in 2016 and updated in 2021. It highlights the climate ambition under the Paris Agreement. The Climate Change National Adaptation Plan (NAP) was prepared in 2021. It provides a clear vision for adaptation and identifies measures to be addressed in various sectors to guide institutions from different sectors such as governmental, academic, Community-Based Organisations (CBOs), and private sectors entities. The Green Finance Strategy, published by the Central Bank of Jordan in 2023, aims at greening the financial sector and mobilize green finance.

In terms of regional plants on climate change, the Amman Climate Plan published in 2019 outlines climate efforts specifically for the country's capital, which is part of the C40 Cities Climate Leadership Group. In addition, Sustainable and Energy Climate Action Plans were published for municipalities such as Ajloun, Maan, Sahab, Irbid, and are currently being developed for Al Jiza and Al Azraq. These municipal strategies are not covered in the subsequent analysis.

To promote sustainable economic growth, Jordan has developed two major visions with respective frameworks and plans. In 2020, the Energy Sector Green Growth National Action Plan 2021-2025 (GG-NAP) was published. It outlines sector-level implementation frameworks for the green growth vision, ensuring economic growth, social inclusion, and resilience. The Economic Modernisation Vision focuses on accelerated growth and improved quality of life. Its Executive Program 2023-2025 issued in 2022 reflects the government's commitments and summarizes the actions and outputs for the respective period. In addition, the National Standardization Strategy, circulated in 2022, addresses the stagnating economy after the COVID-19 crisis.

2.2.3 Relevance of buildings per strategy document

The Second National Energy Efficiency Action Plan (NEEAP) for the Hashemite Kingdom of Jordan 2018-2020

Jordan's 2nd NEEAP aims at 20% improvement in energy efficiency by the year 2020, which translates into accumulated final energy savings of about 1,570 ktoe between 2016 and 2020 and 13,500 ktoe to 2030. The electricity savings will be around 9,120 GWh up to 2020 and 40,960 GWh

up to 2030. Following the reduction in energy and electricity consumption, the cumulative emissions in 2030 will be 6 Mt CO_2 below the business-as-usual (BAU) scenario.

The plan covers six sectors, including the residential sector. The energy consumption in the residential sector will be 16% (24%) below the BAU scenario in 2020 (2030) if all the outlined energy efficiency measures are implemented. These energy savings are the highest of any of the considered sectors.

Energy efficiency measures for buildings can be found in several sectors, namely the residential, the commercial and services, as well as the municipal level sector, and under cross-sectorial measures. These measures include energy efficiency building code enforcement in the residential and the tertiary sector, thermal roof insulation of existing buildings in the residential sector, and energy efficiency in hotels.

For some of the measures, the plan specifies the respective energy savings and emission reductions. For instance, for energy efficiency building codes for the residential sector the savings amount to 397 GWh/year or 7.9 TWh over the entire lifetime and reduce emissions by 185 thousand t CO_2. For thermal roof insulations of existing buildings in the residential sector, the energy savings per year are 41 GWh/year and 821 GWh for the entire lifetime, with emission reductions of 19 thousand t CO_2.

Jordan Energy Strategy 2020-2030

The Energy Strategy 2020-2030 targets an increase in RE capacity from 2400 MW in 2020 to 3200 MW in 2030. It aims at a share of renewable energies in the total primary energy mix of 14% in 2030 up from 11% in 2020, and of 31% in 2030 up from 21% in 2020 in the electricity generation. It further repeats the goal outlined in the 2nd NEEAP of an increase in energy efficiency by 20%.

The strategy lists recommendations to achieve its goals. To improve energy efficiency, it suggests actions in the domestic, industrial, government, commercial, and service sector. It does however not mention specific measures or energy saving potentials, but rather calls for a follow-up of the NEEAPs.

National Cooling Strategy of Jordan (NCS)

The recently published NCS aims at reducing cooling demand, enhancing appliance energy efficiency, and transitioning to natural refrigerants. These goals are to be achieved across the residential, commercial, transport, and industrial sector. In the residential sector, areas of intervention include fridges, freezers, and air conditioning units.

Tangible measures include enforcing building codes and improving the efficiency of refrigeration and air conditioning systems within these structures, for instance through standards and regulations. In addition, awareness and information campaigns as well as capacity building for service technicians and decisionmakers would add to the uptake of energy efficient appliances. While the NCS explains these tangible measures in detail, it does not provide quantitative targets or energy saving potentials.

The NCS provides an extensive overview of the interlinkages with other national policies and laws, such as the Economic Modernisation Vision, the Energy Strategy, and the NDC.

Updated Submission of Jordan's 1st Nationally Determined Contribution (NDC)

Jordan's updated NDC enhances its commitment to climate change mitigation by raising its GHG emission reduction target from 14% by 2030 in the 1st NDC to 31% in the updated version, both compared to BAU scenarios. Of this, 26% is the conditional target, meaning that the resources and means of implementation need to be available, with only the remaining 5% being unconditional.

While the updated NDC contains priority mitigation and adaptation actions for the energy, transport, water, agriculture, health, waste, and biodiversity sector, it does not refer to the buildings or residential sector. It however mentions the extensive potential for green building retrofitting of existing building stock through the adoption of green building codes, by considering water and/or energy use in buildings and the energy efficiency in public buildings and public spaces.

Only one specific measure targets the building sector, namely installing solar water heaters for 90,000 houses. This results in cumulative emission reduction of 500 thousand t CO_2eq. For adaptation, the updated NDC recommends improving building efficiency for adapting to increased heat in urban centers, as outlined in the National Climate Change Adaptation Plan of Jordan.

The National Climate Change Adaptation Plan of Jordan (NAP)

The NAP aims at an increased adaption capacity to climate change in Jordan. Its objectives include strengthening policies, strategies, and legislations, supporting the coordination mechanism between relevant stakeholders, and building a dynamic and sustainable funding instrument for NAP implementation in Jordan.

To embark on climate adaptation, the NAP analyzes the following different sectors: agriculture, water, urban systems, ecosystems, coastal, health, and socio-economic. Each sector was reviewed in terms of its vulnerabilities to climate change. Based on the results, the NAP outlines a list of adaptation measures for each sector.

The urban systems sector includes measures for construction and the operation of buildings. Outlined programs include introducing climate responsive building techniques and improving building efficiency for adapting to increased heat in urban centers. The latter calls for interventions such as better insulation, sustainable cooling, and energy efficiency measures, as well as for modifications in building codes and awareness raising on the long-term benefits of energy efficiency and saving devices.

Green Finance Strategy

The Green Finance Strategy underscores the vital role of financing energy efficiency and renewable energy projects. While it does not explicitly refer to the building sector, green buildings and improving buildings' energy performance are mentioned as relevant and impactful areas for green finance.

The Amman Climate Plan

The Amman Climate Plant presents a collective vision among the government, private sector, development partners, and residents of Amman to reduce GHG emissions. It aims at an interim

target of 40% reduction of emissions by 2030 and at setting the capital on a path to a GHG emission neutral city by 2050. To achieve this goal, the per person emissions need to be kept at or below current levels of around 2.2 t CO_2eq.

The plan outlines programs and measures for six sectors, including the building sector. It facilitates a pipeline of projects that address residential, commercial, and public building energy efficiency standards. Goals include improving energy efficiency, enforcement of existing building codes, energy efficiency programs for existing residential buildings, and a solar water heater program. It does not state goals, emission mitigation potentials, or energy saving potentials for the building sector or individual measures.

Energy Sector Green Growth National Action Plan (GG-NAP) 2021-2025

The GG-NAP defines various objectives and identifies multiple actions for the energy sector to ensure green economic growth. Objectives include improved energy demand, resource efficiency, and developing a national energy storage action plan. It further emphasizes the importance of achieving energy efficiency through green building and construction.

Some of the identified actions target the building sector. These include improving the market for green building and construction services with implementation costs of $1m, developing and implementing a national Green Building Strategy and Action Plan ($3m), and conducting energy efficiency retrofits for public buildings ($1.5m). The measures are explained in detail in the document, including the objectives, milestones, and the implementation period.

Economic Modernisation Vision Executive Program 2023-2025

The Economic Modernisation Vision lays out a roadmap to economic growth consisting of eight economic drivers. Each driver comprises a cluster of sectors and concerted actions, outlined in detail in the Economic Modernisation Vision Executive Program 2023-2025.

Construction and buildings are mentioned in two of the identified drivers. The Green Jordan Driver calls for green urban development, including creating and deploying Jordan-specific green urban concepts, integrating green elements into land-use planning, and launching a ‘net-zero buildings’ initiative. The Vibrant Jordan Driver mentions smart mobility systems, open and green spaces initiatives, and green building standards, all improving the quality of life.

National Standardization Strategy (NSS)

The NSS identifies several priority areas, including energy and construction. In terms of energy, the strategy addresses the role of energy management and auditing systems across various sectors, particularly in buildings. It explains that energy and water consumption of buildings contribute significantly to the stress on energy and water resources and identifies energy efficiency as a crucial factor in reducing national energy costs and mitigating greenhouse gas emissions.

Construction incorporates industrial activities (regarding the production or import of construction products and materials) and service activities (engineering, construction projects, building and infrastructure maintenance, etc.). Here, the NSS places significant emphasis on the development of green buildings, recognizing them as a cornerstone of sustainable development. Concrete measures include standardization and related activities, including the creation of guidance documents, the provision of training, and the establishment of eco-labeling schemes.

Other measures include the production and usage of environmental-friendly cement, water-saving fixtures and equipment's, and thermal building insulation. The NSS does not state goals, emission mitigation potentials, or energy saving potentials for the construction sector or individual measures.

2.2.4 Conclusion for Jordan

While many of Jordan's strategies explain that green buildings are important for sustainable development, only few cover the building sector as a separate chapter or even explicitly refer to it. Thus, they do not seem to have a coherent approach to sustainability for construction and buildings. Nevertheless, most of the analyzed plans suggest measures and programs to improve the sustainability of buildings in one form or another, and the suggested measures are the same across plans.

One significant challenge is that the analyzed strategies refer to different related sectors, but only one explicitly mentions the building sector. For instance, the NEEAP lists measures that can be attributed to the residential and the commercial and service sector, thus covering most of the building sector, without explicitly referring to it. The Green Finance Strategy addresses the Construction sector, the Energy Strategy includes the domestic sector, and the NAP has a section on urban systems. Only the Amman Climate Plan explicitly considers the building sector as one of its six key sectors, but the plan does not apply to the entire country of Jordan. The NDC as one of the most important climate mitigation strategies does not refer to any of these sectors.

While some of the strategies mention targets and mitigation potentials for specific sub-sectors or measures, numbers for the entire building sector are missing. The 2nd NEEAP commits to energy consumption reduction through energy efficiency measures in the residential sector but does not specify mitigation potentials or energy savings. Quantitative emission mitigation potentials and energy savings are only stated for concrete measures in some of the strategies.

Many of the strategies outline specific measures for buildings, especially the 2nd NEEAP and the NCS. The measures are coherent across documents and contribute to the overarching goal of decreasing the energy demand for buildings. Examples include improved building codes, enhanced energy efficiency of cooling appliances, better insulation, and solar water heaters.

Jordan's strategies would benefit from concrete goals for the building sector and a well-defined roadmap to achieve the respective goals fostered through different documents. Detailed measures with clear targets, costs, timelines, and emission saving potentials would contribute to the overarching goal, as well as a clear linkage between goals for Amman and the whole country.

2.3 Lebanon

2.3.1 Country context

Lebanon is currently experiencing a multi-faceted crisis. An already challenging political and economic situation has been further exacerbated with the onset of the COVID-19 pandemic, ongoing conflict in the region, the limited capacities of the infrastructure to provide services to the large number of Syrian refugees, and a devastating explosion at the port of Beirut in 2020. As a result, the country experiences an economic crisis with a GDP that decreased from $54.9 billion in 2018 to $17.9 billion in 2023. Simultaneously, the country faces a sharp devaluing of its currency and soaring inflation rates reaching 221% in 2023. Correspondingly, its population – 5.3

million in 2023 – is shrinking, with a negative growth of minus 2.5% in 2023 (The World Bank Group 2024c).

In addition, Lebanon is facing an energy crisis. This crisis materializes in electricity blackouts and energy shortages, with electricity supply sometimes being limited to a few hours per day. End-users have started to rationalize the energy use leading to a reduction of national electricity demand from 22,880 GWh in 2018 to around 16,380 GWh in 2022. This difference includes what is labeled as "suppressed load" where the end-user is trying to reduce its electricity bill by avoiding and canceling some electricity usages, including some that are vital.

Those who can afford it can fall back to diesel generators or decentralized solar PV. Renewables uptake rose swiftly after the ministry of energy and water enacted a radical decision to remove subsidies on all types of fossil fuels in 2021, followed by a decision in 2022 to correct the electricity tariffs. While the country's overall energy generation still relies heavily on fossil fuels, the total cumulative hydro and solar capacity installed by the end of 2022 was around 870 MW, leading to a share of renewables of 20% in the Lebanese Electricity mix (LCEC data). The emissions per capita were around 3.8 t CO_2 in 2023 (The World Bank Group 2024c).

The building sector represents a large share of total energy consumption. It accounts for 40% of total energy use and energy-related CO_2 emissions, with residential buildings representing around 36% of total electricity consumption (United Nations Development Programme 2022). The building sector is dominated by a large number of dwellings following rapid urbanization and an old buildings stock. Most buildings were built before 1971 and lack proper maintenance or refurbishment activities (LCEC Lebanese Center for Energy Conservation 2016).

Hence, improving energy efficiency in the building sector is a key aspect to reduce energy consumption and thus enhance energy security. With comparatively low investments, these measures help to alleviate the impact of energy and electricity demand on the economy, to reduce the economy's dependence on fossil fuels, and to increase levels of independence, resilience, and stability. A stronger energy efficiency agenda in the building sector would benefit the country economically and environmentally and enable emission mitigation in line with international commitments. In addition, these steps would reduce the suppressed load and assist the end-user in living normally while lowering its energy consumption.

2.3.2 National strategies

Lebanon has published a variety of national plans and policies in the last years. Some foster economic development while others specifically target emission mitigation or the rollout of renewable energies.

Several strategies specifically aim at countering the aforementioned multi-faceted crisis by defining future economic growth. These include the Financial Recovery Plan from 2020, the 2018 Lebanon Economic Vision (LEV) and the Capital Investment Programme (CIP) published in 2018.

Two documents that specifically address energy consumption and the building sector are the NDCs. The Lebanese government joined both the United Nations Framework Convention on Climate Change (UNFCCC) and the Paris agreement. In accordance with the agreement, Lebanon submitted the first NDC in 2015, followed by an update in 2020. Both documents outline the steps that the country wants to undertake to lower emissions at the national level.

The Guidance for Integrating Efficient Cooling in National Policies in Lebanon, also known as the National Cooling Plan (NCP) or the National Cooling Action Plan (NCAP), was published in 2021. It is joint work from the United Nations Development Programme and the National Ozone Unit of the Lebanese Ministry of Environment. The NCP enhances the country's cooling systems, ensures energy efficiency, sustainability, and reduces environmental impact.

Other relevant strategies are the NEEAPs. Since 2010, Lebanon develops the NEEAPs in five-year steps to meet the growing energy demand by improving energy efficiency in the different sectors of the Lebanese economy. The measures tackle both primary energy savings and end-use measures. While the first (2011-2015) and the second NEEAP (2016-2020) were published on time, the third (2024-2030) is still under development.

The National Renewable Energy Action Plan for the Republic of Lebanon (NREAP) 2016-2020, prepared by the Lebanese Center for Energy Conservation (LCEC) was published in 2016. It is the country's main national document to lead the way for Lebanon to develop different RE technologies. The NREAP 2024-2030 is currently being prepared and will be published soon.

Moreover, the Lebanese parliament has ratified the Decentralized Renewable Energy Law in December 2023. It allows electricity generation by the private sector, peer-to-peer exchange, and all types of net-metering for renewable capacities up to 10 MW. As this law is neither considering buildings nor available in English, we did not include it in the following analysis.

At present, the Committee of Public Works and Energy at the parliament is discussing the Energy Conservation Law that includes energy conservation and energy efficiency measures tackling all sectors including buildings.

2.3.3 Relevance of buildings per strategy document

Financial Recovery Plan 2020

The plan calls for reform measures of the economy and the financial system to incentivize foreign financial rescue packages. It includes rebalancing the government budget through better tax collection, recovery of stolen assets, and tax reforms and aims at reducing the inequalities in the population, for instance through social safety nets.

The Financial Recovery Plan does not touch upon buildings or housing in any way.

Lebanon Economic Vision 2018

The vision aims to grow GDP and create jobs through selecting productive sectors that could become competitive, with a focus on export opportunities. It further seeks to understand the government's role to foster economic growth in the selected sectors.

One of these sectors is construction, where the industrial production of prefabricated buildings is detailed as one option to spur economic growth in Lebanon.

Capital Investment Programme (CIP)

The CIP is a key pillar of the government's vision for stabilization and development against the background of the multi-faceted crisis. It comprises new projects for infrastructure investment to eliminate the gaps that exists between the demand and need for infrastructure services in

different sectors, and to reduce the cost to the economy of the lack of adequate infrastructure. It includes several sectors, such as transport, electricity, and water.

In terms of buildings, it only calls for the protection of historical and heritage buildings and cities as part of investments in the tourism sector.

Lebanon's Nationally Determined Contribution – Updated 2020 Version (NDC)

Through the updated NDC, Lebanon commits to RE targets in 2030 both for the electricity demand and for its heat demand in the building sector. For the electricity sector, the unconditional (conditional) target aims to generate 18% (30%) of the country's power demand from renewable energy sources. For the building sector, Lebanon unconditionally (conditionally) commits to generate 11% (16.5%) of its heat demand from renewable sources in 2030. The heat demand in the building sector in 2030 in the projected BAU scenario is 18 PJ. The NDC does not formulate specific measures to achieve the goals for the building sector.

National Cooling Plan (NCP)

The NCP comprises five aspects: It describes the results of a market study, outlines a financing approach to support the introduction of energy-efficient appliances, explains the integration of the NCP into Lebanon's NDC, and outlines a roadmap for the transition to carbon neutrality in the cooling sector by 2050. One aspect explicitly refers to tangible measures to foster energy efficiency in the cooling sector, which is the regulation of labels and standards.

The NCP additionally calculates energy savings and related emission savings based on energy efficiency improvements in the cooling sector. By 2050, the mitigation actions could lead to energy savings of 2,976 GWh and emission mitigation of around 4 Mt CO_2eq in the model. The highest mitigation potential is attributed to air conditioning units. These figures however do not represent goals, but rather saving potentials.

The Second National Energy Efficiency Action Plan for the Republic of Lebanon (NEEAP) 2016-2020

Lebanon's 2nd NEEAP for the period 2016 to 2020 outlines nine end-use-measures for the building sector. These include double wall ordinance, consisting of the establishment of the ordinance and the implementation in 100 buildings. Another measure aims at using energy efficient equipment in 200 buildings. Energy performance certificates for buildings shall be established and an occupied area of 200,000 m^2 labelled accordingly. A measure on capacity building for refurbishment aims at training workers on options for renovating existing buildings to improve their energy efficiency.

The required funds for each of the measures is indicated, together with the potential source of funds. The total funding needs are $37.2m, most of which is required for the implementing measures in selected public buildings ($20m). For eight out of the nine measures the budget is stated as being not available at the moment.

The NEEAP further calculates the potential savings from the aforementioned measures. For four out of the nine measures, quantitative savings are stated. Installing double wall insulation for instance could save around 43% of a building's energy consumption for cooling and heating, resulting in total savings of 26 GWh for the period 2016 to 2020. The measure aiming for energy

performance certificates for buildings has the greatest saving potential of 66 GWh. The total savings of the end-use-measures in the building sector amount to 149 GWh.

National Renewable Energy Action Plan for the Republic of Lebanon (NREAP) 2016-2020

The NREAP identifies individual targets for the different RE technologies needed to reach the 12% renewable energy target first set in 2009. Taken together, solar, wind, hydro, and biomass would contribute approximately 767 ktoe of electricity in 2020.

While the policy does not explicitly cover the building sector, it lists the initiatives outlined in the first NEEAP. Some of those target the building sector, such as banning the import of incandescent lamps, and implementing a building code.

The action plan outlines one measure related to the building sector, namely installing solar water heaters. Here, it targets 1,345,185 m^2 in 2025 and 1,716,835 m^2 in 2030, leading to energy saving of 755 GWh and 1,116 GWh, respectively. The cumulative installed area of solar collectors exceeded 1 million m^2 by the end of 2023.

2.3.4 Conclusion for Lebanon

Based on the published national strategies, Lebanon has a coherent approach to reduce energy consumption and emissions in the building sector. Both, quantitative targets and the emission mitigation potential are stated. The updated NDC outlines tangible goals to increase the share of renewable generation for heat in buildings based on the projected heat demand, while the most recent NEEAP provides a detailed explanation of end-use-measures to increase energy efficiency in the building sector, including their mitigation potential.

Before the multi-faceted crisis, Lebanon was a first mover in terms of energy efficiency of buildings. Lebanon was for instance the first country in the MENA region to develop and adopt a NEEAP in 2010. Prior to the crises, some features such as double wall and double glazing became the common practice in the construction sector.

However, recent policies to accelerate economic recovery, such as the Financial Recovery Plan, do not cover the building sector. The Economic Vision, a detailed and thorough strategy, only refers to the construction sector by mentioning prefabricated buildings as part of industrial construction zones.

Despite the current economic situation, energy security remains a priority. Energy efficiency in building will for instance be covered in the currently developed Energy Conservation Law. The major challenge for measures in the sector is directly related to the cost of living at the end-user level and the financing availabilities at the public sector level.

3 Conclusion

Egypt, Jordan, and Lebanon have all published several strategies on economic development, sustainability, energy, and climate change. The degree to which the building sector is covered in these policies and plans varies as highlighted in Table 1.

Table 1. Overview of the relevance of the building sector in national strategies

Strategy document	Covers buildings	Buildings-related section	Targets for building sector	Examples of measures for construction and buildings stated in the strategies (up to two examples mentioned)
EGYPT				
Egypt's Updated Vision 2030	Yes	Adequate Housing	Partial	- Increase the number of buildings using RE. - Increase usage of clean cooking fuels and technology.
Low Emissions Development Strategy	Yes	Building Sector	Partial	- Implement energy efficient lighting in governmental buildings.
2nd NEEAP	Yes	Building Sector	Partial	- Install solar water heaters (800,000 systems). - Implement energy efficiency standards (30,000 buildings).
Integrated Sustainable Energy Strategy	Yes	No	Energy savings potential	- Improve efficiency of heating, ventilation, and air conditioning. - Introduce building codes and standards.
Strategy for Adaptation to Climate Change	Yes	Housing and Roads	Partial	- Improve natural ventilation in new and existing buildings.
National Climate Change Strategy	Yes	No	Partial	- Improve energy efficiency in buildings. - Implement the National Green Building Code.
Second NDC	Yes	Buildings and Urban Cities	Partial	- Install solar water heaters (5,300 systems). - Activate energy efficiency codes for new buildings.
JORDAN				
2nd NEEAP	Yes	Residential Sector	Energy savings target	- Support energy efficiency building code enforcement. - Roof insulation of existing buildings in the residential sector.
Energy Strategy	Yes	No	No	None
National Cooling Strategy	Yes	Residential Sector	Partial	- Refrigerant standard and regulations - Awareness and information campaigns
Updated NDC	Yes	No	Partial	- Install solar water heaters (90,000 houses). - Adoption of green building codes.
National Climate Change Adaptation Plan	Yes	Urban Systems	Partial	- Introduce climate responsive building techniques. - Modify building codes.
Green Finance Strategy	Yes	No	Partial	- Finance renovations to upgrade energy efficiency of buildings - Offer green commercial real estate loans
Amman Climate Plan	Yes	Building sector	Partial	- Install solar water heaters. - Improve enforcement of existing building codes.
Energy Sector Green Growth National Action Plan	Yes	No	Partial	- Implement a national Green Building Strategy and Action Plan. - Conducting energy efficiency retrofits for public buildings.
Economic Modernisation Vision	Yes	Building sector	Partial	- Launch a 'net-zero buildings' initiative. - Implement effective green building standards.
National Standardization Strategy	Yes	Construction	No	- Environmental-friendly cement - Eco-labelling schemes for appliances
LEBANON				
Financial Recovery Plan	No	No	No	None
Lebanon Economic Vision	Yes	No	No	- Invest in the industrial production of prefabricated buildings.
Capital Investment Programme	Yes	No	No	- Investments to preserve historical cities and buildings.
NDC - Updated 2020 Version	Yes	No	Share of RE for heating	None

National Cooling Plan	Yes	Residential Sector	Emission mitigation potential	- Minimum energy performance standards - Implementation of a labelling system
2nd NEEAP	Yes	Building Sector	No	- Set and implement the Double Wall Ordinance (100 buildings). - Update the building code to include green buildings items.
National Renewable Energy Action Plan	Yes	No	No	- Installing solar water heaters (1,716,835 m^2).

The matrix above provides several important insights. For one, it shows that almost all strategies cover buildings or construction in one way or another. While only one to two policies per country feature the building sector explicitly, many consider a subset, such as Construction, Urban Systems or Adequate Housing. When it comes to quantitative targets or emission mitigation potentials for the building sector, only four of the analyzed documents state numbers.

Almost all policies and plans suggest some kind of tangible measure that can be attributed to the building sector. These include measures both on design and appliances, including energy efficient appliances, solar water heaters, and green building codes. Only three documents do not mention any specific measure, one from Jordan and two from Lebanon. However, most policies solely state qualitative measures, without specifying concrete objectives, costs, or emission and energy saving potentials for the respective action.

Evaluating the coherence of strategies for Egypt, Jordan, and Lebanon, a common pattern emerges. For all countries, the documents are consistent in the overall direction for energy demand in buildings. However, only few strategies explicitly target the building sector, have quantitative targets, or state energy and emission saving potentials. When it comes to specific measures, the strategies in each country are consistent, as the measures are partly mentioned in other documents and the policies refer to and/or build on each other. It is worth to mention that there are a limited number of quantitative goals and measures.

Based on the findings, it becomes apparent that all three countries can improve their national strategies in terms of the building sector. The following policy recommendations represent opportunities for Egypt, Jordan, and Lebanon to better incorporate the building sector in national policies and strategies. It is recommended to develop a national strategy focusing on energy efficiency in the building sector. This can be a dedicated chapter in the national energy efficiency action plans NEEAP. Alternatively, the local responsible entity may develop a dedicated national strategy to improve the energy efficiency in the building sector. Such efforts can be led by Housing and Building Research Center in Egypt HBRC, Royal Scientific Society or the Jordanian National Building Council (JNBC) in Jordan, and by Lebanese Center for Energy Conservation LCEC. Such a strategy, may focus on the following goals and aspects:

- **Feature the building sector more prominently in national strategies.** A separate section dedicated explicitly to the building sector would enhance its relevance, especially when using the same term across documents, i.e., building sector instead of domestic, residential, urban, or other terms. This is the case for strategies on economic development, sustainability, energy consumption, climate change, and other related topics.

- **Commit to quantitative targets for the building sector in policies and plans.** Documents should include information on sector-wide energy efficiency improvements, reduction in energy and electricity consumption, and emission mitigation. These concrete targets allow for a joint vision for the sector across stakeholders and policies.

- **Explain the specific measures in more detail.** Strategies would benefit from a more comprehensive description of the specific measures targeting construction and buildings. Stating quantitative goals, timeframes, and costs would enable to assess progress and to achieve the overarching sector-wide targets.

Increase coherence between different strategies. The strategy for the building sector and how it can contribute to economic development, energy efficiency, and climate change mitigation and adaptation should be consistent across stakeholders and policies. Here, it would be beneficial to explain how new policies build on existing targets and measures to advance the joint efforts on construction and buildings. Based on a number of international experiences and literature such as the Energy Performance of Buildings Directive of the European Commission and the National Building Energy Strategy of the IEA. The following recommendations may contribute to the overall aim of achieving a coherent representation of the building sector in the national strategies:

- The pilot introduction of minimum energy performance standards MEPs and Energy Performance Certificates EPC for buildings. Such an introduction should identify quantitative targets for different building types e.g., residential vs non-residential.
- The elaboration of the cost-optimality methodology may be of a support to identify the most economically feasible minimum energy performance requirements for new and existing buildings.
- To gradually enhance the construction requirements for new buildings towards more energy efficient and zero-emissions buildings.
- To elaborate a long-term renovation plans to improve the levels of energy efficiency in the existing building stock.
- The introduction of building renovation passports or EPCs to provide the building owners and developers with a clear guidance on how to renovate their buildings. The guidance may also include the potential funding options and incentives for EE measures.
- To develop financing strategies and business models by assessing potential for integrating energy efficient buildings into existing financial schemes and support designing additional new financial schemes/mechanisms to finance energy efficient building projects.

By incorporating these recommendations, Egypt, Jordan, and Lebanon can ensure that the building sector is given the appropriate importance in their strategies. This is imperative, considering that construction and buildings are essential for both climate change mitigation and adaptation.

Publication bibliography

Alrwashdeh, Saad (2018): Comparison among solar panel arrays production with a different operating temperatures in Amman-Jordan. In *International Journal of Mechanical Engineering and Technology (IJMET)* 9.

Intergovernmental Panel on Climate Change (2007): C3. Megadeltas: their vulnerabilities to climate change. Available online at https://archive.ipcc.ch/publications_and_data/ar4/wg2/en/xccsc3.html.

International Energy Agency (2023a): Buildings. Available online at https://www.iea.org/energy-system/buildings.

International Energy Agency (2023b): Egypt. Available online at https://www.iea.org/countries/egypt.

LCEC Lebanese Center for Energy Conservation (2016): The second national energy efficiency action plan for the republic of Lebanon. NEEAP 2016-2020. Available online at http://climatechange.moe.gov.lb/viewfile.aspx?id=229.

Ministry of Environment (2021): Updated Submission of Jordan's 1st Nationally Determined Contribution (NDC). Available online at https://unfccc.int/sites/default/files/NDC/2022-06/UPDATED%20SUBMISSION%20OF%20JORDANS.pdf.

Ministry of Planning and Economic Development, Egypt (2023): The National Agenda for Sustainable Development: Egypt's Updated Vision 2030. Available online at https://mped.gov.eg/Files/Egypt_Vision_2030_EnglishDigitalUse.pdf.

Programme for Energy Efficiency in Buildings (2023): BUILDINGS IN THE NDCS. Mapping Targets on Buildings in the Nationally Determined Contributions (NDCs). Available online at https://www.peeb.build/imglib/downloads/PEEB_Report_Buildings-in-the-NDCs.pdf.

The World Bank (2020): Residential Energy Efficiency Retrofit Programme and Certification Scheme. Available online at https://moenv.gov.jo/ebv4.0/root_storage/en/eb_list_page/jordan_residential_energy_efficiency_certification_scheme__report_(1).pdf.

The World Bank Group (2022): MIDDLE EAST & NORTH AFRICA CLIMATE ROADMAP (2021-2025). Driving transformational climate action and green recovery in MENA. Available online at https://thedocs.worldbank.org/en/doc/6f868d4a875db3ef23ef1dc747fcf2ca-0280012022/original/MENA-Roadmap-Final-01-20.pdf.

The World Bank Group (2024a): Egypt. Available online at https://data.worldbank.org/country/egypt-arab-rep.

The World Bank Group (2024b): Jordan. Available online at https://data.worldbank.org/country/jordan.

The World Bank Group (2024c): Lebanon. Available online at https://data.worldbank.org/country/LB.

The World Bank Group (2024d): Renewable energy consumption (% of total final energy consumption) - Jordan. Available online at https://data.worldbank.org/indicator/EG.FEC.RNEW.ZS?locations=JO.

United Nations Development Programme (2022): Advancing the ARZ Green Building Rating System – Roadmap for the Green Building in Lebanon. Available online at

https://arzrating.com/storage/user-guidelines/bqGZe5ZVpZkvAZTPYZvMXR06k1bIx8IDlHn81Qt7.pdf.

United Nations Environment Programme (2018): A GUIDE FOR INCORPORATING BUILDINGS ACTIONS IN NDCS. Incorporating fundable buildings sector Green House Gas (GHG) emission mitigation actions in Nationally Determined Contributions (NDCs). Global Alliance for Buildings and Construction (GlobalABC); United Nations Environment Programme (UNEP). Available online at https://globalabc.org/sites/default/files/2020-03/GABC-NDC-GUIDE_ENGLISH.pdf.

World Economic Forum (2023): How to cut direct emissions in MENA by 2030. Available online at https://www.weforum.org/agenda/2023/12/cut-direct-emissions-mena-2030/.

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