



REGULATORY ANALYSIS JORDAN:

Analysis and recommendations for the regulatory and policy instruments governing the RAC sector

August 2022



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Acronyms

AB	Arab Bank
AC	Air conditioning/conditioner
CAGR	Compound Annual Growth Rate
CBJ	Central Bank of Jordan
CFC	Chlorofluorocarbon
COP	Conference of the Parties
CTC	Carbon tetrachloride
EE	Energy efficiency
EEAA	Egyptian Environmental Affairs Agency
EEBC	Energy Efficiency Building Code
EEI	Energy Efficiency Index
EER	Energy Efficiency Ratio
ExCom	Executive Committee
F-gas	Fluorinated gases
GG-NAP	Green Growth National Action Plan
GHG	Greenhouse gas
GWP	Global warming potential
HCFC	Hydrochlorofluorocarbon
HFC	Hydrofluorocarbon
HPMP	HCFC Phaseout Management Plan
IKI	International Climate Initiative
JAB	Jordan Ahli Bank
JD	Jordanian dinar
JLGC	Jordan Loan Guarantee Corporation
JNBC	Jordanian National Building Council
JREEEF	Jordan Renewable Energy & Energy Efficiency Fund
JSMO	Jordan Standards and Metrology Organization
MEMR	Ministry of Energy and Mineral Resources
MENA	Middle East and North Africa
MEPS	Minimum energy performance standards
MLF	Multilateral Fund
MoEnv	Ministry of Environment
MoERE	Ministry of Electricity and Renewable Energy Egypt
MP	Montreal Protocol
MPWH	Ministry of Public Works & Housing
NAP	National Adaptation Plan
NDC	Nationally determined contribution
NEEAP	National Energy Efficiency Action Plan
NERC	National Energy Research Centre
NGGP	National Green Growth Plan
NOU	National Ozone Unit

ODP	Ozon Depletion Potential
ODS	Ozone-depleting substances
PV	Photovoltaic
RAC	Refrigeration, Air Conditioning
RACHP	Refrigeration, air conditioning and heat pump equipment
RE	Renewable Energy
RSS	Royal Scientific Society
SEER	Seasonal energy efficiency ratio
SME	Small and Medium-Sized Enterprises
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
VTC	Vocational Training Corporation

1. Introduction

With energy demand expected to increase 50% by 2040,¹ Middle East and North Africa (MENA) countries are facing a range of climate-change related challenges. The region's energy challenges include rapidly growing populations, urbanisation, and a heavily strained energy infrastructure. Cooling in Air Conditioning (AC)-equipped households already represents a major source of energy consumption in the region. The use of cooling is expected to grow further since, with an improved standard of living, more households are using air conditioning (AC) systems. There is large potential for energy saving as many of the space cooling and refrigeration systems in use have a low energy efficiency. An additional climate impact from cooling comes from the refrigerants still used in many of today's air conditioners and refrigerators. Such refrigerants with a high global warming potential are hundreds to thousands. Without further policy intervention, direct and indirect emissions from cooling and refrigeration may rise 90% above 2017 levels by 2050², creating a vicious feedback loop.

1.1. The Cool Up programme

The Cool Up programme promotes accelerated technological change and early implementation of the Kigali Amendment to the Montreal Protocol and Paris Agreement in Egypt, Jordan, Lebanon, and Türkiye. The programme focuses on enabling natural refrigerants and energy efficient solutions to mitigate the effects of rising cooling demand. The Cool Up approach is based on four pillars: reducing cooling demand, phasing down hydrofluorocarbons (HFCs), replacing and recycling inefficient equipment and refrigerants, and training and raising awareness.

The programme's cross-segment approach focuses on the residential and commercial AC (air conditioning) sector and on the commercial refrigeration sector.

The programme aims to develop lasting institutional capacity and increase the deployment of sustainable cooling technologies in the market. To enable a cooling market transformation towards sustainable cooling technologies, the Cool Up programme will:

- ▶ Enhance cross-sectoral dialogue between national actors to build ownership to support long-term impact.
- ▶ Develop policy actions to create a supportive regulatory environment.
- ▶ Develop financial mechanisms and funding structures to enable the cooling market transition.
- ▶ Support the commercial deployment and dissemination of existing and emerging technologies with natural refrigerants.
- ▶ Provide resources for capacity development on sustainable cooling in the four partner countries.

In Middle East and North Africa (MENA) countries, cooling constitutes a major source of energy consumption; it produces indirect greenhouse gas (GHG) emissions and contributes to ozone depletion and global warming. The Cool Up programme seeks to address this challenge in its partner countries by mitigating the adverse impacts of refrigerants through promoting accelerated technological change and facilitating early implementation of the Kigali Amendment and Paris Agreement.

The programme is divided into three pillars:

- ▶ Policy and regulation
- ▶ Technology and markets
- ▶ Financing and business models

¹ British Petroleum, "BP Energy Outlook 2018 Edition"

² United Nations Environment Programme and International Energy Agency (2020). Cooling Emissions and Policy Synthesis Report. UNEP, Nairobi and IEA, Paris.

This report focuses on the policy and regulation pillar. Policy and regulation are powerful stimuli to encourage the uptake of new technologies. In the policy and regulation pillar, the Cool Up programme supports its partner countries in leveraging policy stimuli and developing policy interventions closely linked to national policy goals, strategies, plans, and programmes as well as international processes. Cool Up works with partner countries to define roadmaps and regulatory measures to create a regulatory environment that requires reduced cooling demand and increased energy efficiency (EE) and supports sustainable cooling technologies that contribute to the phase down of hydrofluorocarbons (HFCs) and focus on natural refrigerants.

Building on a scan of policy instruments conducted for Cool Up's cooling sector status reports, the Cool Up programme developed an in-depth regulatory analysis, analysing the strengths and shortcomings in each partner country.

1.2. Aim and scope of this report

The main output of this report is to formulate policy recommendations towards phasing down HFCs, utilising natural refrigerants, and reducing cooling demand in Jordan.

The analysis covers four categories of policy instruments:

- ▶ International protocols and commitments
- ▶ National plans and strategies
- ▶ Laws and bylaws relevant to the Refrigeration, Air Conditioning (RAC) and building sector
- ▶ Standards and codes

The report examines the status of these instruments and investigates the degree to which they are implemented and complied with. The analysis also discusses which technical elements are covered by each policy instrument, examining if and how they contribute to enhancing EE in the RAC and heat pump sector, reducing cooling demand, phasing out ozone-depleting substances (ODS), phasing down HFCs, and promoting natural refrigerants. Data for the analysis was gathered by studying country-specific laws, regulations, standards and codes, input from the Cool Up cooling sector status reports, secondary literature, and interviews, bilateral meetings, and stakeholder discussions with national experts and policy stakeholders. The reports culminate in an action plan and roadmap to support each partner country in making policy and institutional changes to accelerate Kigali Agreement implementation. All identified measures have been discussed and agreed upon in conjunction with the National Ozone Unit (NOU) in each Cool Up partner country. Figure 1 provides an overview of the key implementing institutions across the sustainable cooling policy space in Jordan.

<p>MEMR Ministry of Energy and Mineral Resources</p>	<ul style="list-style-type: none"> • Responsible for setting regulatory frameworks and regulations that support the implementation of standards and labels for EE and RE.
<p>MoEnv/NOU Ministry of Environment / National Ozone Unit</p>	<ul style="list-style-type: none"> • Responsible for monitoring compliance of refrigerants with relevant standards. Only when the refrigerant code is not indicated in imported appliances, a test is carried out on a sample in a test lab.
<p>JSMO Jordan Standards and Meteorology Organization</p>	<ul style="list-style-type: none"> • Responsible for the preparation and issuance of all standards and technical regulations through the involvement of technical committees, in addition to inspection of locally produced appliances.
<p>MPWH / JNBC Ministry of Public Works and Housing / Jordan National Building Council</p>	<ul style="list-style-type: none"> • Responsible for the development of different codes.
<p>RSS Royal Scientific Society</p>	<ul style="list-style-type: none"> • NERC hosts the specialized testing lab for testing the efficiency of different appliances. • Building Research Centre is responsible for reviewing buildings documents targeting the Jordan Green Building Certificate.

Figure 1 Key responsibilities among stakeholders in Jordan

2. Overview

2.1. Setting the scene

Jordan's climate varies between Mediterranean and desert and is generally very arid. Energy consumption and power demand in the country has steadily increased due to economic and population growth. With these increases, Jordan is facing rising energy demand, particularly in the residential sector. Lighting, cooling, and heating represent the largest share of energy consumption in the country, and the residential sector accounts for about half of electricity consumption in Jordan. More than 60% of energy consumed in households is used for heating and cooling³.

2.2. Cooling market landscape

Several companies in Jordan are manufacturing different types of air conditioning (AC) under different brand names. Roughly 50% of all AC systems on the market in Jordan, are produced by local manufacturing companies. However, the country still relies on imports from other countries to meet the growing demand. Jordan has more than 400 workshops that provide maintenance and services to the refrigeration and air conditioning (RAC) sector.⁴

The demand for RAC units across Jordan is growing and this trend is expected to continue. AC market drivers include increasing affordability (gross domestic product growth), rising population, new construction activities, climate change, increasing electricity prices, the introduction of new technical regulations, and the availability of new technologies. The demand for different AC technologies is driven by the installation in new buildings, new installations in existing buildings (to increase the share of air conditioned rooms), and the replacement of defective AC systems.⁵ In the new construction sector, around 60% of all new apartments and 80% of new single-family buildings, between 70% and 75% of new offices and supermarkets, and 90% and 95% of new healthcare and new hotel buildings install AC systems.⁶ In existing residential buildings, there is substantial growth potential for the cooling market, as about 80% of the residential floor area and about 50% of the non-residential floor area is not yet air conditioned.⁷ While the AC market in Jordan has already grown by 1.5% between 2017 and 2020, the AC market is expected to experience a compound annual growth rate (CAGR) of about 6% between 2021 and 2027.

Currently installed equipment and new units installed have a lower efficiency than the best available technology, so there is a large potential for energy savings. AC systems installed in the building stock have an energy efficiency ratio (EER) or a coefficient of performance (COP) in the range of 2.5-4.5 (existing buildings) and an average of about 3.5.⁸

The commercial refrigeration sector is dominated by local manufacturers for condensing and centralised systems. Commercial standalone refrigeration systems are locally manufactured and imported. The main suppliers of standalone systems to supermarkets and quick service and casual restaurants are the Jordanian and international food and beverage industries.⁹

Jordan currently imports all refrigerants. The main refrigerant used in the AC sector is R410A, followed by R134a. The refrigeration sector mainly uses R134a, R404A, and R407C. Servicing equipment mostly employs R22 for the old units and R134a, R407C, R410A, R600a, and R717 for the newly installed units.

³ Source: Potentials and Barriers of Energy Saving in Jordan's Residential Sector through Thermal Insulation, I. Al Hinti, H. Al-Sallami, JJMIE, 2017

⁴ United Nations Industrial Development Organization (UNIDO) 2018, Cooling Sector Status Report Jordan 2022

⁵ Cooling Sector Status Report Jordan 2022

⁶ Cooling Sector Status Report Jordan 2022

⁷ Cooling Sector Status Report Jordan 2022

⁸ Cooling Sector Status Report Jordan 2022

⁹ Cooling Sector Status Report Jordan 2022; United Nations Industrial Development Organization (UNIDO) 2018

Natural refrigerants are available in Jordan, though their uptake has been limited.¹⁰ The government is promoting the transition to natural refrigerants in RAC applications by mobilising the required support from international agencies for the private sector to facilitate the shift to new technologies.

The overall market for cooling equipment in Jordan is expected to continue to grow. This strong market growth requires sustainable cooling technologies, and natural refrigerants being introduced very early as a direct replacement to prevent potential lock-in effects to harmful refrigerants. Perceived key challenges to the uptake of natural refrigerants include safety issues and the associated costs.

Cool Up presents a unique opportunity to build on the regulatory framework that is currently in place - Jordan's well-established manufacturing sector, and commercial banks, which provide green finance to scale-up sustainable cooling technologies and the use of natural refrigerants. It is imperative that Cool Up raises awareness of the potential and opportunities around natural refrigerants and improving energy efficiency; the programme must also address concerns about safety and upfront investment costs.

2.3. Finance landscape

Jordan has weathered the COVID-19 shock better than most countries¹¹. The Banking sector in Jordan is quite robust and relevant indicators such as capital adequacy ratio of 19% which is well above the prudential requirement of 12%. Banks have comfortable liquidity, with an average ratio of 138.1%, well over the regulatory minimum of 100%. Commercial banks finance both public and private sectors and there are 23 banks in the country some of them establishes more than 50 years bank¹².

Central Bank of Jordan (CBJ) data indicated that the total assets of the banking sector increased from EUR 72.46 billion¹³ in 2019 to EUR 77.06 billion in 2020 (by 6.3%). This rise may be attributed to Government's introduction of policies with subsidised lending rates to the private sector, and more small and medium enterprises (SMEs) accessed the utilisation of the financing resources during the pandemic. The private sector deposits increased marginally mainly due to rise in spending during the pandemic. Commercial banks increased their borrowings from the CBJ during the year 2020 to fulfil the increasing demand for private lending. Overall, the country's financial sector demonstrated resilience to changing financing climate. Banks adapted to the Government's policies to address the economic requirements resulting from COVID-19 while still maintaining enough liquidity.

Jordan predominantly imports single split room air conditioning systems and imports all of its refrigerant's requirement. Whereas it exports room air conditioners of almost equal numbers. All compressors needed for commercial refrigeration systems are imported and then assembled locally. There are about 14 manufacturers of commercial refrigeration systems in Jordan, many of which belong to SME categories. Distribution and warehousing have significant roles in both room air conditioners and refrigeration segments. Retail sales focuses primarily on individual appliances (e.g., room air conditioners, walk-in refrigerators and refrigerators). Financing of individual stages mentioned above is mainly facilitated by local commercial banks in Jordan. Most commercial banks have dedicated divisions to assist SMEs. Almost all banks provide finance for operations including working capital finance based on the strength of a balance sheet. Cool Up could possibly explore developing interventions for manufacturing with specific focus on commercial refrigeration systems manufacturers.

Most commercial banks assist solar PV electricity generation (renewable energy - (RE) generation) and EE projects as a part of their lending or as a sustainability initiative. Financial institutions are strong in Jordan, and with the policy push from the Government and CBJ, they have been expanding their portfolios within the energy efficiency and renewable energy sectors. Reputed commercial banks such as Arab Bank (AB) and Jordan Ahli Bank (JAB), have sustainability approaches, commitments, disclosure, and adequate

¹⁰ Expert Interviews 2021

¹⁰ National Ozone Unit Jordan 2021, Jordan Customs 2021

¹¹ Jordan's Economic Update, April 2022 - The World Bank

¹² Annual Report of Central Bank of Jordan 2021

¹³ All currencies not given in Euro were converted to EUR using the exchange rate of the European Central Bank on 05 July.

reporting. The Jordan Renewable Energy & Energy Efficiency Fund (JREEEF) invests in various renewable energy and energy-efficient technologies. JREEEF signed an agreement with the number of local commercial banks to provide finance at the subsidised rates of interest. In addition, Jordan Loan Guarantee Corporation (JLGC) provides guarantees to SMEs through participating commercial banks. JLGC also offers export credit guarantees and guarantees to loans offered for Renewable Energy projects.

Financing Sustainable Cooling Options can broadly be considered as an extension of financing energy efficiency. Financing energy efficiency has been discussed widely over the years, and there is a substantial amount of literature. Besides, the focus is on financing the RAC sector and RAC products and equipment. The assessment focused on financing three principal end-user segments a) residential, b) commercial, c) public sector concerning RAC products.

Credit guarantee, Debt finance, dealer finance are prominent approaches to financing sustainable cooling technology options. Public private partnership financing could be used for the public sector especially large space cooling projects. As regards, sources of finance commercial banks can play significant role along with specialized institutions.

3. Methodology

Jordan has progressed on its commitments relevant to the Montreal Protocol (MP) by implementing several relevant programmes, laws, and other policy instruments such as codes and standards. In this report, the policy instruments governing the RAC and building sector in Jordan are analysed to identify the key strengths and the shortcomings towards the phase down of HFCs, the use of natural refrigerants, and the reduction of cooling demand. The regulatory analysis covers the following four categories of policy instruments:

1. International protocols and commitments
2. National plans and strategies
3. Laws and bylaws relevant to the RAC and building sector
4. Standards and codes

Figure 2 explains the main steps of this analysis. First, existing policy instruments are identified. Second, these instruments are assessed and third, an initial list of policy recommendations is drafted. The initial list of recommendations will be discussed with relevant stakeholders—mainly the NOU.

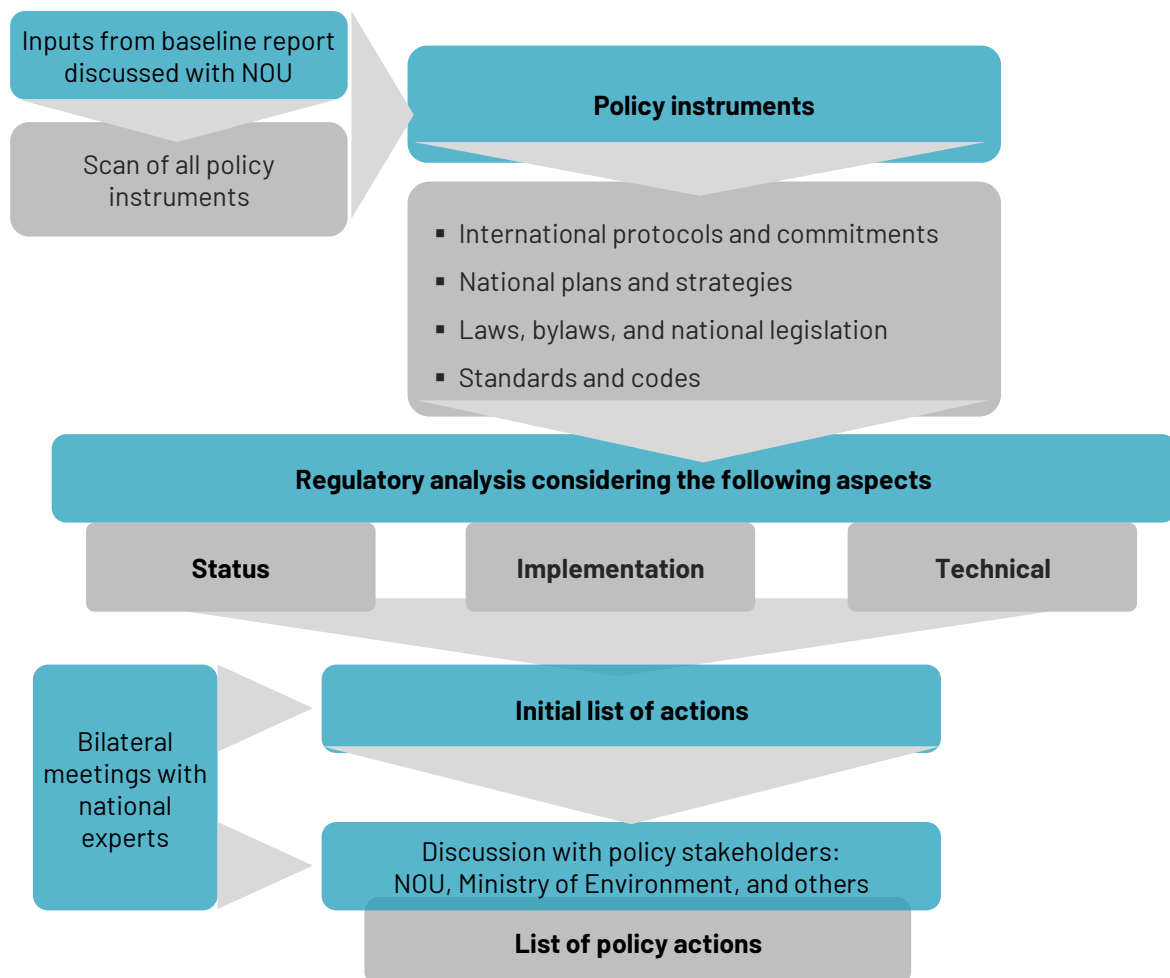


Figure 2 Methodology and working steps of the regulatory analysis in Jordan

The regulatory analysis in this report covers three key aspects (see Table 1).

- ▶ Availability status of the policy instruments in Jordan
- ▶ Implementation and compliance
- ▶ Provisions of the policy instruments in terms of the required and planned technical aspects

Table 1 Aspects of policy instruments analysis in Jordan

A. Status	B. Implementation and compliance	C. Technical aspects
In place	High level of compliance/ implementation	EE of refrigeration, air conditioning and heat pump (RACHP) equipment and systems
Planned	Medium level of compliance/ implementation	Reducing cooling demand
Not available	Low levels of compliance/ implementation	Phaseout of ODS
		Phasedown of HFCs
		Promoting natural refrigerants

The colour codes of the analysis

For the policy instruments analysis, a colour code has been used in a table format to outline and scan the strengths and define the gaps in policy instruments governing the RAC sector. Three colour shades are used for this purpose (as explained in Table 2). The white colour has been used when the aspect in question is not applicable or not relevant.

Table 2 Colour codes

Colour	Meaning
Advanced	Highlight the aspect that has been sufficiently addressed by the policy instrument.
Moderate	Describes the aspects that are partially mentioned or partially developed.
Early	Depicts there is gap that needs to be further investigated.
White	Not applicable.

Table 3 explains the colour code applied for the different aspects of the policy analysis. For example, for the first aspect that covers the status, the table explains the meaning of the three possible statuses (in place, planned, and not available". The second group of aspects focuses on the implementation and enforcement of the policy instruments. In many cases, the codes and standards are well elaborated and include ambitious EE requirements and sufficient technical detail, but those codes and standards are intermittently implemented and not sufficiently enforced. While some laws, standards and codes are fully enforced with high or almost complete levels of compliance, some other laws and regulations are not well enforced due to a lack of compliance procedures or the complexity of implementing these policy instruments.

Table 3 Colour codes applied for the different aspects of the policy analysis in Jordan

A. Status aspects	
In place	One of the following conditions applies: <ul style="list-style-type: none"> ▶ The policy instrument has been issued/adopted through a decision, law, or other legal procedure. ▶ The competent authority has officially announced the adaptation. ▶ The policy instrument has been published in the National Gazette.
Is planned	One of the following conditions applies: <ul style="list-style-type: none"> ▶ The adaptation/issuance process is ongoing. ▶ The policy instrument has been officially announced to be under preparation. ▶ The policy instrument has been suggested/proposed by the competent authority.
Is not available	No announcement/proposal/suggestion yet.

B. Compliance and Implementation aspects	
High level of compliance/ implementation	One of the following conditions applies: <ul style="list-style-type: none"> ▶ High levels of compliance (e.g. most of the appliances have an EE label). ▶ A monitoring/reporting mechanism is in place. ▶ The implementation meets the planned targets (e.g. reduction of hydrochlorofluorocarbons (HCFCs) was successful).
Medium level of compliance/ implementation	One of the following conditions applies: <ul style="list-style-type: none"> ▶ Medium level of compliance—for example, there are no sufficient capacities to control compliance or there are no clear compliance/implementation procedures. ▶ The monitoring/reporting/verification mechanism is not completely implemented. ▶ The implementation partially meets the planned targets.
Low level of compliance/ implementation	One of the following conditions applies: <ul style="list-style-type: none"> ▶ Low level of compliance (e.g. most of the buildings do not comply with the code). ▶ No clear monitoring/reporting/verification mechanism is in place. ▶ The implementation has not started or is far from meeting the planned targets.
C. Technical aspects	
Specified	One of the following conditions applies: <ul style="list-style-type: none"> ▶ The criterion/topic has been explicitly specified in the policy instrument. ▶ Clear targets or plans have been identified.
Not specifically mentioned	One of the following conditions applies: <ul style="list-style-type: none"> ▶ The criterion/topic has not been mentioned, but other provisions indirectly lead to or promote this criterion/topic. ▶ The aspect will be considered in the update of the policy instruments or is planned to be included.
Not provided	The aspect is not covered or is not considered.

The third aspect covers the relevant technical criteria including the EE of RACHP equipment, reducing cooling demand, the phase out of ODS, the phase down of HFCs, and promoting natural refrigerants. **Table 4** explains the meaning of each (for example, technical aspects such as reducing the cooling demand are an integral part of any plan or policy instrument to phaseout ODS consumption).

Table 4 Explanation of the technical aspects considered in the regulatory analysis in Jordan

C. Technical aspects	Description and example
EE of RACHP equipment and systems	Addressing energy efficient operation of RACHP equipment and systems by establishing energy monitoring, setting targets for seasonal energy efficiency ratio (SEER) or other parameters, enhancing maintenance, etc.
Reducing cooling demand	In buildings, addressing energy consumption through measures assessing and reducing the cooling demand such as energy monitoring, insulation, shading, using renewable energy to meet the cooling demand, etc.
Phaseout of ODS	Addressing import, manufacture, export, and destruction of bulk ODS as well as the import, manufacture, export, installation, servicing, maintenance, and end-of-life management of equipment and systems containing or relying on ODS.
Phasedown of HFCs	Addressing import, manufacture, export, reclamation, and destruction of bulk HFCs as well as the import, manufacture, export, installation, servicing, maintenance, and end-of-life management of equipment and systems containing or relying on HFCs.
Promoting natural refrigerants	Addressing production and use of natural refrigerants in the RAC sector.

Awareness raising, capacity building, training, and certification will be considered when it is related to sustainable cooling (e.g., by promoting consumer information, enhancing labelling, providing information for different target groups, setting requirements for technician training and certification, and capacity building of planners, relevant authorities, etc.).

4. Summary of key findings and recommendations

Jordan has progressed on its commitments relevant to the Montreal Protocol and Kigali Amendment through the implementation of several relevant programs, laws, and other policy instruments such as codes and standards. The policy instruments governing the RAC and building sector in Jordan were analysed to identify the key strengths and shortcomings towards phasing down HFCs, using natural refrigerants and reducing cooling demand.

The regulatory analysis shows that Jordan has successfully implemented ongoing projects to phase out HCFCs, including through controlling imports of ODS through licensed importers and monitoring ODS-consuming and converted enterprises. Jordan has also started implementing a plan to phase down HFCs through the recently approved instructions. Though new instructions for phasing down HFC consumption are in place, HFCs are not yet controlled substances and are not monitored by Jordanian customs. As a result, importers are not obliged to register or obtain a license to import nor to report the quantities of imported HFCs to the NOU.

Sustainable cooling still needs to be reflected and streamlined across the different Jordan national strategies. The government has published an updated NDC (2021) and has raised Jordan's mitigation ambition to 31% reduction of emissions by 2030 compared to business as usual for base year 2012. The updated NDC includes a measure targeting reduction of HFCs consumption aligned with the national commitments to comply with the Kigali Amendment. For instance, the Ministry of Energy and Mineral Resources is planning to prepare the Third NEEAP which is supposed to compile key measures that are relevant to energy efficiency and related national priorities. However, Jordan has not developed a National Cooling Plan to integrate cooling aspects in Jordan's overall climate strategies.

Most of the existing laws are –to a large extent– well enforced and implemented, however there is room for improvement. For example, the Waste Management Framework Law No.16 of 2020 and the forthcoming Electrical and Electronic Waste Management all could contribute to improving the end-of-life management of the RAC appliances but a recovery and waste management scheme for phased-out refrigerants still needs to be elaborated. There is room for improvement to further develop codes and standards which govern the waste management of ODS and HFC as well as safety requirements and the certification of technicians and updating procedures for MEPS. There are several well-elaborated MEPS and labels for most RAC appliances of residential use but not for commercial RAC appliances.

Although Jordan has a National Ozone Committee, that serves as an advisory body to provide guidance to NOU to prepare the national ODS phase-out regulations, it lacks awareness of the linkages between F-gases regulations, energy efficiency standards of the RAC sub-sectors and the building codes. This lack of awareness is identified as a key gap that hinders the coordination and mainstreaming of the cooling relevant issues across national regulations and policies. There is also a need for awareness raising around other sustainable cooling topics, especially the link between Kigali Amendment commitments and energy efficiency measures, as well as the enforcement of the building codes to reduce the cooling demand.

Based on the analysis of the policy instruments and experts interviews with several stakeholders in Jordan, some key policy recommendations have been derived to support the preparation of policy frameworks that guide the transition towards sustainable cooling and utilization of natural refrigerants.

1. National Cooling Strategy and National Cooling Action Plan

A National Cooling Action Strategy works as a roadmap to holistically support the transition towards sustainable cooling practices and promoting the use of non-ODS refrigerants. Such a strategy covers the whole country and may include different sectors such as RAC sector, industrial refrigeration, mobile refrigeration etc. A National Cooling Strategy is an integrated document linked to climate, energy, and economic development strategies. It is based on the HPMP and HFC phasedown plans (if available) and intends to promote EE and the technology transition. Thus, it also links to Nationally Determined Contributions (NDCs) which drive energy efficiency requirements. In Jordan, the National Cooling Strategy is still a proposed action to support the NDC implementation. As a second step based on this Strategy a concrete National Cooling Action Plan can be prepared covering a wide range of measures such as promoting more stringent MEPS and outlining reduction potential, investments needed, potential financial

mechanisms, responsibilities etc. for each measure. In addition, the governance framework and MRV system is described.

2. To mainstream the sustainable cooling into the national strategies

To mainstream sustainable cooling into the national strategies, it is recommended to develop actions that promote efficient cooling as part of the national priority measures in the Third NEEAP.

3. Adopting new standards (MEPS) for different RAC applications in commercial sector

Based on the analysis of MEPS and regulation governing the RAC sector in Jordan and several expert interviews, it has been concluded that the MEPS do not cover labelling and MEPS for commercial RAC equipment. Therefore, it is of a great importance to expand or adopt new standards (MEPS) for different RAC applications in commercial sector and update the ones used in the household sector to promote the transition to low-GWP alternatives and the use of energy efficient RAC appliances.

4. National reporting, licensing, and quota allocation system for HFCs

As the basis for ratifying the Kigali Amendment, a national licensing and quota system for HFCs and a national reporting system for HFCs needs to be in place. The existing licensing and quota system appears to involve manual work data and is not performed using a harmonised database approach.

Specifically, a reporting scheme covering imports, exports, use, reclamation, and destruction of HFCs would need to be set up to comply with the Kigali requirements. An electronic and interlinked institutional data collection system would follow specific reporting requirements and unify reporting under Article 7 of the MP and manage the HFC quota. Further, effective licence checks of concerned goods (mainly bulk HFCs and HFC-containing equipment) would facilitate effective control at the Jordanian borders.

The legal basis for the measures needed for an effective implementation (i.e. licensing and quota allocation scheme), and reporting could be established through environmental statistics, existing legislation on environmental monitoring, a national F-gas regulation, or separate, dedicated legal acts.

5. National certification scheme for RAC technicians

Qualification and certification of RAC technicians is important for the transition to low-GWP (natural) refrigerants as required under the Kigali Amendment, especially on the safe use of flammable, toxic refrigerants or refrigerants requiring higher operating pressure. In this context, the NOU needs to build the technical capacities of the workers and technicians in the industrial sector and technicians working in maintenance workshops in order to promote the transition to low-GWP alternatives in household and commercial RAC applications. A national training and certification scheme should be developed and implemented. Training programmes should meet minimum requirements to address F-gas emissions reductions, leakage control, documentation, safe handling, use, storage, and transport of alternative refrigerants (including flammable refrigerants). To get certified, technicians should pass an exam proving the minimum qualification.

6. Improve the Waste Management Frameworks

The available Waste Management Framework Law No.16 (2020) underpins some key principles of waste management. Support could be provided to develop instructions based on the provisions of the Law No.16 for the end-of-life management of RAC applications, including destruction and final disposal, considering the cost recovery aspect.

7. Accompanying measure: awareness activities

Mainly, awareness activities about natural refrigerants and outreach to the relevant private and public stakeholders. Awareness activities should include crucial topics such as sustainable cooling technologies and disposal of conventional refrigerants. Consumer awareness activities are needed as well to increase demand for higher energy efficient cooling appliances and for improved energy performance of buildings. Some specific awareness activities have been discussed with stakeholders in Jordan. For example, the expert interview with the JNBC indicated that capacity building programmes are still needed to improve the knowledge of the linkages between sustainable cooling, cooling demand, and the enforcement of the relevant building codes. The NOU also needs to build the technical capacities of the workers and technicians at the industrial sector to promote the transition to the low-GWP alternatives in the household and commercial RAC applications. A national training and certification scheme should be developed and implemented.

5. Regulatory analysis

5.1. International protocols and commitments

Jordan has been a party to the MP on substances that deplete the ozone layer since 1989. Since then, the country has ratified the five subsequent amendments made under MP, including the recent Kigali Amendment in October 2019. Jordan continues to implement measures to comply with the Protocol provisions with technical and financial assistance from the Multilateral Fund (MLF) given that it is classified as a party operating under paragraph 1 of Article 5 of the Protocol. It also benefits from institutional strengthening support from the MLF, which provides all Article 5 countries with 2-year recurring grants to manage the country's MP programmes. Jordan succeeded in the two subsequent ODS phaseout programmes according to the following timeline:

- ▶ CFCs phaseout programme: The ODS phaseout programme in Jordan began in 1993 in coordination with the World Bank, which, as an implementing agency, assisted Jordan in obtaining the necessary financial support from the MLF for a country programme. Jordan was successful in phasing out CFC consumption through the National Ozone Depleting Substances Phase-Out Plan. This plan was known as the Country Programme, which was approved by the Executive Committee of the MLF for Implementation of the Montreal Protocol (ExCom) in 1992 and was updated in 2002. In 2002, the MLF Executive Committee approved the National ODS Phase-Out Plan for the remaining use of CFCs and CTC in Jordan. The plan entailed the introduction of new alternative substances in imported products and as raw material for manufacturing and servicing across a number of sectors including the RAC subsectors. These alternatives consist of HCFCs, HFCs, and natural refrigerants. With this assistance, Jordan was able to achieve complete phaseout of CFCs before the required deadline of 1 January 2010.

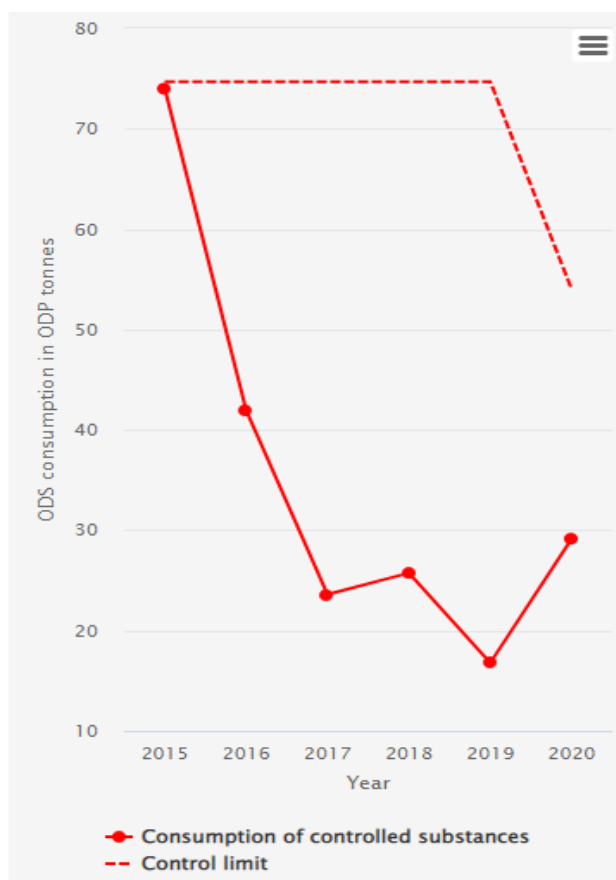


Figure 3 Jordan ODS consumption. Consumption is calculated as production (if any) + imports – exports¹⁴ (UNEP Ozone Secretariat 2022)

¹⁴ <https://ozone.unep.org/countries/profile/jor>

- ▶ HCFC phaseout programme, which meets all stepped reduction targets on consumption according to the HCFC Phaseout Management Plan (HPMP).

Table 5 Schedule of HCFC phaseout, Jordan

Freeze consumption (imports-exports) by 2013. The baseline is the average consumption for 2009-2010.	
Phasedown	10% of the baseline by 2015
Phasedown	35% of the baseline by 2020
Phasedown	67.5% of the baseline by 2025
Phasedown	97.5% of the baseline by 2030
Complete phaseout	2.5% of the consumption for services by 2040

In 2011, Jordan entered into the HPMP, a performance-based agreement with the Executive Committee (ExCom) of the MLF to address the reduction of Annex-C, Group 1 substances (HCFC-22, HCFC-141b, and HCFC-123) to a sustained level¹⁵.

The NOU successfully implemented the first stage of the HPMP (2011-2016) and, in 2013, started an updated agreement with the ExCom (“Jordan-Third Ozone Depleting Substances and Hydrofluorocarbon (HCFC) Phase-out Project”) to address the reduction of the above-mentioned substances according to a well-defined plan (2016-2022). In its HPMP II, the NOU aimed to phase out 70% of HCFCs by 2021¹⁶.

The HPMP, which is still under implementation by the government, covered the following two stages:

Table 6 Two stages of the HCFC Phaseout Management Plan in Jordan

HPMP stage I	2011-2017	<ul style="list-style-type: none"> ▶ During this stage, the government completed the target of phasing out HCFC-22 from the AC sector (manufacturing). ▶ This stage included implementing a project previously approved at the Committee’s 60th Meeting: the phase out of HCFC-22 and HCFC-141b in the unitary AC manufacturing sector at Petra Engineering Industries Co.
HPMP stage II	2017-2022	<p>The government is working to:</p> <ul style="list-style-type: none"> ▶ Eliminate HCFC-141b in foam manufacturing. ▶ Phase down HCFC consumption to 50% of baseline and an additional 30 by 1 January 2022.

¹⁵ HFC Inventory of Jordan, 2015, UNIDO

¹⁶ HFC Inventory of Jordan, 2015, UNIDO

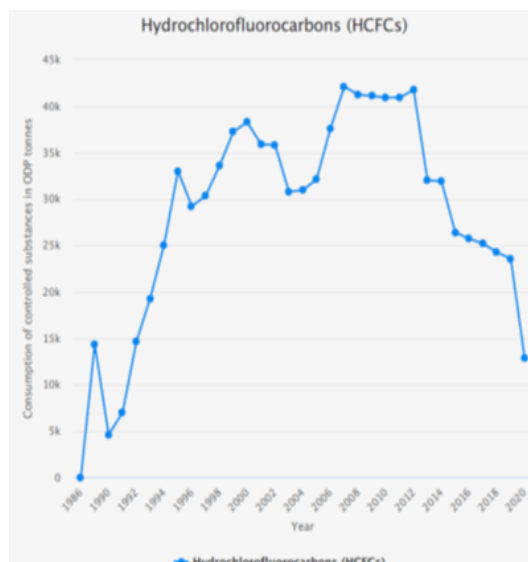


Figure 4 Jordan's HCFC consumption¹⁷

The government enforced its policies by disseminating a series of instructions for controlling and monitoring ODS, which included:

- ▶ Prohibiting of licensing of new installations based on CFCs
- ▶ Assigning the Ministry of Environment (MoEnv) as the national authority to draft the import licence to ODS importers
- ▶ Enforcing the labelling of products containing ODS and the alternatives
- ▶ Regularly updating the regulations to comply with MP commitments

Under the Kigali Amendment, the government approved HFC consumption phasing down target of 80% by 2045, as Table 7 shows.

Table 7 Schedule of phase down HFCs consumption in Jordan

Freeze consumption 2024–2028	
Baseline is the country's average consumption of HFCs for 2020, 2021, and 2022 plus 65% of the baseline for HCFCs.	
Phase down	10% of the baseline for 2029–2034
Phase down	30% of the baseline for 2035–2039
Phase down	50% of the baseline for 2040–2044
Phase down	80% of the baseline for 2045

To proceed with the third stage of the HPMP, the government received funds through the United Nations Industrial Development Organization (UNIDO) to support the ratification of the Kigali Amendment and in the early implementation of new obligations under the Montreal Protocol, and for the preparation of a HFC phase-down plan: Preparation for funding for the development of the HFC phase-down plan.

For the international protocols and commitments, the analysis will consider the first two group of aspects: the status and the implementation aspects.

¹⁷Source: <https://ozone.unep.org/countries/profile/jor#collapseclamation>

Table 8 Status of ratification of MP and Kigali Amendment in Jordan

Policy instrument/ commitment/ protocol	Aspects of analysis	
	Status	Compliance and Implementation
Montreal Protocol	In place. Accession on 31/5/1989	Decision by the Cabinet.
Kigali Amendment and Kigali Ratification	In place. Ratified on 16/10/2019	The Government of Jordan is committed to implementation because it is an amendment to the MP.

To comply with the Kigali Amendment, MoEnv, with the support of World Bank and UNIDO, started awareness and capacity building programmes to facilitate the transition to new low global warming potential (GWP) technologies in RAC industries accompanied by the HCFC phase out under the HCFC Phase out Management Plan (Stage II, second tranche) project. The programme includes the following activities:

- ▶ Capacity building programmes targeted at the technicians working in the RAC industry.
- ▶ Awareness campaign on EE in cooling systems.
- ▶ Capacity building programme for Vocational Training Corporation (VTC).
- ▶ Training programmes on laboratory testing of refrigerants for the staff of the JSMO and Jordan Customs.
- ▶ Training programmes on recovery and recycling of the phased out refrigerants and safe handling and storage.
- ▶ Support provided to update the curriculum for teaching refrigeration and AC engineering courses in local universities to integrate a module on the safe use and handling of flammable refrigerants accompanying new refrigeration technologies.

Table 9 UNIDO's programmes and projects to ensure compliance with the MP in Jordan

International project or programmes	Aspects of analysis	
	Status	Compliance and Implementation
Enabling activities on HFC phasedown with the support of UNIDO	Ongoing	High level
Jordan Ozone Depleting Substances HCFC phaseout project (ODS3) with the support of World Bank	Closing date is 31 December 2022	High level
HFC Phasedown Management Plan Preparation	Ongoing (July 2020- June 2022)	Instructions are in place
HCFC Phase-out management plan HPMP (Stage II)	In place	High level

In summary, the Government of Jordan is committed to implementing HPMP. Additionally, the government succeeded in reporting a significant decrease in HCFC consumption in 2018 to be 25.74 ODP tons of HCFC¹⁸, which is 69% below the HCFC baseline for compliance according to the data reported under Article 7 of the MP. For instance, HCFC-22 consumption is decreasing due to the implementation of HPMP activities, including training on good servicing practices and controls of imports and the adoption of HCFC-free alternatives in AC. As Jordan ratified the Kigali Amendment in October 2019, it has started to create an enabling environment for the phasedown of HFCs through the received funds for enabling activities, which are directed toward public and private stakeholders.

¹⁸

<https://open.unido.org/api/documents/17284517/download/HPMP%20Stage%20II%20Second%20Tranche%20Project%20proposal%20Jordan>, HCFC phase-out management plan (II stage, second tranche), ExCom Eighty-Fourth meeting, 2019.

5.2. National plans and strategies

Economic Modernisation Vision (2022)

Jordan's Economic Modernisation Vision focuses on the slogan of "A Better Future", and is based on two strategic pillars: accelerated growth through unleashing Jordan's full economic potential; improved quality of life for all citizens, while sustainability is a cornerstone of this future vision. Through the Vision and its Roadmap, Jordan will continue its efforts to tackle needs related to climate change (including delivering on the Paris Agreement).

Sustainability will be a key element in Kingdom's economic future, in particular: Expanding on renewable energy, including new sources of energy and continuously promoting improved energy efficiency.

Green Growth National Action Plan 2021-2025

MoEnv has been taking solid action to support Jordan's green growth transformation. In 2017, the Cabinet approved the National Green Growth Plan, which established green growth as a top national priority. Jordan's green growth vision—economic growth, which is environmentally sustainable and socially inclusive—puts a strong emphasis on the importance of building resilience. The next step in implementing this vision, the Green Growth National Action Plan 2021-2025 (GG-NAP), was published. The development of this plan lies at the heart of continuous efforts and ambitions to support environmental and climate action in Jordan, while also achieving Jordan's sustainable economic growth objectives.

The National Green Action Plan 2021-2025 targeted and created plans for six sectors:

- ▶ Agriculture
- ▶ Energy
- ▶ Tourism
- ▶ Transport
- ▶ Waste
- ▶ Water

The Energy Sector GG-NAP 2021-2025 outlines a green growth framework and actions for the sector aligned with the National Green Growth Plan (NGGP), Jordan Vision 2025, and Nationally Determined Contributions (NDC) under the Paris Agreement. At the heart of the green growth approach lies the leveraging of the sector's resilience through economic growth that is environmentally sustainable and socially inclusive. The GG-NAP outlines the five national green growth objectives on which the Energy Sector GG-NAP was developed for:

- ▶ Enhance natural capital
- ▶ Sustainable economic growth
- ▶ Social development and poverty reduction
- ▶ Resource efficiency
- ▶ Climate change adaptation and mitigation

The Energy Sector in the Green Growth National Action Plan 2021-2025 was developed to lead to transformational impacts based on these objectives. This includes supporting Jordan's objectives to achieve a cleaner energy mix through renewable energy as well as a reduction in national GHG emissions of 14%.

- ▶ Promoting the revitalisation of the energy services market and the pursuit of energy sector innovation as a driver of future economic growth and employment.
- ▶ Increasing the readiness of key national institutions to attract climate finance.
- ▶ Emphasising the importance of achieving EE through green building and construction, electric transport, and appliances.

Updated NDC (2021)

The government published an updated NDC (2021) and has raised the ambition to 31% reduction of emissions by 2030 compared to business as usual for the base year 2012. The updated NDC includes a measure targeting reduced HFC consumption aligned with the national commitments to comply with the Kigali Amendment.

National Energy Strategy

The latest National Energy Strategy 2020-2030 calls to increase the EE of all sectors to 9% in 2030 compared to 2018.

National Energy Efficiency Action Plan (NEEAP)

Jordan has prepared the first National Energy Efficiency Action Plan (NEEAP) in 2011 for the years 2012-2014. Subsequently, Jordan developed its second NEEAP for 2017-2020, which was implemented through 26 sectoral measures to achieve the strategic objectives of 20% improvement in EE by 2020 compared to the 5-year (2006-2010) baseline average consumption. Table 10 illustrates the measures relevant to the cooling sector as adopted in Jordan's NEEAP. The government plans to develop the third NEEAP soon after evaluating the progress of the second NEEAP.

Table 10 Key measures in Jordan's NEEAP relevant to the RAC and building sectors

MEASURE 2	▶ Energy label and standard programme for home appliances
MEASURE 3	▶ EE building code enforcement in the residential sector
MEASURE 4	▶ Roof insulation of existing buildings in the residential sector
MEASURE 7	▶ EE in existing health centres
MEASURE 9	▶ EE in existing small and medium hotels
MEASURE 10	▶ EE building code enforcement in tertiary sector
MEASURE 24	▶ EE in the Al-KARAK Municipality Buildings building
MEASURE 29	▶ Energy efficiency buildings codes (EEBCs)

National Cooling Plan

At the time of writing this report (March 2022), Jordan had not developed a National Cooling Plan. A local research centre is applying to receive a fund from the NDC Support Facility, where the proposal includes outcomes related to efficient cooling solutions and drafting a National Cooling Plan, among others. Jordan is in the process of securing a fund aiming to cut emissions from the cooling sector by transitioning to low-GWP refrigerants and developing a cooling strategy, mainly for the AC subsector.

Climate Change National Adaptation Plan (NAP) (2021)

The NAP document was prepared based on the Climate Vulnerability Assessment of the Third National Communication Report and adopts the values and principles of the NAP Framework. 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, and private sectors entities to implement adaptation initiatives, develop partnership relations and synergies with each other, to reach the required adaptation goals. The plan includes a description of sectoral adaptation programmes and measures through enhancing the resilience of urban structure to climate change impacts and supporting sustainable urbanisation.

One of the programmes addresses sustainable cooling, supporting urban green infrastructure interventions for climate resilience. Key measures relevant to cooling to be applied under this programme include introducing climate-responsive building techniques and elements to reduce the effect of heat and reducing demand on energy for cooling. Another important policy is the National Climate Change Policy of

the Hashemite Kingdom of Jordan 2013-2020, which is updated for 2022-2050 and will be adopted and launched soon. The updated policy focuses on applying measures to achieve net-zero carbon emissions.

Key conclusions of analysis of the national plans and strategies

In general, Jordan has developed and adopted a wide spectrum of national policies in different sectors to drive and achieve a variety of development prospects. Some of these policies are strategic, such as the National Energy Strategy, so all of the country's long-term objectives should be taken into consideration while developing the other inter-sectoral policies. Some policies were developed and adopted but their implementation depends on the availability of support including finance, capacity building, and technology transfer such as the national climate-related plans. Similarly, the MP commitments are not going to succeed in implementation unless the international support is being mobilised. However, there are still opportunities for increasing improvement in the cooling sector to be reflected in the NEEAP as well as in other national climate-related policies. For instance, according to NOU, there is no national cooling strategy in Jordan. Having the cooling strategy in place will build the foundation for sustainable cooling to be part of the national energy objectives and contribute to the NDC implementation.

Table 11 Summary of the assessment of standards and codes relevant to the RAC and building sectors in Jordan

National plans/ strategies	Status	Compliance and implementation	Technical aspects				
			EE of RACHP equipment and systems	Reducing cooling demand	Phase out of ODS	Phase down of HFCs	Promoting natural refrigerants
Green Growth National Action Plan 2021-2025	In place	Low level of compliance for implementation	EE mentioned for appliances in general				
Updated NDC (2021)	In place	Submitted in 2021, considered national priority upon availability of support	Refers to synergy between Kigali Amendment and Paris Agreement	Encouraging efficient cooling		Mentioned	
National Energy Strategy 2020-2030	In place	The government complies with the strategy	Improving efficient energy consumption by 9% in all sectors	Improving efficient energy consumption by 9% in all sectors			

National plans/ strategies	Status	Compliance and implementation	Technical aspects				
			EE of RACHP equipment and systems	Reducing cooling demand	Phase out of ODS	Phase down of HFCs	Promoting natural refrigerants
Second National Energy Efficiency Action Plan (NEEAP) 2018-2020	In place	Upon availability of support	Energy label and standards for home appliances Energy efficiency in small and medium hotels including AC	Energy efficiency building code enforcement in residential sector Energy efficiency building code enforcement in tertiary building including commercial (thermal insulation in particular)	Not provided	Not provided	Not provided
National Cooling Plan	Planned	Not available yet	Not available yet	Not available yet	Not available yet	Not available yet	Not available yet
HCFC Phase-out Management Plan (HPMP)	In place	Complied	Not provided	Not provided	Mentioned	Mentioned	
HFC phasedown plan	In place	Complied	Not provided	Not provided	Mentioned	Mentioned	
Climate Change National Adaptation Plan (NAP (2021))	In place	Adopted					

5.3. Laws and bylaws and other national legislation

Jordan has developed several laws, regulations, and policy instruments that govern EE and environmental protection. Some of these still work without being updated, such as the General Electricity Law (2002) and the Air Protection Bylaw (2005), while some have already been updated to adapt to the national context and perspectives.

In general, the Jordanian government has taken many measures to develop the regulatory and legislative framework by issuing several laws and legislations:

- ▶ General Electricity Law, Temporary Law No. (64), 2002
- ▶ National Environment Protection Law No. (6) of 2017. This law consists of 33 articles aimed at protecting the environment providing that (i) the Ministry of Environment is the authority responsible for environmental protection, and (ii) the Ministry, together with the related parties, develops the policies and prepares the plans and programmes, works on forecasting climate change identifying the involved sectors, follows the implementation of international environmental agreements, and protects the biodiversity, identifying areas that need special attention.

- ▶ Instructions to control the use, import and re-export of substances controlled under the MP and its amendments for 2021. The instructions were issued according to the provisions of paragraph (d) and (q) of Article (4) and paragraph (b) of Article (30) of the Environment Protection Law No. (6) for the year 2017. The instructions are comprehensive and consist of 52 Articles. They cover the HCFC phaseout plan, HFC phasedown plan, the National Ozone Committee roles and responsibilities, and the NOU roles and responsibilities at national and international levels. The instruction applies to import, re-export, and handling of all chemical mixtures, devices, and equipment that contain controlled and permitted substances under the MP. The responsibilities apply to all the national stakeholders including, among others, JSMO, Jordan Customs, VTC, and Civil Defence Directorate. Although these instructions do not exclusively mention the EE target or the natural alternatives, the planned activities under the country's commitments to Kigali Amendment include the awareness and capacity building programmes that aim to build the country's readiness for the new accompanied cooling technologies.
- ▶ Climate Change Bylaw No. 79 for 2019, the MoEnv declared this bylaw to ensure full engagement of all stakeholders including technical and decision makers. The bylaw set the procedures for climate change projects to be ratified by the National Climate Change Committee, which includes stakeholders from all governmental entities. The committee has the right to invite and consult with experts when needed. The Renewable Energy and Energy Efficiency Law No. (13) of the year 2012 and its amendments No. (33) of year 2014.
- ▶ Bylaw No. (13) of 2015 of Provisions and Conditions of Exempting Systems of Renewable Energy Sources and its Devices and Equipment and the Energy Efficiency equipment from the Customs Fees and Subjecting them to General Sales Tax in Percentage or Amount of (Zero) according to the Paragraph (C) of Article (11) of the Renewable Energy and Energy Efficiency Law No. (13) of 2012.
- ▶ Jordan Renewable Energy & Energy Efficiency Fund (JREEEF) as established in 2012 by the Renewable Energy and Energy Efficiency Law 13 (articles 12, 13, 14, 15, and 16), yet it became operational in 2015 after the promulgation of Bylaw 49 of 2015.
- ▶ The Bylaw No. (73) of 2012 on Regulating Procedures and Means of Conserving Energy and Improving Its Efficiency issued by virtue of article (18) of the Renewable Energy and Energy Efficiency Law No. (13) for year 2012.
- ▶ The Waste Management Framework Law No. (16) of 2020 adopts the five waste management principles including the extended responsibility principle and the polluter pays principle. Chemical substances and electric/electronic waste are classified as hazardous waste that require management under the supervision of the Ministry of Environment for final disposal.
- ▶ E-waste management instructions for the 2021, which were issued in accordance with the provisions of paragraph (b) of Article (13) of the Hazardous Substances and Waste Management Bylaw No. (68) for 2020. These instructions cover the handling of used and end-of-life refrigerators and ACs as electrical appliances. However, the instructions do not specify the environmentally safe methodology or technology to be used in the treatment, recycling, recovery, and handling for final disposal of these appliances.
- ▶ Air Protection Bylaw No. (28) of 2005, which stated that any entity shall comply with the national regulations of the use of the substances under the control of MP.
- ▶ Jordan Environment Fund 2018 bylaw and its amendments encourage the development of initiatives aimed at the optimal use of environmental components and natural resources towards sustainable development.
- ▶ National Building Law (7), 1993.

Key conclusions of analysis of the laws and bylaws

Generally, the national legislation covers a wide range of aspects addressing HFCs, HCFCs, and ODS. Most of those laws are, to a large extent, well-enforced and implemented. Yet, there is a need to develop regulations targeting specific issues. For example, the phase out of ODS is not clearly addressed in the waste management laws. Therefore, it is important to develop legislation for the disposal of ODS and F-gases. The certification of technicians dealing with refrigerants should also be addressed.

Table 12 Initial assessment of laws relevant to the RAC sector in Jordan. Colour coding as described in **Table 3**

Laws and bylaws	Status	Compliance and implementation	Technical aspects				
			EE of RACHP equipment and systems	Reducing cooling demand	Phase out of ODS	Phase down of HFC	Promoting Natural Refrigerants
General Electricity Law (2002)	In place	Enforced			Not applicable	Not applicable	Not applicable
Environment Protection Law	In place	Enforced instructions, incl. for F-gases, are in place			Compliance to international agreement	Compliance to international agreement	
ODS regulation	In place	Enforced					
Renewable Energy and Energy Efficiency Law	In place	Enforced			Not applicable	Not applicable	Not applicable
Waste Management Framework Law	In place	Enforced	The end-of-life RAC equipment are part of electrical and electronic waste	Not applicable	Not specifically mentioned	Not specifically mentioned	Not provided
Building Law	In place	Enforced		Thermal code	Not applicable	Not applicable	Not applicable
Climate Change Bylaw No. 79							
Bylaw No. (13) of 2015, Bylaw of Provisions and Conditions of Exempting Systems of Renewable Energy Sources and its Devices and Equipment and also the Energy Efficiency equipment	In place	Implemented and correlated with JSMO technical regulations scope.	Applied for residential according with JSMO technical regulations .				
The Bylaw No. (73) of 2012 on Regulating Procedures and Means of Conserving Energy and Improving Its Efficiency	In place	Implemented					
Air Protection Bylaw No. (28)	In place	Enforced			Relevant to ozone	Relevant to ozone	

5.4. Standards and codes

Starting from 2014, Jordan adopted and enforced several technical regulations in line with EU standards related to AC. There are technical regulations for refrigerators used at households, but there are no

technical regulations covering commercial types. Coming updates will correspond to the new updates on EU standards. Additionally, there are several safety standards.

Table 13 Technical regulations for the RAC sector in Jordan

Standards name and number	Focus and content
Jordanian Technical Regulation 2108:2013	Technical Regulation on energy efficiency labelling of air conditioners. It focuses on the variable capacity room AC (Window - Split) with variable speed compressor and a cooling capacity not more than 12 kW.
Jordanian Technical Regulation 2107:2013	Technical Regulation on eco-design requirements for Air Conditioners and Comfort Fans. It provides the minimum requirements for placing on the market electric main-operated ACs with a rated capacity of ≤ 12 kW for cooling, considering GWP and capacity in kW.
Jordanian Technical Regulation 2101:2013 Energy labelling for household refrigerating appliances	<p>This Technical Regulation establishes requirements for the labelling and provision of supplementary product information on electric main-operated household refrigerating appliances with a storage volume between 10 and 1,500 litres. This regulation shall apply to electric main-operated household refrigerating appliances, including those sold for non-household use or for the refrigeration of items other than foodstuffs and including built-in appliances.</p> <p>It shall also apply to electric main-operated household refrigerating appliances that can be battery-operated.</p> <p>This implementing Technical Regulation shall not apply to:</p> <ul style="list-style-type: none"> (a) Refrigerating appliances that are primarily powered by energy sources other than electricity such as liquefied petroleum gas, kerosene, and biodiesel fuels. (b) Battery-operated refrigerating appliances that can be connected to the mains through an AC/DC converter, purchased separately. (c) Custom-made refrigerating appliances made on an on-off basis and not equivalent to other refrigerating appliance models. (d) Refrigerating appliances for tertiary sector applications where the removal of refrigerated foodstuffs is electronically sensed and that information can be automatically transmitted through a network connection to a remote control system for accounting. (e) Appliances where the primary function is not the storage of foodstuffs through refrigeration, such as standalone icemakers or chilled drinks dispensers.
Jordanian Technical Regulation 2102:2013 Technical Regulation on eco-design requirements for household refrigerating appliances	<p>Minimum requirements for placing on the market of electric main-operated households Refrigerating appliances with a storage volume up to 1,500 litres. This version of the technical regulation is enforced starting from July 2014. The technical regulation aims to specify the minimum requirements for EE for refrigerating appliances to be allowed for use and placed in Jordan market. It also shows the needed calculations to calculate the Energy Efficiency Index (EEI). It provides a verification procedure for market surveillance purposes.</p>
JS EN 60335-2-40:2012:	Household and similar electrical appliances - Safety - Part 2-40: Particular requirements for electrical heat pumps, air-conditioners, and dehumidifiers.
JS EN 60335-2-89:2007:	Household and similar electrical appliances - Safety - Part 2-89: Particular requirements for commercial refrigerating appliances and ice makers with an incorporated or remote refrigerant unit or motor-compressor.

Regarding EE in the building sector, Jordan elaborated several codes mostly developed by the MPWH and the Jordanian National Building Council (JNBC). Table 14 shows the most relevant codes related to the cooling sector.

Table 14 Codes related to energy efficiency in buildings in Jordan

Codes name	Focus and content
Energy efficiency building code (2010, update under preparation, published planned by June 2022)	<p>The code aims to provide minimum requirements for EE in buildings, excluding the low-rise residential buildings (two floors or less), in the design, construction, operation, and maintenance phase of the building.</p> <p>The code contains seven sections dealing with the most important information the engineer needs to carry out the design, implementation, and operation of buildings in accordance with the requirements of the minimum EE.</p>

Codes name	Focus and content
Thermal insulation code (2009)	The code aims to define the building thermal design principles and the methods for calculating the thermal characteristics of different structural elements. Additionally, it sets the minimum thermal requirements for these elements to facilitate the best selection by the engineers to achieve thermal comfort in buildings.
Mechanical ventilation and air conditioning code (2018)	This code aims to provide the minimum requirements for comfort, health, general safety, and security resulting from mechanical ventilation systems and AC for space while achieving energy savings and environmental conservation by organising and controlling the design, planning, installation, quality of materials used, examination, operation, maintenance, and safety of mechanical ventilation and AC systems. It includes the most important information needed to carry out the work of designing mechanical ventilation and AC systems for buildings and facilities, implementing, installing, testing, and operating them.
Green Building Guideline	The Green Building Guideline and rating system for Jordan is referenced to Jordan's building codes (as compulsory requirements). The Green Building Guideline contains parameters and credits that are suitable for Jordan's climate, resources, legislation, policies and policies instruments, building techniques, and strategies. This guideline is attached to a voluntary rating system that is connected to an incentive scheme given by the government.

National certification scheme for RAC technicians

The VTC provides training services, continuous education, and vocational preparation programmes with different levels of qualifications covering Basic skills level and technical upgrading programmes (Vocational Training Corporation 2022).

End-of-life management and extended producer responsibility approach

Jordan did not adopt a recovery and waste management scheme for the phased out refrigerants. Therefore, there is a lack of specific leakage detection method, procedure, or protocol for refrigerant recovery. There is also no regulation, system, or procedure in place for waste management and the disposal of used refrigerants. According to the provisions of the instructions 2021, all the companies that import the substances under the control of the MP shall provide the Ministry of Environment with biennial and annual reports including all the quantities of substances that were imported, consumed, and not consumed yet, in addition to records of the number of equipment and compressors that were used.

The instructions guide the companies to comply with the procedure adopted by the Ministry of Environment for the final disposal of the hazardous waste or the final disposal of the electrical and electronics waste to dispose of the equipment and apparatus that contain any of the substances under control of the MP. The guide does not provide clear provisions on the methods and techniques of refrigerant disposal. The MoEnv controls the final disposal of the electrical and electronics waste by applying the "Instructions for Managing Electrical and Electronic Waste for the year 2021, issued pursuant to Provisions of Paragraph (B) of Article (13) of Hazardous Substances and Waste Management System No. 68 of 2020." Based on these instructions, the MoEnv permits specialised companies to collect and environmentally sound handle the electrical and electronics waste. And for the final disposal, the MoEnv is responsible for safely managing the hazardous waste landfill.

The electrical and electronics waste producer can apply for the final disposal service at the MoEnv and pay the fees for this service. After that, the officers at the hazardous waste landfill can receive the waste to safely dispose of it. There is no waste management technical regulation in place for the equipment including refrigerants. The MoEnv, with the support of United Nations Development Programme (UNDP), developed a training manual that explains how to handle electrical and electronics waste in an environmentally sound manner including the ACs and refrigerators, but it is not adopted as a directive.

Key conclusions of analysis of the standards and codes

The EEBCs are detailed, and there are several enforcement plans. Some of the codes are well-enforced (e.g. the building insulation code). Yet, the continuous updating and development of energy codes and manuals faces several challenges such as the lack of the necessary financial support to update the related

codes and manuals. The standards of appliances such as minimum energy performance standards (MEPS) and labelling of appliances such as ACs and refrigerants are well-implemented, monitored, and enforced. Yet, those standards do not cover all RAC appliances. For example, the MEPS for household AC are in place and well-enforced, but there is no MEPS for the commercial ACs. Jordan did not develop a recovery and waste management scheme for the phased out refrigerants.

Table 15 Summary of the analysis of the standards and codes in Jordan

Standards and codes	Status	Compliance and Implementation	Technical aspects				
			EE of RACHP equipment and systems	Reducing cooling demand	Phase out of ODS	Phase down of HFC	Promoting natural refrigerants
Air conditioning MEPS (Household)	In place	Enforced					
Air conditioning Labels (Household)	In place	Enforced					
Air conditioning MEPs & Labels (commercial)	Not in place						
Refrigeration Labels & MEPS (Commercial)	Not in place						
Safety Standards	In place	Enforced					
Energy efficient building code (2010)	Under update	Enforced	Mentioned only for AC equipment		Not provided	Not provided	Not provided
Thermal insulation code (2009)	In place	Enforced and under update	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Thermal insulation Guide (2018)	In place	Voluntary and under update	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Mechanical ventilation and air conditioning code (2018)	In place	Enforced	For AC		Not provided	Not provided	Not provided
Green Building Guide	In place	Voluntary and under update	For AC		Not provided	Not provided	Not provided

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