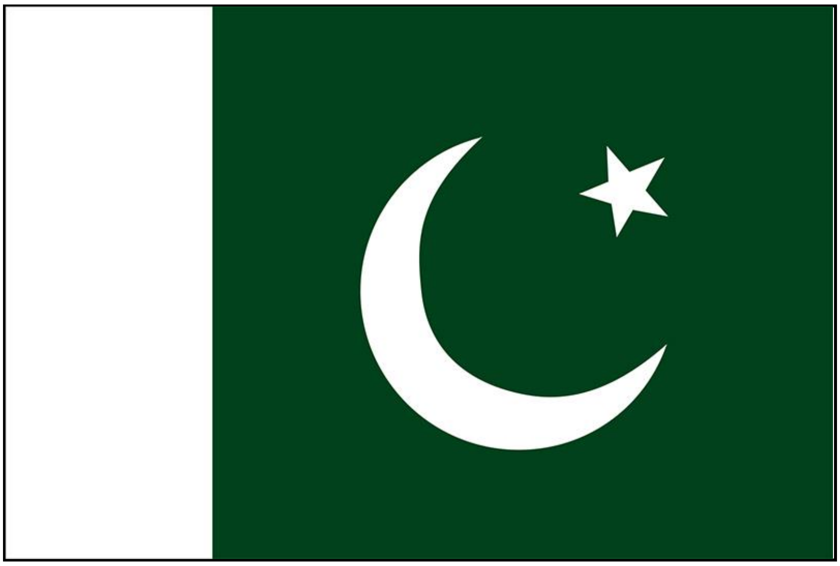

PAKISTAN

FINAL COUNTRY ASSESSMENT REPORT FOR RATIFICATION AND IMPLEMENTATION OF THE KIGALI AMENDMENT TO THE MONTREAL PROTOCOL

June 2023

Prepared by

National Ozone Unit, Ministry of Climate Change and Environmental Coordination,
with the assistance of UNEP and
Financial support from the Multilateral Fund

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Acronyms

ACs	Air Conditioners
AJKTTB	Azad Jammu Kashmir Trade Testing Board
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASYCUDA	Automated System for Customs Data
BTTB	Baluchistan Trade Testing Board
BTU	British Thermal Unit
CAR	Country Assessment Report
CBT	Competency Based Training
CDC	Curriculum Development Committee
CFC	Chlorofluorocarbons
CO_2	Carbon dioxide
CP Report	Country Program Report
CPD	Continuing Professional Development
EA	Enabling Activities
EPA	Environmental Protection Agency
ES&L	Energy Efficiency Standards and Labeling
EU	European Union
ExCom	Executive Committee of the Multilateral Fund for the Implementation of the Montreal Protocol
FBR	Federal Board of Revenue
GDP	Gross Domestic Product
GHGs	Green House Gases
GIZ	Gesellschaft für Internationale Zusammenarbeit
GTTI	Government Technical Training Institute
GWP	Global Warming Potential
HAT	High Ambient Temperature
HC	Hydrocarbon
HCFC	Hydrochlorofluorocarbon
HEC	Higher Education Commission
HFC	Hydrofluorocarbons
HFO	Hydrofluoro-olefin
HPMP	HCFC Phase out Management Plan
HS	Harmonized System
HVACR	Heating Ventilation Air Conditioning and Refrigeration
IEC	International Electrotechnical Commission
iPIC	informal Prior-Informed Consent
IPO	Import Policy Order
JS(IC)	Joint Secretary (International Cooperation)
NPM	National Programme Manager
KA	Kigali Amendment
KPBTE	Khyber Pakhtunkhwa Board of Technical Education
KPK	Khyber Pakhtunkhwa
kWh	kilowatt hour
LVC	Low Volume Consuming
MAC	Mobile Air Conditioner
MEAs	Multilateral Environmental Agreement
MEPs	Minimum Energy Performance Standards
MLF	Multilateral Fund for the Implementation of the Montreal Protocol
MOCC&EC	Ministry of Climate Change and Environmental Coordination
MP	Montreal Protocol

MT	Metric Tonn
MTOE	Million Tonnes of Oil Equivalent
NAVTTC	National Vocational and Technical Training Commission
NDCs	Nationally Determined Contributions
NEECA	National Energy Efficiency & Conservation Authority
NGOs	Non-Governmental Organizations
NH3	Ammonia
NOU	National Ozone Unit
NSUs	NVQF Support Units
NTB	National Training Bureau
NUTECH	National University of Technology
NVC	National Vocational Certificate
NVQ	National Vocational Qualifications
NVQF	National Vocational Qualifications Framework
ODP	Ozone Depleting Potential
ODS	Ozone Depleting Substances
ODSA	Ozone Depleting Substance Alternatives
PBTE	Punjab Board of Technical Education
PCT Codes	Pakistan Customs Tariff Codes
PEPCO	Pakistan Electric Power Company
PRAL	Pakistan Revenue Automation (Pvt.) Ltd.
PS	Pakistan Standards
PSQCA	Pakistan Standard & Quality Control Authority
PU	Polyurethane
PVTC	Punjab Vocational Training Council
Q2C	Qualification, Certification and Compliance
QABs	Qualification Awarding Bodies
RAC	Residential Air Conditioner
RAC	Refrigeration and Air Conditioning
RACHP	Refrigeration, Air Conditioning & Heat Pump
RDL	Refrigerants Driving License
RPL	Recognition of Prior Learning
RTOC	Refrigeration, Air Conditioning & Heat Pump Technical Options Committee
SBTE	Sindh Board of Technical Education
SDGs	Sustainable Development Goals
SMEs	Small Medium Enterprises
SNCP	Sustainable National Cooling Plan
SRO	Statutory Regulatory Order
TEVTA	Technical Education & Vocational Training Authority
TOR	Terms of Reference
TTB	Trade Testing Board
UNDP	United Nations Development Programs
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
UNTC	United Nations Treaty Collection
USA	United States of America
WCO	World Customs Organization
WeBOC	Web based One Customs
XPS	Extruded Polystyrene

Chapter-1

INTRODUCTION

1.1 Introduction

This report is developed to assess the country's preparedness for the ratification and implementation of the Kigali Amendment (KA) to the Montreal Protocol (MP) on Substances that Deplete the Ozone Layer and provide recommendations for future strategy and action plans required for the implementation of the Hydrofluorocarbon (HFC) phase-down in Pakistan. This is part of the Enabling Activities (EA) Project currently being implemented by the Ministry of Climate Change and Environmnetal Coordination (MOCC&EC) of Pakistan in coordination with the United Nations Environment Programme (UNEP) and financial support from the Multilateral Fund (MLF) for the Implementation of the Montreal Protocol.

The parties to the Montreal Protocol on Substances that deplete the Ozone Layer reached an agreement at their 28th Meeting of the Parties on 15 October 2016 in Kigali, Rwanda to phase down Hydrofluorocarbons (HFCs) that are commonly used as alternatives to ozone-depleting substances (ODSs). These HFCs are not ozone-depleting substances but are greenhouse gases that have high or very high global warming potential.

The Executive Committee of the MLF (ExCom) at its 79th meeting in July 2017, adopted Decision 79/46 on the Enabling Activities to support Article 5 countries to ratify the Kigali Amendment and take preparatory steps to fulfill their initial obligations. The funding for the Enabling Activities for Pakistan was approved at the 81st Meeting of the ExCom with UNEP as implementing agency. The National Ozone Unit (NOU) of Pakistan is responsible for the delivery of the project which is aimed to

- achieve a broader understanding of the Kigali Amendment provisions and to prepare a legislative basis for the ratification;
- build the capacity of the industry, market and service sector on ODS alternatives and outreach on low GWP technologies and energy efficiency;
- understand the capacity needs of the service sector for low Global Warming Potential (GWP) alternatives;
- develop a proposal to establish a new or modify the present ODS import/export licensing system to include HFC and HFC reporting; and
- raise general awareness of the public and implementing partners about the importance and benefits of the Kigali Amendment on the environment. In addition, develop sector-specific awareness and outreach programmes and knowledge materials.

1.2 Country Profile & Status of the Ratification of the Montreal Protocol

Pakistan is classified as an Article-5 country under the MP as the national average consumption of ODS chemicals is within 300 grams per capita. Pakistan is also a non-low volume consuming country as its ODS consumption exceeds 360 MT. Pakistan neither produces nor exports any HCFCs or HFCs to other countries. However, Pakistan imports HCFCs and HFCs from different countries for use in the manufacturing and servicing sectors. Pakistan is part of Group 2 countries under the Kigali Amendment and benefits from a delayed phase-down schedule compared to Group 1 countries, with the first obligation to freeze imports at baseline level to start in 2028. Pakistan is in the list of High Ambient Temperature (HAT) countries[1].

Pakistan ratified the Vienna Convention, Montreal Protocol and all its Amendments except the Kigali Amendment. Pakistan has also ratified all the major international environmental treaties related to Climate Change, as outlined in the below table.

Table 1: Multilateral Environmental Agreements related to ODSs and Climate Change

Conventions/ Protocol/ Amendment	**Adoption**	**Date of Ratification**
Vienna Convention for the Protection of the Ozone Layer	1985	1992
Montreal Protocol on Substances that Deplete the Ozone Layer	1987	1992
London Amendment to the Montreal Protocol	1990	1992
Copenhagen Amendment to the Montreal Protocol	1992	1995
Montreal Amendment to the Montreal Protocol	1997	2005
Beijing Amendment to the Montreal Protocol	1999	2005
Kigali Amendment to the Montreal Protocol	2016	Under consideration
United Nations Framework Convention on Climate Change	1992	1994
Kyoto Protocol to the UNFCCC	1997	2005
Paris Agreement under the UNFCCC	2015	2016

Source: www.ozone.unep.org/all-ratifications and www.informea.org/en/node/168/parties

1.3 ODS Phase-Out Achievements

The country has successfully met its obligations to reach the target set for the phasing out of ODSs listed under Article 2A, 2B, 2C, 2D & 2E of the Montreal Protocol. When it comes to HCFCs (Article 2F), the country has successfully implemented two stages of HCFCs phase-out Management Plan (HPMP) to achieve the 2020 target. In Pakistan, the use of HCFC includes HCFC-141b, HCFC-142b and HCFC-22. HCFC-141b, HCFC142b & HCFC-22 are used in the manufacturing sector whereas HCFC-22 is also used in the servicing sector as under:

- HCFC-141b is used in the foam manufacturing sector including residential and commercial refrigeration, Thermoware PU foam, PU sandwich panels, flexible foam, pipe PU insulation and spray foam. It is planned that the remaining HCFC-141b will completely be phased out in 2025 under HPMP Stage-III that is planned for submission at the 89th ExCom.

- HCFC-142b is used in extruded polystyrene along with HCFC-22. It is planned that HCFC-142b will also be completely phased out in 2025 under HPMP Stage-III that will be submitted in 89th ExCom.

- HCFC-22 is used in the cooling circuit in manufacturing as well as for the servicing of domestic and commercial air conditioners. It is planned that HCFC-22 in AC manufacturing will be completely phased out in 2025 under HPMP Stage-III. Furthermore, the country is continuously working on different areas for the phasing out of HCFC-22 in the servicing sector including the following:

    - Policy and regulation
    - Custom and Enforcement Officers capacity building
    - RAC technician training and certification

[1] The Kigali Amendment includes an exemption mechanism that can be used in countries with high ambient temperatures for certain applications that cannot use low GWP alternatives.

- National Recycling, Recovery and Reclamation Scheme
- Technical Assistance
- Monitoring and control

The baseline initially agreed with the MLF for Pakistan was 247.4 ODPT which was revised to 248.11 ODPT and approved in 29th Meeting of the Parties to the Montreal Protocol (decision #XXIX/16). Out of this, 71.7 ODPT were replaced by Cyclopentane under stage-I in the manufacturing sector while 7.4 ODPT ton was reduced in the servicing sector. 70.74 ODPT was replaced by Cyclopentane, Water blown and CO_2/DME/HFO under stage-II in the manufacturing sector in HCFC-141b & HCFC-142b/HCFC-22 whereas 6.90 ODPT was reduced in the servicing sector under stage-II.

Table 2: HCFCs phase-out progress in Pakistan under HPMP Stage I & II

Chemicals	**Baseline**	**Stage-I phase-out amount**	**Stage-II phase-out amount**	**Stage-I & II total phase-out amount**	**Remaining phase-out amount**
HCFC-141b	138.50	71.70	58.70	130.40	8.11
HCFC-142b	4.65	0	2.99	2.99	1.66
HCFC-22	104.95	7.40	15.98	23.38	81.58
Total	**248.11**	**79.10**	**77.67**	**156.77**	**91.34**

Source: HPMP Stage-III Pakistan

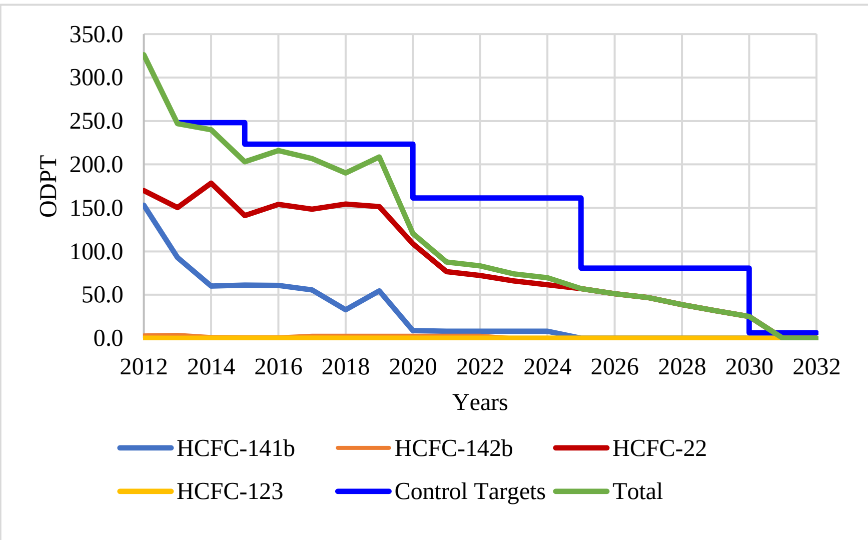
The remaining consumption of HCFCs after the implementation of HPMP Stage-I & II is 91.34 ODPT and it will be phased out under the subsequent stages of HPMP during 2020-2030. Therefore, the reduction shall be brought to a sustained level of zero ODPT prior to 1 January 2030 with understanding that consumption between 2030 and 2040 (i.e., the servicing tail) may exceed zero in any year as long as the average calculated level of consumption over the ten-year period from 1 January 2030 to 1 January 2040 does not exceed 2.5 per cent of country baseline consumption, in compliance with Montreal Protocol schedule.

Pakistan has met its obligation with regard to the 2013 freeze target, 10% reduction target in 2015 and 35% reduction target in 2020. In fact, the country has reduced its HCFC consumption by 50% in 2020 and will be submitting HPMP Stage-III to achieve 97.5% reduction by 2030. The duration of the remaining HPMP activities is under discussion with MLF.

1.4 Historical Consumption and Projections of HCFCs

The consumption of HCFCs was studied based on the historical data from 2012 to 2019 and projected up-to 2030. The graphical presentation of the historical and projected consumption data in ODPT along with control targets for the country up to 2030 is provided below:

Figure 1: Historical consumption and projections of HCFCs in ODPT

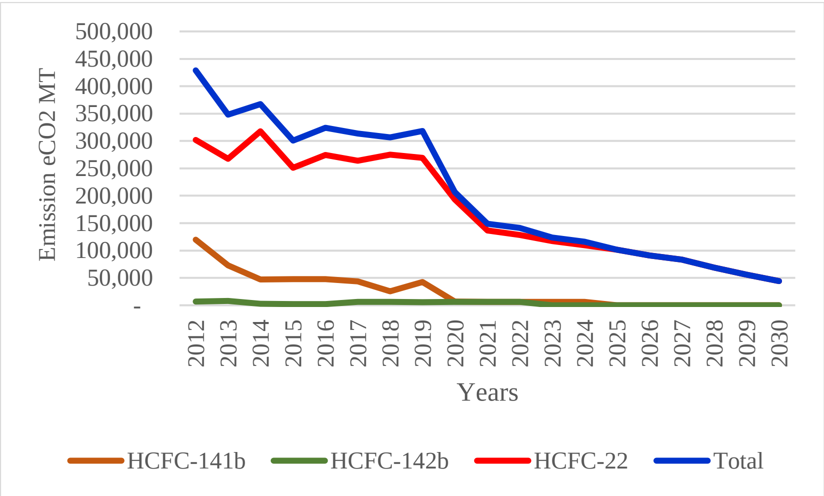


Source: HPMP Stage-III Pakistan

It is evident from the above graph that the consumption of HCFCs is declining.

Further, the emission CO_2e in metric ton of HCFCs is also calculated and presented in the graph below:

Figure 2: Historical emission and projections HCFCs



Source: Emission as reported in HPMP Stage-III Pakistan

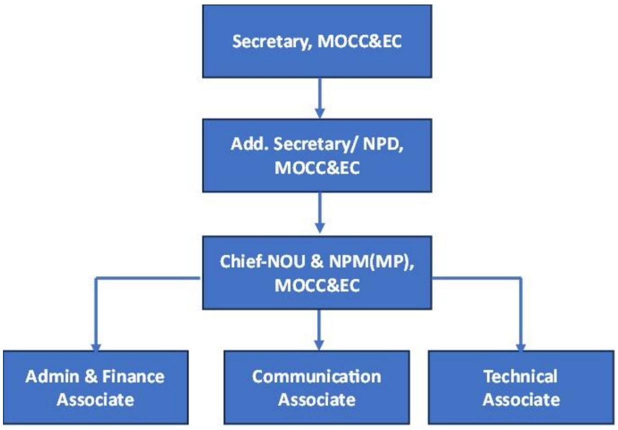
1.5 Existing Institutional Framework for the Control of ODS

The Government of Pakistan ratified the Montreal Protocol in 1992. After the approval of the Institutional Strengthening Project for Pakistan at the 14th Executive Committee meeting of the Multilateral Fund, the Government of Pakistan established the National Ozone Unit (NOU) under the Federal Ministry of Environment, now the Ministry of Climate Change and Environmental Coordination (MOCC&EC), to implement the Protocol. The NOU started working in 1996 in Islamabad and is responsible for coordinating with all stakeholders to comply with the control measures of the Montreal Protocol and the ExCom. The NOU is supported through funding from the MLF. These funds have been provided for the institutional strengthening of the National Ozone Unit as well as for carrying out activities to phase out the consumption of ozone-depleting substances through investment and non-investment projects. Over the years, the NOU has extended assistance to the local ODS-based industries for their conversion into ozone-friendly technology through the implementing agencies (UNIDO, UNEP, UNDP and World Bank) and with the financial assistance of the MLF. At present, UNDP is providing Institutional Strengthening support while UNIDO and UNEP provide technical assistance. A committee comprising members from MOCC&EC, Ministry of Commerce and Federal Board of Revenue exists to control the quota matters.

The National Ozone Unit has ensured the implementation of the Montreal Protocol through various policies and regulatory measures and continuous monitoring of the use and phase-out of ODS. In this regard, it regularly interacts with various Government ministries and agencies such as the Ministry of Commerce and Federal Board of Revenue (FBR). It has also carried out various training and awareness programs for the use of ODS substitutes for technicians as well as for custom officers.

The National Ozone Unit is located in Islamabad and is administered by the MOCC&EC. The National Program Manager of the National Ozone Unit currently reports to the Additional Secretary of MOCC&EC. The organizational chart of NOU is shown below:

Figure 3: Approved organizational chart of NOU/MOCC&EC



Source: Ministry of Climate Change and Environmental Coordination

1.6 The Enabling Activity Project Component and Country Assessment Development Process

The Country Assessment Report, being a key report under the Enabling Activities Project, covers a comprehensive review of the preparedness of the market & existing policies, identifying the new policies required and their implementation plan. This report includes:

- A market assessment in terms of the preparedness of the market and its players, including the RAC servicing sector, to transition from HFCs to their low-GWP alternatives.
- An overview of relevant policy frameworks, institutions and stakeholders, and identification of policy gaps and opportunities for better synergies to increase policy coordination and support market transition.
- Quota, licensing and data monitoring system for effective control of HFCs and
- A strategy proposal that will be the basis for an elaborate and detailed roadmap and action plan for the HFC phase-down and the Kigali Amendment implementation in Pakistan. The strategy proposal will provide an outline of the policy direction, necessary legislative changes, institutional remapping, and other interventions that need to be in place in the short and long terms.

The Country Assessment Report's contribution to the Enabling Activities Project along with its development process is provided in the table below:

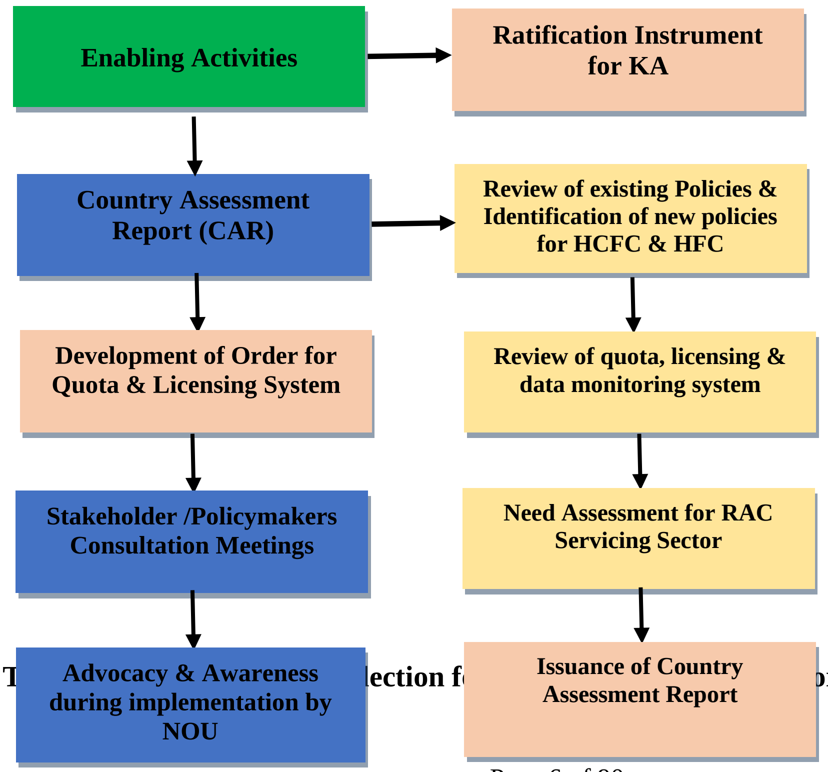
Table 3: Enabling Activities Project Component and Country Assessment Development Process

Enabling Activities Project Components	Country Assessment Report and its development process
Preparation of the Country Assessment Report (CAR)	The component of CAR includes: • Review of existing relevant documents/ policies and identification of new policies/ legislation with regard HCFC & HFC • Review of the quota, licensing and data monitoring system for effective control of HFCs and implementation of the Kigali

Enabling Activities Project Components	Country Assessment Report and its development process
	Amendment for HFC Phase-down • Need Assessment for Refrigeration and Air-conditioning Servicing Sector
Consultations for the implementation of the Kigali Amendment	Consultations with stakeholder/policymakers on the successful implementation of the Kigali Amendment was also part of the Country Assessment Report development process. The stakeholder assessment conducted as part of the Report and the stakeholder engagement strategy developed as part of this project component. The consultative process remained mutually beneficial and facilitating in sensitizing the stakeholders and provoking the discussion on the implications of the Kigali Amendment and the required country's follow-up actions.
Development of quota, licensing and data monitoring system for effective control of HFCs and implementation of the Kigali Amendment for HFC Phase-down	This component includes review of the existing licensing and reporting system for ODS, HFC and RAC equipment based on HFCs. The review of exitsing practices enabled ways to strengthen and better plan/ implement the newly required HFC licensing system. The Project component also requires the dedicated Pakistan customs tariff codes for ensuring effective control measures for HFCs and their alternatives.
Communication, Advocacy and Awareness	Under the awareness and outreach stretagy reached out various stakeholders in different identified sectors to collect lastest data, information and sharing of the findings of the country assessment Report with them as part of the required process. The activity helped in developing the process as well as raised the awareness of the stakeholders on the existing and upcoming issues related to the Montreal Protocol and the Kigali Amendment. The Country Assessment Report will also serve as a useful communication tool to use for advocacy and awareness-raising during the implementation of the Project and the HFC phase-down.
Legal Instrument for the ratification of Kigali Amendment by the country	Development of legal and technical instrument of Kigali Amendment ratification instrument to Treaty Section, Office of Legal Affairs, United Nations (UNTC depository)

The work flow of the Enabling activities is deliberated in the diagram below:

Figure 4: Work Flow diagram of Enabling activities



1.7 T ection f ort

The approach and methodology adopted to collect data to assess the country readiness for the ratification and implementation of the Kigali amendment is as below:

- Collection of Pakistan Revenue Automation (Pvt.) Ltd. (PRAL) import data[2] from Federal Board of Revenue (FBR) for the period 2016-2019 for the import of HFCs, HFC blends and natural refrigerants to determine the annual quantity of each HFCs imported in the country
- Preparation of 14 survey forms for consultation with the Government to collect data to assess the status of existing policy/ regulation and to identify the gaps, recommendations and timeline for future policy measures/ interventions.
- Preparation of 12 forms to collect equipment data manufactured for RAC & foam industries to determine the annual consumption of HFCs, HFC blends and natural refrigerants.
- Preparation of 3 forms for collection of data from importers, traders & workshops to assess the current situation, identify the gaps and develop the plans required for the implementation of the Kigali amendment. These forms were also intended to assess the acceptability of the new technologies, present and future market trends.
- Preparation of 2 forms for collection of data from National Vocational and Technical Training Commission (NAVTTC) and Technical Education & Vocational Training Authority (TVETA), Academia and NGOs. The form for NAVTTC/TVETA was designed to assess the current situation, identify the gaps and to develop the plans required for the implementation of the Kigali amendment. The form for NGOs was designed to seek their ideas on how they can participate in the awareness campaign of HFCs.

  The target group wise survey sample size, actual survey, number of forms and percentage share is provided in the table below:

Table 4: Survey target group and sample size

Sr.#	Target Group	No. of forms	Planned number of respondents	Response Received	Response Rate
1	Industries in RAC and Foam Sector	12	64	28*	44%
2	Importers for Refrigerants	1	32	10**	31%
3	Traders/ Wholesalers/ Retailer	1	77	77	100%
4	Servicing Workshop	1	90	90	100%
5	NAVTTC/TEVTA/ institutes & Academia	1	13	13	100%
6	NGOs	1	4	2	50%
7	Relevant Government bodies	14	9	9***	100%
	Total	**31**	**288**	**229**	**81%**

Source: Surevy Statistics of target groups

* The data collected from the industries for the preparation of HPMP Stage-III was also used for this assignment
**The refrigerant data by the remaining importers was provided by NOU.
***Information on policies was obtained through the office of NOU interviews, exchange of emails and internet research.

[2] PRAL data is equal to Customs database data; PRAL system records all the imports including refrigerants.

Chapter-2

THE KIGALI AMENDMENT AND ITS IMPLICATION TO PAKISTAN

The Kigali Amendment was adopted to phase down the consumption of hydrofluorocarbons (HFCs) globally, by up to 80 percent by 2045 for Article 5 Group 1 Parties, 85 percent by 2047 for Article 5 Group 2 Parties, and 85 percent by 2036 for non-Article 5 Parties. If fully implemented, the Amendment can help avoid up to 0.4 °C increase in global temperature by the end of the century.

Pakistan being a party to the Montreal Protocol, participated at a high level in the international negotiation and adoption of the Kigali Amendment that was agreed at the 28th Meeting of the Parties on 15 October 2016 in Kigali, Rwanda.

2.1 The Kigali Amendment and its Obligations Applicable to Pakistan

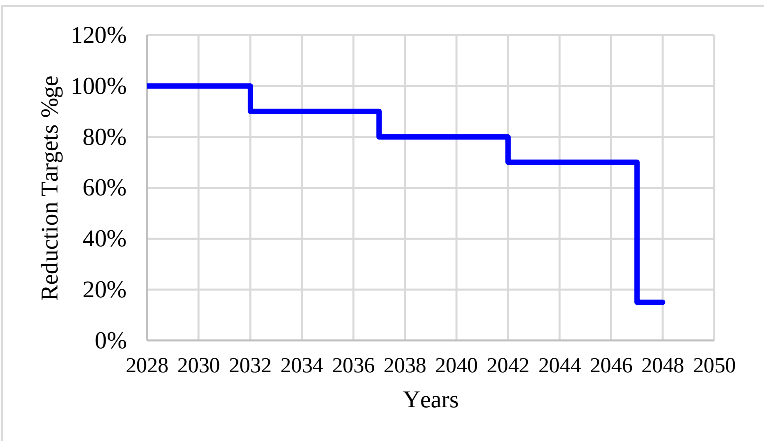
Pakistan has completed the required consultation process for the ratification of the Kigali Amendment. Once Pakistan ratifies the Kigali Amendment, the Amendment will enter into force for Pakistan on the ninetieth day following the date of deposit of its instrument of ratification. Then Pakistan will need to control, report and reduce its HFCs consumption according to the phase-down schedule set out in the Kigali Amendment for the Article 5 Group 2 countries, shown in detail in the table below.

The HFC phase-down implementation for Pakistan will start in 2028 with the freeze in HFC consumption from January 2028 at the baseline level, and ultimately phasing down 85 percent of its HFCs consumption from the baseline by 2047. Carbon dioxide equivalent (CO_2e) is used as the unit of measure for HFCs.

Table 5: Article 5 Group 2 Party's HFC phase-down schedule as determined by the Kigali Amendment

Baseline Years	2024, 2025 & 2026
Baseline Calculation	Average production/consumption of **HFCs** in 2024, 2025, and 2026 *plus* 65% of **HCFC** baseline production/consumption
Reduction steps	
Freeze	2028
Step 1	2032 10%
Step 2	2037 20%
Step 3	2042 30%
Step 4	2047 85%

Figure 5: Article 5 Group 2 Party's HFC phase-down schedule as per the Kigali Amendment



Pakistan does not produce nor export any HFCs and imports 100 percent of the HFCs used in the country. As per the definition of the Montreal Protocol, consumption equals production plus import minus export. Therefore, Pakistan needs to control its HFC imports and exports to control its HFC consumption to meet the HFC phase-down obligation as in the Kigali Amendment.

The Kigali Amendment controls the consumption of HFCs whether as a single substance or as a composition in mixtures. Therefore, Pakistan has to phase down the consumption of both single substances HFCs stipulated in Annex F of the Montreal Protocol, and any mixtures containing them.

Table 6: HFCs listed in Annex F of the Montreal Protocol

Group	**Substance**	**100-Year Global Warming Potential**
Group I		
CHF_2CHF_2	HFC-134	1,100
CH_2FCF_3	HFC-134a	1,430
CH_2FCHF_2	HFC-143	353
$CHF_2CH_2CF_3$	HFC-245fa	1,030
$CF_3CH_2CF_2CH_3$	HFC-365mfc	794
CF_3CHFCF_3	HFC-227ea	3,220
$CH_2FCF_2CF_3$	HFC-236cb	1,340
CHF_2CHFCF_3	HFC-236ea	1,370
$CF_3CH_2CF_3$	HFC-236fa	9,810
$CH_2FCF_2CHF_2$	HFC-245ca	693
$CF_3CHFCHFCF_2CF_3$	HFC-43-10mee	1,640
CH_2F_2	HFC-32	675
CHF_2CF_3	HFC-125	3,500
CH_3CF_3	HFC-143a	4,470
CH_3F	HFC-41	92
CH_2FCH2_F	HFC-152	53
CH_3CHF_2	HFC-152a	124
Group II		
CHF_3	HFC-23	14,800

Source: Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer

Pakistan will also need to establish an effective licensing system to control the import and export of HFCs as per Article 4B of the Montreal Protocol, within three months of the date of entry into force of the Kigali Amendment. It is in the interest of the country to get the HFC licensing system in place as early as possible to facilitate the accurate data reporting required as mentioned below. The licensing system empowers the licensing authority to effectively control the import and export as well as to monitor and report HFC consumption.

Pakistan has started reporting of HFC consumption data as part of the CP report to the Ozone Secretariat for the year 2020.

It is important to understand that why this is important for Pakistan to ratify the Kigali Amendment. The ratification of the amendment by Pakistan will open the new funding windows from the multiletral funds being a classified Article 5 country under the Montreal Protocol. Apart from financial aspect, raftification will also qualify Pakistan for seeking technical support from the international community to support Pakistan to meet its obligations and phase-down the use of HFCs according to schedule.

The Kigali Amendment is a binding international treaty which is intended to create rights and obligations in international law. Once the Amendment enters into force for a Party, that Party assumes legal obligations under the Amendment. Pursuant to the above, it is essential for Pakistan to be prepared to fulfil the initial obligations after ratification of the Kigali Amendment, which include:

- **Accurate reporting of HFC consumption as part of Article 7 data, which will be used to calculate country's baseline consumption**[3]: Pakistan imports HFCs and HFC blends. An effective system for monitoring and reporting of HFC import and export is critical to accurately establish the country's baseline consumption.
- **Establishment of a licensing system to control the import and export of HFCs**: This is one of the key regulatory obligations under the Montreal Protocol and the Kigali Amendment within 3 months after the ratification. Nonetheless, it is still in the interest of the country to get the licensing system in place as early as possible (regardless of ratification) to facilitate the accurate data reporting required as mentioned above. The licensing system empowers the licensing authority to effectively control the import and export as well as to monitor and report HFC consumption.
- **Freeze in consumption of HFCs (and HFC blends) from 1 January 2028:** Freezing the consumption of HFCs from January 2028 at the baseline level, and phase down HFC as per the agreed schedule for A5 Group 2 countries.

2.2 Key alternative technologies

The available alternative refrigerants and technologies, and associated challenges to market entry and their potential solution are addressed in the table below.

Table 7: Key Alternative Technologies – Challenges and Potential Solutions

Chemicals	Applications	Alternate Technologies	GWP	Challenges to market entry	Potential Solutions
HFC 134a	Domestic Refrigerator/ Freezers	HC 600a	3	- High Flammability	- Safety Device - Standards and Service procedures - Engineering Design
		*HFO 1234yf	4	- Slight Flammability - Long term reliability - Market availability	- Engineering design - Research and development
	Commercial Refrigeration	HC 600a	3	- High Flammability - Safety Code restrictions - Liability concerns	- Safety Device - Standards and Service procedures - Training and Education
		HC 290	3		
		HC 744 (CO2)	1	- Safety risks - High operating pressure	- Engineering design - Training and Education
	Motor Vehicle Air Conditioners	*HFO 1234yf	4	- Slight Flammability - Limited production capacity - Regulatory approval - Limited availability may prevent full market penetration in the near terms	- Safety System installation - Engineering Design - Increase production capacity - Currently under EPAs & EU review
		*HC 744 (CO2)	1	- Needs new servicing infrastructure - Asphyxiation risks - High operating pressures - Regulatory approval - System reliability and leak reduction	- Engineering design - Training Education - Inclusion of odorant in formulation as a warning system
		*HFC 152a	53	- Higher Flammability risks - Limited production capacity	- Safety System installation - Engineering Design - Increase production capacity
		*HFO 1234zf Blend	<150	- Slight Flammability risks - Not currently manufactured - Needs Regulatory review and approval	- Safety System installation - Engineering Design

[3] Montreal Protocol parties establish baseline consumption levels with the aim of providing a benchmark or reference level for any control measures relating to production and consumption, such as a freeze or reduction steps.

Chemicals	Applications	Alternate Technologies	GWP	Challenges to market entry	Potential Solutions
	Chillers	*			
HFC 152a	XPS Board	HFC 152a has been used on trial basis as a stop gap arrangement in manufacturing of XPS board due to quota constraints for R 142b.			
HFC 227ea	Fire extinguishing system	This chemical is not used in manufacturing in Pakistan. However, it is imported for specific application related to fire extinguishing.			
HFC 236fa	Fire suppression agent	This chemical is not used in manufacturing in Pakistan. However, it is imported for specific application related to fire extinguishing.			
HFC 23	Semiconductor industry	This chemical is not used in manufacturing in Pakistan. However, it is imported for specific application.			
HFC 410A(1)	Window mounted, non-ducted split, residential & commercial ACs and ducted, split residential ACs	HC 290	3	- High Flammability-Challenges for use in Equipment with a high refrigerant charge - Safety Code restrictions - Liability concerns	- Safety Device - Secondary Refrigerant loop for larger systems, if Performance Penalties can be avoided - Leak testing and pump down circuits - Standards, Service Procedures, Training and Education - Engineering Design, Research and Development
		HFC-32	675	- Low Flammability - High Pressure - Medium GWP classification as per RTOC	- Engineering design-limited technical challenges - Research and Development - Regulatory approval
		*HFO 1234yf *HFO 1234ze	4 6	- Low Flammability - Relatively Low Pressure that would require significant system redesign	- Engineering design - Use in a blend with HFCs to more closely match the performance of R-22 and R-410A - Research and Development
		HC 744	1	- Acute Toxicity/ Safety Risks - High operating pressure - Low critical temperature; Can lead to low efficiency	- Engineering design - Training & Education - Research is being conducted to overcome safety and efficiency barriers
HFC 407C(2)	Ducted, commercial, split and packaged Air Conditioners	HC 290	3	- High Flammability-Challenges for use in Equipment with a high refrigerant charge - Safety Code restrictions - Liability concerns	- Safety Device - Secondary Refrigerant loop for larger systems, if Performance Penalties can be avoided - Leak testing and pump down circuits - Standards, Service Procedures, Training and Education - Engineering Design, Research and Development
		*HFO 1234yf *HFO 1234ze	6	- Low Flammability - Relatively Low Pressure that would require significant system redesign	- Engineering design - Use in a blend with HFCs to more closely match the performance of R-22 and R-410A - Research and Development
		HC 744	1	- Acute Toxicity/ Safety Risks - High operating pressure - Low critical temperature; Can lead to low efficiency	- Engineering design - Training & Education - Research is being conducted to overcome safety and efficiency barriers
HFC 404a(3)	Commercial Refrigeration	HC including 290, 600a	3	- High Flammability - Safety code restrictions - Liability concerns	- Safety Device - Standards and Service procedures - Training and Education
		HC 744	1	- Safety risks - High operating pressure	- Engineering design - Training & Education
		HC 717	0	- Toxic and slightly flammable - Building and fire code restriction	- Engineering design - Standards and safety regulation - Revision to existing codes
		HFO Blends		- Market availability	- Research and development

The barriers that may make the phase-down of HFCs difficult may include the following:

- Lack of availability of low GWP chemicals and technologies
- Lack of technicians skills/ training
- Inadequate safety codes & standards

Furthermore, most of the climate-friendly alternatives in the unitary AC sector face technical challenges such as flammability and toxicity. Pakistan being a High Ambient Temperature (HAT) country is likely to face many challenges that are related to finding the right alternatives for the HCFC-22 given the thermodynamic performance of the available refrigerants at higher ambient temperatures and the need for larger equipment with a larger refrigerant charge.

The fact is that products intended for use in environments carachterized by very high ambient temperatures should be specifically designed for those conditions using specific refrigerants suitable for that application. The product should also have all the safety measures for the appropriate operation. The need for specific designs for high ambient temperatures creates an additional economic burden for the introduction of new products that may result in a reduced choice of products for each application.

2.3 Key condition for HFC phase-down

The following key conditions are required to guide the introduction of low-GWP ODS alternatives.

- Agree with the Customs Department on the use of HS subcodes for precise identification of HFCs and HFC blends under the WCO HS code 2022 version or subsequent versions.
- Establish/strengthen the procedures for HFCs and HFC alternatives trade control and monitoring.
- Establish a system for quota licensing expressed in Kgs with equivlent tons of CO_2 eq.
- Provide training to Customs, registered importers and brokers for the correct reporting on HFCs.
- Consider bans and restrictions concerning specific HFCs and products/equipment containing or relying on higher-GWP HFCs.
- Disaggregate information on HFC uses and develop a roadmap of future technologies.
- Enhance, verify and certify the competence of technicians on the safe use of low-GWP ODS alternatives and handling of multiple types of refrigerants.
- Consider the revision of safety standards and building codes to pave the way for the introduction of certain alternatives, therefore reconsidering as appropriate eventual restrictions are in place.
- Establish voluntary standards that are not available. Once the voluntary standards are available it should be considered for transforming to mandatory standards especially in the energy efficiency for RAC equipment.
- Outreach and awareness-raising to end-users concerning low-GWP ODS alternatives with higher energy efficiency.

2.4 The implications of becoming a party to the Kigali Amendment for Pakistan

There are a number of implications for Pakistan for becoming a party to the Kigali Amendment. They include both advantages and disadvantages that are important to be discussed for the understanding of the concerned bodies in the Government who will be making the decision for the ratification of the Kigali Amendment.

<u>Advantages</u>

- Demonstrate country commitment towards the Montreal Protocol and the global environment protection: All prior agreements and Amendments related to the Montreal Protocol have received universal support. Therefore, apart from the direct climatic and ecological benefits to result from Pakistan’s ratification of the Amendment, Pakistan will also gain political recognition as a contributor and participant to the international efforts to protect the global environment through the phasing-down of HFCs.
- Leaving behind obsolete technologies: As the Kigali Amendment was adopted with universal support and is being ratified by most countries, new business opportunities for HFCs phase-down

are emerging; environmentally superior alternatives have been and will continue to be commercialized, resulting in HFCs becoming obsolete. Therefore, getting up-to-date with markets in the RAC sector will put Pakistan on a significant economic advantage, as the country is heavily dependent on the import of HFCs for the RAC equipment.

- Gain access to financial and technical support from the MLF: Pakistan, as an import-dependent country, will sooner or later face challenges inherent to the technological switch towards HFCs alternatives at the global level. Article 10 of the Montreal Protocol establishes a financial mechanism to provide financial and technical cooperation, including the transfer of technologies, to support Article 5 parties' compliances with the Protocol. If Pakistan ratifies the Kigali Amendment, as an Article 5 party, it will be able to access financial and technical support from the MLF to address challenges and strengthen the capacity of different sectors in the country, building on to the additional support provided by the MLF through the previous ODS phase-out projects and the Enabling Activities for HFC Phase-down Project.
- The adoption of the Amendment is expected to have a positive impact on the Gross Domestic Product (GDP). Country impact assessment studies carried out in USA and Australia indicate a positive impact on the GDP due to the expected implementation of the Kigali Amendment. A similar study may be helpful for Pakistan to assess the impact on the country's GDP due to the implementation of the Kigali Amendment. The initial assessment of the situation reveals that the implementation of the Kigali Amendment may result in a positive effect on the GDP.
- Improve energy efficiency, leading to further climate benefits and energy cost savings: When transitioning away from HFCs, parties have been strongly encouraged to adopt alternatives that are also energy efficient. As per GIZ document, the RAC account for 10% of global CO_2 emission including energy and HFC leakage[4].
- Avoid implication from trade restrictions: Article 4 of the Montreal Protocol restricts Parties from trading the controlled substances with non-Parties. The trade ban will prohibit Parties that have ratified the Kigali Amendment from trading HFCs with the Parties that have not. Therefore, if Pakistan does not ratify the Kigali Amendment, it will not be able to trade HFCs with countries that have ratified the Kigali Amendment from 2033.
- Having the flexibility to adopt a country-driven approach: Article 5 Parties will have the flexibility to prioritize types of HFCs and sectors to control, select technologies and alternatives to promote and elaborate on and implement national strategies to meet the agreed HFC obligations, based on their specific needs and national circumstances, following a country-driven approach.

Disadvantages

- The ratification may face a certain level of resistance from the industry and servicing sector due to the lack of affordable and safe alternatives at this time.
- The resistance may also come from the public as the serviceability of old equipment may become a challenge.
- Challenges associated with alternatives may prevail that can be seen as obstacles in the context of A5 countries.

2.5 The costs of becoming a party to the Kigali Amendment

While it is more advantageous for any country to become a party to the Kigali Amendment, there may be some additional administrative costs that occur to ratify and implement the Kigali Amendment.

[4] Source:http://iki-alliance.mx/en/vinculo-entre-agendas-globales-enmienda-de-kigali-acuerdo-de-paris-y-objetivos-de-desarrollo-sostenible/

They include:

- Amending the existing laws / regulations or introducing new ones to include provisions related to the HFC phase-down obligations.
- Extending the ODS import and export quota and licensing system to cover HFCs.
- Developing the resources to ensure accurate and timely reporting of HFC consumption given that there are more substances to be controlled, including putting in place any practical arrangements that may be required for customs officers to assume extra responsibilities concerning control of HFC import and export.
- Engaging additional stakeholders under the Kigali Amendment regime.
- Surveying existing HFC consumption to understand the situation with regards to how HFCs are being used in the country.
- Developing a strategy for HFC phase-down, including monitoring and enforcement.

However, the Montreal Protocol's financial mechanism could provide financial assistance to developing countries, including Pakistan, to phase down HFCs. This includes support for capacity building and training, institutional strengthening, import quota and licensing system, compliance with the reporting requirements, and the development of national strategies for phasing down HFCs. The initial support was provided by the MLF via the Enabling Activities for the HFC Phase-down Project. Once Pakistan ratifies the Kigali Amendment, further technical and financial assistance may be provided for the country to build its capacity to phase down HFC as was the case for the phase-out of ODS.

Furthermore, the established Trust Fund for the Montreal Protocol also supports the participation of key national decision-makers of Article 5 countries to participate in the international meetings related to the Montreal Protocol.

Therefore, it is expected that no substantial cost will incur additionally for the Government of Pakistan to implement the Kigali Amendment.

Chapter-3
MARKET ASSESSMENT

3.1 Background

Pakistan is located in South Asia. The latitude and longitude of the capital city Islamabad is 33º 40' N, 73º 08' E. Pakistan has more glaciers than any other land outside the North and South Poles. Its glacier area covers some 13,680 sq.km which represents an average of 13% of mountain regions of the upper Indus Basin. Pakistan has four types of climates, hot in summer and cold in winter. A cool, dry winter from November through February; a hot, dry spring from March through June; the summer rainy season, from July through October. Pakistan has an average of at least two months per year over ten consecutive years with a peak monthly average temperature above 35˚C.

The country has four provinces and two administrative areas with a total of 157 districts. The country's population was around 216.56 million in 2019 according to the World Bank[5] and growing at a rate of 1.94%. It has a labor force of 65.50 million people out of which almost 38.5% is in agriculture, forestry and fishery, 37.61% in manufacturing, 16.28% in the service sector while the construction sector only has a 7.61% share of the total labor force. The country's income per capita in the dollar term has decreased to US$ 1,355 in 2019 from 1,455.1 in 2018 showing a decline of 6.9%[6]. The electric consumption per customer (household) in KWh is 1,846 and 1,929[7]for domestic and commercial customers respectively in 2020. The trend during 2010-2018 was increasing in both the sub-sectors while average consumption per customer has decreased from 2018 due to decreasing trend in GDP growth in the country.

Pakistan does not produce nor export any HFCs. Thus, Pakistan's annual HFC consumption is equal to its total import amount into the country per definition[8]. Pakistan, therefore, needs to control its imports of HFCs to reduce its consumption per the Kigali Amendment. However, the blending of R-410A is done within the country besides importing it directly. Due to lower import duties on HFC-32 and HFC-125 than R-410A, two local companies in Karachi are currently blending R-410A for the domestic market as it becomes convenient to them for fiscal reasons.

Most of the RAC appliances used in Pakistan are either manufactured or assembled in the country, while only a very small number of RAC equipment is imported from other countries. RAC equipment that is, imported tends to be those of less common types, imported to fit specific customer demand. When it comes to MAC systems there is no manufacturing of MAC appliances in the country. However, there is a sizeable assembling of vehicles in Pakistan. The mobile ACs needed are imported from other countries to fit in the vehicles assembled in Pakistan including the gas filling.

HFCs are used in Pakistan in the manufacturing of RAC systems, foam, and fire protection systems and the servicing of RAC and MAC systems, as shown below:

- **Manufacturing sector**
    - RAC systems manufacturing
    - Foam manufacturing
    - Fire protection systems manufacturing

[5] https://data.worldbank.org/indicator/SP.POP.TOTL?locations=PK
[6] Economic Survey of Pakistan 2018-2019 (https://www.finance.gov.pk/survey_1819.html)
[7] Power System Statistic 45th Edition (http://ntdc.gov.pk/ntdc/public/uploads/services/planning/power%20system%20statistics/Power%20System%20Statistics%2045th%20Edition.pdf)
[8] Consumption = import + production – export

- **RAC servicing sector**

  - Domestic refrigeration
  - Small and medium commercial refrigeration
  - Large commercial refrigeration
  - Industrial refrigeration
  - Transport
  - Domestic air-conditioning
  - Commercial air-conditioning and chiller
  - Mobile air-conditioning

The assessment of the market has been carried out based on the previous data available from the National ODS Alternatives surveys carried out in 2017 for the year 2012-2015 for Pakistan. In addition, PRAL data was collected for the years 2016-2019 for this study; the PRAL data for the year 2020 was not available. Therefore, the analysis in this report is based on the data for the period 2012-2019.

3.2 Consumption of HFCs & other ODSAs in Pakistan during 2012-2019

Currently, in Pakistan, below mentioned HFCs and other ODS alternatives are being used:

- HFCs: HFC-134a, HFC-32, HFC-152a, HFC-125, HFC-143a, HFC-227ea, HFC-236fa & HFC-23
- HFCs blends: R-404A, R-407C, R-410A, R-417A, R-507A and R-508D
- HFOs: HFO-1234yf
- Natural refrigerants: HC-290, HC-600a, Cyclopentane, R-744 and R-717

3.2.1 Import of HFCs and other ODS Alternatives

The table below shows the import amount of HFCs and other ODS alternatives from 2012 to 2019 by substance. The data for years 2012-2015 is based on PRAL import data as provided in the ODS Alternatives Survey published in 2017. Data for years 2016-2019 is also PRAL import data as provided by Custom Authority to NOU.

Table 8: Import amount of HFCs and other ODS alternatives, 2012-2019 (Metric Tonnes)

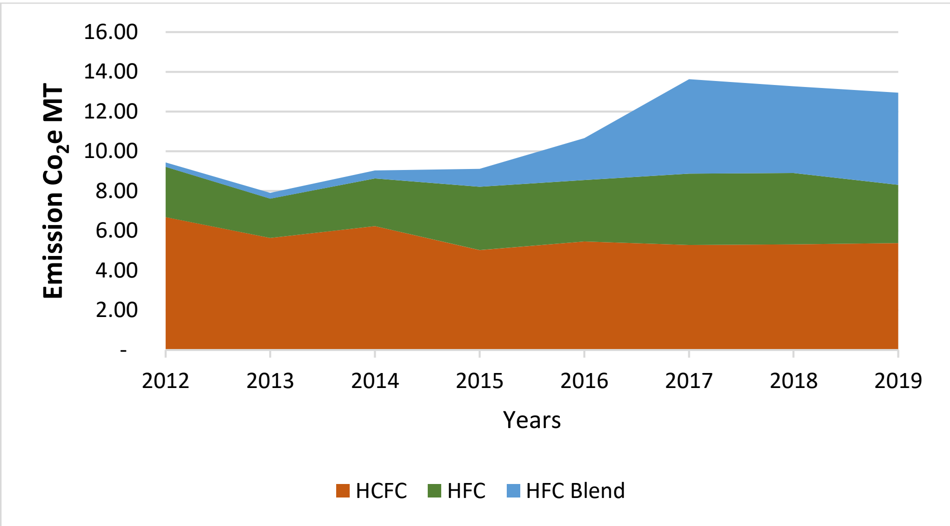
ODS Alternatives	Annual Historical Import Data (MT)							
	2012	2013	2014	2015	2016	2017	2018	2019
HFC								
HFC-134a	1,743.78	1,329.25	1,640.30	2,066.11	2,108.81	2,436.27	2,450.08	2,033.05
HFC-32	0	0	0	0.2	108.00	354.14	291.42	442.50
HFC-152a	2	13	36.01	79	0.00	0.00	0.00	0.00
HFC-125	0	0	0	0.06	108.28	343.00	339.36	424.00
HFC-143a					0.00	0.00	0.00	5.20
HFC-227ea	8.71	18.04	6.05	32.83	9.54	4.26	8.00	0.00
HFC-236fa	0	1	2	5	5.50	8.75	6.30	0.00
HFC-23	0.6	0	0	4.2	0.06	0.15	0.00	0.20
HFC subtotal	1,755.09	1,361.29	1,684.36	2,187.40	2,340.19	3,146.57	3,095.16	2,904.95
HFC blends								
R-404A	48.71	53.3	71.48	105.89	100.46	112.06	119.13	124.15
R-407C	11.15	16.78	23.35	63.28	37.01	26.04	55.45	72.73
R-410A	3.62	21.64	37.05	173.96	539.35	1,327.46	1,156.59	1,037.29
R-417A					0.11	0.00	0.00	2.20

ODS Alternatives	Annual Historical Import Data (MT)							
	2012	2013	2014	2015	2016	2017	2018	2019
R-507					0.68	0.00	0.68	1.81
R-508B					0.00	0.30	0.00	0.08
HFC blends subtotal	63.48	91.72	131.88	343.13	677.61	1465.86	1331.85	1238.26
Other alternatives								
HFO-1234yf					0.00	0.00	0.0045	0.01
HC-290	2.28	0.02	0.03	0.5	137.76	64.12	142.44	29.87
HC-600a	73.6	25.05	95.97	98.8	0.16	47.90	84.53	102.97
Pentane	220	236	487	792	734.51	928.73	821.39	699.08
R-744	14	15	9	7			0.00	0.00
R-717	35	37	38	40	38.46	57.48	54.22	63.06
Other subtotal	344.88	313.07	630	938.3	910.89	1098.23	1102.58	894.99
Total	**2,163.45**	**1,766.08**	**2,446.24**	**3,468.83**	**3,928.69**	**5,710.66**	**5,529.59**	**5,038.20**

Source: PRAL data provided by Custom Department to NOU

The import statistics in CO_2e is provided in the graph below:

Figure 6: Import Statistics in CO_2e



Source: Emission calculated based on PRAL data provided by Custom Department to NOU

The analysis of import data reveals the following:

- HFC-134a, R-410A, R-404A, R-407C, HC-600 and Pentane are the main chemicals that were imported during 2016-2019. HFC-32 & HFC-125 imported during 2016 onward have been mainly used for blending of R-410A as direct use of these last two chemicals has not been reported in the RAC servicing sector. However, during the survey it was learnt that the assembly of HFC-32 based domestic Air conditioners has been started in 2020 in Karachi on a limited scale.

- It has been observed that each HFCs, HFC blends and natural refrigerants may have been imported in recent years and registered under various HS codes because of mistakes in the assignation of HS code. Therefore, the import data for number of refrigerants is different from the actual consumption of chemicals in the manufacturing and servicing sector.

The NOU is working closely with the Ministry of Commerce to establish HS subcodes for the precise collection of import data for the HFCs and HFC blends.

3.2.2 Estimated Use of HFCs and other ODSA

The chemical wise annual historical use of ODSAs in Pakistan is provided in the table below:

Table 9: Historical Chemical wise estimated use data for ODSAs 2012-2019

Alternative	Annual historical estimated use data MT							
	2012	2013	2014	2015	2016	2017	2018	2019
HFC								
HFC-134a	1659.54	1665.12	1742.75	1865.96	1922.37	1983.62	2050.63	2120.54
HFC-32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-152a	2.00	13.00	36.00	79.00	0.00	0.00	0.00	0.00
HFC-125	0.00	0.00	0.00	0.06	0.00	0.00	0.00	0.01
HFC-143A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-227ea	8.71	18.04	6.05	32.83	9.54	4.26	8.00	12.49
HFC-236fa	0.00	1.00	2.00	5.00	5.50	8.75	6.30	4.08
HFC-23	0.60	0.00	0.00	4.20	0.06	0.15	0.00	0.20
HFC Sub-total	1670.85	1697.16	1786.80	1987.05	1937.47	1996.77	2064.93	2137.32
HFC blends								
R-404A	38.52	45.25	63.70	96.32	100.11	102.89	105.76	108.72
R-407C	31.53	30.86	32.05	32.13	34.12	35.44	37.23	38.52
R-410A	81.81	83.60	86.87	90.10	268.54	924.20	1228.54	1476.77
R-417A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R507A	6.04	6.14	6.25	6.45	6.55	6.55	6.55	6.60
R508B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC Blend Sub-total	157.91	165.85	188.87	224.99	409.32	1069.08	1378.08	1630.62
Other alternative								
HFC-1234yf	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HC-290	20.32	21.55	21.65	28.20	32.26	35.63	38.03	40.47
HC-600a	58.49	64.54	79.09	83.28	73.40	76.26	79.24	82.35
Pentane	195.06	450.57	679.48	715.28	751.04	843.59	828.02	869.42
DME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-744 (CO2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
R-717	60.17	66.08	62.38	64.15	66.88	69.46	72.09	74.82
Other Sub-total	334.03	602.74	842.59	890.90	923.58	1024.93	1017.38	1067.07
Total	**2,162.79**	**2,465.75**	**2,818.26**	**3,102.95**	**3,270.36**	**4,090.79**	**4,460.39**	**4,835.00**

Source: Industrial data estimated based on manufacturing data collected through survey

It is evident from the above table that the overall use of HFCs, HFC blends and alternatives are on the increasing side. Furthermore, the use of HFCs & other alternatives has grown steadily whereas the HFC blends have increased in the country from 170.52 MT to 1,647.62 MT during 2012-2019.

The definition of consumption as defined in the Montreal Protocol (Consumption = production + imports –exports) could not be applied here as the estimated use (synonyms of consumption) of various HFCs, HFCs blends in manufacturing of RAC equipment and servicing need of RAC and MAC system was different than the import reported in the country as per PRAL data. While analysing the PRAL data of various HFCs and HFC blends imported in the country during 2012-2019, a number of mikates have been observed in assignation of HS codes.

3.2.3 Comparison of import and estimated use data of HFCs and other ODSA

The comparison of annual import and estimated use of ODSAs is provided in the table below:

Table 10: Annual comparison of import and estimated use of ODSA 2012-2019

Years	Import				Estimated Use				Diffrence			
	HFC	Blends	Others	Total	HFC	Blends	Others	Total	HFC	Blends	Others	Total
2012	1,755	63	345	2,163	1,671	158	334	2,163	84	-94	11	1
2013	1,361	92	313	1,766	1,697	166	603	2,466	-336	-74	-290	-700
2014	1,684	132	630	2,446	1,787	189	843	2,818	-102	-57	-213	-372
2015	2,187	343	938	3,469	1,987	225	891	3,103	200	118	47	366
2016	2,340	678	911	3,929	1,937	409	924	3,270	403	268	-13	658
2017	3,147	1,466	1,098	5,711	1,997	1,069	1,025	4,091	1,150	397	73	1,620
2018	3,095	1,332	1,103	5,530	2,065	1,378	1,017	4,460	1,030	-46	85	1,069
2019	2,905	1,238	895	5,038	2,137	1,631	1,067	4,835	768	-392	-172	203

Source: As per import and estimated use data discussed in above tables

This table is developed based on the import of chemicals reported by Customs Authority and use of chemical by industry and servicing sector respectively as provided in the above tables.

The reason for the difference between the import of HFC & HFC blends and its estimated use for the year from 2012-2015 has not been analyzed, however, the reason of the difference between import and chemical used for the year 2016-2019 is as below:

- Currently, several HFCs, HFC blends are imported either through a number of HS codes or a number of substances are imported under one HS code.
- This difference can be attributed to the stockpiling from the previous years
- In the year 2016, the major difference in the HFC blend is mainly due to R-410A & R-407C. Further, the difference in other refringents is mainly due to excessive reporting of R-717 import.
- In the years 2017 & 2018, the use of HFCs, blend and other alternatives is less than the import values especially for HFC-134a, R-410A, R-407C, HC-290 & R-717.
- In the year 2019, the use of HFCs and other alternatives is more than the import value especially for HFC-134a, HC-290 & R-717 whereas the use of blends is less than the import values mainly for R-410A & R-407C.

3.2.4 The average sale price of refrigerants

The average sale price of refrigerants in the local market during the second quarter of 2021 is provided in the table below:

Table 11: Average Sale Price of Refrigerant in the Local Market

Refrigerant	**Weight of Gases /cylinder (Kg)**	**Cylinder Price in Local Market 2021 Rs.**			**Average Price US$/Kg**
		Minimum	**Maximum**	**Average**	
HCFC-22	13.6	11,100	18,000	14,550	6.90
HFC-134a	13.6	8,800	18,000	13,400	6.36
HFC-32	10	7,700	11,500	9,600	6.19
R-404A	11.6	11,500	18,500	15,000	8.34
R-407C	13.6	11,000	18,500	14,750	7.00
R-410A	13.6	7,900	18,000	12,950	6.14
HC-290	5	6,500	7,500	7,000	9.03
HC-600a	5	3,700	4,500	4,100	5.29

Source: Consultant interviews with market experts

Currently, no registration system exists for the sale of controlled refrigerants for the distributor, retailer/ dealer in the country. Also, no mechanism exists for the reporting of HFCs & HFC blends consumption. Therefore, the exact data for the consumption is not available. However, based on historical data on the number of equipment installed, unit charge against each product, the annual requirement of equipment to meet new customers and replacement of equipment at the end of their useful life, certain assumptions validated through actual field survey, leakage rate etc. is used to assess the refrigerants use in the RAC and MAC sector.

3.3 Sectoral historical estimated use of HFCs and other ODSA in Pakistan during 2012-2019

3.3.1 Overall estimated sectoral use of ODSAs in Manufacturing and Servicing sector 2012-2019

The annual historical estimated use of ODSAs in the manufacturing and servicing sector in each sector/ sub-sector in Pakistan is summarized in the table below:

Table 12: Sectoral refrigerant use of ODSA 2012-2019

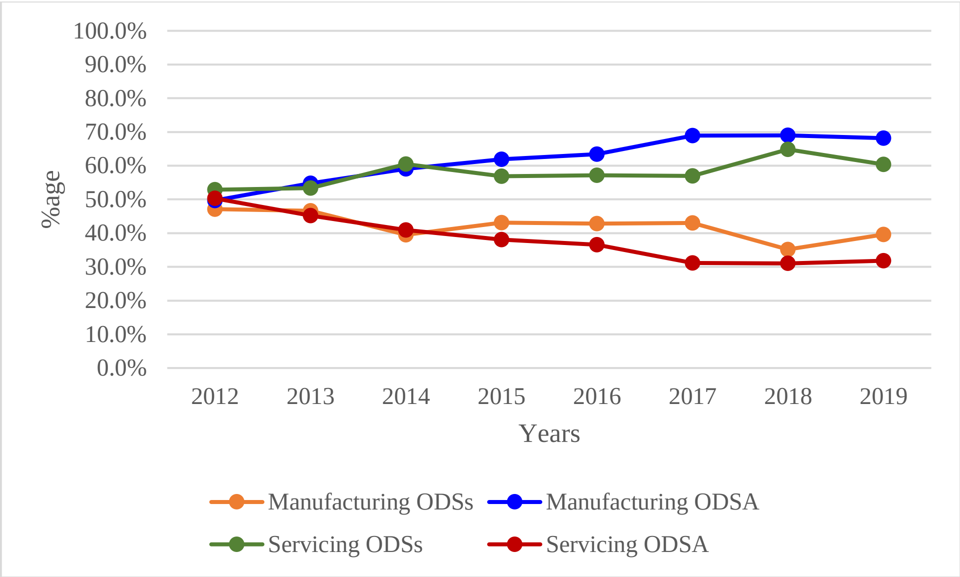
Sectors/ Sub-sectors	2012	2013	2014	2015	2016	2017	2018	2019
Refrigeration (both manufacturing and servicing)								
Domestic	526.40	548.24	579.55	600.68	610.32	633.52	657.71	682.93
Commercial	81.26	86.19	86.58	74.64	71.72	70.40	71.24	72.25
Large Commercial	46.53	56.95	69.48	101.65	105.75	108.67	111.70	114.83
Industrial	44.70	46.69	48.68	50.65	52.84	55.03	57.27	60.70
Transport	14.05	14.40	14.75	15.20	15.56	15.84	16.11	16.45
Sub-total	**712.94**	**752.46**	**799.03**	**842.82**	**856.18**	**883.46**	**914.03**	**947.17**
Air Conditioning (both manufacturing and servicing)								
Domestic ACs	0.00	0.00	0.00	0.00	176.09	829.33	1131.19	1376.86
Commercial ACs & Chillers	453.26	459.23	514.20	565.81	589.09	612.65	637.66	663.19
Mobile	789.36	770.56	780.57	856.99	881.86	907.57	934.13	961.59
Sub-total	**1242.62**	**1229.79**	**1294.78**	**1422.80**	**1647.04**	**2349.55**	**2702.97**	**3001.64**
Foam manufacturing								
PU Insulation Foam for Domestic Refrigeration	188.84	380.97	605.93	636.71	669.55	703.03	738.18	775.09
PU Insulation Foam for Commercial Refrigeration	6.22	69.60	73.54	77.61	81.49	85.56	89.84	94.33
Extruded Polystyrene Board (XPS)	2.00	13.00	36.00	79.00	0.00	0.00	0.00	0.00
Sub-total	**197.06**	**463.57**	**715.48**	**793.32**	**751.04**	**788.59**	**828.02**	**869.42**
Fire Protection system manufacturing	**9.31**	**19.04**	**8.05**	**42.03**	**15.10**	**13.16**	**14.30**	**16.77**
Total MTs	**2162.79**	**2465.75**	**2818.26**	**3102.95**	**3270.4**	**4035.79**	**4460.39**	**4835.00**

Source: Assessment based on National survey

3.3.2 Total annual share of ODSs and ODSAs in manufacturing and servicing during 2012-2019

The overall annual share of ODSs and ODSAs used in the manufacturing and servicing sector is provided in the table graph below:

Figure 7: Total annual share of ODSs & ODSAs use in manufacturing and servicing 2012-2019



Source: Assessment based on National survey

It is apparent from the above graph that the estimated use of ODSAs in manufacturing and servicing during the study period has increased whereas the ODSs use has decreased.

3.4 Overview of supply of HFC-based equipment

3.4.1 Population of Equipment Manufactured during 2019

The estimated number of equipment manufactured in the country by types of substances during 2019 is provided in the table below:

Table 13: Estimated no. of equipment manufactured by substances type-2019

Servicing Sub-sector	**Population of appliance added in the system during 2019**									
	HFC-134A	**HC-600A**	**R-290**	**HCFC-22**	**R-410A**	**R-407C**	**R-404A**	**R-717**	**R-507A**	**Total**
Domestic Refrigerator/ Freezers	1,445,304	412,944								2,064,721
Commercial Refrigerator/ Freezers	244,608		331,968							349,440
Large Commercial Refrigerator/ Freezers				42			167	18		228
Industrial Ref Systems (Cold Stores)				8			8	276		292
Transport Refrigeration System (Reefers)	81			29			510		7	628
Domestic Air conditioner				22,470	855,506					877,976
Commercial Air conditioner & Chillers	2,455			2,995	1,637	2,584				9,670
Mobile ACs										
Cars	321,324									321,324
Buses	17,463									17,463
Support Utilities	10,478									10,478
Total	**2,041,713**	**412,944**	**331,968**	**25,544**	**857,142**	**2,584**	**685**	**294**	**7**	**3,652,218**

Source: Assessment based on National survey

It is evident from the above table that there was no assembling of HFC-32 based equipment in this specific year.

3.4.2 Assessment of Equipment Population requiring Servicing during 2019

The estimated equipment population requiring servicing in the country by types of substances during 2019 is provided in the table below:

Table 14: Estimated equipment population (stock) requiring servicing in the country by substances type-2019

Servicing Sub-sector	**Population of appliance 2019**									
	HFC-134A	**HC-600A**	**R-290**	**HCFC-22**	**R-410A**	**R-407C**	**R-404A**	**R-717**	**R-507A**	**Total**
Domestic Refrigerator/ Freezers	16,489,365	7,066,871								23,556,235
Commercial Refrigerator/ Freezers	2,530,425		2,285,610							3,614,893
Large Commercial Refrigerator/ Freezers				985			1,509	168		2,662
Industrial Ref Systems (Cold Stores)				642			78	2,684	-	3,404
Transport Refrigeration System (Reefers)	925			672			5,655		74	7,325
Domestic Air conditioner				8,743,267	1,505,480					10,248,747
Commercial Air conditioner & Chillers	27,377			57,725	18,252	36,833				140,187
Mobile ACs										
Cars	3,583,535									3,583,535
Buses	194,757									194,757
Support Utilities	116,854									116,854
Total	**22,943,240**	**4,711,247**	**2,285,610**	**8,803,291**	**1,523,731**	**36,833**	**7,242**	**2,851**	**74**	**41,468,601**

Source: Assessment based on National survey

3.4.3 Chemical & sub-sector wise HFCs and alternatives estimated use in manufacturing-2019

Table 15: Chemical wise and sub-sector wise HFC and alternatives use in manufacturing-2019

Servicing Sub-sector	**Annual estimated use of HFC and alternatives Chemical wise and sub-sector wise in manufacturing in 2019**								
	R134a	**R600a**	**R-290**	**R410a**	**R407c**	**R404a**	**R717**	**R507**	**Total**
Domestic Refrigerator/ Freezers	342.69	50.11							392.80
Commercial Refrigerator/ Freezers	3.86		24.48						28.34
Large Commercial Refrigerator/ Freezers						88.78	14.12		102.90
Industrial Ref Systems (Cold Stores)						0.14	20.06		20.20
Transport Refrigeration System (Reefers)	1.23					4.01		6.55	11.79
Domestic Air conditioner				1,115.70					1,115.70
Commercial Air conditioner & Chillers	442.63			45.16	16.37				504.16
Mobile ACs									
Cars	213.83								213.83
Buses	11.62								11.62
Support Utilities	6.97								6.97
Sub-total	**1,022.83**	**50.11**	**24.48**	**1,160.86**	**16.37**	**92.93**	**34.19**	**6.55**	**2,408.31**
Blowing agent									869.42
Fire Protection									16.77
Total of all									3,294.50

Source: Assessment based on National survey

3.4.4 Chemical wise and sub-sector wise HFC and alternatives estimated use in servicing during 2019

Table 16: Chemical & sub-sector wise HFC and alternatives estimated use in servicing -2019

Servicing Sub-sector	Annual estimated use of HFC and HFC Blend Chemical wise and sub-sector wise in servicing in 2019								
	R134a	**R600a**	**R-290**	**R410a**	**R407c**	**R404a**	**R717**	**R507A**	**Total**
Domestic Refrigerator/ Freezers	257.90	32.24							290.14
Commercial Refrigerator/ Freezers	27.91		16.00						43.91
Large Commercial Refrigerator/ Freezers						10.82	1.10		11.92
Industrial Ref Systems (Cold Stores)						0.96	39.53		40.5
Transport Refrigeration System (Reefers)	0.59					4.01		0.05	4.66
Domestic Air conditioner				261.16					261.16
Commercial Air conditioner and Chillers	82.13			54.75	22.15				159.04
Mobile ACs									
Cars	465.86								465.86
Buses	202.55								202.55
Support Utilities	60.76								60.76
Total	**1,097.71**	**32.24**	**16.00**	**315.91**	**22.15**	**15.79**	**40.64**	**0.05**	**1,540.49**

Source: Assessment based on National survey

3.4.5 Chemical wise & sub-sector wise HFCs and alternatives estimated use in manufacturing & servicing-2019

Table 17: Chemical and sub-sector wise estimated use of HFC and Blends in manufacturing and servicing-2019

Servicing Sub-sector	Annual estimated use of HFC and HFC Blend Chemical wise and sub-sector wise in manufacturing & servicing in 2019								
	R134a	**R600a**	**R-290**	**R410a**	**R407c**	**R404a**	**R717**	**R507A**	**Total**
Domestic Refrigerator/ Freezers	600.59	82.35	-	-	-	-	-	-	682.93
Commercial Refrigerator/ Freezers	31.78	-	40.47	-	-	-	-	-	72.25
Large Commercial Refrigerator/ Freezers	-	-	-	-	-	99.60	15.23	-	114.83
Industrial Ref Systems (Cold Stores)	-	-	-	-	-	1.10	59.60	-	60.7
Transport Refrigeration System (Reefers)	1.82	-	-	-	-	8.02	-	6.60	16.45
Domestic Air conditioner	-	-	-	1,376.86	-	-	-	-	1,376.86
Commercial Air conditioner and Chillers	524.76	-	-	99.91	38.52	-	-	-	663.19
Mobile ACs	-	-	-	-	-	-	-	-	
Cars	679.69	-	-	-	-	-	-	-	679.69
Buses	214.17	-	-	-	-	-	-	-	214.17
Support Utilities	67.74	-	-	-	-	-	-	-	67.74
Total	**2,120.54**	**82.35**	**40.47**	**1,476.77**	**38.52**	**108.72**	**74.82**	**6.60**	**3,948.80**

Source: Assessment based on National survey

3.5 Refrigeration Sector

Each sub-sector is discussed in detail in the subsequent sections.

3.5.1 Domestic Refrigeration

- **Overview of the Sub-sector and existing practices**

There are nine domestic refrigerator/ freezers manufacturers including PEL, Orient, Waves Singer, Iceage, URIL, Dawlance, Haier, Electrolux and Changhong Ruba in Pakistan. They manufacture models of refrigerators and freezers of various capacities. Currently, the country's need for domestic refrigerators is being met through local manufacturing and there is no import of domestic refrigerators. The total number of domestic refrigerators manufactured in Pakistan in 2019 was 2,064,721. 80% of these units were based on HFC-134a whereas the remaining 20% was relying on HC-600a.

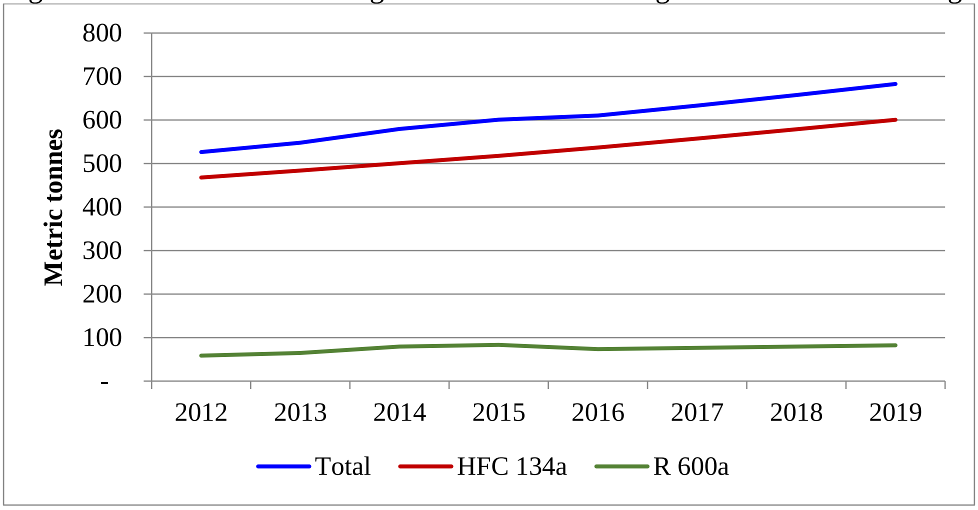
As the units are pre-charged in the premises of each manufacturer and ready for plug in, the refrigerant during the installation is not required. Further, there is no reported import of second-hand domestic refrigerator in the country. The marketing and sale of domestic refrigerators is done either directly by the manufacturer or through their authorized dealers/ distributors. There are instances where the distributors have also sub-distribution channels.

The typical range of average charge size for the domestic refrigerators in the country is around 260 & 200 grams of HFC-134a and HC-600a respectively. The average expected life of the domestic refrigerators is assumed as 15 years. The average annual leakage rate is assumed to be 7.0%.

- **Historical use of refrigerant in domestic refrigerators 2012-2019**

The historical use of refrigerants in MT in domestic refrigerations in Manufcturing & Servicing is provided in the graph below:

Figure 8: Historical use of refrigerants in domestic refrigerations in Manufcturing & Servicing



Source: Data extrapolated from the annual addition of equipment and annual servicing requirement in the subsector

3.5.2 Small and Medium Commercial Refrigeration

- **Overview of the Sub-sector and existing practices**

There are twelve commercial refrigerator/ freezers manufacturers including PEL, Orient, Waves Singer Pakistan, Iceage, URIL, Dawlance, Haier, Electrolux, Changhong Ruba, Varioline, Cool Point and Mumtaz Engineers in Pakistan. They manufacture equipment of various capacities including chest freezers, display coolers, water dispenser, candy boxes etc. for small commercial shops, restaurants, public places, super markets etc. Currently, the country's need of commercial refrigerators is being met through the local manufacturing and there is no import of commercial refrigerators. The number of commercial refrigerators manufactured in 2019 was 349,440. 5% of these units were based on HFC-134a whereas the remaining 95% was based on HC-290.

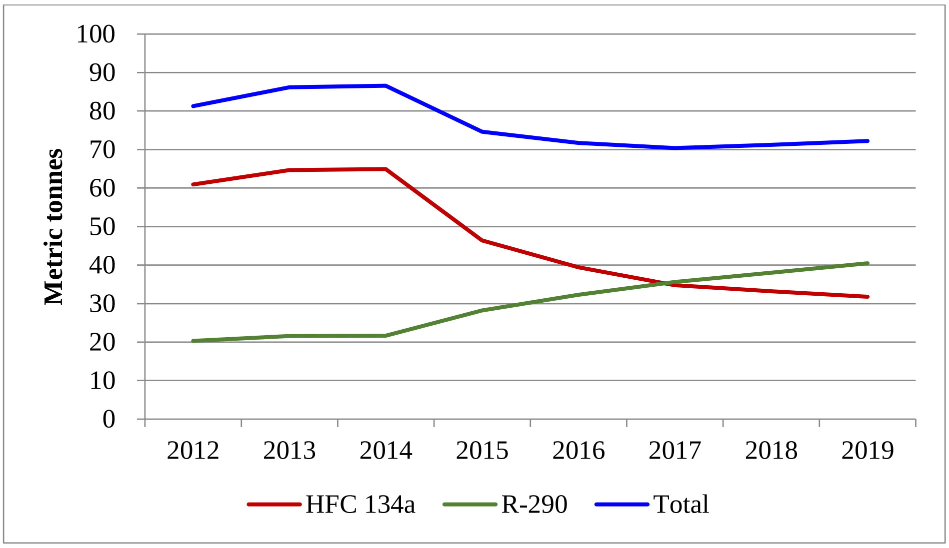
As the units are pre-charged in the premises of each manufacturer ready to plug in, the refrigerant is not required during the installation. Further, there is no import of second-hand commercial refrigerator in the country. The marketing and sale of commercial refrigerators is done either directly by the manufacturer or through their authorized dealers/ distributors. There are instances where the distributors have also sub-distribution channels.

The average charge size for the commercial refrigerators in the country is around 300 &100 grams of R-134a & R-290 respectively. The average expected life of the commercial refrigerators is assumed as 15 years. The average annual leakage rate is assumed to be 7.0%.

- **Historical refrigerants use data 2012-2019 in small and medium commercial refrigeration**

Two ODSAs, HFC-134a and HC-290 are used in this sub-sector in manufacturing as well as in servicing. The historical use of these chemicals in this sub-sector in MT is presented in the graph below. The data shows that the use of HFC-134a is decreasing whereas that of HC-290 is gradually increasing:

Figure 9: Historical use of refrigerant of Small & Medium Commercial Ref in Manufacturing & Servicing 2012-2019



Source: Data extrapolated from the annual addition of equipment and annual servicing requirement in the subsector

3.5.3 Large Commercial Refrigeration

- **Overview of the Sub-sector and existing practices**

The name and the excat number of engineering works could not be ascertained through the existing databases of Pakistan HVACR Society, Pakistan Engineering Council as well as Chamber of Commerce and Industries (CC&Is) in the country. The database of CC&Is do provide the list of engineering works covering all sectors of engineering. However, no meaningful data could be extracted for RAC sector. Understanding that there are number of Engineering Works that manufacture large commercial units in the country. They manufacture equipment of various capacities including ice plants, cold food storages, cooling/chilling/freezing application for dairy, fish and poultry in the super markets. Currently, the country’s need of large commercial refrigerators is being met through local assembling from the imported main components and there is limited amount of import of large commercial refrigerators for special requirement. The total number of large commercial refrigerators manufactured in 2019 was 228. 73.4% of these units were based on R-404A whereas the remaining 18.5% and 8.1% were based on HCFC-22 and R-717 respectively. It is presumed that the HCFC-22 based equipment will be gradually phased out and be replaced with alternate technology by 2040.

As the units are charged at the site at the time of installation, the refrigerant is required during the installation. Further, there is no import of second-hand large commercial refrigerator in the country. The marketing and sale of large commercial refrigerators is done either directly by the engineering works or through their authorized dealers/ distributors.

The average refrigerant charge size for the large commercial refrigerators in each product category is provided in the table below:

Table 18: Refrigerant Charge Size for Large Commercial Refrigerators

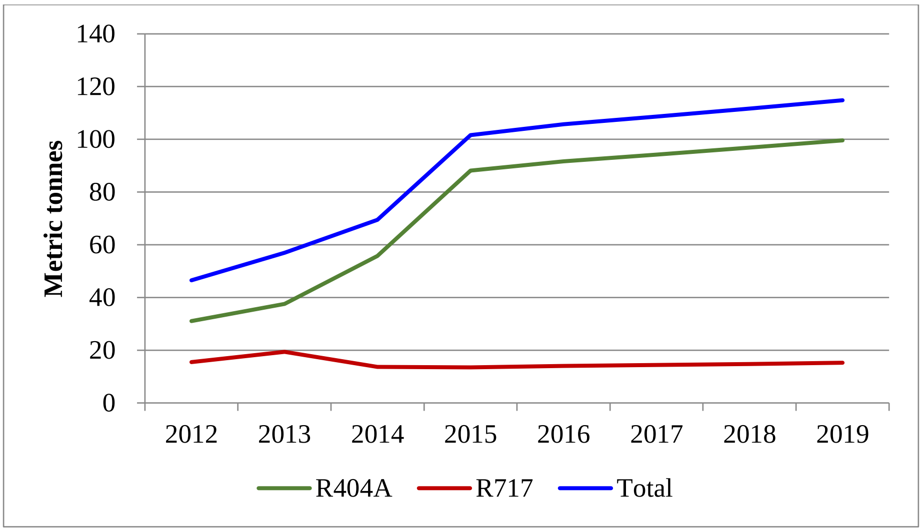
Product Category	**Average Charge Kg**		
	HCFC-22	**R-404A**	**CO2/NH3**
$10m^3$	1.00	0.98	0.90
$100m^3$	10.00	9.80	9.00
$250m^3$	25.00	24.50	22.50
$500m^3$	50.00	49.00	45.00

The average expected life of the large commercial refrigerators is assumed as 15 years. The average annual leakage rate is assumed to be 15.0% for each product category.

- **Historical refrigerants use data 2012-2019 in large commercial refrigeration**

Two ODSAs, R-404A and R-717, are used in this sub-sector in assembling as well as in servicing. The refrigerant is charged at site during the installation. Currently, HCFC-22 is also used in this sub-sector. The historical and projected consumption of these chemicals in this sub-sector in MT is presented in graph below: The data shows that the consumption of R-404A is increasing whereas that of R-717 is nearly steady.

Figure 10: Historical use of refrigerant of Large Commercial Ref in Manufacturing & Servicing 2012-2019



Source: Data extrapolated from the annual addition of equipment and annual servicing requirement in the subsector

3.5.4 Industrial Refrigeration (Cold Storages)

- **Overview of the Sub-sector and existing practices**

Currently, the exact number of engineering works and their location for the fabrication of industrial refrigeration units could not be ascertained in the CC&I's data bases. However, there are number of engineering works that are manufacturing industrial units in the major cities of Pakistan including Karachi and Lahore. These engineering works are manufacturing equipment of various capacities for applications including:

- Fruit and vegetable supply chain
- Dairy Milk chilling process
- Hotel industries
- Pharmaceutical industries
- Meat processing
- Fishing industry

Currently, the country's need of industrial refrigerators is being met through the local manufacturing and there is no import of industrial refrigeration systems. The total number of industrial refrigeration systems manufactured during 2019 was 292. 94.5% of these units were based on R-717 whereas the remaining 2.8% and 2.7% was based-on HCFC-22 and R-404A respectively. It is presumed that the HCFC-22 based equipment will be gradually phased out and be replaced with the alternate technology by 2040.

As the units are charged at the site at the time of installation, the refrigerant is required during the installation phase. Furthermore, there is no import of second-hand industrial refrigerator in the country. The marketing and sale of industrial refrigerators is done either directly by the engineering works or through their authorized dealers/ distributors.

The average refrigerant charge size for the industrial refrigerators in each product category is provided in the table below:

Table 19: Refrigerant Charge Size of Industrial Refrigeration system

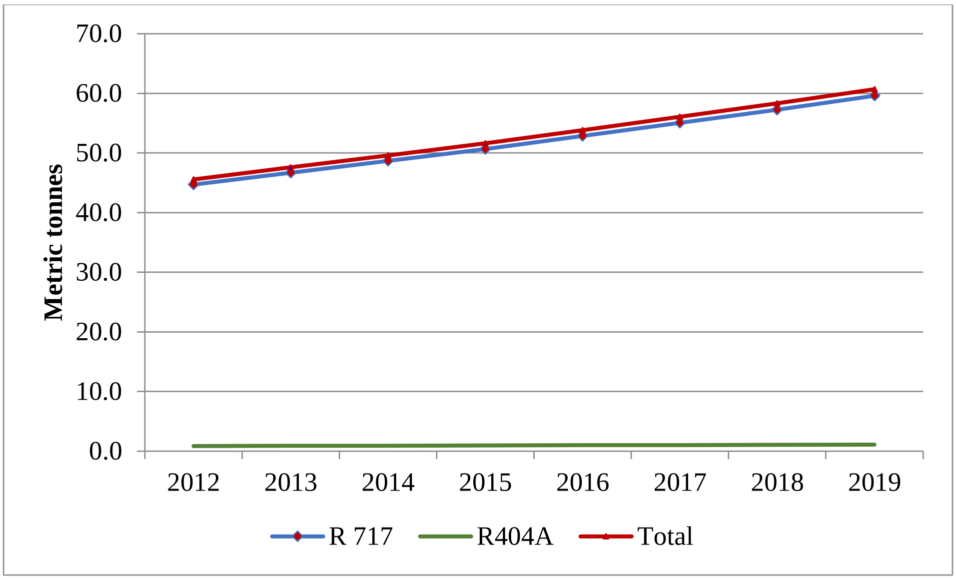
Product Category	**Average Charge Kg**		
	HCFC-22	**R-717**	**R-404A**
250m^3	25.0	25.50	24.50
500m^3	50.0	51.00	49.00
750m^3	75.0	76.50	73.50
1000m^3	100.0	102.00	98.00

The average expected life of the industrial refrigeration systems is assumed as 15 years. The average annual leakage rate is assumed to be 15.0% for each product category.

- **Historical refrigerant use data 2012-2019 in industrial refrigeration**

Two ODSA, R-717 and R-404A are used in this sub-sector in manufacturing as well as in servicing. In addition, HCFC-22 is also used in this sub-sector. The historical refrigerant use of these refrigerants in this sub-sector in MT is presented in the graph below. The data shows that the use of R-717 is increasing.

Figure 11: Historical refrigerant use in Industrial Ref in Manufacturing & Servicing 2012-2019



Source: Data extrapolated from the annual addition of equipment and annual servicing requirement in the subsector

3.5.5 Transport Refrigeration (Reefer)

- **Overview of the Sub-sector and existing practices**

There are number of engineering works that are manufacturing transport units (Reefers) in the major cities of Pakistan including Karachi & Lahore. These engineering works are in the manufacturing of cooling system for vans, 20 & 40 feet of refrigerated trucks. In addition, these engineering works also provide cooling system for fishing vessel, railway wagons etc. Currently, the country's need of Transport Reefers is being met through the local manufacturing and there is no import of transport reefers. Total number of transport reefers manufactured during 2019 was 628. 81.3% of these units were based on R-404A whereas the remaining 12.9%, 4.6% and 1.2% was based on HFC-134a, HCFC-22 and R-507A respectively. It is presumed that the HCFC-22 based equipment will be gradually phase out in favor of alternative technologies by 2040.

As the units are charged at the site at the time of installation, the refrigerant is required during the installation. Further, there is limited import of transport reefer for specialized application in the country. The marketing and sale of transport reefer is done either directly by the engineering works or through their authorized dealers/ distributors.

The average refrigerant charge size for the transport reefer in each product category is provided in the table below:

Table 20: Refrigerant Charge Size of Transport Reefer

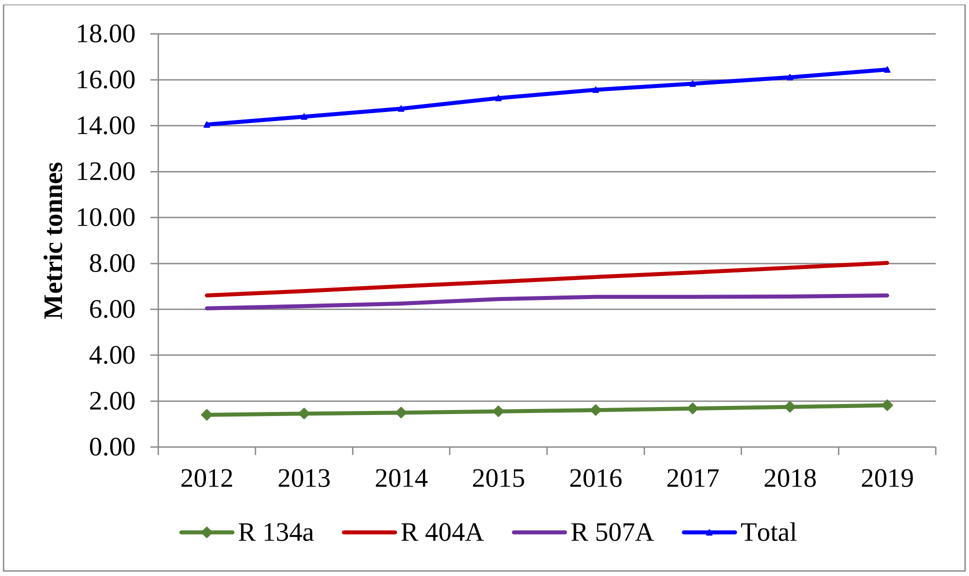
Product Category	**Average Charge Kg**			
	HCFC-22	**R-404A**	**R-507A**	**HFC-134a**
20 feet container	4.00	4.08	3.92	3.88
40 feet container	7.50	7.65	7.35	7.28

The average expected life of the transport reefer is assumed as 15 years. The average annual leakage rate is assumed to be 15.0% for each product category. The refrigerated truck and vans are a part of the cold chain to transport, fruits and vegetables, dairy products & ice-cream, fish & poultry and meat products.

- **Historical refrigerant use data 2012-2019 in transport refrigeration**

Two ODSA, HFC-134a and R-404A are used in this sub-sector in assembling as well as in servicing. In addition, HCFC-22 is also used in this sub-sector. The historical refrigerant use of these chemicals in this sub-sector in MT is presented in the graph below. The data shows that the use of R-404A is increasing whereas that of HFC-134a & R-507A are steady.

Figure 12: Historical refrigerant use in transport refrigeration in Manufacturing & Servicing 2012-2019



Source: Data extrapolated from the annual addition of equipment and annual servicing requirement in the subsector

3.6 Air Conditioning Sector

Each sub-sector is discussed in detail in the subsequent sections.

3.6.1 <u>Domestic ACs</u>

- **Overview of the Sub-sector and existing practices**

There are eight manufacturers including Dawlance, Haier, Orient, PEL, Digital World (Lahore), Digital World (Karachi), Pakistan Air Conditioning and Refrigeration Corporation (PARC) Dailkool, R&I Electrical that are manufacturing domestic ACs. These industries are manufacturing ACs of various capacities ranging between 1 ton to 4 tons in the domestic ACs. This includes single spilt units up to 2 tons and floor standing units up to 4 tons. Currently, most of the country's needs of domestic ACs is being met through the local manufacturing, however there is approximately 1-2% import of domestic ACs observed in the country during the survey of the traders. It was learnt that HFC-32 based domestic ACs are being imported in small quantities in the country. Since, the data for the import of domestic ACs in the country was not available, therefore, the quantity of HFC-32 ACs of various categories could not be ascertained. Total population of domestic ACs manufactured during 2019 was 877,976. 97.4% of these units were based on R-410A whereas the remaining 2.6% used HCFC-22. It is presumed that the addition of new HCFC-22 based equipment will be stopped by 2025. However, the population of installed HCFC-22 in the system will be gradually phased out in favor of alternative technologies by 2040.

As the units are pre-charged at the premises of each industry and ready for plug in, the refrigerant during the installation is not required. Further, there is no import of second-hand domestic ACs in the country. The marketing of domestic ACs is done either directly by the industry or through their authorized dealers/ distributors. There are instances where the distributors have also sub-distribution channels.

The typical range of refrigerant charge size for the domestic ACs in each product category is provided in the table below:

Table 21: Refrigerant Charge Size of Domestic ACs

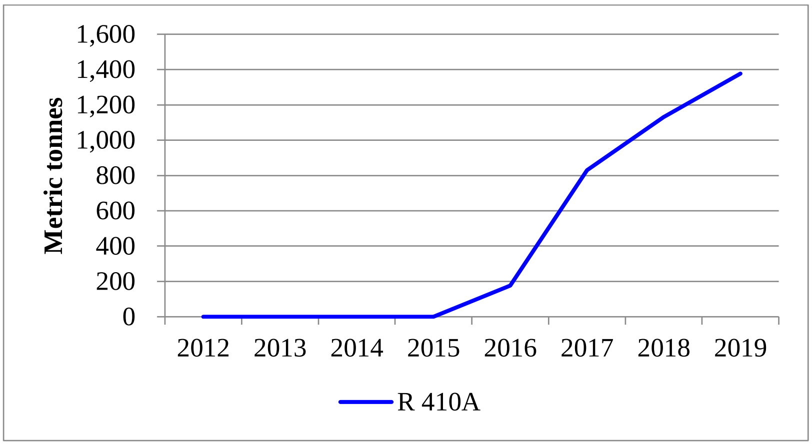
Product Category	**Average Charge Kg**	
	HCFC-22	**R-410A**
1 ton split AC	0.85	0.81
1½ ton split AC	1.20	1.14
2 ton split AC	1.5	1.43
4 ton floor standing AC	3.3	3.14

The average expected life of the domestic ACs is assumed as 15 years. The average annual leakage rate is assumed 14.0% to 20.0% for various product categories.

- **Historical refrigerant use data 2012-2019 in domestic ACs**

Currently, there are two major refrigerants used in this sub-sector in manufacturing as well as in servicing (HCFC-22 and R-410A). However, in 2020 one manufacturer in Karachi started assembling HFC-32 units on a small scale. The historical refrigerant use in this sub-sector in MT is presented in the graph below:

Figure 13: Historical refrigerant use in domestic ACs in Manufacturing & Servicing



Source: Data extrapolated from the annual addition of equipment and annual servicing requirement in the subsector

3.6.2 Commercial ACs

- **Overview of the Sub-sector and existing practices**

There are four manufacturers that are manufacturing commercial ACs including Petal Engineering, Cool Point, Pakistan Air Conditioning and Refrigeration Corporation (PARC) Dailkool and SABRO commercial ACs. These industries are manufacturing commercial ACs of various capacities including the categories of ducted ACs, packaged ACs, large split ACs and chillers. The regular production of commercial ACs and chillers is generally up to 40 tons whereas higher capacities are also built according to the customer needs by these manufacturers. Currently, most of the need of commercial ACs is being met through the local manufacturing, however approximately 5% of commercial ACs being imported in the country. The import data for the commercial ACs was not available, however it was learnt from the market dealers that around 5% of the sale of commercial ACs is met through products generally imported from Italy. The total population of commercial ACs & chillers manufactured during 2019 was 9,670. 25.4% of these units were based on HFC-134A (mainly chillers) whereas the remaining 31.0%, 26.7% and 16.9% was for HCFC-22, R-407C & R-410A. It is presumed that the addition of new R-22 based equipment will be stopped by 2025. However, the population of installed HCFC-22 systems will be gradually phased out in favor of alternative technologies by 2040. In 2019, the share of R-407C, R-410A and R-134A refrigerants used in commercial ACs compared to the overall annual refrigerants used in the other sectors are 42.5%, 3.1% and 20.9% respectively. The historical refrigerant use trend shows that the trend of HFC-134A is on increasing side whereas R-407C and R-410A are steady.

As the units are charged at the site at the time of installation, the refrigerant is required during the installation. Further, there is no import of second-hand commercial ACs in the country. The marketing of commercial ACs is done either directly by the industry or through their authorized dealers/ distributors.

The typical refrigerant range of charge size for the commercial ACs in each product category is provided in the table below:

Table 22: Refrigerant Charge Size of Commercial ACs

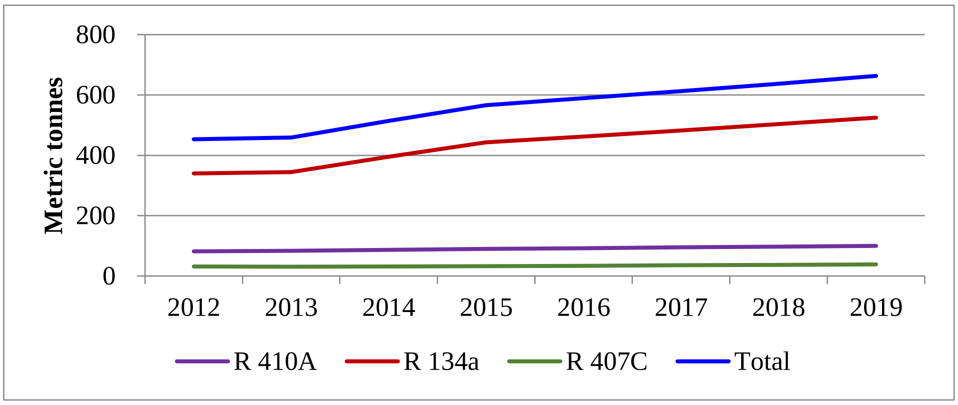
Product Category	**Average Charge Kg**			
	HCFC-22	**R-407C**	**HFC-134A**	**R-410A**
Mini Split AC > 10.5 kW	3.00	2.70	2.85	2.94
Ducted Split	6.00	5.40	5.70	5.88
Package Roof top AC	8.00	7.20	7.60	7.84
Chiller R22 & R407C	8.00	20.00	7.60	7.84
Chillier R134A & 410A			20.00	20.00

The average expected life of the commercial ACs is assumed as 25 years whereas average expected life of chillers is assumed 15 years. The average annual leakage rate is assumed 15% for various product categories.

- **Historical refrigerant use data 2012-2019 in commercial ACs**

There are three ODSAs including HFC-134a, R-407C and R-410A used in this sub-sector in manufacturing as well as in servicing. Currently, HCFC-22 is also used in this sub-sector. The historical refrigerant use of these chemicals in this sub-sector in MT is presented in the graph below:

Figure 14: Historical refrigerant use in commercial ACs in Manufacturing & Servicing 2012-2019



Source: Data extrapolated from the annual addition of equipment and annual servicing requirement in the subsector

3.6.3 Mobile ACs

- **Overview of the Sub-sector and existing practices**

There are eight manufacturers that are manufacturing vehicles requiring mobile ACs including Pak Suzuki Motor, Indus Motor, Honda Atlas Cars Ltd., Hinopak Motors, Gandhara Industries, Gandhara Nissan, Master Motor Corporation and Kia Motor. Most of the needs of vehicles ACs is being met through the local assembling by the manufacturer. The production data for various categories of vehicles having mobile ACs using HFC-134A for the year 2019 are tabulated below:

Table 23: Production Data for various categories of vehicle having mobile ACs

Vehicle categories	**Population 2019**
Cars	321,324
Buses	17,463
Support Utilities	10,478
Total	**2,646,515**

The AC units are pre-charged in the premises of each industry in the vehicles. The typical range of charge size for the various categories of vehicles having mobile ACs is provided in the table below:

Table 24: Charge Size of Mobile ACs

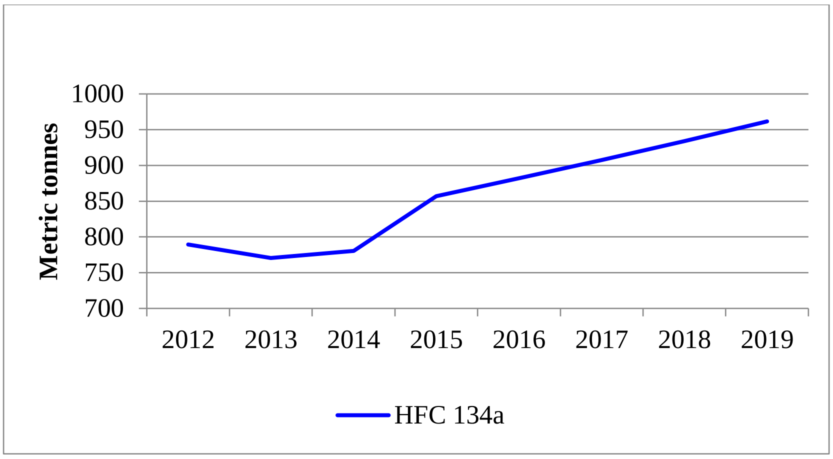
Vehicle categories	**HFC-134a Charge in Kg**
Cars	1.0
Buses	8.0
Support Utilities	4.0

The average annual leakage rate is assumed 13.0% for various product categories. The new imported vehicles are generally pre-charged from the manufactures in exporting countries whereas the refrigerants are generally removed from the second-hand vehicles before the shipment. The gas charging for such vehicles is done in the country.

- **Historical refrigerant use data 2012-2019 in mobile ACs**

There is only one ODSAs (HFC-134a) that is used in this sub-sector in manufacturing as well as in servicing. The historical and projected refrigerant use of this chemical in this sub-sector in MT is presented in the graph below:

Figure 15: Historical refrigerant use in mobile ACs in Manufacturing & Servicing 2012-2019



Source: Data extrapolated from the annual addition of equipment and annual servicing requirement in the subsector

3.7 Foam Sector

There are several companies manufacturing various products in this subsector. Under the HPMPs, the production lines relying on HCFCs have been mainly converted to cyclopentane, full water blown systems and HFOs. Besides limited trials, there is no HFC used in this sub-sector. Each sub-sector is discussed in detail in the subsequent sections.

3.7.1 PU Insulation Foam for Domestic Refrigeration

There are nine manufacturers in PU insulation foam for the manufacturing of domestic refrigerator/ freezers. 100% of the industries in this sub-sector have shifted from HCFC-141b to Cyclopentane under HPMP Stage-I.

3.7.2 PU Insulation Foam for Commercial Refrigeration

There are thirteen manufacturers in PU insulation foam for the manufacturing of commercial refrigerator/ freezers. All except one industry in this sub-sector have shifted from HCFC-141b to Cyclopentane under HPMP Stage-I. However, the remaining one industry is included under HPMP Stage-III to be submitted in the forthcoming ExCom. The phasing out of HCFC-141b to cyclopentane shall be achieved before 2025.

3.7.3 PU Sandwich Panel

There are four manufacturers in PU sandwich panel for the manufacturing of PU discontinuous panels. Currently, the industries in this sub-sector are consuming HCFC-141b. The phase out program for these industries has already been approved in 76th ExCom for conversion to cyclopentane. These conversions are expected to be implemented before 2023. Currently, these industries are using HCFC-141b contained in pre-blended polyol.

3.7.4 Thermoware PU Foam

There are seven manufacturers in PU foam manufacturing in the Thermoware sub-sector. The phase out program for these seven industries has already been approved in the 76th ExCom. These conversions are expected to be implemented before 2023. Currently, these industries are using HCFC-141b contained in pre-blended polyol. Therefore, as the alternative technology is based on the use of Full Water Blown, this translates to nil requirement of any blowing agent.

3.7.5 PU Pipe Insulation

Currently, there is only one industry in this sub-sector and is consuming HCFC-141b. The project for this specific industry has been planned for submission in the forthcoming ExCom under HPMP stage-III. The alternate technology is cyclopentane. The expected project completion is within 2025.

3.7.6 Spray Foam

Currently, there are four industries in this sub-sector and are consuming HCFC-141b. The project for these four industries has been planned for submission in the forthcoming ExCom under HPMP stage-III. The alternate technology is HFO.

3.7.7 Extruded Polystyrene Board (XPS)

Currently, there is only one industry and is consuming HCFC-142b / HCFC 22 (60:40). The industry has also tried to use HFC 152a as an alternative on trial basis. The result was not encouraging. The project to phase out HCFC142b/HCFC22 for this sub-sector was approved in 83rd ExCom. The alternative technology is CO2/ DME/ HFO. The project is expected to be completed within 2025.

3.8 Fire Protection & Suppression system

- **Historical consumption data 2012-2019**

The historical consumption of ODSAs in this subsector including top up charging for the fire protection system in MT is provided in the table below:

Table 25: Historical Consumption fire protection sector ODSAs in Metric tonnes

Chemical	2012	2013	2014	2015	2016	2017	2018	2019
Fire protection system								
HFC-227ea	8.71	18.04	6.05	32.83	9.54	4.26	8.00	12.49
HFC-23	0.60	-	-	4.20	0.06	0.15	-	0.20
HFC-236fa	-	1.00	2.00	5.00	5.50	8.75	6.30	4.08
HFC-125	-	-	-	0.06	-	-	-	0.01
Total	9.31	19.04	8.05	42.03	15.10	13.16	14.30	16.77

3.9 Status of Manufacturing sector using HFCs and low GWP alternatives

The phasing out of HCFC-141b in foam sector in domestic & commercial refrigeration, Thermoware, PU sandwich panel, PU Pipe Insulation & Spray foam has already been either phased out with low GWP alternative including cyclopentane, water blown technology or included in the HPMP stage-III. Furthermore, the HCFC-142b/ HCFC-22 in XPS board manufacturing is being phased out with DME/CO_2/HFO. It is expected that this project shall be implemented by 2025. HCFC-22 in one of the domestic ACs manufacturers is being phased out with R290 while the remaining seven manufacturers have partially converted to R-410a technology (High GWP) at their own cost. The commercial production of R-290 based ACs has not been started as yet. The existing four manufacturers in commercial ACs are manufacturing their products either on R22 or R407C (high GWP) based on the market requirement.

Given the refrigerant use scenario described above that sees a sustained use of refrigerants characterized by high GWP chemcials, it is important that the country develops the necessary laws, guidelines, standards and practices for the use of HFCs and low GWP alternatives in the manufacturing as well as in the servicing of RAC sector.

Chapter-4

REFRIGERATION AND AIR CONDITIONING SERVICING SECTOR

4.1 Review of existing relevant policies

There is no legal system available in the country for the registration and categorization of workshops in the RAC and MAC servicing sector in Pakistan.

4.2 Overview of the RAC Servicing Sector in Pakistan

A National Survey of the servicing workshops was conducted in the first quarter of 2021 as part of this Country Assessment to collect information including the number of technicians, their employment type, their competencies, their level of training and certification, their capability for handling the flammable refrigerants, the availability of tools & equipment required for workshop operation, procedure of handling, storage and charging of flammable refrigerants and other related data to assess the following:

- Number of servicing workshop in the formal and informal sector.
- Availability of tools & equipment especially for flammable refrigerants.
- Average workforce employed.
- Average annual consumption of refrigerant per workshop.
- Annual average number of equipment serviced and average charge per unit.
- Availability of system/ labelling that identify flammable and toxic refrigerants.
- Availability of written procedure to handle flammable and explosive substances.
- Availability of firefighting equipment.
- Reclaim refrigerant from equipment handled by workshop.
- Reuse and or recycle refrigerants practices from equipment handled by workshop.
- Procedures followed by workshop for disposal of reclaimed gases.
- Training & Certification of technician in handling low GWP alternative refrigerants.
- Preparedness of adoption of low GWP alternatives refrigerants with reference to handling & storage.

4.2.1 Number of formal and informal servicing workshops

In the absence of an official definition of workshop registration system, for the purpose of this survey, formal workshops are those belonging to a branded franchise, and informal workshops are the ones that do not belong to any branded franchise. With this understanding, the number of estimated formal and informal workshops per province or admin area is provided in the table and map below:

Table 26: Province/ Administrative area wise number of workshops

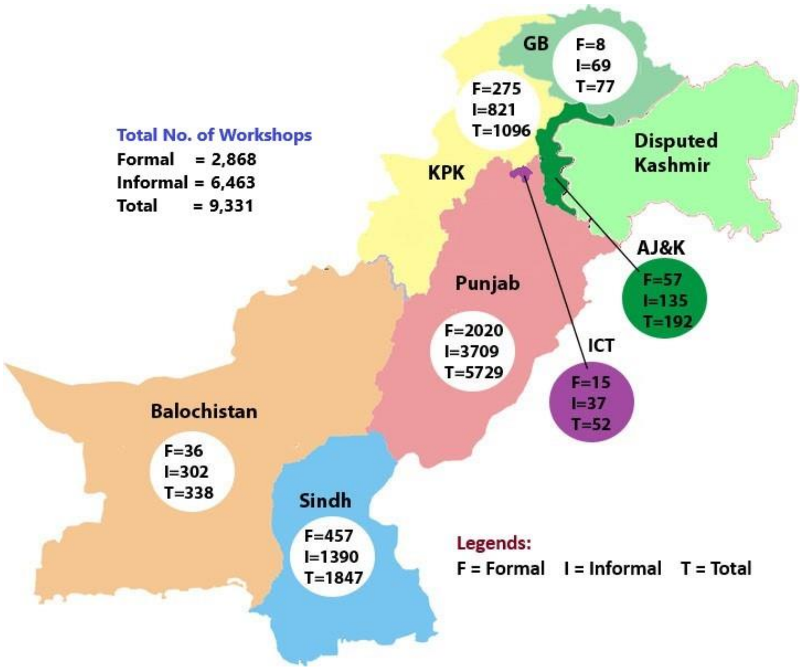
Sr. #	Province / Admin Area	Area km2	Estimated Population 2017	No. of workshops		
				Company's Sponsored/ Franchises (Formal)	Informal	Total
1	Punjab	205,345	110,012,442	2,020	3,709	5,729
2	Sindh	140,914	47,886,051	457	1,390	1,847

Sr. #	Province / Admin Area	Area km2	Estimated Population 2017	No. of workshops		
				Company's Sponsored/ Franchises (Formal)	Informal	Total
3	Khyber Pakhtunkhwa	101,741	35,525,047	275	821	1,096
4	Balochistan	347,190	12,344,408	36	302	338
5	Gilgit Baltistan	72,971	3,500,000	8	69	77
6	Azad Jammu & Kashmir	13,297	4,045,336	57	135	192
7	Federal Territory	906	2,006,572	15	37	52
Total		**882,364**	**215,319,856**	**2,868**	**6,463**	**9,331**

Source: Estimated number of workshops based on Servicing Sector Survey 2021

The graphical presentation of the proviance wise workshop data is provided in the figure below:

Figure 16: Number of formal and informal servicing workshops



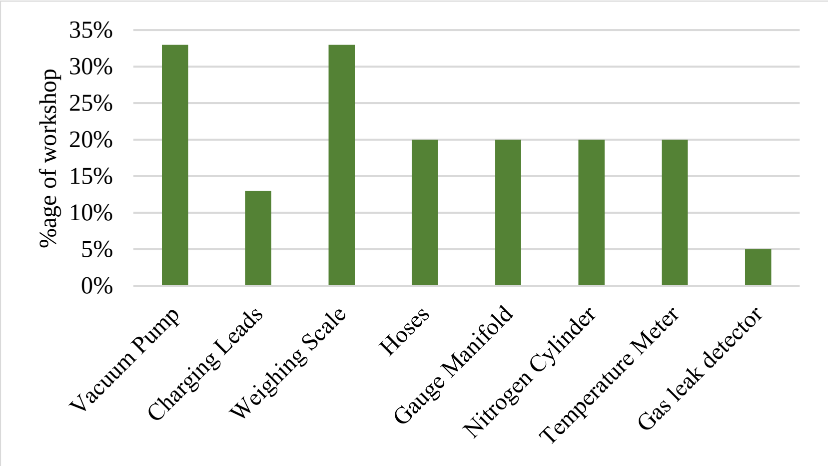
Source: Estimated number of workshops based on Servicing Sector Survey 2021

The percentage share of formal workshop is 30.7% whereas the informal workshops share is 69.3%. The average area covered per workshop is around 95 km^2. An average workshop provides service to approximately 4,200 households. During the national survey, we learnt from few of the respondent that beside these workshops, businesses that have large RAC facilities generally have inhouse professional/ technician/ skilled/ unskilled labor and tool to carry out the necessary repair and maintenance. Currently, no data is available on the number of such in-house technicians in the country.

4.2.2 Availability of Tools & Equipment to handle low GWP alternatives

As per analysis of the national survey data, the percentage of servicing workshops that have various tools and equipment to handle low GWP alternatives for the servicing, repair and maintenance of the RAC equipment is provided in the figure below:

Figure 17: Tools & Equipment to handle low GWP alternatives



Source: Servicing Sector Survey 2021

It is evident that most of the workshops require additional tools and equipment in order to be ready to handle low GWP refrigerants.

4.2.3 Workforce employed in the servicing sector

As per analysis of the national survey data, the average workforce employed per Company's Sponsored/ Franchise's workshop (formal) is provided in the table below:

Table 27: Workforce employed in the formal Servicing sector

Description	Average number of employees per category per workshop			Average Monthly Salary Rs. / Person
	Permanent	Seasonal	Daily Basis	
Administration	1.3	0.2	0.3	17,723
Technical	7.2	0.8	0.3	12,167
Managerial	2.9	0.0	0.1	18,797
Skilled	1.6	0.3	0.1	7,433
Semi-skilled	0.6	0.5	0.5	6,444
Un-skilled	0.6	0.1	0.4	4,995
Total	14.2	1.9	1.6	

Source: Servicing Sector Survey 2021

It is evident from the above table that the technical manpower is around 8.3 person per workshop including permanent, seasonal and daily wages employees.

A small-scale survey of the informal sector workshop reveals that the technical manpower in the informal sector is around 30% of the formal sector workshops i.e. around 3 technicians per workshop.

4.2.4 Refrigerants used in the servicing sector

Based on the recent national survey of 90 workshops in various provinces of Pakistan, 61 workshops (68%) responded to this question. The average annual use of various refrigerants in kg per workshop surveyed is provided in the table below:

Table 28: Annual Average use of Refrigerants in kg per workshop

Chemicals	2015	2016	2017	2018	2019
R-22	365.72	207.1	203.2	642.3	262.2
R-410A	41.53	122.2	295.5	443.6	504.9
R-32	0.00	-	0.0	0.0	0.0
R-404A	0.87	7.0	13.2	11.3	4.9
R-407C	0.00	0.0	0.0	0.0	0.0
R-134A	114.38	163.7	212.2	280.6	242.9
R-600a	1.44	1.4	1.8	12.0	18.9
Total	523.94	501.4	725.9	1389.8	1033.8

Source: Servicing Sector Survey 2021

The annual use of each of the above chemical in kg/ surveyed workshop mainly in the formal sector has been calculated by summing the individual use in each workshop divided by the number of respondents. The same approach has been adopted under similar situation in the report.

These numbers are collected to display use trends at the workshops and shall not be intended as a precise reflection of the used quantities. Based on the above average use per workshop, the estimated annual use in the servicing sector from the formal and the informal workshops is not matchable with the annual estimated consumption derived through the approach using leakage rate multiplied by the equipment population and unit charge. This is mainly due to the lack of the recording and monitoring system in the workshops.

The analysis of the data reveals the following:

- The servicing workshop use of R-22 has declined whereas the use of R-410A has increased.
- The servicing workshop use trend of R-134A and R-600A is also increasing.

4.2.5 Equipment serviced and charge per unit

The average annual number of equipment handled per workshop is provided in the table below. The table also includes the average charge per unit in kg.

Table 29: Average Annual Number of Equipment Serviced per Workshop

Description	**Annual average no.**	**Average Charge/ Unit (Kg)**
Domestic Refrigerators/Freezers (R134a)	534	0.30
Domestic Refrigerators/Freezers (R600a)	94	0.07
Commercial Refrigerators/Freezers	0.7	1.30
Domestic Air Conditioner (R22)	170.9	1.30
Domestic Air Conditioner (R410A)	0.7	1.34
Commercial Air Conditioner	0.4	3.40
Chillers	0.1	0

Source: Servicing Sector Survey 2021

4.2.6 System/ Labelling for identification of flammable and toxic refrigerants

As per the analysis of the survey results, around 70% of the formal workshops confirmed the availability of labelling system that can identify flammable and toxic refrigerants. These systems are developed by their sponsored/franchise company for their specific application. However, no national labeling system exists in the country. 54% of the workshops also confirmed the placement of the "Tagging/ Marking System" again developed by their sponsored/franchisers for their specific application. The limited information collected from the informal workshop reveals that they do not have such systems and most of them are unaware of such systems.

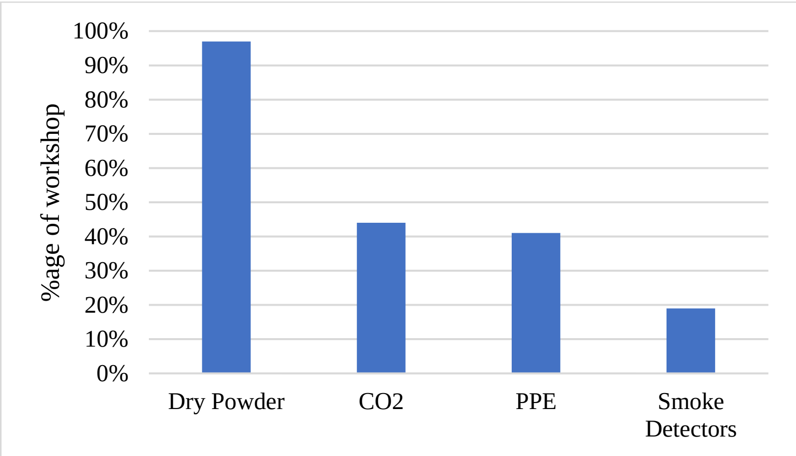
4.2.7 Procedures/ guidelines for handling flammable and explosive substances

As per analysis of the national survey, approximately, 96% of the workshops in the formal sector confirmed the availability of written procedure to handle flammable and explosive substances. These procedures/ guidelines are developed by their sponsor/franchise company for their specific application. However, no procedures/ guidelines to handle flammable refrigerants at national level exist in the country. The limited information collected from the informal workshop reveals that they are not aware of such procedure/ guidelines.

4.2.8 Firefighting equipment

Almost 100% of the workshop in the formal sector confirmed the availability of firefighting equipment in one form or the other. However, the availability of various category of firefighting equipment in terms of percentage of workshops is provided in the table below:

Figure 18: Availability of firefighting equipment



Source: Servicing Sector Survey 2021

4.2.9 Equipment for recovery/ recycle/ reclaim refrigerant by workshop

Currently, none of the workshop is engaged in the recovery, recycling and/ or reclaiming of the refrigerants from the equipment handled by them.

4.2.10 Procedures of disposal of reclaimed gases

3% of the workshops in the formal sector confirmed the availability of procedures for disposal of reclaimed gases. These procedures were developed by the individual workshops for their own application. However, the draft of the regulation for handling, manufacturing, storage, transportation and disposal is under discussion and approval by Ministry of Climate Change and Environmental Coordination, Government of Pakistan.

4.2.11 Training & Certification of technician handling low GWP alternatives

The below table provides the percentage of workshops that offer/ conduct training & certification program to their technicians for the handling of low GWP technologies. These programs are being offered by the sponsor/ franchiser for their formal workshops.

Table 30: Training and Certification of Technicians handling low GWP alternatives

Description	Percentage of workshop offering Training & certification to their Employees/ Technicians
Trained & Certified	14%
Informally trained but not Certified	85%
Not trained	1%

Source: Servicing Sector Survey 2021

It is evident that even in the formal sector there is only a small percentage of formally trained and certified manpower available. Most of the technicians are trained through informal system "Ustad and Shagird" in the informal workshops. This is on-the-job training to uncertified technicians (without formal technical education from TVETs) by the experienced technician (experienced technician may be having certificate from the formal TVET or having job experience through on-the-job training) in the workshop.

4.2.12 Preparedness of adoption of low GWP alternatives refrigerants with reference to handling & storage

42% of the workshops in the formal sector confirmed their preparedness for the adoption of low GWP alternative refrigerants in their workshop with reference to handling and storage of flammable and toxic refrigerants. This is quite promising and supports the adoption of low GWP technologies.

4.3 Existing Servicing Practices

Most of the domestic and small commercial ACs are serviced annually. During the cleaning process the technician along with assistant generally wash the condenser, evaporator, filters and internal external AC bodies without removing the refrigerants. In fact, cleaning of filters are generally on weekly basis. Where necessary the refrigerant is topped up. Most of the technicians do not recover, reuse or recycle the used refrigerant, therefore in most cases the refrigerant is just vented, released in the environment. The servicing of the large RAC equipment is either done by the in house RAC technicians supervised by experienced professionals or through the utilization of the services of RAC equipment supplier or their authorized dealers. These service providers are generally well experienced, follow the standards & procedures and good practices under controlled supervision.

4.4 Overview of Servicing Technicians and their education level

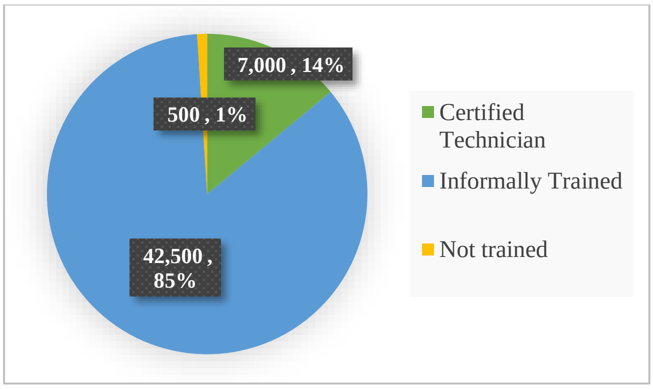
4.4.1 Employment of servicing technician in the sector

There are approximately 50,000 RAC technicians in Pakistan. Among them, around 43,500 technicians work in the formal and informal workshops while the other 6,500 technicians work as in-house technicians affiliated with businesses operating large RAC facilities.

4.4.2 Training and education level of servicing technicians

The population of the certified technicians (technicians having certificate from formal TVETs) estimated at 14% is 7,000 whereas the informally trained (on-the-job training) but not certified technician in the sector is around 42,500. The remaining 500 technicians representing 1% of the total population falls under the category of not trained (they provide support to the certified/ informally trained technicians).

Figure 19: Training level of servicing technician



Source: Servicing Sector Survey 2021

The technicians currently working in the servicing sector without training & certification are being gradually replaced with the trained and certified technicians. The students graduated from the technical institutes usually prefer to work initially in the local market in the existing workshop and later on after gaining experience either seek job in the other countries or establish their own business.

A meaningful data on the education level of the technicians working in formal and informal workshops is currently not available. However, the various RAC programs offered in the country are 6 months to 1 year certificate program, 2 years diploma program and 3 years Diploma in Associate Engineering.

4.4.3 Training of servicing technician

The office of NOU, under the CFC & HCFC phase out program (Stage-I & II), has regularly provided trainings on Good Servicing Practices to the technicians to enhance their skill and capabilities. During 2019, 416 technicians were provided training through 8 workshops in different cities. These training programs covered flammable refrigerants.

4.5 TVET National Structure and Certifying bodies

4.5.1 Structure of National Vocational Qualification Framework (NVQF)

The Version-1 of the NVQF structure issued in March 2015 was revised in October 2017 and is still effective. The revised structure of NVQF contains eight levels. National Vocational Certificates for level 1 to 4 and Diploma for Level 5 will be assessed and certified by Qualification Awarding Bodies (QABs) and graduate and postgraduate qualifications i.e. Level 6 to 8 will be assessed and degrees awarded by universities accredited by the Higher Education Commission (HEC). The below diagram shows the structure of the NVQF.

Figure 20: Structure of National Vocational Qualification Framework (NVQF)

Source: https://tvetreform.org.pk/wp-content/uploads/downloads/NVQF.pdf

Each Level of the qualification framework from level 1 to level 5 is defined by a set of approved level descriptors as per table below.

Table 31: Training and Certification of Technicians handling low GWP alternatives

Level	Descriptors			Qualification type
	Knowledge and understanding	**Skills**	**Responsibility**	
Level 1	Elementary knowledge of an area of work or study with safety procedures	Limited practical skills required to carry out single-process tasks and solve routine problems using simple rules and tools	Work or study under direct supervision with limited autonomy	National Vocational Certificate Level 1
Level 2	Basic knowledge of readily available facts, processes and general theory of an area of work or study	Basic practical skills required to complete tasks and solve problems by selecting and applying basic methods, tools, materials and information	Take responsibility for prioritizing and completing tasks in work or study under indirect supervision with some autonomy and adapt own abilities when solving problems	National Vocational Certificate Level 2
Level 3	Broad theoretical knowledge and interpretation of available information in relevant contexts within an area of work or study	Broad range of well-developed mental and practical skills required to plan and complete multi-stage tasks and generate optimum solutions to specific problems in a field of work or study	Plan and manage own work and/or supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities	National Vocational Certificate Level 3
Level 4	Comprehensive theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	Comprehensive range of mental, technical and practical skills required to complete complex tasks and develop creative solutions to abstract problems	Exercise full responsibility for management and supervision in contexts of work or study activities within well-defined boundaries and where there is unpredictable change Provide inputs to review and develop performance of self and others	National Vocational Certificate Level 4
Level 5	Advanced theoretical knowledge with analytical interpretation of an area of work or study and an awareness of the boundaries of that knowledge	Specialist level of mental, technical and practical skills required to complete variable complex tasks and develop innovative solutions to abstract and complex problems in an advanced field of work or study	Carry out planning and development of courses of action with complete accountability Exercise management and supervision in work or study activities where there is unpredictable change Review and develop performance of self and others	Diploma of Associate Engineer (DAE)

Source: https://tvetreform.org.pk/wp-content/uploads/downloads/NVQF.pdf

The above table described the broad outcomes expected of pass-outs under three categories of “Knowledge & Understanding”, “Skills” and “Responsibilities”. The level descriptors are used as guidelines for levelling competency standards, development of assessment guides, curricula and trainers and learner's guides. The National Vocational Certificate (NVC) level 1 to 4 prepares students from a semi-skilled person to a professional who possess necessary knowledge of an area of work or study from elementary to comprehensive knowledge as per level requirements, skills required to carry out and complete the tasks as per level complexity and take the responsibility from limited supervision (level 1) to full autonomy (level 4). The Diploma (Level 5) prepares students to become specialist having advanced theoretical knowledge of an area of work or study, possess mental, technical and practical skills to complete tasks, carry out planning and development with complete accountability.

Currently, the certification is not mandatory to work in the sector. However, the country is planning to introduce the registration system for the workshops as well as technicians.

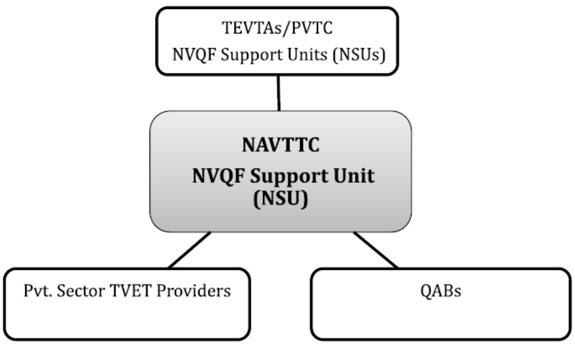
4.5.2 Qualification Awarding Bodies (QABs)

Currently, there are twelve Qualification awarding bodies including the following:

- National Vocational and Technical Training Commission (NAVTTC), Islamabad.
- National Training Bureau (NTB), Islamabad.
- Punjab Board of Technical Education (PBTE), Lahore.
- Trade Testing Board (TTB), Lahore.
- Punjab Vocational Training Council (PVTC), Lahore.
- Khyber Pakhtunkhwa Board of Technical Education (KP-BTE), Peshawar.
- Trade Testing Board (TTB), Peshawar.
- Trade Testing Board (TTB), Karachi.
- Sindh Board of Technical Education (SBTE), Karachi.
- Baluchistan Trade Testing Board (BTTB), Quetta.
- Azad Jammu Kashmir Trade Testing Board (AJKTTB), Muzaffarabad.
- National University of Technology (NUTECH), Islamabad.

The NVQF management bodies i.e. NAVTTC is at the national level wheras TEVTAs and QABs are at the provincial levels. The NVQF management body's structure is provided in the diagram below:

Figure 21: NVQF Management Structure



Source: https://tvetreform.org.pk/wp-content/uploads/downloads/NVQF.pdf

The NOU does not control the certification process.

4.5.3 TVET regulatory framework

National Vocational and Technical Training Commission (NAVTTC) established in 2005 is the apex body for technical education and vocational training in the country mandated to provide for regulations, coordination, and policy direction for vocational and technical training and is thus involved in the policy making, strategy formulation, regulation, and revamping of the country's entire Technical & Vocational Education and Training (TVET) system. It facilitates, regulates, and provides policy direction for skill development in Pakistan. NAVTTC is currently considering the accreditation of TVET institutes across the country where quality training would be conveyed to youth at par with international standards.

TVET Regulatory Framework has defined the role and responsibilities of the NAVTTC and the Technical Education and Vocational Training Authority (TEVTA) in the provinces. It provides framework of collaboration, coordination and cooperation between the federal and Provincial entities working for the TVET Sector in Pakistan like the Provincial Boards of Technical Education, Trade Testing Boards and the TVETAs/ PVTC.

The national competency standards for HVARC were introduced by NAVTTC in 2018. The summary of competency standards, their level, credits and category are provided in the table below:

Table 32: National Competency Standards for HVARC by NAVTTC

Code	Competency Standards	Level	Credits	Category
071300559	Demonstrate Communication Skills	2	4	Generic
061100560	Maintain Safe work Environment	2	4	Generic
071400542	Carry out Calculations and Prepare Estimates	2	5	Functional
071400543	Install Residential Air Conditioner	2	7	Technical
071400544	Repair / Service Residential Air Conditioner Units	2	8	Technical
071400545	Repair / Service Residential Refrigeration Units	3	8	Technical
071400546	Install Commercial Refrigeration Units	3	7	Technical
071400547	Repair / Service Commercial Refrigeration Units	3	8	Technical
071400548	Carry out Fabrication for HVAC Work	4	6	Technical
071400549	Install Central Air Conditioning System	4	7	Technical
071400550	Repair / Service Central Air Conditioning System	4	8	Technical
071400551	Perform Preventive Maintenance	4	8	Technical
041600453	Occupational health and safety	2	3	Technical
041600455	Communicate in the workplace to support customers & team	3	6	Technical
041600459	Work effectively in a customer service - sales environment	3	7	Technical
041600460	Develop professionalism	3	3	Technical
041600461	Comply with health and safety regulations	3	2	Technical

Source: https://tvetreform.org.pk/wp-content/uploads/downloads/NVQF.pdf

NAVTTC or TEVTAs or any other agency may constitute a Curriculum Development Committee (CDC) comprising members from the following list for the development of curriculum

- Representative of NAVTTC
- Industry representatives
- Experts from private and public training providers
- Instructors from TVET institutions with experience, knowledge and writing skills from the relevant sector
- Certified Competency Based Training (CBT) Assessor of the same sector (Allied sector)

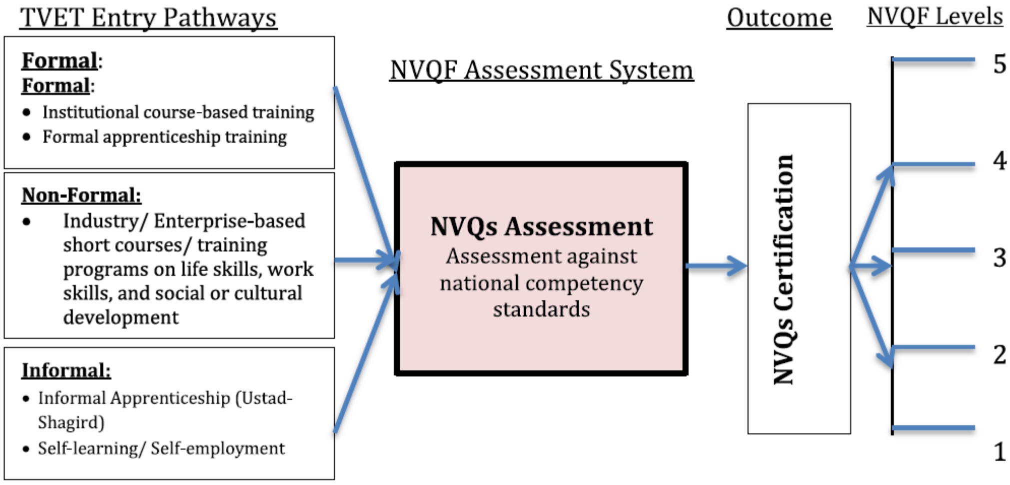
The CDC shall finalize the curriculum on the basis of industry feedback and submit it to NAVTTC for approval and notification.

NAVTTC as per its Act has devised a system for award of NVQ certification to the successful candidates in collaboration with QABs. The QABs and the Assessment Centers will follow the system devised by NAVTTC and use only nationally agreed/approved. NVQs certificate template for award of full qualifications and for award of record of achievement respectively. The “Record of Achievement” will be issued by the assessment centers to those candidates who have been declared “Competent” in few competency standards during modular assessment done by the trained instructors and who don't want to continue further to pursue for full qualification.

4.5.1 Pathway to achieve NVQs

The Figure below shows different pathways that individuals may take to acquire a national vocational qualification.

Figure 22: Pathway to achieve NVQs

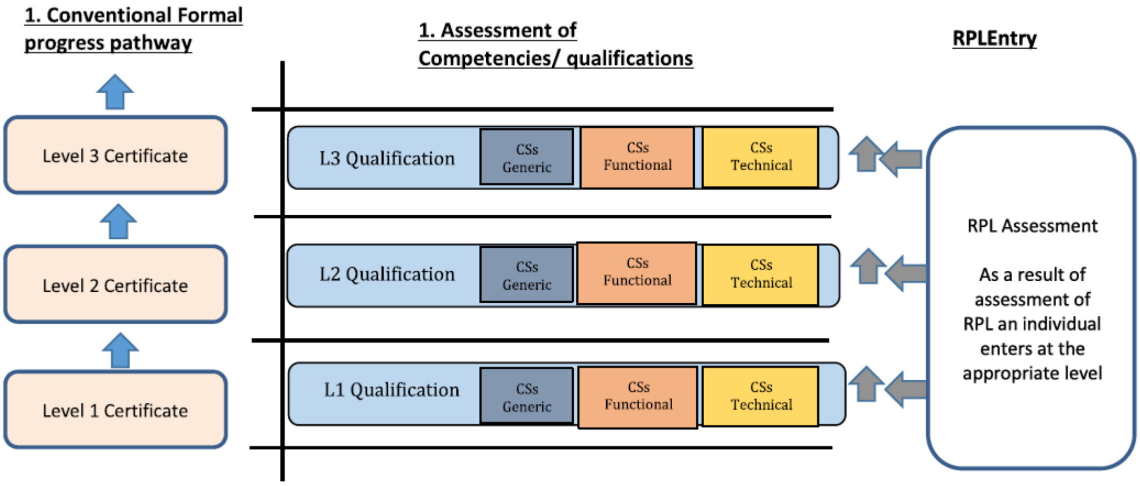


Source: https://tvetreform.org.pk/wp-content/uploads/downloads/NVQF.pdf

4.5.4 Recognition of Prior Learning (RPL)

The NVQs assessment is not limited to just the formal pathway. However, there are informal and non-formal pathways that individuals may follow for assessment for NVQs. The NVQF provides following pathways and progression for RPL entry to acquire NVQs certification at different levels.

Figure 23: RPL Entry and progression in the NVQ

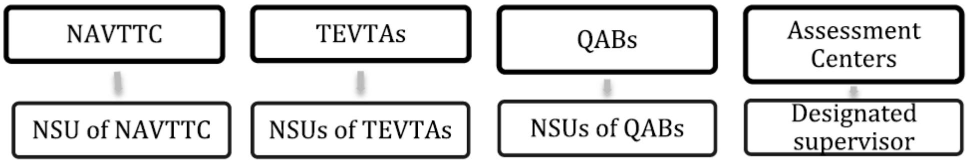


Source: https://tvetreform.org.pk/wp-content/uploads/downloads/NVQF.pdf

All NVQs will be composed of Competency Standards, which are combination of Generic, Functional and Technical. Candidates entering through RPL system shall be assessed for their skills against those standards and may qualify for either national vocational certificate of full qualification if they are declared "Competent" or "Record of Achievement" if they are declared competent in certain numbers of competency standards.

RPL assessments will be carried out and managed by NAVTTC and the NVQF Support Units (NSUs) of TEVTAs, Qualification Awarding Bodies (QABs) and by the trained supervisors of the Assessment Centers.

Figure 24: Management of RPL



Source: https://tvetreform.org.pk/wp-content/uploads/downloads/NVQF.pdf

4.6 Technical Training Institutes and Regional Training Centers Structure

Currently, the following system of Technical Education and Vocational Training (TVETs) structure exists in the country

- Federally controlled NAVTTC system that offers HVACR program/courses in the country in the private sector, public sector and in the industry.
- The province based Technical Education and Vocational Training Authority (TEVTA) system is operational in each province/ admin area. However, the Balochistan TEVTA is currently not fully functional as most of the training activities are being carried out by GIZ and provincial Labor Department.
- Recently, the Punjab Government has introduced a program by the name of "Hunarmand Nojawan (Skilled Youth) E-Learning Program 2020-21". The first batch of training program has been completed. However, the enrollment in the second batch is underway. This program is intended to provide technical training to the unemployed youth in the Punjab through e-learning.

Currently, number of programs related to HFC alternatives were offered in number of above institutes under provincial TEVTAs and Hunermand E-learning program.

4.7 RAC Programs/ Courses offered in Pakistan

4.7.1 Offered by NAVTTC

The list of 48 programs offered by NAVTTC in all the provinces/ administrative areas of the country is provided in the table below:

Table 33: RAC Programs offered by NAVTTC at the federal level

S. No.	Institute	City/District	Province	Diploma/ Certificate	Level as per NVQF	Duration Years
1	Mohammad Shafi Educational Complex	Karachi	Sindh	DAE	5	3
2	Government Technical &Vocational Centre (Boys)	Peshawar	KPK	DIP	4	2
3	GTTI,	Lahore	Punjab	DIP	4	2
4	GTTI	Gujrat	Punjab	DIP	4	2
5	GTTI	TT Singh	Punjab	DIP	4	2
6	GTTI	Bhawalnagar	Punjab	DIP	4	2

S. No.	Institute	City/District	Province	Diploma/ Certificate	Level as per NVQF	Duration Years
7	GTTI	Faqeerwali	Punjab	DIP	4	2
8	Government Technical Training Institute (B)	Bhera	Punjab	DIP	4	2
9	GTTI	Pasrur	Punjab	DIP	4	2
10	Govt. Technical Training Institute, GTTI	Lahore	Punjab	DIP	4	2
11	Government Technical Training Institute	Multan	Punjab	DIP	4	2
12	Government Technical Training Institute	TT Singh	Punjab	DIP	4	2
13	GVTI	Mirpur	AJK	CERT	3	1
14	Government Vocational Training Institute (Male)	Pallandari	AJK	CERT	3	1
15	GTVC	Abbottabad	KPK	CERT	3	1
16	Infinity Institute of Technology	Lahore	Punjab	CERT	3	1
17	AGT, Institute of Techncial & Professional Education	Rawalpindi	Punjab	CERT	3	1
18	Foundation Institute of Technology	Rawalpindi	Punjab	CERT	3	1
19	Vocational Training Institute	Pasrur	Punjab	CERT	3	1
20	Vocational Training Institute	Chishtian	Punjab	CERT	3	1
21	Vocational Training Institute	Jhang	Punjab	CERT	3	1
22	GTTI, Gujjar Khan	Rawalpindi	Punjab	CERT	3	1
23	GTTI, Railway Road	DG Khan	Punjab	CERT	3	1
24	GTTI	Gujranwala	Punjab	CERT	3	1
25	VTI	TT Singh	Punjab	CERT	3	1
26	Vocational Training Institute	Lahore	Punjab	CERT	3	1
27	Faiz-ul-Islam Technical Training Institute	Rawalpindi	Punjab	CERT	3	1
28	GTTI	Jauharabad	Punjab	CERT	3	1
29	Memon Industrial and Technical Institute	Karachi	Sindh	CERT	3	1
30	Shaheen Vocational Training Institute	Jacobabad	Sindh	CERT	3	1
31	Vocational Training Center	Kotri	Sindh	CERT	3	1
32	Vocational Training Institute,	Karachi	Sindh	CERT	3	1
33	Vocational Training Center	Shikarpur	Sindh	CERT	3	1
34	CIS – VTC	Peshawar	KPK	CERT	2	0.5
35	AGT, Institute of Techncial & Professional Education	Rawalpindi	Punjab	CERT	2	0.5
36	VTI	Rawalpindi	Punjab	CERT	2	0.5
37	Jinnah College of Engineering and Technology	Burewala	Punjab	CERT	2	0.5
38	GTTI	Gujranwala	Punjab	CERT	2	0.5
39	Vocational Training Institute (Male)	Bahawalpur	Punjab	CERT	2	0.5
40	Hunar Foundation (FAASTI)	Lahore	Punjab	CERT	2	0.5
41	SOS Multan Institute of Technology	Multan	Punjab	CERT	2	0.5
42	Vocational Training Institute	Hafizabad	Punjab	CERT	2	0.5
43	GTTI	Lodhran	Punjab	CERT	2	0.5
44	Aman Institute of Vocational Training	Karachi	Sindh	CERT	2	0.5
45	Shipyard Training School	Karachi	Sindh	CERT	2	0.5
46	SOS Technical Training Institute	Karachi	Sindh	CERT	2	0.5
47	Karigar Training Institute (KTI)	Karachi	Sindh	CERT	2	0.5
48	The Hunar Foundation	Tando Allah Yar	Sindh	CERT	2	0.5

Source : http://navttc.gov.pk/?page_id=971#tab-id-1

The province/ administrative area wise summary of the programs offered is provided in the table below:

Table 34: No. of RAC Programs offered by NAVTTC at provincial or administrative area

Province/ Admin Area	3 Years	2 Years	1 Year	6 Months	Total
AJK	0	0	2	0	2
KPK	0	1	1	1	3
Punjab	0	10	13	9	32
Sindh	1	0	5	5	11
Total	**1**	**11**	**21**	**15**	**48**

Source: Results derived from Table 33

The data for Balochistan and federal tertiary was not available. It is evident from the table that most programs were offered in Punjab and Sindh. Furthermore, only 25% of the courses were for 3 & 2 years whereas 75% of the courses were the certification program of 6 month to 1 years.

4.7.2 Offered by TEVTA

The list of 78 programs offered by TEVTA in all the provinces/ administrative areas of the country is provided in the table below:

Table 35: RAC Programs offered by TEVTAs

Sr. #	Institute	City	Province	Diploma/ Certificate	Level as per NVQF	Duration Years
1	Government College of Technology	Quetta	Balochistan	DAE	5	3
2	Iqra Centre For Technology Education	Islamabad	Federal	DAE	5	3
3	Government College of Technology	Swabi	KPK	DAE	5	3
4	Government College of Technology	Jhelum	Punjab	DAE	5	3
5	Government College of Technology	Lahore	Punjab	DAE	5	3
6	Polytechnic Institute/vocational Training Centre	Lahore	Punjab	DAE	5	3
7	The Benazir Butto Shaheed University of Technology & Skill Development	Khair Pur	Sindh	DAE	5	3
8	Government College of Technology	Karachi	Sindh	DAE	5	3
9	Pakistan Steel Institute of Technology	Karachi	Sindh	DAE	5	3
10	Sindh Technical Education & Vocational Training Authority	Karachi	Sindh	DAE	5	3
11	Jinnah Polytechnic Institute	Karachi	Sindh	DAE	5	3
12	Memon Industrial and Technical Institute	Karachi	Sindh	DAE	5	3
13	St. Patrics Technical Institute	Karachi	Sindh	DAE	5	3
14	Ymca Polytechnic Institute	Karachi	Sindh	DAE	5	3
15	Govt. College of Technology, Railway Road	Rawalpindi	Punjab	DAE	5	3
16	Government Technical & Vocational Centre	Bannu	KPK	DIP	4	2
17	Government Technical Training Centre	Arif Wala	Punjab	DIP	4	2
18	Government Technical Training Institute	Bahawal Nagar	Punjab	DIP	4	2
19	Government Technical Training Institute	Faisalabad	Punjab	DIP	4	2
20	Government Apprentices Training Centre	Lahore	Punjab	DIP	4	2
21	Government Technical Training Institute	Layyah	Punjab	DIP	4	2
22	Government Technical Training Institute	Rahim Yar Khan	Punjab	DIP	4	2
23	Rawalpindi Institute of Technology	Rawalpindi	Punjab	DIP	4	2
24	Government Technical Training Institute	Lahore	Punjab	DIP	4	2
25	Vocational Training Institute	Karachi	Sindh	CERT	4	2
26	Vocational Training Institute, Men	Pallandri	AJK	CERT	3	1

Sr. #	Institute	City	Province	Diploma/ Certificate	Level as per NVQF	Duration Years
27	Technical Training Centre	Khuzdar	Balochistan	CERT	3	1
28	Technical Training Centre	Loralai	Balochistan	CERT	3	1
29	Vocational Training Center	Killa Abdullah	Balochistan	CERT	3	1
30	Technical Training Centre,	Mastung	Balochistan	DIP	3	1
31	Hitech Training Centre	Quetta	Balochistan	CERT	3	1
32	Technical Training Centre	Quetta	Balochistan	CERT	3	1
33	Islamabad Model School for Boys (technical)	Islamabad	Federal	DIP	3	1
34	Technical Training Center	Islamabad	Federal	DIP	3	1
35	Ali Poly Technic Institute	Abbottabad	KPK	DIP	3	1
36	Ali Poly Technic Institute	Haripur	KPK	DIP	3	1
37	Government Advance Technical Training Centre	Peshawar	KPK	CERT	3	1
38	Government Technical Training Institute	Multan	Punjab	DIP	3	1
39	Faiz-ul-islam Technical Training Institute	Rawalpindi	Punjab	DIP	3	1
40	Institute of Professional and Technical Studies	Rawalpindi	Punjab	DIP	3	1
41	Government Technical Training Institute Gulberg	Lahore	Punjab	DIP	3	1
42	Apprentices Training Center	Sheikhupura	Punjab	DIP	3	1
43	Government Vocational Training Institute	Karachi	Sindh	DIP	3	1
44	Hajiani Ashraf Khatoon Technical Institute	Tando Allah Yar	Sindh	DIP	3	1
45	Shaheen Vocational Training Institute	Jacobabad	Sindh	DIP	3	1
46	Aman Institute of Vocational Training	Karachi	Sindh	DIP	3	1
47	Dehli Mercantile Society Technical Institute	Karachi	Sindh	DIP	3	1
48	Vocational Training Center	Karachi	Sindh	CERT	3	1
49	Vocational Training Institute	Ath Muqam	AJK	CERT	2	0.5
50	Vocational Training Institute	Bagh	AJK	CERT	2	0.5
51	Vocational Training Institute	Mir Pur	AJK	CERT	2	0.5
52	Vocational Training Institute	Muzaffarabad	AJK	CERT	2	0.5
53	Vocational Training Institute	Rawala Kot	AJK	CERT	2	0.5
54	Vocational Training Center (M)	Bhimber	AJK	CERT	2	0.5
55	Balochistan Institute of Technical Education	Quetta	Balochistan	CERT	2	0.5
56	Tech Training Center	Loralai	Balochistan	CERT	2	0.5
57	Allama Iqbal Open University	Islamabad	Federal	CERT	2	0.5
58	National Institute of Science and Technical Education	Islamabad	Federal	DIP	2	0.5
59	National Institute of Science and Technical Education	Islamabad	Federal	CERT	2	0.5
60	P I Technical Institute	Islamabad	Federal	CERT	2	0.5
61	Technical Training Center	Islamabad	Federal	CERT	2	0.5
62	Government College of Technology	Swabi	KPK	CERT	2	0.5
63	Government Technical & Vocational Centre	Haripur	KPK	CERT	2	0.5
64	Fwo Institute of Technical Education	Risalpur	KPK	CERT	2	0.5
65	Shaheen Occasional Training Center	Swabi	KPK	CERT	2	0.5
66	Shaheen Vocational Training Institute	Mingora	KPK	DIP	2	0.5
67	OPF Vocational Training Center	Peshawar	KPK	CERT	2	0.5
68	Government College of Technology	Lahore	Punjab	CERT	2	0.5
69	Polytechnic Institute/vocational Training Centre	Lahore	Punjab	CERT	2	0.5

Sr. #	Institute	City	Province	Diploma/ Certificate	Level as per NVQF	Duration Years
70	Comprehensive Polytechnic Institute	Sargodha	Punjab	DIP	2	0.5
71	Hunar Foundation Technical Institute	Lahore	Punjab	DIP	2	0.5
72	Sos Multan Institute of Technology	Multan	Punjab	CERT	2	0.5
73	Foundation Institute of Technology	Rawalpindi	Punjab	CERT	2	0.5
74	Govt. College of Technology, Railway Road	Rawalpindi	Punjab	CERT	2	0.5
75	National Institution of Management Sciences	Faisalabad	Punjab	CERT	2	0.5
76	Sos Tech Training Institute	Karachi	Sindh	CERT	2	0.5
77	Sos Technical Training Institute	Karachi	Sindh	CERT	2	0.5
78	Pakistan Polytechnic College	Karachi	Sindh	CERT	2	0.5

Source: Data derived from https://www.eduvision.edu.pk/

The office of the NOU has coordinated with one of the TEVTA institute in Rawalpindi for the admission of female in RAC sector. Some achievement has been made. The office of the NOU has to work more closely with NAVTTC/ TEVTAs in Rawalpindi to advocate for the inclusion of women in training opportunities for the RAC sector in Pakistan.

The province/ administrative area wise summary of the programs offered by TEVTA is provided in the table below:

Table 36: Province/ Administrative Area wise summary of RAC Programs offered by TEVTA

Province/ Admin Area	3 Years	2 Years	1 Year	6 Months	Total
AJK	0	0	1	6	7
Balochistan	1	0	6	2	9
Federal	1	0	2	5	8
KPK	1	1	3	6	11
Punjab	4	8	5	8	25
Sindh	8	1	6	3	18
Total	**15**	**10**	**23**	**30**	**78**

Source: Results derived from Table 35

It is evident from the table that most programs were offered in Punjab, Sindh & KPK whereas Balochistan and federal tertiary also offered substantial programs. Furthermore, the number of 3&2 years programs was reasonably high representing 32% whereas the certification program from 6 month to 1 years was almost 68%.

4.7.3 Offered under Hunarmand Nojawan (Skilled Youth) E-Learning Program 2020-21 Punjab

The list of 10 programs offered in batch-1 in Punjab is provided in the table below:

Table 37: RAC Programs/ Courses offered by Skilled Youth E-Learning Program

Institute Name	Organization	Courses	Female trainees	Total Trainees
Govt. technical training institute Bhera	TEVTA	HVACR	0	25
Govt. technical training institute Faqir wali	TEVTA	HVACR	0	25
Govt. technical training institute fateh pur Layyah	TEVTA	HVACR	0	25

Institute Name	Organization	Courses	Female trainees	Total Trainees
Jinnah college of Engineering technology Burewala	Private	HVACR	0	25
Quaid College of Technology Gaggoo	Private	HVACR	0	25
SOS Multan institute of technology Multan	Private	HVACR	0	25
TEVTA-CAMI-SMALL Industries Mian Channu	TEVTA	HVACR	0	25
Vocational training institute Chishtian	PVTC	HVACR	0	25
Vocational training institute opposite Daewoo terminal khanewal road Multan	PVTC	HVACR	0	25
Vocational training institute Mailsi	PVTC	HVACR	0	25
Total			**0**	**250**

Source: Data derived from http://navttc.gov.pk/

The above programs are mostly of short duration ranging upto 6 months.

4.7.4 Annual Enrollment capacity of programs offered in RAC sector

The no. of programs along with their estimated annual enrollment capacity of various programs offered in RAC sector is provided in the table below:

Table 38: Annual Enrollment Capacity of Program in RAC Sector

Description of programs offered in RAC sector	Level	No. of programs	Annual Enrollment
Diploma of Associate Engineering Programs 3 years	5	16	375
Diploma Program 2 years	4	21	525
Certificate Program 6 months to 1 year	2&3	99	3,550
Total		136	4,450

Source: National Survey

The technical and vocational training institutes offering programs in RAC sector are in Government as well as Private sector. A total of approximately 136 RAC programs are offered in different province/ admin areas of Pakistan. The total annual estimated enrollment capacity of this sector is around 4,500. These programs are 6 moths to 3 years duration with a different entry level requirement in terms of previous education.

4.8 Finding of the National Survey of TVET system

During the national survey, the technical and vocational survey generally confirms the following:

- That the existing training programs cover the handling of HCFCs, HCFC blend, HFCs, HFCs blend and natural refrigerant in the existing curriculum.
- Confirms the availability of tools as per table below:

Table 39: Availability of tools with institution for training

Description	percentage of institutes in possession of tools
Manifold gauge 0-50 bar	53.8%
Manifold gauge 0-160 bar	61.5%

Description	percentage of institutes in possession of tools
Portable Leak Detector for Hydrocarbon	76.9%
Portable Leak Detector for Ammonia	84.6%
Portable Leak Detector for CO_2	76.9%
Refrigerant Weight Scale 0-50 kg	76.9%
Refrigerant Weight Scale 0-100 kg	69.2%
Vacuum Pump	53.8%
Recovery Set Hydrocarbon	69.2%
Recovery Set other Refrigerants	69.2%
Recycling Cylinder	76.9%
Nitrogen Pressure Regulator	76.9%
Training tools for technicians	92.3%
Smart tools	84.6%
Any other tools as reported in the surevy	61.5%

Source: National Survey

It is evident from the above table that many of the institutes do not fully possess the adequate number of equipment required to effectively deliver trainings for HFCs and HFC blends.

- TVETA confirmed that their training program offered in RAC sector at their selected institutes covered handling of HFCs/ low GWP alternate refrigerants especially the flammable and toxic refrigerants especially the training offered by UNEP consultant covers flammable and toxic refrigerant.

Chapter-5

OVERVIEW OF EXISTING POLICY AND REGULATIONS

5.1 General

This chapter provides an overview of existing national policies and regulations to identify the requirement of additional policy measures and interventions including strategies, legislations, regulations and other intervention tools for the implementation of the Kigali Amendment in the country. The review of the existing policy measure/ intervention against each area is provided below:

5.2 Existing Legislative Framework for the Control of ODS

A number of measures were introduced in the country after the ratification of the Vienna Convention in 1992 including the following:

- Implemented the regulation on substances contributing to destruction of ozone layer in 2000.
- Extended the list of banned items to cover HCFC-142b through SRO 634(1)/2004.
- Exempted customs duty for components or sub-components related to the refrigeration, air conditioning for non HCFC gases through SRO 981(1)/2007.
- Exempted customs duty especially for compressors using non HCFC gases through SRO 564(1)/2008.
- Instituted restriction on the import of ODS gases and import subject to the policy of quota allocation through SRO 758(1)/2008 and 766(1)/2009.
- Implemented the directive by the NOU office # 7/(72)/ozone/2012 on controls of import of HCFC in 2013.
- Enforced the licensing and quota system in 2013.
- Enforced HCFC/ODS alternative import / export controls Import Policy Order (IPO) in 2013. This policy was revised in 2016 and 2020. The Appendix-F to IPO-2022 for the procedure & guidelines for import of CFCs, Halons, CTC, HCFCs and ODS is provided in the table below:

Table 40: Appendix-F to Import Policy Order 2022

Substance	**PCT Code**	**Remarks**	
Annex A **Group-I** Chlorofluorocarbons	2903.7790	**Completely banned** The import of CFC is completely banned since 31st December, 2009.	
CFC- 12	2903.7790		
CFC-113	2903.7790		
CFC-114	2903.7790		
CFC-115	2903.7720		
Annex A **Group-II** Halons	2903.7600	**Completely banned** The import of Halons is completely banned since 31st December, 2009.	
Halon 1301	2903.7600		
Halon 2402	2903.7600		
Annex B **Group-III** Carbon Tetra Chloride (CTC)	2903.1400	No CTC import allowed, as it already stands banned vide Ministry of Commerce Notification/SRO (1)/2007, dated 28th May, 2007.	
Annex B **Group-I**	2903.1910	No import of Methyl Chloroform allowed, as it already stands banned since November, 2004.	
Annex C **Group-I**		**Control Measure**	**Schedule**
		Baseline	Average of 2009 & 2010
Hydro- chlorofluorocarbons		Freeze	2013
HCFC-22*	2903.7790	90% (10% reduction)	2015

<table>
<tr><th>Substance</th><th>PCT Code</th><th colspan="2">Remarks</th></tr>
<tr><td>HCFC-141b*</td><td>2903.7790</td><td rowspan="2">65% (35% reduction)</td><td rowspan="2">2020</td></tr>
<tr><td>HCFC-123*</td><td>2903.7790</td></tr>
<tr><td>HCFC-124*</td><td>2903.7790</td><td>32.5% (67.5% reduction)</td><td>2025</td></tr>
<tr><td>HCFC-141*</td><td>2903.7790</td><td>2.5% (97.5% reduction)</td><td>2030</td></tr>
<tr><td>HCFC-142*</td><td>2903.7790</td><td rowspan="2">Annual average consumption of 2.5% (for servicing sector)</td><td rowspan="2">2030-2039</td></tr>
<tr><td rowspan="3">HCFC-142b*</td><td rowspan="3">2903.7790</td></tr>
<tr><td>100% reduction</td><td>2040</td></tr>
<tr><td colspan="2">*<u>Restriction on HCFCs import:</u>
Import is only allowed to authorized quota holders. HCFC's import is also subject to permission i.e. Quota Authorization issued by the Ministry of Climate Change, Ozone Cell, Climate Change Division, to monitor the import trends of this controlled</td></tr>
<tr><td>Annex B Group-I
Methyl Bromide</td><td>2903.3910</td><td colspan="2">Ban imposed on import of methyl Bromide since December, 2004. However, import of Methyl Bromide is allowed only for Quarantine & Pre-shipment purposes with the registration of the Plant Protection Department, Ministry of National Food Security & Research, Karachi and NOC from the Ministry of Climate Change.</td></tr>
</table>

Source: Import Policy Order 2022

5.2.1 Status of existing policies on the control of HCFCs and HCFC based equipment

The present status of the existing legislation with regard to the refrigerants covered under HCFCs and HCFC based equipment in the context of Pakistan is provided in the table below:

Table 41: Status of existing legislation for HCFCs refrigerants and equipment

Sr. #	Description	HCFCs Refrigerant		HCFC-based Equipment
		Status	Effective	
1	**General Provisions linked to the Montreal Protocol Obligations**			
	Does the Regulation include phase-out/ phase-down schedule as per MP obligations	Yes	2013	No
2	**Quota System for Import and Export**			
	Quota system in place	Yes	2013	No
	Quota system in operation	Yes	2013	No
	Procedures for quota allocation in place	Yes	2013	No
	Is mandatory registration of importers required?	Yes	2013	No
3	**Licensing System[9] for Import and Export and Custom Clearance**			
	Mandatory import/export licensing system in place	Yes	2013	No
	Mandatory import/export licensing system in operation	Yes	2013	No
	Mandatory labelling requirement in the domestic market in place	Yes	2013	No
	Mandatory labelling requirement in the domestic market in operation	Yes	2013	No
4	**Data Monitoring and Reporting**			
	Post-clearance reporting requirement in operation	Yes	2013	No
	ASYCUDA system and risk profiling	No		No
	The country has a specific harmonized code (HS) to distinguish different types of refrigerants	Yes	2013	No
	Is there a mechanism to share a database on import quotas and actual imports between ozone office and customs?	Yes	2013	No
	Are estimated quantities and origin of imports tracked by country?	Yes	2013	No
5	**Other Provisions/Policy Measures**			

[9] License coincides with quota certificate

Sr. #	Description	HCFCs Refrigerant		HCFC-based Equipment
		Status	Effective	
	Restrict import to a specific type of refrigerants	Yes	2013	No
	Ban the import of RAC equipment (first and second hand)	No		No
	Ban on upgrading or establishing new production capacity using substances	No		No
	Require importer to restrict the sale of refrigerant only to certified technicians or to service workshops that have registered with the concerned department in place	No		No
	Require importer to restrict the sale of refrigerant only to certified technicians or to service workshops that have registered with the concerned department in operation	No		No
	Require RAC and MAC technicians to obtain certification in place	No		No
	Require refrigeration technician to obtain certification in operation	No		No

In summary:

- Most of the policies for HCFC refrigerants were introduced in 2013
- Pakistan may further expand its policy measures/ interventions to help finalize its HCFCs phase-out, some potential measures are highlighted in the table above.
- No policy measure/ intervention for the import and export of HCFC based equipment is currently existing, therefore, these interventions need to be developed.

5.2.2 Status of existing policies on control of HFCs, other refrigerants & HFC based equipment

- No policy/ intervention related to HFC refrigerants were introduced in the country.
- No policy measure/intervention for other refrigerants including ammonia, HC, HFO & CO_2 is currently existing.
- No policy measure/ intervention for non-ODS based RAC equipment is currently existing.

5.2.3 Review of existing Quota System, Import Licensing and Data Monitoring & Reporting for HCFCs

Currently, no consolidated document/ order exists to cover the quota and licensing system for control substances. However, piecemeal instructions were developed and in practice with NOU. The review of the existing quota system, import licensing & clearance system and data monitoring & reporting is provided in the table below:

Table 42: Review of existing Quota System, Import Licensing and Data Monitoring & Reporting

Description	Authority	Yes/No	Present Status
Quota			
Does the country regulatory framework include provisions for allocating quota to importers?	NOU	Yes	The regulatory framework for quota for control substances was enforced since 2013
Does the country regulatory framework include provisions for phasing-down/out the allocable quota over time?	NOU	Yes	The regulatory framework does exist and is managed by NOU/MOCC&EC
Do the importers need supporting documents to apply for the import quota?	NOU, MoCC&EC	Yes	• Goods declaration for last year import • Copy of Bill of Lading • Import records such as details of exporter, brand and origin
Do the importers need to pay to apply for the quota?	NOU, MoCC&EC	No	The existing system does not require any payment for the quota
Are new importers allowed to	NOU,	No	New importers are not eligible except those

Description	Authority	Yes/No	Present Status
apply for the quota?	MoCC&EC		who imported HCFCs in 2009-2010
What is the quota cycle?	-	The duration of the quota cycle exists in the existing regulation	The quota cycle is on annual basis and from January to December each year
When is the deadline for quota application?	-	The deadlines for the quota application are not fixed in the existing regulation	It depends on the date of advertisement; however, NOU tries to receive the applications by mid-January
How is the total annual quota set?	NOU, MoCC&EC	Using maximum allowable consumption in line with MP reduction targets.	-
Based on what criteria is the quota assigned to each importer?	NOU, MoCC&EC	Previous import track record and on the basis of average import during 2009 and 2010 (i.e., baseline years)	-
When is the quota allocation for the next cycle communicated?	NOU, MoCC&EC	The cycle for the annual quota allocation for the next cycle is currently not fixed	On the date approved by the Ministry of Climate Change and Environmental Coordination
How is the quota allocation communicated to importers?	NOU, MoCC&EC	Currently, the system exists	Quota allocation is communicated through a letter to each importer
Is a share of the total annual quota reserved as a buffer and for what purposes?	NOU, MoCC&EC	Yes	In general practice, a cushion of 2 or 3 ODP (less than 3%) is reserved for any contingency factor such as any specific demand of Industry, adjustment of any illegal trade etc.
Are the allocated quota tradeable/transferrable among importers?	-	No	-
Is quarterly/semi-annual review of quota utilization conducted to reallocate non-utilized quota?	NOU, MoCC&EC	Yes	NOU review the quota allocation on a monthly/quarterly basis. Therefore, in case of underutilization of quota, NOU confirms with the importer for its reallocation. Moreover, there is a clause in the annual import quota letter that "If any importer has no plan to import any amount of allocated quota for any year, he/she will intimate the same by 1st August in the same year, to the National Ozone Unit" Moreover, there are quarterly, review meetings with quota holders to review the utilization of allocated quota and issues related to import of HCFCs.
Are importers allowed to file applications for controlled substances types that have never been imported into the country before?	NOU, MoCC&EC	Yes	There is no restriction to import HCFCs subject to the eligibility of the importer.
Import License & Custom Clearance			
Does the county have a general licensing system in place for import/export control?	NOU, MoCC&EC	No	There is no import license issued for each shipment. The Appendix F of the Import Policy Order requires a quota authorization letter from MOCC. However, the importer has to apply for online clearance of shipment through Web Based One Custom (WeBOC)
What kind of supporting documents are required for the license application?	NOU, MoCC&EC	Yes	Good Declaration for last year import, copy of Bill of Lading, Import records such as details of exporter, brand and origin
Do the importers need to pay for	NOU,	No	

Description	Authority	Yes/No	Present Status
the license application?	MoCC&EC		
When does the importer need to submit the license application?	NOU, MoCC&EC	Currently, the quota authorization letter is required and works as a license and it is on an annual basis.	The importer has to submit quota allocation request along with relevant documents
Is iPIC utilized by NOU?	NOU, MoCC&EC	Yes	iPIC is an effective mode to communicate. The queries received from exporting countries are routed through UNEP, Bangkok. Emails are is used for communicating between NOU China and Pakistan since 2019
Who issues the license? If the NOU is not the licensing authority, what are the mechanisms for the NOU to collaborate with the licensing authority to issue the license?	NOU, MoCC&EC	Web Based One Custom (WeBOC) is the tool through which Custom authorities implement the HCFC import quota.	NOU has access to the online tool of the Pakistan Custom. NOU annually feeds the quota in the WeBOC system through which FBR implements the same.
Are import licenses specific to 1 type of substance or bulk permit (more than one substance in a license)?		Yes	HCFCs import quota license varies as per the eligibility criteria, in some cases license is issued for a single item, whereas, to some importers issuance of the license for more than one HCFCs is also in practice.
Is there any mechanism in place to revoke the license once used/fully utilized?	Customs	Yes	For usability of the license 31st December of each year is set as the expiry date. On 1st January the WeBOC automated system automatically expires the license. However, through the online debiting mechanism of the WeBOC, once the quota is fully utilized, no more import is allowed to a specific importer. The system is paperless and a dedicated quota is for each refrigerant.
Do the license holders need to report back how much they imported? If so, how frequently?	NOU/MOCC &EC	Yes	Yes, importers report their import details to NOU on monthly basis and on completion of the year a final consumption detail is also submitted.
Do the importers need to declare who their customers (distributors, servicing workshops) are?		No. the importers are not declaring their customer's names including distributors and servicing workshops	At random NOU ask them to provide the details of their customers and end-users
How is the licensing authority communicating and sharing data with Customs on issued licenses?	NOU/MOC& EC	Yes	NOU has access to the online tool of the Pakistan Custom. NOU annually feeds the quota in the WeBOC system through which FBR implements the same.
What documents need to be submitted by the importer/customs broker for shipment clearance?	Customs	Yes	Letter of Credit, Shipment details including a packing list, quota license
Does the Customs implement risk profiling for the import/export of controlled substances?	Customs	Yes	Customs implements the risk profiling of importers by track records, substance risk, country of origin, utilization and requirement of a substance, etc.
Does the Customs utilize a refrigerant identifier during the custom inspection?	Customs	Yes	Customs randomly use identifiers. However, in most cases, the Pakistan Customs request NOU to facilitate in identification of refrigerants.
Does the certifying authority apply labelling to credit the legitimacy of imported containers?	NOU	No	The country is considering to develop such regulations
Is a web-based system (e.g.,	Customs	No	Pakatan is not a user country of the ASYCUDA

Description	Authority	Yes/No	Present Status
ASYCUDA, PC Trade etc.) utilized for import/exports clearance?			system
What actions are taken by Customs and the NOU when unauthorized imports/exports are discovered during the custom clearance process?	Customs	The Custom Act 1969 amended up to 30.06-2020 Chapter XVII covers confiscation and penalties.	The unauthorized imports are confiscated by Customs Authorities. If the substance is allowed to any importer then it is auctioned to the authorized importers only otherwise the unauthorized imports are sent back to the exporting country.
What are the penalties for unauthorized imports/exports?	Custom / Police / others	The Custom Act 1969 amended up to 30.06-2020 Chapter XVII covers confiscation and penalties.	Imprisonment which may extend to two years, or with fine, or with both; Fine which may be up to one million rupees; The act covers the controlled substance but it is not clear whether it is for those controlled substances that are covered under the Montreal Protocol
Does the country have a regulation in place to control the import/export of HCFC/HFC-based equipment?		No	The country is considering to develop such regulations
Does the country have any regulation to ban HCFC-based equipment?		No	The country is considering to develop such regulations
Data Monitoring & Reporting			
Does the NOU have a mechanism in place to track the cumulative quantity of imported substances from each importer?	NOU	Yes	NOU has the import data monitoring mechanism on a monthly/quarterly basis. HCFCs importers submit their import details on a monthly/quarterly basis to provide the HCFCs import data. Data is duly compiled and monitored by NOU to keep tracking the progress of the annual import quota.
Does the NOU have a mechanism in place to track the cumulative quantity of imported substances from Customs?	NOU	Yes	NOU has the import data monitoring mechanism on a monthly/quarterly basis. NOU requests Pakistan Customs (FBR) on monthly basis to provide the HCFCs import data. Data is duly compiled and monitored by NOU to keep tracking the progress of the annual import quota.
Does the NOU reconcile (crosschecking) data with Customs, licensing authority (if different from NOU), and importer?	NOU	Yes	Separate data sheets are maintained for Customs and Importers data which are reconciled on a monthly/quarterly basis.
How frequently is data reconciliation conducted?	NOU		Data reconciliation is done on a monthly/quarterly basis
What happens in case of discrepancies or missing information?	NOU + Customs + Licensing authority		NOU tracks the missing entries with either importer or Customs department and removes the data anomaly.
Where is the data for Country Program and Article 7 coming from?	NOU		Data for CP and Article 7 data report is based on Customs data reporting or in some cases reconciled data among Custom and importers data is also considered
What are the reporting obligations of importers / custom brokers?	NOU		The importer has to submit the import data on a monthly / quarterly basis.
What type of HS code is in use by the customs?	Customs		Currently, the 2012 WCO HS code version is in practice. Based on HS Codes FBR has devised PCT Codes
Does the HS code system in the country have a provision for inclusion of national HS digits (in addition to the 6 digits if adopting	Customs	Yes	08 digits of the HS code is being used in country HCFC-22 (2903.7100) HCFC-141b (2903.7300)

Description	Authority	Yes/No	Present Status
WCO code or 8 digits if following regional code)?			HCFC-142b (2903.7400) HFC-134a (2903.3930, 2903.3990) R-410A (3824.7800) R-407C (3824.7800)
Is the HS code able to distinguish single HCFCs and HFCs substances commonly used in the country?	Customs	No	HCFC 22 (2903.7100) HCFC 141B (2903.7300) HCFC 142B (2903.7400) HFC 134A (2903.3930, 2903.3990) HFC 410A (3824.7800) HFC 407C (3824.7800)
Are on-site inspections in the domestic market (after import clearance) conducted?	Customs + NOU + Police?	No	Currently, there is no mechanism to check the HS codes once the controlled substance is cleared from the port
What actions are taken by authorities when mislabeled / smuggled refrigerants are found during domestic market inspections?	Law enforcement		The mislabeled imports are confiscated by Customs Authorities. If the substance is allowed to any importer then it's auctioned to the authorized importers only, otherwise, the mislabeled imports are sent back to the exporting country.

5.2.4 Procedures for Quota & Licensing System for Controlled Substances

The NOU through the MOCC&EC issues the import quota to the commercial and industrial importers on an annual basis; quota allocations expire on 31st December of the respective calendar year. This quota is issued to registered importers only. Import quota will be given per substance in MT translated to ODP tons with HS Codes for those substances. The quota allocated to importers at the beginning of each year is registered in the Customs' computerized system – the Web-Based One Customs (WeBOC) which was developed by PRAL (Pakistan Revenue Automation Ltd).). The quota authorization and license permit have been condensed in one process. The actual import of each substance cannot exceed its quota limit in any calendar year. Industry/traders will undertake imports against the import quota allocated for the respective calendar year. Import Quota will not be allocated for a specific substance / industry in case that substance / enterprise has achieved phase-out in that year, either at the enterprise level or at the national level.

If an importer has no plan to import any amount out of its allocated quota for a given year, it needs to inform the NOU by 1st August for that year. Enterprises are required to submit information on the actual import against their quotas by substance to NOU for the Performance Verification of import of HCFCs. The final data is then used for the Country Program Progress data reporting and Article 7 data reporting after Performance Verification.

5.2.5 Data Monitoring and Verification

For the control of HCFCs, monitoring of imports is done monthly, followed by quarterly review meetings that are undertaken by the NOU. NOU compiles data based on the reports given by importers and reports by the Federal Board of Revenue (FBR)/Customs Statistics on imports for the respective quarter which is counter-checked with the information received from the importers.

The Federal Board of Revenue (FBR) is the lead agency in developing the control mechanism for the quota holders through the Pakistan Revenue Automation (Pvt.) Ltd. (PRAL) data. A WeBOC system is in place and NOU provides the inputs to the FBR for providing information on the quota limits for each importer into the system. The import data handhold by the NOU is cross-checked with the data in possession of the Customs and the data received from the importers who sent their import documents to the NOU. The system provides the details of import of all goods imported by the ODS importers to the NOU. Cross-checking of data from the exporting country and analysing the data is a continuous activity of the NOU. Any major difference in data is immediately flagged and verified with the stakeholders.

5.2.6 Additional Measures for the Control of ODS under Development

The current legal framework has adequately addressed the control on the import of ODS. However, under the HPMP Stage-II Tranche-1 & 2, the following additional measures are being examined by the NOU/MOCC&EC for its appropriate application:

- Reduce duties on non-HCFC based products and impose higher duties on HCFC based products and key components.
- Ban on the release of HCFC and HCFC blends during servicing.
- Ban/control of investment in new, enlarged or technically reformed enterprises consuming HCFC and HCFC blends.
- Legislation and guidelines for handling, transportation and storage, end of life management of equipment & waste management of ODS.

Ban on manufacturing of HCFC-based equipment has not been imposed yet. The policy may be implemented after the completion of conversion projects for HCFC-based equipment. The ban on the import of HCFC-based equipment/product will also be introduced similarly. A ban on the use of HCFCs in the foam sector will be imposed after the completion of the conversion projects for the foam sector in HPMP Stage-II & III.

5.3 Policy on Climate Change

The Paris Agreement requires all parties including Pakistan to put forward their best efforts through “Nationally Determined Contributions” (NDCs). This included reporting by each party regularly on their emissions and implementation, efforts including global stock take every 5 years to assess the collective progress towards achieving the purpose of the Agreement.

Pakistan ratified the UNFCCC/ Paris agreement on November 10, 2016 and submitted its first NDC in 2016. The Kigali Amendment is intended to reduce CO_2 emissions by adopting zero or low GWP refrigerants in the RAC sector where there is direct emission from the refrigerant leakage and indirect emission from the use of fossil fuel-based electricity. The implementation of the Kigali Amendment shall help facilitate the reduction in CO_2 emissions. This emission reduction, if realized can help achieve the targets as set in the Paris Agreement. This means that there is a need to work with climate change stakeholders for GHG emission reporting. There is a need to have a proper institutional channel between the office of NOU and the office of climate change for the reporting mechanism of direct and indirect emission reduction. The climate change department is working under the Director-General Environment and Climate Change in the Ministry of Climate Change and Environmental Coordination. The National Climate Change Act was issued in 2017 while the other pertinent rules and regulations were issued as below:

- National Climate Change Policy-2012.
- The Environment & Climate Change Outlook of Pakistan -2014.
- Study on the Introduction of Carbon Pricing Instrument in Pakistan -2019.

The table below provides the overview of the existing policies, regulations and acts on climate change that are relevant to the Montreal Protocol

Table 43: Review of the existing Act, Policies & Regulation on climate change

Policies	Brief Description	Relevance to MP/KA
National Climate Change Policy 2012[10]	The policy provides the guidance and directions for all the stakeholders to address the adverse impacts of climate change and contains goals, objectives and a set of guiding principles followed by broad policy statements under each topics of vulnerability, adaptation, mitigation, capacity building and institutional strengthening, awareness raising, international and regional cooperation, finance, technology transfer and policy implementation mechanism.	Relevant As it has common goals with MP/KA including promoting GHG emissions reduction by improving the demand and supply side of energy; promoting the industry to reduce GHG emissions and introduce a proper waste management system. There is no explicit mentioning of the RAC sector in the document.
Nationally Determined Contribution (NDC) 2016[11]	Sets out Pakistan's GHG emission reduction goals in the sectors of energy (electricity generation), industrial process, agriculture, land-use change and forestry and waste. The key contributors to GHG are identified as Carbon Dioxide (CO_2), Methane (CH_4) and Nitrous Oxide (N_2O). The 2015 emission in eq $MTCO_2$ in various sub-sector including Energy 45.9%, Industrial process 5.4%, Agriculture 43.1%, Land use change and Forestry 2.6% and Waste 3.0%. Pakistan intends to reduce GHG emissions against the BAU scenario by 20% in 2030.	Relevant However, it does not specify HFC or RAC sector.
2nd Nationally Determined Contribution (NDC)	The document is under consultation with stakeholders	Relevant It still does not specify HFC or RAC sector.
Pakistan's Second National Communication On Climate Change 2018[12]	The GHG emission reduction inventory has been revised as per 2018 NDC. The inventory includes four main sectors and 17 subsectors. The main four sectors include 1) Energy, 2) Industrial Processes and Product Use (IPPU), 3) Agriculture, Forestry & Other Land use (AFOLU) and Waste. The estimation under the inventory shows the total emissions from Pakistan are 489.87 MtCO2eq for the year 2018, with 1) the Energy sector contributing 218.94, ii) Industrial processes 25.76, iii) Agriculture, Forestry and Land Use 223.45 and iv) Waste 21.72 respectively. The key GHGs of concern are Carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). It has been estimated that Pakistan has achieved a target of 8.7% reduction in GHG emissions in 2018 out of the 20% committed cumulative target of 2030 and this mainly has been attained from climate compatible efforts.	Relevant Although, it is indicated in the report that additional sectors like gases (HFC - Hydrofluorocarbons and Nitric acid) has been added to the NDC 2018. However, no effective data has been provided/ projected of this specific area has been provided in the report.
The National Climate Change Act 2017[13]	This act covers United Nations Framework Convention on Climate Change (UNFCCC), Rio De Janeiro, 1992; Kyoto Protocol to the UNFCCC, 1997; The Paris Agreement, 2015; and any other agreement relating to climate change to which Pakistan is a signatory.	Relevant This act addresses the emission of green house gases included HFCs.

[10] http://www.nrsp.org.pk/gcf/docs/National-Climate-Change-Policy-of-Pakistan.pdf
[11] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Pakistan%20First/Pak-INDC.pdf
[12] https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Pakistan%20First/Pakistan%20Updated%20NDC%202021.pdf
[13] https://policy.asiapacificenergy.org/sites/default/files/Pakistan%20Climate%20Change%20Act%2C%202017.pdf

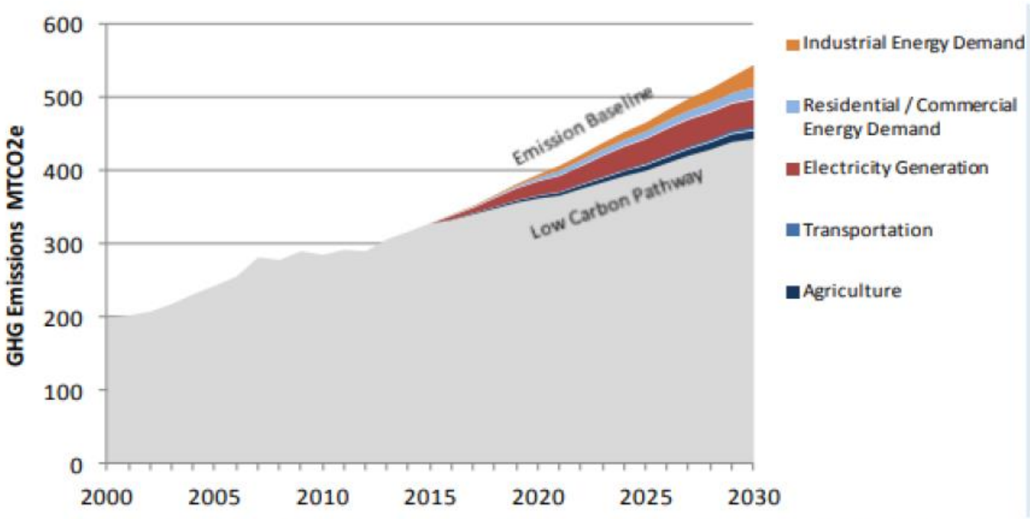
Policies	Brief Description	Relevance to MP/KA
The Environment & Climate Change Outlook of Pakistan -2014[14]	This document provides sector wise projection of GHG emission 2011-2050 including Energy, Industry process, Agriculture, Forestly & Land Use and Waste	Relevant The document addresses the green houses gases but not vey specifically the HFCs

5.4 Policy on Energy Efficiency

Based on the National GHG Inventory for 2014-15, the total GHG emissions of Pakistan from the energy sector were projected in 2020 to around 331 MT CO_2-equivalent. It is more than 50% of the total GHG emissions.

Based on the National Energy Efficiency and Conservation Authority (NEECA) Strategic Plan 2020-2023, NEECA plans to achieve 3 MTOE energy savings in the next 3 years through the introduction of energy efficient appliances. This may result in a reduction of 6.4 MT CO_2 eq. emissions.

Figure 25: National GHG Inventory for 2014-15



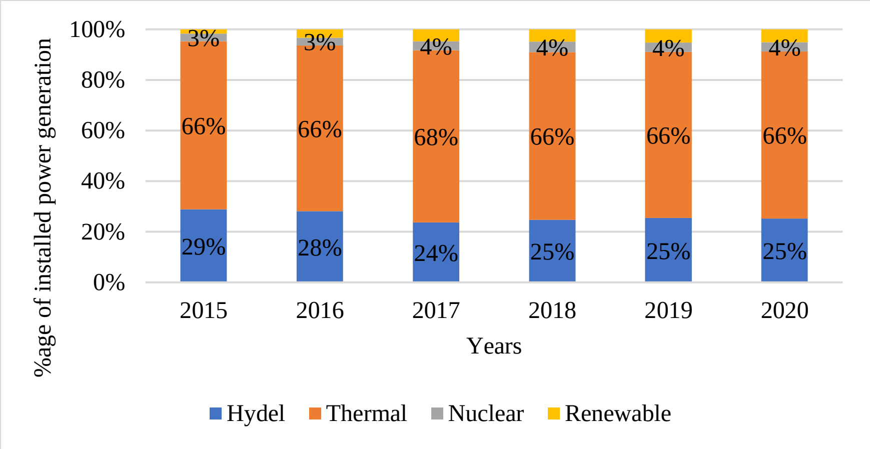
Source: NEECA Strategic Plan 2020-2023[15]

The bulk of electricity generation in Pakistan is primarily from the grid-connected power plants and a small amount of generation in isolated areas are off-grid power plants. The source of installed power generation in the country in terms of percentage share during 2015-2020 is provided in the graph below:

Figure 26: Percentage share of sources of installed power generation in Pakistan, 2015-2020

[14] https://www.unep.org/resources/report/environment-and-climate-change-outlook-pakistan

[15] https://neeca.gov.pk/SiteImage/Misc/files/NEECA%20Strategic%20Plan%202020-23%20Final%2028%20October%202020(1).pdf

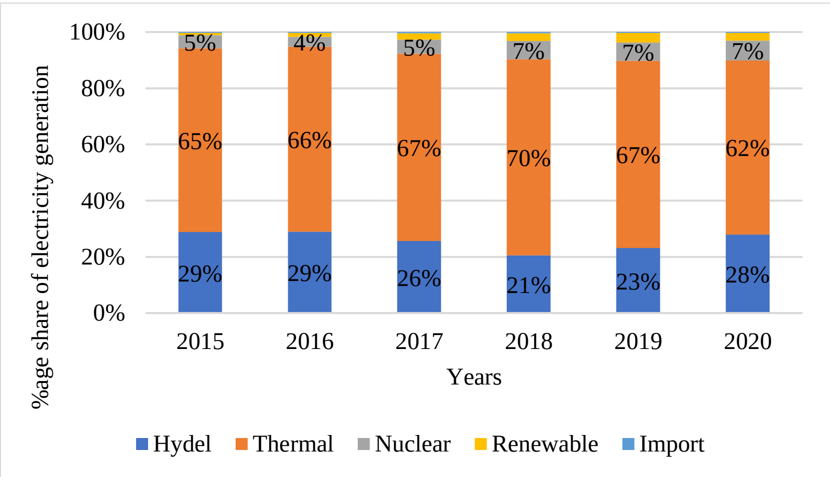


Source: PEPCO Power System Statistic 45th Edition

It is evident that the number of main source of installed power generation is thermal and hydel whereas nuclear and renewable share is small.

The annual generation of electricity in terms of percentage share from 2015 to 2020 from different sources in the country is provided in the graph below:

Figure 27: Percentage share of annual electricity generation from 2015 to 2020

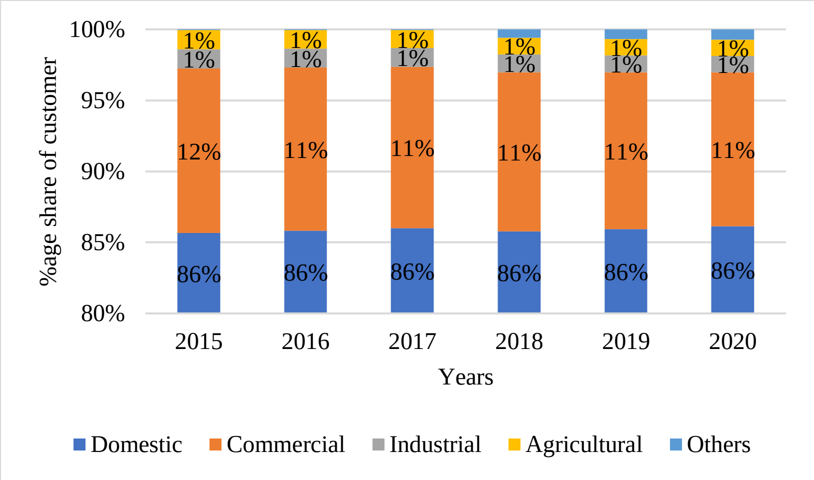


Source: PEPCO Power System Statistic 45th Edition

The main source of electricity generation is thermal and hydel whereas the nuclear and renewable plays a small role.

The category of customers in terms of percentage share from 2015 to 2020 in the country connected to the power system is provided in the graph below:

Figure 28: Percentage share of customers category connected to the power system in the country-2015-2020

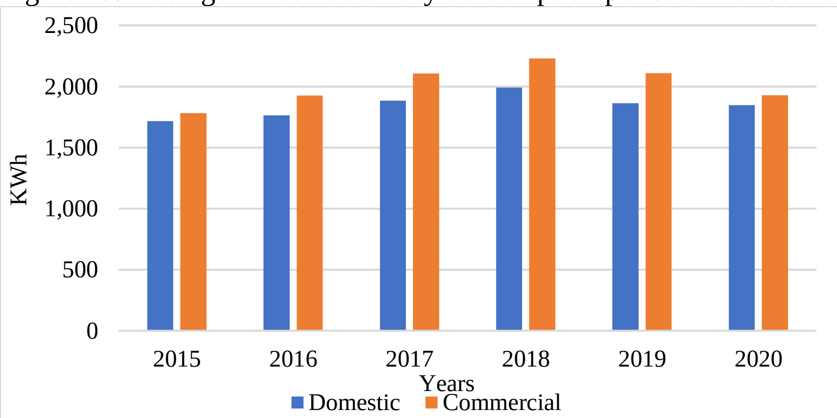


Source: PEPCO Power System Statistic 45th Edition

It is evident that the domestic customer & commercial customers connected to the power system is on the higher side.

The average annual electricity consumption (kWh) per domestic and commercial customer connected to the power system is provided in the graph below:

Figure 29: Average annual electricity consumption per customer connected to the power system



Source: PEPCO Power System Statistic 45th Edition

Air conditions for comfort cooling and refrigerators are one of the major sources of electricity consumption in both categories of the customers.

The policies measures/ interventions for regulation on labeling and energy efficiency for HFCs, other refrigerants including ammonia, HC, HFO & CO_2 and Non-ODS RAC based equipment are not currently in place.

The table below provides the overview of the existing policies on energy efficiency that are relevant to the Montreal Protocol.

Table 44: Review of the existing policies on Energy Efficiency

Policies	**Brief Description**	**Relevance to MP/KA**

Policies	Brief Description	Relevance to MP/KA
Strategy Plan 2020-2023 by National Energy Efficiency and Conservation Authority (NEECA)[16]	This document provides conservation strategies for energy efficiency for Pakistan Energy sector to provide the governance framework to facilitate and strengthen the wide-scale adoption of sound energy-efficient practices at the national level. The Act declares NEECA as the focal organization to coordinate and implement all the policies, programs and regulations to promote energy efficiency & conservation. The strategic sector includes industrial, buildings, transport, power, agriculture and cross-cutting areas	Relevant. Includes provisions to promote energy labelling of appliances; energy efficiency building code; mandatory display of energy performance information of appliances; control of manufacture/import of inefficient appliances; policy recommendations, education of public and seminars on energy efficiency improvement.
Appliance Energy Labelling Programme	Enercon, Government of Pakistan under Bresl program developed the following Minimum Energy Performance Standard (MEPS) and Labels in 2014: - MEPS for Window Type & Split Air Conditioners with Cooling Capacity under: 14000 W (12000 – 48000 BTU/hr) [17] - MEPS and Labeling (Energy Efficiency Standards and Labeling: ES&L) Policy / Guidelines for Implementation of ES&L Scheme[18] However, the MEPS and labels were not implemented.	Relevant The MEPS and energy labelling standards for refrigerators and air conditioners are still underway.
Alternative & Renewable Energy Policy 2019 (ARE Policy 2019)[19]	Developed by the Alternate Energy Development Board, Government of Pakistan. The long-term integrated energy plan of Pakistan envisages four guiding principles: sustainability, affordability, responsibility (of use) and availability. The ARE Policy 2019 has the vision of the development of an efficient, sustainable, secure, affordable, competitive and environment-friendly power market while promoting indigenization of technology and the development of skilled human resources and local manufacturing capabilities in ARE technologies.	Relevant For the purposes of this Policy, the GOP has set the target of at least 20% on-grid RE generation by capacity by the year 2025 and at least 30% by 2030. The use of energy efficient RAC appliance shall reduce the indirect emission produced by the use of electricity from the National Grid System. Higher the share of thermal generation, greater the indirect emission. Higher the share of renewable energy, lower the indirect emission from the efficient RAC appliance.

5.5 Policy on the Safe Adaption of Flammable Refrigerant

Ministry of Climate Change and Environmental Coordination prepared a draft document on "Hazardous Substances Rules, 2003". This document was updated later on in 2016 as a second draft "Handling, Manufacture, Storage, Import of Hazardous Waste And Hazardous Substances Rules, 2016. Further, Pakistan Standards & Quality Control Authority (PSQCA) has issued a number of standards in the context of performance testing and energy consumption measurement but not in the context of safety of product and group safety. Review of existing standards is provided in the table below:

[16] https://neeca.gov.pk/SiteImage/Misc/files/NEECA%20Strategic%20Plan%202020-23%20Final%2028%20October%202020(1).pdf

[17] https://climateinfo.pk/frontend/web/attachments/data-type/Enercon%20(2014)%20MEPS%20for%20Window%20Type%20&%20Split%20Air%20Conditioners.pdf

[18] http://climateinfo.pk/frontend/web/attachments/data-type/Enercon%20(2014)%20MEPS%20and%20Labeling%20ES&L%20Policy%20%20Guidelines.pdf

[19] http://www.aedb.org/images/ARE_Policy_2019_-_Gazette_Notified.pdf

Table 45: Review of Existing Policies and Standards on the safe adoption of flammable refrigerant

Policies	Brief Description	Relevance to MP/KA
Handling, Manufacture, Storage, Import of hazardous waste and hazardous substances Rules, 2016 [20]	Provides provisions for the definitions, approval and notification of sites, safety report and safety audit reports, preparation of on-site and off-site emergency plan, import of hazardous chemicals, transport of hazardous substances and other approval along with schedules	Relevant Provides provisions on thehandling, manufacturing, storage, import of refrigerant including flammable refrigerant.
PS: 5151- Non-Ducted Air Conditioners and Heat pump [21]	Non-Ducted Air Conditioners and Heat pump. Specifies performance testing, the standard conditions and the test methods for determining the capacity and efficiency ratings of air-cooled air conditioners and air-to-air heat pumps	No Relevance. This standard does not cover product safety and group safety
PS:IEC:5327- Multiple split- system Air-conditioners and Air to Air heat pumps [22]	Multiple split- system Air-conditioners and Air to Air heat pumps. Testing and rating for performance for Multiple split system air conditioners and air to air heat pumps	No Relevance. This standard does not cover product safety and group safety
PS:IEC:62552 Household refrigerating appliances – Characteristics and test methods & Part-1[23], Part-2,[24], Part-3[25]	Household refrigerating appliances – Characteristics and test methods & Part-1, Part-2, Part-3. Sets General requirements, Performance requirements and Energy consumption Volume of the refrigerator and other household appliances	No Relevance. This standard does not cover product safety and group safety

5.6 Policy on Waste Management

The Basel Convention regulates the transboundary movements of hazardous wastes & other wastes and obliges its parties to ensure that such wastes are managed and disposed of in an environmentally sound manner.

Pakistan acceded the Basel convention on July 26, 1994. Pakistan issued the last Electronic Reporting System (ERS) report in 2018. The Kigali Amendment is intended to phase down the use of refrigerants in RAC sector that are flammable. Since the convention covers toxic, poisonous, explosive, corrosive, flammable, ecotoxic and infectious wastes, therefore, the implementation of the Kigali Amendment shall have relevance with the Basel Convention. This means that there is a need for working with Basel Convention stakeholders for their reporting. There is a need to have a proper institutional channel between the office of NOU and the Basel Convention on integrating the destruction of unwanted waste from HCFCs/HFCs with the destruction of hazardous waste under the Basel Convention. The Basel Convention is working under the Deputy Director Chemical in the Ministry of Climate Change and Environmental Coordination.

The table below provides the overview of the existing Policies, Regulation and Act on Waste Management that are relevant to the Montreal Protocol

[20] http://environment.gov.pk/images/rules/20160201CORRECTEDHAZARDOUS2016.pdf
[21] https://psqca.com.pk/cs/newitems2021/electrotechnical/PS%205151.pdf
[22] https://psqca.com.pk/cs/newitems2021/electrotechnical/45-PS%205327-2014.pdf
[23] https://psqca.com.pk/cs/Electrical%20Mandatory%20Standards%202018/iec62552-1-2018.pdf
[24] https://psqca.com.pk/cs/Electrical%20Mandatory%20Standards%202018/iec62552-2-2018.pdf
[25] https://psqca.com.pk/cs/Electrical%20Mandatory%20Standards%202018/iec62552-3-2016.pdf

Table 46: Review of the existing Policies, Regulation and Act, on Waste Management

Policies	Brief description	Relevance to MP/KA
Pakistan Environmental Protection Act 1997[26]	According to section 14 (handling of hazardous substances) of Pakistan Environmental Protection Act 1997 "subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle, or import any hazardous substance except ; (a) under a license issued by the federal agency and in such manner as may be prescribed ; or (b) in accordance with the provision of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party. According to section 13 (prohibition of import of hazardous waste) of Pakistan Environmental Protection Act 1997, "no person shall import hazardous waste to Pakistan and its territorial waters, exclusive economic zone and historic waters".	<u>Not Relevant.</u> The policy does not explicitly highlight the refrigerants. It however, provides a general guide on the prohibition of import, handling, store etc. of any type of hazardous waste in the country
Import Policy Order 2016[27]	Import Policy Order 2016, inter-alia, also bans import of hazardous waste as defined and classified in Basel convention except where import is specifically authorized by the government of Pakistan.	<u>Relevant.</u> It provides a general guide on the prohibition of import of any type of hazardous waste in the country

5.7 Policy on Chemical management

The national profile for chemical management in Pakistan lists 55 regulations dealing with various groups of chemicals, their use and handling. There are at least 17 Ministries that have been interested with the responsibilities of ensuring related laws, regulation and other operational guidelines. The ministries and public institutions include Climate Change, Health, Food & Agriculture, Labour & Manpower, Commerce, Industry & Production, Finance, Petroleum & Natural Resources, Interior, Science & Technology, Communication, Railways, Textile Industry, Law & Justice, Ports & Shipping, Defence Production, Foreign Affairs, and Local Governments & Rural Development. The cell within the Ministry of Climate Change and Environmental Coordination is responsible for this activity under Deputy Director Chemical.

The table below provides the overview of the existing Policies, Regulation and Act on Chemical Management that are relevant to the Montreal Protocol.

Table 47: Review of the existing Policies, Regulation and Act, on Chemical Management

Legal Instrument	Objectives of Legislation	Relevant Articles/ Provision
National Profile for Chemical Management in Pakistan 2009[28]	National Profile was prepared, with the aim that it can be used to inform both members of the professional community and the general public, and that implementation of its recommendations will go a long way towards improving the coordination of relevant tasks, and the level of chemical safety in Pakistan.	<u>Not relevant</u> The policy does not explicitly highlight the refrigerants

[26] http://www.na.gov.pk/uploads/documents/Pakistan=Environmental-Protection-Act-1997.pdf
[27] https://www.commerce.gov.pk/wp-content/uploads/2020/09/Import-Policy-Order-25-09-2020.pdf
[28] https://cwm.unitar.org/national-profiles/publications/cw/np/np_pdf/Pakistan_National_Profile_2009.pdf

Legal Instrument	Objectives of Legislation	Relevant Articles/ Provision
Pollution Charge for Industry (Calculation and Collection) Rules 2001 by Pak EPA/ Provincial EPAs[29]	To provide the guidelines for the measurement of a pollution charge payable by an industrial unit. Section 5: determination of pollution level	Not relevant. The policy does not cover refrigerants
Environmental Tribunal Rules 1999 by Ministry of Law & Justice[30]	To provide regulations for the establishment and functioning of environmental tribunals Section 4: formation of tribunal Section 16: disposal of cases Section 18: proceedings of tribunal	Not relevant. The policy does not cover refrigerants
Pakistan Standards and Quality Control Authority Act, 1996[31]	The Pakistan Standards and Quality Control Authority was established to provide for the standardization and quality control services	Not relevant. The policy does not cover refrigerants
National Environmental Quality Standards 1993 by Pak EPA/ Provincial EPAs[32]	To control emission of municipal and liquid industrial effluent, industrial gaseous emissions and exhaust and noise pollution from motor vehicles	Not relevant. The policy does not cover refrigerants
The Dangerous Cargoes Act, 1953 Act by Ministry of Port & Shipping[33]	Safety of ports in respect of the transit, working and storage of dangerous cargoes and incidental matters	Not relevant. The policy does not cover refrigerants
The Railways Act, 1890 by Ministry of Railways[34]	to consolidate, amend and add to the law relating to Railways Chapter VI, Section 47(1c): preparation of general rules for carriage of dangerous goods Section 47(2): penalty Section 59: rules for carriage of dangerous or explosive goods Chapter IX, Section 90: notification for carriage of dangerous or explosive goods Section 107: penalty	Not relevant. The policy does not cover refrigerants
Ports Act 1908 by Ministry of Port & Shipping[35]	To consolidate prior laws relating to the Karachi Port and Port Qasim, and extends to the navigational rivers and channels leading to these ports	Not relevant. The policy does not cover refrigerants
Drugs Act 1976 by Ministry of Health[36]	To regulate the import, export, manufacture and distribution of pharmaceutical drugs	Not relevant. The policy does not cover refrigerants
Explosives Act 1884 (No. IV) by Ministry of Interior & Narcotics[37]	Deals with the manufacture, possession, sale, use and transport of explosives	Not relevant. The policy does not cover refrigerants

[29] https://epd.punjab.gov.pk/system/files/Pollution_Charge_Rules_2001.pdf
[30] http://www.environment.gov.pk/images/rules/envtribunalrules.pdf
[31] https://www.psqca.com.pk/PSQCAACT/PSQCAActVI1996.pdf
[32] http://www.environment.gov.pk/images/rules/SRO742I93SRO1023I95NEQS.pdf
[33] https://dgps.gov.pk/SiteImage/Misc/files/DANGEROUS%20CARGOES%20ACT%201953.pdf
[34] http://www.railways.gov.pk/SiteImage/Misc/files/railway%20act%201890.pdf
[35] https://phkh.nhsrc.pk/sites/default/files/2019-07/Ports%20Act%20Pakistan%201908.pdf
[36] http://www.na.gov.pk/uploads/documents/1493183343_941.pdf
[37] http://punjablaws.gov.pk/laws/7a.html

Legal Instrument	Objectives of Legislation	Relevant Articles/ Provision
The Customs Act, 1969 (IV of 1969) by Federal Board of Revenue[38]	To consolidate and amend the law relating to the levy and collection of customs-duties (fee and service charges) and other allied matters	Not relevant. The Act does not cover refrigerants

5.8 Linkages of Sustainable Development Goals (SDGs) with other agreements

The Government of Pakistan has committed itself to achieving the Sustainable Development Goals (SDGs) as adopted by the UN member states in the year 2000. The cell within the Ministry of Planning in responsible for this activity.
The strategic umbrella policies on sustainable development goals and how Kigali Amendment and Paris Agreement (NDC) contributes to these goals is provided in the table below:

Table 48: Linkages between the SDGs, Paris agreement and Kigali Amendment

SDGs	Paris Agreement (NDC)	Kigali Amendment (Refrigerants)
Goal 7: Affordable and Clean Energy	Decarbonize the current economy through the National Determined Contribution (NDC)	The majority of cooling systems are powered by polluted energy
Goal 9: Industry, Innovation and Infrastructure	Reduce the vulnerability of current infrastructure	Create environmental conditioning system using natural refrigerants and grow the industry
Goal 13: Climate Action	Establish clear goals of GHG and vulnerability reduction	Refrigerant and Air Conditioning Systems account for 10% of global CO_2 emissions (including energy & HFC leakage)

5.9 Other Sector Specific Policies

The table below provides an overview of any other sector specific existing policiesthat may be relevant for the Kigali Amendment:

Table 49: Review of Other Sector Specific existing policies

Policy	Brief description	Relevance to MP/KA
National Policy on Air Quality Management[39]	- National ambient air quality standards established by Ministry of Environment - National Air Quality Policy is covered under the comprehensive framework by Pakistan Environmental Protection Act, which provides prohibitions, penalties, enforcement to prevent & control pollution	Relevant. GHG emissions and ODS emissions from RAC equipment should abide by this policy.
National Policy on Transportation[40], [41]	The draft regulation developed by the Ministry of Climate Change and Environmental Coordination in 2016 and gives directions to the transport sector in Pakistan. The regulation includes Prohibitions, Enforcement procedures, impounding of vehicle, completion of trial and deposit of fine. Further, National Environmental Standards for Motor Vehicle Exhaust and Noise has also been established and referred in the regulation.	Indirectly Relevant. Although by competency this policy could impose a limitation on using ODS and high GWP RAC/MAC equipment in the transportation sector, it does not do that yet.

[38] https://download1.fbr.gov.pk/Docs/20117161572837289customsAct.pdf
[39] http://environment.gov.pk/images/rules/SRO2010NEQSAirWaterNoise.pdf
[40] http://www.environment.gov.pk/images/regulations/20160201DraftMVR2016.pdf
[41] http://environment.gov.pk/images/rules/SRO72KE2009vehicle.pdf

Policy	Brief description	Relevance to MP/KA
National Policy on Public Procurement[42]	The Public Procurement Regulatory Authority has issued Public Procurement Rules in 2004 and updated through SRO no. 442(I)/2020 in 2020	Relevant. Although by competency this policy could be relevant to the RAC sector to limit procurement and installation of the most environmentally damaging RAC equipment, however does not mandate any such limit yet. There are currently no policies in Pakistan that control the procurement of RAC equipment that rely on high GWP refrigerants.
Building Codes of Pakistan[43]	The policy was formulated by the Ministry of Housing and Works, Pakistan Engineering Council and ENERCON in 2011. It consists of Six major sections including Administration & Enforcement, Building Envelope, Heating, Venting & Air Conditioning, Service Water Heating, Lighting and Electric Power	Relevant. Although the policy does not explicitly limit the installation of ODS and high GWP RAC equipment, in Section 5 all mandatory requirements related to HVAC are provided. There are currently no policies in Pakistan that encourage new and refurbished government buildings to meet green building standards.

Currently, there are no legal policies and regulations that are available in the country for governing the procurement of RAC equipment in the public sector related to the following:

- Procurement policies for national government departments and government bodies, to avoid purchasing specific types of equipment and products that contain HFCs where suitable alternatives are available
- Policies that require new and refurbished government buildings to meet green building standards, e.g. using passive cooling where possible (to minimize the need for air-conditioning equipment) and high levels of energy-efficiency (reducing electricity consumption reduces the operating costs of public buildings)

[42] https://www.ppra.org.pk/doc/rules.pdf
[43] https://drive.google.com/file/d/0B_Ht8Q1cIEovU29nYWNGa2tDb1k/view?resourcekey=0-iQ3NdGswlm1bAYiptZyZrQ

Chapter-6

STAKEHOLDER ENGAGEMENT

6.1 Background

There will be number of departments/ organizations that need to take steps for the development and introduction of new national legislations and setting up appropriate legislative procedures to ratify and implement the Kigali Amendment. The required legislation/ administrative procedures include the following.

- Ratification of Kigali Amendment

  The Ministry of Foreign Affairs, Pakistan shall be responsible for the finalization of the ratification instrument and lodging with the United Nations Depository. The ratification instrument shall be prepared by the office of NOU/MOCC&EC.

- National Enabling Legislation

  The required laws have to be enacted in Pakistan to enable the implementation of the Kigali Amendment. There will be several stakeholders that are going to be involved in the development of the national enabling legislation.

- Administrative Systems

  The following systems relating to administration are required:

  - Monitoring and reporting of HFCs
  - Licensing and quota for production and import of HFCs
  - Verification of imports

All the activities stated above for the implementation of the Kigali amendment require input from a long list of stakeholders. Their engagements strategies and outreach & awareness are discussed in the subsequent sections.

6.2 Stakeholder Mapping

The implementation of the Montreal Protocol was assigned to the National Ozone Unit (NOU) in the MOCC&EC. Recognizing that the ratification and the implementation of the Kigali Amendment shall generally be carried out in a way similar to the implementation of the Montreal Protocol, it is appropriate that the same team that has carried out the Montreal Protocol activities carry out the implementation of the Kigali Amendment as a focal point. The stakeholders listed below need to be engaged to facilitate the implementation of the Kigali Amendment.

Table 50: Stakeholders Mapping

Government
• Ministry of Climate Change and Environmental Coordination
• Ministry of Finance/ Federal Board of Revenue / Public Procurement Regulatory Authority (PPRA)
• Ministry of Commerce
• Ministry of Industries & Production/ Engineering Development Board
• Ministry of Science and Technology/ Pakistan Standard & Quality Control Authority
• Ministry of Foreign Affairs
• Ministry of Planning Commission

• Ministry of Energy Power Division
• Ministry of Communication
• Ministry of Housing and Works
Academia
• Technical and Vocational Education Training (TVET) Institutions
• National Vocational and Technical Training Commission (NAVTTC)
• Universities
End Users
• Households
• Hotels, restaurants, bungalows, inns, resorts, convention centers, theatres
• Banks, supermarkets, factories
• Commercial and private buildings, schools
• Airports, seaports
• Hospitals, pharmacies
Chamber of Commerce and Industries
HVACR/ Association and Trading Bodies
RAC Servicing workshops
Refrigerant and RAC Equipment Importers
Refrigerant and RAC Equipment Distributors
Manufacturer of Foam and RAC products

6.3 Key Stakeholders and their roles

National Ozone Unit

The National Ozone Unit located in Islamabad and administered by MOCC&EC shall be responsible for the overall implementation of the Kigali Amendment. NPM/NOU reporting to National Project Director, MOCC&EC shall be responsible to coordinate with all the agencies and stakeholders to comply with the control measures/policies. In Pakistan, the NOU coordinates the implementation of Montreal Protocol activities, and delivery on the country's phase-out obligations which are outlined in its Agreement with the Executive Committee. With the support of other agencies, the NOU is mandated to implement a range of activities including the following:

- Preparing the national strategy for ODS phase-out strategy, that often require coordination with the stakeholders
- Facilitating the ratification of the amendments to the Montreal Protocol including the Kigali Amendment.
- Putting in place and enforcing legislation and regulations for the control and monitoring of controlled substances .
- Managing the collection, analysis and submission of consumption data reports under Article 7 and under progress reports on CP implementation.
- Coordinating stakeholders, for example, government institutions, customs authorities, importers/exporters and traders, industry and industry/trade associations, training centers, and NGOs.
- Linking government authorities with the Ozone Secretariat and relevant national authorities.
- Integrating ozone protection issues into national plans.
- Raising awareness among stakeholders, including the public and private sector.

While implementing the Montreal Protocol, a number of key stakeholders were involved in the formation of policy and regulatory regime, the licensing and quota system for the import of HCFC through the public notices. The table below describes the key stakeholders along with their role/

institutional arrangements.

Table 51: Key stakeholders and their role/ institutional arrangements

Key Stakeholder	Role/ Institutional Arrangements
Ministry of Climate Change and Environmental Coordination	• Enforcement of environmental policies and regulations • Development of Legal Environmental Polices, strategies and frameworks • Implementation and oversight of Environmental Law, regulation on projects, and expanding of Sustainable development. • Public awareness on environmental issues, Impacts of Climate Change, Green House Gases (GHGs), Mitigation and Adaption approaches. • Providing data on imports
Ministry of Commerce	Ministry of Commerce is responsible for the issuance of the Trade Policy, Collect trade statistics and issuance of Statuary Regulatory Orders (SROs). • Issuing of trade license for importing companies • Control the import and export of controlled substances • Coordinate with WCO for HS codes as required by international conventions
Ministry of Finance/FBR/ PPRA	The Ministry of Finance main functions are the collection of revenue, prevention of revenue leakages and other frauds, facilitation of legitimate trade, cooperation and coordination with other government departments and stakeholders with respect to imports and exports and; more importantly, collection of import and export data to provide statistics. It supports the NOU to prevent the importation and penetration of banned ODS substances in the country. The Ministry is also responsible for updating the existing regulation or developing the new regulations for: • Tax incentives to use low-GWP and energy-efficient RAC equipment to end users, local manufacturers & Importers • Revise the public procurement regulation to promote the demand for low-GWP options. • Restrict the investment on large-scale high-GWP based equipment.
The Ministry of Industries & Production/ Engineering Development Board	Ministry of Industries is responsible for promoting industrial development in the country within the wide policy framework by the government and it is the policy formulating entity for the industrial sector as well.
Ministry of Science and Technology/ PSQCA	The Ministry of Science and Technology is responsible to formulate and implement policies on the popularization and advancement of science and technology, including scientific research and development and transfer of technologies, to ensure improved quality and productivity to upgrade economic activities, which are essential for the economic and social development of the country. Ministry can initiate a program in collaboration with NOU to encourage engineering researches and scientists to research low-GWP refrigerants and energy-efficient RAC technologies based on low-GWP refrigerants. Ministry is also responsible for adaptation of safety standards for flammable refrigerants.
Ministry of Foreign Affairs	Ministry of Foreign Affairs will be responsible for getting a decision on ratification of treaties and coordinating the steps necessary for ratification on behalf of the country.
Ministry of Planning Commission	The Federal SDGs Support Unit established to provide coordination and support to respective federal ministries and line departments is coordinating, reporting, and monitoring progress towards SDGs, and providing policy, research, and knowledge management support for the Goals.
Ministry of Energy (Power Division)	The Ministry is a regulatory body and is responsible for updating the existing regulation or developing the new regulations for: • Develop energy policies for the country • Develop MEPS for home appliances including RAC equipment. • Develop standards for energy labelling for home appliances including RAC equipment.
Ministry of Communication	The ministry is responsible for formulating and implementing national policy on transport and other subjects that come under its purview. The ministry manages the country's National Highway's, Motorway's, railways, public bus transport system, and civil aviation. The ministry may be able to formulate a new policy to minimize the use of MAC equipment that operates on high-GWP refrigerants and transportation/handling of flammable substance.
Ministry of Housing and Works	The ministry is responsible for formulating and implementing national policy on housing and construction. The Building Codes of Pakistan was issued in 2013 jointly by PEC, Ministry of Housing & Works and ENRCON. To implement the Kigali Amendment, this code may be required to revise for flammable materials as the majority of the low-GWP RAC equipment that operates on flammable refrigerants

Key Stakeholder	Role/ Institutional Arrangements
Academia and Technical & Vocational Education	The technical and vocational training institute offering programs in RAC sector are in Government as well as Private sector. A total of approximately 136 RAC programs are offered in different province/ admin areas of Pakistan. The total annual enrollment capacity of this sector is around 4,500. These programs are 6 moths to 3 years duration with a different entry level requirement in terms of previous education. These training institutes are required to work closely with NOU for the preparation of curriculum and syllabus of RAC courses.
End users	There are number of end users including Households, Hotels, food processing industries, restaurants, bungalows, inns, resorts, convention centers, theatres, Banks, supermarkets, factories, Commercial and private buildings, schools, Airports, seaports, Hospitals and pharmacies that are using ODS & ODS Alternate in Pakistan
Trading Bodies including HVACR & Pakistan HVACR Importer & Trader Associations	Mainly protecting the rights of their members and end users
RAC and MAC Servicing Workshops	Currently, no association has been established to bring together RAC servicing workshops or technicians. There are around 9,331 RAC servicing workshops across the country that have been identified and it is required that all workshops are registered. During the registration, the workshops are required to disclose the tools, equipment, and chemicals they would use for the services for the relevant registration authorities to ensure safe and eco-friendly delivery.
Refrigerant importers	Importers who import ODS and ODS Alternatives in Pakistan
Manufactures and importers of foam and RAC products.	Responsible for the manufacturing and importing of foam and RAC products in the country requiring phasing out of HCFCs under the Montreal Protocol as well as phasing down of HFCs under the Kigali Amendment.
Refrigerant distributors	Most of the importers sell ODS and ODS Alternatives through their distributors but in some cases these importers also act as main supplier/distributors. Currently the distributor data is not available.
Implementing Agencies	UNIDO, UNEP, UNDP and World Bank are working as implementing and co-implementing agencies for adminstraion and manging the program, research/ data gathering, technical assitstnace, feasibility studies, investment as well as non-investment component.

6.4 Stakeholder Engagement Strategies

During the process of setting up the required legislation and administrative systems, it is important to engage the relevant stakeholders for different HFC phase down areas and policy interventions. The key stakeholders involved during the designing of a legislative framework for HFC substances & equipment and HFC bulk, disposal & destruction have been identified under section 6.3.

6.4.1 <u>Outreach and Awareness</u>

The key stakeholders discussed under section 6.3 above include general public, importer/ exporters, servicing sector, TEVTA etc. There are some stakeholders that are knowledgeable and can make positive contribution to the development of strategy and some of them are not aware of the requirement for the implementation of the Kigali Amendment. Therefore, it is important that such stakeholders falling in different target groups shall be provided with appropriate training/ awareness. The activities and main topics to be covered for each identified target group is provided in the table below:

Table 52: Outreach and Awareness for each target group

Target group	Main topics covered	Activity
End Users and Civil Society including Students, academia, NGO	- Ozone layer protection & Climate Change - ODS, HFC and other ODS Alternatives - MEPS and Label for RAC equipment	- Awareness materials including books, brochures, pamphlets etc. - Presentations - Consultative Workshops

Target group	Main topics covered	Activity
Pakistan HVACR Society & Pakistan HVACR Importer & Trader Associations	- Ozone layer protection & Climate Change - ODS, HFC and other ODS Alternatives - Labeling of flammable refrigerants - Safety Standards - MEPS and Labels for RAC equipment - Custom codes, license and quota requirements for ODSA - Testing kit and identifier of ODSA - Updated policies on ODSA Management	- Awareness materials including brochures, pamphlet, manual etc. - Presentations - Consultative Workshops
- Manufacturer/ Assembler - Importers and Distributor of refrigerants & ODS based equipment	- Ozone layer protection & Climate Change - ODS, HFC and other ODS Alternatives - Labeling of flammable refrigerants - Safety Standards - MEPS and Labels for RAC equipment - Custom codes, license and quota requirements for ODSA - Testing kit and identifier of ODSA - Updated policies on ODSA Management	- Awareness materials including brochures, pamphlet, manual etc. - Presentations - Consultative Workshops
Servicing sector workshop and technicians & TVET Institutions	- Ozone layer protection & Climate Change - ODS, HFC and other ODS Alternatives - Labeling of flammable refrigerants - Safety Standards - MEPS and Labels for RAC equipment - Good practices in installation, maintenance and repairing of ODSA containing equipment - Training of technicians for ODSA - Certificate system and competency assessment - Updated policies ODSA Management	- Awareness materials including brochures, pamphlet, manual etc. - Presentations - Consultative Workshops

Chapter-7

ASSESSMENT OF NEEDS AND RECOMMENMDATIONS FOR HFC PHASE DOWN IN PAKISTAN

In this chapter the gap between the need of Pakistan to implement the Kigali Amendment and the current established infrastructure has been discussed based on the assessment of various aspects as elaborated in previous chapters of this report. It also provides necessary action and options to fill these identified gaps especially for Pakistan to meet its obligations under the Kigali Amendment.

7.1 Market transformation to HFC alternatives

Recommended actions for end users, importers and manufacturer to fill the gaps for the market transformation to HFC alternatives to meet the obligations under the Kigali amendments is provided in the table below:

Table 53: Recommended Actions for End Users, Importers & Manufacturers for market transformation

Recommended Actions	Description
Provide tax incentives for RAC importers to import low-GWP and energy-efficient RAC technologies	The government can provide tax incentives and concessions for importers importing energy-efficient low-GWP RAC equipment while introducing restrictions on the imports of RAC equipment that are based on high GWP or are less energy-efficient.
Provide end-user incentives to use low- GWP and energy- efficient RAC equipment	RAC equipment that operates on low-GWP refrigerants is generally energy-efficient. However, they are initially more expensive than the high-GWP refrigerant-based equipment. Therefore, some incentives need to be provided to end-users for them to use low-GWP refrigerant-based equipment. For example, incentives can be provided for the mass replacement of the old RAC equipment that operates on high-ODS and high-GWP technologies to those using low-GWP alternatives, introducing a mechanism to exchange old RAC equipment to energy-efficient and low-GWP equipment. The mechanism for the replacement of old equipment with energy efficient equipment can be examined and designed by NEECA.
Raise awareness of end-users on the benefits of low-GWP and energy-efficient RAC equipment	The majority of end-users are not aware of the current issues regarding the RAC equipment related environmental issues. Moreover, they are not aware of energy-efficiency measures. However, the distributors and traders are partially aware of the benefits of energy saving from non-ODS RAC equipment. It is imperative to conduct educational and technology awareness programs to advocate the use of low-GWP and energy-efficient RAC equipment in the community.
Develop guide to flammable refrigerants	NOU can work jointly with Pakistan HVARC society with private sector to develop a guide to flammable refrigerants providing impartial information about the flammability issues associated with these refrigerants to end users, specifiers, building owners, manufacturers and contractors.
Promote ways to facilitate the end-user preventive maintenance plan of RAC equipment based on HFC alternatives	A preventive maintenance plan and schedule for the respective RAC equipment should be provided to end-users at the time of purchase of new equipment through an informative/educational brochure. The manufacturer of the RAC equipment can encourage dealers and traders to provide concessional maintenance and services, to end-users upon their purchase of new low-GWP equipment.
Reinforce the recording and monitoring of data and understanding of technology trends	Currently, Pakistan does not have a proper data recording system for the RAC sector. Due to the unavailability of such a database, it is challenging to understand the current consumption patterns and forecast future demand patterns. Inaccurate data may impede the fair and effective allocation of import quota and the issuance of import license when implementing the HFC phase-down. Hence, the local manufacturer and importers of RAC equipment should improve the recording practice of their production and imports. The reporting mechanism can be examined and designed by NOU for accurate and timely reporting of data. Moreover, the NOU should ensure the import, export, and manufacturing of the RAC equipment are duly recorded in the database of Pakistan Customs as well. To accomplish this, NOU may

Recommended Actions	Description
	recruit an IT technologist to create a database to obtain the import data from the Pakistan Customs, Department of Import and Export Control, and importers to verify the accuracy of the data.

7.2 Strengthening the Infrastructure of the RAC Servicing sector

As mentioned in chapter 4, it was assessed that RAC technicians are not familiar with the low GWP refrigerants as well as new RAC technologies. Therefore, the servicing sector finds it difficult to engage with the servicing and maintenance of the low-GWP RAC equipment. In the table below points are identified as the needs of the RAC servicing sector to accelerate the HFC phase-down in Pakistan.

Table 54: Recommended Action for Strengthening the RAC servicing Sector

Recommended Actions	Description
Revision and implementation of regulation, standard operating procedures and technical manuals in servicing sectors	Establish, update existing regulation where necessary, develop standards for the RAC sector for the following: - Checklist for the mandatory tools and equipment specially to handle the flammable re`frigerants - Qualification of the technician - Procedure to handle the flammable refrigerants and other low GWP refrigerants - Safety standards - Labelling for the identification of flammable and toxic refrigerants - Procedures for disposal of reclaimed refrigerants - Procedure for handling and storages of refrigerants - Procedures for regular capacity building and training of technician's programs and best servicing practices
Encourage workshops to maintain an online database of certified technicians and workshops	Service workshops should be encouraged to record their servicing information including: - Amount of refrigerant purchased weekly, monthly, annually - Number of serving equipment - Nature of services - Refrigerant charged during each occasion - Capacity of the serviced RAC systems - Number of technicians participated and the time taken - Available tools - Whether refrigerant was released to the air or recovered. The NOU can encourage them to use a manual logbook or develop an online App to feed the data in an online app so that the NOU can easily collect the data for future references. Moreover, it is encouraged to maintain a geo-referenced online database of registered workshops accessible by the public.
Development and implementation of E-Registration of Servicing Workshop system	The majority of the servicing workshops (formal and informal sector) in the country are not registered as a formal business entity to operate and perform RAC services. There are number of workshops that have only one technician and do not have even basic tools and up-to-date knowledge to service RAC equipment. The Government may consider to introduce mandatory E-registration of the RAC servicing workshops in the country and link it with the following criteria: - Education level of the technicians - Standards & procedures available with workshop - Mandatory tools & equipment available at workshop - Training of local staff and their certification - Availability of workspace - Handling, storage and disposal of refrigerants

Recommended Actions	Description
	Some minimum requirements such as education level of the technicians, availability of mandatory tools, safety standards and precaution measures and workshop space to register these workshops need to be established. Further, the criteria for the categorization of the workshop needs to be established.
Introduce the grading system for the RAC servicing workshops	The Government can introduce the grading system for RAC workshops once the registration system is fully established. A designated agency established by the appropriate authority can establish grading criteria in consultation with the workshop and assigned grades to each registered workshop based on factors such as: - Education level of the technicians - Proportion of skilled vs unskilled technicians - Size of workshop space - Availability of tools - Safety precaution measures - Range of refrigerants a workshop can handle, - Level of bookkeeping and recording of the service history and refrigerant purchase information - Amount of service charge This system, once developed and made publc, can help end-users to make the decision in selecting servicing workshops for their products to be serviced.
Implementation of internationally accepted practice to enhance the efficiency and productivity in the servicing workshops	All workshops should be advised to implement internationally accepted practices such as 5-S or equivalent that is workplace organization method to enhance efficiency and productivity in the workplace environment. This will encourage the servicing workshops to maintain the minimum requirements to provide a high-quality service to the RAC equipment. The NOU can take the initiative to implement this program across the country.
Establish RAC servicing sector association	RAC workshops in Pakistan are performing as individual entities and do not have an official forum or an association to come together, share information and discuss common issues. Such an association can bridge between NOU and the individual workshops/ technicians to communicate HCFC phase out / HFC phase down policies. Further such association could: - Collect and provide feedback to NOU on the issues / needs of the workshops and technicians. - Inform the workshops technicians /supervisors of the RAC service center about new technology development by organizing training workshops, compiling and distributing newsletter so that the good practices training would be sustained even after the completion of activities under MLF projects. - Assist in the implementation of the certification/ licensing system. - Increase the capacity of workshops/ technicians in trading with the dealers/suppliers of refrigerants/ spare parts. - Facilitate compliance with environment regulation. - Formulate an industry code such as good practices and facilitate the implementation. - Promote recovery and reclamation. The NOU may want to discuss this possibility with relevant RAC servicing sector actors.
Introduce National Qualification, Certification and Compliance Scheme (Q2C) for Best Practice Servicing	There is lack of certified technicians in the RAC sector. Most of the workshops have the technicians with the initial qualification only and not certified from a third party. There is need for establishing best practice in the servicing of low GWP refrigerants in a sustainable manner and that can be managed through Qualification, Certification and Compliance (Q2C) scheme. Therefore, it is recommended that NOU works in close collaboration with NAVTTC/TVET institutions and all the relevant RAC sector actors to develop a suitable and sustainable national certification system and encourage technicians/ workshop owners to get themselves certified through this scheme for conducting the best practices in the servicing workshops.
Introduce the Refrigerant Driving	The Refrigerant Driving License (RDL) is a globally recognized qualification program

Recommended Actions	Description
License for the technicians	that sets minimum requirements for the proper and safe management of refrigerants in air conditioning, heating, and refrigeration equipment. This system shall help prepare the country for a smooth transition to alternative refrigerants, increase the safety of practitioners and consumers, promote cost effective services across the HVAC&R supply chain network, reduce ozone depleting substances (ODS) and greenhouse gas (GHG) emissions. The license is issued to individuals who work as RAC servicing technicians who have achieved the enhanced refrigerant management skills for handling of HFC refrigerant, flammable and other low GWP refrigerants. NOU can lead to encourage and promote RDL as a standard advanced qualification for the RAC technicians.
Introduce mechanisms to support workshops to purchase the tools and equipment to handle low-GWP and energy-efficient RAC technologies	The majority of servicing workshops do not have the basic tools and equipment to perform the repairs and maintenance. New RAC technologies require a new set of special tools due to their different operating conditions compared to conventional technologies. Therefore, there is a need for servicing workshops to purchase new tools & equipment's and refrigerant recovery machines. The NOU is already providing support to selected businesses in the servicing sector through the implementation of the HPMP where the purchase of tools is a major component. Nevertheless there is still the need to expand this support, the NOU may consider mechanisms to provide incentives or concessional prices to support the workshop owners in purchasing the equipment and tools as most of the workshop owners have small and medium size workshops and face difficulties in investing funds. NOU can initiate an action to develop a mechanism for the funding for the workshops from the Microfinance institutions in the country for the procurement of tools and equipment for low GWP technologies.
Organize capacity building workshops with mandatory attendance	A large majority of technicians after getting their initial qualification have never participated in the capacity building programs. In fact, most of them have never updated their knowledge and skills to handle new technologies including low GWP refrigerant and managing flammable refrigerant in their workshops. The inadequate knowledge and skills, lack of information regarding the new policies, technologies for the refrigerants especially for HFC and flammable refrigerant in the servicing sector is becoming a big challenge for the implementation of the KA. It is therefore necessary that a mechanism for the capacity building of the servicing sector need to be developed in close collaboration with TVET institution. Capacity building workshops cannot accomplish the intended objectives unless the attendance of the technicians to these workshops is ensured. This can be accomplished if the attendance of the technicians is made compulsory and linked to the annual renewal of the registration of their workshop. In case such attendance is made compulsory and mandatory, it is expected that most of the technicians will participate in these workshops to enhance their knowledge, skills and capabilities. A similar approach as adopted by Pakistan Engineering Council for the continuing Professional Development (CPD) for the workshop technicians if adopted will improve their quality and skill as well as understanding and implementation of the related policies, procedures etc. for the implementation of KA. NOU should examine as to how the approach of CPD can be implemented for the compulsory training of the RAC technicians. The mechanism for the CPD requirement and how to earn CPD points shall be studied and adopted after consultation with the concerned stakeholders.
Enforce mandatory curriculum revisions for TVET institutions	Currently, most of the TVET institutions conduct their courses based on the conventional technologies using HCFC-22 refrigerants. The curriculum has not been updated to meet the new RAC technologies that operate on different operating conditions. A prior hands-on experience should be provided for the technicians during their vocational education for them to handle new technologies. Therefore, a mandatory curriculum revision is needed to include new technologies, standards, guidelines, policies and good servicing practices. Especially, TVET curriculum for NVQF-3, NVQF-4 and NVQF-5 should be considered for revision to educate the trainees on the handling of low-GWP refrigerants (R- 717, R-744, HFC-32, HC-290, HCR-600a), new RAC technologies (inverter, VRV/VRF) with low- GWP refrigerants, refrigerant recovery and reclaiming machines, updated national

Recommended Actions	Description
	and international standards and policies of the RAC sector. The NOU can initiate a dialogue with NAVTTC/ TVETs for the mandatory revision of the existing curriculum especially for NVQF-3, NVQF -4 & NVQF-5 to meet the requirement of new & emerging technologies and low-GWP (flammable) refrigerants.
Conduct training of trainers in TVET institutes	The educational background of most of the trainers/lecturers in the TVET institutions are NVQF-3 or NVQF-4. Most of the trainers/lecturers in the TVET institutions have teaching experience of over 10 years. They do not have experience with low-GWP refrigerants and new RAC technologies such as inverter and VRV/VRF. Moreover, no information can be collected for their participation to seminars, workshops, online courses on low-GWP refrigerant handling and energy efficient RAC technologies. The NOU shall consider initiating capacity building programs and teacher training programs for trainers that work in TVET institutions with the help of national and international experts in the RAC sector to provide the required training for trainers and enhance their knowledge and practical experience on the latest technologies in the RAC sector. The program shall ensure the training of the trainers from all the Provinces/ Admin areas of the country.
Initiate a program to upgrade the tools of the TVET institutes	A large number of TVET institutes do not have the tools to conduct the service of RAC equipment based on HFC alternatives, the lab equipment to conduct the practical sessions nor the refrigerant recovery systems to provide the hands-on training using those systems. The NOU may consider initiating a program to provide the required tools for TVET institutes that provide RAC technicians courses on refrigerants such as R- 717, R-744, HFC-32, HC-290, and HC-600a and RAC technologies such as inverter systems and VRV/VRF systems.
Establish a public- private partnership to promote servicing sector technicians' competence	It is essential to establish a public-private partnership to enhance the competence of the technicians on low-GWP refrigerant technologies. In the RAC private sector, there are number of RAC manufacturers and assemblers in the country who are currently manufacturing HFC and HC based equipment. Pakistan HVACR society is active country wide, and a memorandum of understanding between Pakistan HVACR society and ASHRE exists since 2019. The public sector organization including NAVTTC/TVET institutions can seek consultation from these private organizations to exchange the knowledge on handling low-GWP refrigerants with the involvement of the NOU.

7.3 Quota and Licensing System

As discussed in chapter 5, there are a number of policy measures that are still required for the management of ODSs. At the same time there is a lack of policy measures related to the control of HFCs, other refrigerants including ammonia, HC, HFO & CO_2 and of equipment relying on HFCs and alternatives. It is proposed that Pakistan shall consider to develop, upgrade/ modify the existing policy measures as applicable for the ratification of the Kigali Amendment including the following:

Table 55: Recommended Action for Quota and Licensing System

Recommended Actions	Description
Expand the existing import quota and licensing system to include HFCs refrigerants, procedures for penalties and exemptions to the importers	Most of the policies for HCFC refrigerants were introduced by the country but there is no consolidated document/ order that exists to cover the quota and licensing system for control substances. However, piecemeals instructions were developed and in practice with NOU. Pakistan may further expand its policy measures/ interventions to help finalize its HCFCs phase-out. Further, no policy/ intervention related to HFC, HC, HFO & CO2 refrigerants were introduced in the country. Therefore, it is recommended to improve and extend the existing licensing and quota system to cover all refrigerants and foam blowing agent and related mixtures including HFCs and other ODS alternatives to assist monitoring. The establishment of an HFC licensing system will be one of the key obligations for Pakistan once it ratifies the KA, it is recommended that the NOU works well ahead to develop a

Recommended Actions	Description
	regulation that includes this scope.
Establish the criteria for HFC quota allocation	The NOU shall implement the quota system for HFCs from January 2028. To this end, the criteria for quota allocation needs to be established: • From 2021-2027, the allowed import allocation to importer may be based on the requested quantity from importers without restrictions, the quota allocation system will not be enforced between 2021 and the end of 2027. • By September 2027, the country's HFCs baseline consumption will be determined and notified to the NOU (as the baseline year of Pakistan is 2024-2026). o The NOU will disseminate and make public the criteria for quota allocation to importers by 2027. o Based on those criteria, by end of 2027, each importer will need to apply for the 2028 quota cycle. From the freeze in 2028, which is the first HFC phase-down obligation of Pakistan, the NOU will allocate quota to importers based on the established quota criteria.
Expand the existing import quota and licensing system to include HFC based equipment and accessories, procedures for penalties and exemptions to the importers	There is no policy for the control on the manufacturing and import / export of equipment relying on HCFCs, HFCs and their alternatives. Therefore, it is recommended to initiate a national licensing system for the manufacturing and import / export of equipment. The NOU shall consult with relevant authorities on the best set up for such a system, particulary to identify a suitable licensing authority for this system. Authorities shall initially provide the license for production and import / export of equipment to all requiring and possibly without additional costs but shall require in turn a periodical detailed report of production with precise figures on type of models produced, and the refrigerands those are relying on.
Include data requirement for importers to renew import license and quota	Update the ODS policy to have a provision that mandates an importer to submit the information on its annual import of all the refrigerants and RAC equipment and financial information such as unit cost of the refrigerants to renew the license and receive the quota for the subsequent year.

7.4 Data Monitoring and Reporting

As discussed in chapter-5, the policy measures for data monitoring and reporting for HFCs, HFC blends, other refrigerant including ammonia, HC, HFO & CO_2 and Non-ODS RAC based equipment are not currently in place. It is proposed that Pakistan shall consider development, upgrade/ modification of the existing policy measures as applicable for the ratification of the Kigali amendment including the following:

Table 56: Recommended Action for Monitoring and Reporting

Recommended Actions	Description
Introduce HS codes for HFC and HFC Blends	Currently, most of the HFCs, HFCs blend and natural refrigerants are imported in the country either through a number of different HS codes or number of substances are imported under one HS code. Therefore, the recording of import data for the refrigerants is slightly different from the actual consumption of chemicals in the country. Assigning an individual HS code will help distinguish and gather accurate import data based on refrigerant and blends and help the NOU to calculate the baseline amounts and issue annual quota. Therefore, it is highly recommended that country should accelerate the development of a detailed HS code system with the support of Custom department.
Update online data reporting and monitoring system for HFCs, HFC blends and other alternate refrigerants	Pakistan have an electronic system "WeBOC" in place for HCFCs. However, for HFCs, HFCs blends and other alternatives there is no such system that exists in the country. Therefore, it is highly recommended to update the existing system for inclusion of the HFCs, HFCs blends and other alternatives so that an online database shall be available for all the stakeholders for reporting and cross checking.
Update the existing online data	The country does not have any online system available for monitoring the import

Recommended Actions	Description
reporting and monitoring system for HCFCs, HFCs and HFCs blends-based equipment's	and export of HCFC, HFC based RAC equipment. Therefore, it is recommended to update the existing WeBOC online system for data monitoring and reporting
Update integrated online system to issue import license and quota electronically for HFCs, HFC blend and other refrigerants	NOU to coordinate with competent authority to update the existing WeBOC online system to include a function for importers to apply and the NOU to issue the quota and license online for HFCs, HFC blends and other refrigerants. Once the system is developed, the NOU should organize stakeholder meetings and training workshops to raise awareness and train the stakeholders to use the new system.
Develop an integrated online data recording system for HCFCs, HFCs and HFCs blends-	Currently, there is no integrated online system available for controlling the refrigerants and RAC equipment. Therefore, it is recommended to develop an online system for data recording. The system should: - record the import information of refrigerants and RAC equipment by the importers, distributors, traders, retailers - record RAC equipment manufacturing data and refrigerant purchasing quantities by RAC equipment manufacturers - record the purchased quantities of number of RAC units serviced, the nature of the service work and the capacity of the equipment, the refrigerant charge per service, by the servicing workshops and technicians The above records should be accessible to NOU for frequent monitoring of data by the NOU. Based on this data, the NOU should prepare and issue an annual outlook of the RAC sector in the country. Further, the NOU can encourage large end-users such as cold storages, dairy companies, hospitals, hotels, etc. to maintain their in-house recording systems to record their servicing history.
The NOU to coordinate with customs to apply sampling method to verify refrigerants using refrigerant identifiers at border entry checkpoints and apply the risk profiling system to not only HCFCs but also to HFCs.	HFC and non-ODS refrigerants must be checked and monitored strictly at the border to discourage the possibility of illegally importing HFC or ODS as other refrigerants. Pakistan has acquired devices that can analyse the types of refrigerants, known as refrigerant identifiers during the implementation of HPMP. However, there will be challenges in inspecting the import of HFCs by the customs officers during the customs clearance process due to the following reasons: • The use of the refrigerant identifier is considered to be a time-consuming task for customs. Nonetheless, customs officers normally check the labelling first and other set criteria according to the risk profiling system in place, and if there is any suspicion of irregularities the officers will, in turn, use the identifier to verify. • There are certain HFC substances or blends that cannot be analysed by the identifier, such as HFC-32 and R-427A. Without a proper understanding of the limitation of refrigerant identifier, the associated misinterpretation of types of refrigerants will result in operational issues. Therefore, it is highly recommended that the NOU coordinates with customs officers to apply a sampling method for the verification of refrigerants using a risk profiling system along with the refrigerant identifier, to significantly reduce inspection time. NOU and Customs need to ensure that the risk profiling system also applies to HFCs upon the ratification of the Kigali Amendment. This will facilitate the work of customs officers during the verification and will contribute towards stricter control and accurate reporting on the import of HFCs. Additionally, given the limitations of refrigerant identifiers, further advanced identifiers will be procured during the implementation of HPMP.

7.5 RAC equipment based on high-GWP HFCs

The policy measures to control, restrict and ban RAC equipment based on high GWP HFCs, other refrigerant including ammonia, HC, HFO & CO_2 and Non-ODS RAC based equipment are not currently in place. The recommended actions to fill the identified gaps to meet its obligations under the Kigali Amendment is provided in the table below:

Table 57: Recommended Action for RAC equipment based on high GWP HFCs

Recommended actions	Description
Increase the customs duties for the import of parts of RAC equipment that operate on high-GWP refrigerants and reduce the tax on the import of low-GWP-based RAC equipment parts	RAC equipment that operates on low-GWP refrigerants is generally more expensive than its high-GWP based counterpart. As Pakistan mainly assembled the RAC equipment in the country after importing parts of RAC equipment, therefore, it is proposed that custom duties of the part of RAC equipment that operate on high-GWP refrigerants should be increased while the custom duties on parts of RAC equipment operate with low-GWP refrigerants should be reduced. This will promote the end-users to purchase the newer technology that is more environmentally friendly and also often more energy efficient. Further, there is nominal import of RAC equipment (as one unit) in the country, it is recommended that duties for RAC equipment that contained high-GWP refrigerant shall increase while reduce the taxes in the RAC equipment that contained the low GWP refrigerants
Revise the public procurement regulation to promote the demand for low-GWP options	According to the national procurement guideline of Pakistan, the tender is normally awarded to the one with the lowest quotation during the evaluation. As the RAC equipment that operates on low-GWP technologies are generally more expensive than their high-GWP HFC- based counterpart, the latter is more likely to win the tender. Therefore, the public procurement guideline should be updated/ developed to highlight the mandatory requirement to allow only low-GWP based RAC equipment and to make it mandatory to specify the refrigerant of the RAC equipment and if it has low or high GWP in the Bill of Quantity for the equipment specification. This will allow the Technical Evaluation Committee to have the information to reject the lowest quotations which do not satisfy the low GWP requirement.
Clearly describe the definitions of low-GWP and high-GWP refrigerants to implement the recommended economic measures and policies	According to RTOC the classification of the refrigerants based on 100 year GWP, the refrigerant with GWP less than 30 is considered as ultra-low-GWP, less than 100 GWP very low, less than 300 as low GWP refrigerants. The refrigerants having greater than 1000 are classified as high GWP refrigerant. HFC-152a and HFC-32 whose GWPs are 124 and 675 respectively fall under the category of low and medium GWP refrigerants. These refrigerants may be an alternate option to replace other high-GWP refrigerants whose GWP is greater than 1,000, considering their viability and significant efficiency improvement over the high-GWP HFCs. Hence, refrigerants whose GWP is less than 700 can be considered as an acceptable GWP refrigerants in the policies. This definition should be clearly stated when revising existing policies and developing new ones to avoid any confusion.
Restrict the investment on large-scale high- GWP based equipment	The government should restrict and control the investment on large-scale high-GWP HFC-based equipment by revising existing policies such as green building and zero-emission building policies according to the Sustainability in Energy and Environmental Development (SEED) & Leadership in Energy and Environmental Design (LEED) green building certification requirement. It should be made mandatory for enterprises to obtain an Environmental Impact Assessment for large-scale projects to enforce this restriction.
Gradually restrict and ban the import of high- GWP HFC based RAC equipment	As per HPMP Stage-III submitted, it is proposed that the import of new and second-hand RAC equipment based on HCFCs shall be banned within 2025. It is also proposed that the local manufacturing of RAC equipment based on HCFC-22 shall also be banned by 2025. Similarly, the government can take a further measure to ban the imports of new and secondhand RAC equipment based on high-GWP HFC refrigerants during the implementation process of Kigali Amendment. However, this may be implemented in two stages: first increase the import tax for equipment operate on high-GWP refrigerants to restrict the import and later impose the ban on their import. Once the import restrictions are enforced, end- users will start to choose RAC equipment based on HFC alternatives which will also be

Recommended actions	Description
	cheaper and more available. Once the import ban is imposed, demand for high-GWP HFC-based equipment will be reduced and such equipment will eventually be phased out in due course of time depending on their life expectancy.
Encourage local RAC equipment manufacturers to produce equipment based on HFC alternatives	The majority of the industrial refrigeration systems, cold storage systems and commercial and domestic refrigeration and Air conditioning systems available in the local market are supplied by local manufactures and based on high-GWP HFCs. The government should enforce ban on manufacturing of RAC equipment based on high-GWP HFCs while supporting these manufacturers to switch their productions to low-GWP where alternative technologies are available by providing tax incentives during their change-over period.
Ban/control of investment in new, enlarged or technically reformed enterprises consuming HCFC & HCFC blends and HFCs & HFC blends.	Government should enforce the ban on new industries/ enterprises that are consuming HCFC & HCFC blends and HFCs & HFCs blends (high GWP) in the manufacturing of their products.

7.6 Policies on climate change

The recommended actions for policies on climate change to fill the identified gaps to meet its obligations under the Kigali Amendment is provided in the table below:

Table 58: Recommended Action for policies on Climate Change

Recommended actions	Description
Coordinate and integrate various GHG emission reduction efforts within the Government	There is a necessity to coordinate and integrate the efforts of individual government stakeholders working towards GHG emissions reduction through different paths, such as the NDCs, the SDGs and the Kigali Amendment. These individual tasks should be unified and coordinated to work together towards a single national agenda to minimize GHG emissions. Currently, there is no common platform to discuss the individual agenda. There is a need to have a proper institutional channel between the office of NOU and the office of climate change for the reporting mechanism of direct and indirect emission reduction.
Establish a common roadmap for national GHG emission reduction that include HFCs, share HFC data among national stakeholders and include HFCs in the UNFCCC reporting documents	Individual divisions that collect GHG emission data should share them with other stakeholders so that the country can establish a single roadmap towards the mitigation of GHG emissions that includes HFCs. In the given circumstances, it is important that an internal system of coordination and reporting channel be established between office of NOU and the climate change department so that the phasing out of HCFC and phasing down of HFCs, HFC blends be reported and included in the reporting of NDCs. One of the goals of the NDCs in Pakistan is the mitigation of GHG emissions in different sectors. The Kigali Amendment is well aligned with this general objective of the NDCs. However, the NDCs do not specifically highlight the need for HFC phase-out as it gives priority to CO_2. Therefore, the NDCs of Pakistan should be widened to include the Kigali Amendment objectives so that the formulation and the enforcement of the national policies are integrated and streamlined. As the GHG emission from the high- GWP HFC is significant, HFC emission, consumption, and usage data should also be included in the NDC statistics and reporting.
Reduce GHG emissions from the RAC sector by introducing MEPS & Labels	RAC sector contributes to GHG emission in two ways; - Direct emission due to leakages of refrigerants from the RAC system - Indirect emission from the use of fossil fuel-based electricity which emits CO2 in large quantities. As the leakage rate of RAC/ mobile AC devices is high, the GHG emission from high-GWP refrigerant from the RAC sector is significantly high although their refrigerant charge is not very high. In addition, poorly performing systems require larger equipment with more refrigerant charge compared to efficient systems.

Recommended actions	Description
	Therefore, Minimum Energy Performance Standard (MEPS) and labels for RAC equipment should be introduced and higher customs duties for poorly performing high- GWP equipment should be enforced.

7.7 Policies on energy efficiency

The recommended actions for policies on energy efficiency to fill the identified gaps to meet its obligations under the Kigali Amendment is provided in the table below:

Table 59: Recommended Action for policies on Energy Efficiency

Recommended actions	Description
Develop a Sustainable National Cooling Plan (SNCP)	Pakistan being HAT country requires more comfort cooling than non-HAT countries. The cooling demand of the country is increasing progressively due to improvement in the economic condition with the increasing number of building projects. Therefore, it is essential to develop a Sustainable National Cooling Plan (SNCP) to minimize the energy consumption of RAC equipment and the usage of high-GWP refrigerants. The SNCP should be in accordance with the HCFC phase out and HFC phase-down plan in the Kigali Amendment and the GHG emissions reduction plan in the country's NDCs. Zero-emission building construction and green building design concepts that compel the building constructors to use low-GWP refrigerants and energy-efficient RAC technologies for their buildings can be introduced while enforcing the Leadership in Energy and Environmental Design (LEED) green building certificates to newly constructed buildings. Currently, Sustainability in Energy and Environmental Development (SEED) is working for all buildings from homes to corporate headquarters at all phases of development.
Develop and implement country's standards for energy labelling for RAC equipment	Enercon, Government of Pakistan under Bresel program developed the following Minimum Energy Performance Standard (MEPS) and Labels: - MEPS for Window Type & Split Air Conditioners with Cooling Capacity under: 14000 W (12000 – 48000 BTU/hr) - MEPS and Labeling (Energy Efficiency Standards and Labeling: ES&L) Policy / Guidelines for Implementation of ES&L Scheme The energy labelling standards for refrigerators and air conditioners are still underway. NOU shall consider the opportunity to initiate an action with competent authority for the finalization and implementation of the MEPS and labels for RAC equipment.

7.8 Policies on safety in the adoption of flammable refrigerant

Currently, the low-GWP refrigerants that are flammable used in Pakistan are HC-600a, HC-290 and HFC-32 in the RAC sector. Therefore, it is necessary to adopt and impose policies on safety in the adoption of flammable refrigerants as recommended below:

Table 60: Recommended Action for policies on flammable refrigerants

Recommended actions	Description
Adopt necessary safety standards for flammable refrigerants	Currently, the country has developed few standards for RAC equipment, however, most of the safety standards for the flammable refrigerants have not been developed including the following: - ISO-5149-1, 2, 3 & 4 - ISO-817 - IEC-60335-2-40-2018 (Product Safety) - IEC 60335-2-24:2020 (Product Safety) - IEC 60335-2-89:2019 (Product Safety) - ISO13043 - ISO 20854 These standards and procedures have to be strictly followed when using flammable refrigerants. However, the International Electro-technical Commission (IEC) has already developed the necessary standards to handle and accommodate the flammable refrigerants and has emphasized the individual countries to adopt them with minor variations if needed. The safety standards for flammable refrigerants should be developed for different stages of the equipment life cycle considering the stages of design, manufacturing, shipping/transport, installation stage, servicing and repairing. It is recommended that NOU shall coordinate with the appropriate authority in the Ministry of Science and Technology to develop the safety standards to handle the flammable refrigerants based on IEC standards to allow the service and repair of RAC systems with flammable refrigerants to those that have the authorization or licensing from the relevant authority.
Revise/ modify the Building Codes to allow the use of RAC equipment based on flammable refrigerants	The existing building codes do not mention restrictions to the use of RAC equipment relying on flammable substances in the buildings. NOU to coordinate with the appropriate authority to revise/modify the existing National Building Codes and standards to, while allow the use of RAC equipment that operates on flammable refrigerants for building air conditioning and cooling purposes, also establish some technical guidelines referencing ventilation and room size standards.
Implement verification and compliance procedures for standards such as standardization of testing procedures	Currently, Pakistan does not have a standard testing procedure for RAC equipment based on flammable refrigerants. As the majority of low-GWP refrigerants are flammable gases, it is recommended to develop a testing procedure to standardize the RAC equipment to fit in the Pakistan context.

7.9 Policies on chemicals and waste management

The recommended actions for policies on chemical and waste management to fill the identified gaps to meet its obligations under the Kigali Amendment is provided in the table below:

Table 61: Recommended Action for policies on Chemicals and Waste Management

Recommended actions	Description
Ensure waste management policy to cover flammable refrigerants management	Hazardous Substances Rules, 2003 developed by Ministry of Environment has been revised in 2016 by MOCC&EC. This rule is under approval. However, it covers handling, manufacturing, storage & import of hazardous waste and hazardous substance. NOU to coordinate with concerned authorities to ensure that the management of refrigerants is fully covered under this policy.
Establish recovery, recycling and reclamation facilities for high-GWP refrigerants	Currently, Pakistan has no reclamation facilities for HCFC-22. Similarly, no reclamation facilities for high-GWP refrigerants as well. It is recommended that, in collaboration with relevant RAC sector actors, NOU/MOCC&EC explores the feasibility of establishing pilot R&R centers not only for HCFC-22 but also for high GWP refrigerants, so that recovered and recycled substance can be used during servicing of RAC equipment.
Revise policies to instruct proper destruction of ODS and HFC	Chemical and waste management policies of Pakistan do not have provisions on the proper destruction of ODS and HFC. Therefore, it is necessary to introduce a new policy to instruct the proper destruction practices for ODS and HFCs.
Revise policies to define the disposal	The existing draft hazardous substance policy 2016 provide method for the disposal

Recommended actions	Description
process for each refrigerant category	of solid, liquid substances and chemicals. However, it does not cover specific policies for the disposal of each category of refrigerants. NOU to coordinate with concerned authorities to ensure that the inclusion of the required clauses in the draft policy document for the disposal of each category of refrigerant.
Revise the chemicals policies to ban foam manufacturing using ODS and HFC	As HFCs could be used in foam manufacturing, it is recommended to revise the chemical policies to ban the use of HFCs and HCFCs in the foam manufacturing process in the future.

7.10 Enforcement

Although, the capacity building of the customs officers and local enforcement officers has been carried out regularly under HPMP stage-I & II for the ODSs yet Pakistan has to examine number of policy measures and their enforcement in the context of HFCs, HFCs blends, ammonia, HC, HFO, CO_2 and RAC equipment/ facilities in the following areas.

Table 62: Recommended Action for policies on Enforcement

Recommended actions	Description
Train and build the capacity of Customs and specialized inspectors to control the import of HFCs and equipment	The NOU, with the support of UNEP, works closely with the Customs in organising the training for customs officers and specialized inspectors to strengthen their capacity to control the import of ODSs. With the implementation of the Kigali Amendment, further training and workshops need to be organised to strengthen the capacities of the enforcement officers on entry points and border checkpoints, to efficiently monitor and control HFC imports. The regular Customs' training curriculum needs to be updated. The training on HFCs control should include: • Types of smuggling methods used by international syndicates for ODS, HFC, and equipment containing them, as well as safety in handling refrigerant cylinders. • New provisions related to HFC control, as well as monitoring and mechanism. • Operation of advanced refrigerant identifiers machines.

7.11 Need for awareness raising on HFC related issues

As discussed in section 6.4.3, the outreach and awareness initiative for different stakeholders' groups have been discussed and identified. It is important that the training of different group of stakeholders shall consider their minimum education level, past working experience and skills in the RAC sector. The training/ workshop/ meeting shall cover the main topics that have been identified in the table in the same section for each target group. Before initiating the awareness raising program for each target group, the specific requirement of the main topics to be covered and activity involved has to be assessed after discussion and agreement with the respective consultative forum.

Chapter-8

SUMMARY OF RECOMMENDED ACTIONS

8.1 Recommended Action

The assessment of the policy needs for the implementation of the Kigali Amendment have been discussed in detail in chapter-7 above. There are certain policy measures/intervention that shall need to be developed and enforced before or within 90 days after the ratification (timeframe 1). Certain policy intervention is required to be completed before freeze date and or at least before the date of the first phase down step (timeframe 2). The remaining identified interventions may be considered for the future implementation based on their need (timeframe 3). The table of the required Policy measure/interventions is provided below:

Table 63: Table of the required Policy measure/interventions

Sr. #	Required Policy measures/ Intervention	Time frame	Responsible Agency
A	**Market transformation to HFC alternatives**		
1	Provide tax incentives for RAC importers to import low-GWP and energy-efficient RAC technologies	2	NOU & Ministry of Finance
2	Provide end-user incentives to use low- GWP and energy- efficient RAC equipment	2	NOU & Ministry of Finance
3	Raise awareness of end-users on the benefits of low-GWP and energy-efficient RAC equipment	1	NOU/MOCC&EC
4	Develop guide for flammable refrigerants	2	NOU/ HVACR Society
5	Promote ways to facilitate the end-user preventive maintenance plan of RAC equipment based on HFC alternatives	2	NOU/MOCC&EC
6	Reinforce the recording and monitoring of data and understanding of technology trends	2	NOU/MOCC&EC
B	**Strengthening the Infrastructure of the RAC Servicing sector**		
1	Revision and implementation of regulation, standard operating procedures and technical manuals in servicing sectors	2	NOU/MOCC&EC
2	Encourage workshops to maintain an online database of certified technicians and workshops	2	NOU/RAC Associations
3	Development and implementation of E-Registration of Servicing Workshop system	2	NOU/MOCC&EC
4	Introduce the grading system for the RAC servicing workshops	2	NOU/MOCC&EC
5	Implementation of internationally accepted practices to enhance the efficiency and productivity in the servicing workshops	3	NOU/MOCC&EC
6	Establish RAC servicing sector association	2	NOU/MOCC&EC
7	Introduce National Qualification, Certification and Compliance Scheme (Q2C) for Best Practice Servicing	2	NOU/MOCC&EC
8	Introduce the Refrigerant Driving License for the technicians	3	NOU/MOCC&EC
9	Introduce mechanisms to support workshops to purchase the tools and equipment to handle low-GWP and energy-efficient RAC technologies	3	NOU/MOCC&EC

Sr. #	Required Policy measures/ Intervention	Time frame	Responsible Agency
10	Organize capacity building workshops with mandatory attendance	3	NOU/MOCC&EC
11	Enforce mandatory curriculum revisions for TVET institutions	3	NOU/ NAVTTC/ TVET
12	Conduct training of trainers in TVET institutes	3	NOU/ NAVTTC/ TVET
13	Initiate a program to upgrade the tools of the TVET institutes	3	NOU/ NAVTTC/ TVET
14	Establish a public- private partnership to promote servicing sector technicians' competence	3	NOU/MOCC&EC
C	**Quota and Licensing System for ODSs and alternatives**		
1	Expand the existing import quota and licensing system to include HFCs refrigerants, procedures for penalties and exemptions to the importers	1	NOU/MOCC & Ministry of Commerce
2	Establish the criteria for HFC quota allocation	2	NOU/MOCC&EC
3	Expand the existing import quota and licensing system to include HFC based equipment and accessories, procedures for penalties and exemptions to the importers	1	NOU/MOCC&EC and Ministry of Commerce
4	Include data requirement for importers to renew import license and quota	1	NOU/MOCC&EC and Ministry of Commerce
D	**Data Monitoring and Reporting**		
1	Introduce HS codes for HFC and HFC Blends	1	NOU/MOCC&EC and FBR/ Custom Department
2	Update online data reporting and monitoring system for HFCs, HFC blends and other alternate refrigerants	2	NOU/MOCC&EC and FBR/ Custom Department
3	Update the existing online data reporting and monitoring system for HCFCs, HFCs and HFCs blends-based equipment's	2	NOU/MOCC& and FBR/ Custom Department
4	Update integrated online system to issue import license and quota electronically for HFCs, HFC blend and other refrigerants	2	NOU/MOCC&EC/ Custom Department/ Importers
5	Develop an integrated online data recording system for HCFCs, HFCs and HFCs blends	2	NOU/MOCC&EC/ Custom Department/ Importers
6	The NOU to coordinate with customs to apply sampling method to verify refrigerants using refrigerant identifiers at border entry checkpoints and apply the risk profiling system to not only HCFCs but also to HFCs.	2	NOU/MOCC&EC and FBR/ Custom Department
E	**RAC equipment based on high-GWP HFCs**		
1	Increase the customs duties for the import of parts of RAC equipment that operate on high-GWP refrigerants and reduce the tax on the import of low-GWP-based RAC equipment parts	2	NOU/MOCC&EC and Ministry of Finance /FBR

Sr. #	Required Policy measures/ Intervention	Time frame	Responsible Agency
2	Revise the public procurement regulation to promote the demand for low-GWP options	2	NOU/MOCC&EC, Ministry of Finance/ PPRA
3	Clearly describe the definitions of low-GWP and high-GWP refrigerants to implement the recommended economic measures and policies	2	NOU/MOCC&EC
4	Restrict the investment on large-scale high- GWP based equipment	3	NOU/MOCC&EC and Ministry of Finance
5	Gradually restrict and ban the import of high- GWP HFC based RAC equipment	3	NOU/MOCC&EC and Custom Department
6	Encourage local RAC equipment manufacturers to produce equipment based on HFC alternatives	3	NOU/MOCC&EC
7	Ban/control of investment in new, enlarged or technically reformed enterprises consuming HCFC & HCFC blends and HFCs & HFC blends.	3	NOU/MOCC&EC and Ministry of Industry & Ministry of Finance
F	**Policies on climate change**		
1	Coordinate and integrate various GHG emission reduction efforts within the Government	2	NOU/MOCC&EC//NEECA
2	Establish a common roadmap for national GHG emission reduction that include HFCs, share HFC data among national stakeholders and include HFCs in the UNFCCC reporting documents	2	NOU/MOCC&EC
3	Reduce GHG emissions from the RAC sector by introducing MEPS & Labels	2	NOU/MOCC&EC/NEECA
G	**Regulation on energy efficiency**		
1	Develop a Sustainable National Cooling Plan (SNCP)	2	NOU/MOCC&EC/NEECA
2	Develop and implement country's standards for energy labelling for RAC equipment	2	NOU/MOCC&EC/NEECA
H	**Policies on safety in the adoption of flammable refrigerant**		
1	Adopt necessary safety standards for flammable refrigerants	2	NOU/MOCC&EC/PSQCA/NEECA
2	Revise/ modify the Building Codes to allow the use of RAC equipment based on flammable refrigerants	2	NOU/MOCC&EC/PSQCA/ NEECA/PEC
3	Implement verification and compliance procedures for standards such as standardization of testing procedures	2	NOU/MOCC&EC/PSQCA/NEECA
I	**Policies on chemicals and waste management**		
1	Ensure waste management policy to cover flammable refrigerants management	2	NOU/MOCC&EC
2	Establish recovery, recycling and reclamation facilities for high-GWP refrigerants	2	NOU/MOCC&EC
3	Revise policies to instruct proper destruction of ODS and HFC	2	NOU/MOCC&EC
4	Revise policies to define the disposal process for each refrigerant category	2	NOU/MOCC&EC
5	Revise the chemicals policies to ban foam manufacturing using ODS and HFC	2	NOU/MOCC&EC
J	**Enforcement**		
1	Train and build the capacity of Customs and specialized inspectors to control the import of HFCs and equipment	2	NOU & Custom Department