ORM-12 IRAQ REPORT

INTRODUCTION

Iraq joined the international efforts to protect and heal the ozone layer in 2008 as well as joined many environmental treaties since 2003 to support, solve and heal many environmental issues,

Since joining Montreal protocol Iraqi ozone department / ministry of environment, prepare a national plan in coordination with UNEP and UNIDO, and took extraordinary procedures to phase out CFCs,

Within two years, Iraq was able to phase out CFCs and issues laws that bans imports of CFCs, 67% of HCFCs imports shall be phase out next year, starting now to determine HFCs baseline in 2027 to begin the first step of phasing down HFCs in 2032.

1- OBSERVATIONAL ACTIVITIES

1.1 – Stratosphere-troposphere exchanging variables:

Many different variables that affect the ozone layer, these variables are combined and connected effected directly to the ozone chemistry in the stratosphere,
such as wind, dust, NO_2, CO_2 ambient temperature, climate change as well as ODSs and HFCs circulation and exchange of these gases and elements between stratosphere and the ground surface will decrease and maybe increase the stratospheric and the tropospheric ozone,

1.1.1- Air Pollutants

Different private and governmental institutions monitor air quality all over the country, ministry of environment distributes many lab-stations all over the environment directorates in most of the Iraqi governorates to monitor air pollution; some of these stations under maintenance at the time of making this report; other resources adopted to complete the required pollutant concentrations:

Average monthly data in 2017 (PPM)

	CH_4	CO	NO	NO_2	NO_X	O_3	CO_2	SO_2	NMHC
January	1.725	0.843	0.025	0.041	0.031	0.031	401.35	0.040	0.815
February	1.564	0.496	0.024	0.035	0.020	0.027	310.62	0.021	0.783
March	1.834	0.460	0.012	0.032	0.034	0.037	380.41	0.032	0.752
April	2.354	4.045	0.037	0.097	0.006	0.045	500.60	0.056	0.720
May	1.536	0.581	0.006	0.039	0.018	0.032	473.2	0.066	0.681
June	2.423	0.390	0.034	0.047	0.052	0.022	379.35	0.144	0.801
July	2.594	9.056	0.531	0.433	0.095	0.071	633.48	1.048	0.960
August	1.133	0.512	0.051	0.030	0.036	0.039	461.60	0.011	0.670
September	1.687	0.523	0.062	0.009	0.070	0.023	514.51	0.029	0.590
October	1.961	1.304	0.018	0.253	0.026	0.006	405.15	0.027	0.770
November	1.003	0.764	0.033	0.461	0.044	0.014	438.06	0.036	0.842
December	2.001	0.611	0.042	0.026	0.048	0.052	385.54	0.035	0.652

Average monthly data in 2018 (PPM)

	CH_4	CO	NO	NO_2	NO_X	O_3	CO_2	SO_2	NMHC
January	1.468	0.458	0.023	0.040	0.046	0.021	435.21	0.052	0.639
February	1.361	0.694	0.042	0.056	0.038	0.014	465.65	0.046	0.726
March	1.630	0.631	0.061	0.052	0.019	0.036	358.38	0.026	0.659
April	2.012	0.617	0.054	0.123	0.050	0.026	365.32	0.031	0.694
May	1.224	0.374	0.033	0.210	0.032	0.030	321.46	0.041	0.597
June	1.549	0.590	0.024	0.069	0.035	0.038	301.69	0.022	0.763
July	1.721	0.745	0.006	0.048	0.033	0.033	423.36	0.144	0.634
August	1.189	1.365	0.014	0.169	0.021	0.041	510.62	0.075	0.671
September	2.454	0.322	0.018	0.033	0.050	0.048	523.69	0.074	0.741
October	2.548	0.411	0.055	0.021	0.003	0.016	498.32	0.168	0.745
November	1.250	0.536	0.042	0.094	0.063	0.035	326.91	0.033	0.765
December	1.684	0.378	0.035	0.088	0.036	0.032	364.15	0.026	0.586

Average monthly data in 2019 (PPM)

	CH_4	CO	NO	NO_2	NO_X	O_3	CO_2	SO_2	NMHC
January	2.365	0.516	0.046	0.058	0.062	0.034	490.99	0.057	0.587
February	2.154	0.431	0.041	0.046	0.053	0.035	416.83	0.066	0.645
March	1.009	0.433	0.048	0.074	0.045	0.031	338.88	0.035	0.598
April	1.210	0.594	0.032	0.030	0.065	0.006	334.00	0.068	0.684
May	1.369	0.355	0.021	0.041	0.071	0.046	386.97	0.059	0.784
June	2.197	0.768	0.027	0.119	0.066	0.045	454.58	0.046	0.695
July	2.034	0.965	0.052	0.029	0.043	0.026	513.98	0.231	0.569
August	2.011	0.812	0.039	0.256	0.035	0.023	501.61	0.201	0.528
September	1.719	0.700	0.060	0.054	0.044	0.023	446.93	0.090	0.642
October	1.118	0.511	0.024	0.066	0.054	0.051	302.80	0.096	0.856
November	1.964	0.539	0.011	0.095	0.099	0.048	496.32	0.033	0.768
December	1.896	0.321	0.049	0.006	0.064	0.029	420.54	0.012	0.722

Average monthly data in 2020 (PPM)

	CH4	CO	NO	NO2	NOX	O3	CO2	SO2	NMHC
January	1.687	2.88	0.006	0.002	0.042	0.004	461.22	0.006	0.664
February	1.549	2.96	0.014	0.001	0.066	0.006	335.76	0.007	0.715
March	2.154	2.68	0.024	0.001	0.071	0.005	261.39	0.007	0.635
April	1.189	2.218	0.065	0.000	0.064	0.015	447.82	0.008	0.565
May	2.011	2.37	0.045	0.001	0.043	0.011	584.22	0.010	0.628
June	1.210	2.927	0.033	0.011	0.045	0.013	522.79	0.019	0.630
July	2.454	5.325	0.331	0.004	0.044	0.031	397.31	0.013	0.756
August	1.361	7.288	0.051	0.009	0.025	0.014	347.05	0.018	0.829
September	1.004	3.306	0.072	0.006	0.074	0.018	386.97	0.014	0.736
October	1.931	3.459	0.078	0.007	0.056	0.013	474.28	0.014	0.660
November	1.563	3.934	0.053	0.003	0.099	0.005	583.23	0.010	0.695
December	2.354	2.88	0.065	0.002	0.1	0.005	556.31	0.007	0.498

Average monthly data in 2021 (PPM)

	CH4	CO	NO	NO2	NOX	O3	CO2	SO2	NMHC
January	1.007	0.515	0.033	0.034	0.040	0.019	323.22	0.041	0.562
February	1.369	0.450	0.046	0.029	0.004	0.031	480.46	0.029	0.866
March	1.729	0.367	0.032	0.022	0.033	0.043	400.83	0.021	0.678
April	1.128	0.323	0.073	0.026	0.034	0.044	375.6	0.019	0.753
May	2.354	0.242	0.016	0.027	0.021	0.044	349.55	0.034	0.668
June	1.103	0.260	0.028	0.035	0.035	0.044	589.18	0.035	0.681
July	2.000	0.389	0.013	0.046	0.070	0.040	362.60	0.060	0.751
August	2.574	0.415	0.041	0.046	0.076	0.029	395.79	0.044	0.735
September	1.943	0.340	0.005	0.038	0.024	0.033	436.85	0.058	0.666
October	1.534	0.526	0.038	0.037	0.066	0.044	435.38	0.046	0.647
November	1.991	0.495	0.364	0.035	0.079	0.025	364.30	0.035	0.733
December	1.429	0.473	0.061	0.032	0.056	0.021	316.67	0.037	0.660

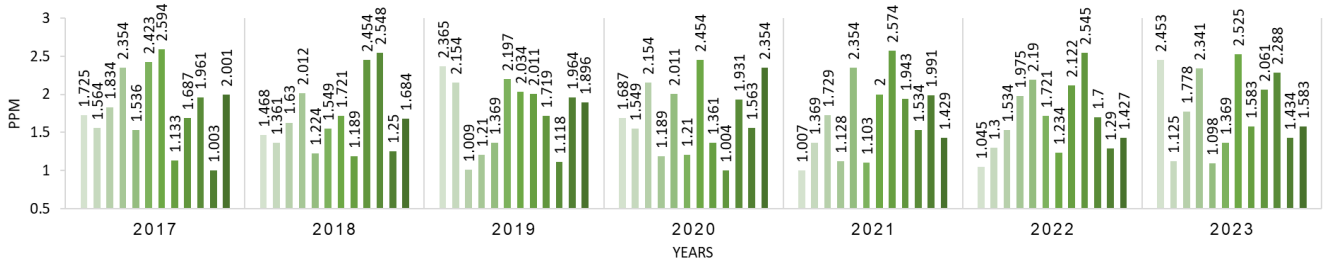
Average monthly data in 2022 (PPM)

	CH4	CO	NO	NO2	NOX	O3	CO2	SO2	NMHC
January	1.045	0.343	0.051	0.029	0.054	0.024	328.22	0.203	0.698
February	1.300	0.375	0.045	0.027	0.045	0.025	435.00	0.194	0.557
March	1.534	0.321	0.062	0.022	0.085	0.037	375.79	0.148	0.657
April	1.975	0.362	0.081	0.029	0.061	0.043	404.08	0.188	0.731
May	2.190	0.303	0.023	0.024	0.064	0.043	519.03	0.194	0.671
June	1.721	0.387	0.004	0.032	0.042	0.047	507.47	0.182	0.705
July	1.234	0.369	0.012	0.033	0.055	0.042	466.53	0.195	0.835
August	2.122	0.441	0.038	0.039	0.025	0.038	382.70	0.202	0.770
September	2.545	0.436	0.050	0.031	0.036	0.050	538.60	0.196	0.662
October	1.700	0.475	0.023	0.040	0.046	0.040	478.82	0.201	0.763
November	1.290	0.577	0.011	0.047	0.038	0.028	425.82	0.235	0.562
December	1.427	0.489	0.049	0.013	0.052	0.020	366.25	0.237	0.674

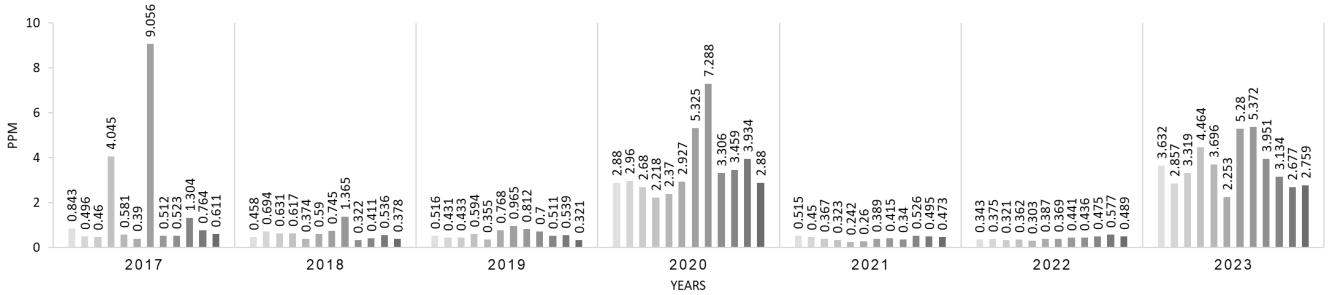
Average monthly data in 2023 (PPM)

	CH4	CO	NO	NO2	NOX	O3	CO2	SO2	NMHC
January	2.453	3.632	0.025	0.025	0.036	0.010	346.53	0.015	0.757
February	1.125	2.857	0.032	0.033	0.044	0.023	465.46	0.018	0.628
March	1.778	3.319	0.064	0.052	0.078	0.018	465.49	0.268	0.787
April	2.341	4.464	0.078	0.014	0.054	0.011	318.87	0.016	0.674
May	1.098	3.696	0.017	0.025	0.047	0.015	519.33	0.188	0.745
June	1.369	2.253	0.298	0.013	0.040	0.018	631.39	0.194	0.529
July	2.525	5.280	0.054	0.021	0.034	0.030	511.43	0.046	0.655
August	1.583	5.372	0.050	0.005	0.015	0.033	489.72	0.182	0.735
September	2.061	3.951	0.085	0.032	0.068	0.048	459.81	0.201	0.872
October	2.288	3.134	0.074	0.028	0.064	0.037	415.06	0.201	0.583
November	1.434	2.877	0.071	0.046	0.010	0.013	499.64	0.235	0.483
December	1.583	2.759	0.050	0.001	0.088	0.016	510.35	0.137	0.543

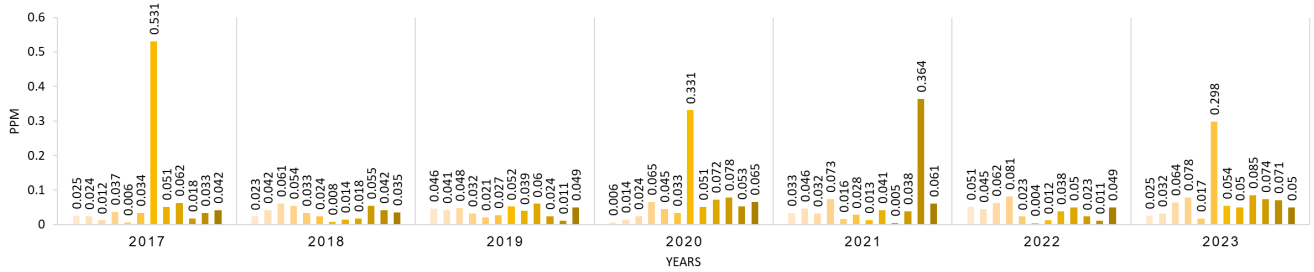
1.1.1.1- Methane (CH_4)



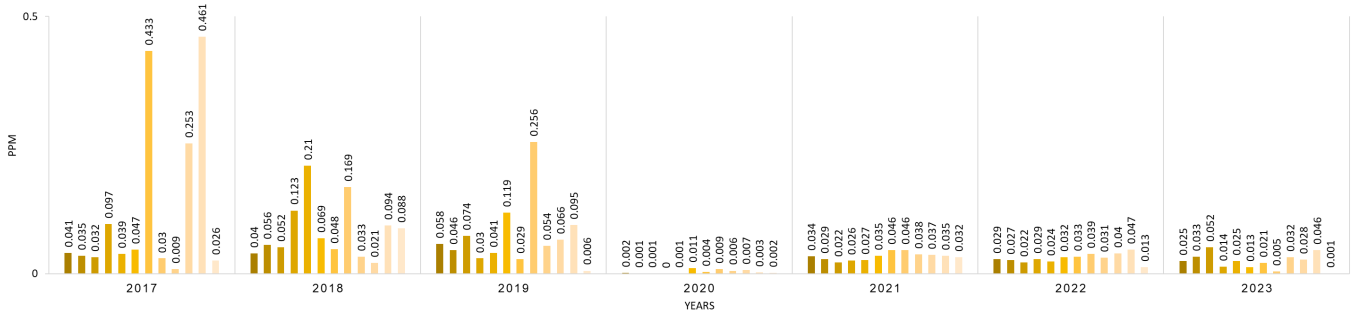
1.1.1.2- Carbon Monoxide (CO)



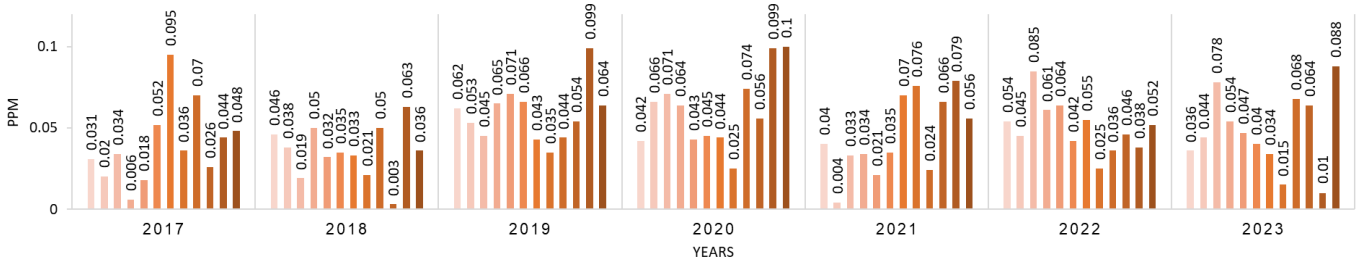
1.1.1.3- Nitrogen Monoxide (NO)



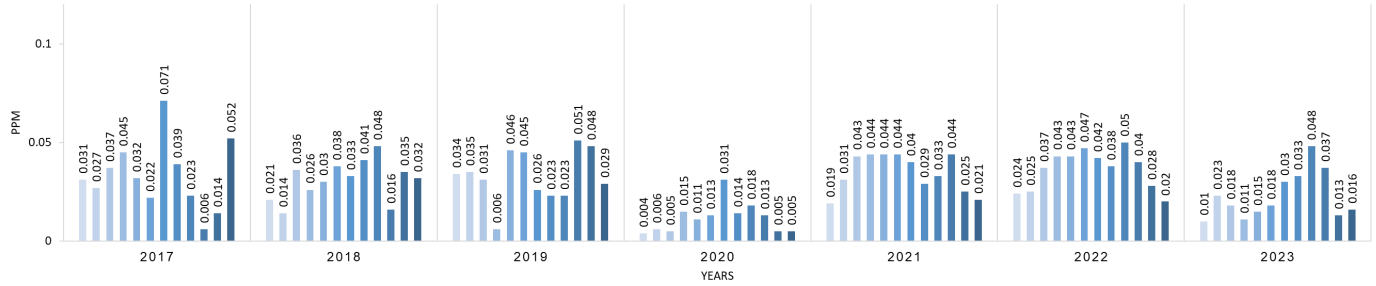
1.1.1.4- Nitrogen Dioxide (NO_2)



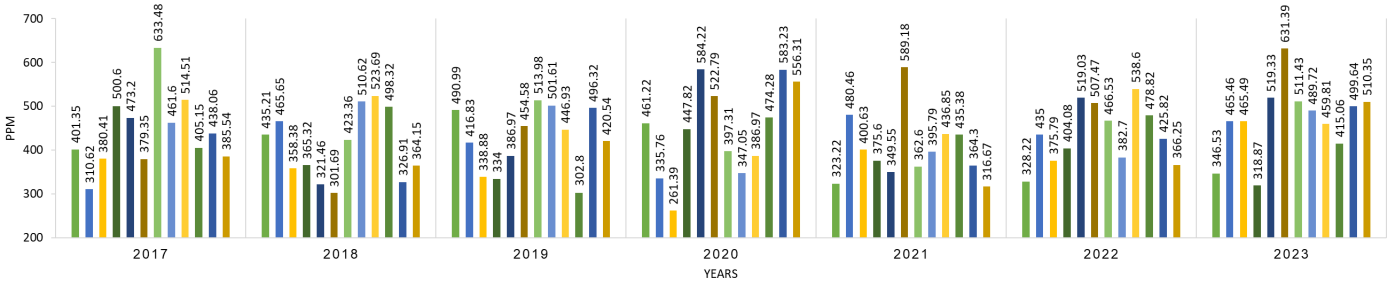
1.1.1.5- Nitrogen Oxide (NO_X)



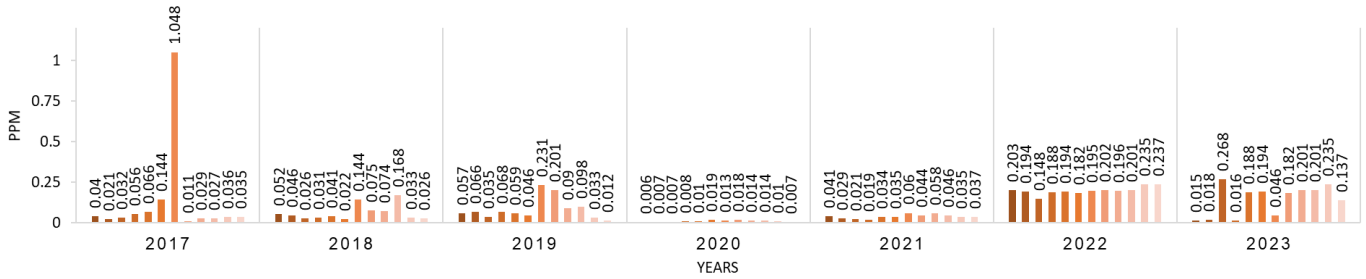
1.1.1.6- Tropospheric Ozone (O_3)



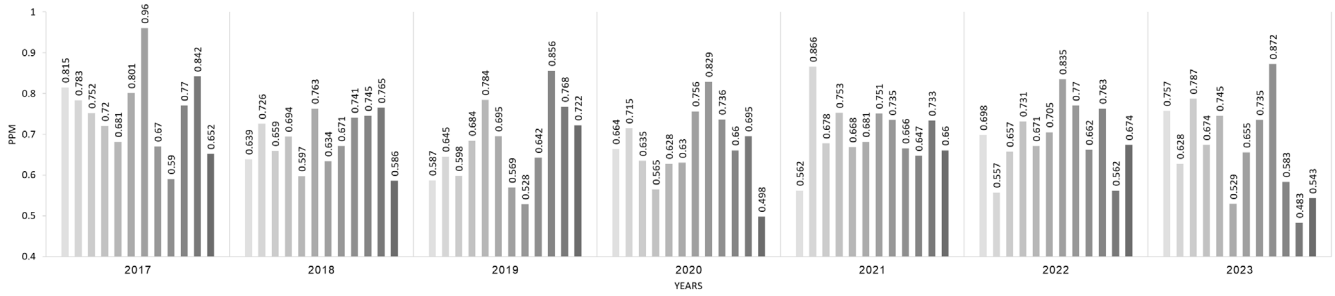
1.1.1.7- Carbon Dioxide (CO_2)



1.1.1.8- Sulfur Dioxide (SO_2)



1.1.1.9- Non-methane Hydrocarbons (NMHC)



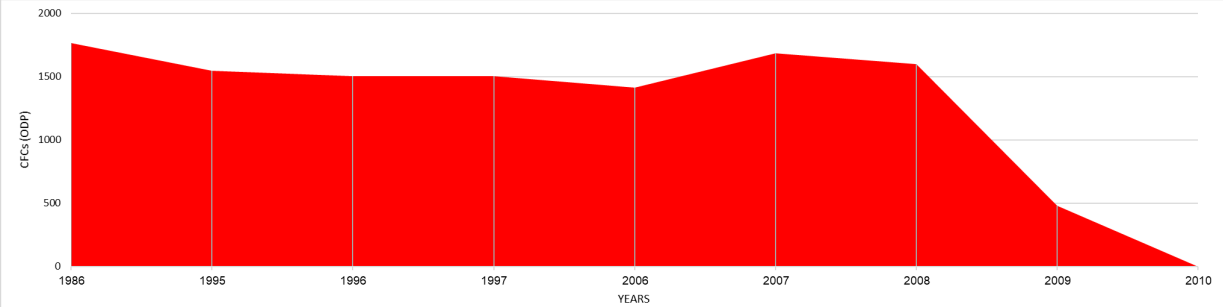
1.1.2- Ozone Depleting Substances (ODSs):

1.1.2.1- CFCs

Since 2008 as a party to the protocol, Iraq has committed to implementing measures to reduce and eventually eliminate the use of ODS in various sectors, such as refrigeration, air conditioning, and industrial processes and within two years Iraq phased out and banned CFCs.
HFCs as alternative was popular at the time and HFCs technologies was already available easily, helped the transformation from CFCs to HFCs then to HCs.

100%
Of CFCs Banned

18,530,000 $MTCO_2e$
Of CFCs Avoided every year since 2010

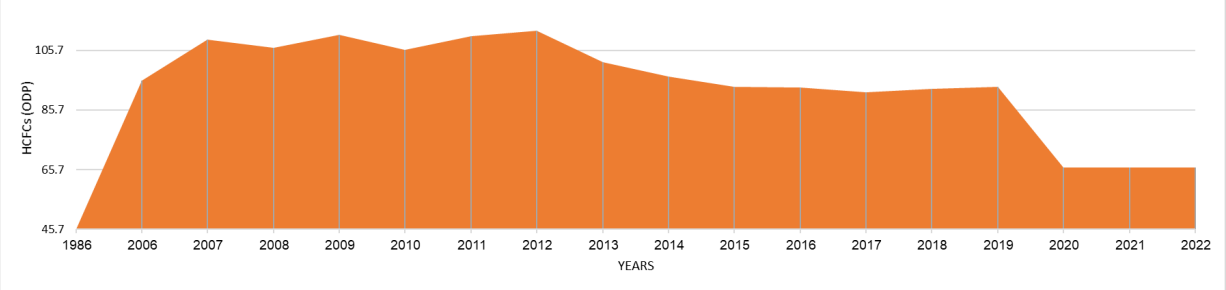


1.1.2.2- HCFCs

According to the Montreal Protocol, all countries, including those with high ambient temperatures should phase out HCFC due to its effect on ozone layer, Iraq is high ambient temperature country, air-conditioning is one of the essential, life-existence demand in our region demanding a high performance high efficiency refrigerant for AC systems, HCFC-22 was the dominate refrigerant for many years,
As HCFCs ozone depleting substances, Protocol Montreal scheduled phase out of HCFCs since 2015, Iraq is phasing out HCFCs year after year according to phase out schedule through quota system for the importers in the market and monitoring system for imported shipments of HCFCs to keep up with protocol Montreal, with assistance of customs and ministry of trade,
Next year in 2025, Iraq will phase out 67% from import of HCFCs,
Moving out to alternatives zero to Low GWP (Global Worming Potential) such as HFC-32, HC-600a and HC-290 as its available and efficient in RAC applications.

67%
Of HCFCs will be phased out in 2025

2,389,200 $MTCO_2e$
Of HCFCs Avoided every year from 2025



1.1.2.3- Carbon Tetrachloride (CTC), Methyl Bromide (MB), Halons:

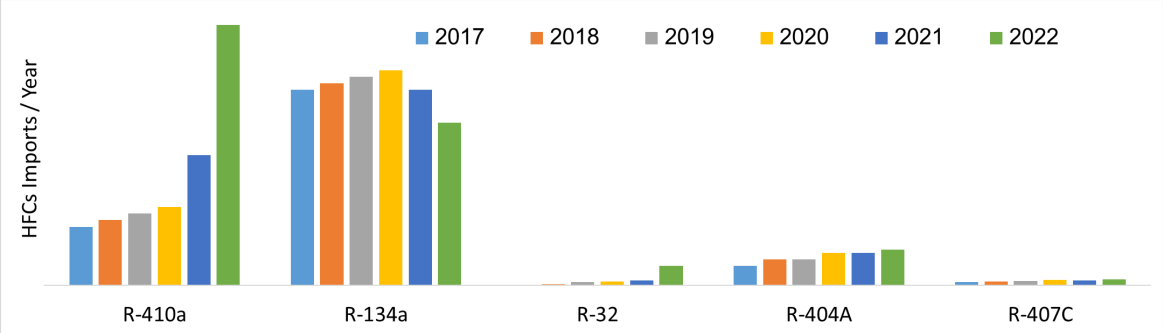
Iraq is already using alternatives for mentioned substances and previously using these substances with small concentrations, phasing out these substances as they tremendous effect on the ozone layer, and moving to alternatives was a major goal that fully implemented in 2015.

1.1.3- Hydrofluorocarbon (HFCs)

Since participation in the Twenty-Eighth Meeting of the Parties to the Montreal Protocol, held in Kigali on October 2016, and the adoption of Kigali amendment that will phase down HFCs moving to zero or low GWP alternatives; Iraq started the procedures to ratify this amendment targeting two pathways:

- Ratifying to Kigali amendment and legislate the phase down of HFCs.
- Technical pathway through surveys, awareness and collecting data from relating institutions about HFCs importation and consumption and future needs.

Ratification process in the Iraqi legislation body almost finished and submitted to the parliament, which is the last step to ratification.



Observations Analysis

Air pollutant concentrations in Iraq maintained high levels throw the last years due to a combination of factors. One significant factor is the rapid increasing in population, urbanization and industrialization. The growth of industries. Additionally, oil refineries and power plants, has led to increased emissions of pollutants into the air, Old technologies in these industries contributes to higher levels of air pollution.
Another contributing factor is the high number of vehicles on the roads, especially in urban areas. The increase in motor vehicles has led to higher levels of exhaust emissions, including pollutants such as carbon monoxide and nitrogen oxides.
Furthermore, the lack of proper environmental awareness in some people has allowed for unchecked pollution from various sources. Inadequate waste management practices, including open burning of waste, also contribute to air pollution.
Efforts by Government and local environmental agencies to address these issues through the implementation of stricter regulations, promoting cleaner technologies, and raising awareness about the importance of reducing air pollution.

Household RAC systems is the dominate in the refrigeration and air-conditioning sector, HCFC-22 refrigerants based technologies is ending soon due to Montreal protocol HCFCs phase-out schedule,

HFC-410a refrigerants based technologies is increasing for the present time, the import of HFC-410a increased rapidly.
New HFC-32 refrigerants based technologies is spreading due to high efficiency in high ambient weathers and energy saving properties of this refrigerants demanding more awareness to the Iraqi importers and end-users due to flammability properties of this refrigerant and its benefits as low GWP substance,
Addition to that HFC-410a based technologies showing bad performance in high temperature summer ambient weather because their efficiency (and refrigeration capacity) decrease, beyond ambient temperatures of 46°C,
HFC-134a refrigerant-based technologies overtaken by HC-600a refrigerant-based technologies due to energy efficiency, low charge and zero effect on the environment.

2- FUTURE PLANS, NEEDS AND RECOMMENDATIONS

- This national report based on the previous ozone research managers meetings, capacity building is required to increase capabilities of the preparation and submission of the ORM Iraq national report and support data collection of the ozone-climate variables.
- Supporting ministry of environment to facilitate a continuous data collection by providing high-end land statins and monitoring equipment such as Pandora and Multi Axis Differential Optical Absorption Spectroscopy (MAX-DOAS) spectrometers for ozone, and Air-Core samplers on small balloons for other trace gases.
- Funding the purchase of spectral UV measurements equipment which is very important devices to measure on land real delivered UV radiation especially UV spectroradiometers and UV radiometers devises and provide long-term changes in UV radiation data.
- Providing Iraq one of the relocated Dobson and Brewer instruments and providing capacity building to operate and calibrate these instruments.

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