Refrigerants

Source: IE

Why in News?

A recent court case in San Diego, US, highlighted the **smuggling of banned refrigerants from Mexico into the US**, shedding light on the environmental repercussions of such illicit activities.

- The refrigerants in question are **hydrofluorocarbons** and a form of hydrochlorofluorocarbons, known as **HCFC 22.**

What are Refrigerants?

- **About:** A refrigerant is a chemical substance used in **refrigeration and air conditioning systems.**
  - They work by absorbing heat and transferring it in a cycle to achieve cooling of air or objects.
  - They typically have **low boiling points**, allowing them to evaporate and cool the surrounding environment at relatively low temperatures.
  - **Example:** chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs).
- **HFCs and HCFCs:** In the 1990s, **hydrofluorocarbons (HFCs) and hydrochlorofluorocarbons (HCFCs)** gained popularity as substitutes for **chlorofluorocarbons (CFCs)** in refrigeration and air conditioning systems.
  - This shift came after research in 1985 confirmed that **CFCs were causing abnormally low** ozone concentrations above Antarctica, leading to the ozone hole phenomenon.
  - Refrigerants, including HFCs and HCFCs, are released into the atmosphere primarily when **appliances reach the end of their life** and are disposed of improperly, contributing significantly to environmental pollution.

What Measures have been Taken Globally to Reduce the Usage of Refrigerants?

- The Vienna Convention for the Protection of the Ozone Layer **(Vienna Convention)** was agreed in 1985. It established global monitoring and reporting on ozone depletion.
  - In 1987, nearly **200 countries** signed the **Montreal Protocol** aiming to halt the production and use of ozone-depleting substances **like CFCs.**
    - India became a signatory to the Montreal Protocol in 1992.
  - The Protocol mandated the **phasing out of CFCs by 1996 and HCFCs by 2030**, with HCFCs acting as a temporary solution due to their lesser impact on the ozone layer.
  - Consequently, HFCs emerged as the primary refrigerant as they do not deplete the ozone layer.
    - However, they were later recognised as **potent** greenhouse gasses.
- The Climate and Clean Air Coalition (CCAC) **report** highlighted that HFCs contribute significantly to global warming, despite having zero ozone-depleting potential.
  - In 2016, over 150 countries agreed to the **Kigali Amendment under the Montreal**

Protocol aiming to **reduce HFC consumption by 80-85% by the late 2040s.**
    - **India is also signatory to the Kigali Amendment.**
    - India will complete its phase down of production and consumption of HFCs for controlled uses in 4 steps from 2032 onwards with cumulative reduction of **10% in 2032, 20% in 2037, 30% in 2042 and 85% in 2047.**
- Successful implementation of the Kigali Amendment could potentially prevent more than 0.4℃ of global warming by the year 2100.

Note

- The Vienna Convention and its Montreal Protocol are the first and only global environmental treaties to achieve universal ratification, with **197 parties.**

Fluorochemical	Ozone Depleting Potential	Global Warming Potential
Chlorofluorocarbons (CFCs)	High	High
Hydrochlorofluorocarbons (HCFCs)	Low	High
Hydrofluorocarbons (HFCs)	Zero	High
HydrofluoroOlefin (HFOs)	Zero	Very Low

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q1. Which one of the following is associated with the issue of control and phasing out of the use of ozone depleting substances? (2015)

(a) Bretton Woods Conference
(b) Montreal Protocol
(c) Kyoto Protocol
(d) Nagoya Protocol

Ans: (b)

Q2. Consider the following statements: (2012)

1. Chlorofluorocarbons, known as ozone-depleting substances, are used
2. in the production of plastic foams
3. in the production of tubeless tyres
4. in cleaning certain electronic components
5. as pressurising agents in aerosol cans

Which of the statements given above is/are correct?

(a) 1, 2 and 3 only
(b) 4 only
(c) 1, 3 and 4 only
(d) 1, 2, 3 and 4

Ans: (c)