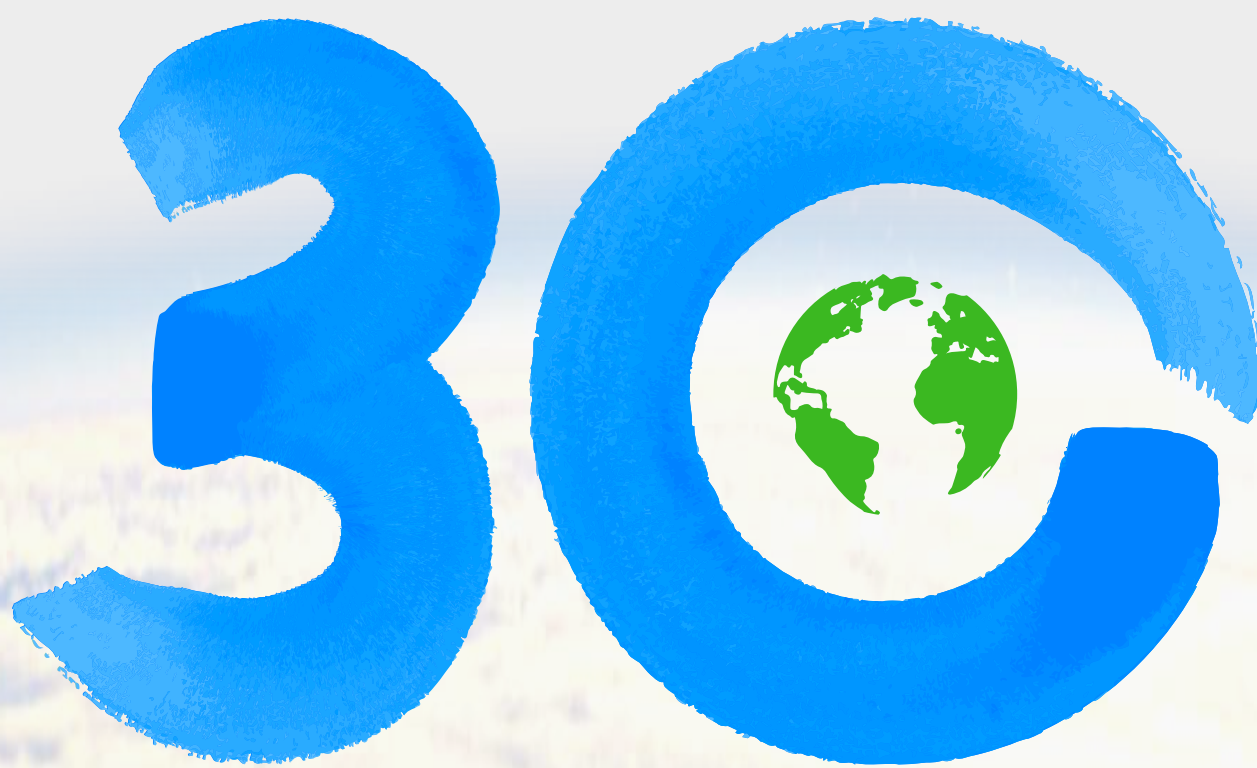


30th Anniversary of the Montreal Protocol

(1987-2017)



MONTREAL PROTOCOL

caring for all life under the sun



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Ozone Heroes Campaign



WE ARE ALL
#OZONEHEROES

WORLD OZONE DAY
16 SEPTEMBER 2017



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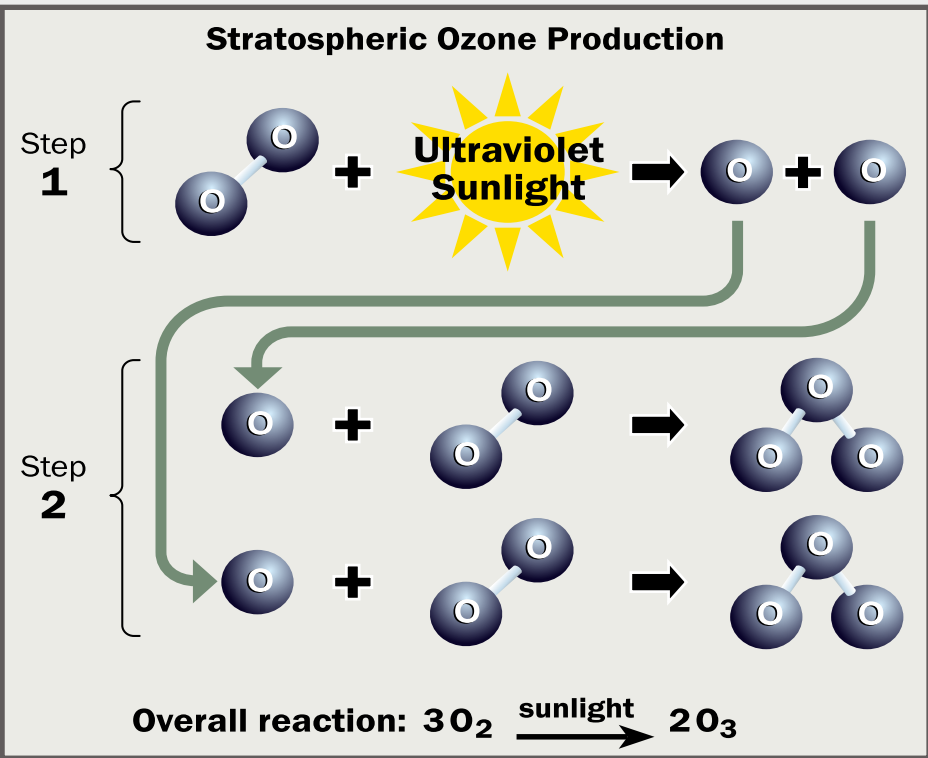
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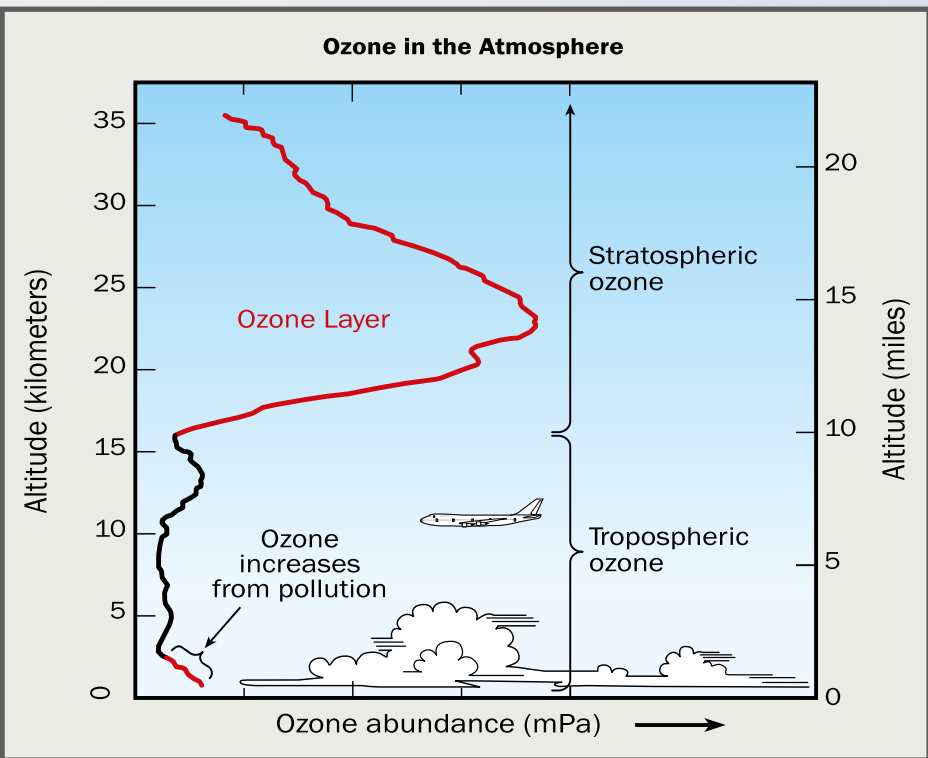
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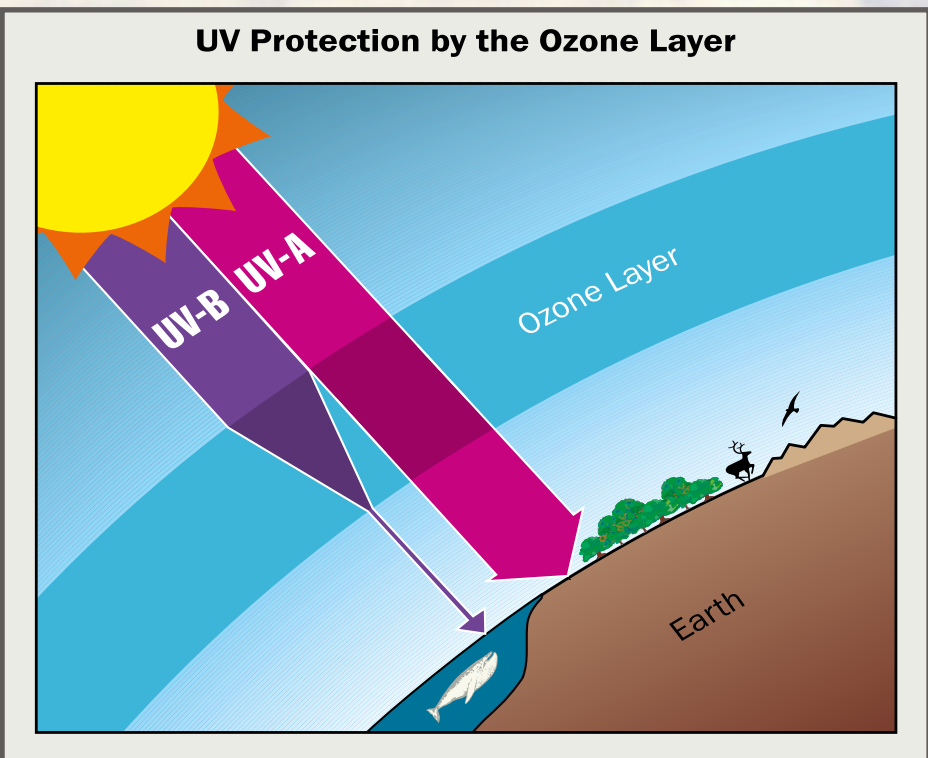
Stratospheric Ozone Layer



- Ozone is a tri-atomic molecule of oxygen
- Formed naturally in the upper level of the Earth's atmosphere
- Three molecules of oxygen in the presence of sunlight form two molecules of Ozone in the stratosphere



- **Stratosphere extends between 10-50 kilometers above the earth surface**
- **90% of ozone formed in the atmosphere is present in the Stratosphere, hence called Stratosphere Ozone Layer**



- **Stratospheric Ozone Layer absorbs a large part of the Sun's biologically harmful UV-B ultraviolet radiation**

Source (figures):
 Michaela I. Hegglin (Lead Author), David W. Fahey, Mack McFarland, Stephen A. Montzka, and Eric R. Nash, *Twenty Questions and Answers about the Ozone Layer: 2014 Update, Scientific Assessment of Ozone Depletion: 2014*, 84 pp., World Meteorological Organization, Geneva, Switzerland, 2015.



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Science of Ozone Layer Depletion

Principal Steps in the Depletion of Stratospheric Ozone

1

Emissions

Human and natural processes emit **Halogen source gases**, which contain chlorine and/or bromine, at earth's surface. **Halogen source gases** are often referred to as Ozone Depleting Substances (**ODSs**). Human activities generate major proportion of **ODSs** as compared to natural sources.



2

Accumulation

ODSs accumulate in the atmosphere and are globally distributed throughout the lower atmosphere by winds and other air motions.



3

Transport

ODSs are transported to the stratosphere by air motions.



4

Conversion

Most **ODSs** are converted in the stratosphere to reactive halogen gases in chemical reactions involving ultraviolet radiation from the sun.



5

Chemical reaction

Reactive halogen gases cause chemical depletion of stratospheric ozone over the globe.



6

Removal

Air containing **reactive halogen gases** returns to the troposphere where the gases are removed by moisture in clouds and rain.

Source:

Michaela I. Hegglin (Lead Author), David W. Fahey, Mack McFarland, Stephen A. Montzka, and Eric R. Nash, *Twenty Questions and Answers About the Ozone Layer: 2014 Update, Scientific Assessment of Ozone Depletion: 2014*, 84 pp., World Meteorological Organization, Geneva, Switzerland, 2015.



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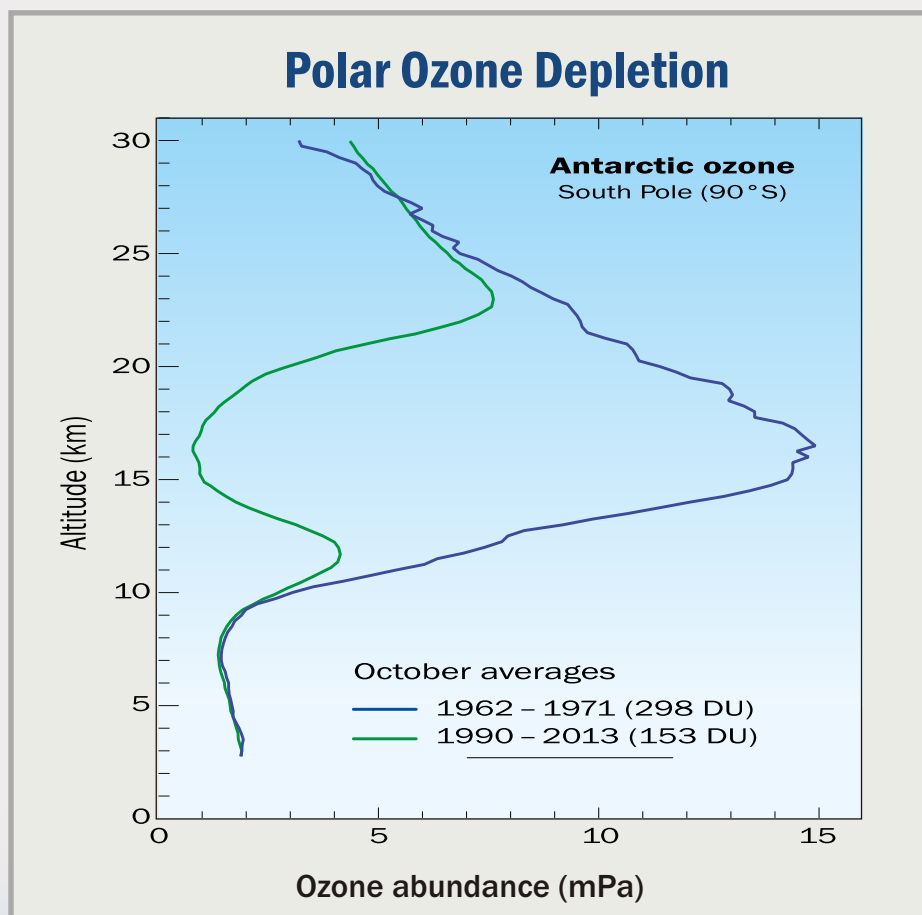
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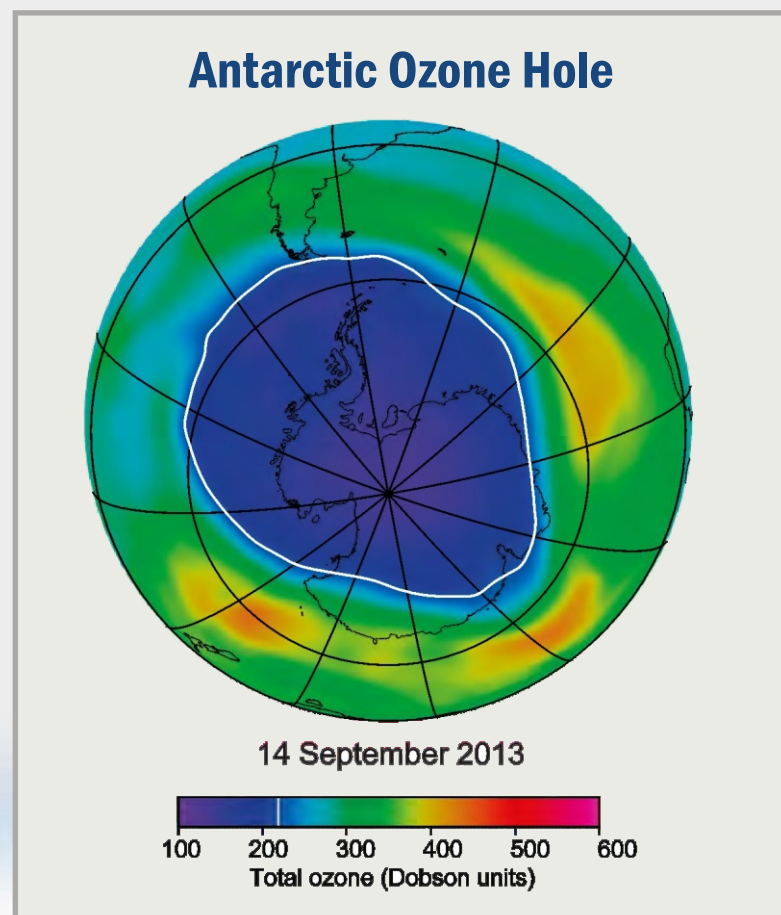
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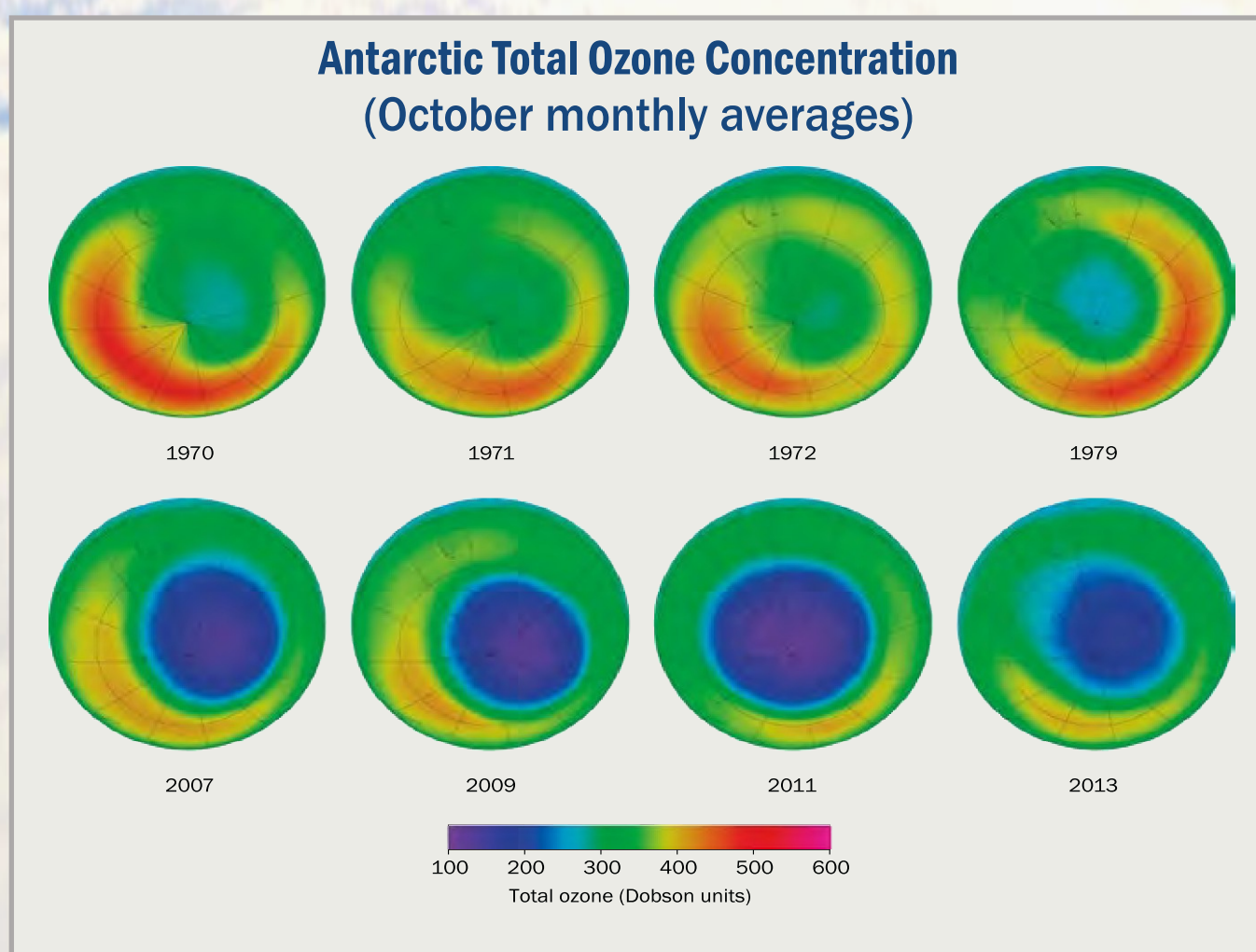
Antarctic Ozone Hole



Vertical distribution of Ozone in Stratosphere over Antarctica



Antarctica Ozone Hole in 2013
(Blue region depicts extremely low concentration of ozone over Antarctica)



Changes in Ozone concentrations over Antarctica
(1970-2013)

Source:
Michaela I. Hegglin (Lead Author), David W. Fahey, Mack McFarland, Stephen A. Montzka, and Eric R. Nash, *Twenty Questions and Answers About the Ozone Layer: 2014 Update, Scientific Assessment of Ozone Depletion: 2014*, 84 pp., World Meteorological Organization, Geneva, Switzerland, 2015.



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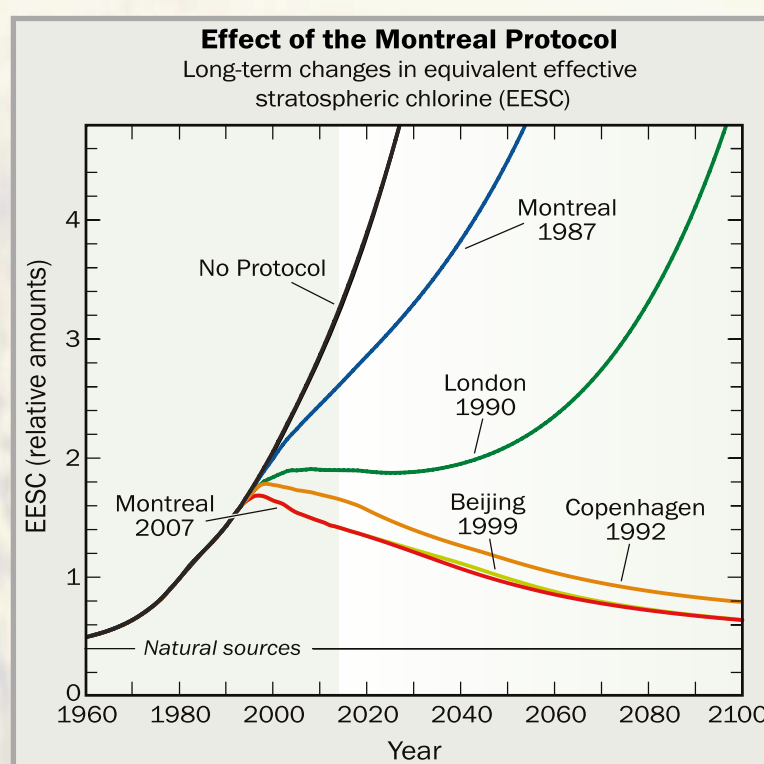


International Actions for Protection of the Ozone Layer

- Vienna Convention for the protection of Ozone Layer – 22nd March, 1985
- Montreal Protocol on substances that Deplete the Ozone Layer - 16th September, 1987

Amendments to the Montreal Protocol

- Montreal - 1987
- London - 1990
- Copenhagen - 1992
- Beijing - 1999
- Kigali - 2016
- Implementation of the Montreal Protocol has led to phase-out of major Ozone Depleting Substances such chlorofluorocarbons (CFCs), Halons, carbon tetrachloride (CTC) and methyl bromide globally, Hydrochlorofluorocarbons (HCFCs) are still being phased-out.
- Montreal Protocol is the only environment treaty having universal ratification of 197 UN member countries.
- Montreal Protocol has not only phased-out Ozone Depleting Substances, but has also provided significant climate co-benefits by avoiding 135 billion tonnes of CO₂ equivalent emissions in the atmosphere.
- As per estimates, Montreal Protocol has led to reduction is two million skin cancer cases per year globally by 2030.
- Ozone Depleting Substances not only have Ozone Depleting Potential, but also have high global warming potential.



Source (graph):
Michaela I. Hegglin (Lead Author), David W. Fahey, Mack McFarland, Stephen A. Montzka, and Eric R. Nash, *Twenty Questions and Answers About the Ozone Layer: 2014 Update*, Scientific Assessment of Ozone Depletion: 2014, 84 pp., World Meteorological Organization, Geneva, Switzerland, 2015.

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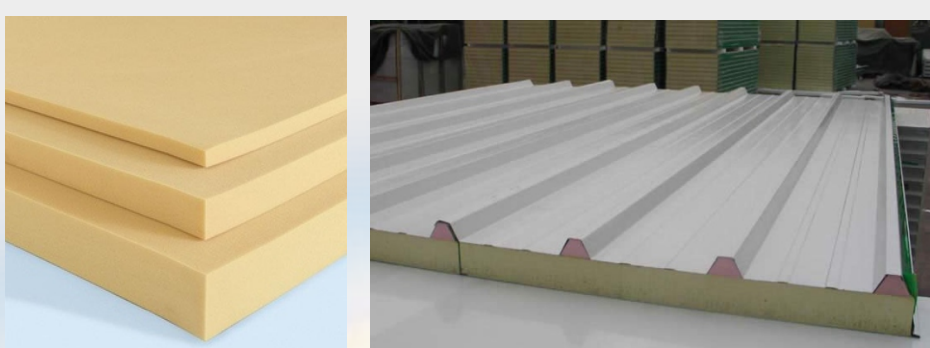


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Major uses of Ozone Depletion Substances

As a refrigerant in air conditioning equipment



As a foam blowing agent in foam manufacturing sector including foam insulation panels, thermoware, insulation for commercial refrigeration products, water heaters, etc.



As a fire extinguishing agent in fire extinguishing equipment.



Uses of Chlorofluorocarbons (CFCs), Carbontetrachloride (CTC), halons and methyl bromide have been phased out globally



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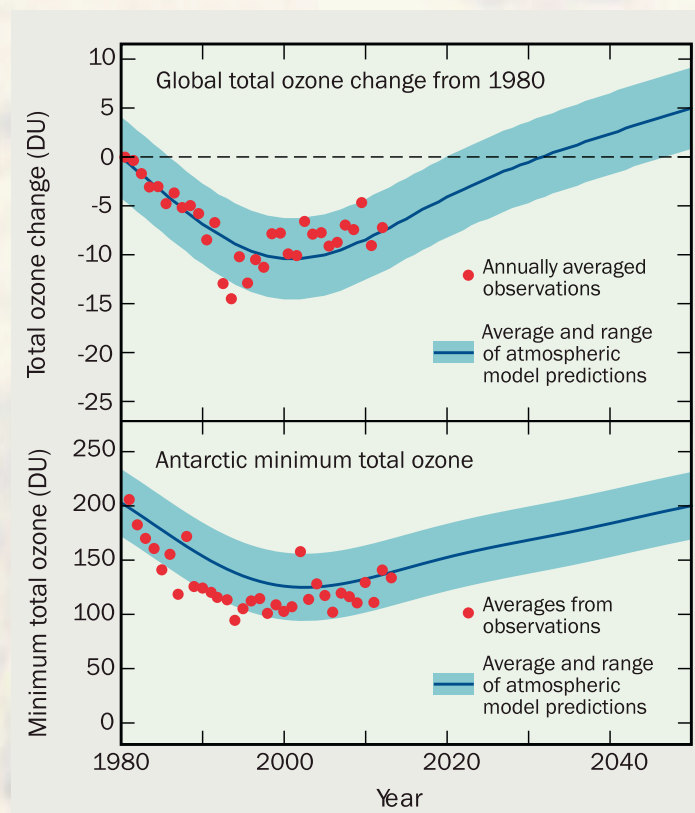


How can you help protect the Ozone layer

- Dispose of old air conditioners and refrigerators containing Ozone Depleting Substances (ODSs) responsibly. Refrigerants should be removed from an appliance before it is discarded.
- Old portable Halon fire extinguisher should be returned for cycling
- Use ozone friendly products. Replace old ODS based equipment with non-ODS equipment
- Buy products (refrigerators, air-conditioners, fire extinguishers, etc.) that do not have ODSs
- Spread awareness about protection of Ozone Layer, and ozone depleting substances

Collective global action has led to the signs of recovery of ozone layer

Simulation results showing trend towards recovery of ozone layer



Source (graph):
Michaela I. Hegglin (Lead Author), David W. Fahey, Mack McFarland, Stephen A. Montzka, and Eric R. Nash, Twenty Questions and Answers About the Ozone Layer: 2014 Update, Scientific Assessment of Ozone Depletion: 2014, 84 pp., World Meteorological Organization, Geneva, Switzerland, 2015.

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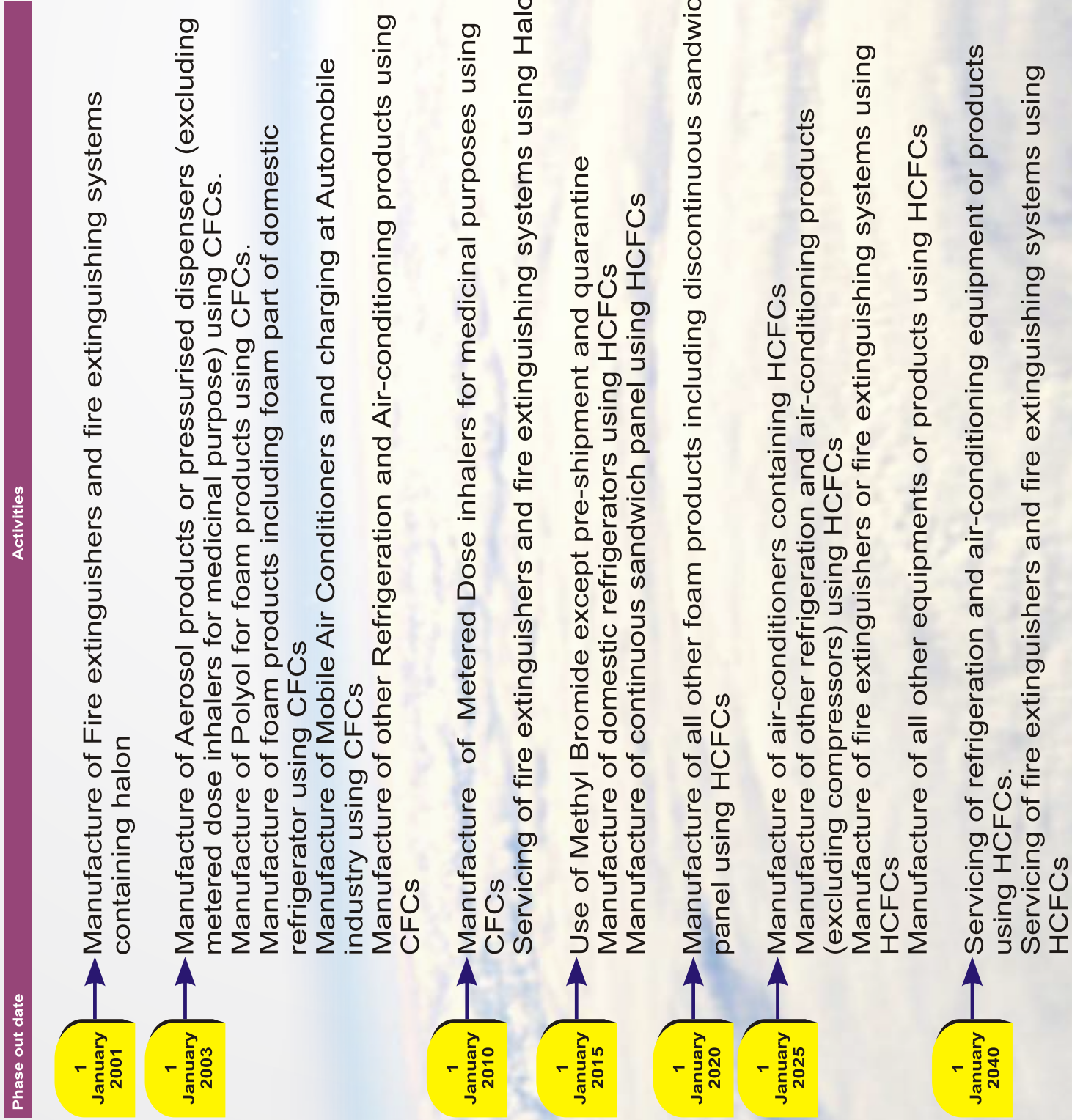


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Implementation of Montreal Protocol: India's Achievements

India has successfully phased out use of Chlorofluorocarbons (CFCs), Carbontetrachloride (CTC), Halons, Methyl Chloroform and Methyl Bromide in the country under the Montreal Protocol. The phase out of Hydrochlorofluorocarbons (HCFCs) is ongoing.



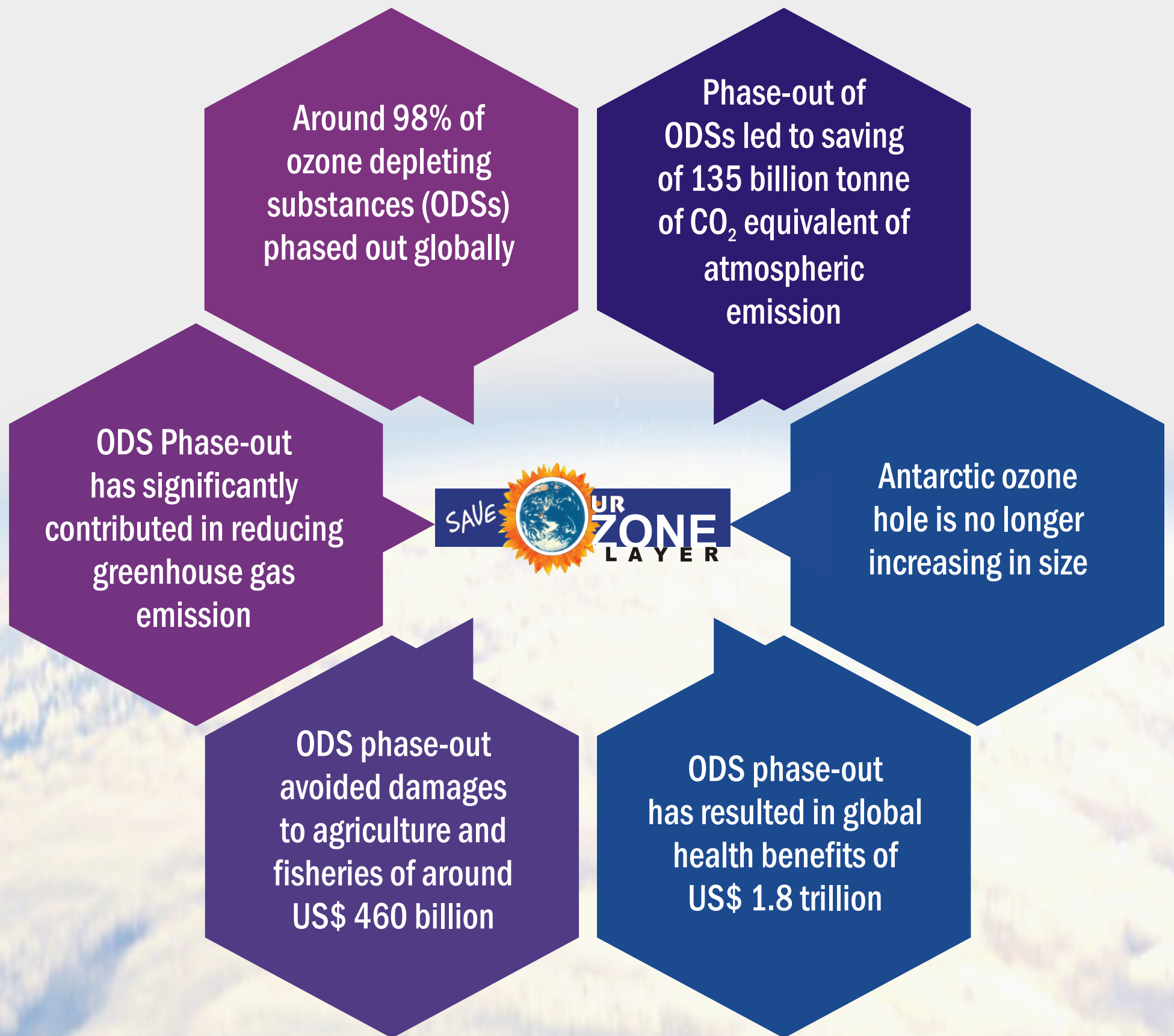
*Allowing for servicing tail at an annual average of 2.5% during the period 2030-40



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Achievements of Montreal Protocol



**India has met its compliance targets under ongoing HCFC phase out
Chlorofluorocarbons (CFCs), Carbontetrachloride (CTC), Halon and Methyl Bromide
completely phased out from India**



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