# **30<sup>th</sup> Anniversary of the Montreal Protocol** (1987-2017)

# AONTREAL PROTOCOL caring for all life under the sun



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# WORLD OZONE DAY 16 SEPTEMBER 2017





United Nations Environment Programme

## **For further information**

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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 kilometeres 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 OzoneDepletion: 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** 



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 OzoneDepletion: 2014, 84 pp., World Meteorological Organization, Geneva, Switzerland, 2015.



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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 OzoneDepletion: 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 22<sup>nd</sup> March, 1985
- Montreal Protocol on substances that Deplete the Ozone Layer 16<sup>th</sup> September, 1987
  - **Amendments to the Montreal Protocol**
  - Montreal-1987
  - London 1990 •
  - Copenhagen-1992 ۲
  - Beijing-1999 •
  - Kigali-2016 ٠
- 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 CO<sub>2</sub> 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 OzoneDepletion: 2014, 84 pp., World Meteorological Organization, Geneva, Switzerland, 2015.



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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 OzoneDepletion: 2014, 84 pp., World Meteorological Organization, Geneva, Switzerland, 2015.



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# tation of Montreal Protocol: India's Achievements mplemen

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.



**100% REDUCTIO** 2010

**35% REDUCTIOI** 

2007

**100% REDUCTION** 

2010

100% REDUCTION 2010

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**100% REDUCTION** 2030

67.5% REDUCTION

2015

2010

**100% REDUCTION** 

2015

2025

2020

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# **Achievements of Montreal Protocol**

Phase-out of ODSs led to saving of 135 billion tonne of  $CO_2$  equivalent of atmospheric emission

Around 98% of ozone depleting substances (ODSs) phased out globally

ODS Phase-out has significantly contributed in reducing greenhouse gas emission



Antarctic ozone hole is no longer increasing in size

ODS phase-out avoided damages to agriculture and fisheries of around US\$ 460 billion

ODS phase-out has resulted in global health benefits of US\$ 1.8 trillion

India has met it compliance targets under ongoing HCFC phase out

Chlorofluorocarbons (CFCs), Carbontetrachloride (CTC), Halon and Methyl Bromide completely phased out from India



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