U-3ARC WEBINAR TRAINING #8

REFRIGERATION IMPACT ON THE ENVIRONMENT

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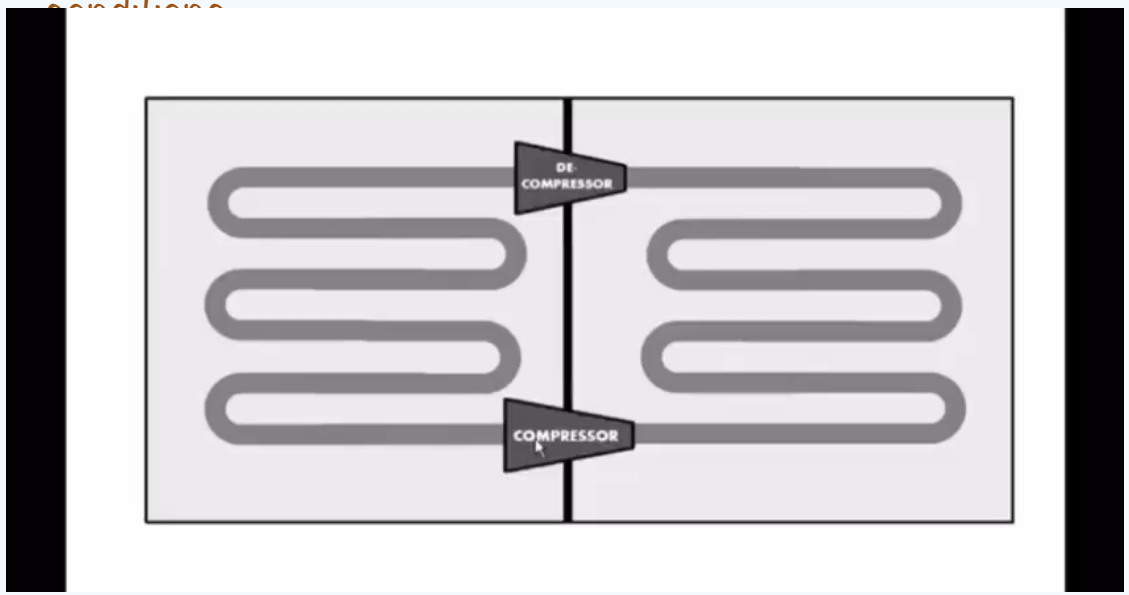
LEARNING OUTCOME/OBJECTIVE

- What is Required for a substance to be a Refrigerant?
- Overview Of Refrigerant Classification- CFC, HCFC, HFC, HFO & NATURAL GASES
- Effect Of CFC, HCFC
- Ozone Depletion
- Global Warming Potential
- Green House Gases
- Environmental Concerns- Short Live Climate Pollutant
- Evolution of Refrigerant and Phase out Period
- Refrigerant Replacement and Application
- Safe Servicing Procedures in Handling Natural Refrigerant & it's Equipment
- Basic Approach For Working With Flammable Refrigerants
- Safe Workshop Layout

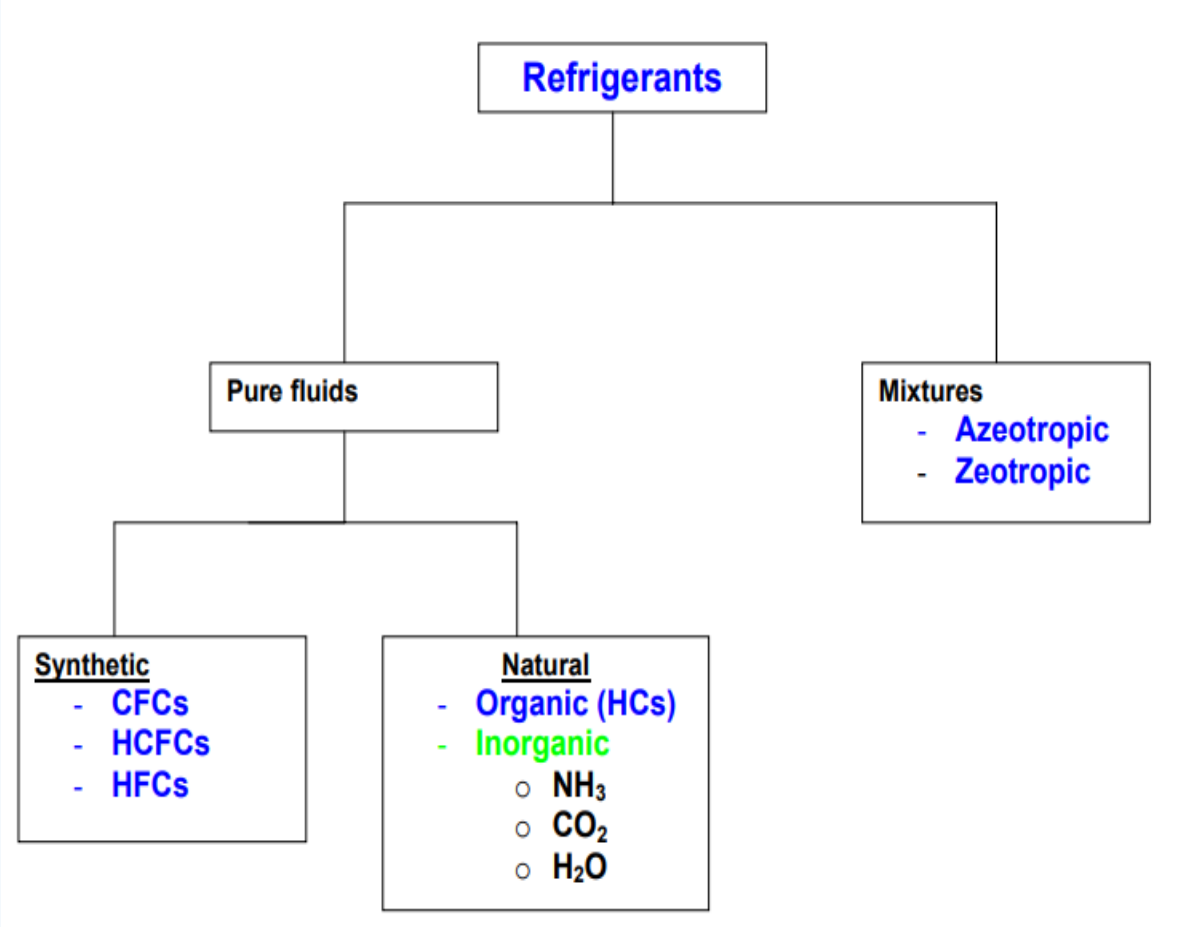
What Is Required For A Substance To Be A Refrigerant?

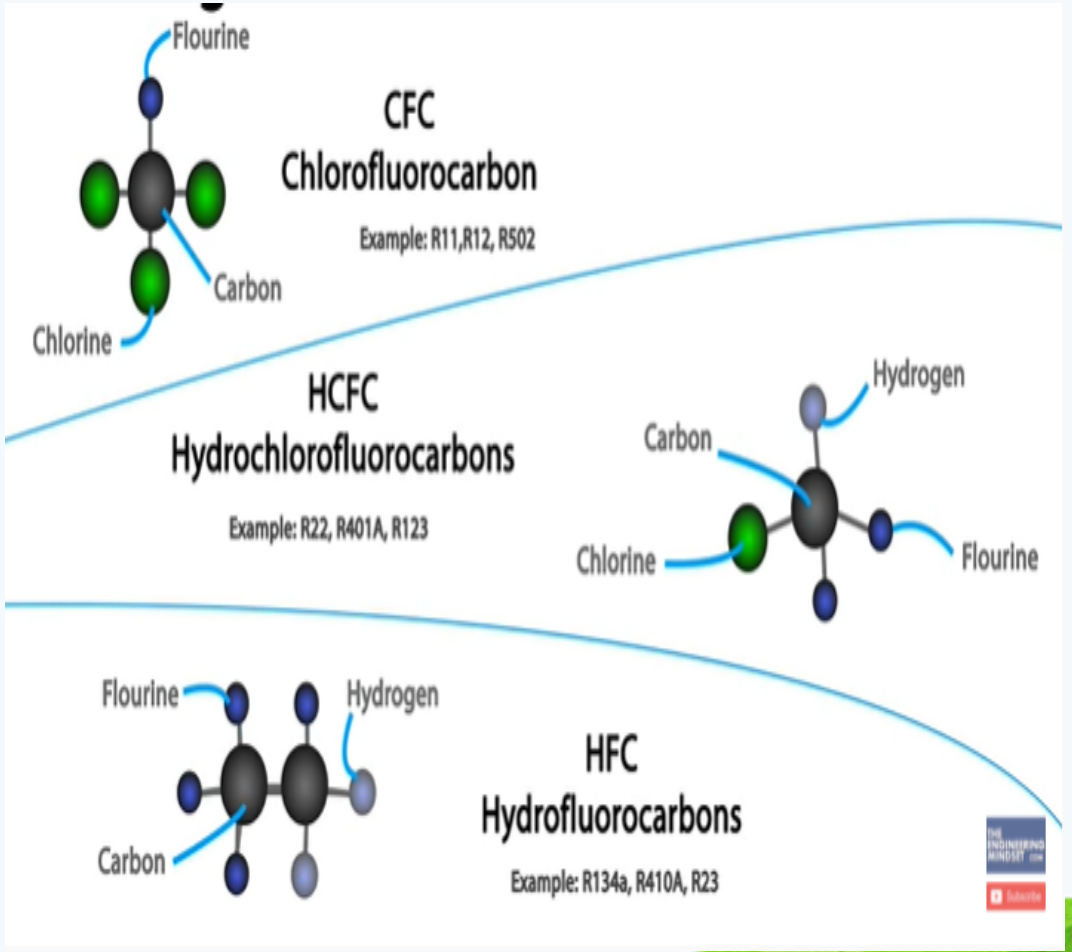
- Refrigerant - A refrigerant is a fluidlike substance or mixture used in the refrigeration cycle to absorb and reject heat thus affecting the temperature within. In most cases they undergo a repeated phase transition from a liquid to a gas and back again.
- The chemical, physical and thermodynamic properties of the refrigerant must suit the system and the working conditions



Chemical:	• Stable and inert
Health, safety and environmental:	• Non-toxic • Non-flammable • Benign to the atmosphere, etc.
Thermal:	• Critical point and boiling point temperatures appropriate for the application • Low vapor heat capacity • Low viscosity • High thermal conductivity
Other:	• Satisfactory oil solubility/miscibility • High dielectric strength of vapor • Low freezing point • Reasonable containment materials • Easy leak detection • Low cost

Overview Of Refrigerant Classification- CFC, HCFC, HFC, HFO & NATURAL GASES

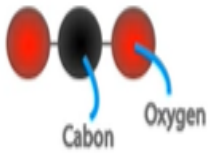




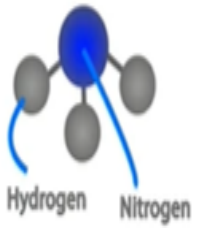
Refrigerants- The future

HFO
Hydrofluoroolefins

Natural Refrigerants



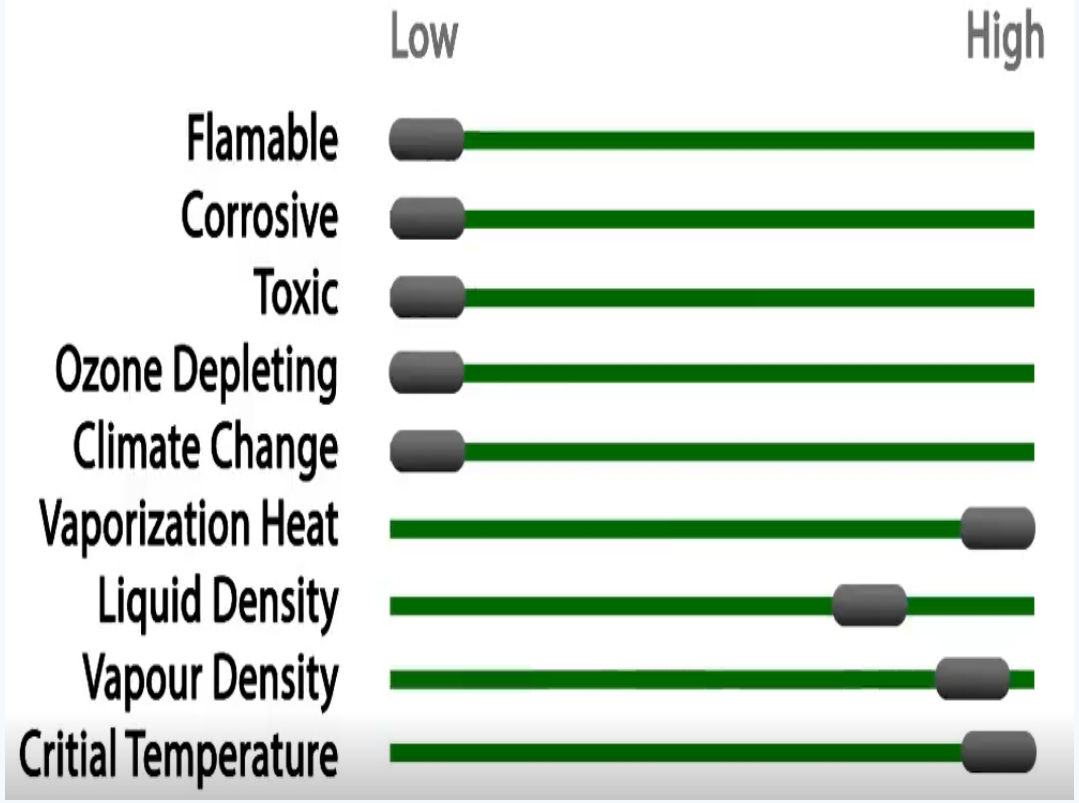
CO_2
Carbon Dioxide



NH_3
Ammonia

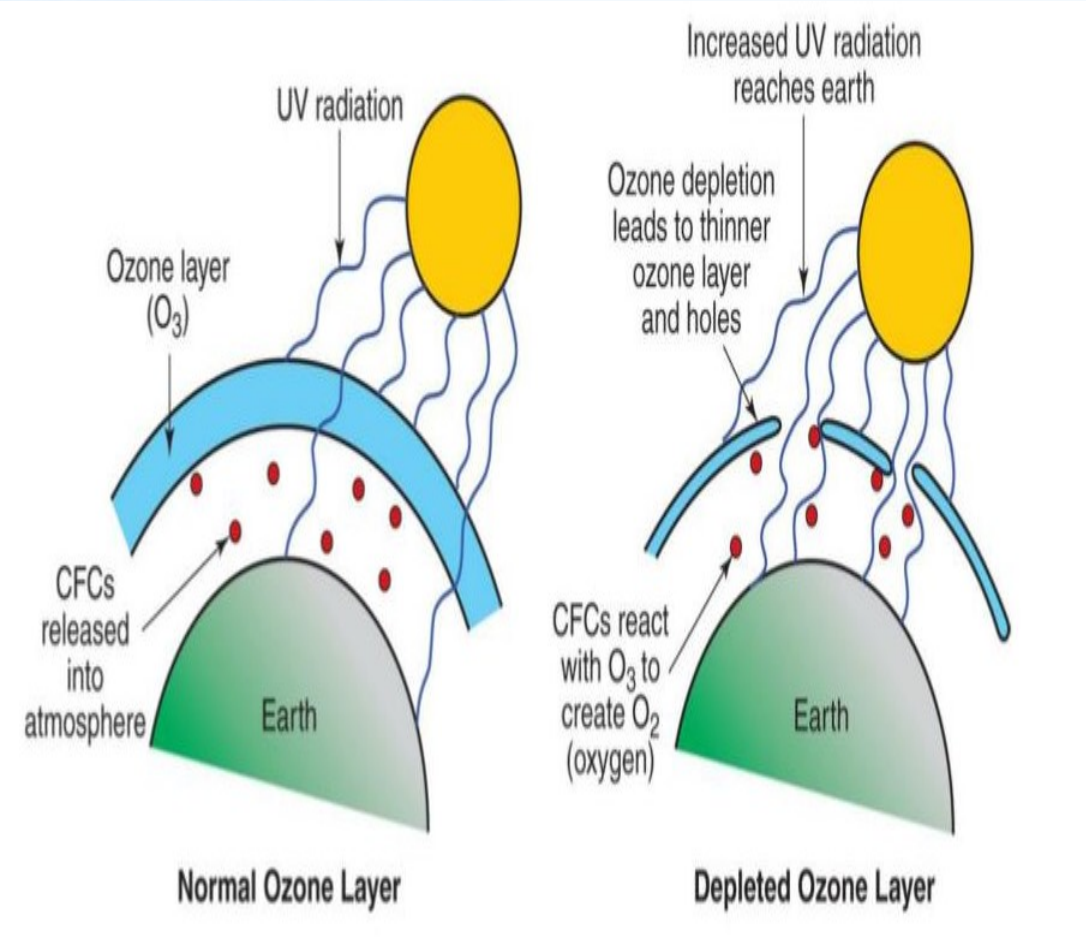
HC
Hydrocarbons

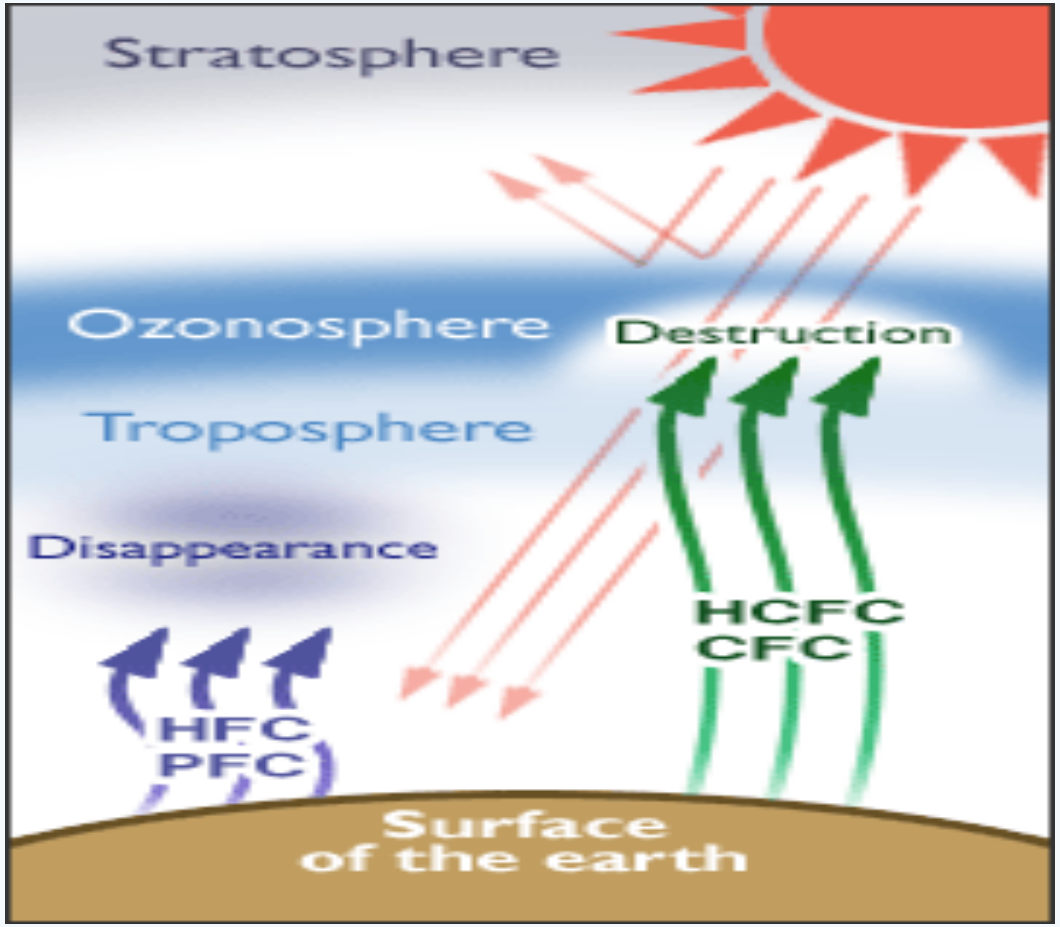
Ideal Refrigerant



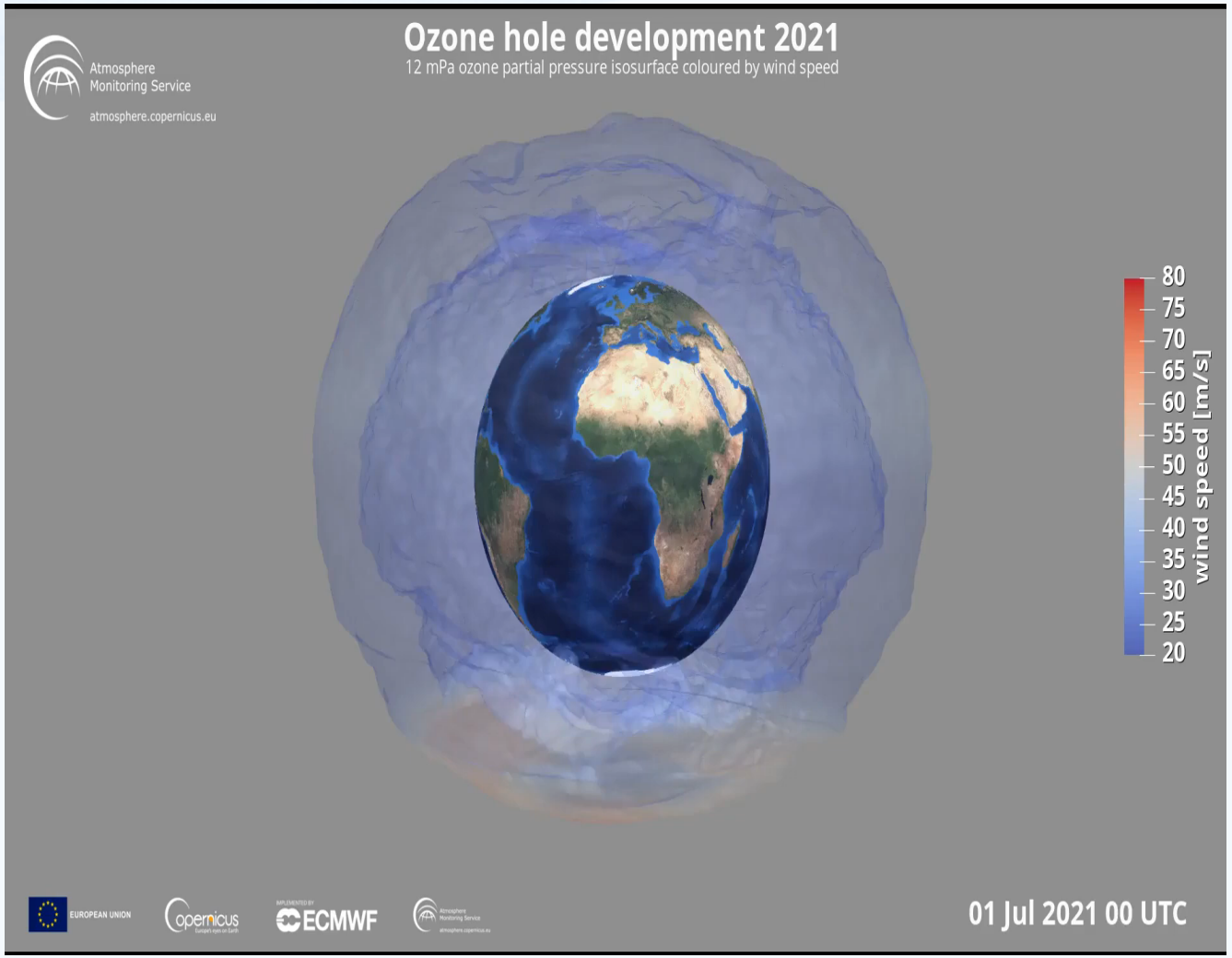
Ozone Depletion/Potential (ODP)

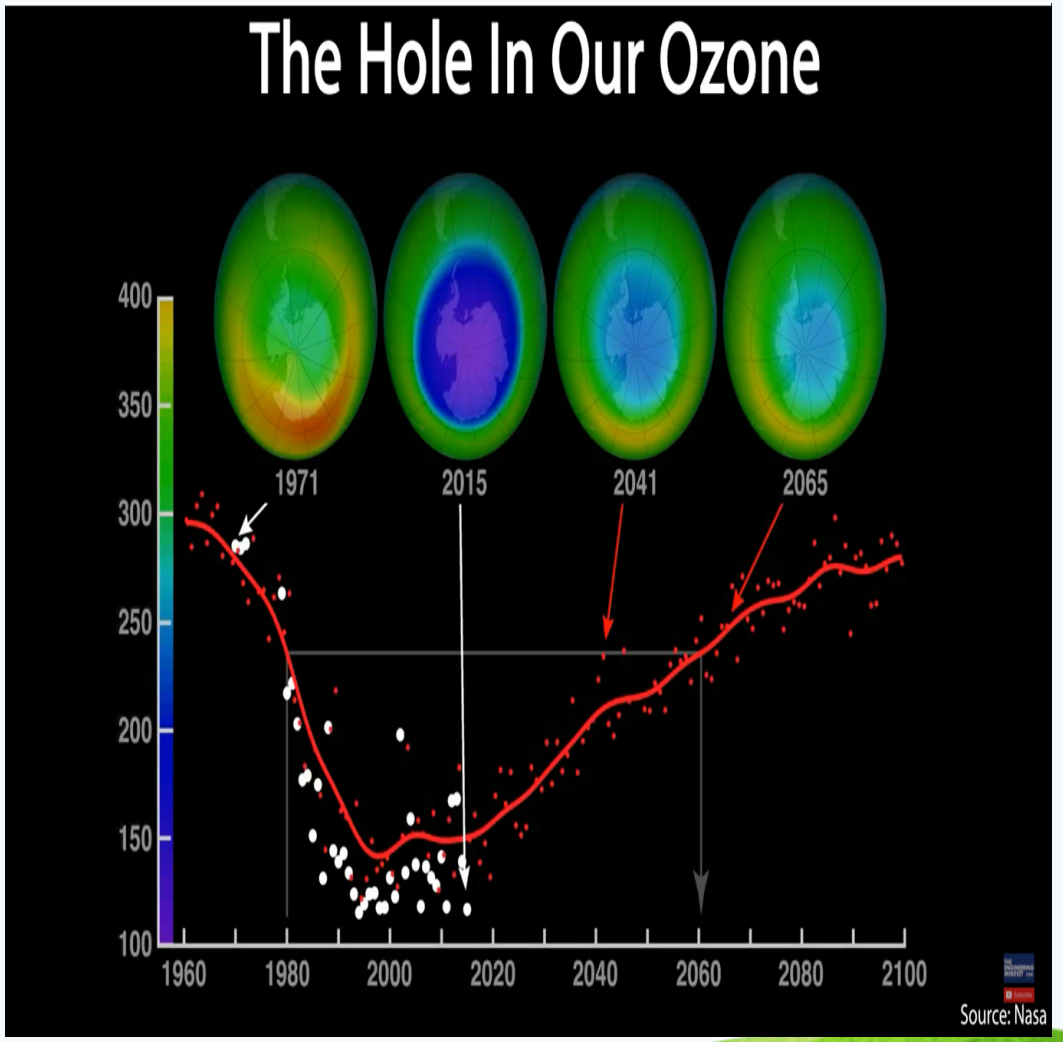
PICTORIAL VIEW



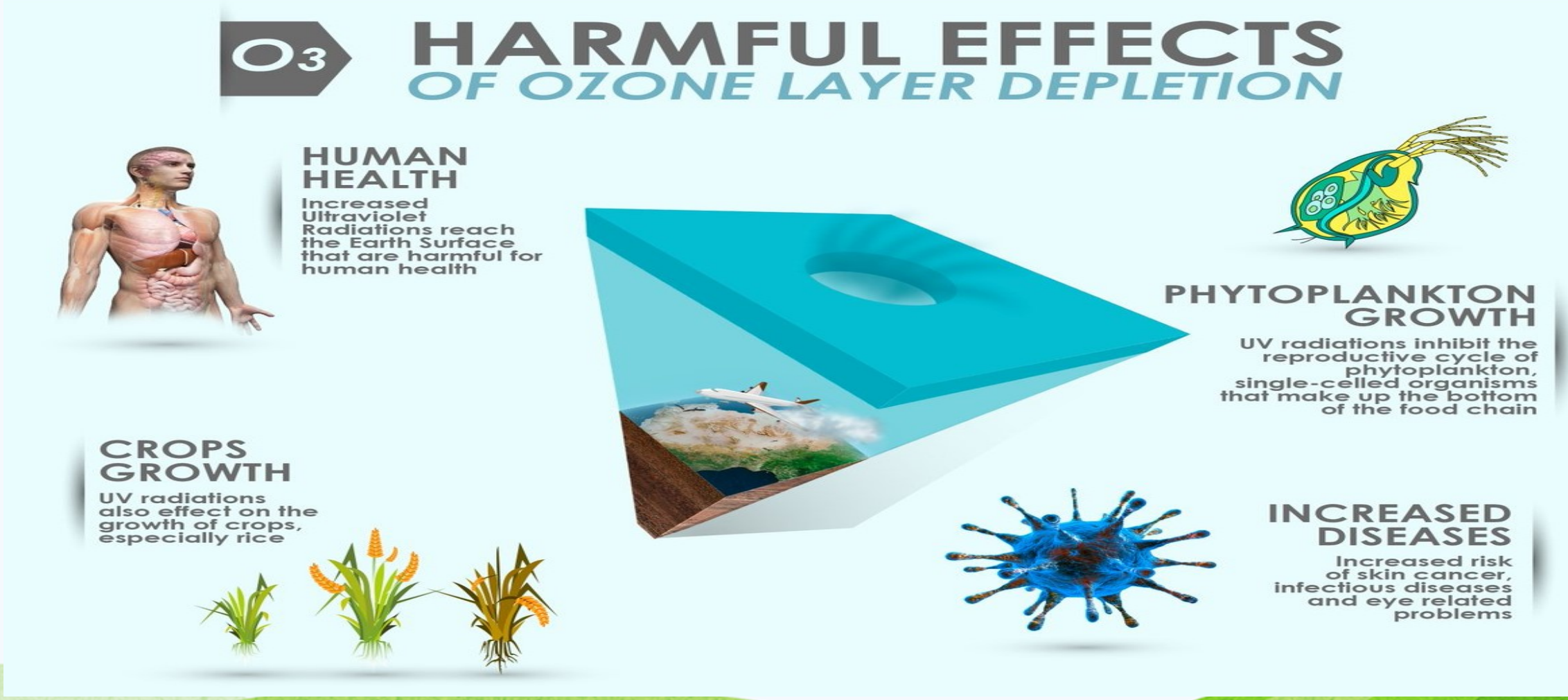


Ozone Development

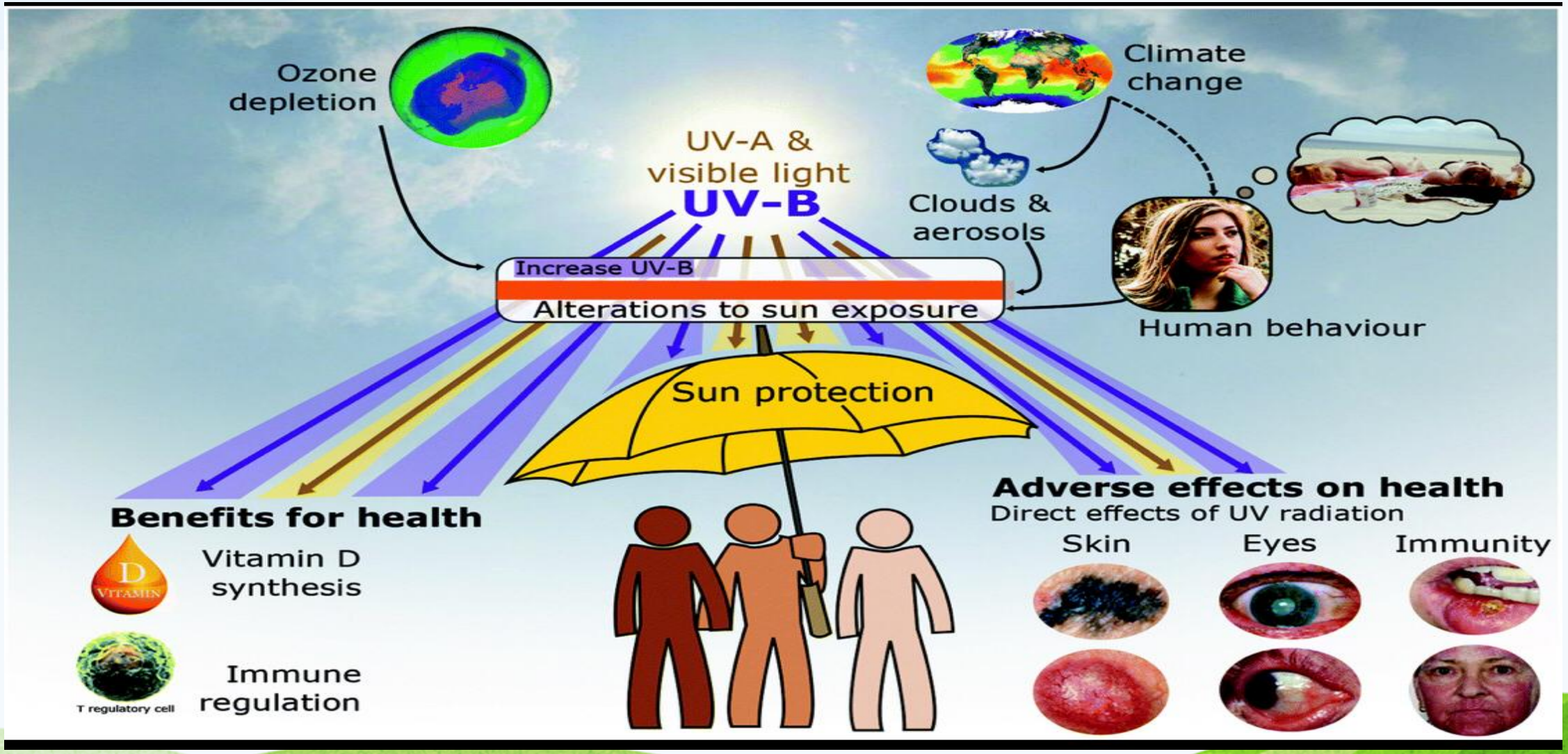




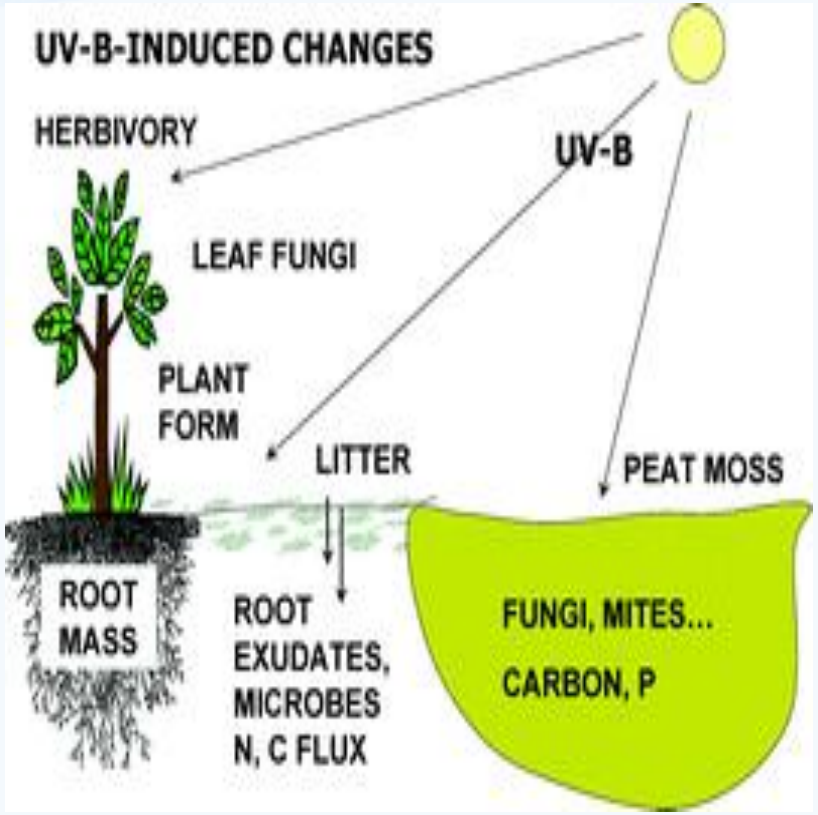
Ozone Depleting Effects on Human Life and the Environment

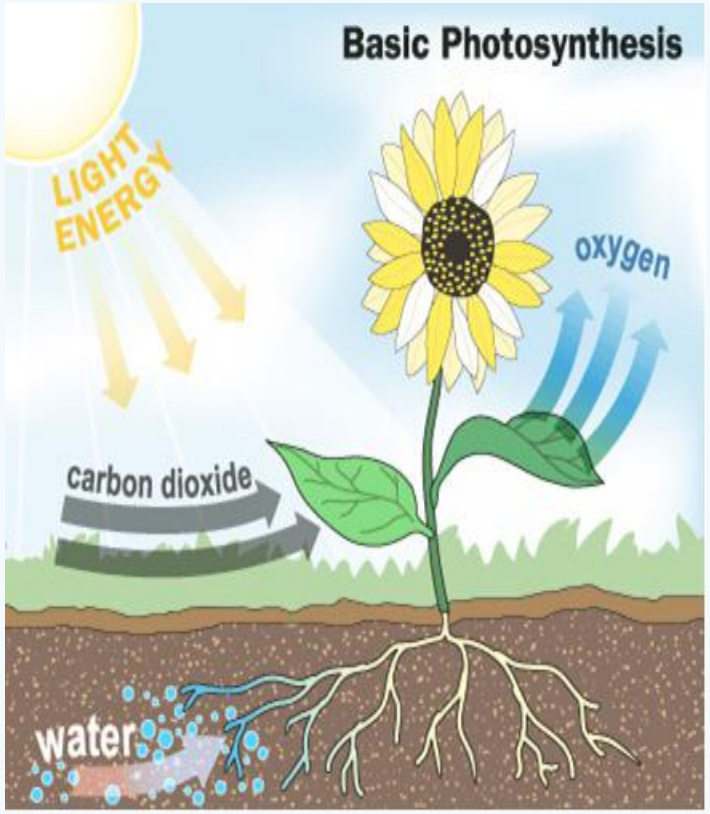


Effect Of Ozone Depletion – Human



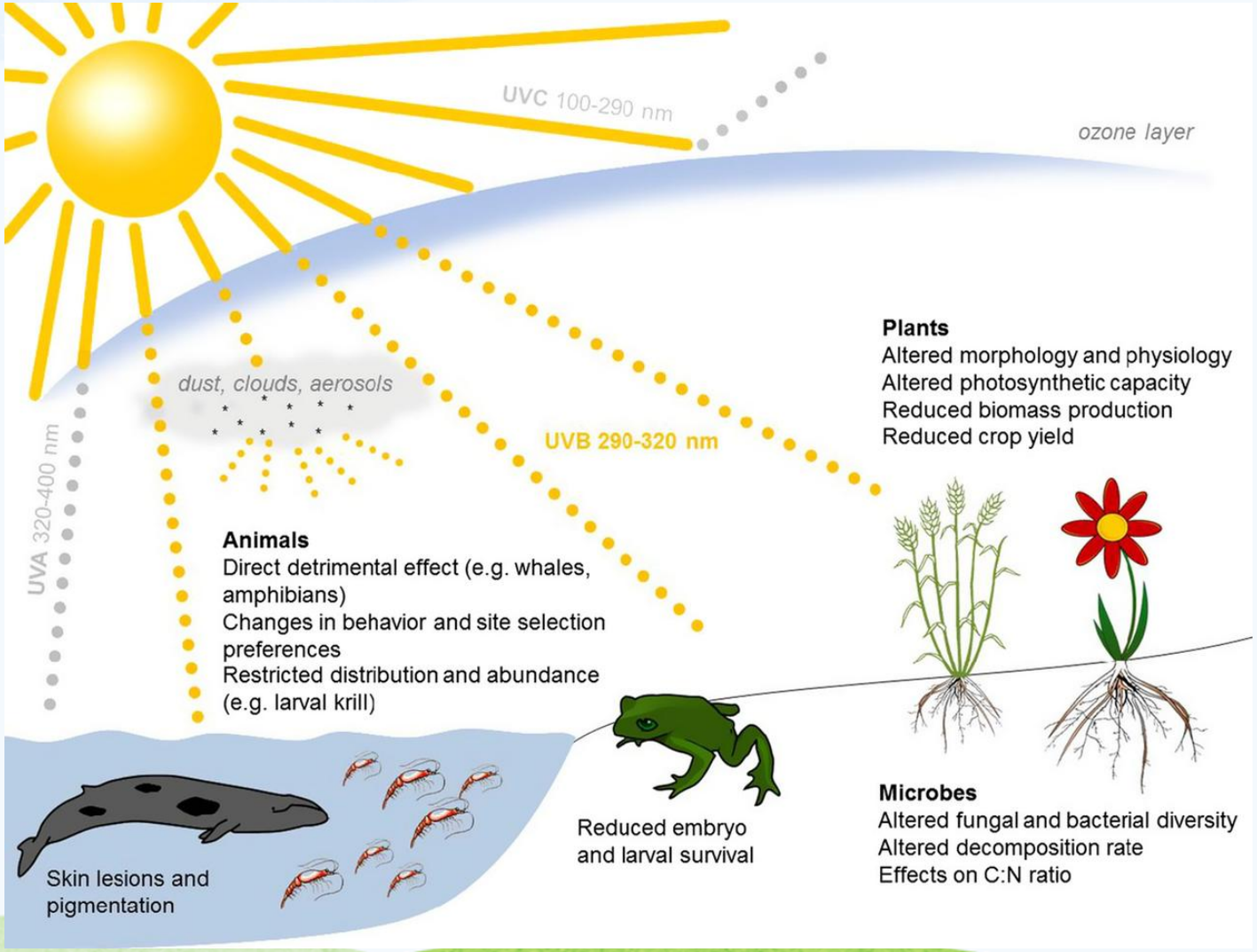
Effect Of Ozone Depletion – Plant





This clover plant is showing dead tissue after 9 hours of exposure to ozone

Effect Of Ozone Depletion – Marime Life



Global Warming Potential (GWP)

- HCFC & HFC

Radiation from the sun and other forms of heat energy, are being prevented from being released from the atmosphere by carbon dioxide, CFC and HCFC refrigerants, causing an increase in temperature on the earth surface. The result of this is referred to as "Greenhouse Effect".

Global Warming Potential - Green House Gases

Green house Gas – gases that have the ability of retaining some of the earth energy that leads to increase in temperature within the atmosphere. For example:

- Carbon dioxide
- Methane
- Fluorinated Gases
- Chlorofluorocarbon

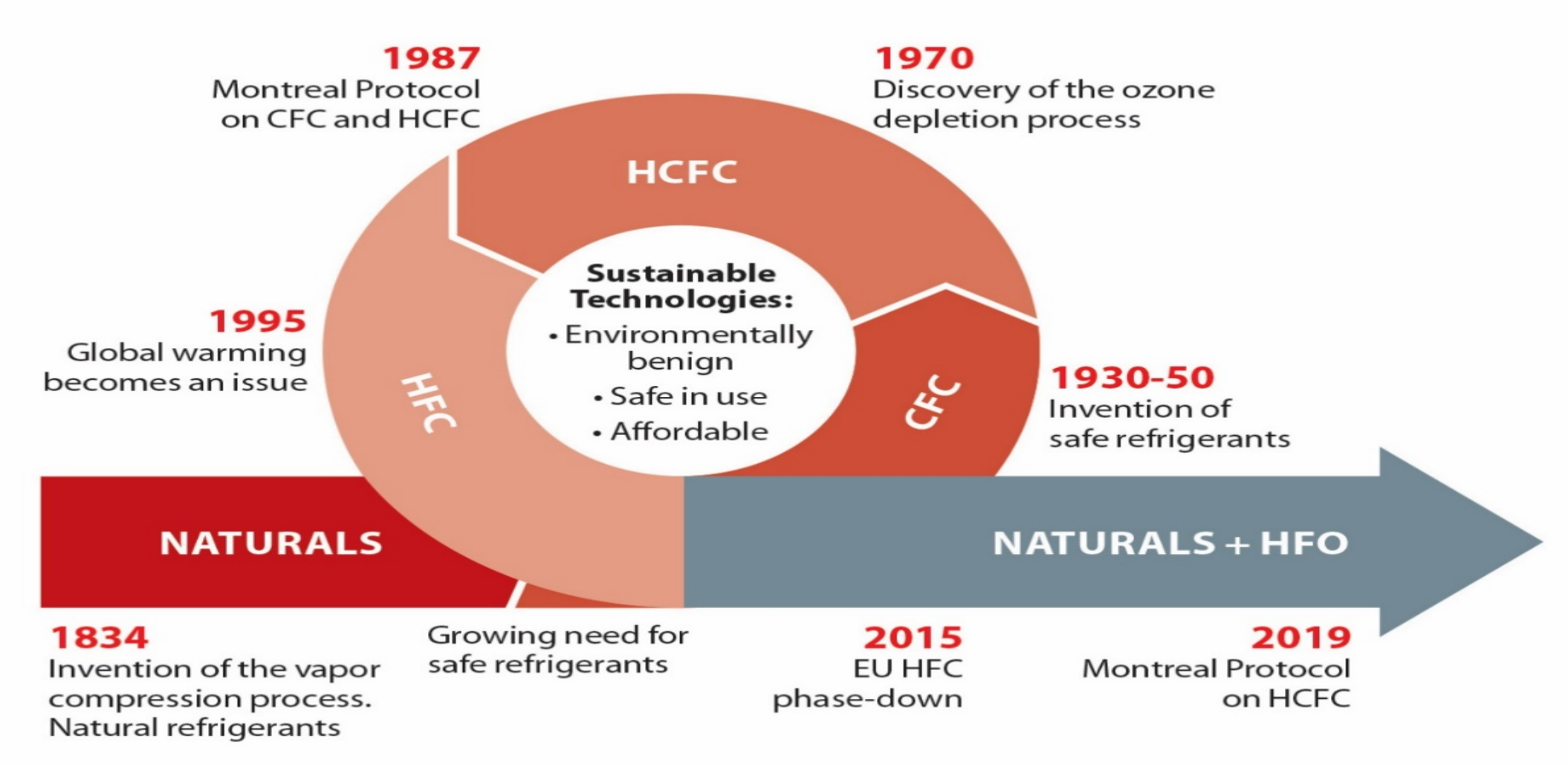
Environmental Concerns- Short Live Climate Pollutant

There are two main areas of environmental impact:

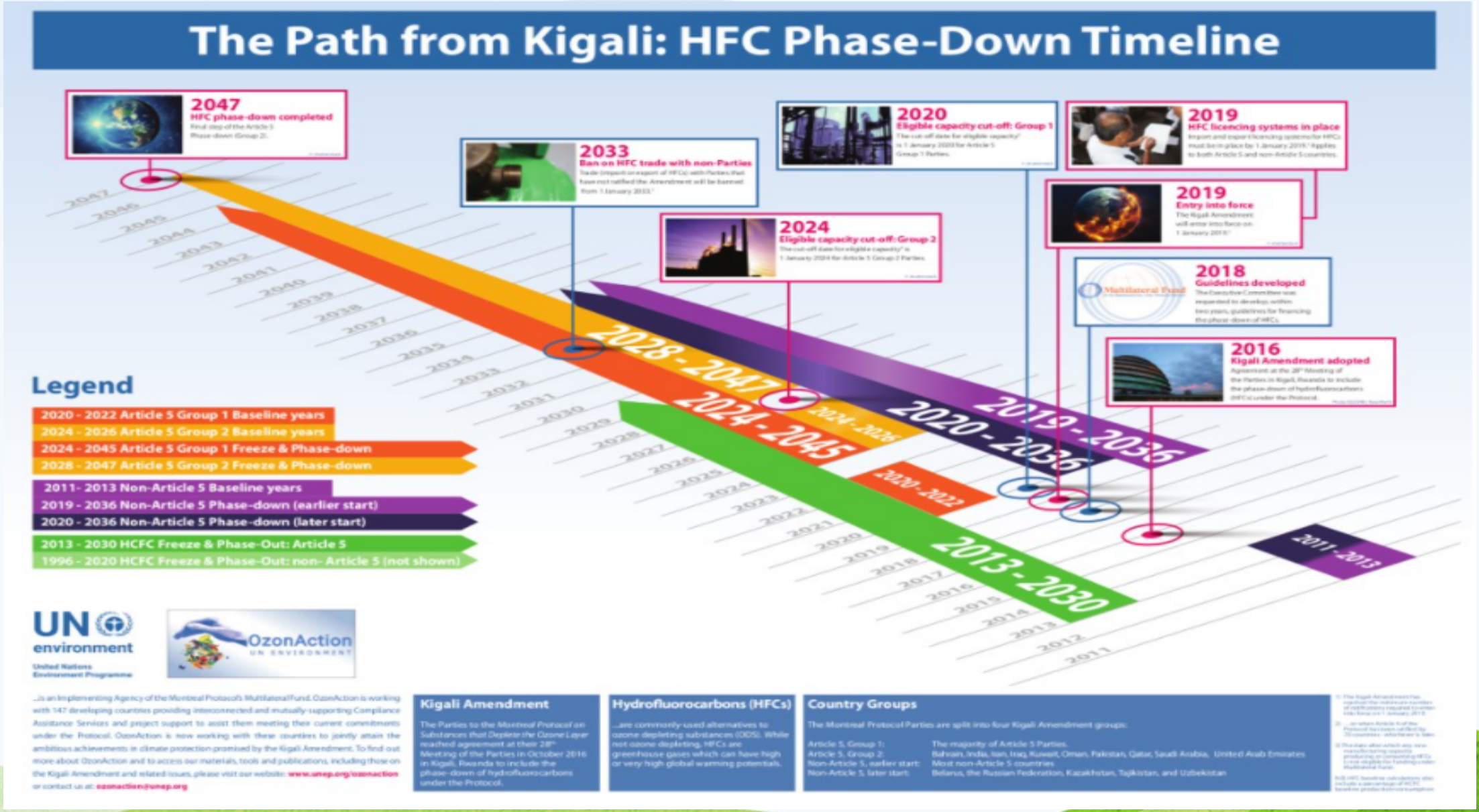
1. Direct: The leakage of refrigerant gases into the atmosphere which can cause ozone depletion and contribute to global warming.
2. Indirect: Refrigeration and air conditioning systems consume energy, which raises CO_2 emissions and contributes to global warming

Evolution of Refrigerant and Phase out Period

Montreal Protocol



Kigali Amendment




MONTREAL
PROTOCOL
ACHIEVEMENTS

African Countries – Roles and contribution

•Africa have been signatories to these protocol and amendment though we contribute less than 2-3% of causes depleting the ozone and alarming global warming potential we are yet to be the most vulnerable.

•Quoting from UN climate change conference report held 2006 " the frequency and intensity of drought seems to have already worsened in parts of African; total available water in large basin of Niger, Lake Chad and Senegal has decreased by 40-60% ."

•Between 13.1 and 14.1 million people are waking each day to face high level of acute food insecurity and severe water shortages across Ethopia, Kenya and Somalia due to drought in the first quarter of 2022.

Mitigation Procedure To Environmental Impact

Reduce Direct Impact

- Use a refrigerant gas with lower environmental impact: Look to use a refrigerant gas with zero ozone depletion potential (ODP) and low global warming potential (GWP).
- Lower the leak rates of your system: Refrigerants only create direct emissions when they leak to atmosphere. It is recommended that you ensure your system is leak-tight, considering every fitting, seals, O-ring within the systems and follow a regular maintenance schedule.
- Ensure correct end-of-life treatment of refrigerant gases: Ensure that you recover and dispose of refrigerant correctly when maintaining, upgrading or decommissioning a system.

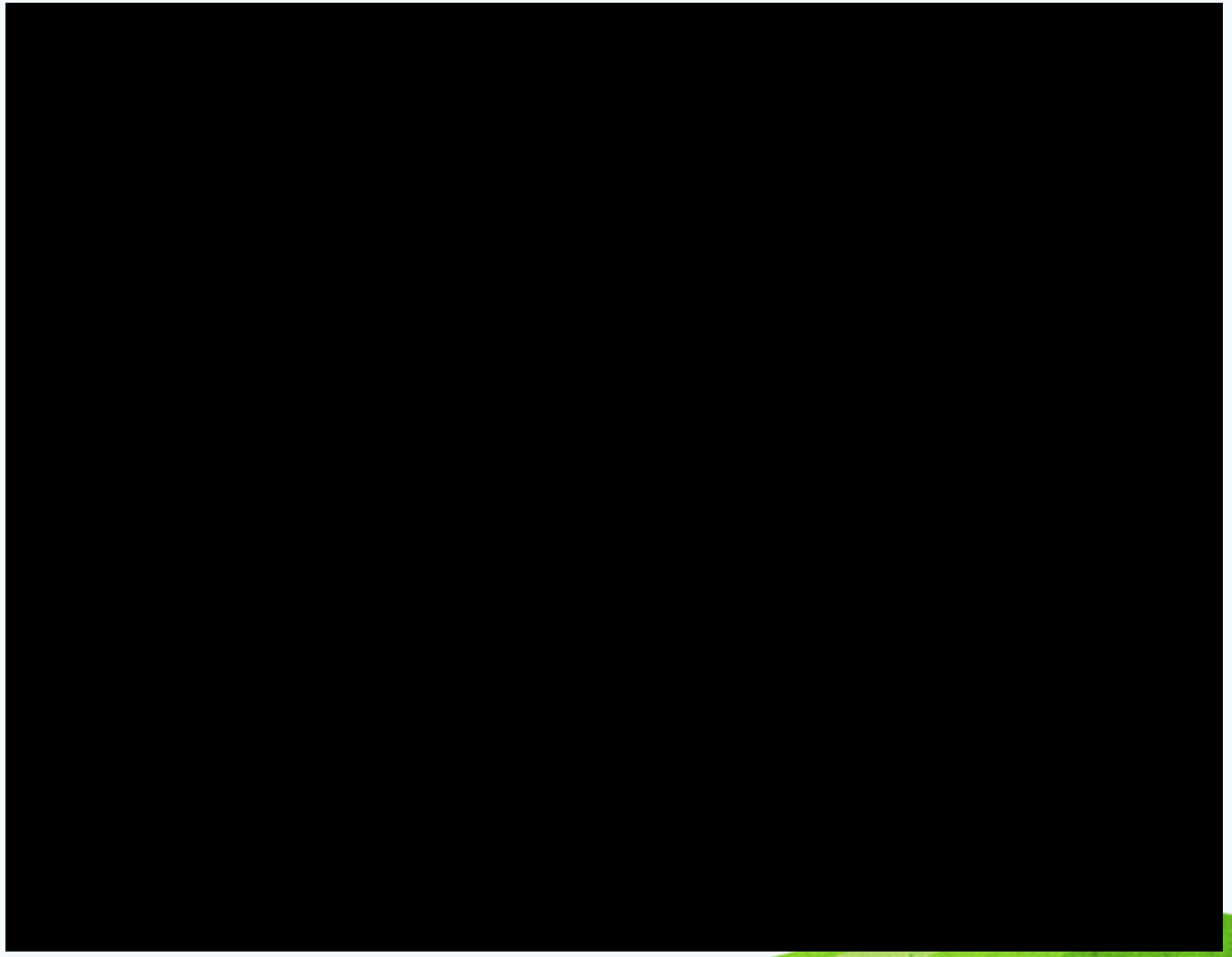
Reduce Indirect Emissions

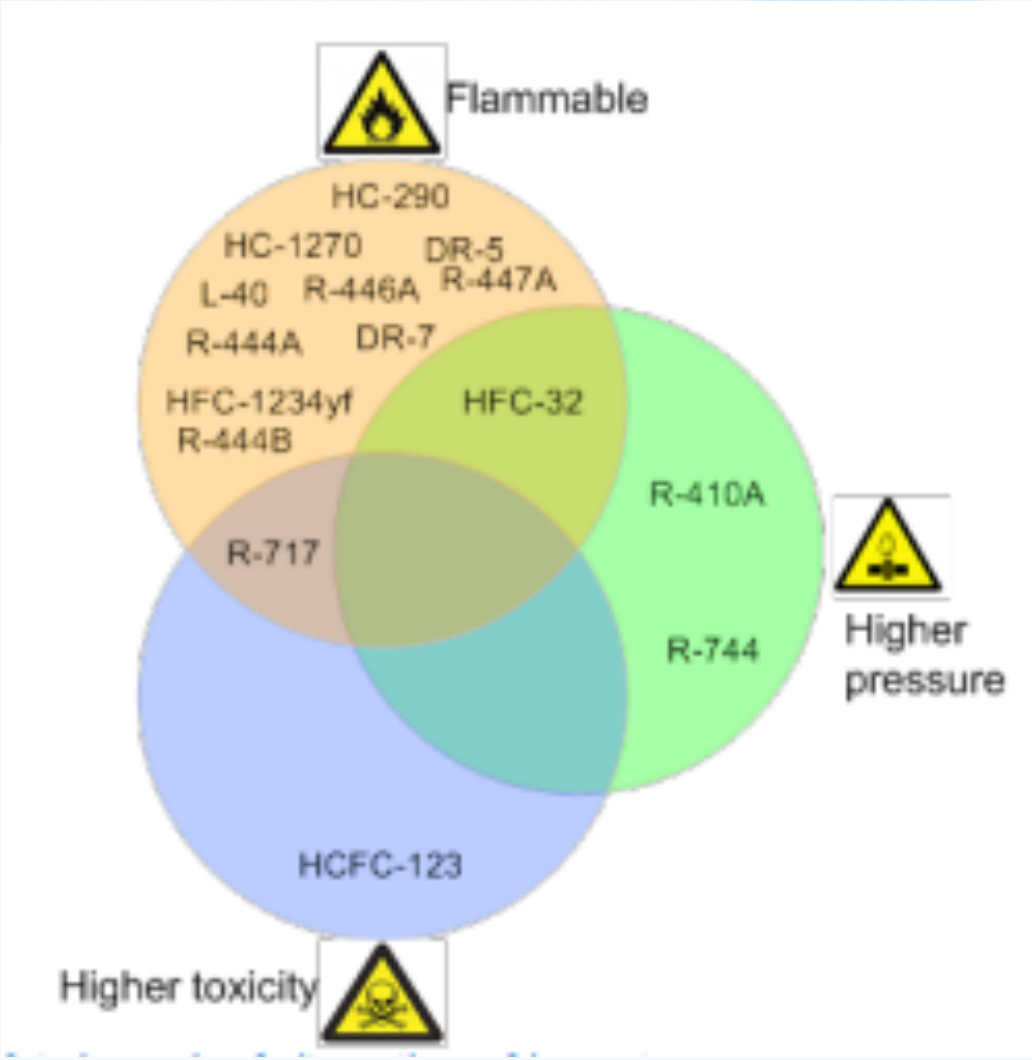
- Minimize the power consumption of your refrigeration or air conditioning system: For existing systems, ensure that you are regularly maintaining the system and using the correct refrigerant gas. Installing new systems may offer substantial energy savings, via modern technology using next generation refrigerants, including HC, HFOs, and Natural Refrigerant.
- Use your refrigeration or air conditioning system less often: Improve insulation, install doors on commercial refrigerators, freezers and display cases, and change the temperature set-points for air conditioning.

RECAP OF MAIN POINTS

- Ozone Depleting Substances – CFC – R12 (100%), halon, HCFC – R22 (50%)
- Global Warming Potential – HCFC (50%), HFC (100%)
- Green house Gases - Carbon dioxide, Methane, Fluorinated Gases, Chlorofluorocarbon
- Phase out period –

1. CFC – R12 - 2010
2. HCFC – R22- 2030
3. HFC – R134a, 410 - 2047





The Future

Convergence and uncertainties


THANKS FOR
LISTENING
Questions & Answers