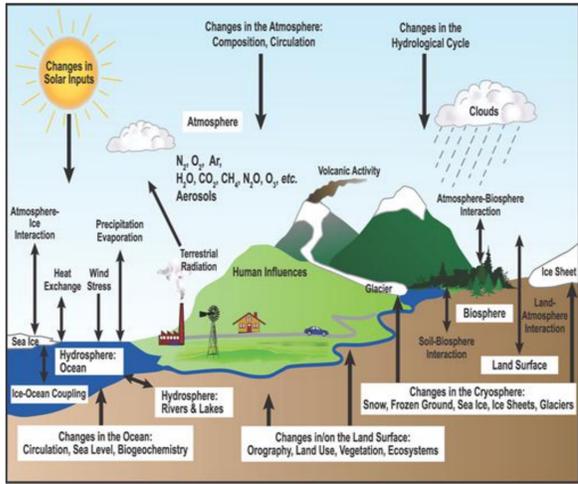


## CLIMATE CHANGE AND THE INTERNATIONAL SHIPPING RESPONSE



### GHG Emissions and Their Impacts

The following gases are considered as the main GHG gases:

- **Carbon dioxide:** Most of the atmospheric GHG emissions are CO<sub>2</sub>. Variety of sources including use of fossil fuels.
- **Methane:** Agriculture and livestock, mining, transportation, and use of certain fossil fuels, sewage, and decomposing garbage in landfills.
- **Nitrous oxide:** The industrial agriculture and use of fertilizers accounts for the majority of releases.
- **Halocarbon:** Non-natural but manufactured compounds, extensively used as refrigerants.

Other gases like ozone or water vapour have also GHG properties. The GHG emissions act as a blanket for the earth, leading to warming of the planet with significant implications for weather system, land desertification, ice cap melting, sea level rise, oceans acidification and so on.

### CLIMATE CHANGE IS A TRULY GLOBAL ISSUE AND THUS REQUIRES A GLOBAL APPROACH

### Global Response

The United Nations (UN) organizations have been at the forefront of dealing with environment and climate change as they are global problems, requiring global response.

#### Organizations and instruments

**United Nations Environmental Program (UNEP):** Mandate is to coordinate the global response to established and emerging environmental challenges.

**Intergovernmental Panel on Climate Change (IPCC):** Its mission is to review the science of climate change and acts as a major knowledge-organization on climate change issues. IPCC have generated 5 major assessment reports on various aspects of climate change so far.

**United Nations Framework Convention on Climate Change (UNFCCC):** This is a framework Convention which aims to limit the level of climate change by focusing on promoting cooperation on understanding and reducing the effects of human activities. The Convention itself does not set precise objectives/targets but these are embodied in Kyoto Protocol that was adopted later.

**The Kyoto Protocol (1997):** This was concluded a first part of efforts to create stronger commitment by the developed countries in the form of GHG emissions targets for Annex I countries. Non-Annex I countries accepted to support the process within CBDR (Common But Differentiated Responsibility) framework. To reach their targets, Annex I countries can reduce their emission and/or offset their emissions via:

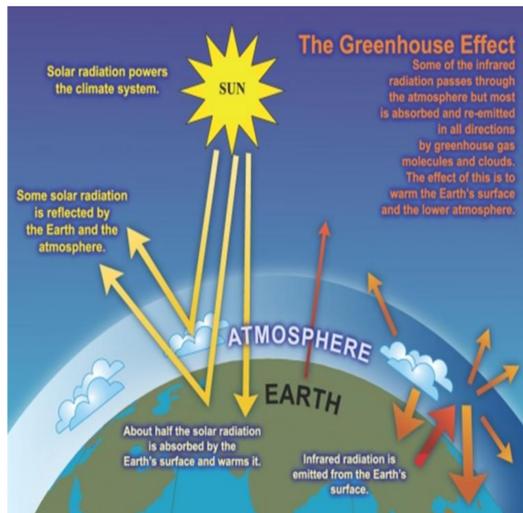
- Joint Implementation
- Clean Development
- Emission Trading.

**International Maritime Organisation (IMO):** The role of IMO has been defined in Article 2.2 of the Kyoto Protocol. Accordingly, IMO is responsible for control of GHG emissions from international shipping.

### Overview

Air emissions has emerged as a serious concern in the past few decades due to their impact on human health and the wider eco-system including land and sea. Generally, the air emissions became an issue for the regulators when:

- Air emissions impacted the public health;
- Air emissions had visible effects on the environment, sea, land, agriculture, etc.
- Climate change was single out as the most serious environmental threat to earth, countries and global communities.



The GHG emissions act as a blanket for the earth, leading to warming of the planet

### Air Emissions and Human Activities

Air emissions are closely linked to human activities and industrial production growth. There are ample evidence that show that the issues of air emissions and their impact have been exacerbated as a result of:

- Industrialization and production growth
- Urbanization and population growth
- Dramatic growth in use of fossil fuels
- Significant growth of transportation as a result of societal changes

### CO<sub>2</sub> as the Main GHG Emission

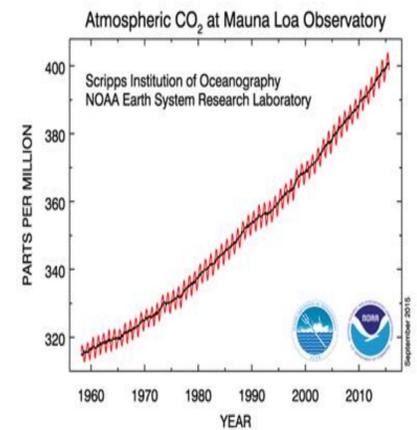
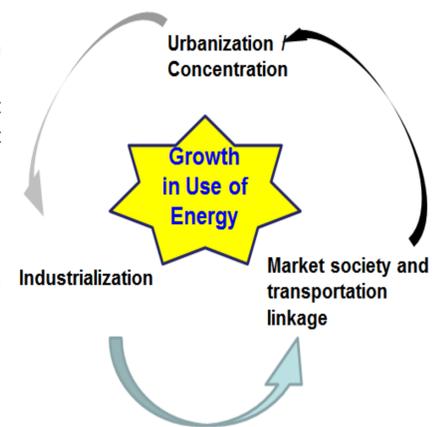
The link between air emissions and industrial activities are unequivocal. All types of GHG emissions show a sharp rise since industrialization. CO<sub>2</sub> increase is alarming and has recently passed the 400 ppm in the atmosphere. The danger level set by IPCC is 450 ppm that would represent a 2 °C global warming.

Man-made GHG emissions are mainly generated due to the burning of fossil fuels. IPCC's estimates that if the world going to limit the atmospheric CO<sub>2</sub> to 450 ppm; they should reduce the man-made GHG emissions by 50% by 2050 relative to 1990 levels.

### Climate Change Impact on Oceans

Oceans are a major sink for air emissions including CO<sub>2</sub>. As a result, oceans' water properties changes and as a result the marine habitats are disturbed by the modification of the ocean properties.

- **Oceans acidification:** Due to absorption of CO<sub>2</sub> and acid rains; a lower pH by 0.1 units is already in place. The high rate of oceans acidification may impair the ability of many organisms to cope with changing water properties.
- **Ocean dilatation (sea-level rise)** due to melting ice caps endangers the coastal ecosystems, small island countries and accelerates coasta erosion.



### International Shipping Response

#### Mandate

IMO, through Kyoto Protocol, is mandated to deal with control of GHG emissions from international shipping.

#### IMO GHG studies

IMO have so far conducted a number of major GHG studies in order to establish the level of GHG emissions from shipping, to evaluate the technical and operational measures and policies that could be used to control shipping GHG emissions and to establish a consensus view on the subject. These studies, inter alia, include:

- First IMO GHG Study 2000
- Second IMO GHG Study 2009
- Third IMO GHG Study 2014

#### Regulatory developments

IMO have debated the subject of regulatory developments for control of GHG emissions from international shipping in its Marine Environment Protection Committee (MECP) since 1997 and in 2011 have adopted a mandatory set of technical and operational measures to make ships more energy efficient. These are:

- EEDI (Energy Efficiency Design Index) for new ships.
- SEEMP (Ship Energy Efficiency Management Plan): for all ships.
- EEOI (Energy Efficiency Operational Indicator): As a voluntary operational indicator for all ships.

As a result, a new Chapter 4 on energy efficiency for ships was added to MARPOL Annex VI.

#### IMO Further measures

All studies so far indicates that despite significant effort by the IMO, the general rising trend of the GHG emissions from international shipping will continue. As under UNFCC and globally, the objective is to stabilize or ideally reduce the trend of GHG emissions, IMO has undertaken to look at additional further measures.

The main work is currently concentrated on a fuel consumption data collection system. The draft developed data collection system identifies three core elements including:

- Data collection by ships,
- Flag State functions in relation to data collected including verification and
- Establishment of a centralized database by the IMO.

