

# Air Pollution: A overview

# What is air pollution?

- Contamination of the air by **noxious gases and minute particles of solid and liquid matter (particulates)** in concentrations that endanger health



# Sources of Air pollution

<i>Stationary Sources</i>	<i>Point Sources</i>	These are large stationary sources, such as, industries, power plants, municipal incinerators, etc.
	<i>Area Sources</i>	These are small stationary sources and mobile sources with indefinite routes, such as, residential heating, commercial and institutional heating, open burning, city traffic, etc.
<i>Mobile Sources</i>	<i>Line Sources</i>	These are highways, railway tracks, navigation routes, etc.
	<i>Area Sources</i>	These are airports, railway stations, ports, etc.

# Sources of Air Pollution

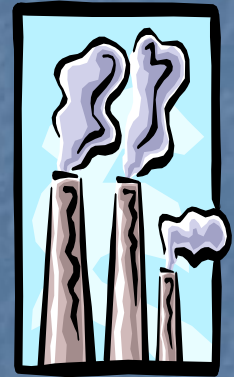
## Two Types:

### A. Natural Sources (Caused by nature)

- Volcanic eruption
- Natural Forest fires, volatile hydrocarbons etc

### B. Antropogenic Sources (Man caused)

- Combustion of gasoline and other hydrocarbon fuels in cars, trucks, and airplanes
- Burning of fossil fuels (oil, coal, and dinosaur bones)
- Insecticides
- Herbicides
- Everyday radioactive fallouts
- Dust from fertilizers
- Mining operations



# Types of Air Pollutants

Two Types of Air Pollutants :

1- Primary Air Pollutants

2- Secondary Air Pollutants

## Primary Air Pollutants

Pollutants which are directly contributed from the sources.

There are five primary air pollutants which together contribute **more than 90 % of global air pollution.**

These are:

- Carbon Monoxide, CO
- Nitrogen oxides, NO<sub>x</sub>
- Hydrocarbon, HC
- Sulphur Oxides, SO<sub>x</sub>
- Particulates

## **Secondary Air Pollutants**

**These are pollutants, which are forms with the intermixing of primary air pollutants.**

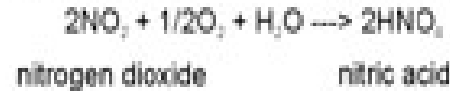
**These are:**

- **Photochemical Smog**
  - **Acid rain**
  - **Peroxyacetyl nitrate (PAN)**
- Etc.**

## Sun's Energy

photochemical  
reactions are driven  
by the sun

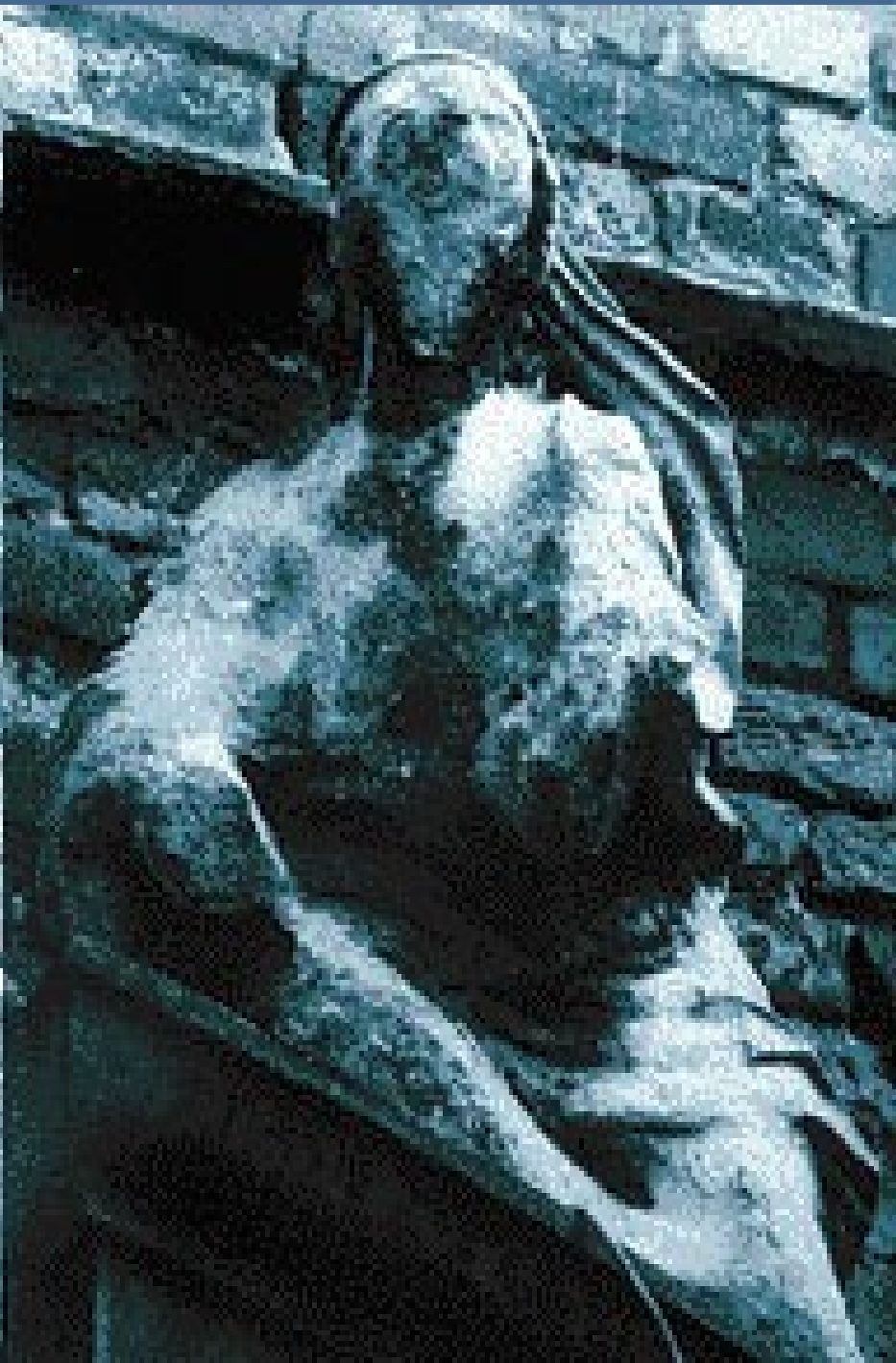
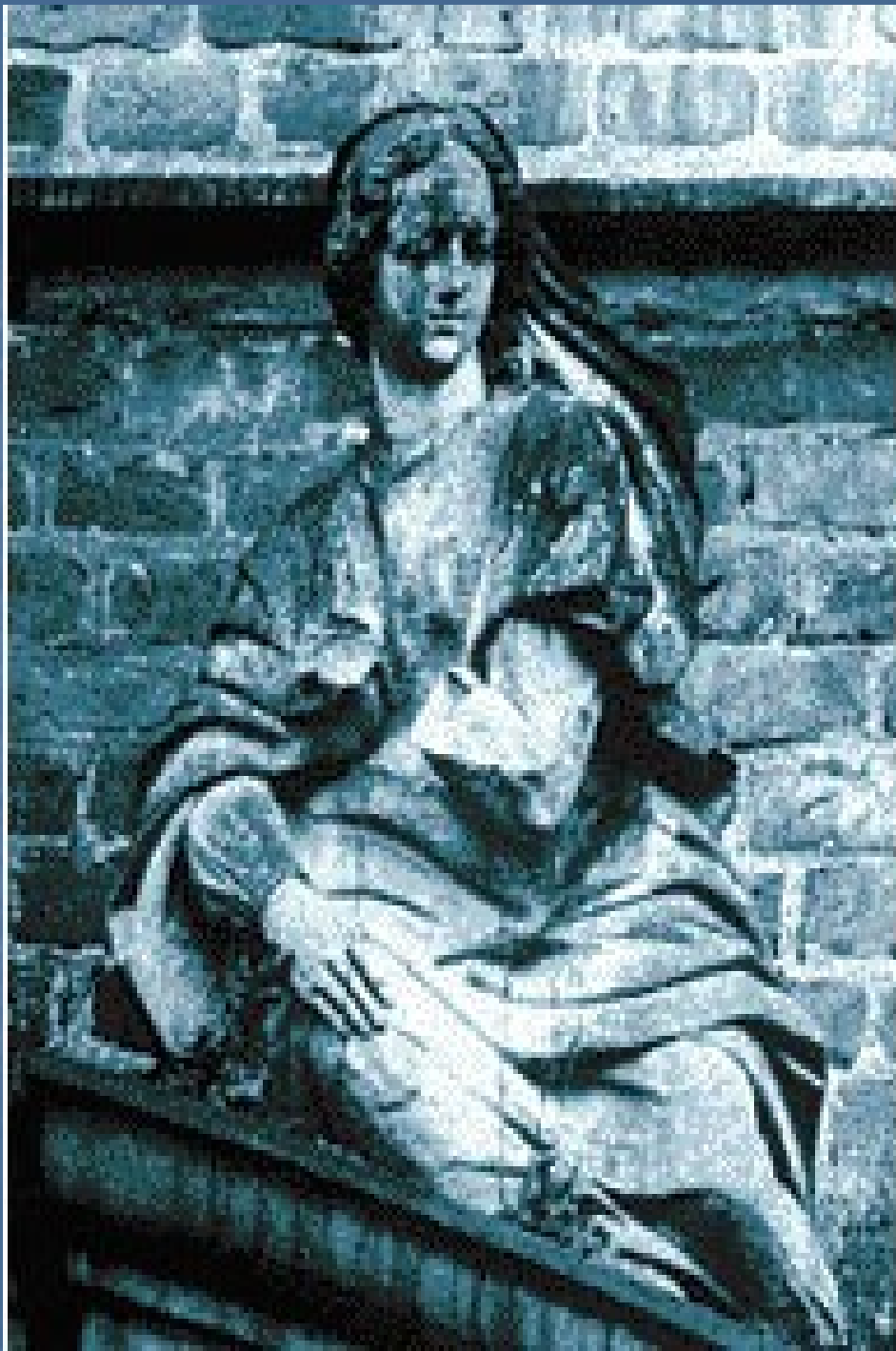
### Oxidation



Acid-forming gases and particles have been linked to a variety of impacts, including forest decline, accelerated leaching of metals from rocks and soils, the decay of limestone, marble, and other building materials, and damage to the human respiratory system.

### Acid Rain

# Acid Rain





# Effects of air pollution

## Categories:

- 1) Biological effects
- 2) Physical and economical effects
- 3) Other effects (global warming, Ozone depletion, acid rain et c)

# Biological effects

Sub categories:

## I Effect on vegetation:

- Affects metabolism of plants
- Visible effects: Necrosis, Chlorosis, Discoloration of leaves/ Needles, Disturbed root growth, etc
- Effects on physiological reaction such as photosynthesis, chlorophyll concentration, carbohydrate and mineral contents, transpiration,
- Effect on biochemical process such as ascorbic acid content,

## II effects on acidic deposition on terrestrial and aquatic ecosystem:

- Al mobilized, root damaged
- Plant nutrient form soil such as K is gradually leached out of soil.
- Change in pH prevents hatching of fish eggs.
- Organics matter loss from soil
- Prolonged acidification results in the total collapse of aquatic ecosystem.
- High acidity causes killing of fishes, reduced growth and reproductive failure

## III effects on Human health:

- Long term exposure cause server health affects in humans
- Incidence of respiratory disease

### Specific diseases:

Lung cancer, Bronchitis, Stomach cancer etc.

Industrial worker may be exposed to various types of occupational hazards following hazards:

Silicosis = due to asbestos

Byssinosis = due to coal dust

Bagassosis = due to sugarcane dust

Tobaccosis = due to tobacco

Siderosis = due to iron

# Specific effects

- $\text{SO}_2$  caused cessation in ciliary action
- Gastro intestinal damage
- Abnormality in fertility
- Hypertension

## CO EFFECTS

$\text{CO} + \text{Hb} \text{ ----- } \text{CO-Hb}$  (Carboxy hemoglobin)

Co-Hb reduced the ability of Hb to carry  $\text{O}_2$

2-5 % Co-Hb level affects CNS

> 5 % causes cardiac and pulmonary function changes

## Lead effect:

Lead poisoning can cause anemia, neurological disorders, heart disease, kidney damage, abdominal pain etc.

### IV Effects on animals:

- Cattles are more sensitive than sheep and pigs, particularly to fluorine
- Fluorine accumulates on the grass and in turn taken by cattle while grazing

# Economic and physical effects

- Material are damaged due to air pollution
- Corrosion of metals
- Decay in buildings stone
- Weakening and fading of textile, leather
- Cracking of rubber
- Discoloration of paper etc

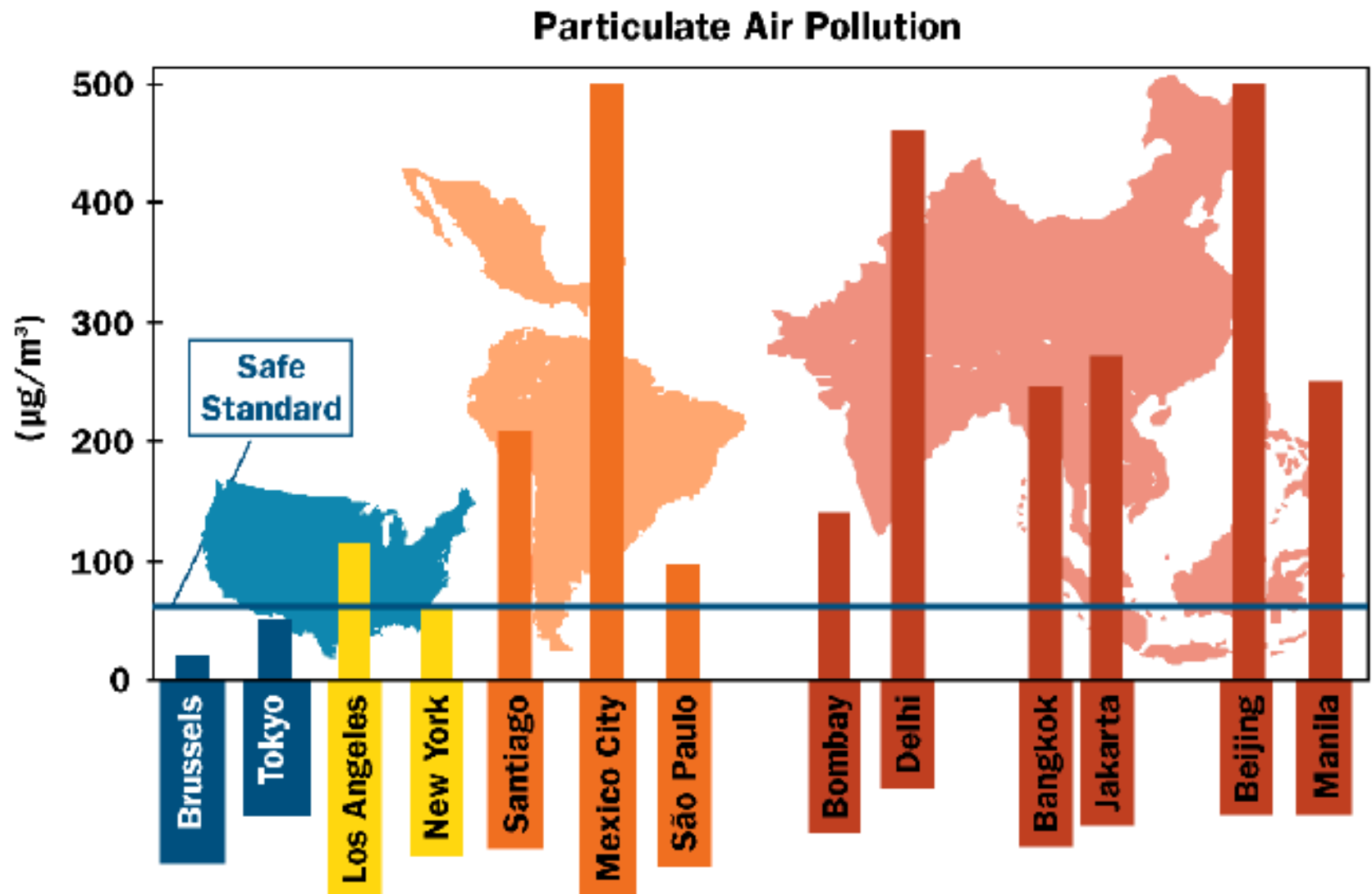
# Effects on the environment

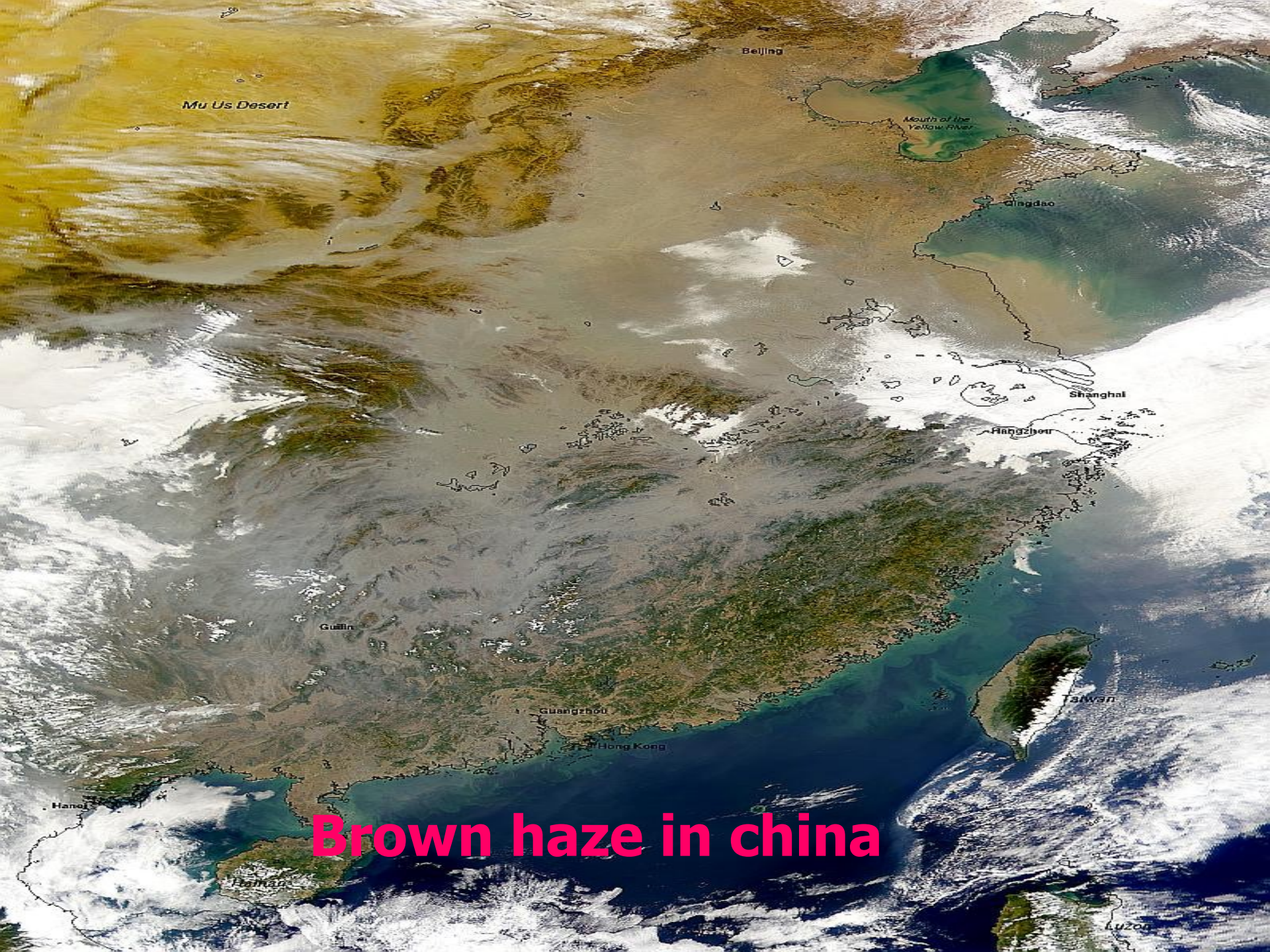
- **Damage Vegetation**
- **Ozone depletion**
- **Global warming**
- **Skin Cancer**
- **Nose and throat irritation**
- **Chest pain**
- **In human population-  
respiratory problems,  
allergies, strengthens  
lungs, and a risk for  
cancer**





# World Wide Figure of Air Pollution





Mu Us Desert

Beijing

Mouth of the Yellow River

Qingdao

Shanghai

Hangzhou

Guilin

Guangzhou

Hong Kong

Taiwan

Hanoi

Palawan

Luzon

**Brown haze in china**

# Pollution turning Indian cities into 'gas chambers'

**Cities like New Delhi are among the 10 most polluted in the world and the govt is doing little to improve the situation, say experts**

NEW DELHI — Faced with choking air pollution in their cities, Indians are increasingly turning to face masks and oxygen shops in a bid to escape what one independent watchdog has described as "lethal gas chambers".

While there are no official figures, most studies agree that India accounts for the bulk of the estimated three million people who die prematurely worldwide each year from pollution-related causes.

The World Health Organisation lists the capital New Delhi as among the top 10 most polluted cities in the world.

A study by the Centre for

Science and Environment (CSE) described India's urban centres as "lethal gas chambers" because of the amount of pollution.

According to another study done last year by a private environment watchdog, the Tata Energy Research Institute (TERI), the level of Respiratory Suspended Particulate Matter (RSPM) in India was almost five times the average level in the United States.

In the western city of Bombay, India's commercial hub, about 30 per cent of RSPM was found to be due to vehicular pollution, 20 per cent due to dust, 15 per cent came from

domestic fuel combustion, small industries, stone-crushing and refuse burning and around 3 per cent from large and medium industries.

In New Delhi, where smog clouds virtually block out the sky almost every winter, about 70 per cent of air pollution is blamed on vehicle emissions.

In a bid to improve the situation, India's Supreme Court has over the past two years tried to force public transport owners to switch to more environment-friendly fuels, but the move has not so far been completely successful.

Each time the court sets a deadline for a switch-over, drivers of around 10,000 buses and 60,000 auto-rickshaws and taxis go on strike to protest against their inability to pay for the fuel conversion kits.

The strikes have led to rioting by transport operators and

angry commuters who find they cannot get to work.

In 2000, India adopted new emission norms that Europe enforced back in 1992-93.

While things were not getting much worse, government inaction was preventing the situation from improving, said Ms Anumita Roy Chowdhury of the CSE.

She added: "You can't simply plant a tree and think the air will be cleaned. Air pollution problems are as complicated as their solutions."

One of the biggest problems of environment control in India is monitoring, experts say.

The TERI report said most studies aimed at measuring ozone concentrations "have tended to focus on traffic intersections".

But ozone travels much further and has wider health implications, they said. — AFP

## **Causes of Ozone depletion**

**Ozone layer is the upper most layer of stratosphere (conc. Is 10 ppm)**

**Absorb u.v radiations in the range of 220-230 Nm.**

**By absorbing u.v it protects living creatures.**

## Types of U.V. Rays:

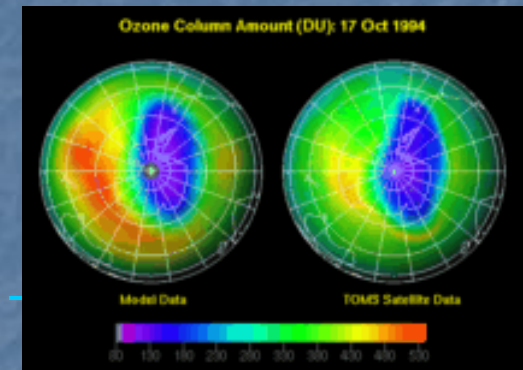
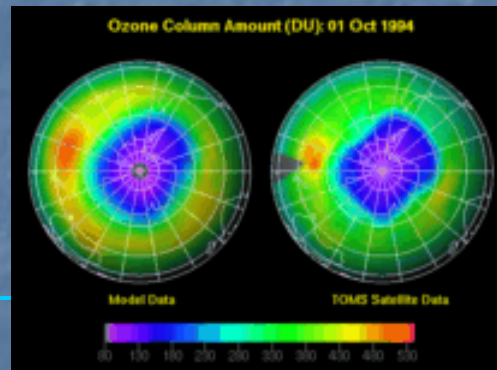
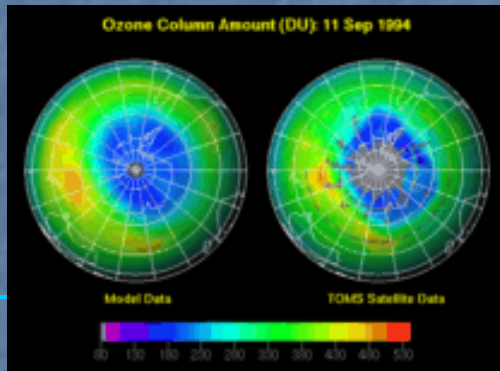
UV-A = 320-400 nm – Not affected by ozone

UV-B = 280-320 nm – Absorb by ozone only  
(Most dangerous)

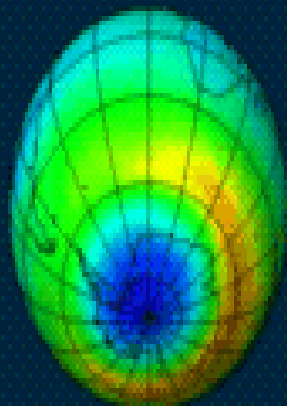
UV-C = 200-280 nm- absorbed by atmospheric constituents and ozone

Ozone is unstable and destroyed mainly in the upper Stratosphere through photochemical reactions

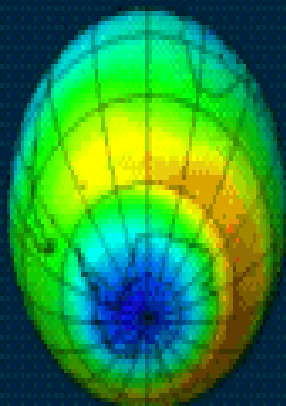
## Comparison between Model Results and Actual Satellite Data



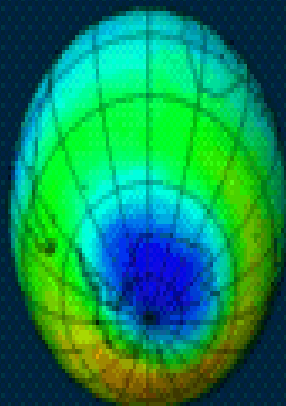
Day 20 (11 September '94) Day 40 (1 October '94) Day 56 (17 October '94)



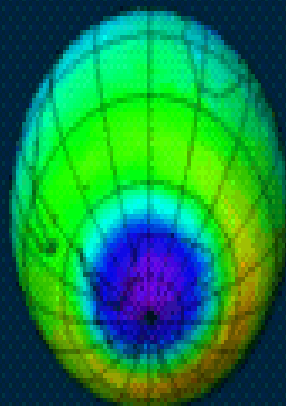
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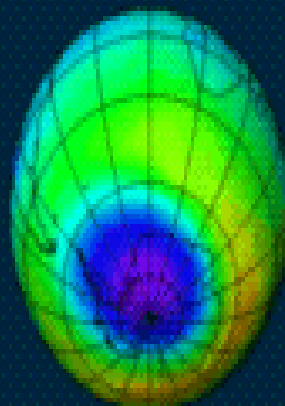
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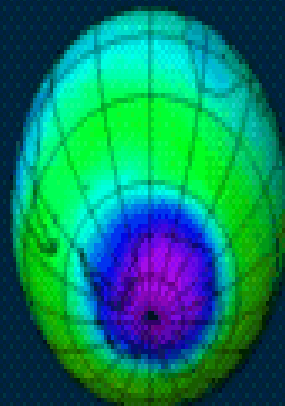
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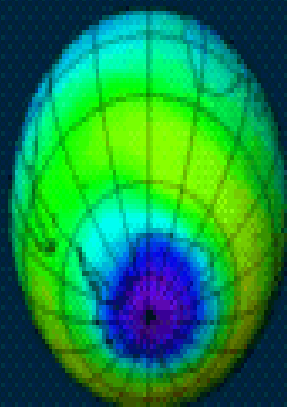
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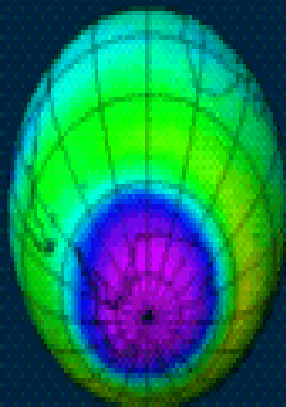
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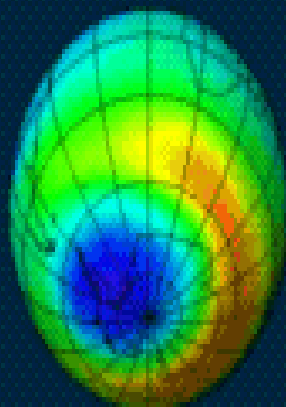
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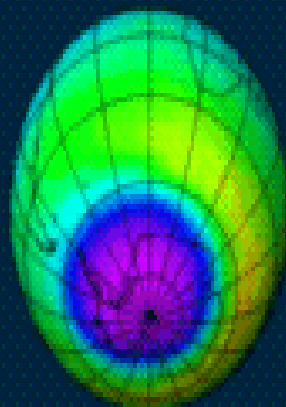
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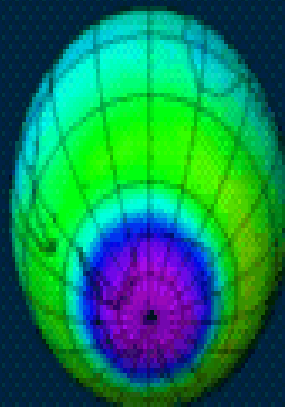
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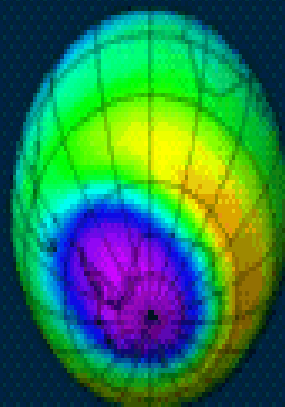
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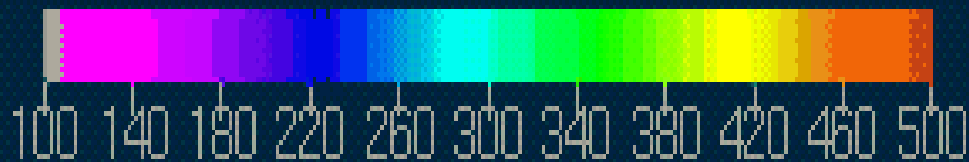
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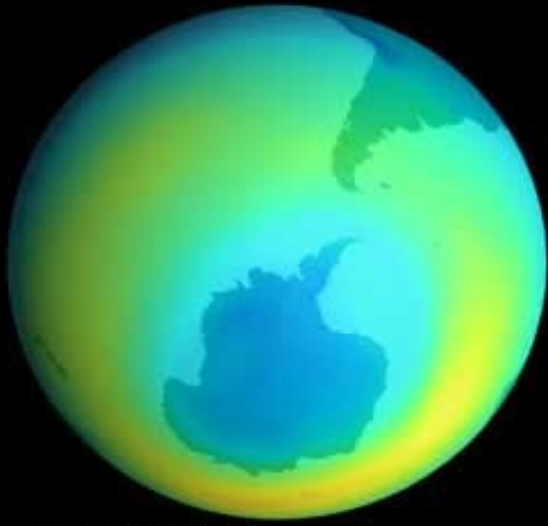


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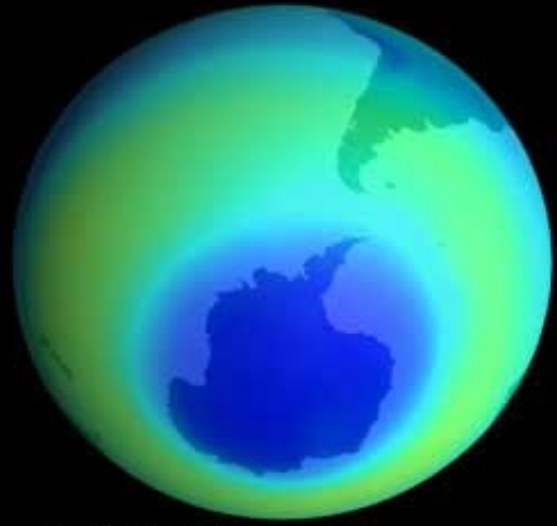


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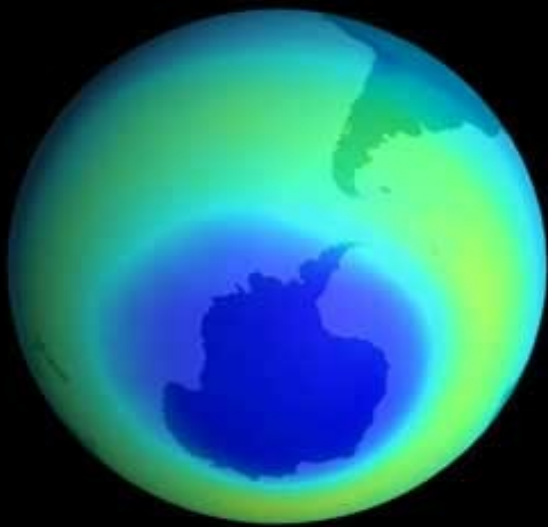




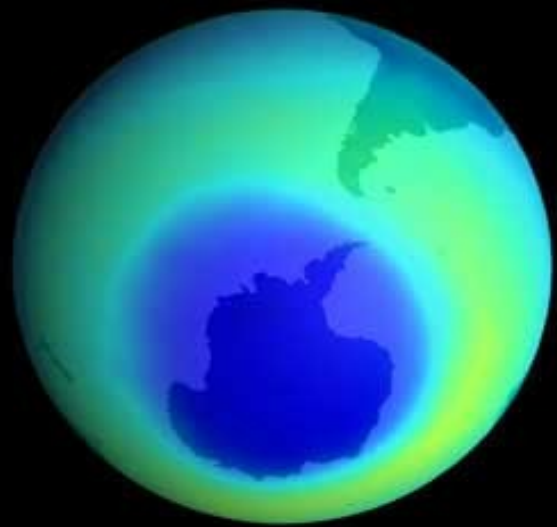
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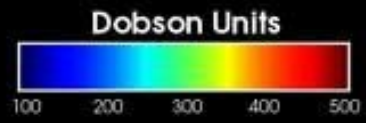
September 1987



September 1993



September 1999





*Thank You*