

IBM NAAN MUDHALVAN

SKILL UP

PROJECT TITLE: ENVIRONMENTAL MONITORING

COLLEGE: PERI INSTITUTE OF TECHNOLOGY

DEPT: ELECTRONICS AND COMMUNICATION ENGINEERING

DOMAIN: INTERNET OF THINGS (IOT)

Submitted By: karpuram prathap

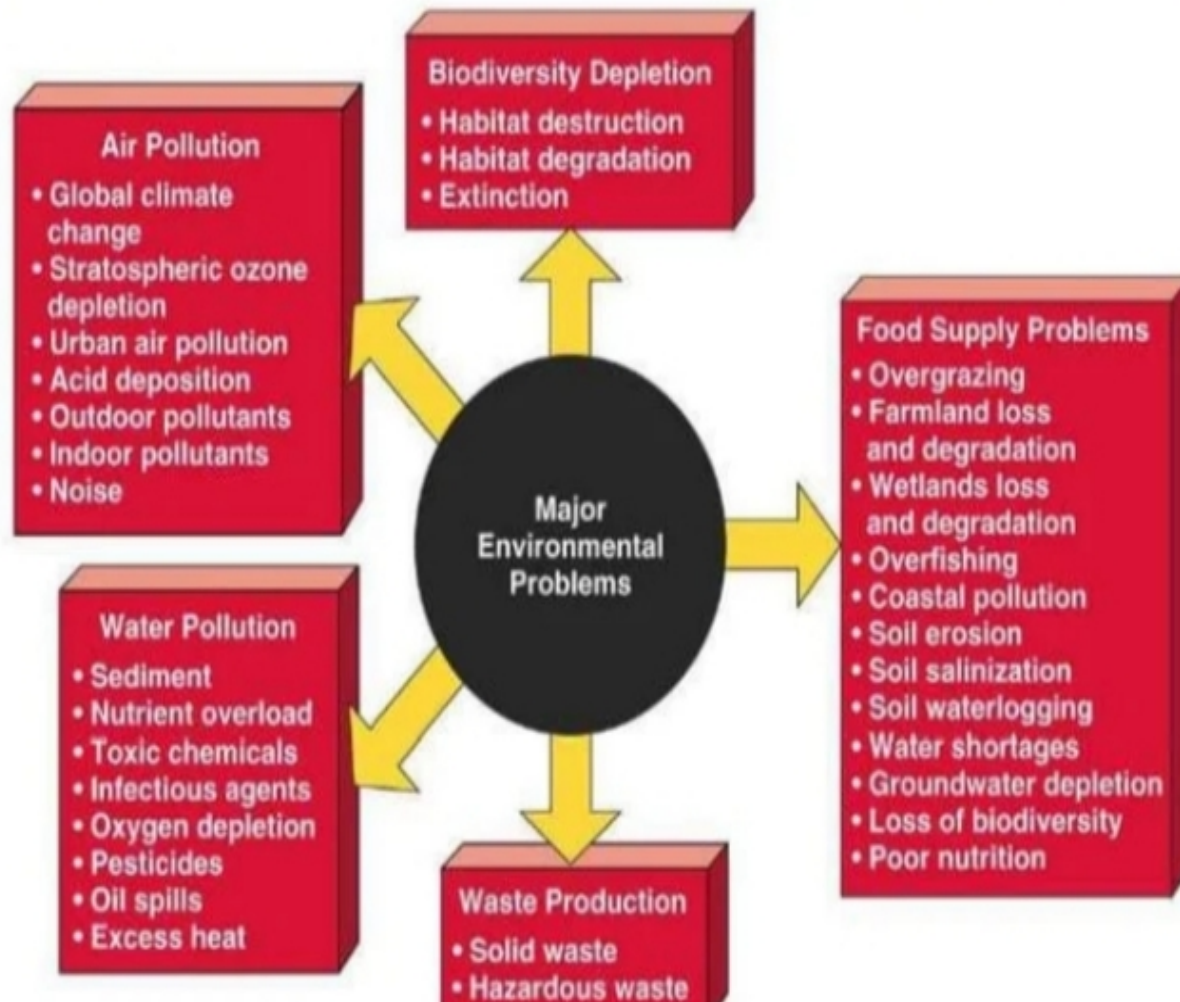
The background features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern and dynamic look. The shapes are layered, with some appearing more prominent than others, and they extend towards the corners of the frame.

# ENVIRONMENTAL MONITORING

# What is environment ?

- ☒ "Environmental" is an adjective that means concerned with the protection of the natural world
- ☒ The environment is the complex of physical, chemical, and biotic factors that act upon an organism or an ecological community
- ☒ Air
- ☒ Land
- ☒ Water

# Major Environmental problem



# ENVIRONMENTAL MONITORING

- ⊠ Environmental monitoring can be defined as the systematic sampling of air, water, soil, and biota in order to observe and study the environment, as well as to derive knowledge from this process.
- ⊠ Environmental monitoring describes the processes and activities that need to take place to characterize and monitor the quality of the environment.
- ⊠ Environmental monitoring is used in the preparation of environmental impact assessments, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment

# OBJECTIVE OF MONITORING

- ☒ Monitoring of the environment may be undertaken for a number of reasons. In general monitoring is done in order to gain information about the present levels of harmful or potentially harmful pollutants in discharges to the environment, within the environment itself or in living creatures that may be affected by these pollutants. This definition can be expanded as follows:-  
Monitoring may be carried out to assess pollution effects on man and his environment in order to identify any possible cause and effect relationship between pollutant concentration and health effects, climatic changes etc.  
To evaluate pollution interactions and patterns To assess the need for legislative controls and emissions of pollutants and to ensure compliance with emission standards.

# *ENVIRONMENT MONITORING METHODS*

- ☒ Ground-based Sampling and Measurements
- Model-based Monitoring
- Satellite based Monitoring

# Satellite Based Environment Monitoring Areas

- ☒ Atmosphere Monitoring
  - Air Quality Monitoring
  - Climate Change Studies
  - Resource Management
- ☒ Glaciers and Snow
  - Flood and Drought Management
  - Landuse / Landcover



# TYPES OF MONITORING

- ☒ SOURCE MONITORING
- AMBIENT ENVIRONMENT MONITORING

# SOURCE MONITORING

- ☒ This may be carried out for a number of reasons
  - Identification and characterization of main sources in urban areas.
  - Determination of the mass emission rates of pollutants from a particular source and assessment of how these are affected by process variations.
  - Evaluation of the effectiveness of control devices for pollution abatement.

# AMBIENT ENVIRONMENT MONITORING

- ☒ Monitoring the environment may be carried out for a number of reasons
  - Mapping the concentration of pollutants in the environment. Identification of pollution sensitive zones.
  - Identification of possible sites for the environmental monitoring stations. Tracking progress towards National Quality Standards attainment and emission reductions.
  - Serve as the basis for modeling of predicted pollutant concentrations in ambient air.
  - Provide input for human health risk assessment studies.

# Air pollution

- ⊠ Air pollution is the introduction of chemicals, particulate matter, or biological materials that cause harm or discomfort to humans or other living organisms, or damages the natural environment into the atmosphere
- ⊠ Air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere.
- ⊠ Household combustion devices, motor vehicles, industrial facilities and forest fires are common sources of air pollution.

# Type of air pollution

- ☒ Particulate matter (PM10 and PM2. ...
  - Ozone (O3)
  - Nitrogen dioxide (NO2)
  - Carbon monoxide (CO)
  - Sulphur dioxide (SO2)

# What Causes Air Pollution

- ✘ The Burning of Fossil Fuels. When fossil fuels are burned, they release large amounts of carbon dioxide into the air.
- Agricultural Activities.
- Waste in Landfills.
- Exhaust From Factories and Industries.
- Mining Operations.
- Fishing Fleets.
- Forest Fires.
- Fine Particulates.

# CLASSIFICATION OF AIR POLLUTANTS

- ✘ PRIMARY POLLUTANTS (emitted directly to the atmosphere)  
There are five primary pollutants that contribute to 90% of global air pollution.  
Oxides of carbon like carbon monoxide and carbon dioxide (CO & CO<sub>2</sub>).  
Oxides of nitrogen, like NO, NO<sub>2</sub>, NO<sub>x</sub>, (expressed as NO<sub>x</sub>).  
Oxides of sulphur particularly sulphur dioxide (SO<sub>2</sub>).  
4. Volatile organic compounds, mostly hydrocarbons.  
Suspended particulate matter (SPM): Aerosols.

# CLASSIFICATION OF AIR POLLUTANTS

## ☒ SECONDARY AIR POLLUTANTS :

The pollutants that are produced in the atmosphere, when certain chemical reactions take place among the primary pollutants and with others in the atmosphere are called secondary air pollutants.

Sulphuric acid

Nitric acid

Carbonic acid

Ozone

Formaldehydes

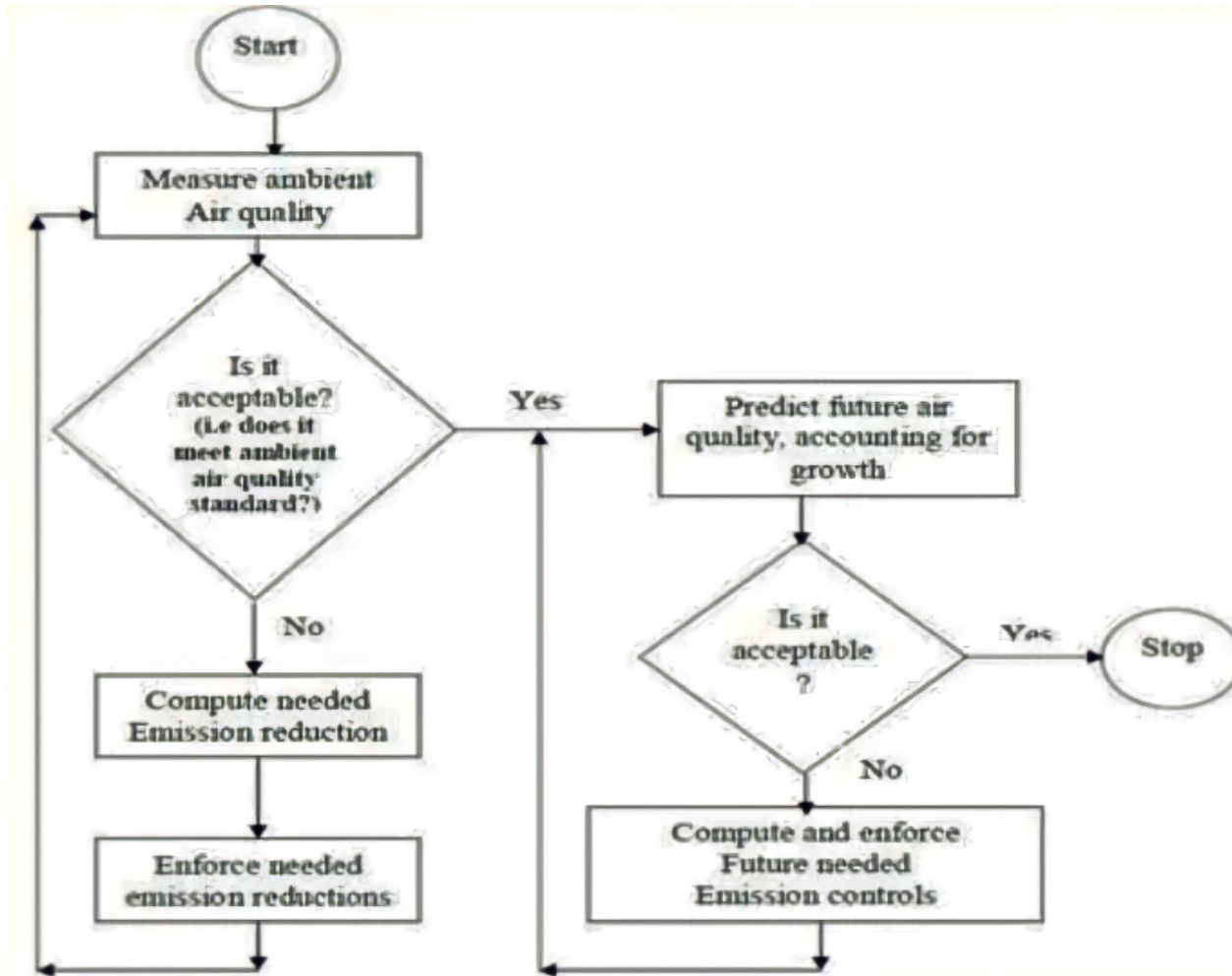
Peroxy-acyl-nitrate (PAN).



# EFFECTS OF AIR POLLUTION

- ⊠ Effects on human health
  - Irritation and inflammation
  - Breathing difficulties
  - Lung damage
  - Heart disease
- ⊠ Effects on natural environment :
  - Acid rain
  - Ozone layer depletion
  - Global warming
  - Global climate change
  - Photochemical Smog
  - Reduction in visibility

# Flow chart of air pollution



# National Ambient Air Quality Monitoring Program

## National Ambient Air Quality Standard Parameters

## Site & Parameter Selection

Background & other areas (Rural, Semi-urban, Urban, Industrial, sensitive etc.)

### Manual Monitoring

SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, O<sub>3</sub>, NH<sub>3</sub>, Benzene, B(a)P, Ni, As, Pb

### Automatic Analyzers

SO<sub>2</sub>, NO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub>, O<sub>3</sub>, CO, NH<sub>3</sub>, Benzene

### Gravimetric

PM<sub>10</sub> & PM<sub>2.5</sub>

### Wet-chemical Methods

SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>, NH<sub>3</sub>, Benzene

### Sample Processing & Chemical Analyses

Benzene, B(a)P, Ni, As, Pb (in PM<sub>10</sub>)

Well established monitoring -cum- laboratory infrastructure, Trained manpower, Well established guidelines, manual data generation & dissemination etc.

### Site Selection

- Away from source & other interferences (Inlet 15 m away from source / traffic artery)
- Height of inlet > 1m (preferably 3-10m)
- Double the height of nearby wall / obstruction
- Free flowing, well mixed
- Elevation Angle < 30° (from inlet to top of building)
- Collocated samplers should be 2 m apart

### Parameter Selection

- Sensitive Location (SO<sub>2</sub> & NO<sub>2</sub>)
- Health Impact Stations (All pollutants)
- Population & Exposure (All Criteria Pollutants)
- Kerb side [Traffic Intersection] (Criteria Pollutants + CO)
- Downstream [Accumulative, 50 m away traffic intersection] (Criteria Pollutants + O<sub>3</sub>)

Sophisticated Analyzers, QA/QC, Instant Data Generation, On line data disseminations, Air Quality Index, Early Warning System, Forecasting, Modeling etc.

# IMPORTANCE OF SATELLITE IMAGERY IN MONITORING AIR QUALITY

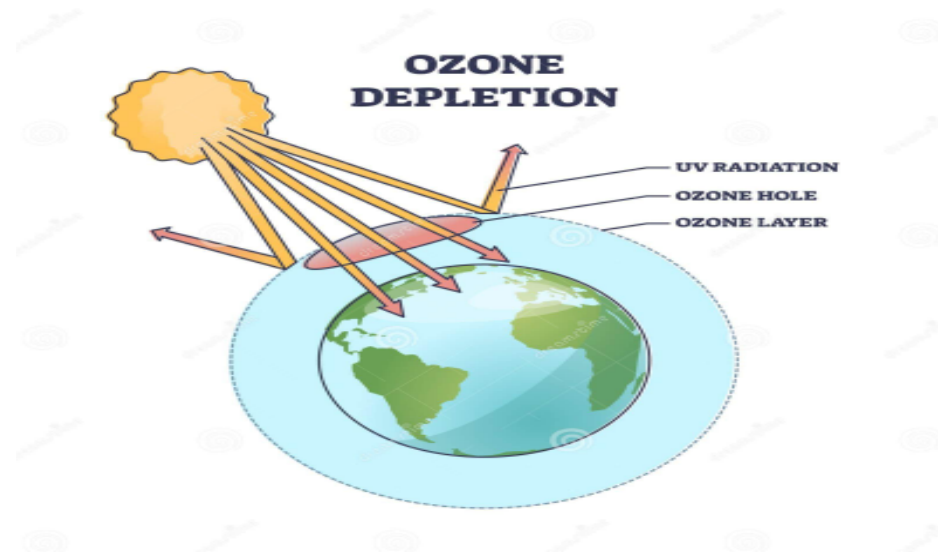
- ☒ Satellite remote sensing provides complete and synoptic views of large areas in one image on a systematic basis due to the good temporal resolution of various satellite sensors. Satellite remote sensing can monitor many pollutants simultaneously. It has the capability to monitor in near real time, and – provides continuously rapid monitoring.

## Some International Weather Satellites (Geostationary)

Name	Operator
METEOSAT, ERS, ENVISAT	European Space Agency
GMS	Japan
INSAT	India
Feng Yun	China
GOMS, METEOR	USSR
RADARSAT	Canada

# Ozone depletion

- ❑ Ozone layer depletion is the thinning of the ozone layer present in the upper atmosphere
- ❑ This happens when the chlorine and bromine atoms in the atmosphere come in contact with ozone and destroy the ozone molecules.
- ❑ One chlorine can destroy 100,000 molecules of ozone. It is destroyed more quickly than it is created.





# How can Ozone depletion be Reduced

- ☒ Check your fire extinguishers to find active ingredients.
- ☒ Don't buy aerosol products with chlorofluorocarbons (CFC).
- ☒ Dispose of pre-1995 refrigerators, freezers, and air conditioning units properly.
- ☒ Buy lumber, wood products and plywood that were not treated with methyl bromide.



# WATER POLLUTION

- ⊠ Water quality is affected by materials delivered to a water body from either point or nonpoint sources.
  - Point sources can be traced to a single source, such as a pipe or a ditch.
  - Nonpoint sources are diffuse and associated with the landscape and its response to water movement, land use and management, and/or other human and natural activities on the watershed.
  - Agriculture, industrial, and urban areas are anthropogenic sources of point and nonpoint substances.
- ⊠ Major factors affecting water quality in water bodies across the landscape are suspended sediments (turbidity), algae (i.e., chlorophylls, carotenoids), chemicals (ie., nutrients, pesticides, metals), dissolved organic matter (DOM), thermal releases, aquatic vascular plants, pathogens, and oils.



# EFFECTS OF WATER POLLUTION

- ☒ Water borne diseases diarrhea, typhoid etc.
- ☒ Eutrophication
  - organic matter dissolved oxygen (DO)
  - High levels of organic chemicals (acids, salts& toxic metals) can make the water unfit to drink, harm fish and other aquatic life, reduce crop yields.
  - Thermal pollution
  - Heavy metal poisoning eg Arsenic and Mercury poisoning of water.
  - Sediments (Increase the turbidity of water)

# SOURCE OF MONITORING

- ⊠ Apart from the monitoring of pollutants in liquid effluents, sampling may be carried out.
- ⊠ a) In rivers, lakes, estuaries and the sea in order to obtain an overall indication of water quality
- ⊠ b) For rain water, groundwater and run-off water particularly in the urban environment) to assess the influence of pollutant sources.
- ⊠ c) At points where water is taken for supply, to check its suitability for a particular use.
- ⊠ Apart from the measurement of chemical and physical parameters the quantitative or qualitative assessment of aquatic flora and fauna is often used to give a holistic view of the presence or absence of pollution, and well recognized relationships exist between the abundance and diversity of species and the degree of pollution. This is often used to assess the cleanliness of natural fresh waters (biological monitoring).