**ADB TA-9911 SUBPROJECT:** DEVELOPMENT AND IMPLEMENTATION OF A TRAINING PROGRAM FOR THE NATIONLA AQUATIC RESOURCES RESEARCH AND DEVELOPMENT AGENCY (NARA), SRI LANKA (53068-002).

# National Aquatic Resources, Research and Development Agency (NARA)'s Status and Needs on Disaster Preparedness



**Shyamali Weerasekara, Environmental Studies Division, NARA, Sri Lanka**

**June 2023**

# Sri Lanka's location of the Indian Ocean

- Located at the **centre of international shipping lanes connecting East and West**, roughly **10 nautical miles off the traditional East-West maritime trade route** .

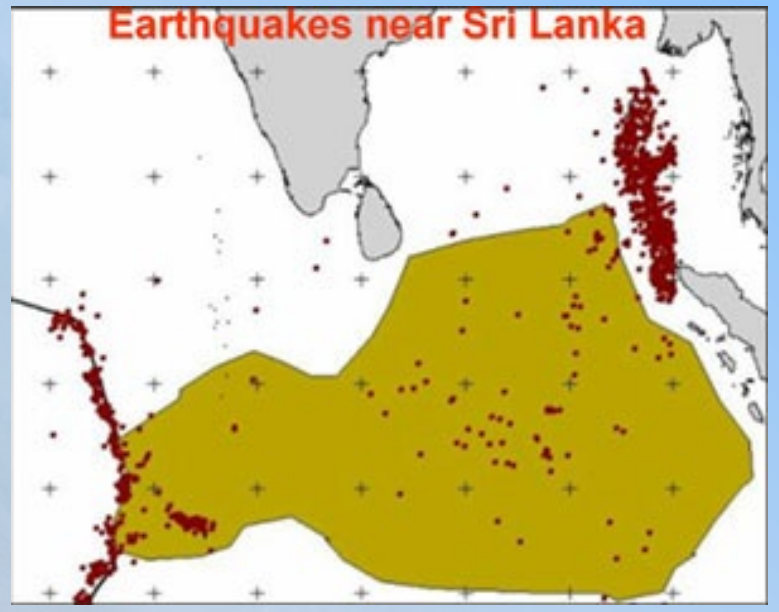
- Accounts for **24% of container traffic in the South Asian region.**

- **Around 60,000 ships are passing through the country's waters annually.**

Showing high vulnerability to marine pollution

Source: Hellenic Shipping News Worldwide (2020).

# Natural Disasters (Earth quakes & Tsunamis)

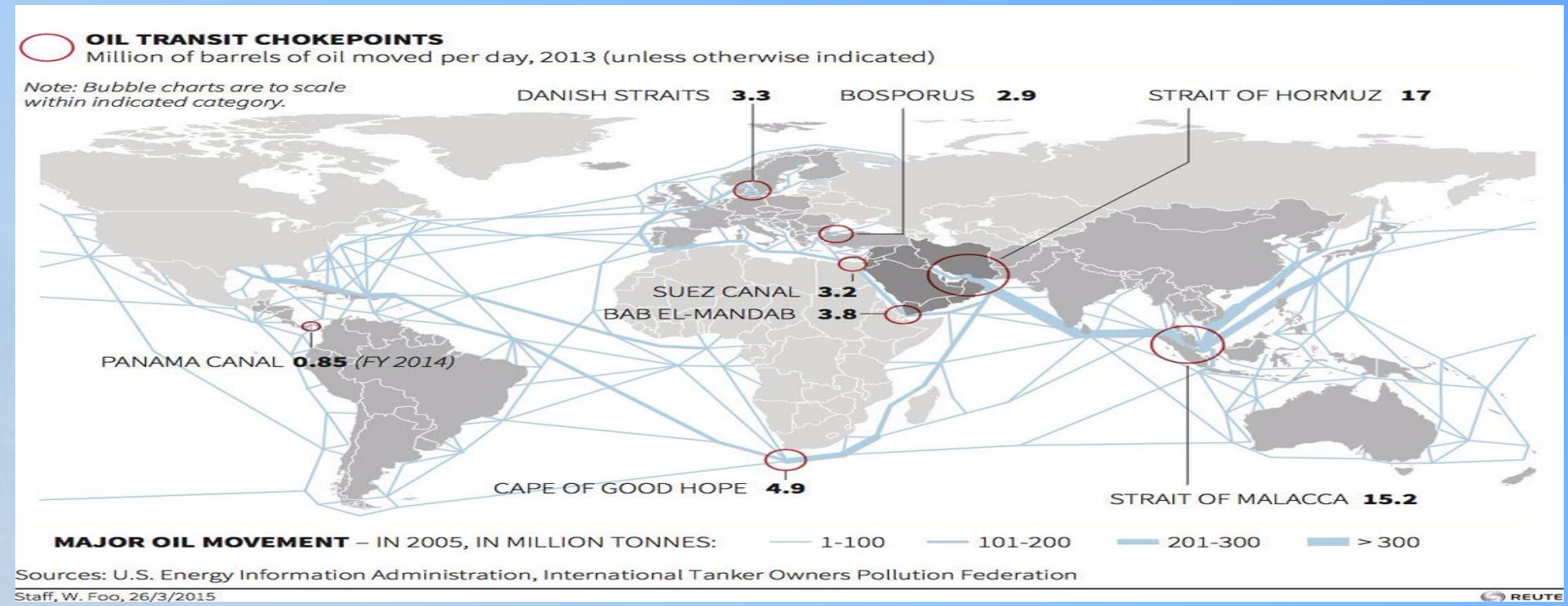




- Sri Lanka **lies in the large Indo-Australian plate** seemingly far away from any of the plate boundaries.
- The Indo-Australian plate is indeed **splitting about 500 -700 km from the southwest coast of Sri Lanka.**

**Source:** https://www.sundaytimes.lk/100627/Plus/plus_18.html

# Other Risk Factors




- About **525 million tons oil is transported in tankers in annually** in the EEZ of Sri Lanka.
- **Exploration of oil within the EEZ.**

# Marine Pollution Prevention & Disaster Preparedness in Sri Lankan Context…..

- Among the South Asian countries, Sri Lanka has the **most comprehensive domestic legal framework to fight marine pollution.**

- It has enacted laws specifically dedicated to **prevention and control marine pollution.**

**The Marine Pollution Prevention Act of Sri Lanka (Marine Pollution Prevention Act No.35 of 2008)** is the enabling legislation to give effect to the international conventions that Sri Lanka is a party to.

**Act is serving both the purposes;**

-**Giving a domestic legal framework** for prevention of marine pollution .
- **Incorporating the relevant international legal obligations** into domestic legal framework.

## Response Arrangements for Maritime Disasters

**A National Contingency Plan** was prepared by the Marine Environment Protection Authority (MEPA) in 1995 and revised in 1998 and 1999. It received Cabinet approval in 2000 and has undergone subsequent amendments.

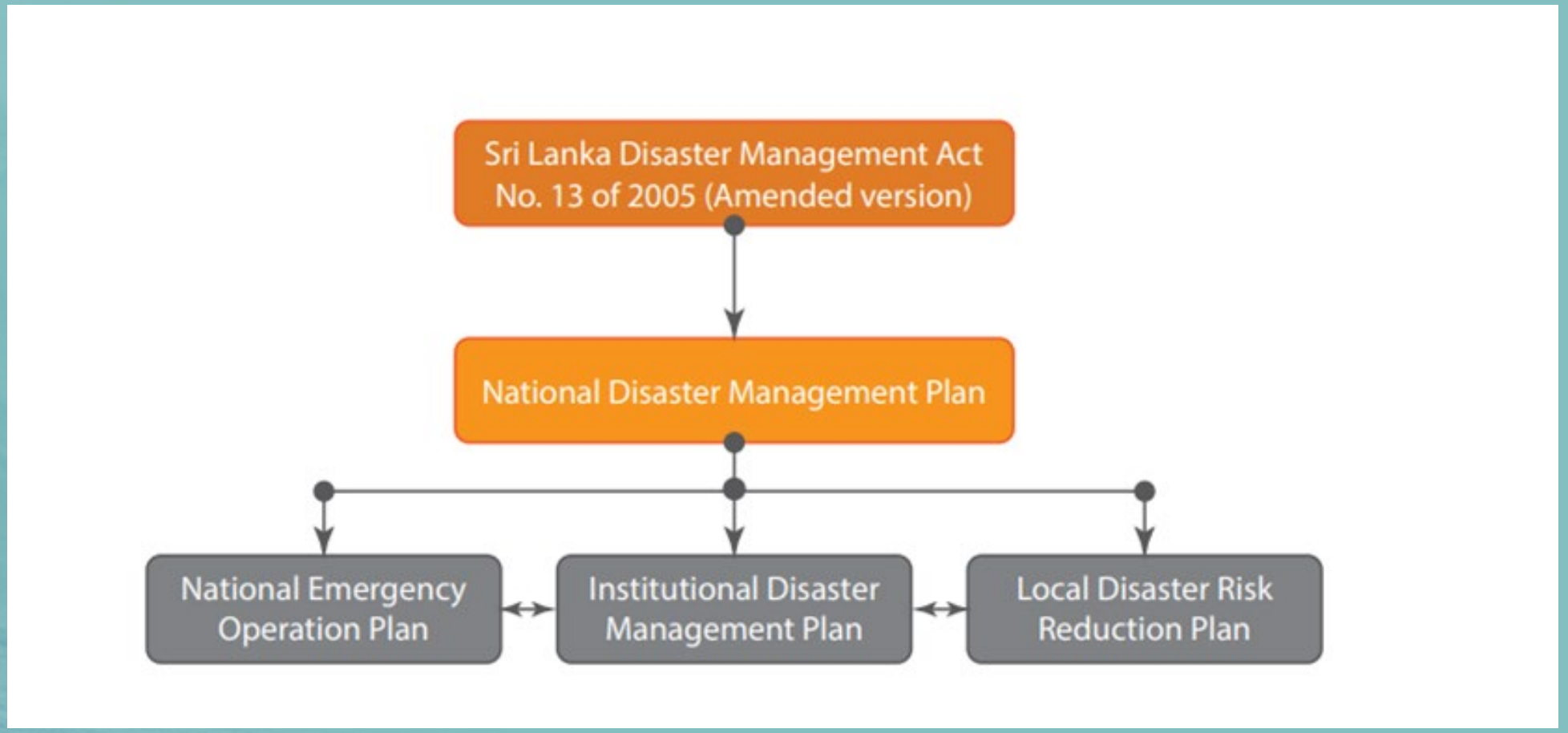
**The MEPA is the national authority responsible for** prevention, control, monitoring, mitigation and management of marine pollution in Sri Lankan waters and the restoration of the damaged environment and authority will take overall command particularly in larger spills at sea or where significant quantities of oil escape the port confines.

**Small spills of less than 100 tons**, however, would be generally tackled by the Sri Lankan Port Authority with the MEPA acting in a monitoring role.

If necessary, an Advisory Committee is formed consisting of local oil industry representatives and government bodies which provides the back-up to the On-Scene Commander appointed by the MEPA.

In the event of a large spill additional support would be sought through the spiller or neighboring countries.

# Disaster Management Centre(DMC)



# Frequency and consequence of hazards

## Sri Lankan Context

| Hazard type | Frequency of occurrence | Consequence | | |
|---|---|---|---|---|
| | | Area affected | Losses and damages | Impact on Population |
| Drought | Extremely high | Very high | High | Very high |
| Landslide | Extremely high | High | Significant | Significant |
| Floods | Very high | Very high | Very high | Very high |
| Cyclone | High | Very high | Very high | Very high |
| Tsunami | Rare | High | Extremely high | Very high |
| Earthquake | Rare | Significant | Significant | Significant |
| Animals/ insects | High | Significant | Significant | Significant |
| Coastal erosion | High | Significant | Significant | High |
| Tornadoes, lightning strikes and severe thunder storms | Very high | High | Significant | Significant |
| Pandemic, Epidemic | Very high | Very high | High | High |
| Industrial hazard | Significant | Significant | Significant | Significant |
| Forest fire | Significant | Significant | Significant | Significant |
| Chemical accident | Significant | Significant | Significant | Significant |
| Oil spills including inland and marine oil spills | Rare | Significant | Significant | Significant |

Source: Desinventar, NDMP – 2013-2017

## Loopholes – Sri Lankan Context

- In Sri Lanka, there is **no fund allocated for maritime disaster management**. The funds are only available after such incidents happens in Sri Lanka, that too under certain conditions.

## Way forward

- It is beneficial to have **properly trained, well equipped rescue team** placed in the Indian ocean region who can respond to maritime disasters timely in an effective manner to reduce the aftermath of such disasters.
- **Improving the human and physical facilities required for institutional strength.**
- **Establishing and monitoring of facilities to obtain Maritime information related to marine pollution** through satellite technology in real time.
- **Capacity development** for control of oil and chemical spill related to ports.
- **Focusing on the establishment of Forensic Laboratory** to identify the causes of accidents and deaths of marine life.
- Considering the possibility of **establishing funding mechanism** and the concept that the **polluter must be paid** so as to be able to cope with the maritime accident **without incurring the cost of their Treasury.**

# NARA’s status and needs on disaster preparedness

**These are the types of natural disasters and man-made disasters responded by NARA under the purview of Ministry of fisheries;**

**Natural Disasters**

- Storms and Cyclones
- Tsunami

**Man-Made disasters**

- Oil Spills
- Ship Accidents
- Waste disposal

## For Oil spills;

- NARA follows the protocols included in **National Oil Spill Contingency Plan** under the section 39 of the Marine Pollution Prevention Act No 35 of 2008.
- NARA **with the collaboration of MEPA**, respond to large scale oil spills and ship accident related disasters.
-If any **waste disposal to aquatic sources in Sri Lanka** is reported to NARA, it is considered as emergency case and the due investigations are carried out.

-For this purpose, a significant amount of the **treasury budget is allocated by NARA for emergency case studies as a part of disaster preparedness**.
-Further, a **study team is always allocated to respond** to any emergency cases.
This component is led by the Environmental Studies Division of NARA collaboration with all the other technical divisions of NARA.
- For instance, **X-Press pearl ship and MT New Diamond Ship fire incident** responses

- According to the guidelines for preparation for all ministries, government institutions. Departments and agencies prepared by Disaster Management center, **NARA is one of the stakeholders whose responsibility is to keep records of ;**

*“Maps and other information regarding coastal areas prone to coastal erosion and flooding/ tsunamis/ storm surges, rise of sea levels, waves, sea-surface temperature data, other relevant information etc. in varying degrees”*


**- Mapping sensitive habitat such as coral reefs, mangroves, sea grass, tidal flats estuaries is vital to generate data/ information for mitigation, preparedness and planning of disaster management.**

- The local **coastal topography, oceanography and marine meteoro**logy are the **critical parameters** which determine the **magnitude and the period of high frequency** ocean waves like tsunamis and storm surges.

- NARA has maintained **permanent sea level stations** to provide tide and sea level data.

- **Monitoring** sea level changes, measuring currents, temperature, waves, tides and salinity are monitored by NIOMS that helps with disaster preparedness.

-NARA has **technical tools to measure oceanographic and meteorological parameters** such as CTD, ADCP, Florometer etc;

-R/V Samudrika (Research Vessel)

-NHO(National Hydrographic Office) conducting bathymetric and Side Scan Sonar Surveys

# Routine (Non-X Press Pearl) monitoring/sampling program

# Microplastic Research

| Research Title | Location |
|---|---|
| Assessing contamination of microplastic in water, sediment and selected fish species in Negambo lagoon Sri Lanka | Negambo Lagoon Sri Lanka |
| Microplastic and heavy metal absorption of Seagrasses in Negombo lagoon | Negambo Lagoon Sri Lanka |
| Microplastic and heavy metal absorption in Mangroves in Negombo Lagoon | Negambo Lagoon Sri Lanka |
| Study on Microplastic abundance, Characterization and behavior of heavy metals in selected crab species in Negombo lagoon and coastal areas in Sri Lanka. | Negambo Lagoon Sri Lanka |
| Microplastic in Hirikatu Oya | Hirikatu Oya |
| Microplastic in Organic and Inorganic Agriculture Farmland Soils | Boralanda, Sri Lanka |
| Spatial and Temporal Variation of Microplastic in the freshwater fish species at Gin River ,Sri Lanka | Gin River ,Sri Lanka |
| Microplastic contamination in Bellanvilla Athtidiya Wetland | Bellanvilla Athtidiya Wetland |
| Microplastic abundance and distribution of shrimps in coastal area of Sri lanka | Coastal area of Negombo |
| Microplastic abundance in Tilapia Species in Fresh Water Resources in Anuradhapura District | Anuradhapura District |
| Occurrence of microplastic in sea salt in Sri Lanka | Hambantota |
| Occurrence of microplastic in mussels and their habitats in Sri Lanka | Negambo and Kokilai Lagoon |
| Determination of micro plastic abndance of beach seine fish in southern and western coastal area of Sri Lanka | southern and western coastal area of Sri Lanka |

# Summary of the Past Project Details - ESD

| Programme | | Project | Period | |
|---|---|---|---|---|
| No | Category | Title | From | To |
| 1 | Management, Development and Conservation of the fisheries and Aquatic resources | Development of Coastal Water Quality Index (WQI) for Southern Beaches: A road to the Blue Flag Certification . | Jan 2021 | Dec 2021 |
| 2 | Management, Development and Conservation of the fisheries and Aquatic resources | Study on marine litter and microplastic abundance in the sediments, fish & other aquatic species in the coastal area of Sri Lanka. | Jan 2021 | Dec 2021 |
| 3 | Management, Development and Conservation of the fisheries and Aquatic resources | Nutrient dynamics and agrochemical impacts to inland fish and aquatic resources in Walawe River Basin . | Jan 2021 | Dec 2021 |
| 4 | Management, Development and Conservation of the fisheries and Aquatic resources | Study on current status of water pollution levels in Deduru Oya river basin in Sri Lanka basin for Environmental Pollution Assessment . | Jan 2021 | Dec 2021 |

| No | Category | Title | From | To |
|---|---|---|---|---|
| 5 | Management, Development and Conservation of the fisheries and Aquatic resources | Assessment of Environmental Pollution Impacts of coastal fishery at selected landing sites in Southern Province, Sri Lanka. | Jan 2021 | Dec 2021 |
| 6 | Management, Development and Conservation of the fisheries and Aquatic resources | Identification of most appropriate freshwater fish species as a biological indicator for Environmental pollution assessment in Kelani River basin Sri Lanka. | Jan 2021 | Dec 2021 |
| 7 | Management, Development and Conservation of the fisheries and Aquatic resources | Investigation of causes for emergency incidents such as oil spills algal blooms and fish kills (Emergency Studies). | Jan 2021 | Dec 2021 |
| 8 | Management, Development and Conservation of the fisheries and Aquatic resources | Assessment of Pollution Status of Selected Fishery Harbours in the Western and Southern Province of Sri Lanka. | Jan 2021 | Dec 2021 |

| Project | | Period | |
|---|---|---|---|
| No | Title | From | To |
| 5.1 | Assessment of Water Pollution Status of Selected Fishery Harbours in the Southern Province of Sri Lanka (Hambantota, Tangalle, Mirissa, Kudawalla, Dewundara). | Jan 2022 | Dec 2022 |
| 5.2 | Investigation of causes for environmental emergencies (e.g. mass fish kills, oil and chemical spills, algal blooms). | Jan 2022 | Dec 2022 |

# Research in Future (Next 5 years)

| | No | Component | Sub component | Responsibility | Time frame | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 2024 | 2025 | 2026 | 2027 | 2028 |
| Management | 01 | **Development of Environmental Studies Division's Laboratory** | Developing microbiology laboratory | NDH | | | | | |
| | | | Developing microplastic laboratory | DA | | | | | |
| | | | Obtaining accreditation for ESD main laboratory | SW | | | | | |
| | | | Improvement of test services functions | SP | | | | | |
| | 02 | **Capacity and skill development of staffs of ESD** | Improving the lab analysis skills of the staff | PJ | | | | | |
| | | | Improving the field/sampling skills of the staff | PJ | | | | | |
| Research and Development | 03 | **Obtaining Blue Flag Certification** | Obtain Blue Flag Certification for at least 3 beaches located in the Southern and Eastern Provinces of Sri Lanka | RNJ | | | | | |
| | 04 | **Microplastic and macroplastic pollution** | Focusing more areas in researches on microplastic and macro plastic pollution | BK | | | | | |
| | | | Development of policies on microplastic and macro plastic pollution | ST | | | | | |
| | 05 | **Emergency Incidents** | Development of Standard Operating Procedures (SOPs) to address future maritime accidents and other related marine pollution issues. | CN | | | | | |
| | | | Development of contingency plans to address future maritime accidents and other related marine pollution issues. | CN | | | | | |

# Thank You !

ජාතික ජලජ සම්පත් පර්යේෂණ සහ සංවර්ධන නියෝජිතායතනය

தேசிய நீரியல்வள ஆராய்ச்சி அபிவிருத்தி முகாமை

NATIONAL AQUATIC RESOURCES RESEARCH AND DEVELOPMENT AGENCY

## FTIR


- FTIR is to analyze the interaction of infrared light with a sample, providing valuable information about its chemical composition, molecular structure, and functional groups.
- FTIR spectroscopy is used to analyze environmental samples for pollution monitoring and assessment
  - Microplastics (size less than 5mm)

## ELISA Kit


- ELISAs are a type of immunoassay that are commonly used to quantify levels of a specific target within a sample. Samples routinely used in ELISAs include serum, plasma, cell culture supernates, cell lysates, saliva, tissue lysates, and urine.

## Iron chromatography

- IC is widely employed for environmental analysis to measure and monitor ions in water, soil, and air samples.
- It enables the detection and quantification of pollutants such as fluoride, bromide ,nitrates, nitrites, phosphates, sulfates and chlorides.
- This information is crucial for assessing water quality, evaluating pollution sources, and monitoring environmental impacts.

## UV Spectrophotometer


- UV spectrophotometry is employed in environmental analysis to measure the concentration of various pollutants, such as nitrates, nitrites, phosphates, Ammonia, Chlorophyll and some other organic compounds.
- These measurements aid in assessing water quality, monitoring air pollution, and evaluating the environmental impact of industrial processes.