Monitoring ecologic

A comprehensive cheat sheet covering the key aspects of environmental monitoring, including types, principles, levels, methods, and specific monitoring systems.

Fundamentals of Environmental Monitoring

Definition and Types of Monitoring

Environmental Monitoring Definition: Systematic and continuous surveillance of environmental conditions and components under natural and anthropogenic influences. Also, measuring parameters in time and space for a defined purpose.

Types of Monitoring Programs:

1. **Baseline Monitoring:** Establishes initial (unpolluted) state for reference.
2. **Trend Monitoring:** Tracks long-term changes in parameters.
3. **Implementation Monitoring:** Verifies correct application of planned activities.
4. **Efficiency Evaluation Monitoring:** Assesses if implemented measures achieve their goals.
5. **Standards Compliance Monitoring:** Checks if values are within legal limits/standards.
6. **Validation Monitoring:** Tests and confirms the effectiveness of a model or standard.

Principles and Levels of Monitoring

Institutional Principles:

1. **Supranational Level:** International coordination, cooperation, data exchange (e.g., UNEP).
2. **National Level:** Centralized systems, internationally compatible, with clear responsibilities.

Operational Principles:

Comparable techniques, SI units, Intercalibration, standard references, Compatible databases, Quality control, Clear reporting deadlines, Station descriptions, Long-term data preservation, Warning/control systems, Double analysis upon method change, Statistical data analysis.

Levels of Work: Local, Regional, Global.

Scope of Monitoring Levels

Local Level: Conducted by each country, tailored to local needs, resources, human impacts, and scientific interest.

Regional Level: For groups of countries with common interests; consensus decisions, shared data, regional coordination centers.

Global Level: Addresses planetary issues (climate, ozone, biodiversity); conducted by international organizations (UN) with global data synthesis centers.

Sampling Methods and Integrated Approaches

Sampling Methods

Gas Sampling: Filtration, impaction, centrifugation, adsorption, absorption, condensation, global collection, continuous flow measurement.

Water Sampling: Surface, depths, affluents, films, surfactants, organisms (nets, devices), substance/metal adsorption, sediments.

Soil Sampling: Granulometric sorting, coring, pitfall traps (for surface fauna).

Integrated Approach Considerations

Integrated Approach Considerations: Long-term objectives, flexibility and comprehensiveness, international collaboration, data comparison system, automation and accessibility, continuous R&D, personnel training, adequate funding, implementation in environmental protection.

Phases of Environmental Monitoring

Monitoring Phases: Defining objectives, selecting observation stations, establishing parameters, setting observation period and frequency, determining sampling methods, using specific analytical lab techniques, calibrating equipment, taking measurements, processing data, presenting results, dimensioning/transmitting information.

Atmospheric Composition and Aquatic Monitoring

Atmospheric Composition Changes

Processes Modifying Atmospheric Composition: Water evaporation (lithosphere, hydrosphere), evapotranspiration (biosphere), oxygen enrichment (photosynthesis), carbon dioxide loss (photosynthesis), gas/dust input (volcanic activity), cosmic dust capture, substance loss via precipitation.

Marine and Freshwater Monitoring

Marine Monitoring Stations: Fixed points (islands, lighthouses, coasts, near pollution sources/river mouths), Mobile points (specialized/commercial ships).

Inland Water Monitoring: Stations far from pollution, waters influenced by agriculture (pesticides/fertilizers), waters with wastewater discharges (known sources, diffuse/masked points, accidental/clandestine discharges), special situations (acidification/eutrophication of lakes).

Soil and Vegetation Monitoring

Soil Biocenosis and Vegetation

Soil Biocenosis Characteristics (Anthropogenic Influence): Soil biota adapts poorly to human changes; anthropogenic influence disrupts natural processes (humus, mineralization) leading to accelerated erosion, reduced plant production, desertification.

Vegetation in Monitoring: Vegetation = air-soil interface, protects, retains/neutralizes pollutants. Advantages: live filter accumulating pollutants long-term, detects low pollutant levels, provides accurate pollution data.

Changes in Arboricultural Phytocenoses (Pollution): Rapid species successions, invasion of pollution-resistant species, increased windthrow, increased pest attacks.

Biological Monitoring and National Systems

Biological Monitoring Aspects

Biological Monitoring: System for observing/forecasting changes in living world due to natural/human factors, using organisms as indicators.

Environmental Aspects Highlighted: Pollutant impact on organisms, changes in ecosystem productivity, exceeding organism tolerance limits, decreased biodiversity, ecological processes across scales.

Biological Indicators (Bioindicators): Species used to assess environmental state; organisms sensitive to stress or indicating specific substances; their function/population reflects ecosystem integrity.

Levels and Types of Biological Monitoring

Biological Monitoring Levels: Individual (molecular, cellular, tissue), Population, Biocenotic.

Types of Biological Monitoring: Early warning (rapid-reaction organisms, bioindicators, automated systems), Diagnostic (essential parameters linked to bioaccumulation), Prognostic (biotesting, ecotoxicology tests).

Pollutant Monitoring and National Systems

Pollutant Monitoring: Focuses on long-term effects (human, environment, climate), pollutant interactions, legislation/limits, accident intervention procedures, historical emission data, land/water use in affected areas.

Substance Circulation Mechanisms: Substances circulate between Source, Air, Water, Soil/Sediment, and Biota through release, exchanges, and transformations.

National Air Monitoring System: RNMCA (Air Quality Monitoring Network) with stations (automatic, mobile), monitoring pollutants (SO2, NOx, CO, O3, VOC, PM10, PM2.5), using specific and general indices.

National Soil Monitoring System: Organized on 3 levels: general surveillance, systematic investigations, detailed research.