Assessment of State of the environment influenced by air and water pollution

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Norway’s Leading University

• Founded in 1811 in Oslo, the capital of Norway
• Leading research and teaching institution in the country
• 30 000 students, one of largest institutions in Scandinavia
• 5000 employees of which 3000 are academic staff
• 4 Nobel prizes (Chemistry, Physics, 2 in Economics)
• 9 National & 2 Nordic Centres of Excellence
Number of Students per Faculty

- Theology
- Law
- Medicine
- Humanities
- Science
- Dentistry
- Social Sciences
- Education

- Ph.D.
- Graduate
- Professional Study Programmes
- Undergraduate
Impetus for research cooperation

• Enable decision makers to establish knowledge based abatement strategies on environmental challenges thereby ensuring a sustainable development for you and for us..

Sustainability implies positive solutions for all components

Needs for environmental protection are balanced against limitation posed by social harmony and economic production

– To obtain this knowledge, integrated assessment studies of the ways pollution and inadequate resource management affect the environment and humans are required.
Understand the links

Drivers

Pressures

Dispersion

Long range transport

Transformation

Responses

Abatement measures

Legislation

Effects & Interactions

State of the environment
DPSIR – philosophy
Conceptual framework

Drivers: Population growth, consumption, energy, travel
Pressures: Side effects of drivers (Emissions to air and water)
State: Resources, Pollution, Chemical & Biological state of Water, Air, Soil
Impacts: Climate change, eutrophication, vegetation damage
Nature’s Response: Changed biodiversity, change in eco-system services, feedback mechanisms
Society’s Response: Adjustments, environmental protection, adaptation, environmental technology, policy, legislations, taxes
Science to policy interaction
- Integrated assessment

- Monitoring
- Modelling
- Critical Assessment

• Scientific monitoring to interact with decision makers facilitated by indicating data sets and initiating abatement actions

  “The deposition below which significant harmful effects do not occur according to present knowledge”
Integrated research
State of environment influenced by air and water pollution - Sampling strategy

- **SOIL**
  - Minor temporal variation
    - Mainly large spatial variation
  - Sampling according to genetic soil horizons
  - Agricultural soils mainly influenced by agricultural practice – not air pollution
    - Irrigation water quality, fertilizers, pesticides
  - Grassland
    - More suited as it is less directly influenced
  - Forests
    - Best suited as the canopy adsorbs and filters the air
  - Transect out from emission source
  - Hotspots or samples that are representative for larger area
  - Conceptual or statistical sampling strategy
State of environment influenced by air and water pollution - Sampling strategy

- Water
  - Follow watershed from headwater to low order streams
  - Large temporal variation
    - Governed mainly by variation in flow
    - Sampling according to hydrological regimes
      - Snowmelt
      - Summer baseflow
      - Fall heavy rainfall episodes
Water and soil analysis

• Soil
  – LOI
  – PSD
  – Potential CEC
  – Tessier sequential extraction

• Water
  – Environmental assessment
    • Need to acquire the full chemical environment
  – pH, temp., conductivity
  – Alkalinity, TOC
  – Major anions and cations
  – Heavy metals
QC of data

- After the analysis the data must be compiled and quality controlled by ion balance and agreement between measured and calculated conductivity.