



Department of Natural Resources and Environment (DONRE)
Ho Chi Minh City



NORAD

DIREKTORAT FOR UTVIKLINGSSAMARBEID
NORWEGIAN AGENCY FOR DEVELOPMENT COOPERATION

Ho Chi Minh City Environmental Improvement Project
Air Quality Monitoring Component

Understanding Air Pollution and future applications in Ho Chi Minh City

Bjarne Sivertsen, NILU

Understanding Air Quality, Future applications

- Sources
- Monitor
- Exposure
- Source - exposure
- Contributions to exposure
- Damage

Assessment

- Control options
- Cost - benefit
- Control strategy
- Investment plan

Control

- Develop institutions
- AQ Information System

Surveillance

Masterplan

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Presented at
DONRE, HCMC
November 2005

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Understanding Air Pollution and future applications in Ho Chi Minh City

Introduction

This report is based on a presentation prepared for the Seminar: “HCMC Air Quality Monitoring and Management Programme”. This was a final seminar held at the end of the Ho Chi Minh City Improvement Project, Air Quality, Monitoring Component, Second part: Reference laboratory and Training. The project has been supported by Norwegian Agency for Development Cooperation (NORAD). The seminar was arranged by DONRE in Ho Chi Minh City (HCMC) on 23 November 2005.

The seminar presented a summary of the air quality monitoring and management programme, which has been developed, based on DANIDA and NORAD funds in Ho Chi Minh City. The presentations were mainly based on the development and training performed by NILU and will include background, monitoring system, the calibration laboratory and air quality results.

This report presents air quality information aimed at explaining the characteristics of the air pollution situation in HCMC. For future applications it is of utmost importance that the data are adequately quality assured. Air quality planning, abatement strategies and future master plans for the reduction of the air pollution load may then be implemented using the systems developed for HEPA in HCMC.

Air Quality Planning

The integrated Air Quality Management (AQM) platform, AirQUIS, includes all elements needed to undertake assessment and planning of air quality. AirQUIS provides the basis for air quality management through an integrated tool for monitoring and emission inventorying, air quality modelling and assessment, enabling forecasting of future air quality and development of cost-effective abatement strategies.

The GIS based AirQUIS system includes several modules that can be selected and applied according to the user’s needs. Important common parts are the measurement database, and the graphical user interface including the GIS (Geographical Information System). The procedures used are often referred to as the Impact Pathway Approach (See Appendix Figure 2 and 3).

A basis for the planning process is the dispersion models. Collection of emission data for the establishment of an emission inventory is an essential starting point. This work is presently being undertaken by HEPA in HCMC.

Based on defined abatement options and scenarios, cost-benefit analyses can be used to evaluate the best possible options to reduce the air pollution load seen from an economic

point of view. The results of such analyses may again lead to the development of action plans.

The AirQUIS platform established at HEPA represents a basis for the Air Quality Management and Planning System (AQMS). The system can be applied to develop action plans for air quality improvement in a cost-efficient manner.

The essence of the Action Plan often deals with air pollution exposure of the population rather than just emissions. In the action plan, the costs of each control option may be calculated in terms of costs per percentage point of exposure reduction, and this is compared with the potential to reduce the pollution exposure that is associated with the option.

Based upon this, the control options are ranked according to their cost-effectiveness. Least cost packages of control options to arrive at a given target for air quality can then be developed.

The quality assurance programme

Good quality in every phase of the complete air quality programme is essential in order to be able to assess the air quality. Comparisons with national and international limit values need data that are adequately quality assured and meet international inter comparison criteria.

In ambient and emission air quality measurement systems, the quality system is concerned with all activities that contribute to the quality of the measurements. The aim of the quality system is to assure that the results meet the predefined standards of quality. To produce results of known and sufficient quality, a whole range of tasks have to be performed such as periodic status checking, maintenance, calibrations, data evaluation and so on. Failure to perform all or some of these tasks will decrease the data quality.

The quality system shall assure that:

- Data is reliable for its intended use (fulfils the data quality objectives).
- Data has known quality (fulfils the performance standards).
- Data from different sites can be compared.
- The receiver of the measurement results (management, public, etc.) has confidence in the results.

The quality terms relevant for QA/QC procedures and criteria can be defined as follows (ISO 8402, 1994):

- Quality is the totality of characteristics of an entity that bear on its ability to satisfy stated or implied needs.
- Quality assurance involves the management of the entire process, which includes all the planned and systematic activities that are needed to assure and demonstrate the predefined quality of data, to provide adequate confidence that an entity will fulfil requirements for quality.
- Quality control comprises the operational techniques and activities that are undertaken to fulfil the requirements for quality.

Understanding air quality a basis for planning

An important element in the understanding of air pollution is the understanding of the meteorological dispersion conditions. The atmosphere's ability to transport and disperse pollutants emitted into the atmospheric surface boundary layer is often more decisive for the pollution levels than the emission rates itself.

Meteorological data are being collected along a 30 m tower at DOSTE and at the surface. Nighttime surface inversions combined with unstable convective daytime conditions in HCMC bring about large diurnal variations in many of the air pollutants. These changes in weather conditions together with chemical reactions and variations in emission rates as traffic and human activities change from day to night has to be understood in order to evaluate the results of the measurement and modelling results.

Figures presented in the Appendix illustrate some of the typical patterns seen in the data from HCMC. The diurnal variation of NO₂ concentrations at urban background concentrations relative to variations very close to the source (the street or road) confirm the rapid dilution of pollutants as one move away from the street. This is due to the convective and very unstable surface layer over HCMC at daytime.

The relationship between NO₂ and ozone concentrations also illustrates the use of background ozone (and following reduction in ozone) as NO emissions and chemically transformed into NO₂.

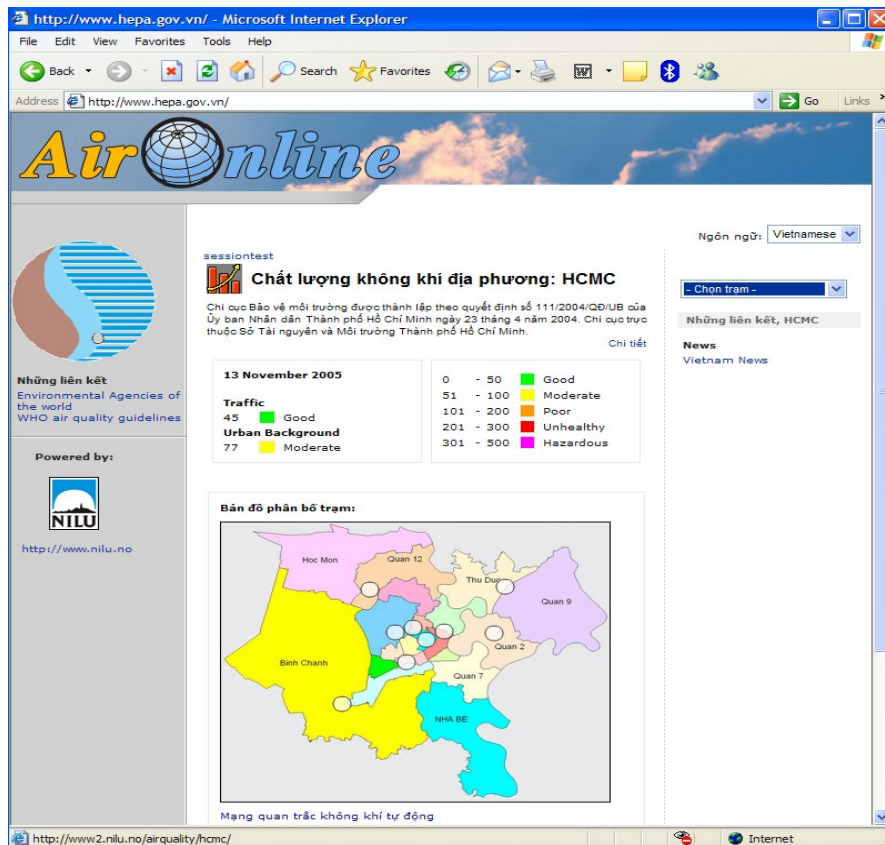
Air pollution concentrations as functions of wind directions (an other meteorological parameters) may explain the importance of different source and the impact of emissions from source areas. High levels of PM₁₀ concentrations measured at the District 2 station is evidently originating from the industrial complexes and power plants near the ThuDuc area.

Data dissemination and information to the public

The daily values of the Air Quality Index (AQI) which is being generated automatically by AirQUIS are being transferred every day to the information board near Binh Thanh marked in the city centre of HCMC.

NILU also supported HEPA in establishing an Internet presentation of air quality data online. Establishing of this web site was not a part of this project. However, HEPA asked assistance from NILU and the data can be found at www.hepa.gov.vn and www.luftkvalitet.info for more information about NILU as Air Quality Service Provider.

Rising public awareness of the air quality situation is important to protect people against unwanted air pollution. Awareness makes decision making easier. In many large cities there have been a number of serious air pollution incidents, which have influenced on people with respiratory problems, lung cancer and emphysema.



A future further development of the Internet information for common people to access will help the most sensitive part of the population to protect themselves against pollution.

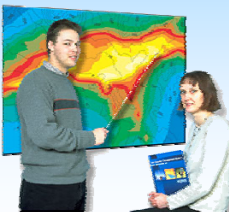
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Appendix

Understanding Air Quality Future Applications in Ho Chi Minh City

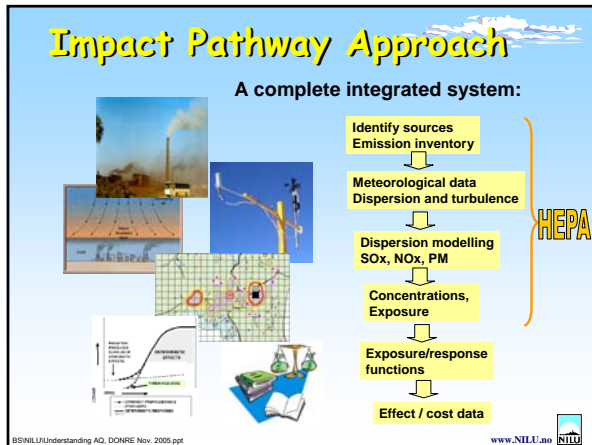
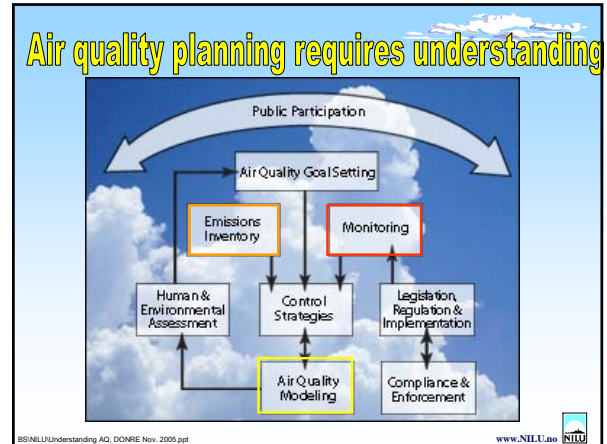
Understanding Air Quality Future applications




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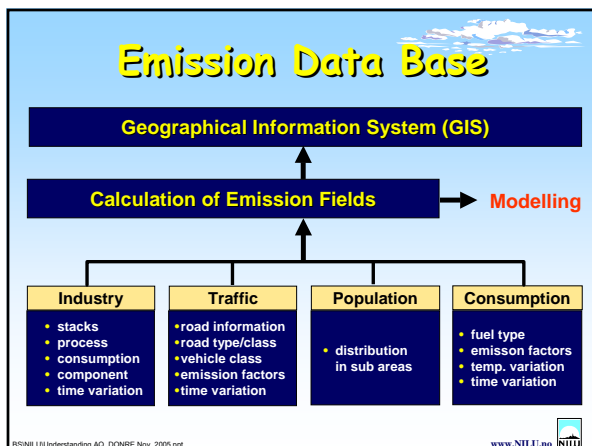


Air pollution comes from many different sources

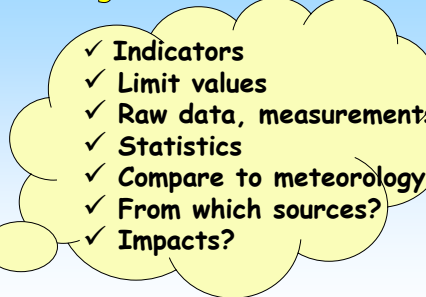


- Stationary sources such as factories, power plants, smelters and different types of industries,
- Small sources such as various industries, dry cleaners, food production etc.
- Mobile sources such as motor bikes, cars, buses, planes, trucks, and trains,
- Naturally occurring sources such as windblown dust, volcanic eruptions evaporation etc..

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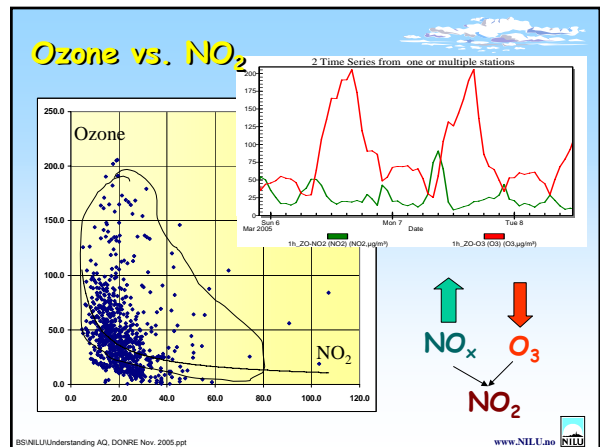
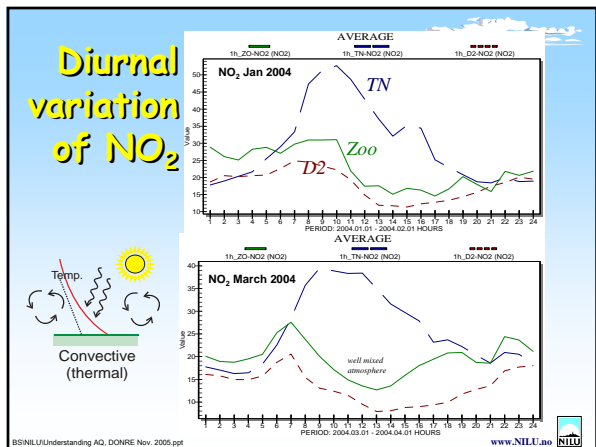
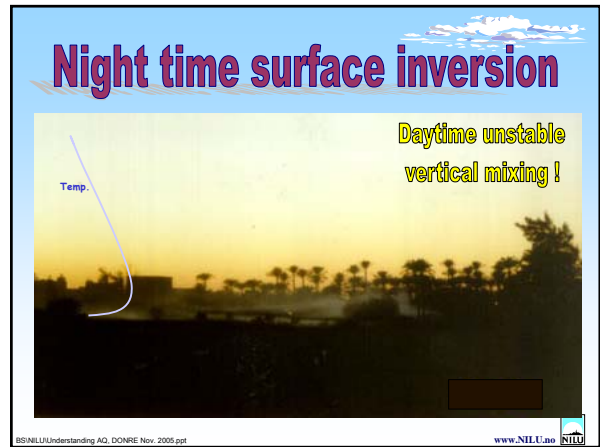
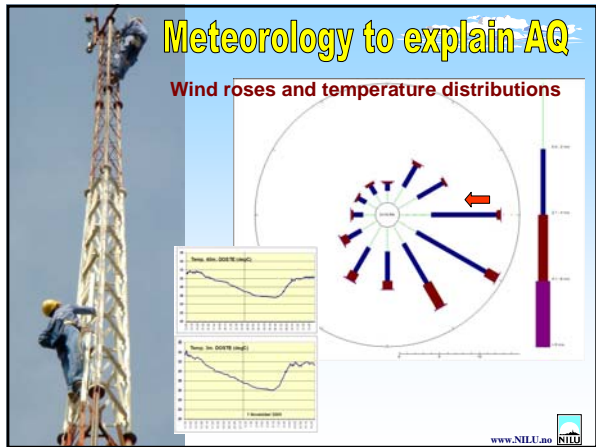
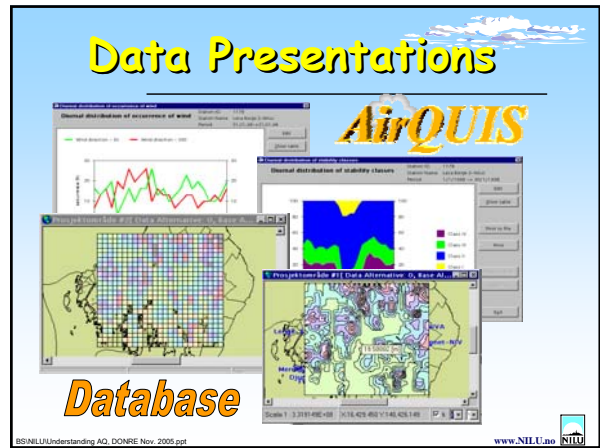


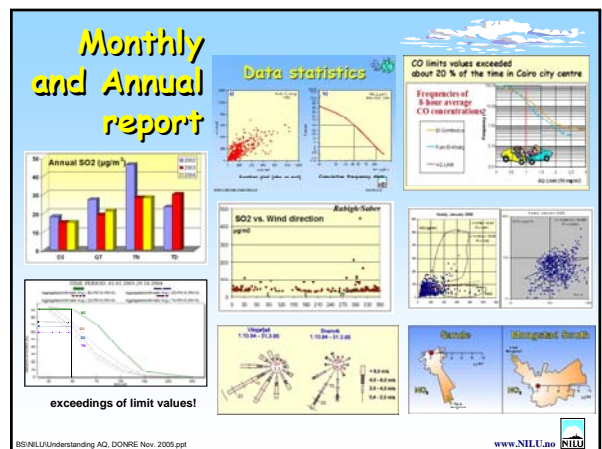
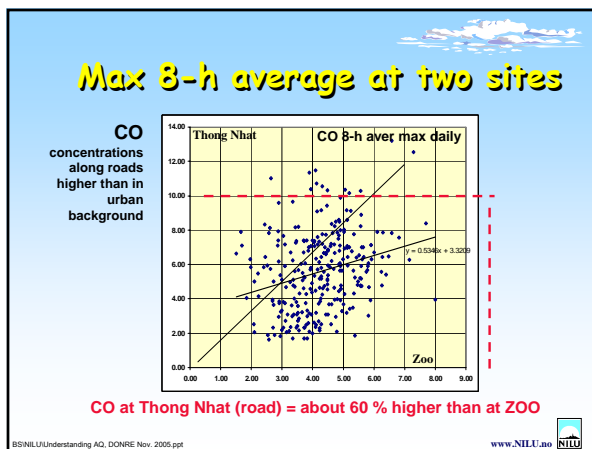
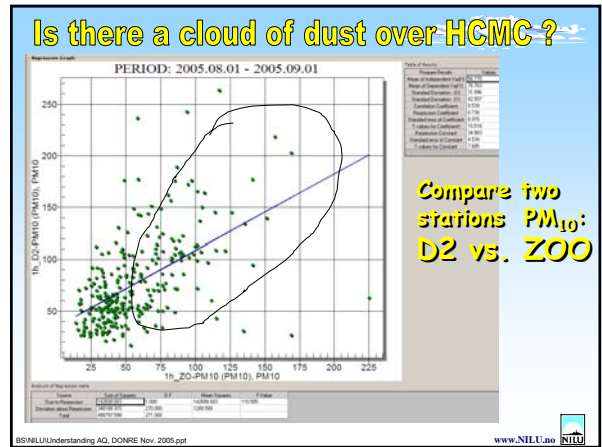
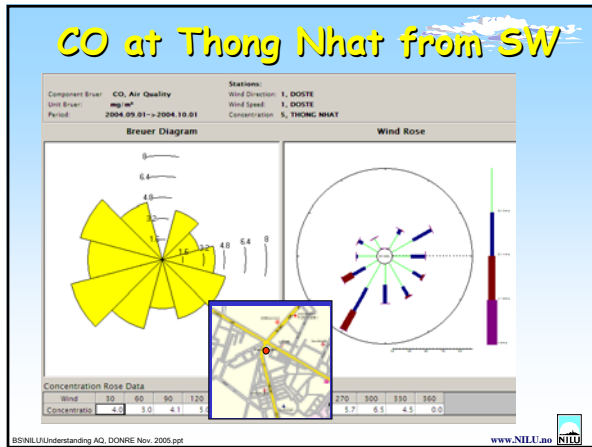
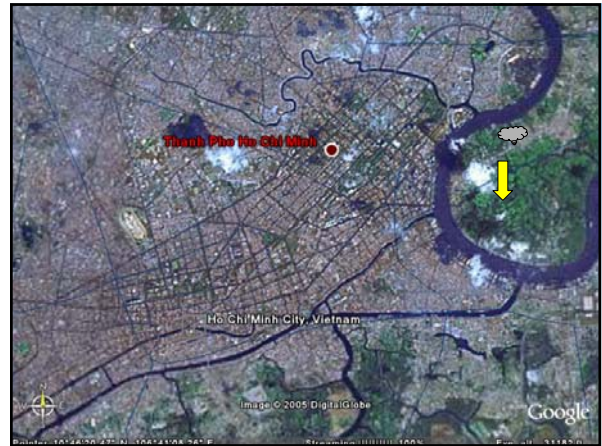
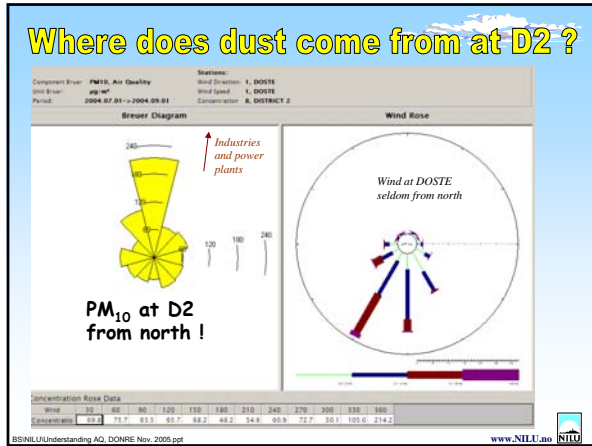
Air Quality Data

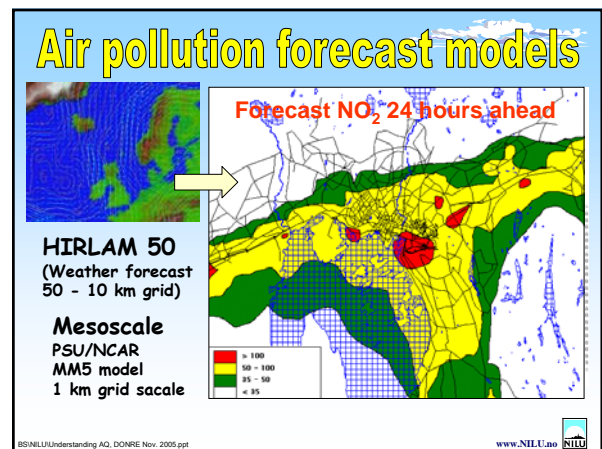
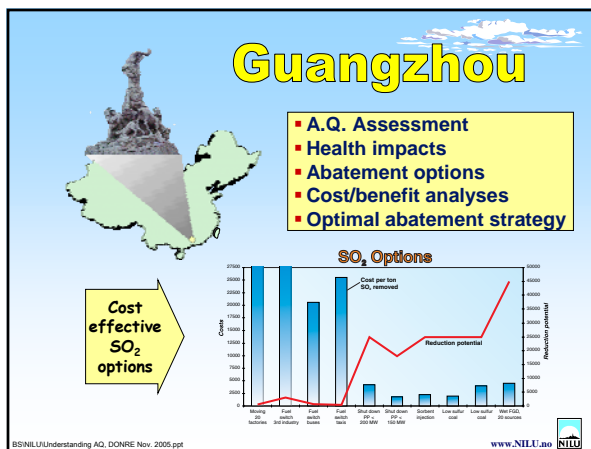
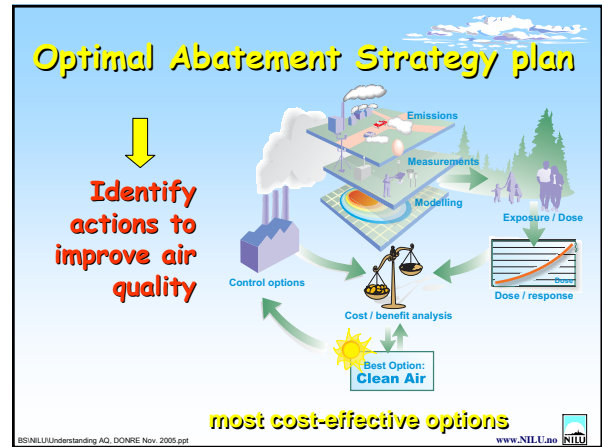
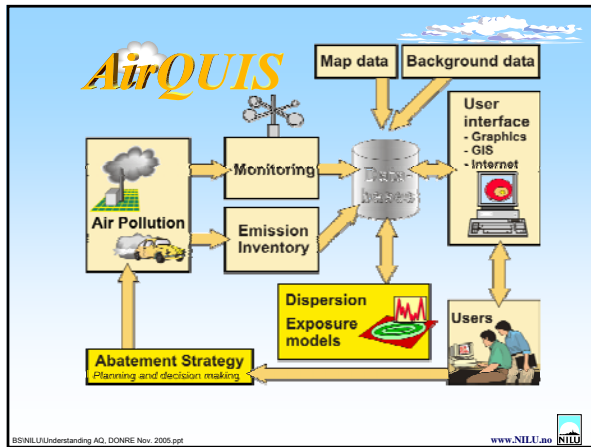
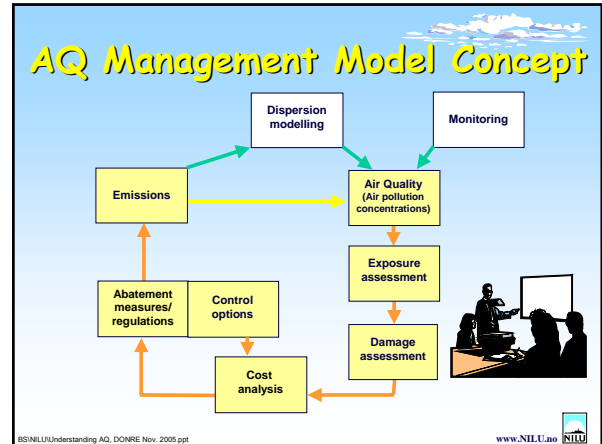
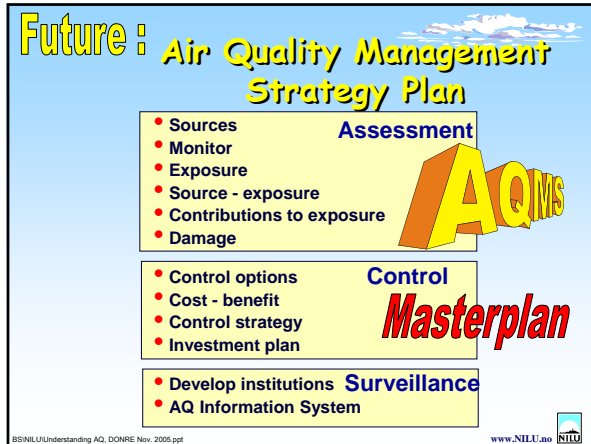


- ✓ Indicators
- ✓ Limit values
- ✓ Raw data, measurements
- ✓ Statistics
- ✓ Compare to meteorology
- ✓ From which sources?
- ✓ Impacts?

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On-line information on Web

The image displays four screenshots of the NILU website. The top-left screenshot shows 'Overvåking av luftkvalitet' with a list of monitoring stations. The top-right screenshot shows a line graph of 'Svoveldioxid (SO2) i Oslo 10 dager'. The bottom-left screenshot shows 'Overvåking av bakkenært ozon' with a map of Norway. The bottom-right screenshot shows the 'HEFA' logo and other project logos like 'Air Online' and 'CBEM'.

www.NILU.no

Understanding Air Quality will give HCMC Better Air Quality

The image shows a busy street in Ho Chi Minh City (HCMC) filled with numerous motorbikes, illustrating the source of air pollution. The text 'Understanding Air Quality will give HCMC Better Air Quality' is overlaid on the image.

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Norwegian Institute for Air Research

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The image shows the exterior of the NILU building, a modern structure with a large glass facade and a curved roofline. A Norwegian flag is visible on the building.

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The image shows a clear blue sky with a few wispy clouds, representing clean air.

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