SURVEY OF METEOROLOGICAL DATA FOR ENVIRONMENTAL IMPACT ASSESSMENTS IN THE ENV-E-CITY PROJECT

Jaakko Kukkonen[1], Ari Karppinen[1], Juha Nikmo[1], Nicolas Moussiopoulos[2], Petroula Louka[2], Steinar Larssen[3], Trond Bøhler[3], Achim Lohmeyer[4]
[1]Finnish Meteorological Institute (FMI), Air Quality Research, Helsinki, Finland
[2]Laboratory of Heat Transfer and Environmental Engineering (AUT), Greece
[3]Norwegian Institute for Air Research (NILU), Norway
[4]Ingenieurburo Dr.-Ing. Achim Lohmeyer (LOH), Germany

INTRODUCTION

The objective of project "Environmentally viable electronic city - ENV-e-CITY" is to develop an on-line application for environmental information related services (Karatzas and Moussiopoulos, 2002; http://www.env-e-city.org). The e-content domain extends over four application areas: air emission, air quality, topography and meteorology. The application framework to be developed includes metadata structures for all application areas, export and import filters, interfaces and various e-content basic services.

The user community of the platform envisaged consists of city authorities, consultants involved in environmental impact assessment studies and citizens desiring valid information on the state of the environment. An electronic market place for the e-content itself and the services is also envisaged. This paper presents the meteorological domain within the ENV-e-CITY project.

THE METEOROLOGICAL DATA AND PRODUCTS

The relevant meteorological data and products include:

1. Directly measured meteorological data from synoptic and sounding stations and radar products,
2. Climatological data (e.g., wind and stability statistics),
3. The data obtained from measurements using meteorological pre-processing models, and
4. The data obtained with numerical weather forecasting (NWF) models (e.g. ECMWF, HIRLAM, MM5).

European Centre for Medium-Range Weather Forecasts (ECMWF) provides meteorological data for the whole of Europe, but the meteorological data is also available via any national meteorological institute, but only two of them (United Kingdom, France) have already an "One-Stop-Shop" available. The World Meteorological Organisation (via ECOMET, www.meteo.be/ECOMET/) has issued the basic rules for the licensing and costs of various meteorological data and services.

The availability of the measurement data, and the related commercial costs will be investigated for each participating country. The availability of relevant data from Numerical Weather Prediction (NWP) models will be compiled. Examples of such models are listed in the following.

ECMWF (http://www.ecmwf.int/services/data/index.html) has collected an extensive set of global Numerical Weather Prediction data in its archives from its operational and research activities. To enable this data to be accessible to all possible users, ECMWF Data Services provide data sets or tailored retrievals from the archive.

The aim of the HIRLAM project (High Resolution Limited Area Model, www.knmi.nl/hirlam) is to develop and maintain a numerical short-range weather forecasting system for operational use by the participating institutes. The project has started in 1985. A reference version of HIRLAM is maintained at the ECMWF, and all changes to HIRLAM are introduced via the reference system. Each HIRLAM member can obtain new versions via their links to ECMWF.

The Pennsylvania State University, National Center for Atmospheric Research (PSU/NCAR) has developed a Mesoscale Model MM5 (www.mmm.ucar.edu/mm5/mm5-home.html). This is a limited-area, nonhydrostatic or hydrostatic, terrain-following sigma-coordinate model designed to simulate or predict mesoscale and regional-scale atmospheric circulation.

The major aims of the ALADIN project (Aire Limitée Adaptation dynamique Développement InterNational, http://www.cnrm.meteo.fr/aladin/) are to prepare and maintain a NWP system for use on limited geographic areas and to work with small domains and high spatial resolution.

As an example of the relations of NWP models and atmospheric models, the modelling systems utilised at the Finnish Meteorological Institute are presented schematically in Figure 1. The results from the ECMWF model are utilised for applications on a global scale, while various versions of the HIRLAM model are applied for assessments on continental, regional, and local scales. The figure illustrates also some other atmospheric models, in addition to atmospheric dispersion models (such as those listed in the category of global scale models). Clearly, this is not a comprehensive presentation of all the atmospheric models utilised at the institute; however, we have included examples of models from each main model category.

The electronic services in ENV-e-CITY
The electronic services scheduled to be developed in the project are:

1. Links and instructions for the user to find the most relevant data or service provider, based on the request: linking to the already existing portals that provide data or services on-line and linking to the institutes that provide data or services off-line (such as most of the European national meteorological offices).
2. Service for evaluating the costs of meteorological data, based on user requirements and possibly, the transfer of payment electronically.
3. The evaluation of relevant meteorological data for a specific location and time period.
4. Possibly, a meteorological pre-processing service and licensing of the pre-processing models.

The services of ENV-e-CITY are designed to be attractive for consultants that conduct environmental impact assessments (EIA), environmental protection agencies, city authorities and industrial installations. For EIA consultants, it is especially important that the information regarding the existing data is comprehensive. When an EIA is to be conducted for a certain region, e.g., an area of 10 km x 10 km for a new road, it is absolutely necessary to include all existing information. E.g., in Germany, if there are existing meteorological measurements in the region considered, and the EIA consultant is not aware of these, the assessment will probably not be accepted in the public hearing.

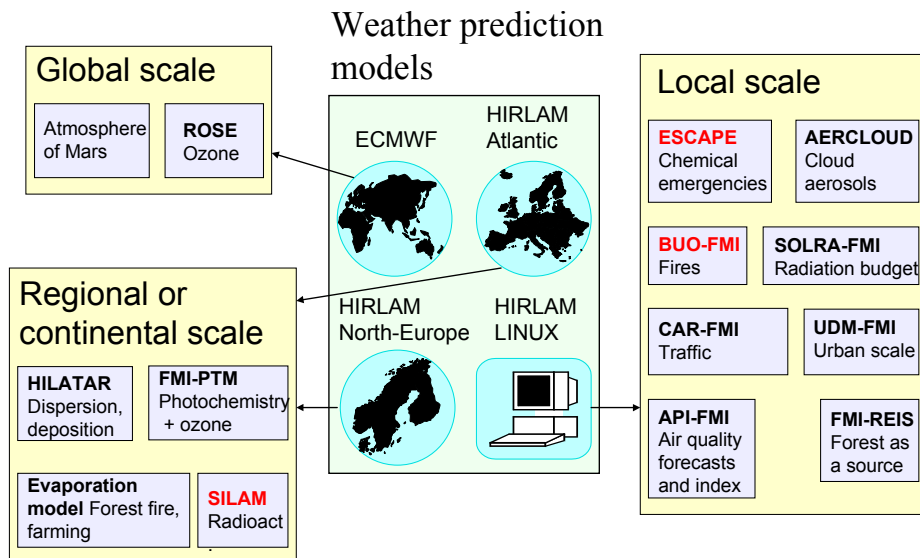The planning of the detailed form of these services is currently in progress.

Figure 1. The relations of the various versions of numerical weather prediction models and other atmospheric models (including atmospheric dispersion models) at the Finnish Meteorological Institute.

COLLABORATION WITH OTHER ORGANISATIONS AND PROJECTS
The project aims to contact and seek for collaboration with the following organisations:

- European Centre for Medium-Range Weather Forecasts (ECMWF, www.ecmwf.int),
- World Meteorological Organization (WMO, www.wmo.ch),
- Network of European Meteorological Services (EUMETNET, www.eumetnet.eu.org),
- National Weather Services,
- Meteorology applied to Urban Air Pollution Problems (COST 715, http://www.dmu.dk/atmosphericenvironment/cost715.htm) and
- European Environmental Agency (EEA, http://www.eea.eu.int/) and Eurocities (http://www.eurocities.org/).

The WMO Global Atmospheric Watch (GAW) has initiated an Urban Research Meteorology and Environmental Project (GURME; World Meteorological Organisation, 1999; http://www.cgrer.uiowa.edu/people/carmichael/GURME/GURME.html). GURME was established to help enhance the capabilities of National Meteorological and Hydrological Services (NMHS's) to handle meteorological and related aspects of urban pollution.

EUMETNET provides a framework to organise co-operative programmes in the various basic meteorological activities such as observing systems, data processing, basic forecasting products, research and development, training.

Uniform Data Request Interface (UNIDART, www.dwd.de/UNIDART/) is lead by the Deutscher Wetterdienst. The UNIDART project is aimed at the development of an information

system based on Internet technologies offering uniform access to all kinds of meteorological data and products.

U.K. Met Office (www.met-office.gov.uk) has developed a portal called Data and Products Distribution System at www.met-office.gov.uk/wfc/serv1.html. It covers a range of numerical weather prediction products, and has been designed specifically for weather forecasting companies. Météo France (www.meteo.fr) has also developed a system called FOSS at www.meteo.fr/meteonet/services/ser.htm.

The COST 715 action aims at increasing knowledge of, and the accessibility to, the main meteorological parameters which determine urban pollution levels (e.g., Fisher et al., 2001).

COST 715 maintains a database of urban meteorological stations within the participating countries (http://www.mi.uni-hamburg.de/cost715/). The database includes basic information about meteorological sites in urban areas.

References

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