



World Meteorological Organization
Working together in weather, climate and water



Forecasting Perspective from Europe

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WMO Secretariat



WMO Congress XVI (May 2011) CAS FUTURE ORIENTATIONS

Question CAS President:

What are the significant technical, social and environmental stressors which will drive the demand for more accurate and user friendly environmental assessments and predictions?

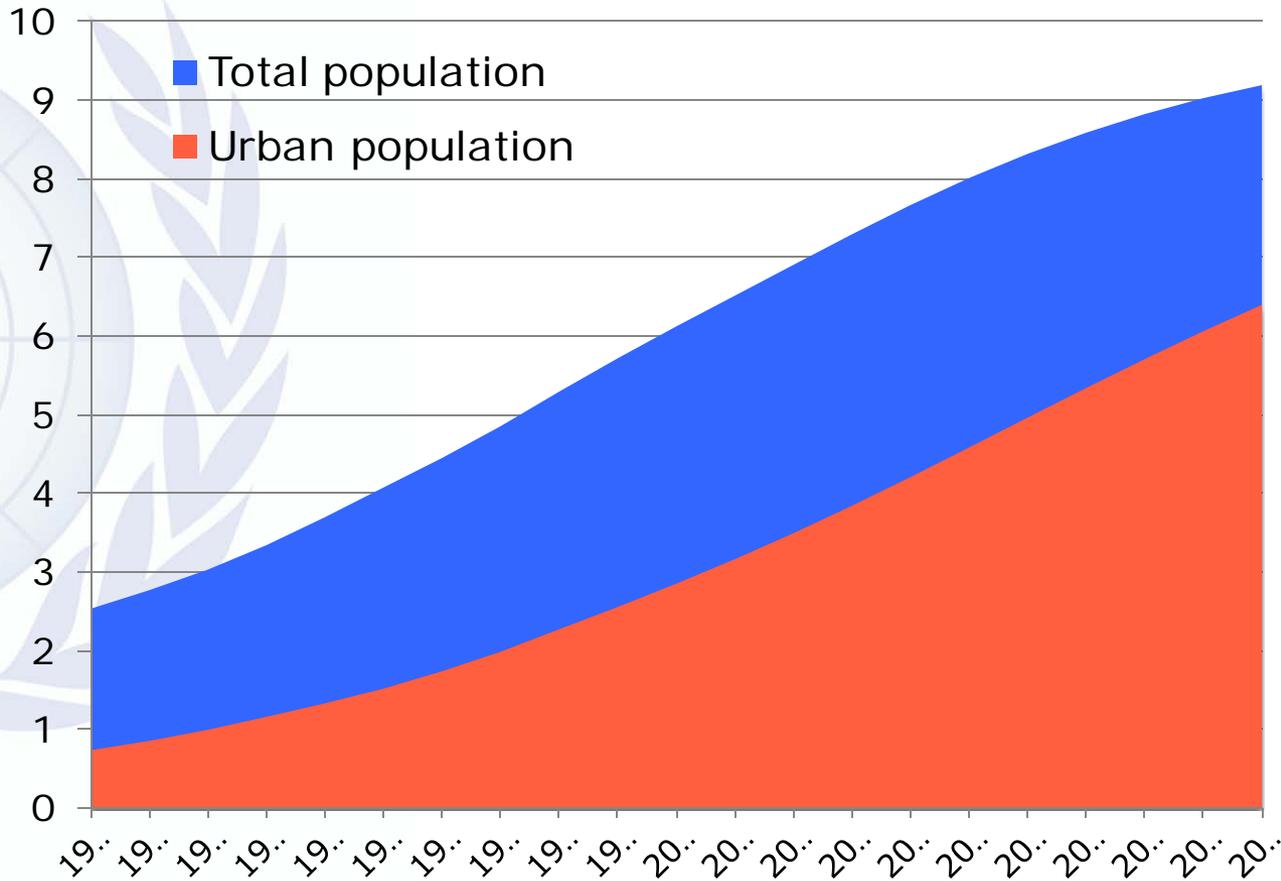


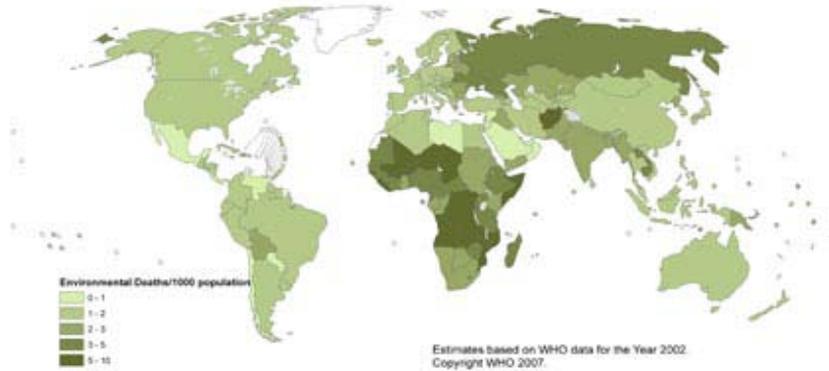
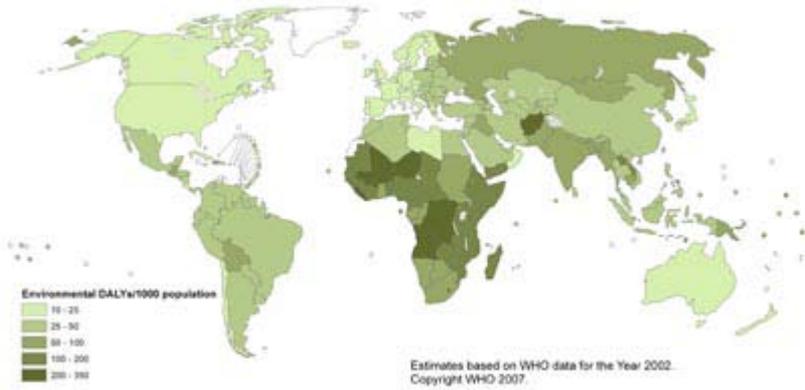
Reply:

**CLIMATE CHANGE
POPULATION GROWTH
AND URBANIZATION**

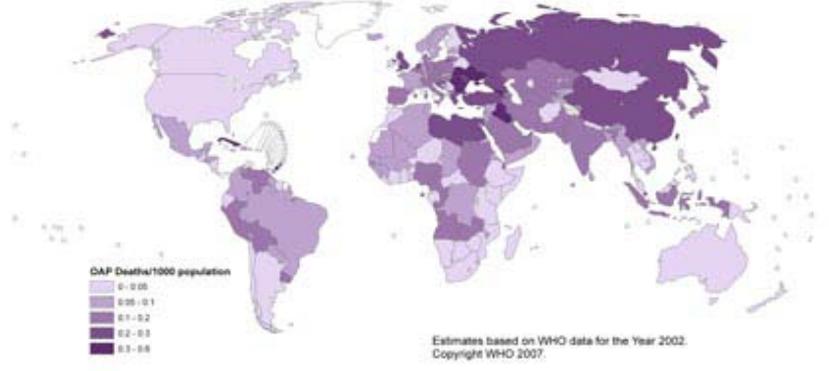
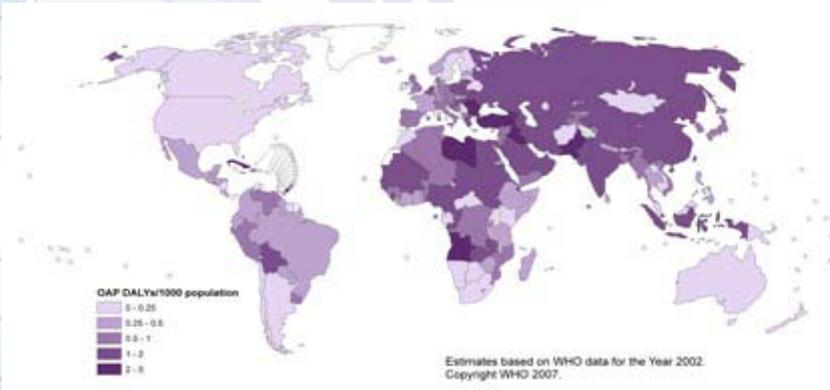
Growing Urban Population

(Billion)

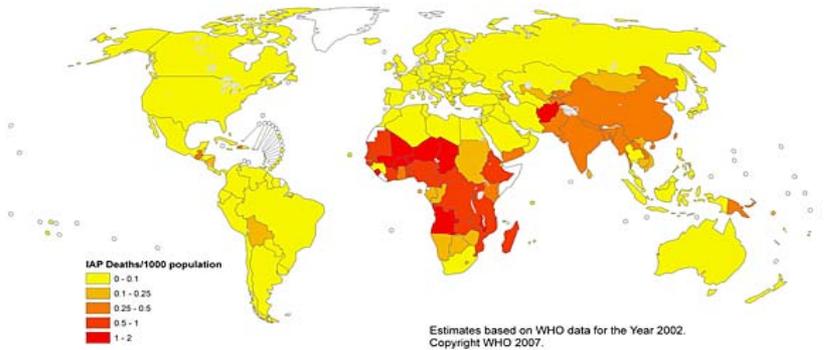
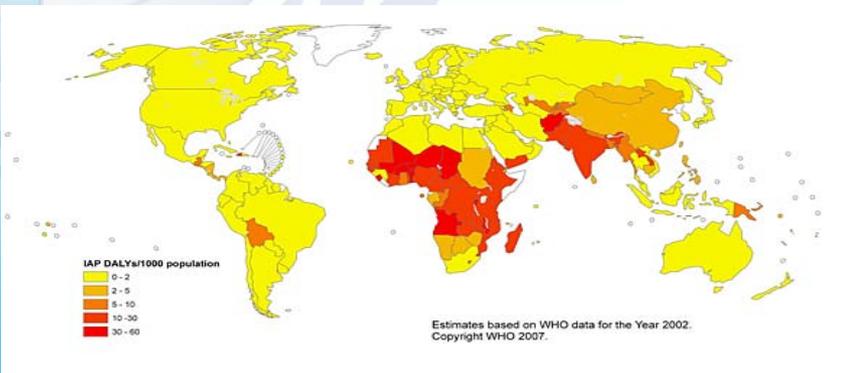




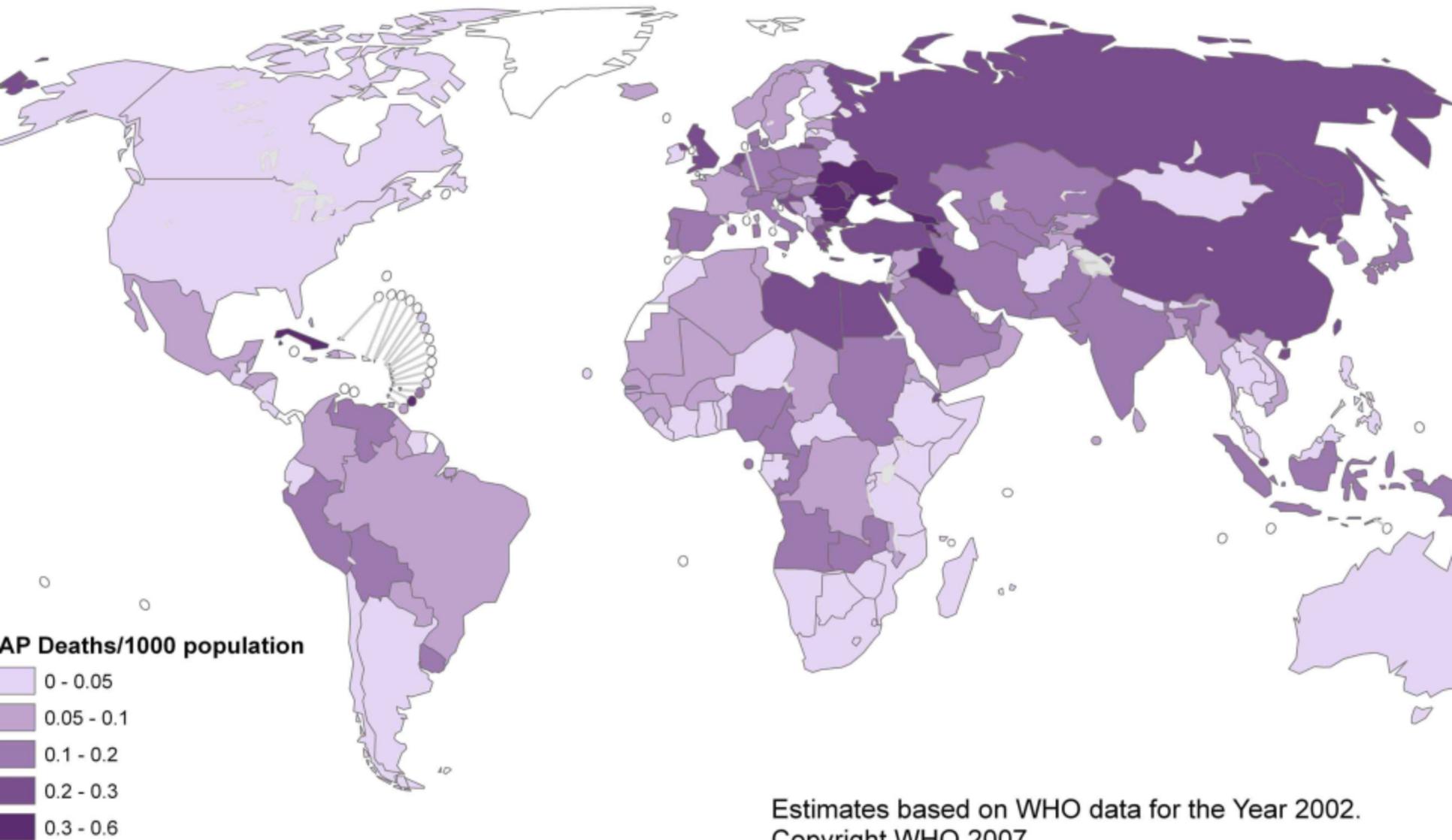
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European activities

- National efforts in AQF
- Projects e.g. MACC, MEGAPOLI
- COST Actions

728 Mesoscale for AP and Dispersion Applications

0602 Chemical weather

0603 Allergenic pollen

1004 European framework for online integrated air quality and meteorology modelling (EuMetChem)

Typical air quality problems affecting Europe

Summer	Winter	Long range transport
<p>Regional/urban scale photochemical episodes</p> <p>Local circulations impact (complex terrain, sea breeze)</p> <p>Biogenic emissions</p> <p>Forest fires</p> <p>Pollen</p>	<p>Particulate matter winter episodes</p> <p>Urban winter smog</p> <p>Late winter-spring dust episodes (re-suspension)</p>	<p>Dust pollution from Africa and Arabian Peninsula</p> <p>Transcontinental transport from North America</p> <p>Stratospheric ozone intrusions</p> <p>Impact of wild fires on aerosol loading</p> <p>Pollen transport episodes</p>

Cross-border effects within Europe

Megacities: Emissions, Impact on Air Quality and Climate, and Improved Tools for Mitigation Assessments (MEGAPOLI)

EC 7FP project for: ENV.2007.1.1.2.1. Megacities and regional hot-spots air quality and climate

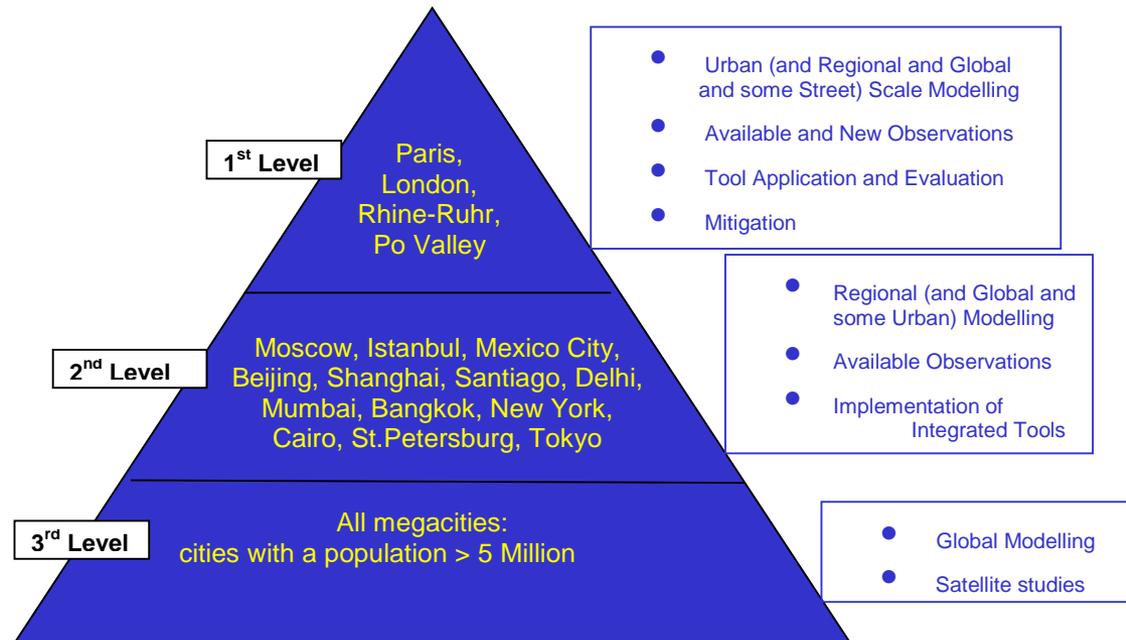
Project duration: 2008 – 2011; Budget: 5,1 mln. Euro
 27 European research organisations from 11 countries are involved
 Coordinator: A. Baklanov (DMI)
 Vice-coordinators: M. Lawrence (MPIC) and S. Pandis (FORTH)

(Project web-site: <http://megapoli.info>)

The main aim of the project is

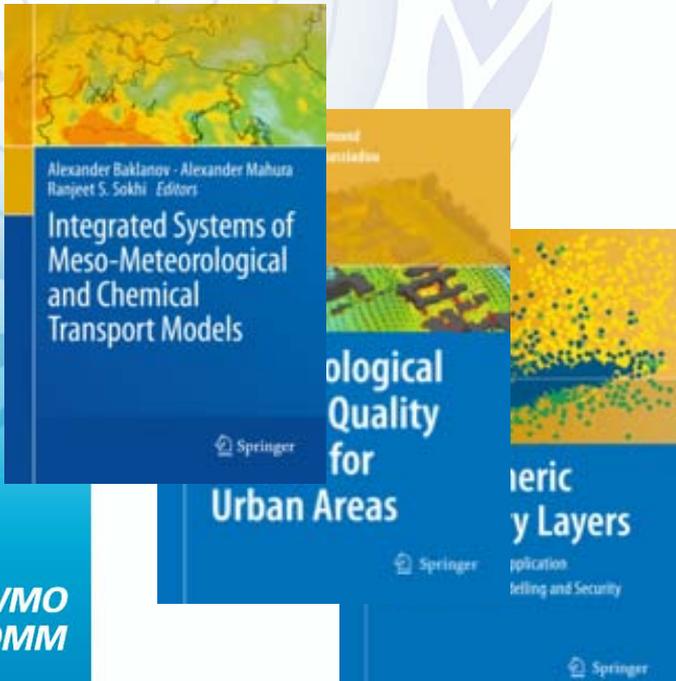
(i) to assess impacts of growing megacities and large air-pollution “hot-spots” on air pollution and feedbacks between air quality, climate and climate change on different scales, and

(ii) to develop improved integrated tools for prediction of air pollution in cities.



MEGAPOLI Dissemination

- **Web-site:** <http://megapoli.info>
- MEGAPOLI Newsletter (10)
- MEGAPOLI Sci. Reports (28)
- Several Books published by Springer
- 3 Journal Special Issues
- A number of scientific papers (>60)



MEGAPOLI Scientific Report 10-03
Evaluation of Zooming Approaches Describing Multiscale Physical Processes
 MEGAPOLI Deliverable D4.1
 Nicolas Moussiopoulos, John Douras, George Tsagas (Eds.)
 Contributing Authors:
 Nicolas Moussiopoulos, John Douras, George Tsagas, Gerold Halmer, Roman Nüßlerman, Alexander Mahura, Alexander Baklanov, Iratxe Gonzalez

Thessaloniki, 2010

Helsinki, 2010

London, 2010

MEGAPOLI Newsletter (10)
 MEGAPOLI Sci. Reports (28)
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 3 Journal Special Issues
 A number of scientific papers (>60)

Megacities: Emissions, urban, regional and Global Atmospheric Pollution and climate effects, and Integrated tools for assessment and mitigation
 Theme FP7-ENV-2007-1-2-1-1
 Megacities and regional hot-spots air quality and climate

Issue 1
 Welcome to the first issue of the Newsletter
 Editorial
 The MEGAPOLI consortium is pleased to present the 1st issue of the MEGAPOLI Newsletter. An abstr presentation of the project is given here. Details can be found in public documents available at the project website (megapoli.dtu.dk), description of work (DOW), scientific presentations at international conferences and the project's brochure.
 The purpose of the newsletters is to inform about activities, progress, and achievements of the MEGAPOLI project as well as to establish a dynamic communication link with the Partners, Collaborators, and Users Community, to monitor the project activities and to exchange input and experiences. For these reasons your contributions to newsletters and news at the web-site as well as comments are always welcome (see to www.megapoli.dtu.dk).

Issue 2
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Issue 3
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Issue 4
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Cost actions

❖ **Cost 728** (2004-2009)

- Enhancing Mesoscale Meteorological Modelling Capabilities for Air Pollution and Dispersion Applications
- Chair: Prof. Ranjeet SOKHI

❖ **Cost ES0602** (2007-2011)

- Towards a European Network on Chemical Weather Forecasting and Information Systems (ENCWF)
- Chair: Prof. Jaakko KUKKONEN

❖ **Cost ES1004** (2011-2015)

- European framework for online integrated air quality and meteorology modelling
- Chair: Dr Alexander BAKLANOV

COST (728) Model Inventory

<http://www.mi.uni-hamburg.de/index.php?id=539>

about 105 models

Joint publications with GURME (available for sign up at meeting)

GAW Rep 177: Overview of Existing Integrated (off-line and on-line) Mesoscale Meteorological and Chemical Transport Modelling Systems in Europe

GAW Rep 181: Overview of Tools and Methods for Meteorological and Air Pollution Mesoscale Model Evaluation and User Training

GAW Rep 187: Review of Capabilities of Meteorological and Chemistry-Transport Models for Describing and Predicting Air Pollution Episodes

Tables of model information from NMHSs, COST and European projects compiled for GURME website.

COST ES0602

Chemical Weather (2007-2011)

The main objective of the Action was:

to set up a forum for benchmarking, harmonising and developing approaches, practices and protocols in forecast data exchange and multi-model capabilities

towards a chemical weather forecasting network and near-real-time (NRT) information system in Europe.

... closely related to MACC

European chemical weather forecasting portal (ECWFP) - usage and scope

Can be used, e.g., to find out, **which services are available** for a specific domain, for specific source categories or for specific pollutants

Functions for obtaining relevant **supplementary information**

Inter-comparison of the various available forecasting systems

Such **a single point of reference** for the European chemical weather forecasting information has not previously been in operation.

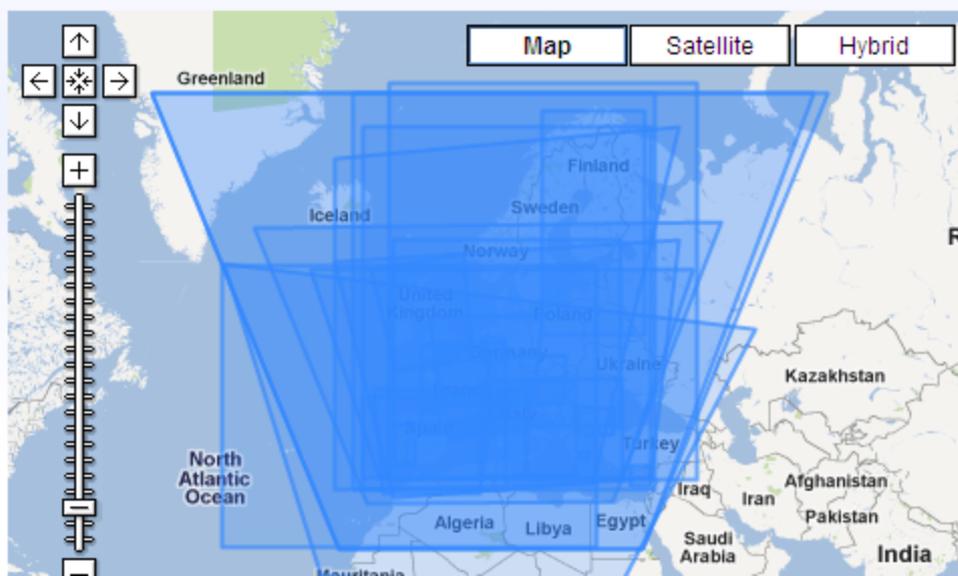


COST ESo602, Chemical Weather

Action ESo602: Towards a European Network on Chemical Weather
Forecasting and Information Systems (ENCWF)

[Home](#)[Meetings](#)[Links](#)[Material](#)[CW Portal](#)

European Chemical Weather Forecasting Portal

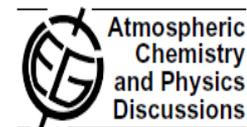


AirMerge

The [AirMerge System](#) is an extension of the ChemicalWeather portal, and allows you to view, combine and compare results from chemical weather models.

Domains

- Athens (NKUA-AUTH)
- Austria
- Balkan Peninsula (NKUA-AUTH)
- Bulgaria
- Catalonia (Csan)

COST ES0602**Review article in
ACPD
Kukkonen et al.
(2011)**Atmos. Chem. Phys. Discuss., 11, 5985–6162, 2011
www.atmos-chem-phys-discuss.net/11/5985/2011/
doi:10.5194/acpd-11-5985-2011
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This discussion paper is/has been under review for the journal Atmospheric Chemistry and Physics (ACP). Please refer to the corresponding final paper in ACP if available.

Operational, regional-scale, chemical weather forecasting models in Europe

J. Kukkonen¹, T. Balk^{1,2}, D. M. Schultz^{1,2,3}, A. Baklanov⁴, T. Klein⁵, A. I. Miranda⁶, A. Monteiro⁶, M. Hirtl⁷, V. Tarvainen¹, M. Boy², V.-H. Peuch⁸, A. Poupkou⁹, I. Kioutsoukis⁹, S. Finardi¹⁰, M. Sofiev¹, R. Sokhi¹¹, K. Lehtinen¹², K. Karatzas¹³, R. San José¹⁴, M. Astitha¹⁵, G. Kallos¹⁵, M. Schaap¹⁶, E. Reimer¹⁷, H. Jakobs¹⁸, and K. Eben¹⁹¹Finnish Meteorological Institute, Helsinki, Finland²Division of Atmospheric Sciences, Department of Physics, University of Helsinki, Finland³Centre for Atmospheric Science, School of Earth, Atmospheric and Environmental Sciences, University of Manchester, Manchester, UK⁴Danish Meteorological Institute, Copenhagen, Denmark⁵Swedish Meteorological and Hydrological Institute, Norrköping, Sweden⁶University of Aveiro, Aveiro, Portugal⁷Section of Environmental Meteorology, Central Institute for Meteorology and Geodynamics, Vienna, Austria⁸Meteo-France, Toulouse Cedex, France

Discussion Paper | Discussion Paper | Discussion Paper | Discussion Paper

ACPD

11, 5985–6162, 2011

Operational, regional-scale, chemical weather forecasting models in Europe

J. Kukkonen et al.

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Interactive Discussion

COST ES1004

Online air quality/meteorology modelling

The main objectives of the Action are:

- ✓ to set up a multi-disciplinary forum for online integrated air quality/meteorology modelling
- ✓ to elaborate a European strategy for a new generation of integrated ACT/NWP-CLIM modelling framework.

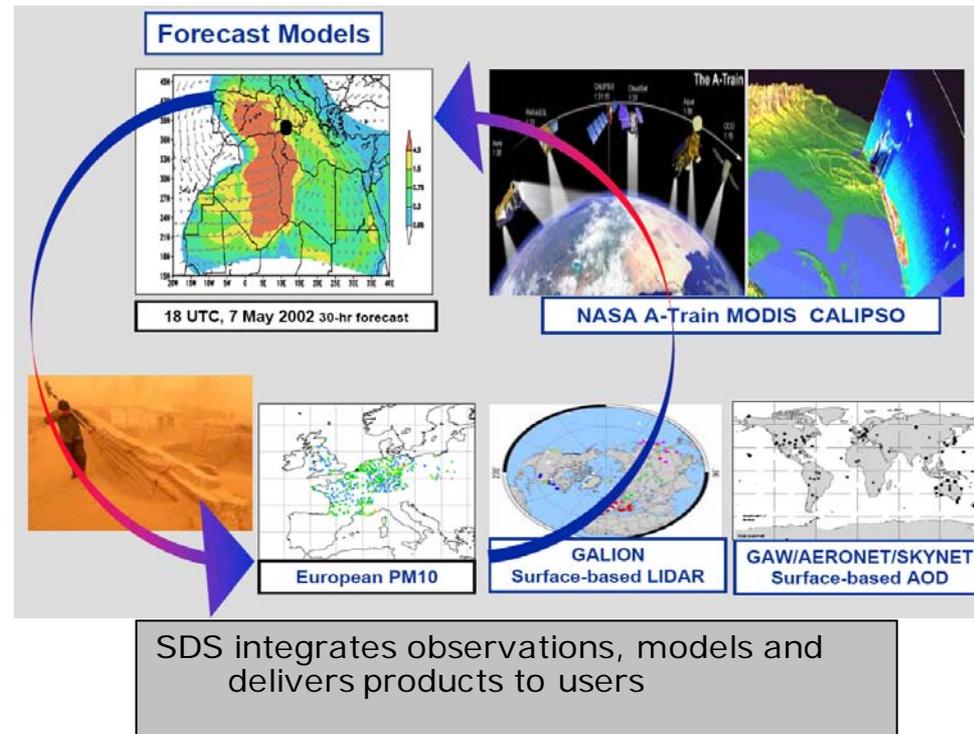
Started 28.02.2011

The WMO Sand and Dust Storm Warning, Advisory and Assessment System (SDS-WAS)

- A Global Consortium Helping Society Reduce Risk Through Research, Assessments and Forecasts
- **IMPACTS:** Human Health, Agriculture, Marine productivity, Weather and Climate, Aviation
- **Node in Spain** moving to operational

SDS-WAS

- 40 WMO Members interested in the initiative
- ~ 15 institutions running research operational dust model forecasts
- 2 SDS-WAS nodes (in China and Spain) established to coordinate regional cooperation
- Joint GAW and WWRP initiative



Heat waves cause excess deaths, large portion due to air pollution

Heat wave in Europe summer 2003:

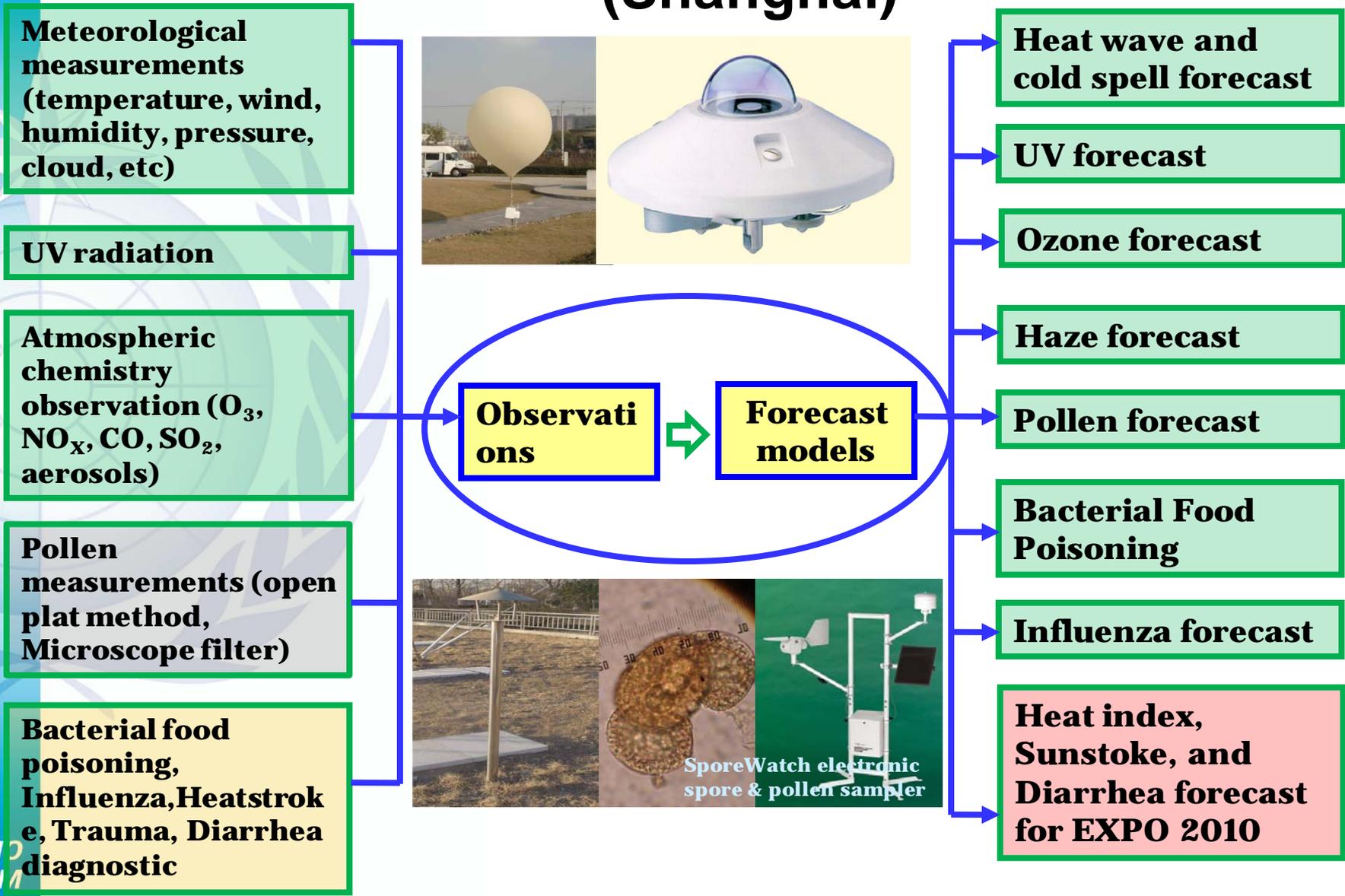
70 000 extra deaths, about 20 – 38 % due to air pollution

More ozone:

- High T favors production of O₃
- Low RH reduces destruction of O₃
- Less dry removal through vegetation (T, no precipitation)
- Biogenic precursor emissions higher (isoprene)
- Stable meteorological situation with no clouds (containment of pollutants and favorable for photochemistry)

AQ forecasts and Heat Health Early Warnings (HHEW)

Meteorological services for public health (Shanghai)

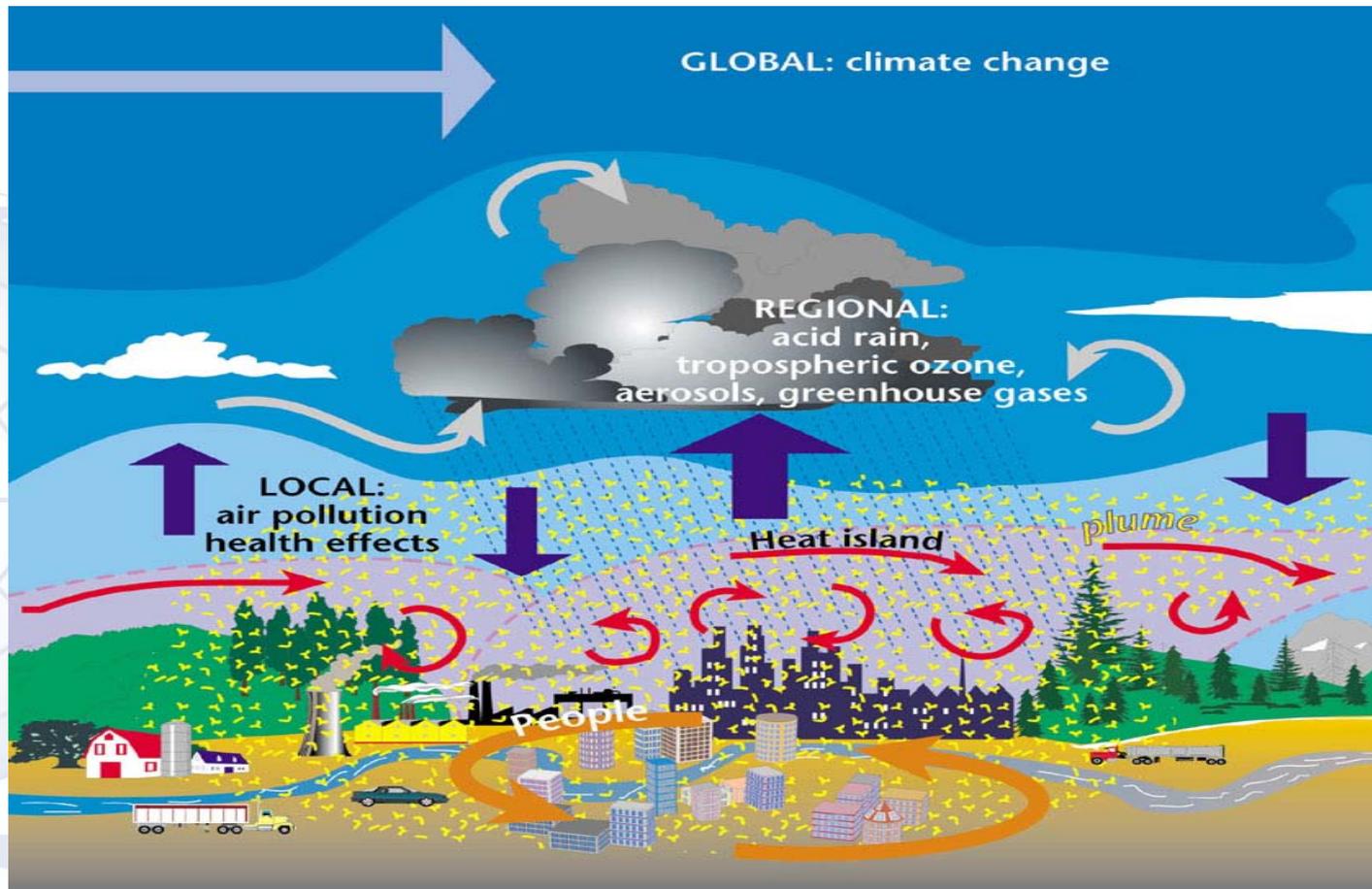


New focus: Integrated approach combining physical, chemical and biological weather

There is a need to design and implement public information and warning levels for biological weather ES0602 (pollen, spores, viruses, bacteria, microbes).

In addition to separate impacts, the three need to be considered together and research is needed to improve the coupling of these, to understand exposure and improve modelling and forecasting.

WMO GURME



Connecting different regions of the globe



Collaboration critical for success!

Examples of Health Effects for Europe

- WHO estimate for Europe (51 countries)
 - Children age 0-4 years: 1.8 – 6.4 % of deaths from all causes due to outdoor air pollution
- In a selection of European cities each year:
 - Air pollution responsible for 100,000 deaths and
 - 725,000 years of lost life (DALYs)
- European Commission estimates in CAFÉ:
 - 350,000 premature deaths in 2000 due to outdoor air pollution of PM_{2.5} alone
 - Average loss of life expectancy of 9 months for each European citizen
- Ozone causes 20,000 premature deaths annually