The CityZen project

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Project acronym: CityZen

Project full title:
megaCITY - Zoom for the Environment

Total budget: ~ 4 m€

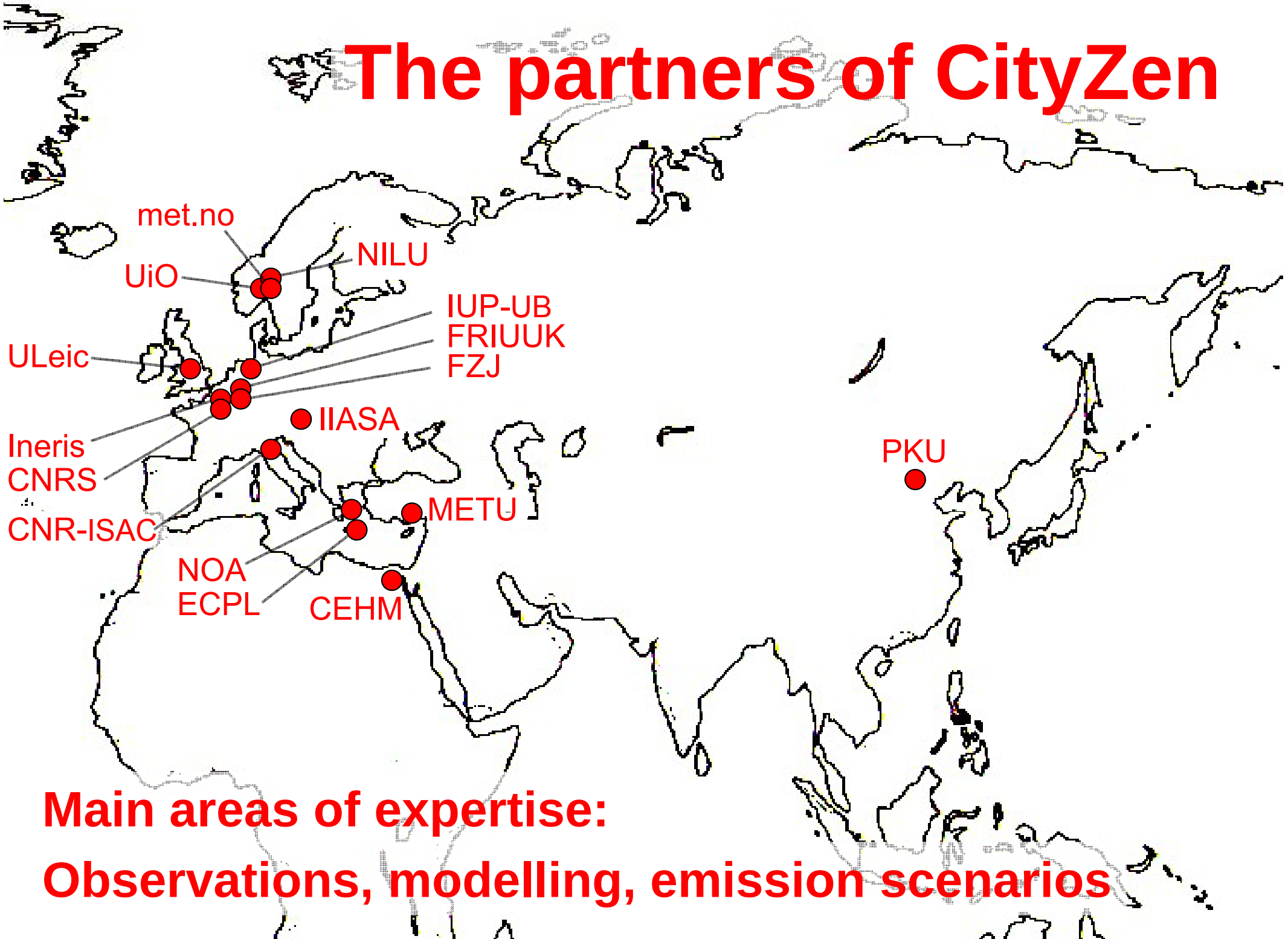
(FP7 medium-scale focused research project)

Duration: 3 years (start: September 2008)

- 2007 was the first year in history when urban population was larger than rural population
- Large cities, in general, are polluted environments
- A increasing part of the world's population is exposed to poor air quality

- Megacities, being large emission sources, can have a global impact on air pollution and climate.
- Most megacities are growing rapidly, implying changes in habits and infrastructure and thus emissions.
- The pattern of emissions matters! E.g. non-linearities in chemistry.
- Megacities can influence local climate (e.g. aerosol-cloud interactions, low visibility, urban heat islands).
- Climate change will influence megacities (e.g. transport patterns, chemical oxidation and biogenic emissions).
- Impact strongly depends on latitude and season.

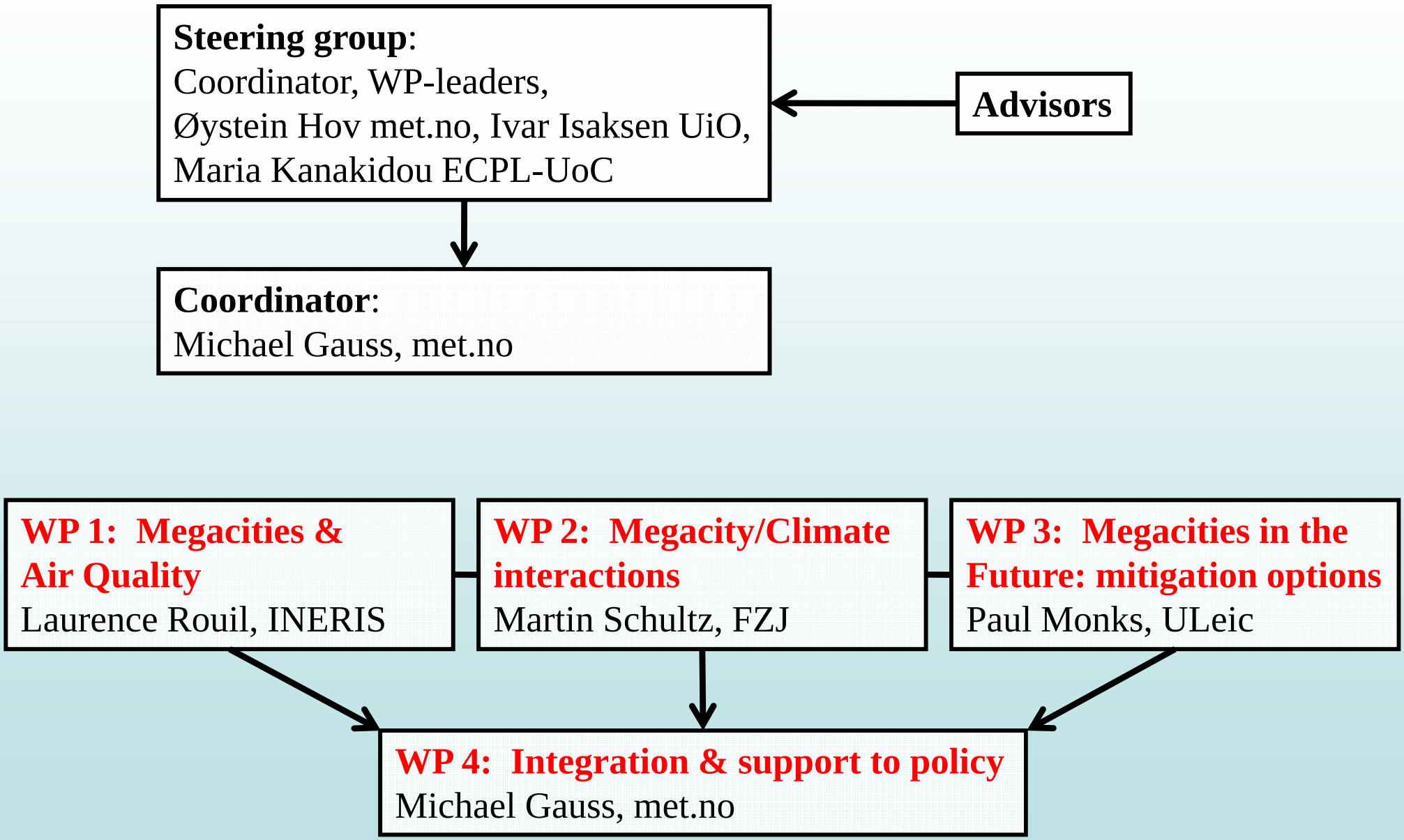
The partners of CityZen



Main areas of expertise:

Observations, modelling, emission scenarios

Partner no.	Partner name	Country
1 (Coordinator)	Meteorologisk institutt	Norway
2	Peking University	China
3	Centre National de la Recherche Scientifique	France
4	Institut National de l'Environnement Industriel et des Risques	France
5	Universität Bremen	Germany
6	Rhenish Institute for Environmental Research at the University of Cologne	Germany
7	Forschungszentrum Jülich GmbH	Germany
8	University of Crete	Greece
9	Consiglio Nazionale Delle Ricerche	Italy
10	Norsk Institutt for Luftforskning	Norway
11	Universitetet i Oslo	Norway
12	Institute of Marine Sciences-Middle East Technical University	Turkey
13	University of Leicester	United Kingdom
14	International Institute for Applied Systems Analysis	Austria
15	National Observatory of Athens	Greece
16	Cairo University Center for Environmental Hazard Mitigation	Egypt


Steering group:
Coordinator, WP-leaders,
Øystein Hov met.no, Ivar Isaksen UiO,
Maria Kanakidou ECPL-UoC
Advisors
Coordinator:
Michael Gauss, met.no
WP 1: Megacities & Air Quality
Laurence Rouil, INERIS
WP 2: Megacity/Climate interactions
Martin Schultz, FZJ
WP 3: Megacities in the Future: mitigation options
Paul Monks, ULeic
WP 4: Integration & support to policy
Michael Gauss, met.no

- Focus on four selected emission hot spots

- BeNeLux and Ruhr area
- Po Valley
- Eastern-Mediterranean (Athínai, İstanbul, Al-Qāhirah, etc.)
- Pearl River Delta (Guangzhou, Shenzhen, etc.) + Hong Kong

- Interactions between spatial scales

- local
- regional
- global

- Feedbacks

- air pollution → climate
- climate → air pollution

- Case studies

- extreme summer of 2003 (NW and central Europe)
- extreme summer of 2007 (SE Europe)

The main objectives of CityZen (1/2)

- **Quantify and understand current air pollution in and around selected megacities/hot spot regions**
  - **distribution and evolution over time**
  - **interaction across the different spatial scales**
- **Estimate how megacities/hot spots influence climate change**
  - **emissions of greenhouse gases, particles, precursors**
  - **different spatial scales**
- **Estimate how megacities are responding to climate forcing**
  - **transport patterns**
  - **chemical oxidation and biogenic emissions**
- **Development of tools to estimate interactions between different spatial scales**
  - **modeling**
  - **analysis of observational data**

The main objectives of CityZen (2/2)

- **Estimate the impact of future emission changes**
  - **rapid growth in the population of megacities/hot spots**
  - **increasing background of pollutants**
  - **focus on ozone, particulate matter, and their precursors**
- **Study mitigation options**
  - **introduction of alternative fuels**
  - **different public transportation options**
  - **structural changes in population distribution**
- **Provide technical underpinning of policy work**
  - **both during and after the project has ended**

Examples of hypotheses to be tested in CityZen

1) Megacities and hot spots have changed the regional and global distribution of ozone, particulate matter, and their precursors including carbon monoxide CO and other pollutants significantly compared to what would be the case with more evenly distributed emissions.
2) Megacities affect the radiative budget and aerosol microphysics such that precipitation and the number of sunlit hours and thus temperature and photochemistry change significantly both locally and over larger regions. This may become more significant in the future as megacities and their emissions grow.
3) Climate change will change weather patterns (winds, temperature, stability, precipitation) and surface properties, which affect air quality in megacities and regional hot spots. If more frequent high pressure situations occur, episodes with reduced air quality will become more frequent.
4) Climate change will induce episodic and permanent changes in the natural and anthropogenic cycles of atmospheric trace chemicals.
5) Changes in frequency and intensity of forest fires and other biomass burning will at times contribute significantly to air pollution in megacities and hot spots.
6) Measures can be defined that reduce the adverse effects of megacity/hot spot emissions. The adverse effects relate both to air quality (human health) and climate change/weather modification.
7) The effect on air quality in some megacities following the replacement of gasoline in parts by biofuel is to reduce the formation of secondary pollutants: aerosols and ozone.