
Centre for Energy, Environment and Health

# Centre of Energy, Environment and Health

*Lise M. Frohn, Camilla Geels, Jørgen Brandt, Jesper H. Christensen, Kaj M. Hansen, Ole Hertel, Alexander Baklanov, Allan Gross, Alix Rasmussen, Kenneth Karlsson, Lars Henrik Nielsen, Eigil Kaas, Torben Sigsgaard, Jan Sørensen, Jytte Seested Nielsen, Esben Meulengracht Flachs, Jacob Hjort Bønløkke, Knud Juel and Henrik Brønnum-Hansen*

*Lise.Frohn@dmu.dk*

Centre for Energy, Environment and Health

CEEH is an interdisciplinary collaboration with the mission to support planning of future Danish energy systems, where both direct costs as well as external cost to the environment, climate and health are considered.

The centre will work on several realistic scenarios characterised by various assumptions on economic growth and energy prices.

The product will be suggestions for optimised Danish energy systems.

The centre is financed by the Danish Council for Strategic Research and runs over 5 years beginning in January 2007.

*Lise M. Frohn, National Environmental Research Institute, Denmark*

# Objectives

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CEEH is a collaboration between 7 Danish institutions working within the subject areas of

- meteorology,
- toxicology,
- epidemiology,
- public health economy and
- system analysis.

**Common language: Money and cost minimization**

*Lise M. Frohn, National Environmental Research Institute, Denmark*

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# Product

**Estimated *total* costs for different scenarios, characterised by the size of economical growth and energy prices. Scenarios for 2010, 2020, 2030, 2040 and 2050 are in play.**

**The final product will be suggestions for optimal planning of Danish energy systems for each scenario.**

**Common language: Money and cost minimization**

*Lise M. Frohn, National Environmental Research Institute, Denmark*

# CEEH model chain

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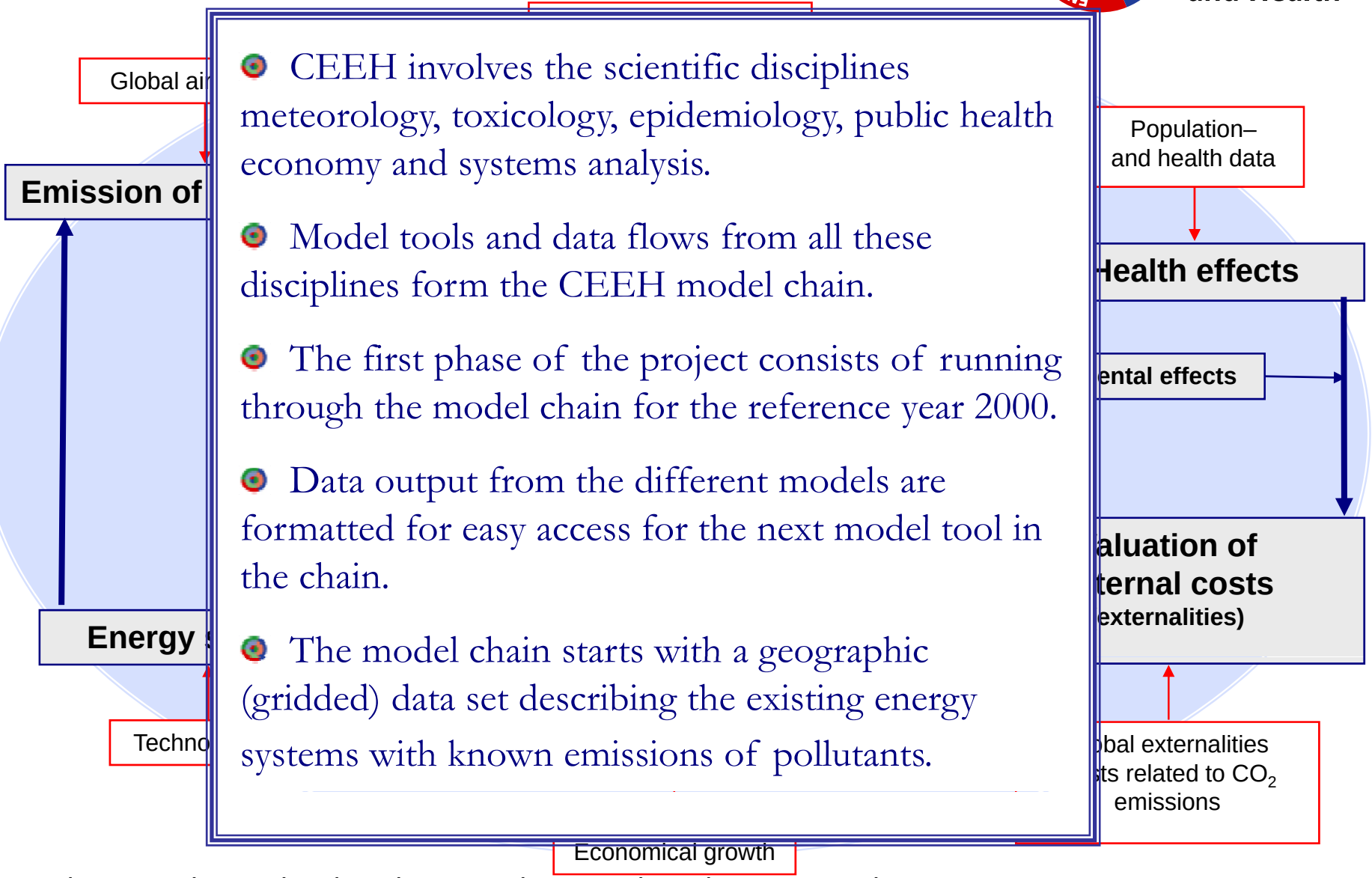
- CEEH involves the scientific disciplines meteorology, toxicology, epidemiology, public health economy and systems analysis.
- Model tools and data flows from all these disciplines form the CEEH model chain.
- The first phase of the project consists of running through the model chain for the reference year 2000.
- Data output from the different models are formatted for easy access for the next model tool in the chain.
- The model chain starts with a geographic (gridded) data set describing the existing energy systems with known emissions of pollutants.

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# CEEH model chain

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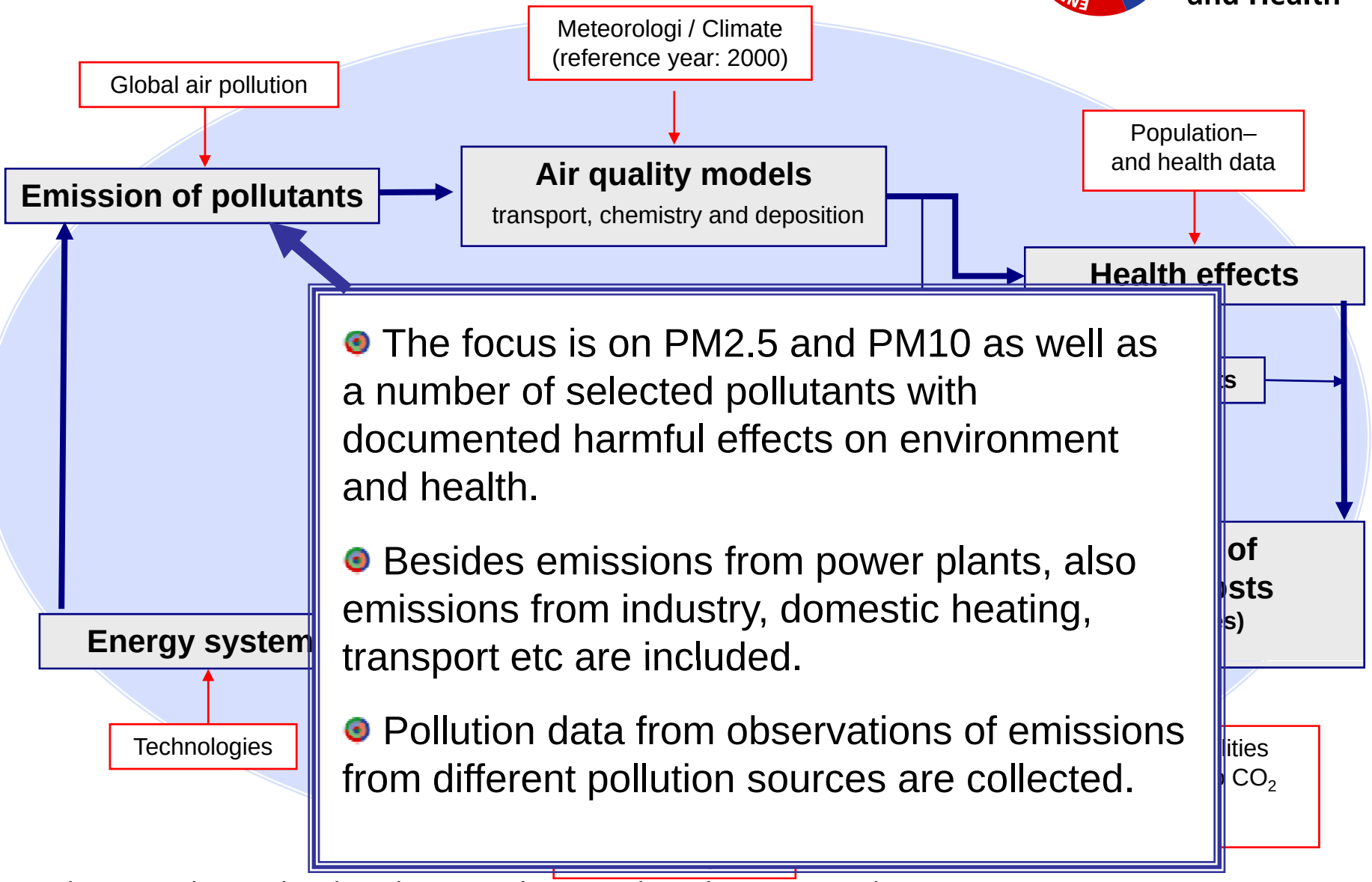


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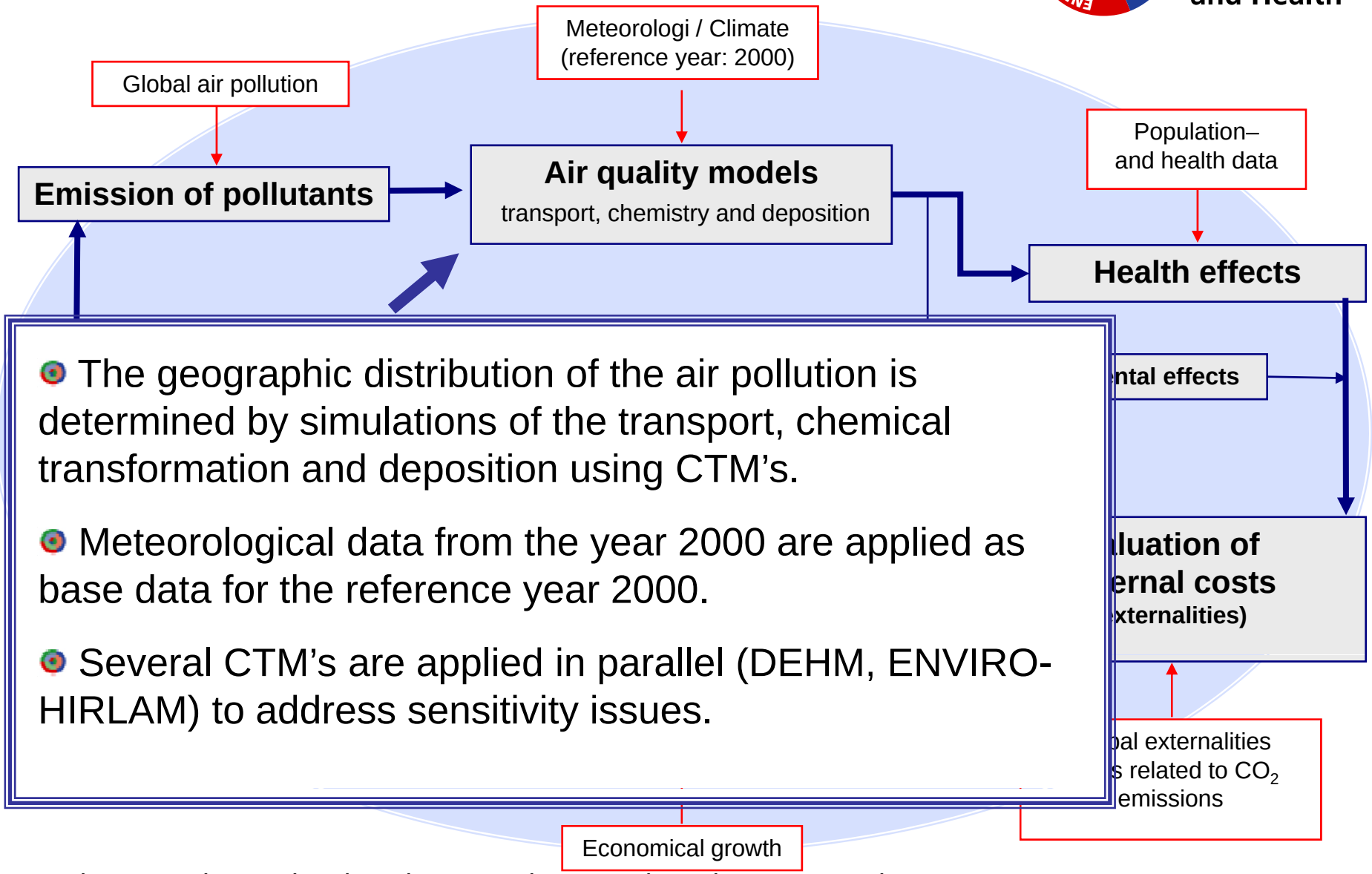


- The geographic distribution of the air pollution is determined by simulations of the transport, chemical transformation and deposition using CTM's.
- Meteorological data from the year 2000 are applied as base data for the reference year 2000.
- Several CTM's are applied in parallel (DEHM, ENVIRO-HIRLAM) to address sensitivity issues.

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# CEEH model chain

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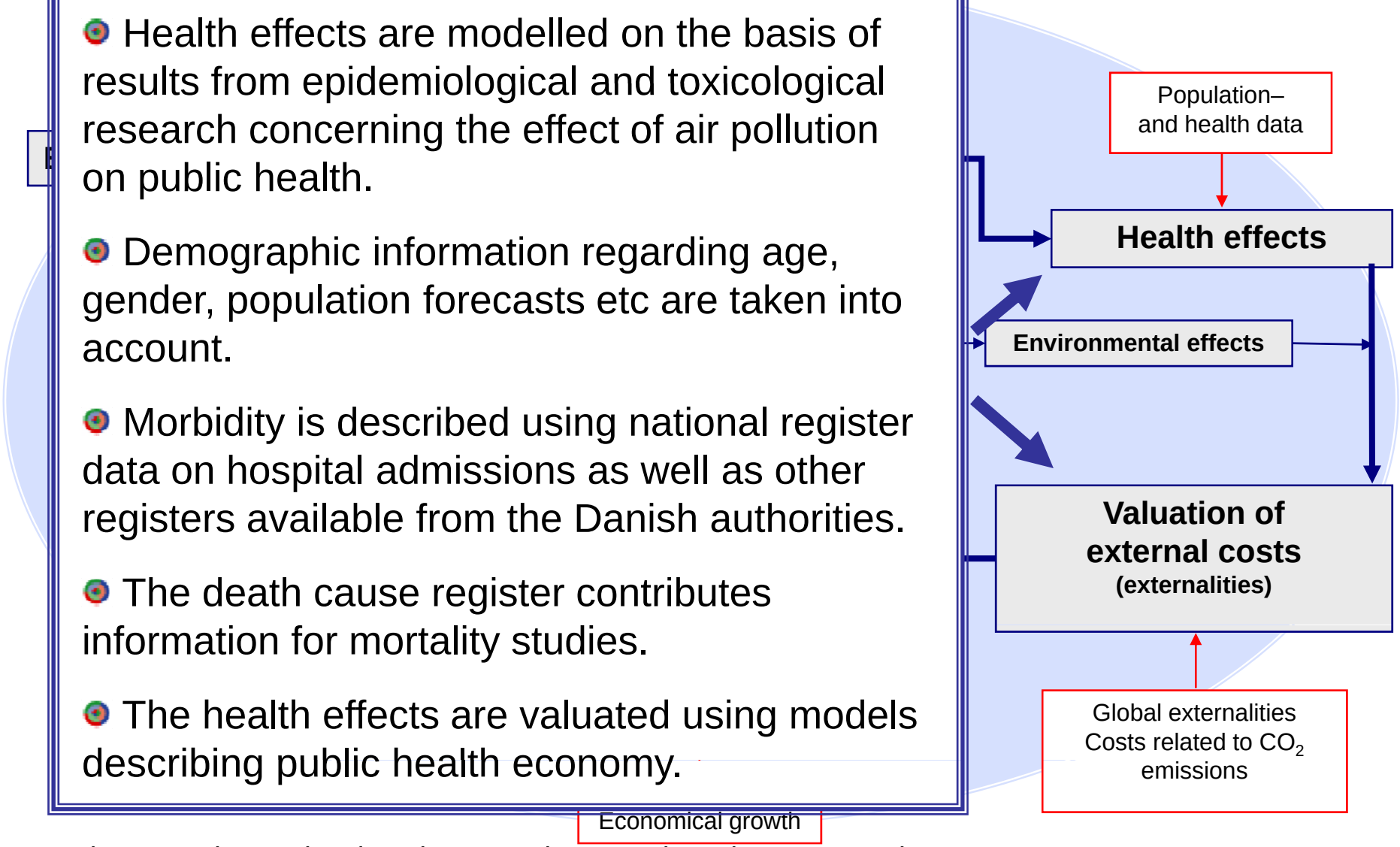
- Health effects are modelled on the basis of results from epidemiological and toxicological research concerning the effect of air pollution on public health.
- Demographic information regarding age, gender, population forecasts etc are taken into account.
- Morbidity is described using national register data on hospital admissions as well as other registers available from the Danish authorities.
- The death cause register contributes information for mortality studies.
- The health effects are valuated using models describing public health economy.

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# CEEH model chain

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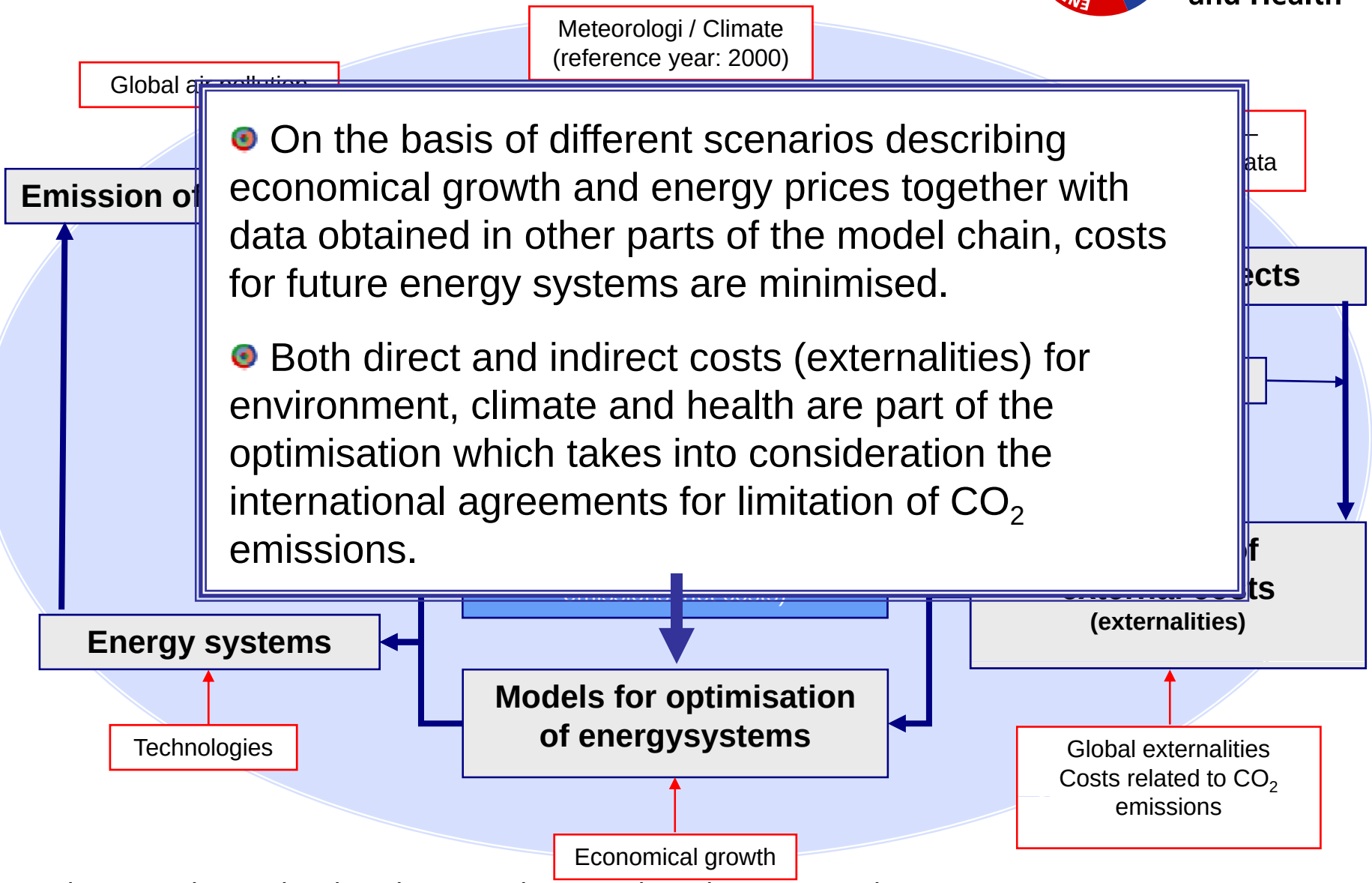


- On the basis of different scenarios describing economical growth and energy prices together with data obtained in other parts of the model chain, costs for future energy systems are minimised.
- Both direct and indirect costs (externalities) for environment, climate and health are part of the optimisation which takes into consideration the international agreements for limitation of $CO_2$ emissions.

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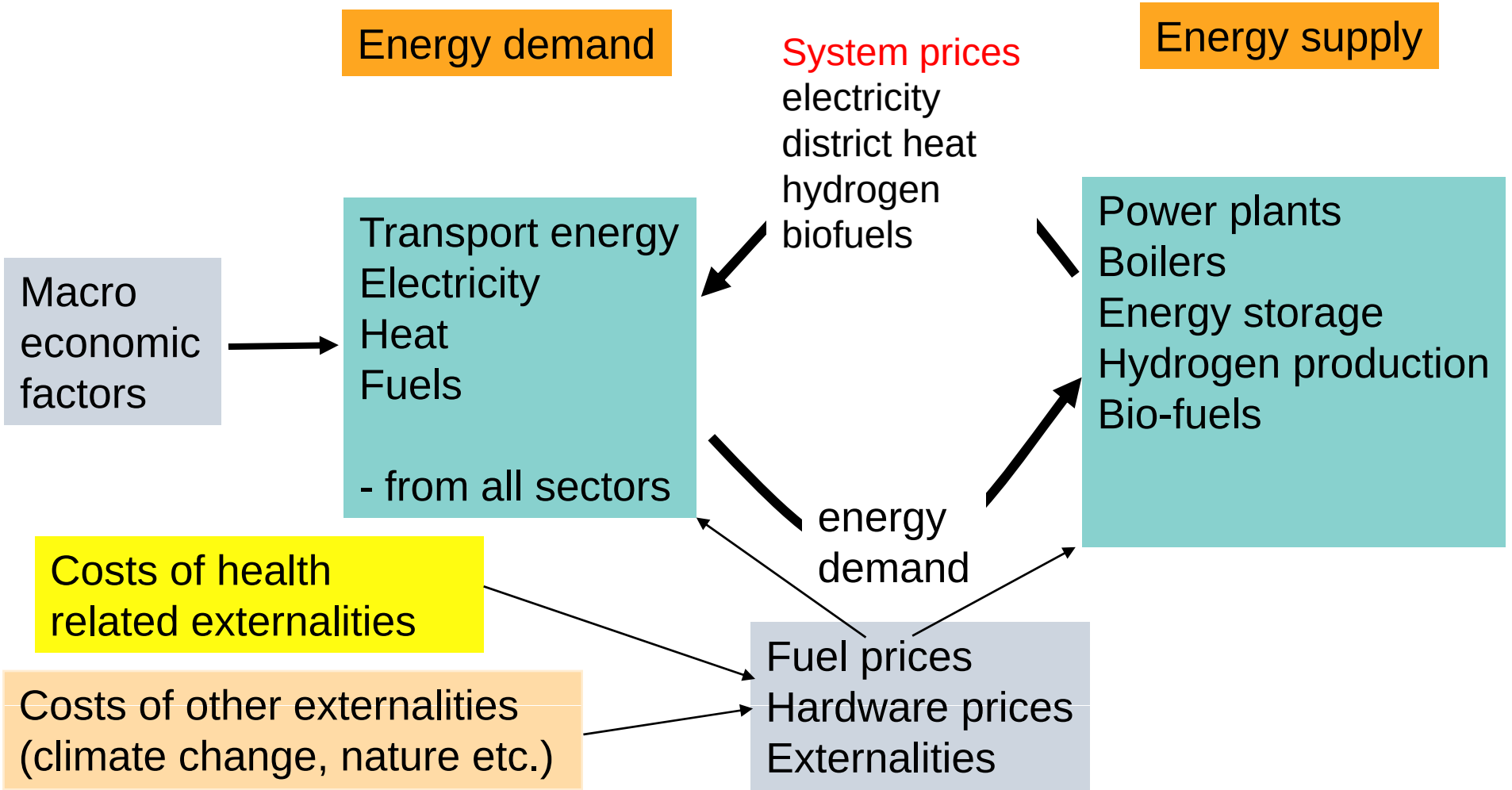
# Energy System Modelling – 2005 to 2050

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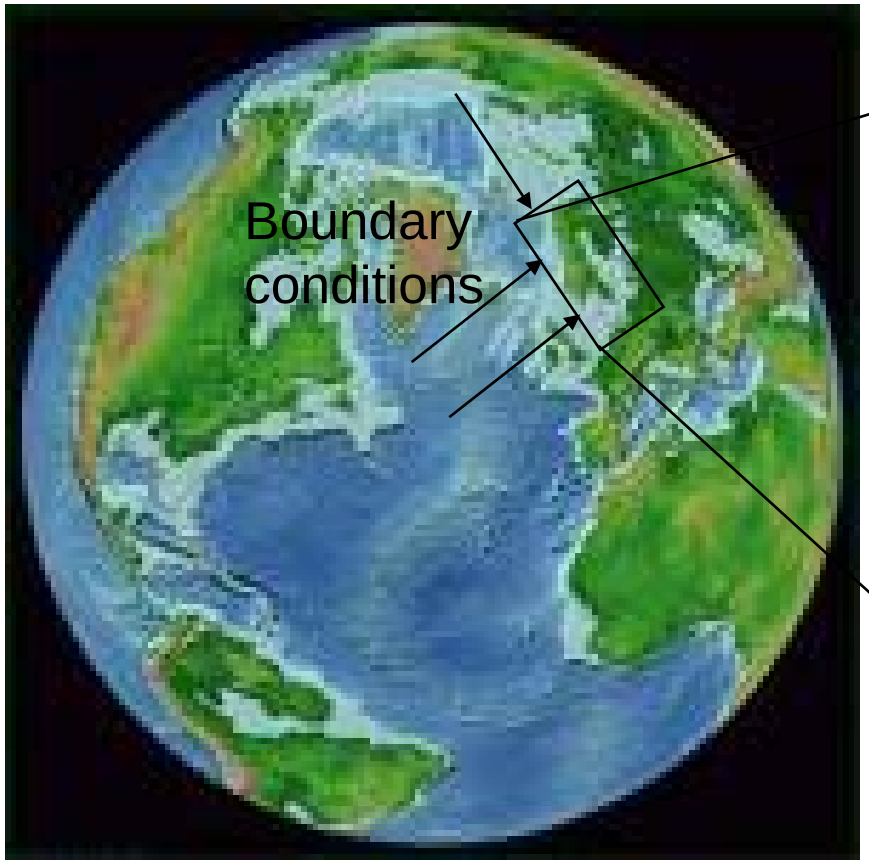
# Modelling Global and Regional Energy Systems

Global scenarios

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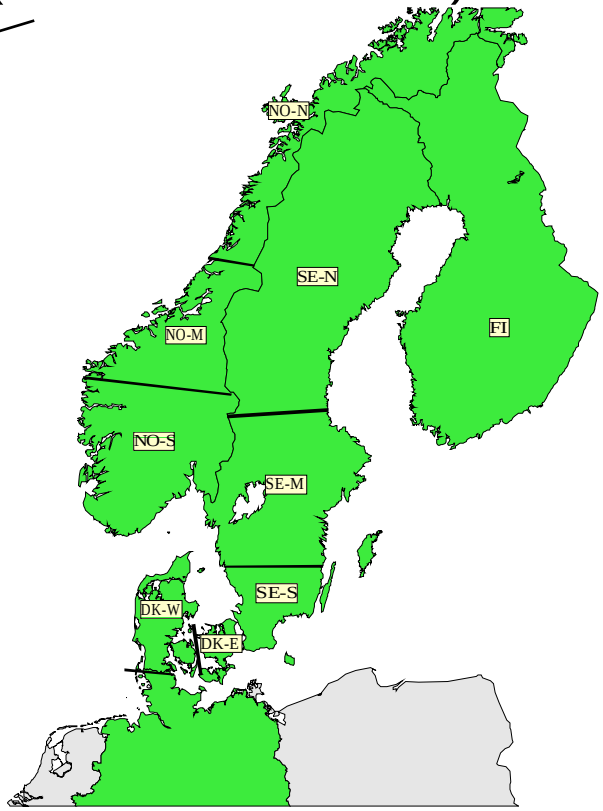


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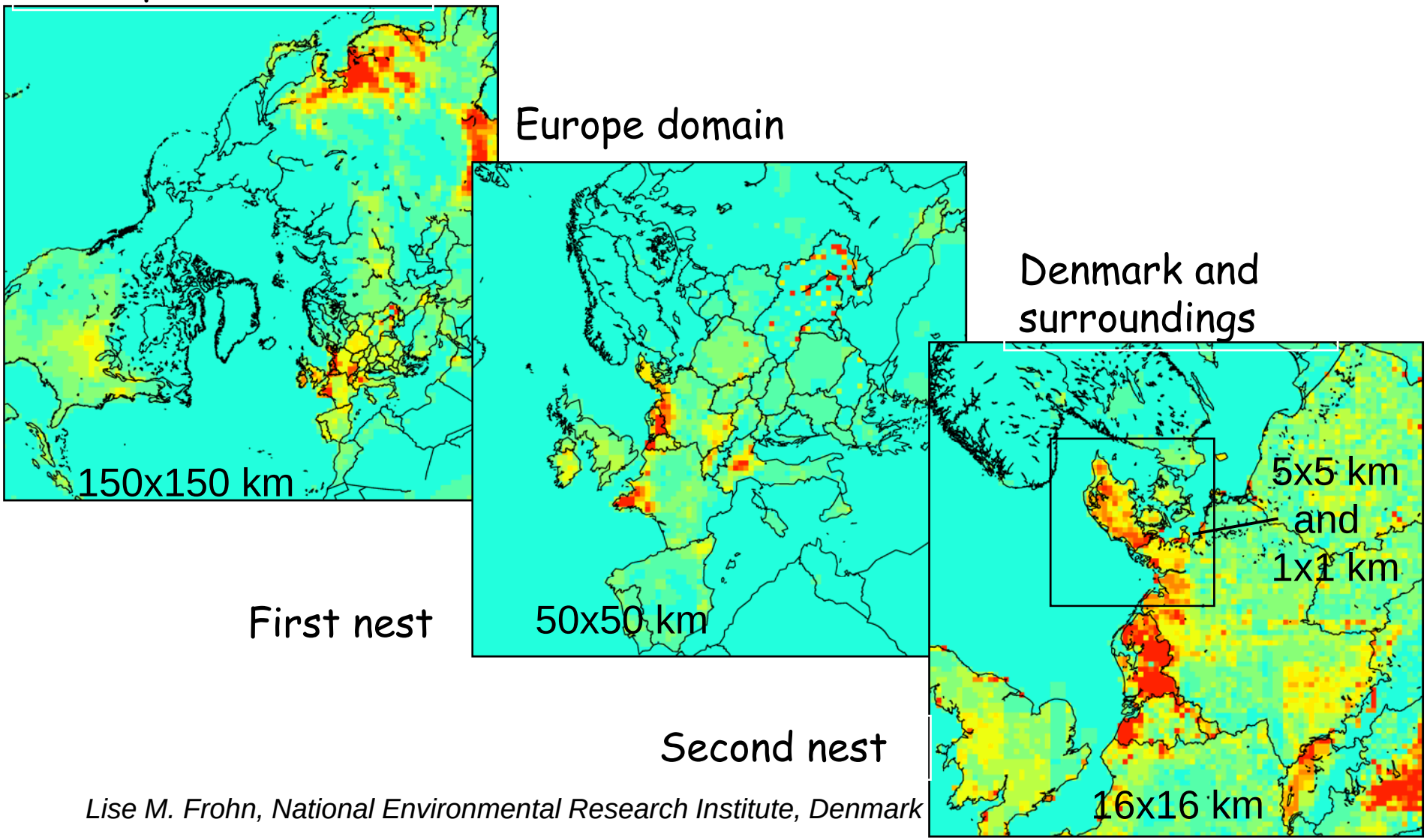
# The NERI model system - DEHM

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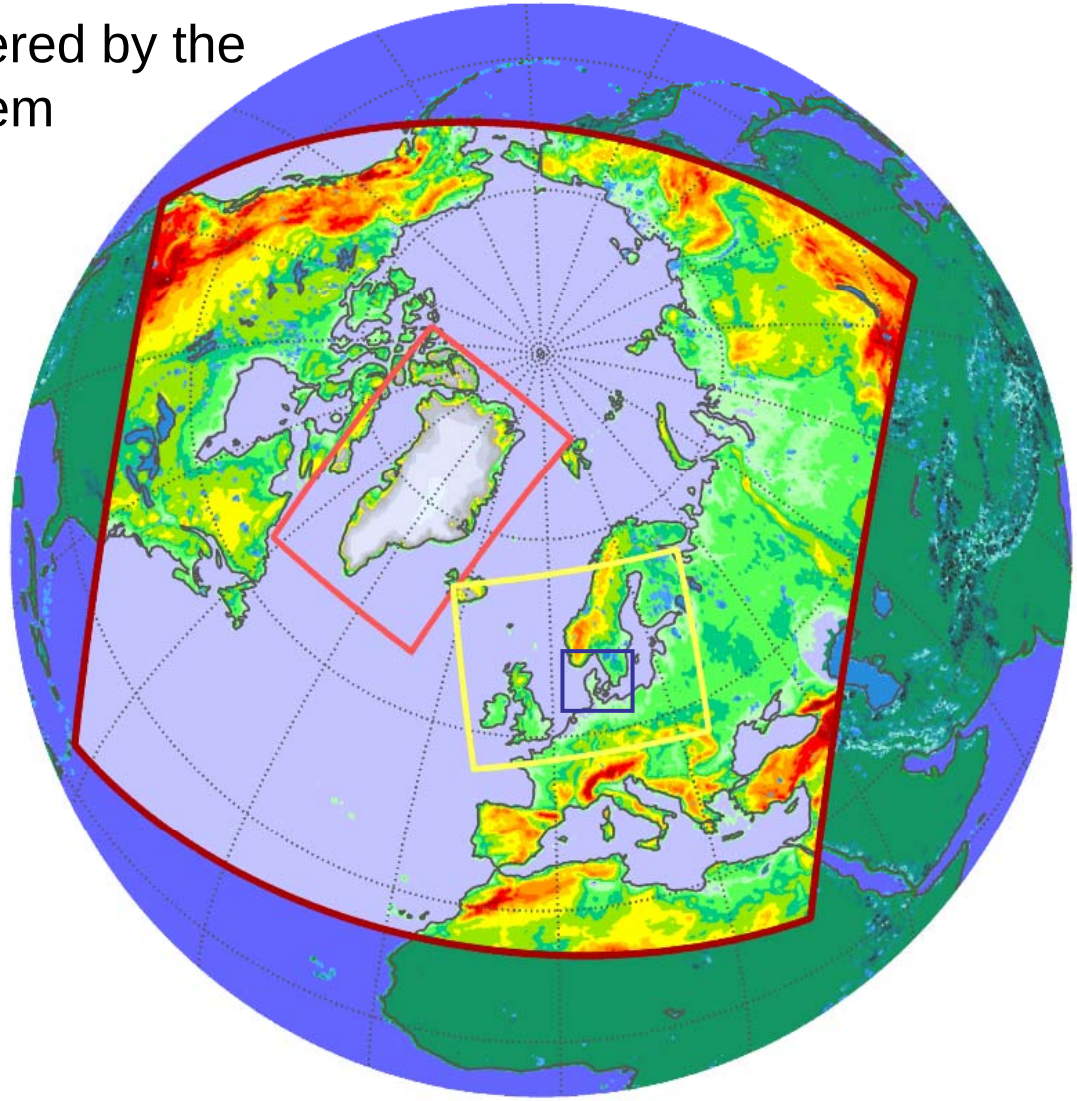
# Enviro – HIRLAM air pollution modelling at DMI

Operational areas covered by the Enviro – HIRLAM system today

50x50km horizontal down 1.4x1.4km for Denmark.

Vertical it goes into the stratosphere



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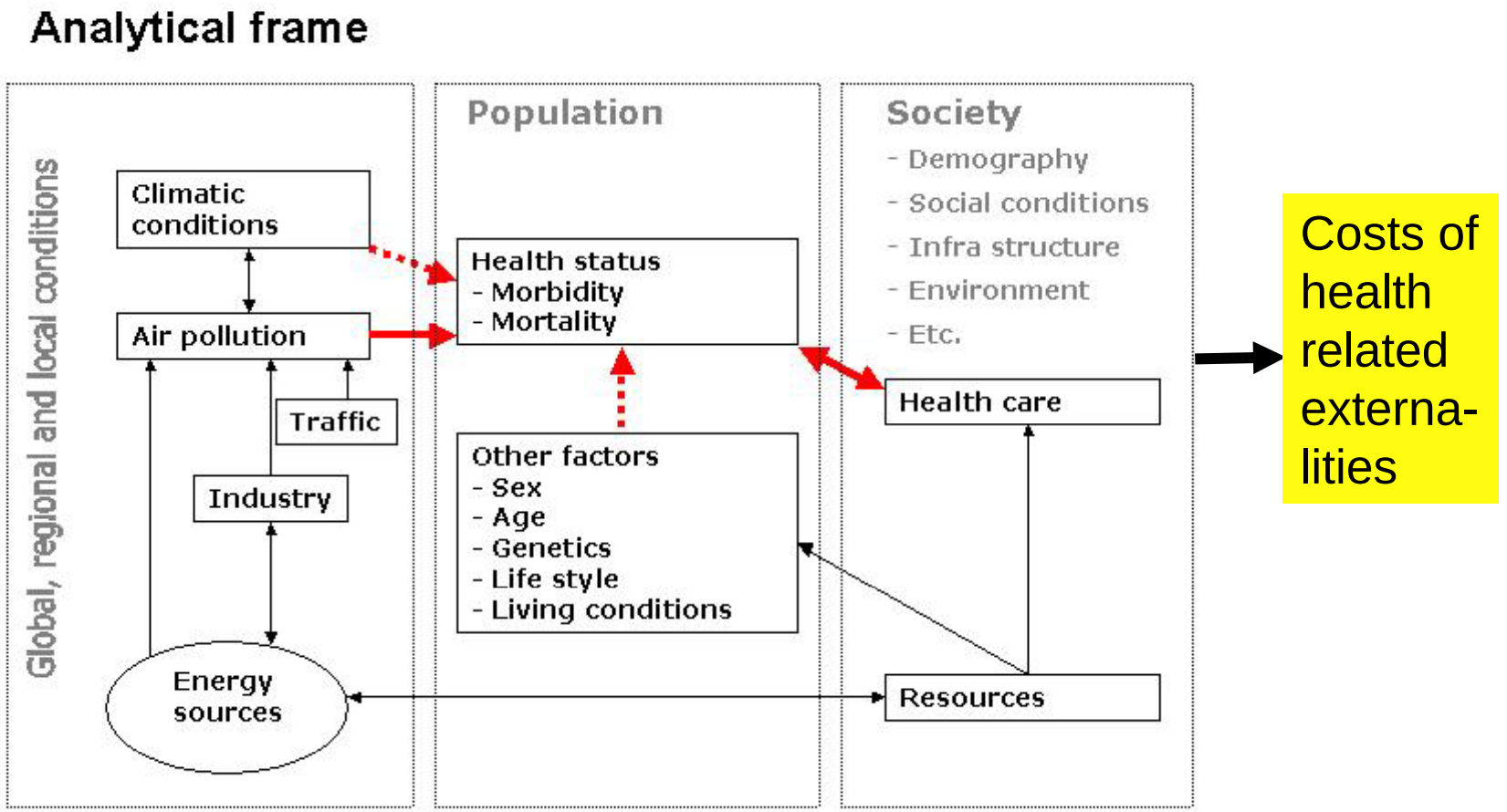
# Quantification of Health Effects – Dose Response Functions

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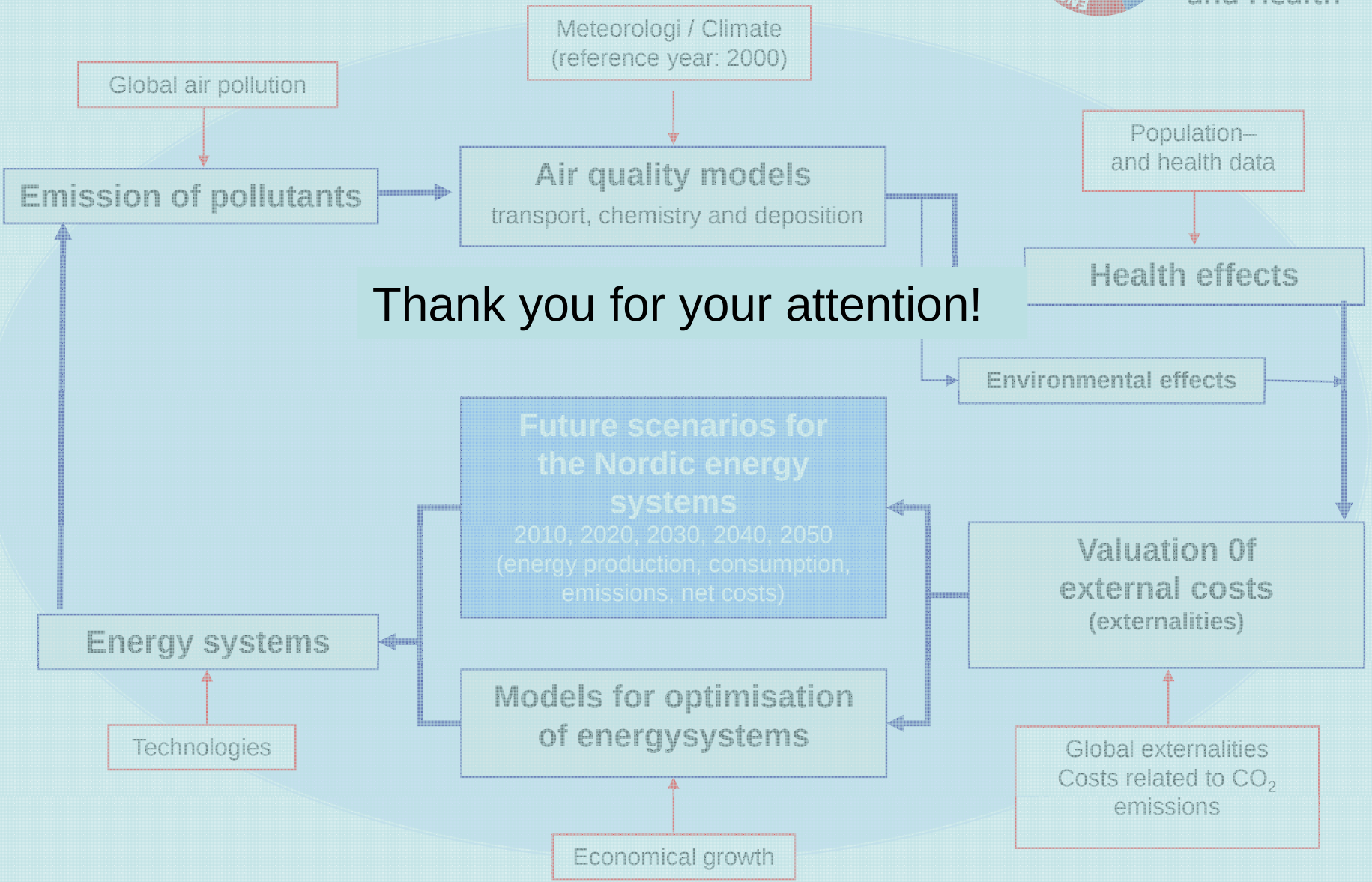


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