Integrated Assessment Modelling : the EU Projects INTARESE and HEIMTSA and their Common Case Study on Health Benefits of Climate Change Mitigation Policies

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Two Integrated Projects under EU FP6:

Environment and Health, Global Change and Ecosystems

- **INTARESE** – **Int**egrated **A**ssessment of Health **R**isks from **E**nvironmental **S**tressors in **E**urope : 5 years; 34 partners;

  Coordinator: David Briggs, Imperial College, London
- **HEIMTSA** – **H**ealth and **E**nvironment **I**ntegrated **M**ethodology and **T**oolbox for **S**cenario **A**ssessment : 4 years; 21 partners;

  Coordinator: Fintan Hurley, Inst. for Occupational Medicine, Edinburgh

  Both will finish January 2011

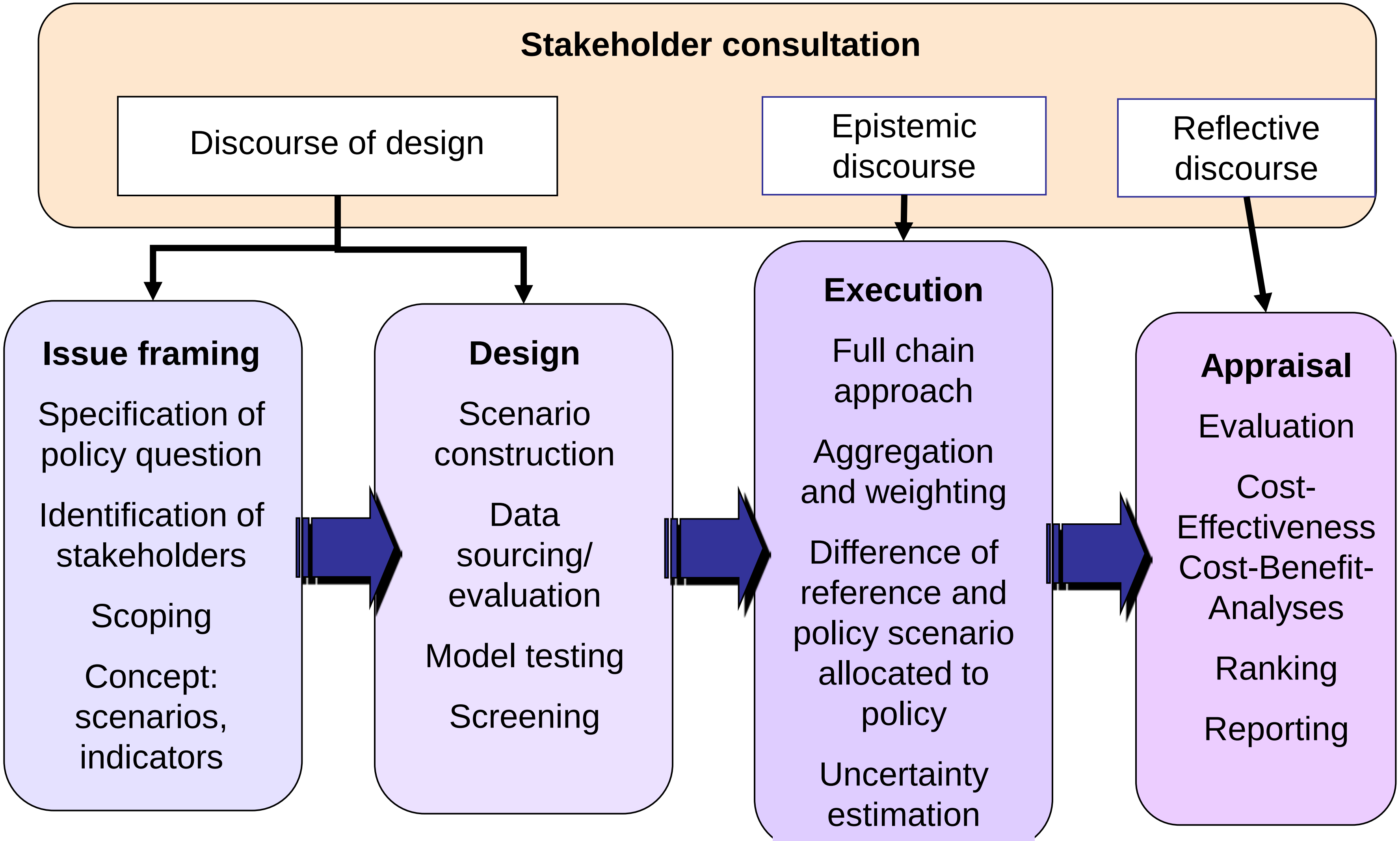
- **Aims: Develop, test and demonstrate the use of methods and tools for integrated assessment of health impacts to support policy in Europe**

- **INTARESE: focus on development of methodological framework**
- **HEIMTSA: focus on development of data, relationships, application**

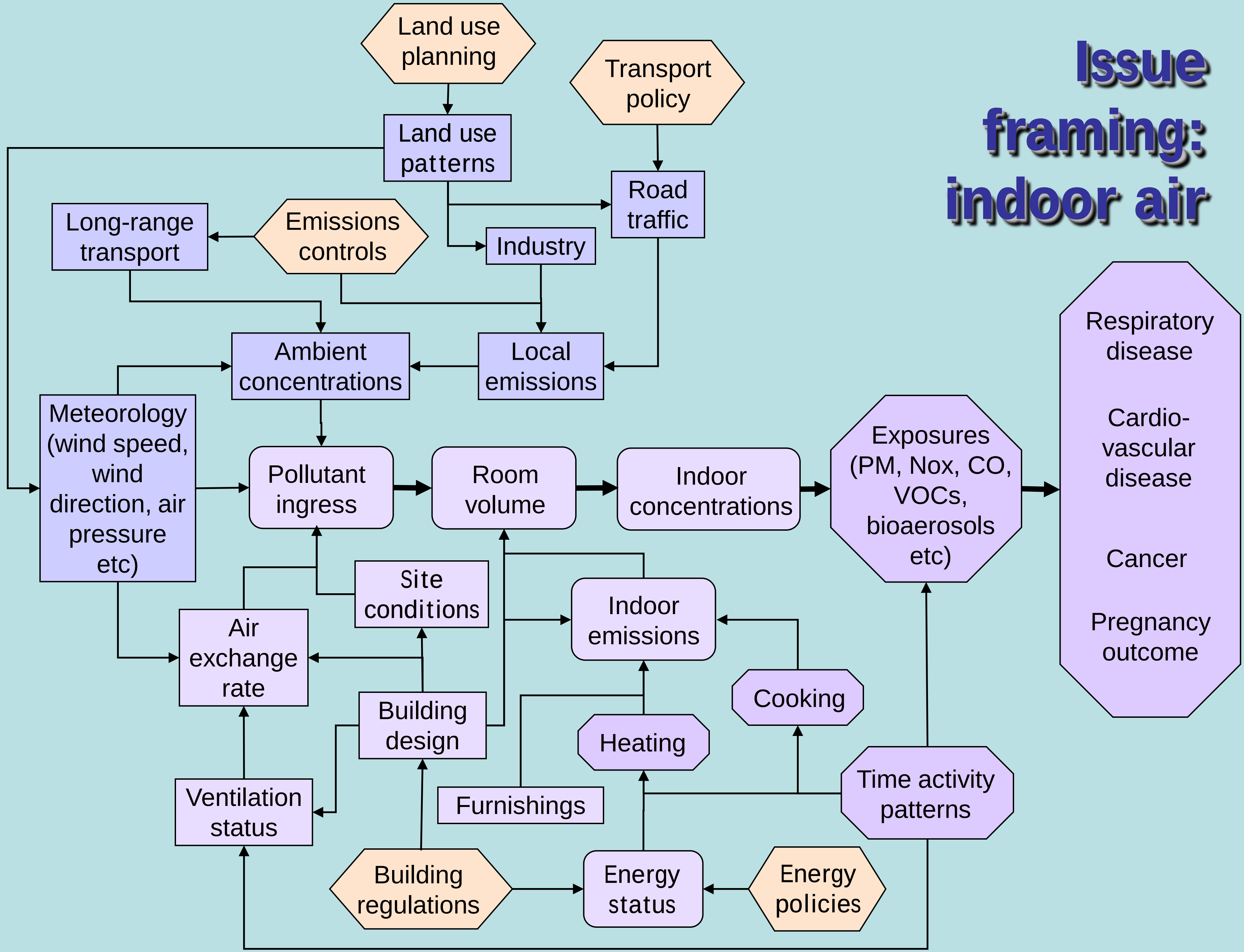
- **Two main results:**
  - **a guide book and resource centre on integrated assessment**

    → see prototype at www.integrated-assessment.eu
  - **a case study**

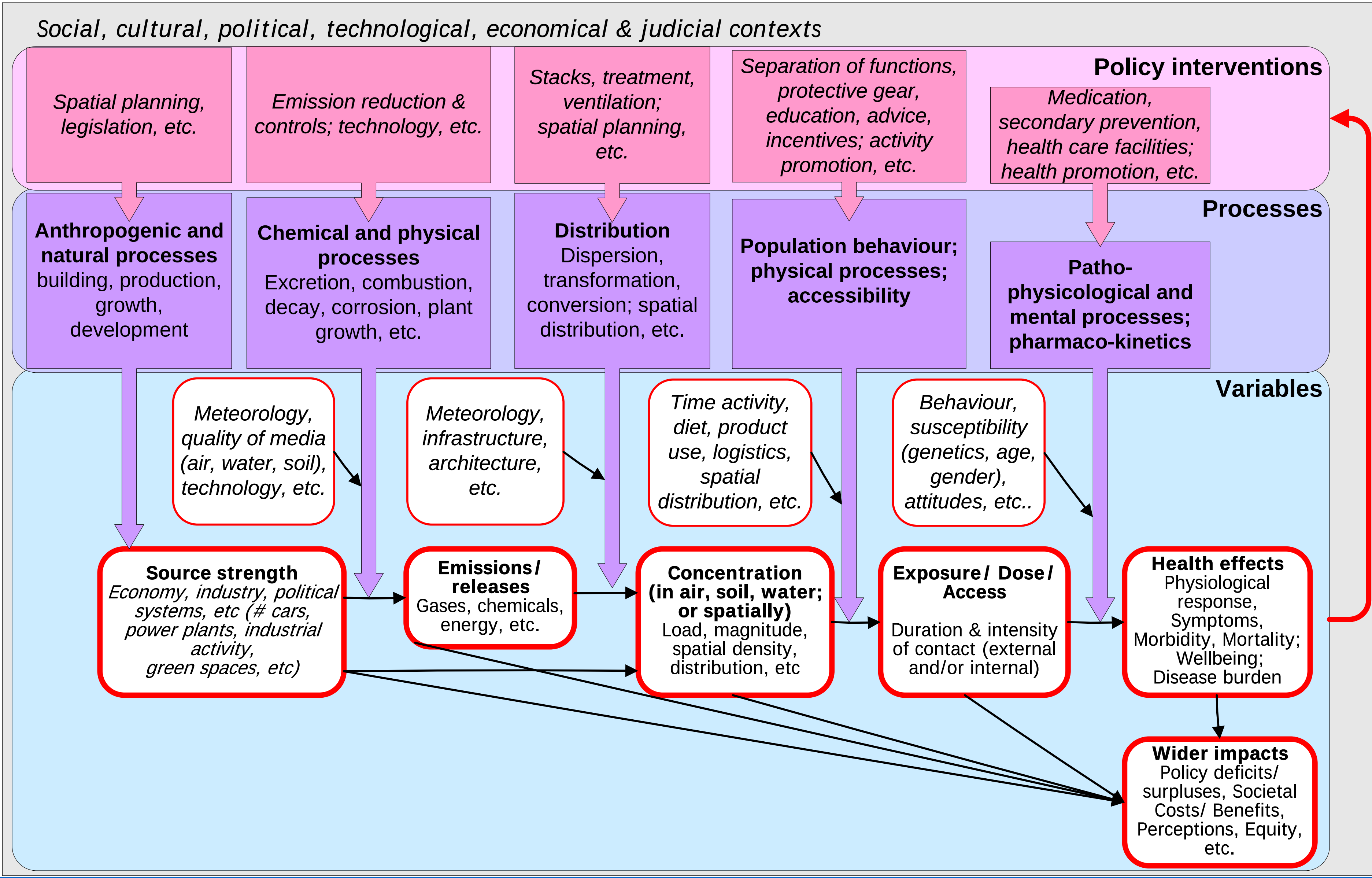
The integrated assessment process



Issue framing: indoor air



The Assessment Model



New tools, data, relationships

- **Integrated across sectors and pollutants:**

Pollutants/stressors covered:

PMx, NOx, SO2, VOC, NH3, GHG, noise, dioxins, furans, PCBs, pesticides, NH3, HM, heat; indoor: PMx, formaldehyde, ETS, radon;

- **Integrated across media, i.e. multimedia modelling**

soil-plant-food: pesticides, dioxins and furans, PCB, HM; noise generalisation model and indoor model

- **Exposure modelling:**

concentration in microenvironments, time-activity-patterns

- **New European population data base**

Disaggregated according to gender and age – per grid; unemployment (per country)

- **Methodology for uncertainty estimation**
- **Background rates for mortality and morbidity endpoints**

Case Study Overview

- Aim: assess environmental health impacts of high-level, cross-cutting policy issues at EU level
- Provide a full example of an integrated environmental health impact assessment according to INTARESE and HEIMTSA recommendations

The problem:

Policies and measures for mitigation of and adaption to climate change are nearly always chosen with only a few criteria:

- **reduction of CO2eq. emissions (mitigation)**
- **reduction of climate change impacts (adaption)**
- **costs and distribution of costs (who pays how much)**

- **However there may be relevant side benefits or side detriments, that are also important for the decision process, especially secondary environmental health impacts. These are typically regional (i.e. European wide) effects, there is a more or less broad spatial and temporal gap between release/emission and health impact.**

- **Examples: production and burning of biomass, renewables and nuclear instead of coal and gas for electricity production, lower air exchange rate indoors, wood stoves indoors…**

Question of the INTARESE/HEIMTSA case study

What are the (negative or positive) impacts of

a) EU mitigation options (policies and resulting measures) to reduce greenhouse gas emissions

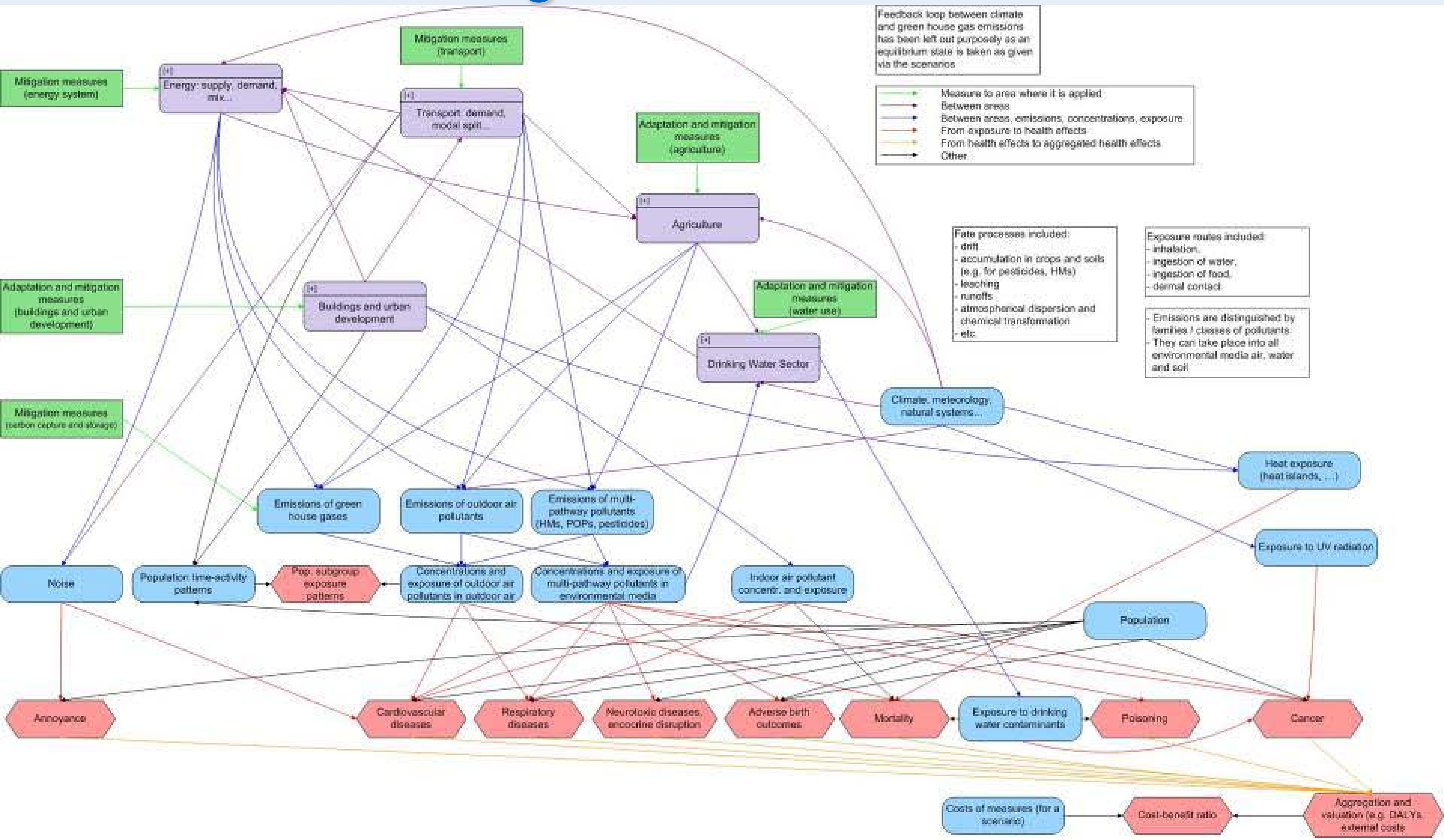
b) EU adaptation options (policies and resulting measures) to reduce impacts of climate change

on human health worldwide?

Policies are assessed by comparing a scenario without the policy (bau scenario without further climate protection policies) with a scenario with the policy – embedded in a climate scenario striving for not exceeding a 2° increase of the surface temperature

INTARESE HEIMTSA

Main causal diagram



INTARESE/HEIMTSA Case Study

Selected policies - Energy

- Energy supply changes (biomass, wind, solar, nuclear, CCS, CHP)
- Energy savings

Selected policies - Transport

- Alternative fuels and drive trains (bio fuels, electric, hybrid, fuel cells)
- Increased efficiency
- Economic policies (e.g. increasing fuel taxes, road pricing, city tolls)
- speed limits in cities
- Investment in transport modes (public transport, bicycle lanes)

INTARESE/HEIMTSA Case Study

Selected policies - Agriculture

- Biomass production for energy use
- Reduced demand for red meat and milk products
- Optimized fertiliser use

Selected policies - Housing

- Improved insulation
- Increased air conditioning
- Enhanced use of wood stoves

Selected policies –Urban Planning

- Reduction of urban outside temperature (improving airflow, water, shading, vegetation)

Screening results

- Energy Policies (mDALYs / t CO_2 avoided):
  1. Larger share of renewables: -0.68 (reduction of impacts)
  2. Larger share of nuclear (+50%): -0.8
  3. Larger share of CCS (hard coal and lignite): -0.62
  4. Larger share of biofuels (+20%): 0.43 (increase of impacts)
  5. More combined heat and power: -1.23
  6. Increased insulation of building: -0.99

- Transport Policies (mDALYs / t CO_2 avoided):
  1. Electric vehicles (30% of new cars in 2030): -0.2
  2. Energy efficiency: -1.7
  3. Ecodriving: -0.2

Conclusions

- Decisions should be made taking all relevant aspects into account.
- Important parts of an integrated assessment, that should be properly adressed, are:
  - Issue framing: Definition of the policy question, scoping and screening
  - Scenario building
  - Stakeholder involvement
  - Inclusion of behavioural changes; adaptation
  - Uncertainty estimation
  - Presentation of results

Conclusions II

- Case study screening results:
    i. Health impacts of quite a number of climate change mitigation policies and adaptation measures (e.g. energy efficiency in the transport and housing sectors) are as important as the climate change effects.
    ii. Some policies, e.g. biomass burning and insulation of houses might cause quite high additional health impacts.
    iii. In general: relevant ‘side effects’ might change policy recommendations drastically and should thus be taken into account hen making decisions

Some research needs

Improvements along the full chain (impact pathway):

robust approximation techniques (when reliable data and knowledge is missing); exposure modelling; indoor exposure; multi-media modelling; exposure response relationships (esp. PM species, size and number; noise and multiple exposures), radiative forcing of PM, O3; SOA formation

Modelling of human behaviour and responses

Quantification of further pathways:

Flame retardants (PBDEs) and phthalates indoor, electromagnetic fields, nano particles; disinfection by-products and nitrates in drinking water; biodiversity changes due to climate change, eutrophication and acidification, long term risks of climate change

(monetary) assessment of Damocles risks, cancer, biodiversity losses,

Assessment of altruism (WTP of risk reduction for others)

Inclusion of the precautionary principle