Work on Nitrogen Effects in CLRTAP

(an overview with focus on Modelling&Mapping)

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1. The issue
2. Policy response
3. The Working Group on Effects and its International Cooperative Programmes
4. Critical loads and dynamic models
5. Future work

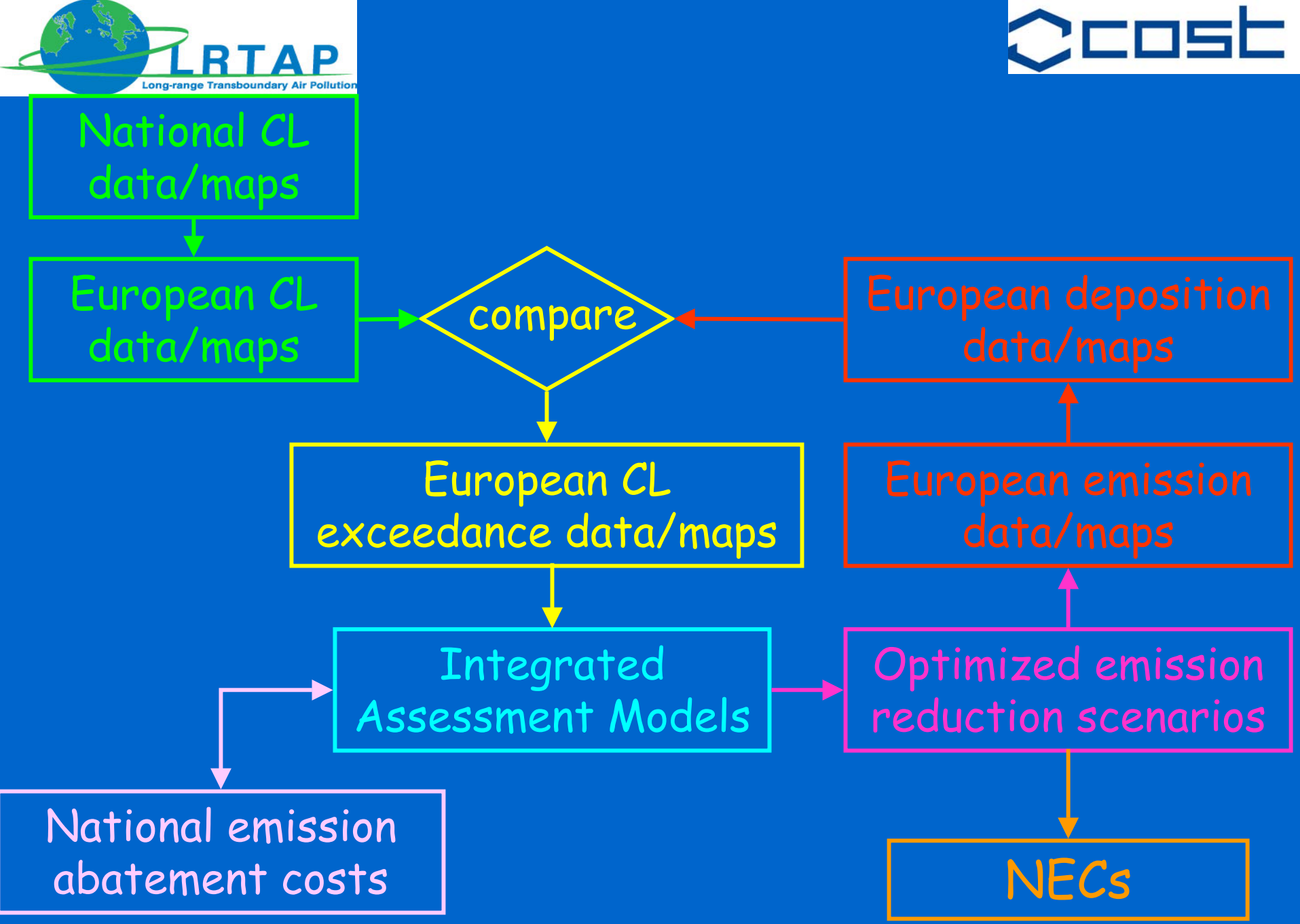
The issue

- Long-range transport of air pollutants has caused severe environmental effects in Europe

CLRTAP approaches

- BAT: Technical emission standards
- Effects-based approach:
  Emission abatement policy driven by critical load exceedances
- Integrated assessment modelling:
  Least-cost emission abatement optimization (effects based)

  → National Emission Ceilings per pollutant


LRTAP
Long-range Transboundary Air Pollution
cost
National CL data/maps
European CL data/maps
compare
European deposition data/maps
European CL exceedance data/maps
European emission data/maps
Integrated Assessment Models
Optimized emission reduction scenarios
National emission abatement costs
NECs

Main results of CLRTAP negotiations

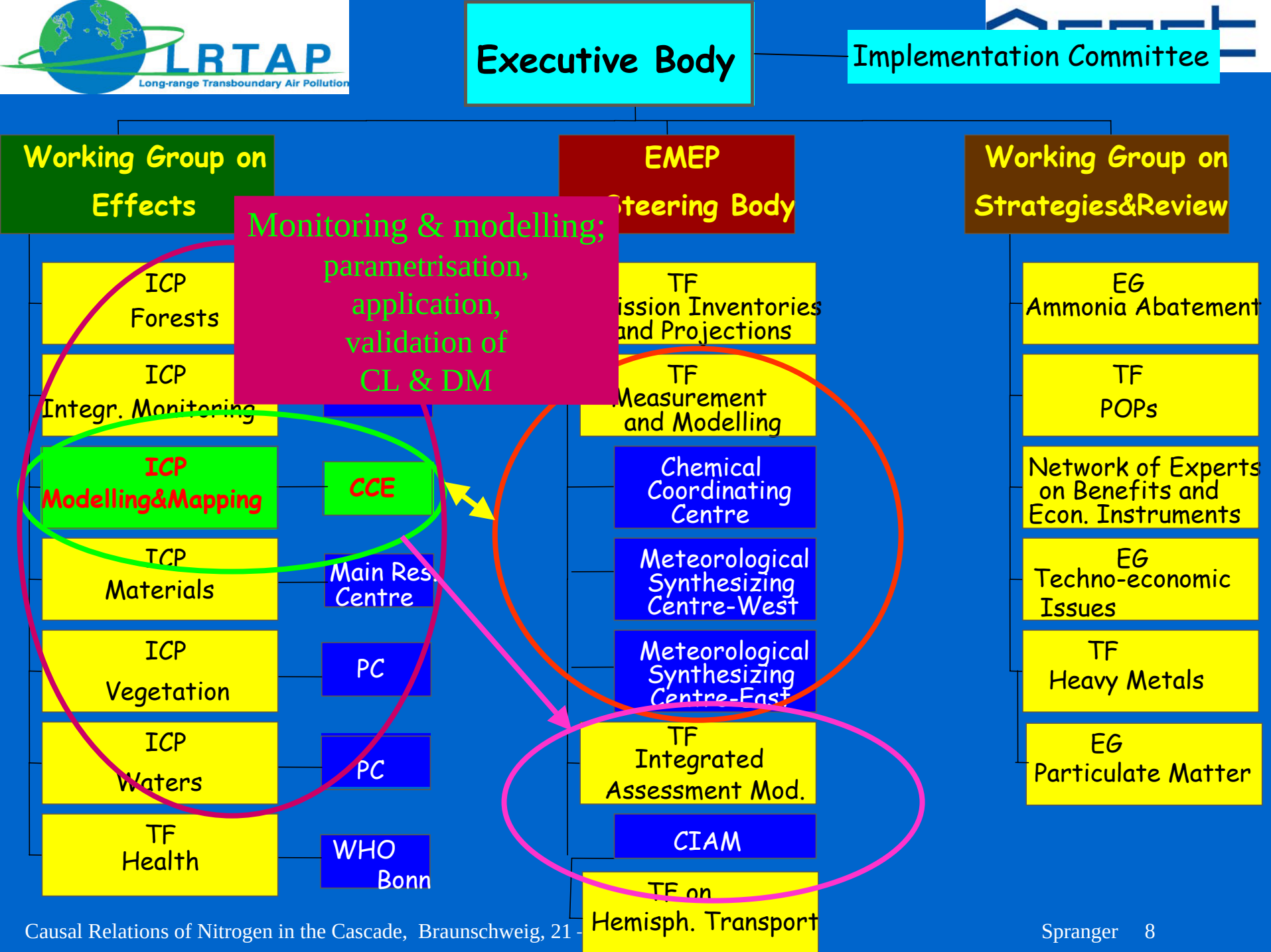
- National Emission Ceilings (2010) for European countries:
  NO_x, NH_3, SO_2, NMVOC
- Emission reductions 1990 - 2010:
  NO_x - 40%; NH_3 - 17%
- CL exceedances for eutrophication >> acidification (amount and area)
- Highest remaining exceedances (N and Ac) dominated by NH_3 emissions from intensive animal husbandry

& European Union

- (presentation by Michel Sponar!)
- National Emission Ceilings (NEC) Directive
- Clean Air For Europe (CAFE) Program and Thematic Strategy „Air"

- Both rely on CLRTAP methods and data concerning effects

- Present priorities:
  PM > eutrophication > acidification > ozone
  (& heavy metals)


LRTAP
Long-range Transboundary Air Pollution
Executive Body
Implementation Committee
Working Group on Effects
EMEP Steering Body
Working Group on Strategies&Review
Monitoring & modelling; parametrisation, application, validation of CL & DM
ICP Forests
ICP Integr. Monitoring
ICP Modelling&Mapping
ICP Materials
ICP Vegetation
ICP Waters
TF Health
CCE
Main Res. Centre
PC
PC
WHO Bonn
TF ission Inventories and Projections
TF Measurement and Modelling
Chemical Coordinating Centre
Meteorological Synthesizing Centre-West
Meteorological Synthesizing Centre-East
TF Integrated Assessment Mod.
CIAM
TF on Hemisph. Transport
EG Ammonia Abatement
TF POPs
Network of Experts on Benefits and Econ. Instruments
EG Techno-economic Issues
TF Heavy Metals
EG Particulate Matter

ICP Workplan on N: 2006, 2007, 2008

excluding acidification by N

- deposition trends at level II sites (F)
- dynamic modelling of N effects on forest soils (F in coll.w.M&M)
- long-term N concentration trends in mosses using herbarium material (V)
- N concentration and flux trends at IM sites (IM)
- European database on critical loads (eutrophication) (M&M)
- WS and report on key N processes for dynamic modelling (JEG DM)
- WS and report on methods to model (risk from) N effects, incl. biodiversity (M&M et al.)

- deposition, defoliation and forest growth trends (F)
- species diversity impact of N deposition (F)
- C/N interactions and conditions (IM)
- critical loads of nitrogen using monitoring sites (IM)
- support NFCs with the European scale modelling of (risk of) nitrogen effects, incl. biodiversity (M&M et al.)
- links between effects of air pollution and climate change on a European scale, e.g. including nitrogen budgets (M&M et al.)

- deposition trends (F)
- support NFCs with the European scale modelling of (risk of) nitrogen effects, including biodiversity (M&M et al.)
- links between effects of air pollution and climate change on a European scale incl. nitrogen budgets (M&M et al.)
- ...

ICP M&M:

International Cooperative Programme
on
Modelling and Mapping
Critical Loads&Levels
and
Air Pollution
Effects, Risks and Trends

Critical load: definition
for nitrogen

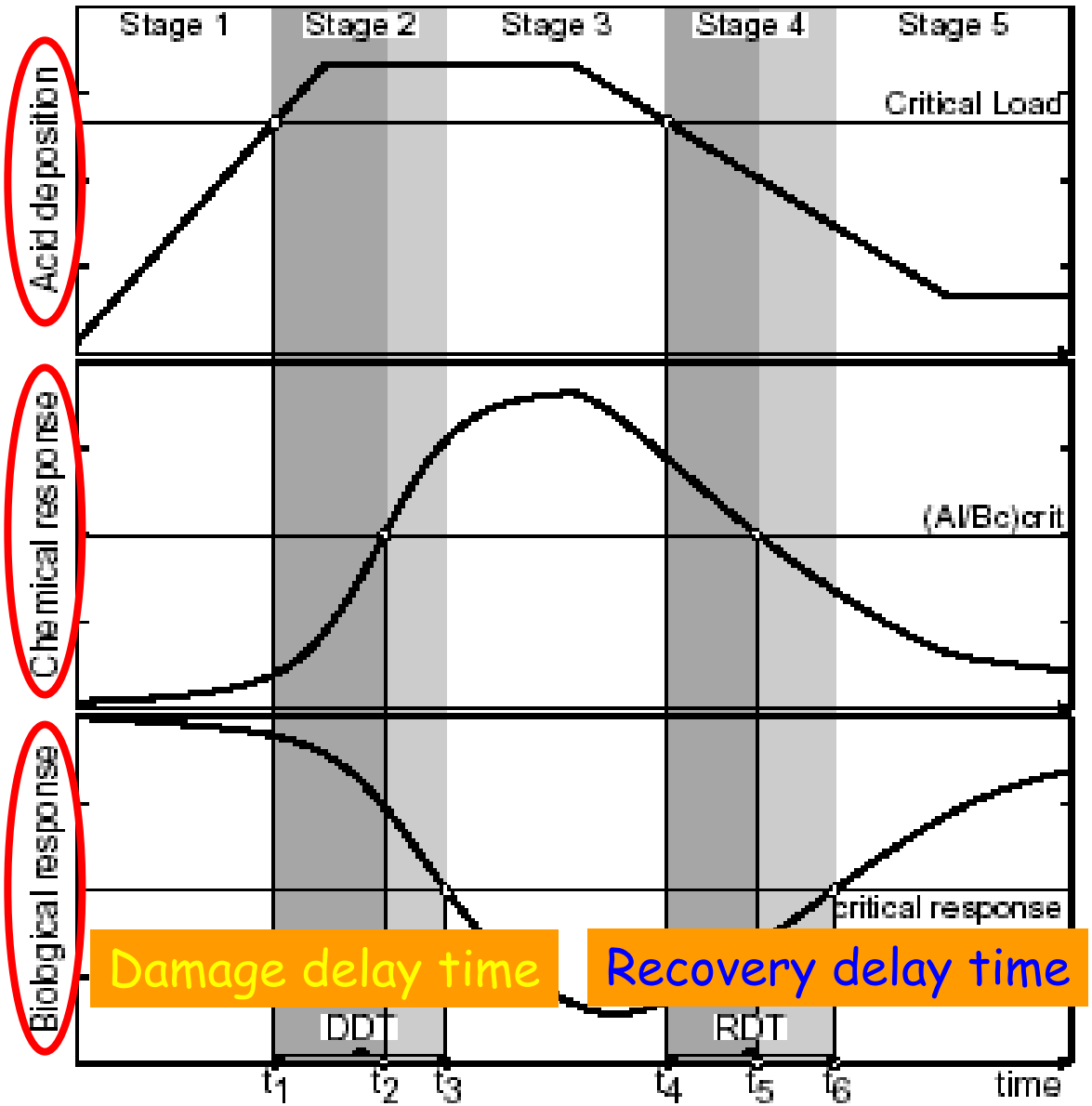
"the highest deposition of nitrogen (NH_x and/or NO_y) below which harmful effects in ecosystem structure and function do not occur according to present knowledge"

- = long-term ecosystem capacity
- defined for specific combinations of pollutants, effects, and receptors

Critical loads cont´d

- terrestrial and (non-marine) aquatic ecosystems
- based on chemical criteria linked to biological effects
- spatially variable, thus leading to regionally differentiated emission reduction needs
- steady-state
- = desired future state of the environment, not a prognosis!
- used as sustainability indicators for policy guidance

Dynamic models



→ reconstruction

→ prognosis

→ CL validation

→ available for acidification

Nitrogen:

Challenges

(1) General: Strong links and feedbacks to biological processes and climate change

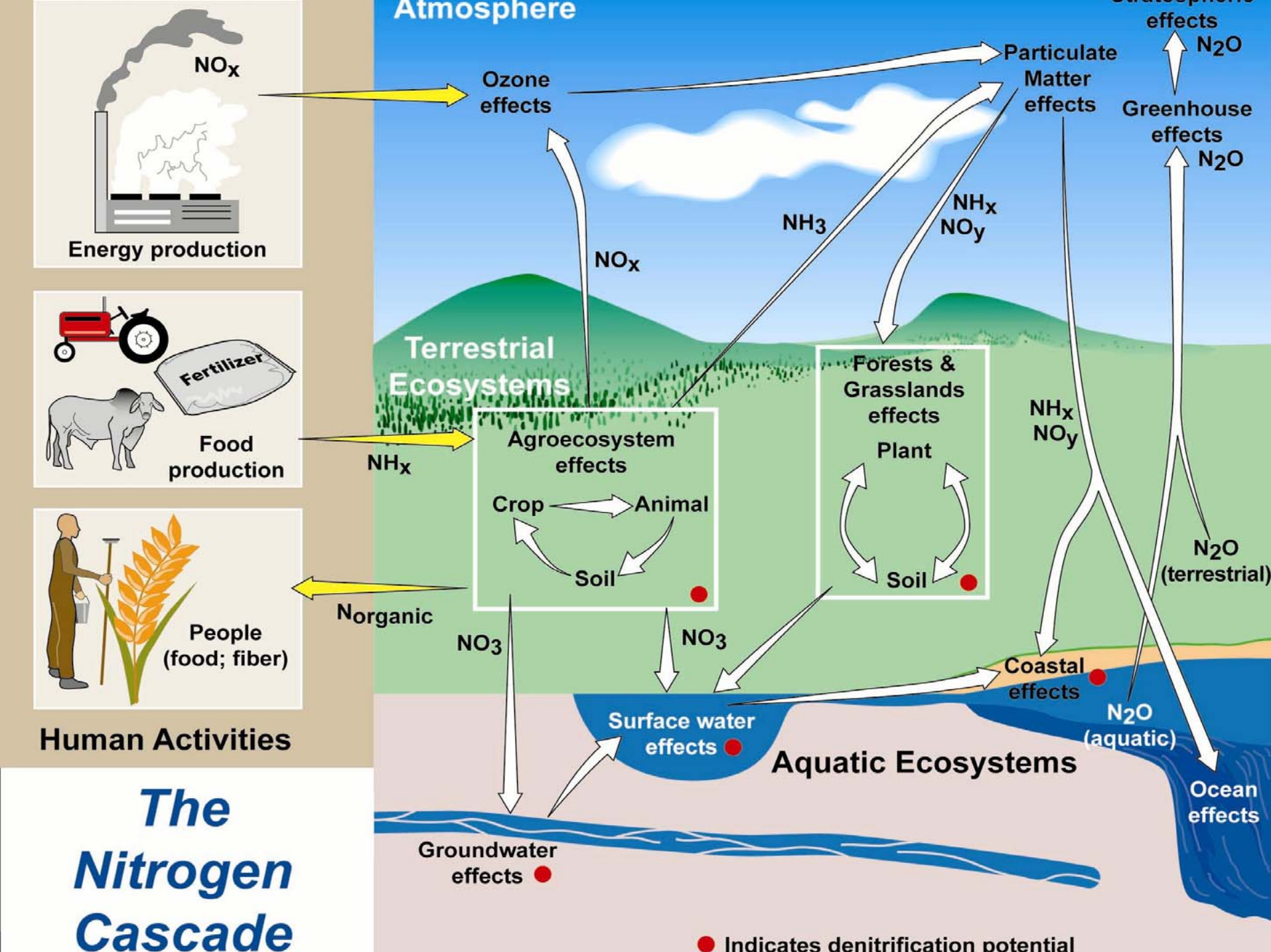
(2) Are present model approaches adequate?

(3) Choice of **biodiversity** effects indicators (e.g. C/N,...), dose/effect relations, and critical limits

(4) Assessment of interactions between air pollution and **climate change** (e.g. long-term C and N sequestration, long-term N_2O, CH_4 etc. emissions)

(5) **Land cover**: Land use change and scale effects

(6) Is an extension of IAMs possible? How else could policy (not only air pollution abatement!!) be advised?


Atmosphere
NO_x
Energy production
Ozone effects
Particulate Matter effects
Stratospheric effects
N_2O
Greenhouse effects
N_2O
NH_3
NO_x
NH_x
NO_y
Fertilizer
Food production
Terrestrial Ecosystems
Forests & Grasslands effects
Plant
Soil
NH_x
NO_y
NH_x
Agroecosystem effects
Crop
Animal
Soil
N_2O (terrestrial)
$N_{organic}$
People (food; fiber)
NO_3
NO_3
Coastal effects
Surface water effects
N_2O (aquatic)
Aquatic Ecosystems
Ocean effects
Groundwater effects
Human Activities
The Nitrogen Cascade
Indicates denitrification potential

Nitrogen:

Status and aim

- Exceedance of CL(N) even after Gothenburg Protocol implementation
- **Aim: (dynamic and critical load) modelling of biodiversity and other N deposition related effects on a European scale in an IAM framework**
- National approaches (NL, D, SE, DK, UK, ...)
- Cooperation between ICPs (&JEG) and with external networks (NitroEurope, SEBI2010, ...)

Summary: ICP Tasks

- „Classic" tasks:
  - Input to Multipollutant and HM Protocol review / possible revision
  - (&Input to EU CAFE process)
- New focus:
  - Nitrogen deposition – biodiversity – climate change

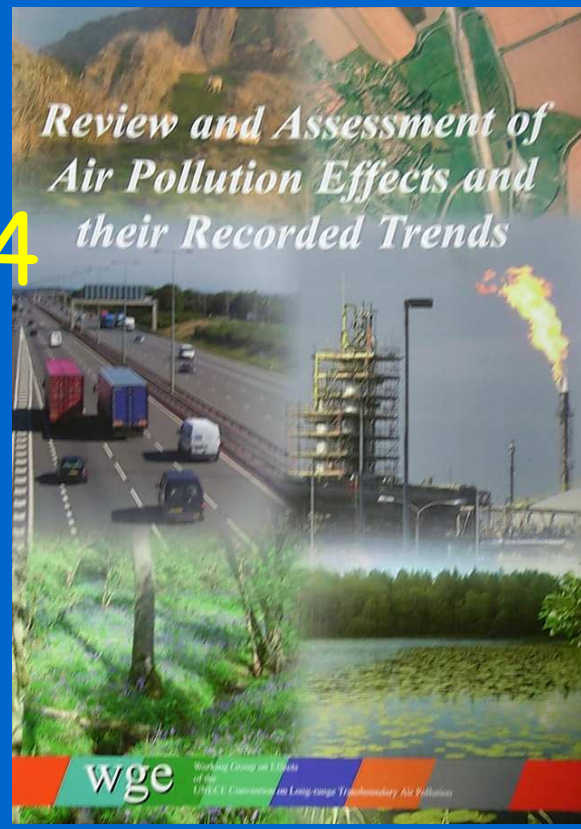
Summary: ICP Instruments

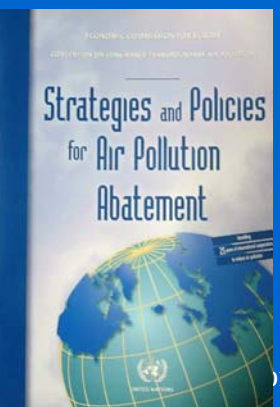
- Monitoring
- Method harmonisation:
  - Land cover, …
  - via Manuals
- Critical Loads (Ac & **Eutr**) and their exceedances
- Dynamic modelling / Target Loads (Ac)
- Nitrogen effects modelling
  - with feedbacks to biodiversity and climate change
  - which can be used within IAM

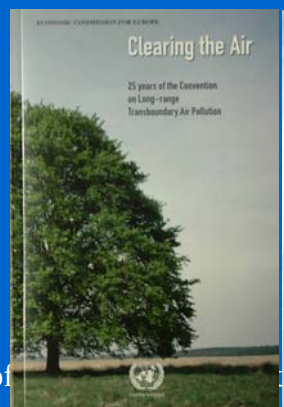
WGE Substantive report 2004

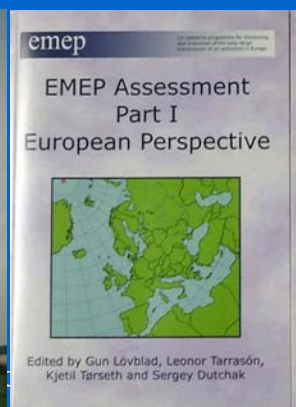
– status, trends, challenges

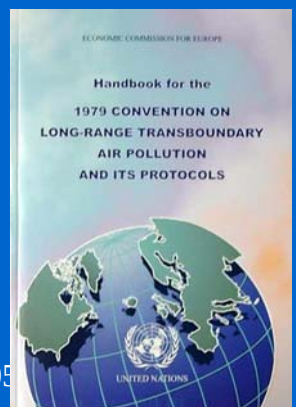
- as various other reports available from…

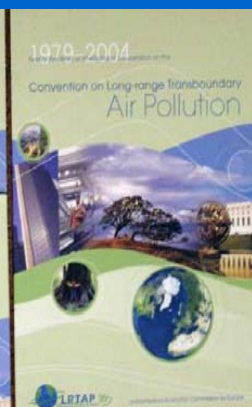












More information

UNECE Convention www.unece.org/env/lrtap

WG on Effects www.unece.org/env/wge

ICP M&M www.icpmapping.org

Thank you for your attention!