# 2009 EC4MACS Modelling Methodology Consultation - A Summary of Comments on the GAINS-Model

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EC4MACS Workshop on the Review of Modelling Methodology,
5 October 2009, IIASA, Laxenburg

## Main topics of comments summarised

- System boundaries
- Representation of reality
- Improvements in scientific knowledge
- Uncertainty assessment
- Communication, transparency, need for further information
- Miscellaneous

# System boundaries

- **Use of GAINS in conjunction with the specialised energy model PRIMES**
  - **Risk of incompatibilities between exogenous energy projections and changed energy structure/supply in GAINS when using the 'GAINS mode'?**
  - **Risks about over-/underestimation of reduction potentials?**
  - **Risk of inaccurate translation of sectors that are differently defined in both models?**
- **Limited inclusion of 'non technical measures' (behavioural change, structural change …)**
- **Specific treatment of the contributions of shipping, non-EU countries ... as exogenous contributions**
- **Impacts of climate change (e.g. on ozone concentration) should be taken into account when making long-term assessments**

# Representation of reality in the model

=> Overall credible representation of reality at the degree of detail at which the model operates

- Limits of a model specialised on transboundary issues as compared to one assessing more local issues
  - **Spatial resolution:** impact on estimates of ecosystem exceedance and measures recommended for ecosystem protection
  - **Assessment of atmospheric concentrations in urban areas:** simplified approach
- Limits in power plant sector modelling
  - **Number of control technologies, control efficiencies fixed over time, limited reflection of situation of plants with low load factors**
- Use of a linearised representation of EMEP source-receptor relationships in GAINS

➢ **Risk of missing important non-linear features in the relationship between changes in emissions and in effects?**

# Improvements in scientific knowledge

=> The GAINS approach is underpinned by good science

=> Important scientific improvements have been introduced in the model

- Continue to reflect improvements in scientific understanding in the model, e.g.
  - dynamic modelling in parallel to critical loads
  - ecosystem-dependent dry deposition

- Keep account of different PM components (size or composition?) so that new insights on their toxicity can be built into the model in the future

# Uncertainty assessment

**IIASA have undertaken substantial sensitivity analysis to investigate the effect of various assumptions and uncertainties, but more is needed**

**Suggestions:**

- **Do more scenario analysis:** use a higher number of alternative activity projections; systematically assess effects of different carbon & fuel prices and meteorology; use 'what if' scenarios for structural and behavioural change
- **Assess the potential effect of the rising number of constraints on the robustness of optimisation**
- **Conduct full uncertainty analyses; quantify uncertainties**
- **Discuss how limited information especially for non EU-countries affects results**
- **Check certain data:** compare GHG emissions in GAINS with national estimates; assess uncertainties in PM emission inventories and compare sources covered in GAINS and in national inventories
- **Have national data and emission estimates reviewed by a third party**

# Complementary approaches to dealing with uncertainty

## Increase consistency of parameters & data provided by users

- **harmonise approaches to activity forecasts (energy) and technology forecasts**
- **harmonise approaches of countries to calibration of their control strategies**

## Develop mechanisms to deal with uncertainty from forecasts

- **inaccuracy in predicting the future is inevitable (e.g. economic shocks)**
- **use flexible policy mechanisms or targets ensuring that objectives are met even if forecasts are inaccurate**

# Communication, stakeholder involvement and transparency

**There are various routes to information and stakeholder involvement:** GAINS-online, TFIAM, NIAM, bilateral consultations, GAINS workshops, direct interaction with IIASA

**=> agreement that GAINS sets a high standard in terms of openness and transparency**

**However, there is a large disparity in the perception of the 'absolute' transparency of GAINS**

- **For some stakeholders the greatest lack of transparency is related to the data fed in from other models (e.g. PRIMES)**
- **Other stakeholders believe stakeholder confidence can only be guaranteed by giving them the possibility to**
  - **undertake sensitivity studies themselves**
  - **re-run the optimization in order to verify the robustness of results of interest**
  - **access the full model code**

# Further information needs expressed

**Some stakeholders feel unable to review the GAINS model with respect to its use in the 'GAINS mode'**

- **need for more adequate technical documentation on the main assumptions and quantitative estimates used in analyses in the 'GAINS mode'**

**Provide more information**

- **on how constraints to structural changes are set for the 'GAINS mode'**
- **on how measures to improve efficiency or switch fuels are represented and how this is consistent with PRIMES etc.**
- **on the performance of the optimisation, on the sensitivity of outputs to (small) changes in inputs, on how results might be affected by (subjective) choices of the modeller**
- **on recent work by IIASA on cost curves for greenhouse gas reductions for Annex 1 countries, broken down at a national level**

**Update information** (e.g. documentation on the $SO_2$/NOx cost database)

# Further improvement of transparency & communication of results

## Online model system

- Document sources of main input data together with an assessment of their level of quality
- Allow the design and calibration of more detailed automated runs and outputs for reporting purposes
- Give users the possibility to graphically display a wider range of parameters/results
- Provide full access to the database of measures and to country-specific control strategies for the greenhouse gas part of the model
- Keep old data, including control strategy and emission vector, available for a longer time (and indicate in reports the activity pathway used)

## GAINS web-site

- Document updates of reports with a search by key words to facilitate tracing of updates

# Miscellaneous

**Carry out ex-post analyses on reasons for non-compliance with 2010 NECs, to assess**

- **reasons for why some ceilings are more generally complied with than others**
- **where possible biases were introduced in the initial NECD modelling, and what can be learned from the past**

**Increase approval of, and responsibility for, data by country representatives**

- **country representatives should be responsible for correcting mistakes and providing missing data, national submissions should not be changed at IIASA,**
- **data submissions to IIASA should have the same status as submissions to CLRTAP so long as GAINS is the official emission model for the EC**

**Concern that NOx and PM emission factors for road vehicles are expressed in k tonnes per PJ might imply wrong results for emissions when energy-efficiency increases**