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Second Progress report of FINSKEN subproject

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Aims and tasks:

(a) Application of scenarios of global energy use and technological change, estimates of emissions (SO_2, NO_x, NH_3, VOC) and resulting likely range of deposition and regional air quality in Finland (collaboration with IIASA, Austria, University of Kassel, Germany and FINSKEN subproject FMI-2 of the Finnish Meteorological Institute).

(b) Estimation of the plausible impacts of climate change on the atmospheric transformation and transportation of pollutants (collaboration with University of Kassel, Germany and FMI-2)

(c) Illustrations of impact estimates of various SRES scenarios in relation to critical thresholds for air pollutants in Finland and comparisons with national projections.

Research method and tools: Global energy scenarios are reflected in changing emission quantities in Europe. The regional energy scenarios are compared to Finnish national estimates to highlight the consistency and differences of different derivation approaches. The new emissions of sulphur, nitrogen compounds and volatile organic compounds in Europe lead to a new pattern of air concentrations and depositions, calculated with both long-range and mesoscale models available at SYKE (Syri, 2001; Kangas & Syri, 2002). This work is carried out in cooperation with task FMI-2 and University of Kassel, Germany. The exposures and loads are compared to critical thresholds, which are derived and updated at SYKE for the UN-ECE/CLRTAP framework (Posch et al. 1997, Johansson 1999). The exceedances of these critical thresholds are assessed with different indicators.

Progress during 2001:

(a) Global and European emissions scenarios: The determining factors in the long-term projections of air pollution in Finland are the European developments of energy supply and consumption and technologies in use. This was analyzed by applying the SRES energy and emissions scenarios for the European region, together with more detailed national projections. The work was partly carried out in collaboration with the University of Kassel. The work concentrated on the SRES marker scenarios. An example of the work is shown in Figure 1, which illustrates the **preliminary** European SO_2 and NO_x emission scenarios developed.

(b) Collaboration with the EU AIR-CLIM project was established. The aim of the AIR-CLIM project of the EU 5th framework programme was to perform an integrated analysis of the linkage between climate change and air pollution in Europe. As part of the project activities climate data calculated by the GCM ECHAM4 of the Max Planck Institute for Meteorology is used as input to the EMEP Lagrangian Acid Deposition Model (LADM). LADM was used to calculate transboundary acidifying pollution in Europe using national emissions estimates and future GCM climate. Based on the results of the AIR-CLIM project, the plausible impacts of climate change on the atmospheric transportation and transformation were assessed with respect to Northern Europe. The results implied that by 2040's the climate change could have a minor reducing effect on the amount of long-range transported air pollution from Central Europe to Finland.

(c) Comparison with Finnish national projections: Work was also carried out at SYKE by the research team to estimate the environmental effects of Finnish national climate policy, as part of a large project coordinated by the Finnish Ministry of Trade and Industry. Three alternative scenarios were derived up to the year 2020: a "business as usual scenario" BAU, and two scenarios aiming at meeting the Kyoto emission targets (KIO1, KIO2) (Hildén et al., 2001). The impacts of these scenarios on the acidifying emissions, depositions and exceedances of critical loads were evaluated at SYKE. In cooperation with the Finnish Meteorological Institute, also the effects on the critical thresholds of ozone were assessed. These results indicated that the Finnish Climate Strategy would have clear beneficial effects on the emissions of acidifying and ozone-forming pollutants and on the exceedances of critical thresholds. These data provide the presently best available knowledge about the likely future of Finnish GHG and acidifying emissions.

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