

## Progress report of FINSKEN subproject

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Aims and tasks:

- (a) Application of global energy use scenarios, estimates of emissions 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) Illustrations of impact estimates of various SRES scenarios in relation to critical thresholds for air pollutants in Finland (12 person-months).

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 FEI (Syri et al. 1998). This work is carried out in cooperation with task FMI-2. The exposures and loads are compared to critical thresholds, which are derived and updated at FEI 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 year 1 of FINSKEN:

- (a) Collaboration with the AIR-CLIM project of the University of Kassel

The aim of the AIR-CLIM project of the EU 5<sup>th</sup> framework programme is 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 is used to calculate transboundary acidifying pollution in Europe using national emissions estimates and future GCM climate.

The transfer matrices produced by LADM in this exercise are an excellent starting point also for the FINSKEN task FEI-2, because they will allow also estimation of the effects of changing climate on the deposition fields of the SRES scenarios in Finland. Contact was therefore established with the AIR-CLIM project (Petra Mayerhofer), and collaboration has been agreed upon. Compared with the original FINSKEN proposal, this cooperation will allow more detailed evaluation of the deposition changes than originally anticipated. The AIR-CLIM matrices should be available during spring 2001.

- (b) Preliminary assessment of the SRES emission scenarios

The long-term energy use and emission projections of the IPCC Special Report on Emissions Scenarios have been implemented for use in task FEI-2. The work concentrates on the six marker emission scenarios of the SRES. The SRES scenarios are of global nature and thus provide data on a rather coarse level. Further work will include down-scaling of the scenarios for Europe and comparison with shorter-term national and European energy and emission projections to ensure consistency and use of best available knowledge in the projections of depositions and exceedances of critical thresholds.

- (c) Comparison with Finnish national estimates

Work has also been carried out at the FEI 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 have been derived up to the year 2020: a "business as usual scenario" BAU, and two scenarios aiming at meeting the Kyoto emission targets (KIO1, KIO2).

Table. Acidifying emissions with the energy scenarios of the Finnish Climate Programme (in kton SO<sub>2</sub> / NO<sub>x</sub> per year) (Hildén et al., 2001).

Year	BAU		KIO1		KIO2	
	SO <sub>2</sub>	NO <sub>x</sub>	SO <sub>2</sub>	NO <sub>x</sub>	SO <sub>2</sub>	NO <sub>x</sub>
1998	90	252	90	252	90	252
2010	114	187	91	170	88	172
2020	117	182	79	160	84	164

The impact of these scenarios on the acidifying emissions, depositions and exceedances of critical loads have been evaluated at the FEI. In cooperation with the Finnish Meteorological Institute, also the effects on the critical thresholds of ozone were assessed. These results indicate that without further technical measures Finland would not meet the international emission reduction commitments of the UN/ECE and the EU. The scenarios used in the preparation of the Finnish Climate Programme 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 and thus form the background for further work on the SRES scenarios.

#### References

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- Posch, M., Kämäri, J., Henriksen, A., Forsius, M. and Wilander, A. 1997. Exceedance of critical loads for lakes in Finland, Norway and Sweden: Reduction requirements for acidifying nitrogen and sulfur deposition. *Environmental Management* 21 (2): 291-304.
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