Assessment and improvement of methodologies used for Greenhouse Gas projections

Annex B of the final report to DG Environment under service contract no. ENV.C.2/SER/2006/0008

Workshops

Authors

Samuela Bassi (IEEP)
Jason Anderson (IEEP)
Karla Schoeters (VITO)

Vlaamse Instelling voor Technologisch Onderzoek
Boeretang 200
2400 Mol
Belgium

Öko-Institut e.V.
Berlin Office
Novalisstr. 10
10115 Berlin
Germany

Institute for European Environmental Policy
Quai au Foin 55
1000 Brussels
Belgium

Table of content

Acronyms

Team members and speakers	QA/QC: Quality Assurance and Control
AH: Anke Herold (Oeko-Institut)	RES: Renewable Energy Sources
BH: Bernard Hyde	WM: With Measures
BM: Barbara Muik	WOM: Without Measures
EK: Erasmia Kitou	WAM: With Additional Measures
FD: François Dejean	
FV: Frank Veroustraete	**Countries acronyms**
HG: Stephan Hubertus Gay	BE: Belgium
IK: Ivars Kudrenickis	SE: Sweden
JA: Jason Anderson (IEEP)	BE: Belgium
JB:Jiří Balajka	UK: United Kingdom
JD: Jan Duerinck (VITO)	CZ: Czech Republic
NR: Nele Renders (VITO)	DK: Denmark
PP:Paula Perälä	DE: Germany
SB: Samuela Bassi (IEEP)	EE: Estonia
PTB: Patrick ten Brink (IEEP)	EL: Greece
TVD:Ton van Dril	ES: Spain
WN: Wouter Nijs (VITO)	FR: France
WS: Wolfgang Schade	IE: Ireland
	IT: Italy
	CY: Cyprus
Other acronyms:	LT: Lithuania
CERs: Certified Emissions Reductions	HU: Hungary
GHG: Greenhouse Gas	MT: Malta
ETS: Emission Trading System	NL: Netherlands
EU: European Union	AT: Austria
MM: Monitoring Mechanism	PL: Poland
MS: Member State	SI: Slovenia
NAP: National Allocation Plan	RO: Romania
NMS: New Member State	FI: Finland
IPCC: International Panel on Climate Change	

1 Annex B-1: Workshops organized on 21, 26 and 27 May 2008

A. AGENDA – of Working Group II meeting

Agenda of the day: Climate Change Committee Working Group II "National Programs and Projections" **-** Time: 10:00-17:00

1. Opening (DG ENV)
Adoption of the agenda, approval of draft minutes of the 5 October 2007 meeting

Current Reporting

2. MS submissions Update (MS/ETC ACC)
Member States currently revising / planning to revise their national projections or a particular aspect of their national climate program are invited to give an overview of their plans overview of completeness of submissions for the March 2007 reporting obligation

3. Template (ETC ACC)
A revised version of the Art 3(2) template will be circulated in early April for discussion today. The purpose of the template is to facilitate and improve reporting in the short-term (2009 MM plus any MS ad hoc updates).

4. Modeling policy impacts AEA/ICCS/Ecofys/Fraunhofer
The latest results of project 'Quantification of the effects on greenhouse gas emissions of policies and measures' will be presented.

Future Reporting

5. 23 January 2008 EC CC and energy package of proposals (DG ENV/EEA)
- overview and implications for the revision of the MM decision
- projections used as basis for the proposal on effort sharing
- MS are invited to discuss additional PAMs needed to meet the new COM proposals
- EEA presentation on MS 2020 projections (from T&P report 2007)

6. MM Revision Discussion (DG ENV/ETC ACC)
- overview of revision process
- suitability of current guidance available (UNFCCC, IPPC, MM IP) and need for improvements/additional guidance as part of the revised MM
- linkages with other instruments (e.g. EUETS, NECD, PRTR and other standard based instruments e.g. LCPD, WID, SED)

7. Discussion on reporting parameters (VITO/Oeko/IEEP)

A discussion paper containing recommendations on reporting parameters, developed under the EC project on projections methodologies, will be distributed prior to the meeting.

B. MINUTES

Discussion on reporting parameters (VITO/Oeko/IEEP)

Anke Herold (AH) of Oeko-Institut presents the recommendations related to reporting of projection parameters. She clarified that latest data released by Member States (MS) in 2008 (e.g. Spain) are not portrayed in the report.

The objective of the report was to identify, compare and categorize projection parameters, assess the existing status of national projections, identify sources of problems, achieve a higher level of quality of the projection and, in general, provide recommendations

The report looked at future potential revisions of the monitoring mechanism decision and at improving reporting under the existing decision.

57 parameters are used for projections – Efforts by MS have been acknowledged, nevertheless information is not always complete and comparable.

In order to use projection parameters at EU level it will be important to:
- improve the understanding of the method used
- provide additional information to underpin emission trends at EU level
- compare key parameters and assumption used by MS
- compare deviations of MS Assumptions with EU-wide projections

General Recommendations:

With regard to an improved understanding of the models, it is recommended that more comparable, systematic and complete descriptions are used. It is also noted that additional voluntary guidance on descriptions could be helpful.

Furthermore, projected data reporting advance every 5 years. In the future, projections should be dealt in a more flexible way, as guidance should automatically advance in time and be better formulated.

The reporting period should include 2 historic years (e.g. for current reporting, historic data should be reported for 2000 and 2005). The checking of consistency with historic data should be improved.

Analysis of parameters, problems and recommendations:

■ **GDP**

The definition of GDP should be made clear – and data should be in constant prices. Further harmonization of units is needed, and the base year should be updated every 5 years. Also, as many MS relies on Eurostat data, it should be discussed and clarified whether Eurostat will continue to report GDP data in constant prices.

It will be relevant to aggregate GDP data provided by MS at EU level and compare the results with other GDP projections (e.g. GDP used in Primes). GDP would also be useful to explain future GHG trends.

■ **Population**

Some MS refer to population in absolute numbers, others refer to growth rate. Absolute numbers should be preferred, and growth could be calculated from these data.

Also in this case it would be valuable to aggregate MS data at EU level and compare the results with other sources (e.g. Eurostat).

■ **Fuel Prices**

Comparability problems were encountered due to different units used by MS: some use real prices, other use constant prices for different base years, etc; also, in some cases different physical and energy units are used. A consistent conversion of these data is needed. A general methodology for the conversion of fuel prices should be developed in cooperation with Eurostat and IEA (potentially by DG Tren).

The IEA energy outlook is most widely used source, and may be suitable to achieve further harmonization across MS. It was suggested that national fuel prices scenarios could be used for sensitivity analyzes.

It was also noted that there seems to be no need to report historic fuel prices.
Data should be compared across MS and with other projections/scenarios (e.g. Primes, Poles, IEA etc)

Carbon price is not required among parameters, but is important for ETS. It was suggested to include it in the parameter list.

■ **Energy**

A clear definition of *total gross inland consumption* (PM 6) is needed; in particular, clarification on which fuel to reported will be helpful. Data should also be compared with historic years and others projection (e.g. Primes).

Total electricity production by fuel type (PM 6) should also be better defined (e.g. it is not always easy to understand whether MS refer to gross or net electricity production).

Data should then be aggregated at EU level and compared to EU trends (e.g. with data used in Primes).

It was noted that discrepancies between MS parameters and Eurostat emerge when *energy demand is split by fuel type* (PM 13-17). The problem is usually due to the fact that the Eurostat definition of energy demand excludes certain sectors and uses, and it is not clear what it should be reported by MS. Furthermore, part of the energy sources was missing in some MS or dealt in different ways, leading to problems of interpretation.

In the transport sector it was recommended that diesel and gasoline figures are separated.

It was observed that, electricity and heat are not included, although they are important for several demand categories. Data related to agriculture, forestry fishery are also in many cases missing.

It was recommended that the definition of energy demand should be consistent with Eurostat total final energy consumption and Eurostat des-aggregation of fuels and sub-categories. Past and future trends should be compared on a regular basis. Data should also be aggregated at EU level, and more background information on key drivers for future emission trends should be provided.

■ **Weather parameters (PM 18a and 18b)**
The use data on projected heating degree days is difficult, and it is suggested that the related parameters should be deleted.

■ **Industry (PM 19-21)**
Industry parameters include gross Value Added (VA), share of GDP by sector, growth and production index. There is a lack of pre-defined industrial (sub)sectors, hence aggregation is often difficult. It will be important to either define key important sectors (e.g. 3) in a consistent way across MS, or to improve the guidelines on projections description.

It was observed that the most important parameters for the industry sector is the final intensity. This indicator can provide additional information to explain the projected trend in industrial emissions.

It was suggested that, if MS could report few subsectors consistently, the information could be aggregated and serve as additional explanatory information for the projected trend at EU level

■ **Transport**
Many gaps were found in transport reporting parameters. Historic data (e.g. provided by Eurostat) are also incomplete for a number of MS. Transport modes

definitions are unclear. Furthermore, parameters for road transport – which is an important sub sector – are also unclear.

It was recommended that projections are compared with past trends and the inventory. Parameters 24 (Total passenger kilometers) and 25a (total freight ton kilometers) appeared to be non relevant and could be deleted. Carbon intensity for road transport instead was considered the most important intensity parameter. In general, definitions should be improved, and aggregation of data at EU level and between past and future trends would be useful.

- **Buildings**

   Wide variations were noted across reported parameters, and no aggregation seemed possible. It was suggested to delete a number of parameters (e.g. 27, 28, 29, 30 and 31). The number of households should be included. General intensity indicators should be based on other reported information should be included (e.g. population-related carbon intensity, fuel consumption etc).

   Trends and consistency should be compared with inventory data and other aggregated figures. The explanation of drivers should also be improved.

- **Agriculture**

   In the agriculture sector, the parameter related to animal numbers is important and should be kept. It was suggested to disaggregate enteric fermentation and manure management by major livestock types to calculate the implied emission fact (IEF). Parameters 40 to 47 instead do not seem necessary and could be deleted.

   It was noted that default EFs (parameter 48) are mostly used by MS, but projected activity data are more important, though not included.

   Crop area (parameters) was not considered very relevant, and it was suggested that this could also be deleted.

   It was recommended that trends of animal numbers, trends of IEF emission from livestock and direct N_2O emissions from soil should be compared to check consistency between inventories and projections.

- **Waste**

   5 parameters are requested for the waste sector. Some important parameters are instead missing, such as methane recovery from landfill. The parameter related to the organic fraction instead could be deleted.

   Trends of Municipal Solid Waste (MSW) and methane recovery should be compared.

   Attention should be paid to IEF and to key trends for MSW treatment.

- **Forestry**
  It is suggested to delete all the 3 parameters requested for the forestry sector. Since forestry is not frequently included in the projections it was considered premature to develop parameters in this area.

As a general conclusion, it was noted that it will be important to improve the comparability and completeness of information, improving definitions and consistency with other reported data. Some parameters could be deleted, especially those that only few MS are able to report, or where aggregation problems are not solvable, or those that are not able to explain trends.

AEA noted that the project is consistent with the work they are carrying on, and agreed that a more standardized methodology and reduced parameters would be helpful.

A MS representative mentioned that it could be important to report also on aggregate export electricity base loads.

AH mentioned that she will look at new data submissions and update the report with new information, that will be circulated to WGII for comments. Erasmia Kitou (EK) from the European Commission encouraged MS to submit comments.

One representative asked whether the suggested changes had already been included in the template. AH clarified that a template with proposed changes had been prepared but not to circulated yet. It could be possibly included as a pdf at the end of the report.

One representative mentioned that some MS, like Finland, may have some problems to adjust to Eurostat gross inland consumption, but that efforts should be made. He also agreed that data on import and export of electricity are important.

It was also noted that the revision of monitoring parameters is important. The recoding of PAMs id done biannually, but some elements are also relevant annually, hence in the future annual reporting may be needed.

A representative commented that harmonization in the way PAMs are reported would be crucial, especially when implementing the energy package in the future. EK noted that changes related to the UN compliance mechanisms should be expected. She clarified that the ongoing projects coordinated by the Commission do not take into consideration the energy package. However upcoming projects will look at the findings of the current work in combination with the energy package implications. She also commented that projections on biannual basis have some weaknesses and the Commission should re-examine elements of the decision.

One representative asked whether, from now on, MS should involve other experts than the inventory ones in policy measures, or if it would be advisable to build a special team on policy measures. EK mentioned that a link to inventory data was major requirement for the ex post analysis, and that communication between the two groups was very important. She added that, by the end of the year, more answers will be provided on how the framework is organized. The Commission will present considerations on how to build the communication between the two aspects – as this will be explored further.

A. AGENDA

Introduction

9.15   Registration and coffee

9.40   Overview and objectives of the workshop – *Erasmia Kitou, European Commission, DG Environment*

9.55   Introduction to the project work – *Jason Anderson, Institute for European Environmental Policy (IEEP)*

10.10 Introduction to the use of different models for GHG projections – *Jan Duerinck, VITO*

Models/methods used for agriculture and forestry GHG projections

10.30 Overview of agriculture projection methods – *Anke Herold, OEKO*
   ⇨ Insights on the CAPRI model - *Stephan Hubertus Gay, Institute for Prospective Technological Studies (PTS), European Commission, Joint Research Center*

   ⇨ GHG emission projections for Agriculture: Finland Approach – *Paula Perälä, Statistics Finland*

   ⇨ GHG emission projections for Agriculture: Ireland Approach - *Bernard Hyde, EPA Regional Inspectorate, Ireland*

11.15 Coffee break

11.45 (Continuation: agriculture and forestry)
   ⇨ Overview of projection methods in forestry - *Frank Veroustraete, VITO*

12.15 Discussion on agriculture and forestry

13.00 Lunch break

Models/methods used for waste GHG projections

14.30 Overview of GHG waste projections– *Anke Herold, OEKO*
   ⇨ Insights from the European Environmental Agency on waste projections – *François Dejean, European Environmental Agency (EEA)*

15.00 Discussion on waste

15.45 Coffee break

Conclusions

16.15   Wrapping-up, conclusions and general discussion

17.00 End of day 1

B. MINUTES

Overview and objectives of the workshop – *Erasmia Kitou, European Commission, DG Environment*

Erasmia Kitou (EK) of the European Commission (EC) introduced the rationale behind the project and the workshop.

She stressed the importance of understanding what is happening with projections in the EU Member States (MS). It was noted that MS are free to choose their own methodologies, but that this may lead to uncertainties. Therefore, clarity on the methods and assumptions used is crucial to meet common EU targets. The project is meant to explore MS practices, problems, capacity building needs and best examples. The project and workshop's aim is to help MS and the EC to learn more from country experiences on greenhouse gases (GHG) emission projections. Another goal is to provide the opportunity to better understand MS figures and clarify how to best aggregate data.

It has not yet been decided how the EC will move with projections in the future, in terms of requirements to MS and data aggregation. Difficulties arise from the existence of different parameters and assumptions. The project will identify opportunities for improvement, gaining confidence in what is done by MS and what can be improved.

***

Introduction to the project work – *Jason Anderson, Institute for European Environmental Policy (IEEP)*

Jason Anderson (JA) from IEEP welcomed the participants and presented an overview of the workshop content and organization.

He noted that GHG emission reduction policies have recently experienced two crises: the collapse of prices under the emission trading system (ETS), and the crisis of confidence in Clean Development Mechanisms (CDM) due to non-additionality of many projects. Each affects how the EU is meeting its targets. Emission projections therefore are not only a technical issue but also an important broad political matter.

The workshop will aim to increase understanding of the state of play of emission projections in the EU, and how to achieve improvements, on the basis of the experience learned by MS experts.

Tour de table: JA's presentation was followed by a brief introduction of each attendee.

***

Introduction to the use of different models for GHG projections – *Jan Duerinck, VITO*

Jan Duerinck (JD) of VITO outlined the objectives of the project, and provided an overview of **why GHG projections are required**, highlighting that GHG projection reporting by MS allows evaluation of how reduction targets are met and PAMs implemented.

JD explained that **models should be chosen** on the basis of their ability to generate scenarios and their accuracy in quantifying GHG reductions related to Policy and Measures (PAM) and in evaluating PAM effectiveness.

JD also presented the **classification** used in the report. Models were broadly divided into top-down and bottom-up approaches. General equilibrium models and macroeconomic models were considered top-down, or demand-driven models. Optimization, engineering and simulation models were considered bottom-up, or technology/supply-driven models. Their key characteristics are as follows:

- **General Equilibrium models**: the level of accuracy is considered low; PAMs evaluation is limited but models are able to provide general assessments of welfare implications of high carbon prices
- **Econometric models:** their accuracy is suited to develop a 'without measure' (WOM) scenario, and demand aspects are well elaborated; PAMs evaluation is limited due to weak technology representation and the fact that cost-effectiveness is not a real issue
- **Optimization models**: the baseline scenario is based on expert judgment; PAM evaluation is suited to evaluate cost-effectiveness
- **Engineering models**: the baseline scenario is based on expert judgment; it is possible to evaluate PAMs without taking cost-effectiveness into consideration
- **Simulation models**: the baseline scenario and sensitivity parameters are very much based on expert judgment; the quantification of certain PAMs is possible

A general **overview of MS models** was presented, in light of the categories used in the project. Most MS rely on models based on engineering aspects. Some common characteristic are shared by MS models on agriculture, forestry and waste, namely: the relation between activity and GHG emission is complex; the level of uncertainty is high; models tend to focus on emission calculations; activity data (e.g. land use, crops etc) usually comes from other sources/ministries; only few MS models take into consideration economic expects (e.g. equilibrium models); the documentation on the methodology used by MS is often scarce, hence some models could have been misrepresented in the report. Comments from MS were welcomed.

Finally, an overview of the **projections reported under the Monitoring Mechanism** (MM) was provided. 2005 was used as a base year, and historical data and projections were plotted for each MS in the agriculture, waste and forestry sectors. It was noted that emission projections for CH_4 in EU12 are rising probably because of economic growth expectations.

In conclusion, JD observed that no model is perfect, that experts are as important as the models, that different PAM require different approaches, and that sector-specific elements are important.

It was clarified that presentations would be made available online (now at http://wwwb.vito.be/ghgprojection).

Asked if differences across MS capacities and financial costs exist, JD replied that such differences were noted. Nevertheless, it was observed that even small MS are able to use well-established methodologies. Training is important. Also, there are differences in the budget allocated to projections across MS, and in some countries it was not sufficient.

<div align="center">***</div>

<div align="center">

Agriculture

</div>

Overview of agriculture projection methods – *Anke Herold, OEKO*
Anke Herold (AH) from Oeko-Institut presented an overview of projections in the agriculture sector.

Models can be used to predict key activity data, ie livestock numbers, crop areas and fertilizer use. Eight MS use models for activity data, while the rest use other source.

Some **MS models** were briefly described:
- PASMA (Positive Agricultural Sector Model Austria): it's a model used in Austria and based on positive mathematic programming. It allows evaluation of regional supply responses of agri-environmental programs in detailed, provides separate estimation for 40 regional and structural production units, and includes a separate modeling for organic farming. Data are based on a range of statistics and some assumptions. One main challenge is to get recent data for all parameters. Commodity prices are exogenous and based on OECD FAO, except for organic products. Nominally constant prices are assumed after 2013. Other assumptions are made on technological progress, domestic consumption, future milk yields and animal waste management.
- HUSIM (Hungarian simulation model): its main drivers are macroeconomic development, development of production prices, fuel and energy prices, and some policies (subsidies, agri-environmental programs, rural development plan). Adjustment for livestock categories is not provided
- CAPSIM (Common Agricultural Policy Simulation Model): it is an EU in-house partial equilibrium model used for the Common Agricultural Policy (CAP). In 2006, it was transferred from DG ESTAT to JRC-IPCT. It provides a rather disaggregated coverage of items and individual MS and Candidate Countries (CC). The model is also used by Portugal. Crop areas that are not projected by CAPSIM are assumed constant. Assumptions on N fertilization include historic trends for fertilizer used and area size

In general, it was observed that agriculture models generally build on econometrics, mathematical, programming or simulation models. *Programming models*, like PASMA, provide an exact reproduction of production decisions at a given time and can be used to predict the effect of future policies. *Partial equilibrium models*, like CAPSIM, use estimated responses to price signals, cross elasticities and other structural relationships to predict the effects of policies. They focus on global trade and market development issues, while *mathematical programming models* focus on lower level decision making

It was also noted that in a few MS (Portugal, Romania and Slovenia) **inconsistencies remain between projection and inventory data.**

With regard to **reporting,** while energy models are explained well, agriculture models are still less well-detailed in agriculture. Livestock data are complete where data/statistics exist, and are close to the inventory data.

Policy and measures reported by MS include: CAP, biogas production (reported by 6 MS), biomass production (4 MS), nitrogen (N) fertilization (6 MS), N from animal waste management (3 MS), agri-environmental schemes (2 MS), organic farming (1 MS)

In her **conclusive remarks**, AH observed that improving consistency would require better information and discussion on projections of agricultural markets and commodities from global models.

It was also noted that data sources are often not transparent, and that few important sources (Oecd-Fao, Dg Agriculture, Fapri model) are used by many MS. In this regard, AH raised the question of whether projection on activity data should be more harmonized across the EU. It was then pointed out that few MS explicitly report on impacts of biofuels and biomass. The link between the energy and agriculture sector should be improved in the areas of biomass, biogas and biofuel use projections and their impacts on emissions in the agriculture sector. AH raised the questions of whether further methodological work and/or further work on projections at EU level with regard to these effects is necessary. The steps to improve the estimation of the impacts of increased biomass and biofuel use on emissions from agriculture sector should also be discussed

Finally, it was observed that some MS use lower tier methods. There is also a lack of information on management practices and country specific emission factors (e.g. related to animal waste management, organic farming etc). Inventories using default methods do not mirror emission reductions from implemented measures.

Furthermore, projected emission reductions from policies and measures will not be shown in future inventories if methods are not improved. Issues to be investigated are the need for further steps at the EU level on data availability (e.g. animal waste surveys etc) and areas for further research to better reflect policies and measures.

***

Insights on the CAPRI model - *Stephan Hubertus Gay, Institute for Prospective Technological Studies (PTS), European Commission, Joint Research Center*

Stephan Hubertus Gay (HG) provided some insights on the Capri (Common Agricultural Policy Regionalized Impact analysis) model. The model belongs to the same 'family' as Capsim and was developed by the same experts. It is an EU-wide model for regionalized analysis of the CAP. It is a partial equilibrium model with a focus on the supply side, used to analyze data in EU27, Norway and some West Balkan countries. It allows for endogenous prices and provides a detailed coverage of CAP policies.

The model provides a reference point for counterfactual policy analysis, supplements DG-AGRI Market Prospects by adding the regional dimension and environmental indicators, and provides input to other models and consortia. It covers market balances, prices, areas, herds, yields, inputs, GHG/ammonia emissions at NUTS 2 level. Projections are made in the medium term (8-10 years) and exploratory in the longer term (2020).

The **baseline** is calculated on the basis of simultaneous econometric estimation of agricultural key data, mainly based on historic data and calibrated with expert data – integrating additional info from other models and engineering knowledge – with des-aggregation by NUTS 2 and Farm type.

The **motivation** behind the model is to generate base year regional GHG inventories (ex post), provide medium term projections (baseline) and allow for policy impact analysis.

The **general approach** is to use pan-EU harmonized sources and common methodology (IPCC guidelines), take into account the regional specifics of agricultural production and integrate those into the CAPRI core structure

Positive aspects of the CAPRI baseline are that it provides a generic tool which can be reused by other modeling systems / policy makers; it can easily handle information from other models/experts, and allows the calculation of GHG emission projections for agriculture in an automatized way, based on harmonized data sets and a common methodology at NUTS II level.

Among its **drawbacks**, it was noted, is the fact that detailed quality check of results is and will remain an issue, and that the Baseline has its own limitations because auxiliary info is necessary for des-aggregation and not all product and activities are covered.

In the future, the following developments are expected:
- Lifecycle analysis for the estimation of cattle emissions integrated in 2008-2009
- Emission inventories are calculated for other world by 2009
- The model will be linked to crop-growth models for specific modeling of soil-related N_2O Emissions, and to energy models for explicit consideration of GHG abatement due to biofuel policies (2nd generation, different scenarios etc)
- GHG inventories are downscaled to the grid level

Further information on the model can be found at www.agp.uni-bonn.de/agpo/rsrch/capri/capri_e.htm

<div align="center">***</div>

GHG emission projections for Agriculture: Finland Approach – *Paula Peräla, Statistics Finland*

Paula Peräla described the Finnish approach used for emission projection in the agriculture sector. She stressed that a national climate strategy is under development, and that scenarios will be needed for this, as well as for the National Communication to UNFCCC.

Each ministry is responsible for emission scenarios in its own area (MTT Agrifood Research Finland for agriculture) under the coordination of the Ministry of Employment and Economy, with support from Statistics Finland. WOM and With Measure (WM) scenarios will be ready by summer 2008. Hence, more info will be available soon.

The projections are based on the Dremfia model for the inventory, while for other activity data not covered by the model (e.g. horticulture, manure etc) expert judgment is used.

The **Dremfia model** is a dynamic recursive optimization model simulating agricultural production in 18 regions of Finland in the medium and long term (2020-2050). It provides a detailed presentation of agricultural policies. The model uses exogenous input prices and EU-level products prices (though these may differ from domestic output prices). It is based on the microeconomic theory of profit maximization simulating agricultural production.

The model takes into consideration the following **PAMs**: OECD-FAO price relations, CAP health check implemented until 2015, status quo in other subsidies, slightly increased poultry consumption and some measures for changes in land use and manure management.

Among the **key advantages** of the model are the high level of detail of agricultural policies, economics and investment subsidies, the fact that it accounts for changes in regional farmland areas, and its capability to provide information on which factors drive changes in agriculture (subsidies, markets, or climate policy). Other advantages include the model's consistency (it is used also for other purposes hence data are checked in several occasions), the possibility to swiftly update activity calculations, and the consistency between projections and reported GHG emissions.

However, there are also **drawbacks** associated with the model: it relies on expert judgment, and there is scope for developing calculations for activities not included in DREMFIA. Also, the model has been used in CAFÉ but assumptions were different. Furthermore it is not easy to compare results to other models, as few models produce similar outputs and use similar assumptions. The area of cultivated organic soils and distribution of manure management systems is also uncertain. Further developments may

be needed to evaluate the effect of energy crops and on methods for including soil carbon from cropland and grassland (reported in the LULUCF sector).

<div align="center">***</div>

GHG emission projections for Agriculture: Ireland Approach - *Bernard Hyde, EPA Regional Inspectorate, Ireland*

Bernard Hyde (BH) presented the Irish approach on agriculture emission projections – which are calculated annually by the Environmental Protection Agency (EPA). Agriculture is estimated to account to 26% emissions (2006), especially from enteric fermentation of cattle.

The projections take into account the National Emission Inventory Model – which ensures consistency between inventory & projections. Adjustments to the model take into account management and production practices. The model is also based on the collaboration with and review by all relevant stakeholders.

The method is based on a good system for input data (detailed animal type, manure, fertilizer etc) and produces objective analysis of agricultural policy options based on economic models of commodity markets

The **PAMs** the model takes into account are
- The CAP Reform
- Activity data driven by agriculture policy options
- Various policy options can be considered (e.g. Dairy Quota expansion and special beef cow premium).

Advantages include: the model uses the inventory methodology to project data forward; data are required and supplied generally at the aggregation level used/required by the inventory; projections of NH_3 take into account indirect emissions and wastewater sludge application to land and direct emissions; the method is transparent and straightforward; and it is easy to implement sub-sector changes and examine scenarios

Among its **drawbacks** are the following: the model requires detailed activity data; the link with NH_3 calculations and sludge application statistics is dependent on data for these sources; and some level of programming is required to examine all policy options, changes to production etc.

<div align="center">***</div>

<div align="center">

Forestry

</div>

Overview of projection methods in forestry - *Frank Veroustraete, VITO*

Frank Veroustraete (FV) from VITO illustrated the current status of emission projection in the forest sector in EU. He noted that no common forest policy exists, although 1/3 of the EU area (160 MHe) is covered by forests – 73% of which is used for wood production.

Forest policies also contribute to and are affected by a range of other policies (e.g. climate change, biodiversity, rural development etc). The ownership structure varies in each MS, but on average 65% is privately owned. The level of risk of forest fires also varies significantly.

A **good Land Use, Land-Use Change and Forestry (LULUCF) model** should provide accurate GHG projections, be consistent with inventory data, and focus on policy support by enabling impact quantification of Common and Coordinated Policies and Measures (CCPMs) and national PAMs, and enabling analysis of new PAMs. It should also be able to describe the evolution of land use, its change and forest productivity, explore carbon reuptake potential and provide long term scenarios. It should also be able to take into account side effects, both anthropogenic (e.g. land degradation) and non-anthropogenic (e.g. lighting), enable the inclusion of land reclamation and wood demand, and take into account climate change impacts

FV provided an **overview of the models used in MS**, focusing in particular on the Belgian example. It was noted that information in the Flemish and the Walloon inventories is very similar, and that forest inventories in Belgium have one of the highest sampling rates in Europe. The forest definition adopted is important to understand the area coverage (it is up to MS to choose their definition). Belgium uses the EFOBEL model – a computing model of carbon sequestration in forests.

Examples of PAMs considered in the Belgian regions are:
- Measures to support reforestation
- Reconversion of ground
- Prohibition of deforestation
- Preservation of the ecological stability of forests
- Wood energy plan
- Investigation of carbon sequestration

Examples of **projections reported under the MM** were shown for Finland and Belgium. It was highlighted that the LULUCF sector acts as a net sink in Finland. In Belgium, the main driver of emission from LULUCF is the socioeconomic context, rather than climate change.
In general, it was pointed out that **forest fires** are the most important damaging factor in the Mediterranean countries, and over the last five year they have led to the emission of approximately 11 Mton CO_2 per year in Europe.

With regard to the use of **inventory vs. Remote Sensing** (RS)-based cover estimates, it was noted that RS data are of high accuracy. Inventory data seem to match satellite imagery data well, with some discrepancies. It was also noted that RS and ecosystem modeling is good for the estimation of carbon mass fluxes of vegetation or forests at continental level.

It was also pointed out that in Europe there is no equilibrium between re-uptake of carbon dioxide and anthropogenic carbon emissions (ACE). Europe is responsible for about 26 % of the total carbon emissions at the global scale, and only takes back about 1/3.

Discussion on agriculture and forestry

PP clarified that, while the Dremfia Model is able to provide (agriculture) data disaggregated at regional model, inventory data are aggregated

Asked about how data can be harmonized across the EU, AH suggested to use Working Group 2 (WG2) to give more regular updates on work at the EU level – e.g. aggregated results, links to published studies and papers etc – to make MS aware of this information and improve communication. It was also clarified that the EC has no intention to impose the same model on all MS, although some streamlining may be needed.

Asked about the existence of attempts to make forestry and agriculture projection more consistent, FV highlighted that few projects are looking at this besides some applications related to RS.

AH commented that forest is the weakest sector with regard to emission projections, as most MS do not undertake any projection, or only take into consideration forestation and deforestation. Very few MS have a more complete approach. More work is necessary in this sector, and its relation with agriculture should be explored further. The lack of development of forestry models may have been due to the fact that, in the past, MS had to face a big workload to implement the IPCC guidelines on forestry – which required and is still requiring a significant effort on the part of forestry experts, reducing the capacity to deal with other forestry related issues like emission projections methodologies. Also, the Kyoto Protocol does not give incentives to focus on emission projections because of the way the forest is accounted for – i.e. MS can only account for a small share of their forest sink. There is, however, strong potential to improve the forestry models.

It was also observed that bioenergy and deforestation in the post-Kyoto scenario are changing fast, i.e. there is increasing competition between forest and agriculture in land use. There is, hence, reason to include both agriculture and forestry in a general equilibrium model.

It was also pointed out that, in some MS, projections are not in line with inventories, and that sharing international data and information at WG2 could be helpful.

In this regard, it was also noted that the gap between inventories and projections is in some cases due to lack of coordination among MS departments.

AH also observed that current inventories do not always represent all data, and more research and data may be needed (e.g. in Spain information on biofuels will be crucial).

Several participants noted the need for further information, e.g. a clear definition of how policy evaluation should be done (e.g. life cycle assessment), additional information on future changes in policies (e.g. CAP, nitrate directive, manure management etc) etc. Data availability in the agriculture sector is a factor of main concern, and it was suggested that a central statistics database would be helpful.

AH noted that further work is needed on the implications of bioenergy, and that land use is an important issue of concern. An FP7 project is looking at linking different sectors into a wide macroeconomic scenario, taking into account the impact of different sectors and the change in land use. This information should be then an input to the Capri model. Capri should also be linked to more flexible technological models for biofuels – also in view of possible shifts towards 2nd generation biofuels.

<center>***</center>

<center>**Waste**</center>

Overview of GHG waste projections– *Anke Herold, OEKO*
AH provided an overview of GHG projection models in the waste sector
It was observed that all but one MS report data on CH_4 from landfills, although 5 MS did not report gases separately. No sector specific models are used. Models developed for inventories are largely used, which ensure consistency between projections and inventories. For some MS, though, it is unclear what model has been used for projections. Consistency with inventories has improved, although in some MS inconsistencies remain (e.g. BG, EL, HU, PL)

Activity data are usually based on: own assumptions, information on ban on landfilling of biodegradable waste, and targets on national waste management plans (used by many MS). For some MS no information on data sources was available.

With regard to PAMs, it was noted that in general little information is provided by MS on how national waste management strategies and legislation are reflected in the parameters and how assumptions are used in the models. Information on development of capacities of alternative waste management options (composting, incineration) is also usually scarce. Some parameters also appear unlikely (e.g. France assumes 100% capture of landfill gas up to 2020, on the basis of national targets).

Wastewater was not seen as a problematic area. It was observed that all MS but one estimated CH_4 and N_2O emission from wastewater handling, but no sector-specific model is used. Assumptions on future development of waste treatment are provided. Four MS did not report gases separately.

AH concluded that assumptions regarding waste management should be improved, and discussion on the feasibility of national targets is needed. Corrections of objectives should be applied if implementation of policies/targets is unlikely (e.g. Italy). More information should be provided on strategies and treatments that will replace landfills The extent to

Assess and improve methodologies used for GHG Projections
Annex B

which national waste strategies will influence key parameters used for the estimation of CH_4 emissions from landfills should be better reflected. Improved reporting on methods (e.g. IPCC Tiers) is also necessary.

Finally, AH raised the issue of whether further exchange on key parameters (e.g. landfill gas capture) should be done in WG2. AH also asked if it would be possible to achieve better information on the implementation of waste targets, and if a closer link with the Landfill Directive should be established.

<div align="center">***</div>

Insights from the European Environmental Agency on waste projections – *François Dejean, European Environmental Agency (EEA)*
François Dejean (FJ) presented some insights on waste projections from the EEA. The EEA outlook 2005 foresees that there will be a decrease of net GHG emissions from municipal waste (MW) management despite a 25% growth in MW – since more waste is expected to be recovered, recycled or incinerated with energy recovery (avoided emissions). This may lead even to negative net emissions. The main conclusions can be found in the EEA Briefing 2008/01 (with supporting document) + European Topic Centre on Resource and Waste Management (ETC/RWM) working paper.

GHG projections were calculated through a model developed by the ETC. A macroeconomic model was used to calculate waste quantity on the basis of GDP and population, while a technical model was used to calculate GHG emission in light of waste management options and emission factors.

Key assumptions are population number and households' consumption. Historic quantities of MSW are based on Eurostat data. The split of municipal solid waste (MSW) by management type is based on experts' judgment. Direct GHG emissions builds on IPCC (landfill, incineration), carbon mass balance (incineration) and Life Cost Analysis (LCA) (recycling). Indirect emissions are based on LCA data

PAMs are reflected in input parameters (i.e. past data on waste generation). Only one scenario (the baseline) is developed. The quantification of the effects of individual measures proved to be difficult as there are not enough parameters.

There are no alternative models for comparison, but inventories provide an alternative method for sectoral emissions.

Among its positive aspects, it was noted that the model provides an EU-wide approach, and it is consistent. Among its drawbacks are that the model uses diverging assumptions from the 1996 IPCC guidelines on methane recovery (in the model they are very conservative, i.e. 20%), that its time series is limited for econometric calibration, and that there is a lack of other models for comparison (other benchmarks are welcome).

Discussion on waste

FD clarified that the model can be accessed via the EEA website, where the briefing and supporting document can be found, and information is also available in the ETC website.

Asked about how lower level of emissions are reached from the assumptions used (especially the low rate of methane recovery), FD replied that this depends on waste diverted from landfills and indirect emissions. Increased incineration implies that energy is produced with lower emission compared to from fossil fuels plants.

Asked whether all MS report according to First Order Decay models, AH replied that, although for some MS it is unclear, in general most do use those models in the inventories. New Member States recently changed their models for inventory and projections.

Asked about what is a feasible target for methane capture, AH mentioned that German studies showed that it does not seem technically feasible to collect more than 50% , since there are always cracks in landfills from which gas can escape – as landfills are never completely sealed. A reasonable figure for capture was considered around 30-40%. These measurements are thought very expensive, it was noted.

JD explained that the rational behind the conservative figure used by EEA (20% methane capture) is to take the only default factor in IPPC. Also, it was noted that some landfills are not yet equipped hence 20% is also an average value.

Some of the participants also noted that it would be useful to have a clear definition of MSW because at the moment it is still not clear what exactly should be taken into account in the projections. Some EU Directives could for instance provide clearer definitions and parameters, e.g. the Landfill Directive.

AH asked the participants if it would be possible to achieve better information on the implementation of waste management targets. BM noted that in Austria no additional measure is foreseen, hence possible adjustments will likely be made on the basis of population only.

JA and JD noted that waste targets are political objectives, but they may not be met in reality, and it can be politically sensitive to make projections assuming that certain targets will not be met. EK observed, however, that projections are not used for compliance purposes, and that it is more important that lack of implementation is taken into consideration in the models.

Some participants asked which policies should be taken into consideration in the baseline scenario, e.g. packaging regulations, national plans etc. A clear definition of WM and WOM scenario was also considered needed. Guidelines in this regards would be welcome.

EK commented that, in order to clarify what should be in the WM and WOM scenario, it is necessary to make reference to what has been implemented before the reference year. The EC proposed at WG2 to use 2000 as the base year, hence any policy put in place after the base year is to be considered a 'measure' (WM scenario). If the measures are planned but not implemented, they should be considered 'additional measures'(WAM scenario).

JD added that in the future the WOM scenario may become obsolete, although EK noted that the WOM is likely to stay as it is politically important to show what has been achieved with new measures.

Asked about how to quantify stored carbon, JD replied that such carbon is not a sink, but it is not released in the atmosphere.

It would be helpful to have guidelines to check consistencies across countries, e.g. what measures are included in the baseline scenarios.

The participants also discussed how the carbon not released in the atmosphere and remains stored in the landfill should be considered (e.g. if it should be considered a sink). AH noted that the issue is similar to the question of how to consider harvested wood products. No methodology has been developed yet in the field of water projections.

***

Wrapping-up, conclusions and general discussion

Finally, it was noted that there is a need for further developing projection methods in the forest sector. The MS advancing in this area could report at WG2 to make information available.

Further work on the integration of agriculture and LULUCF projections with regard to land areas, as well as on integrated treatment of assumptions on biomass/biofuels/biogas use between energy projections and agriculture/forestry is needed.

Information on the results from aggregate projections for MS (CAPRI, CAPSIM) should be improved. The projections on the amounts of MSW going to landfills, beside national strategy targets, should also be improved. Further work on the reporting of methodological information (relying on improved guidance) is also needed.

Clarification on WOM, WM, and WAM can be helpful. It will also be important to clarify which issues should be addressed in the description of methods, models and assumptions.

Workshop – 27 May 2008
GHG projection models for energy, industry, transport, residential and tertiary sector

A. AGENDA

Introduction

9.15 Registration and coffee

9.40 Overview and objectives of the workshop (key points from day 1) – *Erasmia Kitou, European Commission, DG Environment*

9.50 Introduction to the workshop (key points from day 1) – *Jason Anderson, Institute for European Environmental Policy (IEEP)*

10.00 Introduction to the use of different models for GHG projections (key points from day 1) – *Jan Duerinck, VITO*

Presentation of different projection models

10.15 Projections models
- ⇨ **Insights on Markal model** – *Ivars Kudrenickis, Institute Of Physical Energetics, Latvia*

- ⇨ **Insights on Prometeus model** - *Barbara Muik, Umweltbundesamt, Austria*

10.45 Questions

11.15 Coffee break

11.45 Continuation: Projection models
- ⇨ **Transport: Insights on the ASTRA model FHG-ISI** – *Wolfgang Schade, Fraunhofer Institute for Systems and Innovation Research(ISI), Germany*

- ⇨ **Insights on Athena/SAVE model** - *Ton van Dril, ECN Policy Studies, Netherlands*

- ⇨ **Insights on Message model**- *Jiří Balajka, Slovak Hydrometeorological Institute, Slovakia*

12.30 Questions

12.45 Lunch break

Interactive sessions

14.00 Interactive parallel sessions

Session 1 - GHG modeling in the energy and industry sector
- ⇨ Overview of project results – *Jan Duerinck, VITO*

- ⇨ Discussion

Session 2 - GHG modeling in the transport sector, households and tertiary sector
- ⇨ Overview of project results – *Kristien Aernouts, VITO*

- ⇨ Discussion

15.30 Coffee break

16.00   Wrapping up, conclusions and general discussion
17.00   End of day 2

B. MINUTES

Overview and objectives of the workshop – *Erasmia Kitou, European Commission, DG Environment*
EK summarized the issues presented in day 1 (see minutes Day 1).
<div align="center">***</div>

Introduction to the project work – *Jason Anderson, Institute for European Environmental Policy (IEEP)*
JA summarized the issues presented in day 1 (see minutes Day 1).
<div align="center">***</div>

Introduction to the use of different models for GHG projections – *Jan Duerinck, VITO*
JD summarized the issues presented in day 1 (see minutes Day 1).
JD also noted that the classification used in the report did not take into consideration recent data submissions by MS.
<div align="center">***</div>

<div align="center">**Projection models**</div>

Insights on Markal model – *Ivars Kudrenickis, Institute Of Physical Energetics, Latvia*
Ivars Kudrenickis (IK) presented an overview of the Markal model in Latvia.

GHG Projections Organization: IK described the legal basis for the Latvian GHG inventory. Activity data on the energy sector are obtained directly from the facilities participating in the EU ETS (bottom-up approach), hence data are relatively precise.

General Introduction to the MARKAL Model: Markal has been developed by the International Energy Agency's Energy Technology Systems Analysis Programme (IEA-ETSAP) and it is widely used across 60 countries. It is an open source model, proven, evolving, flexible, verifiable and adaptable, that encompasses all the energy sectors and is ideal for assessing the role of technology in achieving policy goals.

Markal is a bottom-up technology optimization model able to identify least-cost solutions for energy system planning. It provides estimates of: energy prices, demand activity, technology and fuel mixes, GHG and other emission levels and mitigation costs. Input data are mainly related to costs, technologies' characteristics, environmental impacts and other parameters (e.g. discount rate etc).

Purposes of MARKAL: In Latvia Markal is used to obtain GHG projections for national reports, evaluate the impact of international and national environmental policies, evaluate

the impact of the introduction of different RES targets, and identify least-cost solutions for energy system planning.

Modeling Latvia GHG projections with MARKAL: Certain input data for Markal are particularly challenging in Latvia, especially: GDP projections, primary Energy prices projections, Useful Energy Demand projections (in relation to consumer behaviors), and implication of unfinished structural changes (especially in relation to technology penetration). Also, changes in governmental policy on energy supply security may significantly influence the scenario definition and description. It was noted that in a small country like Latriva, each government decision can affect emission significantly.

The WM scenario takes into consideration:
- Energy efficiency actions
- National RES-E target (49.3%)
- RES-F target (5.75%)
- Energy tax and electricity tax
- Emissions taxes

The WAM scenario includes:
- Increased GHG emissions tax
- Increased noxious air pollution taxes
- More support for energy-efficiency actions

Research related to the model consisted in an integrated analysis of national energy system development, finding the optimal structure of primary energy sources and taking into account RES utilization, security of energy supply, and the costs and implications of climate change mitigation

Finally, an overview of the main results of the model for Latvia was presented.

Questions/discussion:
Asked about accounting for inertia of installations, IK replied that the model is very detailed and can take this into account. It was noted that this can also be done with the Message model.

Asked taking ETS into consideration, IK replied that it is not clear how to do this in practice. The price of CO_2 could be considered as an additional CO_2 price. Uncertainties lie on whether the ETS target of reducing emissions by 20% should be taken for granted, or if we should rather look at national implementation. Advice on this issue was welcomed.

<center>***</center>

Insights on Prometeus model - *Barbara Muik, Umweltbundesamt, Austria*
BM presented the Prometeus model used in Austria for modeling the economy, transport and energy use.

Prometeus is a macroeconomic energy and environmental model. It is disaggregated into 31 sectors (60 NACE codes). It consists of 4 main blocks: production, demand for commodities, employment market and income. Its main exogenous variables are public consumption, exports, GDP of trading partners, world market prices, and technical advances.

A summary of the key features for the evaluation of energy production and demand cost functions (sectoral demand, inter-fuel substitution, RES, private consumption, energy policies etc) was provided.

A key **advantage** of the Prometeus model is that it allows for full integration off the energy system and the economy – unlike pure energy systems model (e.g. Markal) where the economy is introduced exogenously. In addition, almost all parameters are based on econometric estimates with time series for Austria, enabling to simulate the economic effects of changes and shocks affecting the energy system (e.g. oil price shock).

Among its **drawbacks** is that Prometeus misses a detailed modeling of the underlying technological processes and of their link with energy demand.

Key **input parameters** are: GDP, sectoral GDP, population, stock of flats (based on national economic forecast), and energy prices (based on IEA and national €/$ exchange rate forecasts).

The model does not represent single **PAMs**, but their total effect (it includes overlapping effects). PAMs included are:
- Liberalization of electricity and gas markets (national study)
- Energy taxes
- Promotion of RES and combined heat and power (CHP) (including subsidies)
- Effect of Water Framework Directive on the Austrian hydroelectric power production
- ETS and projected emission allowance price
- Joint Implementation (JI) and CDM
- Additional measures for increasing energy efficiency
- Additional measures in promoting electricity generation from RES

Finally, it was noted that the **national system** for projections is currently under development, and projections are consistent with inventories data. Activity data, though, are not regularly updated due to cost issues. Also, no comparison has been made with other MS.

Questions/discussion:
BM clarified that quality control is undertaken to ensure consistency of projections with the inventory data.

She also explained that JI and CDM are included in the model as additional costs.

She also observed that institutional arrangements for regular updates could be helpful, since it would be easier to compare results and assumptions with previous years.

***

Transport: Insights on the ASTRA model FHG-ISI – *Wolfgang Schade, Fraunhofer Institute for Systems and Innovation Research (ISI), Germany*
Wolfgang Schade (WS) introduced the Astra model used for the transport sector in Germany. The model, it was noted, is similar to Prometeus in that it integrates transport, environment and economics.

Astra consists of a system of integrated models, each with different purpose, covering a long-term horizon. It encompasses a wide range of passengers and freight transport modes and vehicle fleets and loads. It is applied for transport policy assessment, technology and scenario analysis (which is particularly important now as energy and transport are expected to change in the future, and changes will have to be consistent); RES policy assessment, and climate policy assessment.

Among its key advantages is that the model can contribute to integrated analysis considering feedbacks and rebounds effects. It also allows for flexibility of policy implementation and has a long-term horizon (up to 2050).

A drawback of the model is its level of detail, which is not sufficient to do regional analyzes. Furthermore, the model size has increased in recent years, due to the broadening of its purposes; hence it was noted that simplification may be required.

Both a pro and a con is that the model is not grounded on mainstream economic theory (i.e. it is not an equilibrium modeling). This makes it a more flexible model, but at the same time it can be difficult to be broadly accepted as many countries focus on economic models.
An overview was provided on **input parameters and data sources** (e.g. OECD, Eurostat, national databases etc).

Measures included in the BAU scenario are:
- Abolition of commuting subsidy for first 20 km of commute
- Ecological tax on fuel
- Mandatory blending of biofuels (6,75% 2010, 8% 2015)
- Heavy goods vehicle charge on motorways
- Voluntary agreement to reduce CO_2 emission of new cars to 140 g CO_2 /km

The planned measures included in the climate change scenario are:
- Complete abolishment of commuting subsidy
- Increase of diesel fuel tax
- Voluntary agreement to reach in 2012: 130 g CO_2 /km and in 2030: 100 g CO_2 /km of average fleet
- Inclusion of air transport in EU-ETS until 2013

- Kerosene tax
- Extension of HGV charge on total long distance road network
- Doubling of HGV user cost until 2015
- 100% market penetration of low rolling resistance tyres and highly fluid oils
- Increase of mandatory biofuel quotas (2020: 12.5 % 2030: 25%)

As conclusive remarks, it was noted that the model has been compared with TREMOVE, PRIMES, TREMOD results, but not yet other with MS models.

The consistency between projections and inventory trends is not an objective of the model, but trajectories of developments are continuous between calibration (past) and forecast (2009-2050).

Questions/discussion:
AH noted that in Germany the Tremove model is used for the inventory, and that the Astra model may use different emission factors, hence differences between inventories and projections could stem from emission data rather than activity data.

Regarding where to find EU network models, it was clarified that the TransII (developed by JRC) is the reference model used by the EC.

IK observed that, according to a study comparing biofuel potential across MS fleets and taking into account soil use and other factors, it emerged that in LV it was considered possible to have 70% of the fleet running on biofuels, while in Germany the biofuel potential was only 20% of the fleet – this was considered a questionable result. It was noted that it is important that transport models use common rules on fleets.   WS also noted that it is possible that some technologies develop more in some countries than in others.

IK added that a more detailed analysis of economic and infrastructure conditions would be advisable.

Asked whether all the additional measures taken into consideration in the German transport model are realistic, WS replied that actually some measures are problematic, and some revisions are ongoing. Not all of them are included in the UNFCCC communication.
AH noted that not all the additional measures have been reported, while some were included in the BAU scenario.

Regarding elasticity, it was noted that the Astra model uses quite detailed elasticity parameters and that sensitivity analysis is possible.

AH noted that fuel tourism can have a large impact on reported emissions and asked how this effect is considered in Germany. WS replied that according to Germany the problem of fuel tourism is overestimated, and is calculated as a proxy.

***

Insights on Athena/SAVE model - *Ton van Dril, ECN Policy Studies, Netherlands*
Ton van Dril (TVN) provided an overview of the model for the energy sector used in the Netherlands.

Among its main advantages are that the NL **approach** facilitates policy analyzes (given its level of detail), that it delivers almost all indicators, and that it is consistent and accurate. The approach, however, requires high data intensity (some data can be lacking or outdated), has a long pass-through time (projections are done every 4-5 years), and is used by a number of institutes that each have their own agenda.

The **model** makes many features possible thanks to its bottom-up approach, and it is consistent with separate models. On the down side, some technologies are missing from the model because of its bottom-up approach. In addition, the model allows no feedback on GDP from the energy systems, and calibration can be incomplete because of missing data.

Input parameters to the model are: sectors economic growth, population growth, physical flows and capacity; fuel prices, CO_2 prices, policy developments, technology data and base year data.

Policy analysis is the main focus of the analysis. Many policies are in place in the NL (eg subsidies, taxes, voluntary agreements etc), and their effect on actual emission reduction can be taken into consideration by the model. Policies are usually clustered. Some work has been done and is ongoing on the way policy and measures interact with each other. Rebound effects are taken into account: directly within the energy function, within the family/company budget, and within the economy, structural changes.

The model is generally consistent with the Primes baseline, although some differences exist on specific issues.

Many uncertainties remain, e.g. in fuel prices, type of fuels used by industry etc. The most recent projections are higher than the previous since there has been a change in the system (e.g. now it includes a more realistic approach to temperature changes related to climate change).

The model also takes into account EU policies, such as: ETS CO_2 prices (in 2007 a price ranging from 20 to 50 €/ton has been used); EU targets (to be translated into national policies) such as RES, CHP, biofuels etc; ACEA successor; future revised Ecodesign directive; future CAP, etc

The model has undergone some improvements, and projections are currently higher than in the past. Improvements include: integration of figures from projections with monitoring, development of the service sector model, update of some technologies (e.g. chemicals efficiency), peer review, and increased competence on the transport demand side.

TVD also clarified that all model inputs are managed in one single large database, which includes all emission factors, technologies, parameters etc. The database is an essential part of the model. It is updated by different institutes/organization – e.g. ECN is responsible for updating its own part.

Asked about the peer review, TVD explained that experts are still working on the process, which is at an early stage. It will be a top-down system.

Asked about the budget required to keep the system running, TVD replied that projections require overall about €1 million (for all the institutes involved), and involve about 20-30 (10-15 people at ECN).

Furthermore, despite the many different models, it was clarified that the energy system is consistent.

<center>***</center>

Insights on Message model- *Jiří Balajka, Slovak Hydrometeorological Institute, Slovakia*
Jiří Balajka presented an overview of the application of the Message model in Slovakia.

The system builds on macroeconomic indicators on GDP, value added (VA) and residential growth rates. Input data on energy balance are based on national energy statistics and on the National Emission Inventory System (NEIS), taking into consideration possible double counting. The final energy uses in industry are determined on the basis of the Statistical Yearbook and domestic and EU assumptions of GDP/VA growth (EU consistent data are available for >2010). District heating demand is based on studies of individual space heating.

The models applied are ENPEP and Message.

The ENPEP Balance module is a Simulation model using a market share approach and lag parameters. The module was particularly useful in the period of economic transition, but is considered a 'myopic' approach, since it is based on a year-by-year simulation, the electricity load distribution is the same for the base and subsequent years, and the scale of energy conversion node is limited. With the ENPEP WASP model instead the simulation for electric system is very flexible, but the model's use is difficult in an open electricity market.

The Message model has been applied since 2005 for SO2, NOx, and PM projections, studies for individual companies, ETS and for the selection of abatement technologies. It is a linear programming, least cost approach. Its objective is to find the minimum of an Objective Function given defined constrains (such as emission quotas, energy export/import constrains, RES availability and required share, etc.)

Its key advantages include: its flexibility, no limitation on the scale, the possibility of using load curve for different demand (electricity, district heat, etc.), the possibility to model

storage of energy, and the possibility to include different constraint implementation, emission quotas, primary energy supply limitation, investment limitation, and ETS simulation.

Problems with the GHG scenario preparation include the prediction of GDP/VA growth rates. The VA growth rate is difficult to estimate in a country with an economy in transformation. The latest GDP data are higher than EU estimates. It is also difficult to identify which industrial branches will be more attractive to future foreign investments.

In order to overcome these problems, several scenario should be developed (high, middle and low), taking into consideration the business plan of large energy sub-sectors (eg gas and electric utilities, metallurgy, refinery etc.). The comparison of GDP and VA prediction with the proposal of CO_2 quotas by individual market player or sectors should also be taken into account.

**

Interactive parallel sessions

Session 1 - GHG modeling in the energy and industry sector

Overview of project results: power sector – *Jan Duerinck, VITO*
JD introduced the issue of emission projections in the power sector. He noted that an ideal '**best' model** should provide accurate GHG projections avoiding rebound effects, be consistent with the inventory, and be a policy support tool to quantify the effects CCPMs and domestic PAMs and to analyze potentials and cost efficiency of new PAMs.

A good model should take into account the evolution of electricity demand, rigidities in production capacities, investment decisions in different technologies, the impact of fuel prices, the growth potential of RES and CHP, ETS and CO_2 tax implications, and the liberalization of the electricity market.

The preferred model for the power sector was considered the optimization model because it can deliver as detailed information as possible. The cost minimization approach reflects real market behavior and the model is the best suited for the evaluation of PAMs. Optimization models are currently used by 14 MS.

PAMs to be considered for the electricity production are the EU ETS (including the Linking Directive), the CHP Directive and the RES Directive, but not all MS currently report on all of them. It was observed that MS face problems in evaluating EU-ETS and CHP directive, while fewer problems are usually encountered in evaluating the RES directive.

PAMs related to electricity consumption are the Directive on the promotion of end-use efficiency and energy services, and the Energy Labeling of Domestic Appliances.

Data on emission projections from energy consumption in the EU 15 show an upward trend, although the share of electricity per GDP is decreasing. In the EU 12, projected emissions are also increasing, and the electricity/GDP ratio is slightly increasing. Net electricity production is also increasing both in the EU15 and EU12. The electricity consumption/production ratio is almost constant in the EU15, and slightly rising in the EU 12. Projections on CO_2 emissions per unit electricity are decreasing in the EU15, but rising in the EU12. In general, it was noted that electricity consumption is still increasing in the EU. Some decoupling is taking place in EU-15 projections, but not in EU-12. Electricity production is almost consistent with demand.

Finally, JD stressed that optimization models are preferable for power sector projections and that electricity demand is a key variable – a bottom-up approach from other sectors or econometric methodology would be helpful to gather data on this. He also highlighted the challenges related to data availability and the issue of electricity imports.

Overview of project results: industry sector – *Jan Duerinck, VITO*
JD introduced the issue of emission projections in the industry sector. He noted than an ideal '**best' model** for the industry sector should provide accurate GHG projections avoiding rebound effects, be consistent with the inventory, and be a policy support tool to quantify the effects CCPMs and domestic PAMs and to analyze potentials and cost efficiency of new PAMs.

An industry model should include activity projection at the proper aggregation level, autonomous energy-efficiency improvement, fuel choice, CHP heat production and accounting, end-of pipe techniques for N_2O and new technologies.

The best suited model for industry projections was thought to be an optimization model integrated into the power sector. Such a model was considered sufficiently detailed and able to allow the evaluation/integration of PAMs. In addition, cost minimization was considered to reflect real market behavior.

PAMs to be considered by industry should be the EU-ETS, the Energy Efficiency directive and the JI/CDM linking directive. Only a few MS currently report on all these PAMs.

It was observed that the industry sector is very heterogeneous and difficult to know, and local circumstances play an important role. Activities are usually expressed as output (turnover or physical quantities) or value added. There is a very high concentration of energy intensive activities in a small number of installations. The output is large and value added from energy intensive activities is low (i.e. there is a weak relationship with macro-economic parameters). It was also noted that industry representatives express shareholders expectations, and that production figures are often considered as confidential. An overview of projections data was provided. In the EU 15 CO_2 and NO_2 emissions from the industry sector are both decreasing (especially the latter), in the EU12 they are slightly increasing.

As a conclusive remark, JD stressed that optimization models integrated in the power sector are the preferred option, and that activity scenarios are needed in the modeling exercise. He also raised the issue of challenges related to data availability, evaluation of ETS, CHP accounting problems and the development of activity scenarios.

Session 2 - GHG modeling in the transport, households and tertiary sector

Overview of project results: residential and tertiary sector – *Kristien Aernouts, VITO*
KA presented an overview of project results in the households and tertiary sector, with the aim to share experiences, identify areas of improvements of existing models and discuss suggested best approaches.

It was noted than an ideal '**best' model** for households and the tertiary sector should provide accurate, close to reality GHG projections, be consistent with the inventory, and be a policy support tool to quantify the effects CCPMs and domestic PAMs, and to analyze the potential and the cost efficiency of new PAMs

A model should:

Include the evolution of needs for housing and service buildings, explore the reduction potential of various measures, provide long term scenarios (especially for households), take into account rebound effects and the effect of changing energy prices, and take into account climate change.

After analyzing the requirements of a number of models, it was concluded that the **optimization model** should be preferred for the households and tertiary sector, mainly for its capability to quantify measures (the model is sufficiently detailed) and to look at a long term horizon (10-30 years). Some problems though may arise from data availability, especially for the tertiary sector. Currently a number of MS use optimization models (e.g. IT, SE, FI, ES, LV and CZ).

The study also analyzed how **CCPMs** (namely the Directive on energy performance in buildings) are taken into considerations. Many countries declare to have integrated the Energy performance Directive, but in some cases using a wrong model.

KA provided an overview of the **projections reported under the MM** for the residential sector. The trend for the EU15 is slightly decreasing, with countries like PT increasing (faster than current trend), and SE and UK decreasing (SE in line with historical trend, UK faster). In the EU 12 the trend is more or less stable with some countries like RO increasing fast.

EU 15 emission projections in the tertiary sector are slightly increasing. PT is rising fast, in line with its current trend. In DE and AT, there is a mismatch with inventory data, maybe

Assess and improve methodologies used for GHG Projections
Annex B

due to allocation problems. In EU 12, the trend is also slightly increasing, though less than in EU15.

It was noted that in many countries CO_2 emission per capita are expected to be higher in 2010 than in 2005. It would be useful if this aspect were described in the reporting.

As conclusive remarks, it was recommended that correspondence between inventories and projections be a major goal.

For the residential sector the optimization model was recommended – making estimations of demography (including households' evolution); input data should include energy and technology process and building stock characteristics.

The optimization model was also suggested for the tertiary sector. Data on demand for services (based on demography and economic growth), energy and technology prices, and building stock characteristics would be needed (although, especially for the latter, data availability can be an issue).

KA finally asked the participants how and why they chose their particular model, what level of detail of building stock they would need to calculate effects of measures, how demand for services is dealt with, and how rebound effects are taken into consideration.

TVD commented that optimization model is more appropriate for rational behavior and market response, but not for households.

KA noted that the observation on rational behavior is correct; nevertheless, the optimization model has the advantage to be appropriate for long term analysis (especially given that the residential sector is characterized by long term investments). Housing demand should be exogenous.

One participant commented that a more engineering-focused, bottom-up approach could also be suitable, as it would have the right level of detail.

It was noted that France has relatively high residential emission. This, it was observed, could be due to the fact that in France more than 40% of heating is based on electricity. There is, however, a progressive switch to fossil fuels in new buildings.

KA observed that in the optimization model data availability may be a problem.

AH added that additional survey were applied in DE (e.g. on electricity use) for reporting and projections. It is important to collect additional data in key areas and understand when data will be collected next to calibrate the model in light of the statistics available.

One of the participants agreed that statistics are needed, and that the construction sector should also be aware of where the market is going.

AH suggested to develop pragmatic approaches. For example, in DE data collection involved asking chimney cleaners for their support because they used to have access to all houses and could provide data on heating used and other parameters. At the end, they were able to provide a good dataset.

It was also suggested that another possibility to collect data on households would be to make labels on insulation mandatory when a house is sold – this would contain useful information

<div align="center">***</div>

Overview of project results: transport sector – *Kristien Aernouts, VITO*
KA presented an overview of project results in the transport sector, with the aim to share experiences, identify areas of improvements of existing models and discuss suggested best approaches.

It was noted than an ideal '**best' model** should provide accurate and close to reality GHG projections, be consistent with the inventory, and be a policy support tool to quantify the effects CCPS and domestic PAMs and to analyze the potential and cost efficiency of new PAMs

A good transport model should take the following into consideration: the increased flexibility of transport system over time (i.e. in 15-30 modal shifts, new technologies and structural changes can happen); global mobility determinants (demographic, economic, sociologic and urban characteristics of MS), transport equipment and use, and related energy consumption and GHG emissions. The models should also be able to understand the driving forces and possible modal shifts of passengers and freight transport. In addition, details on equipment, determinants for new equipment and fuel choice, technological improvements (especially energy efficiency) and the penetration of new technologies should be taken into account.

The ideal model should be able to provide a combination of good mobility and modal shift scenario, technological details, realistic fuel choices, and the possibility to include and evaluate price effects.

It was also highlighted that the DE transport model is a good example of a model combining the advantages of simulation with the inclusion of technical information.

PAMs to be considered in the projections should be the ACEA agreement (although not a real CCPM), and the biofuels directive.

KA also presented an overview of emission projections in the EU MS. In the EU 15 emissions are slightly increasing. In Spain, there is a mismatch with inventory data, but new projections have been released recently. In Austria, there are also divergences that could

be due to fuel tourism. In the EU 12, emissions are increasing more rapidly than in the EU15. In HU and CZ, projected trends are lower than inventory data

Experiences from MS projections reveal that recent mobility statistics are in some cases of poor quality and that data availability is scarce. There are some inconsistencies between MS figures and EUROSTAT historical data. In addition, projections can be complicated by fuel tourism. Finally, there is limited reporting of mobility assumptions, and MS adopt different views of GDP relationships.

Finally, it is recommended that a closer correspondence with inventory data is sought. The most suitable model for transport is considered the **simulation** type of model, which provides a more detailed technological representation, with input on mobility and modal shift scenario, high technological resolution, realistic fuel technology and evaluation of price/tax effects.

Key issues for discussion are data availability (and its implication for the choice of a particular model), the way mobility scenarios are developed, the need for high technological resolution and the implications of fuel tourism.

With regard to the issue of fuel tourism, it was noted that the definition should be extended to cover all fuel sold to non-residents, ie not only tourists but also trucks.

Also, it was observed that, given the increase of international transport, in some cases it is unclear what the effect of fuel tourism is and what the result of transport flows is. Information on traffic flows is important especially for countries with a lot of transit transport.

For instance, this was seen as a problem in Slovenia, where a lot of transit transport takes place and is expected to increase with the accession of new countries – leading to greater uncertainties. It is difficult to estimate the amount of fuel used by trucks and which assumptions should be made (e.g. on vehicle types, EUROV or IV, etc).

Transit transfer is difficult to estimate in Luxembourg too, and different assumptions are made on traffic flows. The participants thought that it would be helpful to have access to EU data on traffic flows.

KA observed that the EU data are only historic ones.

AH also noted that data sets depend on countries, and that it is difficult to collect detailed data, for examples on the length of travels etc.

Ireland is also affected by fuel tourism, since the fuel is cheaper than in the UK. AEA made a study on this for BERR at the local authorities' level.

As for biomass fleet, one participant observed that biomass depends on national and EU targets, and on changes in countries that produce their own biofuels and others that buy it.

<p style="text-align:center">***</p>

Wrapping-up, conclusions and general discussion

Session1

The key conclusions of the discussion at panel 1 (power and industry sector) were presented by Jason Anderson of IEEP.

For the **power sector**, the advantages of the optimization models were highlighted. Among the key difficulties that emerged is that sometimes it can be particularly difficult to get heat demand for CHP. Also, as the ETS is a European system some modeling harmonization might make sense. It was also stressed that it is important to import good numbers on activity data.

In countries that do not use optimization model, it was pointed out, the reasons for choosing a model are often historical, and reflect the need to accommodate inputs from and interests of specific ministries, etc. MS with optimization models should continue to improve their methodology. In other countries, even where it is not possible to change models, approaches can converge around best practices on essential elements.

It was noted that optimization models deal with total costs, but partial decisions can be made (e.g. on the choice against CHP as lowest total cost in order to minimize electricity cost only). Also, it was pointed out that perfect forecasts do not necessarily reflect reality. While there are issues in the short term, over the long term optimization modeling (with suitable constraints) is considered the best approach, and is useful in an evaluative sense (with some normative power).

Some issues also remain on the comparison of MS projections. Figures on electricity consumption per GDP are still very divergent. It was also noted that it would be useful to have PRIMES available to MS for comparison.

As for industry projections, most countries use engineering models, because of their pragmatic approach. Getting data and technology options is considered difficult.

The energy in industry sector can be modeled similarly to the power sector – having a similar approach will provide advantages.

Non-CO_2 emissions can be quite easily integrated into optimization models.

Uncertainty about activity data remain. This could be tackled in combination with another model – e.g. at the European level for energy-intensive industry in particular.

Session 2

The key conclusions of the discussion at panel 2 (households, tertiary and transport) were presented by Samuela Bassi (SB) of IEEP.
The correspondence with the inventory was highlighted as a key issue.

The optimization model was seen as the best model for households projections, as it allows the estimation of demographic issues (especially the estimation of housing evolution), and it takes the energy and technology process and the building stock characteristics into account.

The optimization model was also recommended for the tertiary sector because it takes into account the demand for service activities (on the basis of demographic data and economic growth), the energy and technology process and the building stock characteristics (though, for the latter, data availability can be an issue).

In the residential and tertiary sector a number of needs and concerns were identified, namely:
- Data availability: for the residential sector detailed data are needed – these can be obtained in different ways, e.g. through certificates, chimney cleaners etc. For the service sector, most MS use macroeconomic data.
- Optimization models assume rational behavior. Although the residential and tertiary sectors are not characterized by rational behavior (which is at the base of the optimization models), optimization was the preferred option because it allows cost evaluations of PAMs, while the rational behavior aspect was considered to be of limited influence in the overall calculation due to long term thinking
- Regular updates are needed – institutional arrangements would be useful.

For the transport sector, a simulation type of model with a more detailed technological representation was recommended. It should include input on mobility and modal shift scenarios, high technological resolution, realistic fuel technology and evaluation of price / tax effects. The German Astra model was considered a good example. It was also noted that the integration of different models is needed (with input on mobility from outside the model), and that the fuel tourism issue is still not resolved. In this regard a methodology should be developed, (covering definitions, vehicle fleet, influence enlargement, domestic/foreign traffic flows etc).

Final discussion and remarks
Asked about the optimization of total costs for CHP, AH noted that in some cases this is not possible in practice. It is difficult to aggregate data at the national level, since local realities are very different.

One participant also highlighted that the relative price of fuels in different countries affects fuel tourism, and that two transport models should be developed, one for resident and one for non-resident traffic flows.

Another participant observed that the presentations of different models made at the meeting were interesting, but suggestions on further concrete steps to improve MS projections were missing, and asked what the next steps of the projects would be.

KS clarified that, given the diversity of the attendees, the knowledge level varied and hence the discussion was relatively generic in order to involve all. She pointed out that the team is working on the next steps and the final workshop will present the final results.

JA added that one goal of the workshop was to share ideas and collect opinions that can be reflected in the final report, hence at this stage the projects does not mean to be prescriptive. Further information will be exchanged in the future, and more messages and lessons will be communicated. Recommendation will be officially given by the European Commission.

As for the upcoming March deadline, EK clarified that everything will remain the same for next year. This project, however, could help clarify certain issues or parameters that had been unclear.

AH mentioned that one idea could be to develop voluntary guidance on the methodologies used for projections, and to provide some good practice examples. More consistency across MS will be welcomed.

One participant expressed support for the use of optimization models because they utilize economic information and other technical details which allow cost assessment of PAMs. That is considered an important issue.

KS provided a reminder that no model is perfect, and that any suggested option comes with some drawbacks. In this regard, feedback from MS is very useful. As mentioned in earlier presentations, it is important to keep in mind that who uses the model is as important as the model.

One participant pointed out that subcontracting modeling can be risky for accurate long term projections, as consultant may change over time and there can be lack of consistency in the model used by different subcontractors.

Asked whether the project will look at harmonization of national projections with the Primes approach, EK clarified that this in not an objective of the study. Since it is not clear what the role of Primes will be in the future, it is advisable not to get chained to that model. One of the objectives of the project is to compare national projections with other models in order to understand how data can be aggregated into EU-wide estimates.

AH clarified that data sources for the project included official information from MS written national communications and MM, information obtained through country visits as part of another project led by Oeko, international journals and historic overviews. In some cases it was difficult to get information on actual developments as MS work on projections is

ongoing. AH also mentioned some recent publication by DG Tren with new Primes results, that can be useful for MS.

EK concluded by reminding that MS contribution will be very welcome. It will be important for the EC to develop more guidance and information useful for MS. Any ideas on the subject will also be appreciated. The work on this project will be combined with another project on ex-post evaluation to get useful results.

The full text of the presentations can be found at http://wwwb.vito.be/ghgprojection/

C. PARTICIPANT LIST – 26 and 27 May 2008

Surname	Name	Organization	Member State
Aernouts	Kristien	VITO	
Anderson	Jason	Institute for European Environmental Policy (IEEP)	
Baetens	Katrijn	VITO	
Balajka	Jiri	Slovak Hydrometeorological Institute	Slovakia
Balkelyte	Lina	AAPC	Lithuania
Bassi	Samuela	Institute for European Environmental Policy (IEEP)	
Beheydt	Daan	VITO	
Beniusis	Ricardas	Lithuanian State Forest Survey Service	Lithuania
Borge	Rafael	Technical University of Madrid	Spain
Cabal	Helena	CIEMAT	Spain
Cesen	Matjaz	Jozef Stefan Institute	Slovenia
Cotter	Eimear	EPA	Ireland
Cristofaro	Dania	European Commission, DG ENV	
De Brabanter	Eric	Ministère de l'Environnement	Luxembourg
De Cara	Stephane	INRA	France
Deaconu	Sorin	National Environmental Protection Agency	Romania
Dejean	Francois	European Environment Agency (EEA)	
Dramais	Frederic	ULB - EcoMod	Belgium
Duerinck	Jan	VITO	
Fabrellas Rodriguez	Begoña	Spanish Bureau of Climate Change	Spain
Fuentes Merino	Maria	European Commission	
Gavrilova	Olga	Tallinn University of Technology	Estonia
Gay	Stephan Hubertus	European Commission, JRC-IPTS	
Harfoot	Michael	AEA Energy and Environment	
Heeren	Katrin	Federal Environment Agency	Germany
Herold	Anke	OEKO-Institut	
Hoffmann	Bastian	European Institute for Energy Research, KIT	France
Hussey	George	Department of Environment Heritage Local Government	Ireland
Hyde	Bernard	Environmental Protection Agency	Ireland
Juillard	Marianne	Ministry for ecology, energy, sustainable development and spatial planning	France
Kargulewicz	Iwona	Institute of Environmental Protection	Poland
Kitou	Erasmia	European Commission, DG ENV	
Kudrenickis	Ivars	Institute of Physical Energetics	Latvia

Surname	Name	Organization	Member State
Labriet	Maryse	CIEMAT	Spain
Lagerquist	Malin	Swedish Energy Agency	Sweden
Lambert	Catherine	Brussels Environment	Belgium
Lechón	Yolanda	CIEMAT	Spain
Lenfant	Thierry	MET-SG	Belgium
Lenkaitis	Romas	AAPC	Lithuania
Majlathova	Ludmila	European Commission, DG ENV	
Martino	Angelo	TRT Trasporti e Territorio	Italy
Meyer	Regis	French Ministry of Ecology	France
Mohora	Cristina	European Commission, DG TREN	
Moller	Ulvi-Karmen	Ministry of Environment	Estonia
Muik	Barbara	Umweltbundesamt Austria	Austria
Olecka	Anna	Institute of Environmental Protection	Poland
Perälä	Paula	Statistics Finland	Finland
Poinelli	Mauro	European Commission	
Rasmussen	Erik	Ministry of Climate and Energy	Denmark
Renders	Nele	VITO	Belgium
Schade	Wolfgang	ISI	Germany
Schoeters	Karla	VITO	
Sempos	Ioannis	National Technical University of Athens	Greece
Siska	Bernard	Slovak University of Agriculture in Nitra	Slovakia
Slentoe	Erik	National Environmental Research Institute	Denmark
Streimikiene	Dalia	Lithuanian Energy Institute	Lithuania
Tervo	Pekka	Ministry of Employment and the Economy	Finland
van Dril	Ton	ECN Policy Studies	Netherlands
Van Regemorter	Denise	CES KULeuven	
Varsanyi	Kornel	Ministry of Environment and Water	Hungary
Vassallo	Saviour	Malta Environment & Planning Authority	Malta
Veroustraete	Frank	VITO	

D. EVALUATION – 26 and 27 May 2008

Total replies: 19

Scale	Strongly Disagree				Strongly Agree	
	1	2	3	4	5	average
1. The workshop was timely and the subject important	0%	0%	16%	47%	37%	**4.2**
2. The speakers were appropriate and knowledgeable	0%	0%	16%	53%	32%	**4.2**
3. The speeches/discussion were relevant to the most important aspects of the subjects at hand	0%	0%	26%	42%	32%	**4.0**
4. I will apply knowledge that I have gained from this workshop.	5%	5%	32%	37%	21%	**3.6**
5. Overall, I am satisfied with the workshop	0%	5%	16%	53%	26%	**4.0**

6. The technical level of the presentations (indicate one):

	Number resp.	%
❑ Assumed too much knowledge	2	**11%**
❑ Was about right	15	**83%**
❑ Assumed to little knowledge	1	**6%**
❑ No opinion	0	**0%**

7. Has the workshop been helpful to you?

	Number resp.	%
❑ Yes	18	**95%**
❑ No	1	**5%**

Reason for **Yes**
- To integrate sensible recommendation into ongoing and future model-developing.
- Assess the system in my country and propose changes if needed.
- Informing my colleague involved in the projections for Germany on results in order to improve our projections.
- Enhance the models used in Slovenia in a way that will better address the ideal model.
- I have now some questions to our national modelers, with a view to important requirements.
- Think about targets in forecasts.
- I will review agriculture slides if they are suitable for my country and transmit to my colleagues on other states' models.

- ECN example

- Studying more in deep the different models I've seen in the presentations in case they may be useful for our tasks. Thinking of the conclusions regarding recommendations and other important characteristics.

- At the moment, we are trying to develop a "national system" to estimate GHG emissions in a coherent and comprehensive way. The things learned in this workshop will be very useful in selecting the methodology and tools best suited.

- To use modeling in other sectors as energy.

- New ideas for approaches to modeling.

- I will consider this information in future work for UK projections and in our ex-post evaluation of ECCP.

- For orienting future work / reporting.

Reason for **No**
- Too many issues hardly touched upon. More dedicated and customized sessions needed.

8. What motivated you to come for this workshop (multiple choice is possible)?

(multiple choice - % do not add up)	Number resp.	%
Keeping aware of possible upcoming changes to EU requirements	8	**42%**
Desire to compare notes with colleagues working elsewhere	10	**53%**
Interest in deepening knowledge on technical issues	11	**58%**
Keeping track of the issue for my department/	9	**47%**
Influence possible Commission's future requirements	3	**16%**
Asked to make a presentation	2	**11%**
Others	2	**11%**

Others:
- Sent by SHMU

- Grabbing ideas on how to improve national projections

9. The logistical aspects (invitations, directions, venue, meals etc) were:

	Number resp.	%
Poor	2	**22%**
Adequate	4	**21%**
Good	7	**37%**
Excellent	6	**32%**

10. Any other comments:
- A deep and detailed analysis of a "best" implementation of the suggested optimization models would be rather helpful. By detailed meaning description of any restriction, directive simulation, etc., how this directive impacts projections, how this directive was simulated in the optimization model.

- Missed information on inventories and definitions so preparation was not possible.

- More about organization scheme to do projection. Role political level/administration/academic/consultant.

- Logistical arrangements were excellent but the venue was very uncomfortable.

- "Poor" for logistical aspects because of the venue. Rest was OK.

- I was expecting more practical/concrete proposals. For the future, I would recommend the writing of a guidebook allowing more data consistency among Member States.

- Thanks!

2 ANNEX B–2: Workshop organized on 13 and 14 October 2008

<div style="background-color:green; color:white; text-align:center; font-weight:bold;">Training session – 13 October 2008</div>

A. AGENDA

This training is organized as part of DG Environment's 'Assessment of GHG methodologies for projections' project in order to provide MS representatives and emission modelers with the necessary basic understanding of sectoral GHG projections methodologies, assumptions and requirements. The training will also provide useful technical information on the TIER methodologies that were developed under this project, will help MS improve their projections, and will highlight common problems and inconsistencies with a view to increasing coherence across the EU. The training is targeted in particular to MS that have limited or no experience with methodologies applicable to the targeted sectors, namely energy, households and services, transport, waste and agriculture.

Introduction

9.30   Registration and coffee
10.00   Overview and objectives of the training – *Erasmia Kitou, European Commission, DG Environment*
10.05   Introduction to the training sessions: organization and aims of the day – *VITO/IEEP*

Practical session

In the morning the focus will be on the different end-use sectors (industry, residential, services and transport) together with waste and agriculture. Presentations on draft preliminary guidelines to calculate GHG emissions will be given, followed by discussion. The data generated for these sectors will in practice be used to feed into an energy model. A simulation exercise with such a model will take place in the afternoon.

10.15   Overview of TIER methodologies used with a focus on the lower TIER methods and the data collection (activity data, interpretation of historical figures, etc) *Jan Duerinck/Nele Renders, VITO*
(1) Industry
(2) Residential/Services
(3) Transport
(4) Waste and agriculture
11.00 Coffee break
11.15   Continue overview of TIER methodologies
13.00   Lunch break
14.00   Simulation exercise: How does a model like Markal/Times work? *Wouter Nijs/ Jan Duerinck, VITO*
16.00   Coffee break

Conclusions

16.15   Wrapping-up, conclusions and general discussion - With feedback from participants on usability of TIER methodologies

17.00   End of training session

Location: Federal Public Service – Environment, Eurostation Building, 40 Victor Horta Place, Brussels, Belgium

Attendance: 27 representatives from 21 MS + 9 team members (VITO, OEKO and IEEP) + Erasmia Kitou (DG Env)

B. MINUTES

Practical session

Overview of TIER methodologies (from 10.15 to 13.00)

1 - Industry methodologies

JD from VITO presented an overview of tier 1 and tier 2 methodologies for the industry sector.

Asked by CZ to clarify what meant by 'other industries', JD replied that this category includes labor intensive activities, such as textile, metal processing, cars, electrical equipment, woods, etc

SK noted that a higher level of detail in the inventory, and a clear split of emissions across sectors (energy intensive and process emissions) will provide more information for the projections. Also he observed that all countries should use the same definition of CHP, as it can be unclear whether to allocate some of these emissions to the industry or energy sector. A clearer definition from IPCC as to what should be considered 'energy' would be needed. Additional detail should be required on energy intensive industry, e.g. clarifying if emissions derive from calcination, iron technology, cement production, lime etc. JD noted that deciding how to allocate CHP emissions is difficult, as many MS use different approaches. The issue deserves further attention. AT noted that it will not be easy to change any reporting under IPCC. Nevertheless she stressed the importance of having good coordination between inventory and projection teams.

Asked by EK about the advantages of tier 2 over tier 1 methodologies, and the main drivers of tier 1 results, JD explained that the advantage of tier 2 is mainly related to policy evaluation, rather than baseline projections. KS added that it is crucial to have the activity data right to ensure reliable results.

EK also observed that some sectors may develop in similar ways in different countries or cluster of countries, and noted that it could be possible for some MS to base some activity assumptions on neighbor countries' trends and assumptions. JD agreed and noted how

Assess and improve methodologies used for GHG Projections

Annex B

some trends across EU15 and EU12 are recognizable, e.g. certain sectors are generally stabilizing in the EU15 while they are more competitive and growing in NMS.

AH however argued that in some areas it can be dangerous to simply adopt assumptions made by others. If certain subsectors are not well know, it may be advisable to rather make use of consultation with industries associations and ministries.

PTB noted that however assumptions made through consultations can also be subjected to political influence, e.g. the industry sector is usually biased towards reporting growth rather than losses. AH commented that this is not necessarily a problem, as in reality emissions have been growing even more than reported economic growth.

2 - Residential/Services methodologies
NR from VITO presented an overview of tier 1 and 2 methodology for the residential and service sector.

The NL noted that so far projections have taken into account mainly heating processes, while now cooling demand is also becoming increasingly significant, and asked how this was taken into account in the guidelines. NR explained that cooling was taken into account through linear corrections.

ES observed that their national projections for the electricity sector take into account cooling, while fuel consumption takes into account heating degree days.

Asked by SK whether heating could be taken into consideration also for less energy intensive industry, JD confirmed that this is possible.

Regarding the steep rise of Hungary's projected emissions estimated by the team, HU argued that the increase was mainly based on rise in GDP. However, noted HU, an increase in GDP could also stimulate improved technology and insulations, hence the estimate was too pessimistic, and should be rather considered as a baseline scenario. The cooling demand though was considered likely to rise with GDP. JD confirmed that tier 1 methodology should be mainly considered as WOM scenarios, but that GDP is however positively related to emissions (e.g. as it can imply larger houses). HU noted that the country expects to have large potential to decrease emission from the residential sector. An optimization model is under construction. Their WM scenario is more optimistic.

Asked by SI about the correlation between GDP growth and increase of dwelling size (m^2), JD noted that there is no direct observation of dwelling size, but only of energy consumption. Historical data show that there is a positive correlation – although not strong - between GDP and energy consumption from households (on average 0.5 in EU).

Asked about how energy prices affect the outcome when analyzing policies, JD noted that in the residential sector most policies are related to regulation of insulation, hence not

necessarily related to energy prices. NL however noted that prices can be an issue when considering white certificates.

3 - Transport methodologies

JD presented an overview of methodologies in the transport sector. He noted that, although fuel is relatively cheap in Poland, the country is importing fuel due to its expanding international freight activities. PL also noted that some fuel is imported by neighboring countries, like Ukraine, and JD observed that the assumptions made imply that the EU is a close system, while interactions with neighbor countries make reality far more complex.

PTB observed that there is a limit to growth of transport emissions, as the number of cars cannot increase indefinitely. JD commented that freight transport is related to economic growth, and that there is a reduction in the number of passengers, as many families have more than one car. But some stabilization in the number of vehicles is observed. There is a low elasticity between transport of passengers and economic growth. Congestion issues may also play a role.

ES asked whether energy efficiency is the most important mean to reduce emissions from the transport sector, and why there are such substantial differences between Belgium and Germany data. JD mentioned potential reduction thanks to the RES Directive and biofuels. Cars renewal and trends in improvement expected to be stable in the next years. Differences in trends across MS are mainly due to efficiency of whole car park.

Questioned by DE regarding the impact of biofuels, JD noted that the impact of their production falls in the energy sector. AH noted that it will be important to have consistent approaches throughout the whole biofuel chain, including in the agriculture sector.

ES asked if light duty vehicles were included in freight transportation projections estimated by the team. JD replied that they were not considered, however more detail is needed in projection models.

ES also noted that the most important PAM in transport is modal shift, and asked how this was included in the model. JD clarified that this was not included in tier 1 methodologies. AH noted that, from Oeko's experience on a EEA paper on modal shift, it is difficult to model transport demand, more complex than a tier 1 approach, as a demand model is needed.

Regarding international transport, SI was surprised that, in a graph representing fuel imports and exports, SI did not have a positive bar – ie net export of fuel. He noted that, since SI joined the EU, about 10 per cent fuel consumption in the country is due to transit/foreign consumption. Given that the price of fuel is cheaper than in AT, it is possible that part of AT exports should instead be allocated to SI. He then asked the Commission whether there is any plan to address fuel tourism. EK observed that fuel tourism is addressed in the IPCC guidelines and it is not likely to change. Targets at the moment do

not take into account fuel tourism, and currently there is no EU project aiming to assess fuel tourism.

4 - Waste and agriculture methodologies
NR presented an overview of methodologies in the waste and agriculture sectors.

ES asked if agriculture projections took into account methods to calculate emissions from land use change. KS clarified that such methods were not included. She also mentioned that no guidelines were developed for the LULUCF sector.

Asked by CZ if the methodology for agriculture included a method to calculate N_2O from soil, NR explained that only a spreadsheet calculation was used, on the basis of the IPCC guidelines.

Simulation exercise: (from 14.00 to 16.00)
WN and JD explained how a cost-optimization model like Markal/Times works to calculate emission projections in the energy sector.

WN started by providing a general presentation of the model.
AT asked whether it will be possible to include emission ceilings in the model to find least cost options. WN replied that it is possible. However it can sometimes be difficult to translate policies into a model, while in other cases it is more straightforward. For instance green certificates can be included as a price value, and standards and emission ceilings can also be included easily.

JD provided some insights on linear programming.

SK noted that the model can be useful also to demonstrate that certain emission quotas cannot be economically achieved

Asked by PTB about the number of variables allowed by the model, JD explained that in theory there are no limitations to variables. The models also allow to aggregate some installations if they have similar characteristics.

Regarding other technical aspects of the model, JD clarified that the shadow price results from the difference between the total energy costs and the cost obtained by changing one constraint in the model – e.g. additional tax on CO_2. He also explained that optimization in the model is always over cost.

It was asked whether optimization models can be useful also for other sectors, beside energy, JD noted that the model is difficult to apply to industry and transport. The model is particularly suited to be used as a policy analysis tool, as it tells 'what to do'.

The UK asked how the interaction of policies is taken into account in the model, and how it can be used to determine the best policy mix. WN replied that the way policy are taken into

account depends on how there are implemented by MS (e.g. through standard, taxes etc). To assess what the best policy mix can be, the model can be run with and without measures to make simulations.

EK observed that interactions between policies, such as ETS and RES, can lead to overlapping effects. WN clarified that, in order to quantify the effect of each policy and the overlapping effects, different scenarios can be created, e.g. with GHG policies only vs. scenarios with multiple policies.

Asked by DK as to why the simulation model for PL did not include nuclear energy, WN clarified that this was part of the assumptions, also due to the fact that no nuclear energy is produced in PL at the moment.

Asked by SB about how to take into account energy efficiency, WN explained that the electricity demand is exogenous, hence cannot be modeled. Efficiency policies are exogenous, while technology efficiency can be modeled by changing some parameters – e.g. the life span of installations, which can be substituted at some point in time by more efficient plants etc

The UK asked if autonomous advancements in efficiency are taken into account, if ex-post analysis can be used to check the model results and if the effect of embedded emissions (e.g. from imports and exports) can be assessed. WN replied that autonomous efficiency is aggregate in the model. The model uses a bottom up approach looking at single installations with different characteristics, and efficiency results as an aggregate analysis across all the energy industries. He also agreed that ex-post analysis can be useful to compare results, and noted that often modeled projections are a bit lower than actual emissions. It was added that embedded emissions (e.g. CO_2 emissions from imported goods) can be factored in the model, but these will be exogenous.

WN run a demo to provide an actual exemplification of how the model works.

Asked by ES as to where the data used were taken, WN explained that present data were based on Eurostat database on existing plant, while future data were based on assumptions (e.g. life expectancy of plants). Information on future technologies (e.g. wind farms) was based on Primes and other models.

ES asked if data from 2000 were calibrated for 2005. WN clarified that these were not calibrated, as 2000 was used as base year, but noted that it will be possible to calibrate (e.g. in 2005) by decreasing the degree of freedom for the chosen year.

CZ asked if Markal is primarily an energy model, and what makes it different to Primes, JD confirmed that Markal is an energy model, and that Primes is similar in the power sector. The major difference is that Markal is based on perfect foresight, as it optimizes for the whole period under consideration, and this is why the model requires a discount rate. It provides a rational view for the whole period. Primes instead works period by period, and

has a relatively short view (i.e. 5 years ahead in the future and back in the past). Decisions are less rational than in the Markal model. JD further noted that the Markal model is not used for EU level analysis because of data availability, and that both Primes and Markal can have feed back effects.

Asked by CZ about the availability of the model software, WN explained that a country has to become an ETSAP member to have free access to it. Demo versions are also made available. He noted that each EU country has at least 1 or 2 institutes represented in ETSAP.

AT asked if Markal's perfect foresight takes inflation into account. JD noted that this depends on the unit chosen, and that usually inflation can be used if prices are expressed in the base year. PTB noted that one could either use real prices or actual prices. Using real prices could give a better sense of how the model is doing, and inflation can be added subsequently.

Wrapping-up, conclusions and general discussion

In the concluding discussion, ES commented that the training session had been an interesting exercise. It was noted that a key step in the projection analysis is to find the key data. While tier 1 methodologies are suitable for some sectors, others may require more complex approaches. It is important to identify, in each MS, for what sectors more complex tiers are needed, and where efforts should be focused – e.g. in those sectors that account for most of the emissions. For less relevant sectors tier 1 approaches could be used.

SK observed that the discussion had been very inspiring, and will be useful to fill methodological gaps in SK. Tier 1 are considered doable in SK, while a model like Markal would be difficult to apply due to capacity issues – which often do not allow to collect sufficient up-to-date data.

Regarding actual recommendations for the monitoring mechanism (MM) decision, EK noted that the project highlighted how MS projections are very different, as often different assumptions are used and there is little consistency across MS. She asked what parameters should be controlled at EU level to ensure consistency. She also asked whether it would be advisable to introduce check and controls in the MM decision, to make sure projections are correct, and also to require explanations for future trends, ie, what was the thinking behind certain assumptions. It should be clarified that the projections starting point should be consistent with actual emissions.

DE suggested that it will be important to use certain common assumptions across MS – e.g. on the future costs of wind turbines, oil price etc. It will be useful to have defaults value at EU level, since often discussion at national level to agree on issues such as fuel prices can be difficult and time consuming.

PTB suggested to use range of cost/values where single figure are not possible. JD agreed that this could be possible for certain aspects, although SI noted this may not always be possible as prices may depend on the starting point.

EK suggested that there could be common guidelines and/or more specific requirements for the agriculture and waste sectors.

ES stressed the importance of increasing collaboration with the inventory teams. He also noted that a link with other air pollutants (streamlining) should also be advisable.

AT noted that optimization models are always put forward as the best option, and asked if this implied that other models should not be used. KS clarified that other good models should be included in the guidelines in the future. EK also noted that the guidelines are meant to be particularly helpful for those MS struggling with specific issues or at the beginning of their projections, while MS with more solid methodologies can keep using their own methods, even if not portrayed in the guidelines.

AH observed that an institutional framework (as for the inventory) would be needed for projections, and stressed that several issues (e.g. biofuels and biomass) should be discussed in a coherent way across teams/experts dealing with different sectors to ensure a consistent approach across all of them.

EK noted that many MS projections are done for internal reason other than the MM decision, hence they not always fulfill the MM requirements. This implies that some times the info needed is not all included. It will be important to change this behavior and ensure a focused exercise to achieve the monitoring purpose. This will be important to see how well MS/the EU is doing with targets and how goods our policy are. She also clarified that this does not imply that MS should have two types of projections, but national projections should take into account the MM purpose. AT however noted that sometimes national and EU interests driving the projections can be different.

UK looked positively at having a streamlined process and making projections comparable, and considered guidelines a good tool to improve models. He observed that an institutional framework is needed to have more comparable projections. The guidelines should be further elaborated in the future, and MS should learn from each other.

CZ suggested that all countries should use the same model, but most participants disagreed.

Assess and improve methodologies used for GHG Projections

Annex B

C. PARTICIPATION LIST – 13 October 2008

	Surname	Name	Organization	MS
1	Armstrong	Jonathan	IEEP	
2	Balajka	Jiri	Slovak Hydrometeorological Institute	Slovakia
3	Bassi	Samuela	IEEP	
4	Cabal	Helena	CIEMAT	Spain
5	Camilleri	Christopher	MEPA	Malta
6	Česen	Matjaž	Jozef Stefan Institute - Energy Efficiency Centre	Slovenia
7	Cieslinska	Joanna	Institute of Environmental Protection	Poland
8	Dagnet	Yamide	DEFRA	UK
9	Deaconu	Sorin	National Environmental Protection Agency	Romania
10	Dramais	Frederic	EcoMod & ULB	Belgium
11	Duerinck	Jan	VITO	
12	Herold	Anke	Oeko-Institut	
13	Juillard	Marianne	Ministry of Ecology, Energy, Sustainable Developement and Town and Country Planning	France
14	Kargulewicz	Iwona	Institute of Environmental Protection	Poland
15	Kitou	Erasmia	European Commission - DG Environment	
16	Kuhnhenn	Kai	Federal Environment Agency Germany	Germany
17	Kythreotou	Nicoletta	Environment Service - Ministry of Agriculture, Natural Resources and Environment	Cyprus
18	Lagerquist	Malin	Swedish Energy Agency	Sweden
19	Ledene	Liselot	Vlaamse Overheid - LNE Afd. LHRMG	Belgium
20	Leinert	Stephan	EPA	Ireland
21	Lumbreras	Julio	Technical University of Madrid	Spain
22	Möller	Ulvi-Karmen	Ministry of the Environment	Estonia
23	Muik	Barbara	Umweltbundesamt Wien	Austria
24	Nevečeřal	Rostislav	CHMI	Czech Republic
25	Niemi	Heta	Ministry of the Environment	Finland
26	Nijs	Wouter	VITO	
27	Noreika	Simonas	Ministry of Environment	Lithuania
28	Olecka	Anna	Institute of Environmental Protection	Poland
29	Renders	Nele	VITO	
30	Schoeters	Karla	VITO	
31	Sempos	Ioannis	National Technical University of Athens	Greece
32	Slentoe	Erik	National Environmental Research Institute (NERI)	Denmark
33	Sterian	Valentina-Mihaela	National Environmental Protection Agency	Romania

	Surname	Name	Organization	MS
34	Ten Brink	Patrick	IEEP	
35	Varsányi	Kornél	Ministry of Environment and Water	Hungary

D. EVALUATION – 13 October 2008

Total replies: 19

1. The technical level of the training (indicate one):

	Number resp.	%
❑ Assumed too much knowledge	1	**6%**
❑ Was about right	16	**94%**
❑ Assumed to little knowledge	0	**0%**
❑ No opinion	0	**0%**

2. Was the training timely?

	Number resp.	%
Yes	15	**94%**
No	1	**6%**

3. Will it be possible to apply what learned in your country?

	Number resp.	%
Yes	16	**84%**
No	3	**16%**

4. If NO, why not?

	Number resp.	%
Insufficient technical/institutional capacity	1	**33%**
No sufficient data available in my country		**0%**
The suggested recommendations/techniques are unclear	1	**33%**
Other (specify)	1	**33%**

- Other reasons: unclear why optimization model is recommended for projections
- Comment: (the possibility to apply what learned) will have to be explored

5. Overall, has the training been helpful to you?

	Number resp.	%
❑ Yes	18	**95%**
❑ No	1	**5%**

Reason for **Yes**
- Good opportunity to familiarize with preliminary guidelines
- I have just started with projections and it was very interesting to see how it works in different MS
- Insights on Markal/Times model
- I have learned a lot about the methodology

- I had the opportunity to have a global insight of the MS situation at present, to meet other researchers from different institutions and share experiences and knowledge, and to learn more on methodologies and difficulties in the projection of emissions

- It gave me an overview of GHG projections and of the EU level. It pointed out the problems in methodology

- Good overview/review of issues; it put work in context

- Some issues are more important for MS with less experience, some however are important for all MS

- Useful technical clarifications about models

- I have got a better insight on the optimization models and also on the process of making projections

- I found out more info about projections, better understood the notion and what it is regulating (in order to be able to estimate projections)

- Strengths and weaknesses enhanced, good overview of all MS projections, questionable presentation of one country projection in energy/industry sectors as an exercise with no sufficient comparison of assumptions used for modeling

- For comparison of data from MS with data based on models; for identification of problems

- Benchmarking with other MS; the guidelines set was helpful

Reason for **No**
- There should have been more hands on training

6. Any other comments:
- The presentations should be made available in advance or at least before starting the workshop. The topic was new for me (not new to my country though) so I found it really challenging to follow the presentation and take notes at the same time

- Correlated documents (drafts) should have date of the revision on them

- Some results were catered to the Commission and were not that important for MS

- Anke's last talk was very interesting (at workshop)

A. AGENDA

This workshop is organized on behalf of **DG Environment** to inform Member State officials and emission modelers on the findings and recommendations of the project 'Assessing and improving methodologies for GHG projections' undertaken by VITO, Öko-Institut and the Institute for European Environmental Policy, for DG Environment. The event will provide insights on widely used methodologies and MS best practices for GHG projections, complemented by recommendations on data, reporting parameters and assumptions used. The aim is to enhance the understanding of the assumptions and methods to be used in preparing GHG projections, to draw best practices by comparing different approaches and to identify possible ways to improve GHG projections and ensure consistency across the EU.

Introduction

9.00   Registration and coffee
9.30   Overview and objectives of the workshop – *Erasmia Kitou, European Commission, DG Environment*
9.40   Introduction to the workshop – *VITO/IEEP*

Presentation of main findings and recommendations

9.50   Analysis of the MS projections - *Anke Herold, Öko-Institut*
Questions
10.30   ***Coffee break***
10.45   Assessment of MS projections – *Jan Duerinck, VITO*
Questions
12.00   Lunch break

Conclusions

13.00   Recommendations on assumptions and data used for projections: understanding of the assumptions and dataset behind GHG projections and recommendations to improve comparability, consistency and completeness of MS reporting. (~ conclusions training) – *Jan Duerinck, VITO*
13.30   Recommendations on reporting parameters: overview of the purposes of projections parameters, comparison across MS and EU-wide GHG projections and suggested improvements for the planned revision of the Monitoring Mechanism Decision – *Anke Herold, Öko-Institut*
14.00   Discussion
15.00   End of workshop

B. MINUTES

Presentation of main findings and recommendations

Comparison of MS projections with CAPRI projections in the agriculture sector (from 9.50 to 10.30)
AH from Oeko-Institut presented some insights on Capri projections in the agriculture sector carried out for the EU27 MS.

Asked by CZ about the source of fertilizer data, AH explained that these were based on FAO figures. Data also included N_2O from soil and ammonia emissions – balanced across all sectors. All nitrogen inputs in soil were calculated. As the model works at regional/NUTS2 level, it also took into consideration differences across soils, at least at regional level. Capri offers a good level of details as it works not only at national but also at regional level

Asked by DK about the added value of using Capri, AH noted that often MS reporting is not detailed so it is difficult to assess the driving forces of projections, while Capri can help.

PTB asked when aggregate models are more useful and when they can be 'dangerous'/lead to wrong results. AH observed that, while aggregation can be easier in the energy sector as emission factors are similar, in agriculture it is easier to make mistakes. It is important to ensure that aggregate models use higher tiers and are sufficiently detailed, otherwise with simplistic tier 1 calculations it is possible to go far from inventory trends. In the future projections from the non-ETS sector will be important (since there will be no cap). Among these, surely agriculture will play an important role, hence it will be crucial to refine the methodology in this area.

Assessment of MS projections (from 10.45 to 12.00)
JD provided an overview of the quantitative assessment of GHG projections for the first commitment period in the residential, service, energy, transport and industry sectors.

Regarding the Swedish projections, SE noted that the estimated decreasing trend for the residential sector, which was much lower than that estimated by the team, was due to the expected switch from oil heating to district heating, encouraged by energy and CO_2 taxes and grants for connection to district heating.

Asked to comment on its projections for the residential sector, the UK noted that these were optimistic due to the expected implementation of policy and measures of the new UK climate program and of its energy white paper. These includes changes in energy use, a gradual switch from liquid fuels to gas and improved domestic energy efficiency. As the UK is quite behind in energy consumption from the residential sector compared to other MS,

there is real potential to improve quickly. The new Department for Energy and Climate Change (DECC) will revise projections in 2009.

BE asked how uncertainty intervals (used to illustrate the trend of aggregated EU emissions per sector) were built by the study team. JD explained that the intervals were built by comparing 3 projections (including Primes). These are based on a broad assessment and are meant to provide an order of magnitude.

Asked by ES about the difference between 2010 and 2005 trends, JD clarified that for tier 1 these were consistent with the inventory. For the residential and transport sector projections were consistent with historical figures. For Primes, in some sectors figures were quite different.

PTB asked how projections work for the ETS sector. JD noted that National Allocation Plans (NAPs) are binding limits for the EU 27 with the exception that they allow for flexible mechanisms. Hence there is almost no uncertainty on the projections for ETS sectors at aggregate level; the only uncertainty comes from small industries.

BE asked how to deal with uncertainties that would effect all EU countries at the same time, e.g. changes in oil prices or cold winters. JD replied that ranges of years were taken in order to reduce the effect of extreme events. He also noted how global expectations on oil prices have changed in the past years. Part of the effect of e.g. cheap oil will be limited in the ETS sector, as emissions will be limited by the cap. Some limit will also be due to infrastructures, e.g. no new coal plants may be built in the future – but the existing ones could be used at maximum capacity if the oil price is high.

HU asked about the effect of banking and transferring CER's in the following ETS commitment periods. JD commented that additional analysis will need to be done in this area.

Asked about the purpose of the uncertainty estimated, EK clarified that the independent assessment by the project team aimed to help the Commission better understand how confident it should be on the numbers presented by MS. The estimates confirm that MS are in the right path. The project also aimed to raise MS awareness on problematic areas in the methodologies. Common problems were identified and will be communicated for future improvements. Now the Commission is more confident re. figures, how they compare, what is the bigger picture. No other follow ups are envisaged.

PTB noted that in the service sector the interval of uncertainty is relatively small. JD commented that the emissions from the service sector are low, and the period analyzed was short (2005-2010).

PTB also asked what a realistic/acceptable level of uncertainty could be. AH noted that it is difficult to be precise in projections, e.g. it is difficult to predict financial crisis and their impact. For instance fuel price projections have been consistently wrong in the past. EK

commented that uncertainty estimations show where more effort is needed to get activity data, and can raise awareness on what to improve. Unlike inventory, no guidelines have been put forward for projections, and this is something to look at in the future to move towards a clearer picture.

ES highlighted that some research has been done in Spain on uncertainties. He noted that, if it is difficult to manage uncertainty for inventory, it is even more difficult to do this for projections. It is more doable for WOM but difficult for WAM projections.

Asked by NL about the main lessons to be learned by MS, JD noted that the analysis undertaken by the team provides MS with inputs regarding differences with their own analysis in different sectors and in comparison with other MS. No conclusions can be really drawn on the ETS sector due to the fact that trading is not taken into account. MS should not simply compare their results with neighbor countries to understand if their results are correct. AH noted that, although some countries have good analysis, we are far away from good uncertainty analysis, and only few countries estimate uncertainty for their projections. Nevertheless, noted KS, this uncertainty check can raise awareness, and it is interesting to understand why certain projections differ from other approaches. EK also commented that comparing yourself with others is important to see where you stand, why you are different or similar.

DE agreed that it will be useful if all MS carried out uncertainty/sensitivity analysis, but pointed out that it can be difficult to predict shocks (e.g. financial crisis).

UK: agree that a lot of guidance was provided for inventories, while much less was given on projections. He also pointed out that the UK is also trying to do sensitivity analysis to reduce uncertainty, and it will probably be ready next year.

Conclusions

Recommendations on assumptions and data used for projections: (13.00- 13.30)
JD provided an overview of the assumptions and dataset behind GHG projections and recommendations to improve comparability, consistency and completeness of MS reporting, taking into account the training session's conclusions

Recommendations on reporting parameters (13.30 -14.00)
AH provided an overview of the purposes of projections parameters, comparison across MS and EU-wide GHG projections and suggested improvements for the planned revision of the Monitoring Mechanism Decision

Discussion (14.00- 15.00)
PTB noted that tier 1 methods are not necessarily unhelpful, and that in the future WOM scenarios will not exist anymore, but there would rather be only WM and WAM scenarios.

UK asked how common EU default parameters could work. AH observed that a lot of MS are struggling with parameters like fuel prices, and many already use available data from different sources (e.g. EEA). The workshop and project revealed positive feedback from MS to have default common parameters on general assumptions, which will have to be made available in due course. The default parameters that are not needed by some MS can simply be ignored.

Regarding the possible development of guidelines for projections, JD noted that these have not been agreed yet, but had a positive feedback from MS at the workshop. EK added that a possible next step will be for the Commission to come up with a list of parameters. Guidelines for parameters could be produced an updated regularly through committology. This option will have to be explored. As for projection guidelines, added EK, these can be important and useful. The process could be started slowly, and could ideally be included at international level in the future.

UK highlighted that guidelines are needed, although they are aware it is a big task. Quality assurance and control (QA/QC) should be prioritized, e.g. starting from providing good practice examples.

DK observed that many MS tend to stick to methodology they are familiar with, hence if guidelines were to become mandatory this could become a problem. EK though stated that there will be no point on imposing one single model or methodology. Guidelines should provide guidance on how MS should improve their work, not harmonize approaches by forcing a model.

ES agreed with the UK on the need for a EU compendium of best practices on QA/QC and how to do sensitivity analysis in the best way – for both NMS and also EU 15.

The NL considered sensitivity analysis useful but asked if a list of mandatory sensitivities should be expected, and if so what the purpose of sensitivity analysis should be. AH explained that the purpose of it is to get a better understanding of uncertainties. She noted that at the moment only general requirement should be asked, not specific requirement on parameters, as these depend on the method used and on MS approaches. Nevertheless it will be useful to require sensitivity analysis in each sector – and it should be up to MS to pick the most suitable parameters.

EK agreed on the fact that no specific parameter should be required for the sensitivity analysis. She also pointed out that the definition of sensitivity analysis should be made explicit, as some MS may interpret it in different ways. It will be useful to provide some indication of what could be possibly tested.

Asked by DE if the sensitivity analysis should be done in the WM or in the WAM scenario, AH clarified that this should be done in both, as they share many parameters (e.g. GDP).

Erasmia concluded by announcing that the parameters will be changed and requirements made more flexible. The Commission will not ask for one single method to be used, but will aim to rationalize the process and ask MS for more pertinent info. She agreed that it will be useful to start from QA/QC guidance. Through discussions with the EEA and the Topic Centre the EC side of process should be improved.

More direct feed back will be provided to MS. Projection results will be compared with ex-post data. The Commission and MS will also continue working through WGII. The reporting template will be an integral part of the MM decision, and more transparency will be insured. In this regard, it was useful to have feedback from MS.

Assess and improve methodologies used for GHG Projections

Annex B

C. EVALUATION – 14 October 2008

Total replies: 26

Scale	Strongly Disagree				Strongly Agree	
	1	2	3	4	5	average
1. The workshop was timely and the subject important	0%	0%	8%	54%	38%	**4.3**
2. The speakers were appropriate and knowledgeable	0%	0%	15%	46%	38%	**4.2**
5. The speeches/discussion were relevant to the most important aspects of the subjects at hand	0%	0%	23%	65%	12%	**3.9**
6. I will apply knowledge that I have gained from this workshop.	0%	4%	27%	62%	8%	**3.7**
5. Overall, I am satisfied with the workshop	0%	4%	0%	85%	12%	**4.0**

6. The logistical aspects (invitations, directions, venue etc) were:

	Number resp.	%
Poor	0	**0%**
Adequate	3	**12%**
Good	18	**69%**
Excellent	5	**19%**

7. Are you representing a NMS?

	Number resp.	%
❑ Yes	10	**38%**
❑ No	16	**62%**

8. Any other comment
- Go deeper into the analysis and technicalities
- The presentations should be made available before the conference - it makes easier to follow
- Graphs indicating MS data or applications of analysis etc to be better updated

D. LIST OF PARTICIPANTS – 14 October 2008

	Surname	Name	Organization	Member State
1	Bassi	Samuela	IEEP	
2	Cabal	Helena	CIEMAT	Spain
3	Camilleri	Christopher	MEPA	Malta
4	Česen	Matjaž	Jozef Stefan Institute - Energy Efficiency Centre	Slovenia
5	Cieslinska	Joanna	Institute of Environmental Protection	Poland
6	Çubukcu	Yavuz	Permanent Delegation of Turkey to the EU	Turkey
7	Dagnet	Yamide	Defra	UK
8	Deaconu	Sorin	National Environmental Protection Agency	Romania
9	Dejean	Francois	European Environment Agency	
10	Dramais	Frederic	EcoMod & ULB	Belgium
11	Duerinck	Jan	VITO	
12	Falconer	Angela	AEA	UK
13	Herold	Anke	Oeko-Institut	
14	Juillard	Marianne	Ministry of Ecology, Energy, Sustainable Development and Town and Country Planning	France
15	Kargulewicz	Iwona	Institute of Environmental Protection	Poland
16	Kitou	Erasmia	European Commission - DG Environment	
17	Klaassen	Ger	European Commission - DG Environment	
18	Kuhnhenn	Kai	Federal Environment Agency Germany	Germany
19	Kythreotou	Nicoletta	Environment Service - Ministry of Agriculture, Natural Resources and Environment	Cyprus
20	Lagerquist	Malin	Swedish Energy Agency	Sweden
21	Ledene	Liselot	Vlaamse Overheid- LNE Afd. LHRMG	Belgium
22	Leinert	Stephan	EPA	Ireland
23	Luht	Kai	Estonian Environment Information Centre	Estonia
24	Lumbreras	Julio	Technical University of Madrid	Spain
25	Möller	Ulvi-Karmen	Ministry of the Environment	Estonia
26	Muik	Barbara	Umweltbundesamt Wien	Austria
27	Neveceřal	Rostislav	CHMI	Czech Republic
28	Niemi	Heta	Ministry of the Environment	Finland
29	Noreika	Simonas	Ministry of Environment	Lithuania
30	Oikonomou	Vlasis	University of Groningen	Netherlands
31	Olecka	Anna	Institute of Environmental Protection	Poland
32	Oudart	Benedicte	CITEPA	France
33	Pantaleoni	Monica	ISPRA - High Institute for Environmental Protection and Research	Italy

	Surname	Name	Organization	Member State
34	Rakonczay	Zoltàn	European Commission	
35	Rasmussen	Erik	Ministry of Climate and Energy	Denmark
36	Renders	Nele	VITO	
37	Schoeters	Karla	VITO	
38	Sempos	Ioannis	National Technical University of Athens	Greece
39	Skoglund	Kai	Statistics Finland	Finland
40	Slentoe	Erik	National Environmental Research Institute (NERI)	Denmark
41	Sterian	Valentina	National Environmental Protection Agency	Romania
42	Svensson	Ulrika	Swedish Environmental Protection Agency	Sweden
43	Ten Brink	Patrick	IEEP	
44	Tervo	Pekka	Ministry of Employment and the Economy	Finland
45	Van Dril	Ton	ECN	Netherlands
46	Van Steenberghe	Vincent	Federal Public Service for Health, Food Chain Safety and Environment - DG Environment - Climate Change Section	Belgium
47	Varsányi	Kornél	Ministry of Environment and Water	Hungary
48	Watterson	John	AEA	UK