Synthesis Report

Climate Negotiation and Emission Trading :

Economic Insight from European Models

BRUSSELS SEMINAR, 29-30 AUGUST 2000

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The seminar on Climate Negotiation and Emission Trading aimed at developing, in the run-up to the 6th Conference of the Parties to the Climate Convention in The Hague, a common knowledge on abatement costs and emission trading, while discussing existing results from models developed in Europe in order to study the economic aspects of the climate negotiation.

Four main issues were discussed during the seminar :

- the fundamentals of emission trading as described in different types of economic models;
- the trading rules proposed and examined in the on-going international negotiation;
- the possible post-Kyoto entitlements schemes and their international equity and acceptability dimension;
- the potential impacts of multi-gas flexibility, in the context of the Kyoto Protocol and beyond.

As a conclusion to the seminar three round tables allowed to draw the main conclusions and define paths for future research activities and cooperation in the EU and with other Parties.

1. The economic fundamentals of emission trading : results from modelling exercises

The presentation by J.C. Hourcade (CNRS-CIRED, France) introduced the main issues at stake in the on-going negotiation on emission trading and particulalry the discussion of the supplementarity condition, proposed by the EU in 1999. After recalling the various economic and political motivations for this supplementarity condition, he examined the economic implications of some alternative supplementarity tools or trading rules :

- a “floor price” for carbon trading would recycle part of the rent associated to the “hot air” and transform this hot air into “real” abatements; by providing a minimum price signal, it would however mitigate the crowding out effect of hot-air on CDM projects ;
- the creation of a national “carbon value indicator” – or of other indicators of domestic action – with a penalty when these indicators stay below a minimum level; this would not recycle the “hot air” and would partially reduce the crowding out effect on CDM projects;
- a “concrete ceiling” system, as proposed by the EU, associated to a “safety valve” (a price cap on emission permits) would limit the additional burden, particulalry for countries with high marginal abatement costs.

All these tools may allow for the improvement of the supplemental character of emission trading and for the control of the negative impacts of hot air on domestic policies. According to the type of tool examined, the potential positive impacts would be to limit the economic burden for countries with high marginal abatement costs, to reduce the volatility of the carbon price, to generate revenues for additional abatements or to compensate for the crowding out effects of hot air on CDM projects.

After illustrating the heterogeneity of the results obtained on tradable emission permit prices with different types of models, C. Kemfert (SPEED-University of Oldenburg, Germany) presented the main characteristics of the World Applied General Equilibrium model (WAGE), the assumptions adopted (particularly for the elasticities of substitution) and the main results concerning the economic impacts of the Kyoto Protocol:

- while meeting the Kyoto targets, all countries, be they Annex B countries or not, may lose welfare as compared to the "business as usual" case, as non Annex B countries suffer both from a lower world economic growth and from less favourable terms of trade ;
- likewise, developed as well as developing countries benefit from emission trading among Annex B, as compared to an autarkic or "no trade" situation;
- low baseline emission paths lead to lower losses of welfare than higher ones, while a lax cap for emission permit trading entails higher permit prices than a more stringent cap : for example, the permit price in a constrained Annex B market reaches 20 $95/tC in 2010 in the "high emission path – lax trading cap" scenario, while the permit price is in the order of 3 $/tC in the stringent trading cap scenarios ;
- a ceiling on emission permit trading reduces the welfare gains from trade; countries with "hot air" like Russia and some Eastern European countries suffer most from these welfare losses; moreover, a ceiling on permit trading may considerably increase the "carbon leakage" towards non-Annex B countries.

D. Gielen (ECN, the Netherlands) provided an overview of recent exercises performed on the impacts of the Kyoto flexibility mechanisms with the MARKAL model. The analyses suggests that non-CO_2 GHG emission reductions may be a key element in the compliance to the Kyoto targets, as they can contribute up to 27 % of the emission reductions required in 2010. The full trade equilibrium price of emission credits could be in the range of 11 to 29 Euros/tC equivalent, if all Kyoto mechanisms (emission trading, JI, CDM) and reduction potentials (including non CO_2 GHGs) were used. But it could reach 55 Euros/tC if non CO_2 reductions were excluded.

He also emphasised the fact that the developing countries should participate to climate change mitigation policies as they may draw important economic benefits from them. As an example, a case study on the Shangai district suggests significant emission reduction potentials in 2010. Large secondary benefits may also be expected from CO_2 emission reductions, in terms of lower local air pollution by SO_2, NOx and PM10. However the positive economic impact of these benefits should not be overestimated as cheap end-of-pipe technologies already exist for the reduction of these pollutions.

Other studies with MARKAL-type models for the petrochemical sector indicate that Kyoto constraints on European countries can lead to a production relocation in favour of developing

countries and, consequently, to carbon leakage. Finally, D. Gielen put forward the significant gains in efficiency of GHG abatement policies if they encompassed technological options on materials and not solely on energy.

P. Capros (ICCS-National Technical University of Athens, Greece) provided a detailed description of the domestic actions that the EU Member States should adopt in order to comply to the Kyoto targets, under the EU Burden Sharing Agreement of June 1998. For this purpose, two scenarios have been defined and evaluated, using the PRIMES energy system model. The AP-no-trade scenario allows no flexibility to achieve the assigned targets and thus leads to very differentiated marginal abatement costs across Member States: at the bottom, Germany with 103 Euros/tC; at the top, the Netherlands with 612 Euros/tC. The annual EU welfare loss would be of 0.13 % of GDP compared to the baseline situation. The AP-full-trade scenario, allowing emission trading across Annex B countries, results in a permit price of 64 Euros/tC and an annual loss of 0.02 % of GDP. P. Capros also emphasised the large potential for low cost non-CO_2 GHG reductions, although their marginal abatement costs still appear highly uncertain.

From a policy perspective and considering the economic efficiency gains from emission trading the key results are the following: while considering the various sectoral abatement costs, a priority should be to involve the power generation sectors in any permit trading system ; all sectors can however contribute and this involves probably a mix of policy instruments (including regulatory instruments or Policies and Measures); last but not least, the cheap potential for non CO_2 GHG reductions should in no way be disregarded.

As a conclusion to this first set of presentations, P. Zagamé (ERASME Université Paris I, France) emphasised the convergence in the qualitative results presented but the divergences in the quantitative results. Qualitatively, all the models point out to the necessity of active CO_2 mitigation policies to meet the Kyoto targets. Similarly, all the models show the importance of the economic impacts of meeting these targets if no emision trading scheme is implemented. Indeed permit trading significantly reduces these costs, in all modelling exercises, as well as non CO_2 GHG reductions when they are considered. Conversely, the introduction of a ceiling on emission trading increases the global cost when compared to global trading and it also changes the distribution of welfare.

Quantitatively, the carbon values differ significantly across the models. This stems either from the characteristics of each model, from the definition of the baseline scenarios or from the policies that are hypothesised. P. Zagamé also recalled the key conceptual differences that distinguish the "top down" models (general equilibrium and econometric models) and the "bottom up" ones. He emphasised the possible overestimation of substitution parameters in the applied general equilibrium models, as well as the importance of the definition of the baseline scenarios. He also pointed out that the concrete conditions for the implementation of policies should be precisely described, as the model results also largely depend on this description. Finally he called upon the search for transparency in modelling exercises and the development of sensitivity and model comparability studies. From the following discussion it also appeared that, when assessing the Marginal Abatement Costs results, a clear distinction should be made between theoretical models (general equilibrium or optimisation models) and applied models (econometric macro-economic or energy sector models).

2. The analysis of proposals for the implementation of emission trading and trading rules in the context of the Kyoto Protocol

H. Jacoby (MIT, USA) examined an assessment of the European proposition on "concrete ceilings". He first presented the theoretical results of import ceilings on emission trading, compared to full trading. For an importer submitted to a constraint, the change in total cost depends on the balance between two opposite effects : the increase in domestic abatement cost (due to higher domestic reductions) and the decrease in the cost of imports (due to the lower permit price and number of permits bought). Thus, increasing the stringency of the import restriction first results in a growing net saving up to a point where this saving diminishes and then fully disappears. For a competitive exporter, the gain from trading is reduced due to the fall both in permit prices and in quantities. In any such supplementarity proposal, there is a potential for monopsony, which shifts rents from exporting to importing nations.

Then H. Jacoby explored the EU proposal on supplementarity, that is : restriction on permit imports, restriction on permit exports and the "however clause". Using the EPPA model results, it appears that the import limit without the "however" clause reduces the global gains

from trade but creates a nearly optimal monopsonic situation for restricted importers : the main effect is not on the US or other importing nations but on Russia and other potential exporters. With the export limit and without the “however clause”, a small amount is sold at a very high price, the importers are worse off and nearly all the potential gains from trade are given up. When the “however clause” operates, these points move toward free trade equilibrium. The beneficial effects of emission trading thus depends entirely on the workability of the “however clause”, which presumes verifiable abatement. As a provision such as the “however” clause would leave any trading regime highly vulnerable to challenge from external parties, the result could easily be the loss not only of hot-air sales but also of sales of true emissions reductions.

J. Jensen (Copenhagen Economics, Denmark) analysed the economic effects of the European proposal of ceilings, using the EDGE model, a dynamic multi-region general equilibrium. In this study the European proposal for trading rules is interpreted in the following way: it is assumed that the European proposal limits the exports of hot air and that the use of the “however clause” constraints imports of emission permits by Annex B countries to 50 % of the total abatement requirement. Moreover “Kyoto forever” emission targets are fixed for Annex B countries from 2010 to 2030. The elimination of hot air through the European proposal drives up permit prices in the short run because the market is constrained from the supply side. But in the longer run, ceilings on imports become binding, they reduce the demand for emission reduction and thus the international permit prices. The second conclusion is that the European proposal increases domestic abatement ratios by 25-30 percent point only in a global trade regime, whereas in the Annex B trade regime none of the import ceilings becomes ever binding. Finally, independently of the trade regime, global welfare costs increase by 15 bn Euros compared to a free trade solution but deadweight losses are moderate for the US and the EU whereas Russia and other hot air exporters inevitably lose from the European proposal.

P. Criqui (CNRS-IEPE, France) used the POLES energy model results to show that the proposition of a “maximum quantity of permits at a minimum price” may provide a solution to reconcile the proponents of the European Union supplementarity condition and those of a safety valve designed to control the cost of compliance to the Kyoto Protocol. He first examined the economic effects of the European proposal of “concrete ceilings” : the

theoretical conclusions are similar to those of H. Jacoby (see above). Based on POLES calculations, the various supplementarity rules and ceilings proposed by the EU bring very different permit prices (from 0 to 149 $90/tC) and total abatement costs of Annex B countries, compared to full Annex B trading.

The price ceiling approach on the other side side allows to know ex ante the maximum price for international permits and functions as a “safety valve” : in case the market price is higher than the predetermined ceiling, an international institution offers additional permits at the ceiling price. Consequently however, emissions may exceed the target. This “second best” solution combines a regulation through quantities and a regulation through prices : The trading rules of the European Union are applied to importers while exporters are not restricted; the price ceiling is then supposed to be at a low level of 20 90$/tC and could also be viewed as a penalty. This allows to comply with the EU supplementary principle while limiting the total abatement cost to reach the Kyoto targets. The outcomes of this scheme, in terms of economic and environmental efficiency as well as of international equity, appear as relatively well balanced. But the political acceptability of this type of solution still remains to be demonstrated

R. Morgenstern (Resources For the Future, USA) highlighted that the Kyoto Protocol ratification is currently threatened, due to the US real concern about potentially high abatement costs as well as to potentially burdensome and unpredictable administrative mechanisms. The “safety valve” proposal developed at RFF limits compliance costs, assures domestic effort and transparency. Countries that have not sold permits abroad are allowed to purchase permits at a fixed price (50 $/tC) to cover any excess emissions at the end of the commitment period in 2012. This alternative of a fixed payment per ton of carbon creates incentives to identify and undertake emission reductions that are less costly than the payment. Indeed the revenues generated from these payments would be used, through a “virtual fund”, to acquire emission reductions from other countries. A reverse auction would be held to purchase emission reductions in the second commitment period : the “virtual fund” would collect the bids for additional emission reductions, through available permits or CDM project. It would then determine the auction price at the marginal cost that would exhaust the accumulated amount . According to RFF calculations, 85 % of the Kyoto emission reduction targets could be achieved and such an approach would increase the likelihood of a timely ratification of the Kyoto Protocol.

P. Capros (National Technical University of Athens, Greece) analysed the economic implications of EU-wide emission trading at the industry level, assuming that the entitlements to industrial sectors correspond to national emission trading schemes or to any other marginal cost equalising scheme. The 2010 results of the PRIMES energy model leads to the conclusion that emission trading across sectors and member states allows for a lower total compliance cost while achieving the same environmental outcome, than if each member state implemented the European Burden Sharing Agreement alone. More specifically, extending the trading scheme (from energy suppliers to energy intensive industries, and then to all sectors) leads to lower costs for each new participant, to lower overall costs and consequent gains in welfare: from a total annual cost of 9 bn Euros if each country implemented its target individually, the compliance cost would decline to 7.2 bn when energy suppliers participate to the market, to 6.9 bn when energy intensive industries are added and to 6 bn when all sectors are included. Further, a step-wise implementation of emission trading appears to be economically attractive provided that the trading regime starts with those participants gaining the most from participation. For that matter, the electricity supply sector is a well-suited candidate to be included in an initial EU trading scheme.

As a conclusion to this second part of the meeting, P. Zapfel (DG Environment, EU) pointed out that the results presented in this session by different teams converged to conclude that any restriction on trading has a negative impact from the perspective of economic efficiency and that supplementarity may imply unexpected distributional effects. He questioned whether too much emphasis is given to the issue and the economic effects of supplementarity, since most models concluded that implementing Kyoto would have rather small effects on economic welfare and a supplementarity constrain would affect this rather low cost by an even smaller effect. He called on modellers to reflect about and explore different definitions of supplementarity. He also suggested that modellers should focus on sensitivity analysis of growth rates, baseline cases and explore questions such as further commitments after the end of the first commitment period in 2012. With regard to models extending their horizon of analysis post-2012, he asked whether using a “Kyoto forever” target assumption is useful.

As for compliance, he stated that strong financial sanctions would be desirable, but were difficult to agree, as no strict enforcement mechanisms (such as the proverbial international police force) existed for that matter. The “safety valve” of 50 $/tC (less than 14 $/t$CO_2$)

proposed by R. Morgenstern did not seem too high to him, and he worried about the missing emission reductions that would follow such a policy, compared to the Kyoto targets. Finally he indicated that P. Capros' paper on emission trading at the industry level was all the more interesting as producing companies should be the prime actors in a European trading scheme and most modelling analysis of emission trading so far has "implicitly" analysed government trading.

3. Post Kyoto entitlements, burden sharing and international equity and multi-gas flexibility in the context of the Kyoto Protocol

M. den Elzen (RIVM, the Netherlands) first presented the main FAIR model's functions : to develop global emission profiles and to evaluate the environmental effectiveness of regimes for the differentiation of commitments in the context of climate targets aimed at stabilising GHG concentrations. Then, using the FAIR model, he quantatively explored three options for international burden sharing in the post-Kyoto period. The "increasing participation" regime gradually involves non-Annex I parties and gradually increases their level of commitment, depending on various participation and commitment differentiation rules. In this context, a "soft term" accession of non-Annex I seems incompatible with stringent ecological targets ; instead, a faster accession with lower thresholds might be needed.

In the "convergence" regime, all parties participate from the start, with emission rights converging to equal per capita levels over time. Global convergence of CO_2/cap is compatible with stringent ecological targets but the assigned amounts to Annex B countries are greatly reduced, while non Annex B countries face significant emission reductions over time, depending on the scenario. Linking the WorldScan macroeconomic model to FAIR results for this regime, it appears that emission trading leads only to modest emission reductions in Annex B countries and that the costs are low for OECD but high for developing countries.

The "triptych" regime is sector oriented : specific burden sharing rules are applied to each of the three sectors (power generation, internationally oriented energy intensive industries, domestically oriented sectors). It comes out that the various policy levers proposed do not allow total emissions to lead to concentration stabilisation in this regime. Among the different points in the discussion that followed M. den Elzen's presentation, it came out that while working on long term economic projections, the modellers agreed unanimously that all results

should be based on GDPs adjusted to purchasing power parities instead of unadjusted GDP numbers.

A. Loeschel (ZEW, Germany) used the results of a dynamic multi-regional general equilibrium model to assess the economic implications of “Contraction and Convergence” scenario. Under the “Contraction” assumption, total carbon emissions are to be reduced by 25 % in 2050 relatively to 1990. They should therefore be no more than 4.4 GtC. “Convergence” postulates that every human being should have an equal emission right in 2050, fixed at 0.48 tC, to count for population projections and the overall emission target. Given the very different per capita emission levels in 2000, the per capita emission right of any country in year t is a weighted average of per capita emissions of this country in year 2000 and the uniform 0.48 ton emission right in 2050. The regional abatement requirements resulting from this scenario substantially differ : OECD countries, China and the Reforming countries would have to greatly reduce their emissions whereas India, the Middle-East and Africa would not have to operate any abatement. The former would thus incur significant economic losses and negative spill-overs from international markets will also adversely affect Africa and the Middle-East. By contrast, international emission trading makes acceptance of the Contraction and Convergence proposal much more likely. The economic welfare of all regions is improved through trade, compared to fully domestic action; furthermore there is a large transfer of economic resources from the developed world to the developing world, while the developed world also benefits from trade compared to the no-trade scenario.

N. Kouvaritakis (JRC-IPTS, Spain) presentation focused on three issues : the endogenisation of carbon values in the POLES model, a post-Kyoto scenario of emission constraints and a simulation of the EU-wide emission trading for energy intensive sectors. On the first topic, he described the main advantages of this endogenisation – as it allows to decribe the time-path of permit prices – but also the corresponding modelling challenges.

The post-Kyoto scenario consists in allocating emissions rights to all countries for the period 2000-2030, with a pragmatic approach focusing more on the accceptability of the entitlements than on ex ante equity principles. For their emission right allocation, world regions are classified into six categories depending on the combined criteria of income per capita and emissions per capita. A different emission stabilisation date is imposed to each category and

the emission growth rates from 2010 to 2030 in non Annex B countries gradually decline till their stabilisation point. World emission stabilisation is thus achieved around 2030 – a target consistent with IPCC's 550 ppm atmospheric GHG concentration scenario. In this configuration, the international carbon value tends to sharply decrease in the years following 2010, as there are lots of low cost emission reduction potentials from non Annex B countries, but it increases again as off 2015.

As for the simulation of emission trading across EU energy intensive sectors, the market is supposed to be fully implemented in 2005 and to function till 2012. Germany, the UK and the Rest of EU-South are the main sellers of permits, France, Italy and the Rest of EU-North the main buyers. These results are consistent with those of the PRIMES model and. gains from trade appear quite clear for all EU countries.

Using the general equilibrium model CLIMOX, B. Muller (OIES, UK) presented the impacts of emission constraints with "Compromise" global targets in the post-Kyoto commitment period 2018-2022, with a particular focus on oil producing countries. The mixed compromise distribution of emission rights across countries results in 75 % of emission allowances on a per capita basis and 25 % on a grandfathering basis, according to the preferences of future world population. The US emission rights would thus be reduced to 9 % of the global endowment, compared to a current 21 %. Conversely, India's emission rights would rise to 13 % of the total, compared to a current 4 %. Through emission trading, developing nations would globally sell permits to developed nations.

While distinguishing emission allocation from burden sharing, B. Muller introduced a "fair burden" rule that should achieve harmony across countries through side payments from OECD countries to the developing world. Permit trading and changes in oil trade balance from Business as Usual entail negative real income effects mainly for the OECD countries, economies in transition and the Middle-East and North Africa. As for all oil producers, 2020 oil revenue growth indices decline from the Business as Usual scenario. Oil revenue losses per capita are particularly sharp for the key oil exporters with a reduced population.

4. Modelling and assessment of multi-gas flexibility in the context of the Kyoto Protocol

L. Bouwman (RIVM, the Netherlands) described the interactions between livestock and crop production in the IMAGE 2.2 model, in order to assess the consequences for GHG emissions. The agricultural economy sub-model of IMAGE 2.2 starts from food demand (animal products versus crops) in order to determine the required level of grass, crop residues and crop production. The land cover sub-model then determines the world allocation of surfaces. From this land use allocation, IMAGE 2.2 calculates the various GHG (and other polluting gas) emissions, source by source (biomass, savanna burning, landfills, animal, animal waste, etc…). L. Bouwman also presented the main assumptions contained in each of the two defined scenarios, for agriculture, land use and emission calculations. In general, production efficiency increases and leads to lower emissions per unit of agricultural product ; population decreases after 2050 ; the demand for livestok products in the second scenario (B1) is lower than in the first (A1) and leads to lower land demand. As a result, projections to 2100 for CH_4 and N_2O emission from land use increase till around 2060 and decrease thereafter.

H. Jacoby (MIT, USA) presented the methodology developed at MIT for a multi-gas assessment of the Kyoto Protocol. Non-CO_2 gases included in the IGSM model comprise the "Kyoto" gases (CH_4, N_2O, PFCs, HFCs, SF_6) and other gases (CO, SO_2, NOx, NMVOCs). The methodology has been initially based on the construction of marginal abatement cost curves (MACs) for non CO_2 GHG. Presently, these MACs are either exogenous to the model (which presents many disadvantages) or endogenised through a fixed Leontieff-type technical coefficient linking disposal to production and consumption. In the latter case, gas-specific reduction technologies are ignored. This determines the next step to be developed in the model. As an overall result, it appears that including non CO_2 gases and sinks in the Kyoto agreement has a significant effect on the CO2 targets and shadow price of carbon as well as on the total compliance costs. Then H. Jacoby presented on-going work at MIT particularly on the effect of multi-gas strategies on urban air quality, using the full IGSM model. H. Jacoby lastly emphasised that more attention should be given in to non CO_2 gases (and not only to those included in the Kyoto Protocol) and to the proper incentives to reduce them.

As a conclusion to the third and fourth session of the meeting, T. Bernheim (Bureau Fédéral du Plan, Belgique) synthesised the main issues associated to long term burden-sharing and multi-gas flexibility. About burden-sharing, he first underlined the various convergences of the models:

- methodologically, all the models identify a burden-sharing scenario, evaluate economic effects and eventually the consequences of emission trading on costs ;
- equity issues are difficult ones which call for an arbitrage between different criteria such as ability to pay, per capita emissions, inherited advantages … ;
- as for the political acceptability of a burden-sharing agreement, environmental considerations may not have been studied with enough detail, while welfare effects are strongly influenced by the hypotheses on emission trading.

T. Bernheim also pointed to the divergences in models specifications and results and raised the key question of the political acceptability of the different entitlement schemes: which proposition of burden-sharing would be more realistic ? which entitlement scenario makes it feasible ? how essential is the “convergence” issue for an agreement and is it actually a central component of this agreement ? On multi-gas flexibility, although many uncertainties remain about the emission measurements, he invited the participants to pay more attention to the secondary environmental benefits of the reduction of the other GHG. He finally stressed the importance of the conclusions drawn by the models, at once for policy support and for further research.

Round tables : building insight and common knowledge from modelling exercises

Round table 1 : Understanding the differences in model results

Synthesis transmitted by the moderator P. Zapfel (European Commission, DG Environment, Economic Analysis Unit)

The discussions in Round Table 1 focused on three issues:

Is there a problem if models come up with different results?

The range of opinions varied quite widely. Some thought that differences are almost inevitable and hence unproblematic, while others suggested that when models work with similar assumptions and data, the results tend to converge to similar answers. It was also pointed out that different results can be due to the different modelling techniques (e.g. partial vs. general equilibrium models) and discussing the techniques and their results can be quite pedagogical.

Are models sufficiently transparent to allow technical experts, political decision-makers and stakeholders to understand the differences?

The issue of transparency and the absorption of different results by various audiences was only touched upon indirectly in the contributions. It was pointed out that communication of modelling results is extremely important and crucial. One comment suggested that modelling is useful for political decision-makers as long as the results point in the same direction even if the orders of magnitude vary, but problems arise if different models imply diametrically different policy recommendations. It was also suggested that policy-makers per se are not interested in the model results and that the relevant clientele is the advisors to the policy-makers. The frequent changes in these advisory positions may constitute an important challenge for modellers in their communication tasks.

If not, what needs to be done by whom in order to make models more useful?

Even though no clear consensus on the answers regarding the two above issues was reached, a number of general suggestions were put forward in order to increase the usefulness of model-based policy advice.

(1) It was proposed that when differences in model results are quite large, a process should be put in place in order to develop a "consensus assessment" to be communicated to policy-makers as input for decision-making..

(2) A need to stimulate a culture of comparison of (a) modelling techniques and (b) modelling results was identified (the policy analysis network as discussed in round table 3 further builds upon this idea).

(3) It was suggested that modeller's need to undertake more efforts in order to present results in a normalised and standardised way to the policy world.

(3) Specifically on the focus of the conference "Climate Negotiations and Emission Trading" it was suggested that new stakeholders (from the financial sector) should also be involved in the discussion.

Round Table 2 : Key issues and opportunities for modelling work in the context of the climate negociation

Moderator : P. Valette (European Commission, DG Research)

Mrs Katri Kosonen (EC, DG Research) introduced the discussion while presenting the new economic modelling projects that are underway in the European Union. On the key issues and opportunities related to modelling work, one comment pointed out the importance of a constant updating of data and suggested a more efficient use of the new information technologies to communicate results, particularly to policy makers. Another comment indicated that modelling is useful to define issues and constitutes a background tool for the implementation of the Kyoto Protocol. It was also emphasised that figures of models are often published too quickly, which may lead to unreliable results. Two propositions were made in order to get safer results : competition between models and a "peer review" that would certify the model results. But the latter solution inevitably takes time and is incompatible with the

decision time lag of policy makers. One comment reminded that the dialogue with policy makers in developing countries woould be very useful but should take into account the differences in preoccupations and policy priorities

Finally, P. Valette announced an international consultation for the European Commission research programme starting in 2002. He emphasised the need to improve the interface between researchers and citizens, as the main goal of this program is to develop the interfaces between "Science, Society and Citizen".

Round Table 3 : Towards a co-ordinated use of models for policy support : The case for a network on policy analysis for environment-economy-energy and/or climate issues in Europe?

Synthesis transmitted by the moderator, Matti Vainio (European Commission, Environment DG, Economic Analysis Unit)

In Round Table 3, it was evident that the environment-economy-energy modellers on climate issues as well as the users of the modelling results (the policy makers) would find it very helpful to have a European-wide network or platform for policy analysis in this field.

Principles

It was thought that the network/platform should have the following principles:

- Focus on issues that are of interest in Europe : it was thought that one *raison d'être* for such a network is to focus on issues that are of keen interest in Europe. In addition to the issues of interest in the EU, the network should also include the EEA and accession country issues. Obviously many global or developing country issues are in the interest of Europe, so these issues should not be forgotten.
- Complementing other similar exercises : it was emphasised that the network should complement other similar exercises, in particular the excellent work that is carried out in conjunction of the Energy Modelling Forum, the IPCC and OECD. It was recognised that many modellers are already part of these forums and thus, efforts should not be duplicated.

- Openness : the network / platform should be open to all modellers, regardless if they come from the EU, other European countries, North America, Japan or elsewhere. Also the network should be open for participation of (private, governmental and non-governmental) users of modelling results. Of course the participation of environmental policy makers is also felt to be essential.
- Research driven, supported by policy makers : it was emphasised that such a network / platform should be formed by the researchers, while it would be supported by policy makers. The network should thus be managed by a research institution (or institutions) and have a very light bureaucratic structure.
- Participation of developing country modellers/experts : Many thought that such a platform/network should be made accessible to modellers/researchers from developing countries. Thus, the network could have financial resources available for e.g. funding the travel to the meetings and for transferring environment-economic-energy modelling know-how.

Characteristics

The network / platform could have the following characteristics: It could be a forum for policy makers to pose policy relevant questions. Likewise, it could be a forum for researchers / modellers to point out (omitted) policy issues that should be addressed. The management of the network would require some funding. Such funding could be available from the Commission (DG Research in particular) as well as from Member States. It was also noted that the network should get some funding from stakeholders – this would not only diversify the funding portfolio but also ensure that the network would look into issues that are relevant from the stakeholders point-of-view. The network / platform should have a large focus. All greenhouse gases as well as on sinks should be included as a key study area.

Further thoughts

It was emphasised that such a network/platform would not replace programmes that fund model development. The network / platform could be initiated in an ad hoc way as part of an existing Commission funded project, like AKROPOLIS. It was noted that a network / platform could induce some Member States to use more the analytical and quantitative approaches in policy analysis for environmental policy making. Many thought that the

network / platform idea would fit very well with the European Research Space initiative that has beenrecenttly launched by DG Research.

Finally it was noted that the forum could have two distinctive issues to deal with : model comparison and analysis for policy work. As part of a model comparison exercise, the key exogenous assumptions could be harmonised. However, this effort will have to cope with the fact that the demand for support to policy analysis is often expressed under conditions of high presure.

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As a general conclusion, it was pointed out jointly by J.M. Salmon (Ministère de l'Environnement, France) and P. Valette that the outcome of this Emission Trading seminar may provide a test, with promising perspectives for increased cooperations and exchanges of information, not only among modellers and between modellers and policy analysts, but also between the economic and policy analysis services of the Member States and of the Commission.