Climate policy. An integrated assessment of international and distributional issues

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1. Background

This special issue of Integrated Assessment contains six survey papers which summarise the main ideas, proposals, scientific achievements, consensus and conflicting views, that emerged at the Second EFIEA Policy Workshop, held at Fondazione Eni Enrico Mattei, Palazzo delle Stelline, Corso Magenta 63, Milan, Italy, 4–6 March 1999. The workshop was organised by EFIEA, the European Forum for Integrated Environmental Assessment, which is a concerted action funded by the Environment and Climate Programme of the European Commission, Directorate-General XII. Generally speaking, the two main objectives of the EFIEA are: (i) to improve the scientific quality of integrated environmental assessment; (ii) to strengthen the interaction between environmental science and policy making. The Second EFIEA Policy Workshop was devoted to improve communication and stimulate cooperation between different stakeholders, policy makers and scientists on the most relevant climate policy issues. The workshop identified policy questions and answers related to climate change provided by representatives from science and economics, governments and NGOs, business and the EU Commission.

The main objective of the workshop was to analyse the costs and benefits of climate change policies from an integrated assessment perspective, addressing equity criteria in cost assessment, as well as identifying the mutual benefits and opportunities of international climate policies.[1] The workshop focused on the analysis of climate change mitigation policies with the aim of providing an evaluation of the decisions taken in Kyoto and Buenos Aires, and of identifying the critical issues to be addressed and tackled in the near future.

The two-and-a-half-day workshop was structured in three main sessions:

(1) *Costs: fairness, equity, burden sharing*, which addressed the international, intergenerational and social equity issues emerging from the distribution of costs and long-term benefits related to climate change mitigation and adaptation policies.

(2) *Opportunities and mutual benefits*, which aimed at exploring the dynamics of the interaction of climate policies with different policy tools in a few relevant sectors, identifying the costs as well as the direct and secondary benefits involved in mitigation and adaptation strategies. The session mainly focused on the energy and transport sectors, including urban air policies.

(3) *Institutions and policies after Buenos Aires*, which offered blueprints for a climate policy, focusing on the integration of environmental policies with industrial and trade policies, as well as on the design of appropriate institutions and norms.

A worldwide call for papers was launched nine months before the workshop in order to collect the best and most recent research analyses on climate issues. In order to avoid a large number of scientific presentations to give time to policy discussions, scientific papers were circulated but not presented. The contents of the scientific papers are summarised by the six survey papers published in this special issue.[2]

The workshop gathered academics, policy makers, representatives of the industry in various sectors, as well as non-governmental organisations' and environmental associations' representatives. This introduction aims at providing a synthesis of the main ideas and concerns expressed in the workshop, by underlying the relevant policy questions that emerged from the presentations of the scientific surveys and the debates, by identifying those issues which encountered a general consensus and those which generated conflicting views, and, finally, by highlighting the new policy perspectives addressed and recommended.

It is worth noticing that during the workshop, despite the presence of different, sometimes conflicting stakeholders, some general ideas were supported by all parties. For example, the link between equity and efficiency of climate agreements was clearly identified and emphasised. On the one hand, an equitable agreement induces more countries

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[1] Indeed, one of the goals of the EFIEA is to assess how integrated assessment approaches can help to identify the relevant policy questions, on the one hand, and consensus answers to these questions, on the other hand.

[2] However, these survey papers contain information and results that often go beyond those contained in the papers circulated at the EFIEA workshop. The reason is that the authors were asked to integrate the EFIEA papers with other relevant literature in order to provide a more comprehensive overview of the problems under discussion.

to commit to emission control, thus enhancing its effectiveness, on the other hand, a cost-effective agreement reduces the conflict on distributional issues. Another example is the importance of using the so-called Kyoto flexibility mechanisms to reduce the costs of compliance. These ideas, and the related policy perspectives, are discussed in more detail in the papers published in this special issue.

2. International issues

International issues were at the core of the workshop. In particular, the equity dimension of international negotiations on climate change was discussed. International climate policies involve several dimensions of equity: equity between countries, referred to as *international equity*, equity between different social groups and stakeholders, i.e., *national/social equity*, and equity between generations, mostly referred to as *intergenerational equity*. These multiple equity dimensions apply to equity on impacts, adaptation and mitigation of climate change. Current climate change policies mainly address international equity issues, which are crucial to the implementation and evolution of the UNFCCC and of the Kyoto protocol. So far, international equity in climate change mitigation has been central to the climate change debate; the international equity aspects of climate change impacts and adaptation have instead received little attention.

Some policy issues are often indicated as the most relevant in terms of their implications for equity: the definition of the emissions reduction quota for Annex-1 parties, the criteria for "burden" sharing, the implementation of the sinks provision, the design of the Kyoto flexibility mechanisms, the share of proceeds for the Clean Development Mechanisms project activities, the consequences of participation in the Kyoto mechanisms for both Annex-1 and non-Annex-1 parties, the future participation of parties in mitigation.

With respect to countries participation, even if the Kyoto protocol starts from a "no harm to developing countries" approach, based on a sense of historic responsibility and allowing for efficient reductions through global trading, increased participation of countries in emissions reduction will be necessary over time in order to be able to stabilise concentrations of greenhouse gases. In his paper published in this special issue, Bert Metz suggests that for the evolution of the UNFCCC two options could be foreseen:

(1) a gradual extension of the group of Annex-1 countries, taking on binding emission levels under the Convention (sometimes referred to as "graduation") or,

(2) defining the emission rights of all parties over a longer period.

The first regime would mean a gradual extension of differentiated commitments, as in the Kyoto protocol, based on rules for participation and burden sharing which are part of an incremental decision making process. This "increasing participation regime" is combined with a long-term perspective by using a global emission constraint.

The second regime would be a major shift away from the Kyoto protocol approach and have a long-term perspective with respect to the distribution of rights and their evolution over time: an example would be the so-called "contraction and convergence" scenario of the Global Commons Institute, which defines emission permits on the basis of a convergence of per capita emissions under a contracting global emissions profile.

Bert Metz's paper also enumerates many different equity principles which can be associated to specific policy proposals (such as policies dealing with climate change mitigation). His conclusion is that there is no objective preference for a specific principle. A more promising – and, therefore, more effective – policy should contemplate a combination of equity principles when considering the allocation of mitigation costs among various countries. One must also consider the manner in which the consequences of climate change are affecting different countries in different ways, and how there can be a disproportion between a country's impact on the problem (the quantities of gas emissions which the country produces) and the costs which the country must face in order to contribute to the solution of the problem.

There is also a general question of equity/fairness when considering the decision making process. International equity is also affected by the manner in which the climate change policy allows a country to participate and contribute (and to what extent) during the formation of the climate change agreement.

3. Intergenerational distribution

When analysing international issues, the focus is on the geographical distribution of costs and benefits of climate policies. However, climate change is a long-term problem which is likely to affect several future generations. In this context, it is important to evaluate how the costs and benefits of climate policies are distributed across generations. Economists have identified the discount rate as a crucial parameter affecting this distribution. The choice of the appropriate discounting technique is indeed crucial to weight the costs and benefits of integrated climate policies in an intertemporal dimension. Ferenc Tóth in his survey paper published in this special issue provides a review of the various discounting techniques that have been proposed and applied in integrated climate change models. Dealing with the effects of climate change, which imply long-time horizons, possibly irreversible changes, the threat of environmental catastrophes, leads to Tóth's dilemma: "one can attempt to be consistent with economic theory and empirical observations, but in this case the derived discount rate will be in the order of 5–8%. As a result, even possibly significant damages from climate change turn out to be negligible

when considered at their present value. The artificially low discount rate based on ethical reasoning, on the other hand, makes climate-related decisions and resource allocation inconsistent with the majority of other public decisions".

Tóth discusses the above dilemma by analysing three major lines of thought regarding the choice of cost-benefit techniques that can be identified in the literature and in the current debate:

(a) A first view, based on the consideration that impacts and benefits related to climate change policy will occur very far in the future, believes that standard cost-benefit analysis (CBA) is appropriate even for policies applied to climate change. Therefore, the discounting technique should not differ from other policy standards, provided they are revised on a regular basis.

(b) A second view "recognises that the technique of CBA is appropriate to address climate policy but tries to bring distant economic losses due to global warming closer to the attention of today's decision makers", using lower discount rates for the evaluation of far future impacts. Nordhaus (1997), however, points out that this procedure does not help to achieve efficient abatement policies, nor to save unique environments.

(c) A third view sustains that, if the environment is highly at risk and irreversible changes are foreseen, CBA may have only a limited validity. The best strategy would be to define specific long-term environmental goals and work out the optimal cost-effective policy to reach them.

This latter view seems to be the one supported by Tóth. Even though he considers CBA techniques an important source of information, he finds that the best and more economically efficient strategy is to set long-term environmental goals and to settle on the more cost-effective policy to obtain these goals accordingly. Tóth restates that discounting is a key issue in policy analyses of climate change. He argues, however, that cost-benefit ratios should not be the only basis on which social decisions are made. When deciding on social and environmental issues, discount rate manipulation is not the correct strategy; policy makers ought first of all to concentrate on finding a broad consensus about the environmental objective which needs to be reached, and then decide on the best strategies to obtain the goal.

4. Sectoral issues

The second day of the workshop was devoted to analyse how the general issues discussed above affect two specific sectors – transport and energy – which strongly affect GHGs emissions and are therefore particularly sensitive to climate policies. The survey on "Policies in the transport sector" by Stef Proost starts from a basic fact: in the EU the transport sector represents approximately 25% of all CO_2 emissions; the majority of emissions comes from the use of fossil fuels for road transport, i.e., cars and trucks. Emissions in the transport sector in Europe have been growing extremely fast, faster than GDP growth, and are expected to grow further. This makes transport a priority in climate change policies. Hence, which instruments would be most appropriate to meet climate change policy goals in the transport sector?

Stef Proost notes that at present the fuel efficiency standard for new cars is the only policy decision which has been taken to reduce CO_2 emissions from cars in the EU. He also suggests that the emphasis of current European policies on fuel efficiency of cars (via standards, eco-bonus, etc.) is not a cost-effective policy. The main reason is that the "fuel efficiency of present cars has already been designed as a function of the present excise on fuels that represent a disguised CO_2 tax of 300% or more".

Moreover, energy taxation (or other instruments) should also be used to internalise the external costs generated in the transport sector, such as air pollution, accidents, noise, and congestion. As regards air pollution, for instance, major externalities generate from the diesel, which has a strong impact on health. Policy measures should be balanced taking such considerations into account. In reality transport pricing appears to be highly inefficient, where inefficiencies are dominated by external congestion costs. Addressing correctly external costs, with measures which may generate additional CO_2 emission reductions, is a challenge for policy making.

In his survey, Stef Proost also underlines that "in certain urban areas, air quality problems can be addressed by a combination of local and global emission measures; due to the strict emission standards that are in place now for the transport sector, a cost-effective solution could require important efforts from other emission sources". This may require the integration of policy instruments and measures from different sectors towards a common policy goal. For instance, transport policies could be integrated with land-use planning policies, and integrated policies should address which patterns of land-use planning would enhance energy efficiency towards climate change mitigation. Transport policies could also enhance fuel switching, from traditional fossil fuels to clean fuels, such as NLG and bio-gas.

The energy sector and its relationships with climate change and climate policies are analysed in the survey by Richard Baron and Alessandro Lanza. The first part of their paper analyses the expected dimension of the carbon market, based on a survey of the modelling results regarding the implementation of the Kyoto protocol goal, with and without reliance on emission trading, and under different trading scenarios. The authors seem to believe that the macro-economic models currently used to analyse costs and benefits of emission trading are too optimistic in their evaluations of how the various flexibility mechanisms can contribute to the achievement of the Kyoto protocol goals. They argue that these models rely too heavily on unrealistic assumptions such as the presence of full market efficiency during emission trading, and on the absence of transaction

costs in trading. Their conclusion is that in order to reach the Kyoto targets more effectively, industrialised countries should concentrate also on domestic action (policies) rather than relying completely on flexibility mechanisms such as the CDM.

In their survey, Baron and Lanza also discuss the issue of financial transfers implicit in the implementation of the Kyoto protocol through the flexibility mechanisms, and more generally the problems of financial needs arising from the large investments necessary to control GHGs emissions. They discuss whether these transfers are politically and economically feasible and how they would affect income redistribution worldwide.

The second part of this paper considers the incentives that the private sector may need in order to undertake environmentally beneficial projects relevant to the Clean Development Mechanism and its contribution to reaching the Kyoto protocol goals. The focus of the analysis are projects and firms belonging to the energy sector. The paper's findings are that the CDM can contribute to cost reductions if projects that are conceived as beneficial to the environment, but also profitable before the inclusion of the certified emission reductions, can qualify for the CDM. Renewable energy projects would require higher CER prices in order to be profitable. Moreover, to obtain the cost reductions projected by the macro-economic models, the CDM must include fuel-switching projects (such as the coal to natural gas example analysed by the authors).

5. Long-term perspectives

Policy prescriptions to control climate change are strictly related to future technological innovations and more generally to the perspective transformations of industrial systems. This issue is analysed in the paper "Industrial transformation towards sustainability of the energy system" by Pier Vellinga. The challenge which society has to face in the beginning of the new century is to reconsider the ways that it sees to its needs and ambitions in view of their environmental impact. The author believes that this challenge must be met through a combination of strategies. He argues that industry will not be able to carry out the necessary transformation of its production processes and the sources of energy it uses unless at the same time society itself does not re-examine its needs and social preferences. In other words, this paper claims that multi-disciplinary approaches are to be preferred as an answer to the sustainable economic development dilemma.

In addressing the issue of how societal requirements and aspirations as well as industrial transformation are to aid in achieving sustainability of the energy system, Pier Vellinga provides a general historical review of how the problem has been dealt with so far. Such a survey is conducted from various perspectives. The conclusion which the author reaches is that a systemic approach is needed in dealing with the general question of how both society (reconsidering its needs and aspirations) as well as industry (the forms of energy it uses and the technological changes it will be asked to make) must evolve, in order to follow a path of environmentally sustainable economic development.

6. Policy guidelines

A final survey paper is devoted to summarise some policy guidelines that could help improve the effectiveness of strategies designed to control climate changes. In "Insights for climate policy in Europe" by Frank Convery, a few key issues are addressed: the problem of how to interest and involve the countries of the "South" – the Group of 77 and China – in climate change policy and its implementation; the assessment of the savings generated through the flexible mechanisms; the prediction of the macro-economic effects of meeting the Kyoto goals; the associated questions of limiting the extent and range of emission trading; operational issues such as the units to be traded, monitoring and enforcement, and the allotment of permits. A few important suggestions are contained in this paper.

First of all, even though the benefits of implementing the Kyoto protocol are still somewhat ambiguous, carrying out the protocol still represents both a great opportunity and a major challenge for the global community. One of the main challenges associated with making the protocol work is obtaining the interest and co-operation of developing countries. Without their participation, the implementation of the protocol would lose much of its importance.

Second, the GHG emission reduction gains obtained through the Clean Development Mechanism should be immediately attributable following 1 January 2000; they will therefore immediately qualify as active policy options. Considering the transaction costs associated with the authorising and monitoring of the CDMs, it is not likely that they will make a very important contribution to the reduction of the climate change impact of developing countries. To obtain visible large scale results, emission trading must be encouraged in some way.

Third, the limits placed on trading proposed by the European Commission may jeopardise the functioning of the emission trading market. Because of the limit on trading in hot air, for instance, the environmental benefits over the first commitment period are bound to be lower than expected. Convery, as well as many other participants in the workshop, states that "to the extent that constraints are placed on carbon trade, the costs of compliance will be increased .... the negative effects would spill over also to the countries likely to export carbon credits, since the volume of their sales and the price they get will be lower because of lower demand induced by higher costs of mitigation measures taken at home by the EU and the USA. All countries lose, and emissions reduction commitments in subsequent periods will be made more expensive and, therefore, less likely to be significant. Since the gains from trade experienced by Russia and Ukraine will be reduced, it will also reduce the prospects for trade gains from potential entrants from the developing countries in the future".

Fourth, permits should be auctioned rather than grandfathered. Frank Convery notes that "grandfathering allows benefiting firms to (a) remain in business for some non-economic reason, (b) have more funds for risky investments, and (c) have cheaper access to bank loans and capital markets". Hence, the auctioning of permits may provide important efficiency benefits.

Fifth, the abatement decision of a group of countries, e.g., Annex-1, can be costly and ineffective if offset by emission expansions in other countries. This is the well known carbon leakage issue, which arises because of the free-riding strategic incentives that characterise the climate problem. Carbon leakage is not adequately addressed in the Kyoto protocol, and future policies should make an effort to develop measures to counteract it. Frank Convery stresses that "carbon leakage occurs whereby firstly carbon intensive products become more expensive in signatory countries and imports increase from non-signatory countries, and secondly, firms using carbon emitting technologies in carbon signatory countries move to non-signatory countries. The Kyoto protocol does not contain any policies or measures to counteract carbon leakage".

Finally, with reference to operational issues, there are a number of principles which any permit trading system should be based on in order to make this system operate effectively and be sustainable in various countries. If these principles are taken into consideration, then global trading can be successful.

7. Conclusions and scope for further research

The six survey papers published in this special issue constitute a good overview of recent theoretical and empirical results on the equity and efficiency of climate change policies.[3] They also contain policy analyses and guidelines that could help improve the speed and effectiveness of the current negotiation process on climate change policy. However, the debate that took place at the workshop, and the many papers that were submitted and circulated, were very useful also to highlight a number of issues on which scientific knowledge is still incomplete, economic analyses are partial or missing, policy guidelines quite uncertain.

Among them, let me mention issues like sinks, the enforcement of the Kyoto protocol, the balance between domestic "policy and measures" and "flexibility instruments", the functioning of trading markets, the role of banking of permits, the role of technological innovation, co-operation and transfers, the influence of uncertainties – many different types of uncertainties – on the negotiation process and on the strategies to be adopted in the short- and long-term to control climate changes, the optimal treaty design, the political economy dimension of climate policies. On these issues more research, both theoretical and empirical, is still necessary. The role of EFIEA is to foster this type of research and to make it relevant for negotiators and policy makers.

[3] Other results can be found in C. Carraro, ed., *Efficiency and Equity of Climate Change Policies* (Kluwer Academic, forthcoming), which contains a selection of the papers that were circulated at the first EFIEA Policy Workshop in Milan.