Economic approach to climate policies and stakes of international negotiations

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According to climate studies, the conclusions of which have been published in successive assessment reports of the IPCC (created in 1988), a continuation of the current trends in greenhouse gas emissions from fossil fuel combustion and agricultural and industrial activities could lead to global and regional climate change. Such changes, which could occur rapidly over the next century, could affect the living conditions and economic activities of all the regions of the world, and above all they could impose particularly strong "climate stress" in the developing regions, where the ecological and economic systems are particularly vulnerable.

At the political level, governments put this question on the agenda for international negotiations at the Earth Summit in Rio in 1992 and practically all of them signed the UN Framework Convention on Climate Change. Article 2 of this agreement stipulates that the signatories agree to stabilize greenhouse gas concentrations *"at a level that would prevent dangerous anthropogenic interference with the climate system".* However, uncertainties still remain concerning both the extent to which the problem is human-induced and the question of identifying a target (to be defined in terms of the level of stabilisation of greenhouse gas concentrations in the atmosphere and the time frame to achieve this stabilisation). Despite these uncertainties, the principle of an absolute reduction in emissions was accepted in the Convention, albeit without agreement on any concrete restrictive measures. This method was taken up again and reinforced in the Kyoto Protocol (1997), signed – which does not mean ratified – by all the major industrial countries, with binding emission commitments defined for 2010, in relation to 1990 levels.

Economics is thus doubly concerned by the question of climate change: first in terms of its potential impacts on human activities in the future, and second in terms of defining policies aimed at reducing greenhouse gas emissions or policies aimed at facilitating adaptation to climate change, at the national and international levels. Numerous economic assessments have been conducted in this regard. They are based on models that represent either the entire economy (Applied General Equilibrium Models) or the sectors of activity responsible for emissions (Sectoral Equilibrium Models, specifically for energy).

The purpose of this contribution is not to describe the models and how they are used, but to review some of the principles and methods of the economic approach to these subjects. This will be the aim of the first part of this paper.

But economics is also concerned by the production and management of a global public good, namely the maintenance of an acceptable climate system. The study of the processes of organising joint action at the global level, or structuring international agreements, falls within another field of economics, that of International Political Economy. This type of approach will be adopted in the second part, in order to analyse the prospects of implementing an international climate regime.

1 CLIMATE CHANGE AND ECONOMICS

1.1 A long-standing but still relevant debate: Cost-Benefit Analysis or Cost-Effectiveness Analysis ?

In theory, in an economic approach that takes into account the environment, maximization of well-being requires that the costs associated with pollution be compared with the cost of policies to reduce such pollution. The Cost-Benefit Analysis (CBA) makes it possible to define a "pollution optimum" as that point where the marginal cost of abatement is equal to the marginal cost of the damages. In fact, despite real progress in techniques for assessing and costing damages, in numerous areas it is still difficult to estimate the market value of environmental goods.

Such is the case with climate change, since the most advanced climate models cannot be used (at least not yet) as predictive tools at relevant spatial scales, in economic impact assessment studies. However, this does not prevent some economists from attempting this task, using models which although rigorous remain nonetheless synthetic models (in this regard, see the pioneering work of W. Nordhaus since 1990 [Nordhaus, 1993]). The results generally point to the need for action, but at a level that remains modest since it corresponds to a "willingness to pay" for the reduction of emissions at a typical rate of 30 € per tonne of Carbon (that is about 3 € for a barrel of oil). The most troubling aspect here is that, despite uncertainties, this approach puts economists at the "controls" since it is they who assess both the problem and the remedy, and then define the policy to be adopted.

In fact, most of the economic studies on climate policies undertaken in recent years take the emission objectives as exogenous, i.e. supposedly resulting from an informed political decision based on input from the natural sciences. The position of the economist is therefore more modest since it is no longer a question of determining these objectives but rather of exploring the possible policies to achieve them, from the point of view of economic effectiveness. The framework of the Kyoto Protocol, as it stands at present, in fact imposes this type of Cost-Effectiveness Analysis (CEA) since the objectives were negotiated by governments, initially in the spirit of what appeared at one time acceptable but on the basis of still uncertain scientific or economic arguments. It may be noted that the results obtained in the CEA generally show an implicit willingness to pay that is much higher, by a factor of 4 or 5, than in the CBA.

We can certainly be satisfied with the dominant role of the Cost-Effectiveness approach, which keeps economics in what is undoubtedly its rightful place today. However, this is not the end of the story. On the one hand, climate models such as monetary appraisal methods are improving and a detailed quantification of damage may one day be possible. On the other hand, the relevance of targets and their "proportionality" to the danger will undoubtedly always be a consuming question for economists and policy-makers.

Indeed, it is easy, and legitimate, to invoke the precautionary principle in deciding to act. But in doing this we do not resolve the difficult question of how far-reaching our actions should be, in other words "how much is too much?". For instance, it was only after providing its own answer to this question that the US government decided to withdraw from the Kyoto Process in 2001.

1.2 Using economic models for designing climate policies

Within the framework of the CEA, once the final environmental objective has been defined, there remains the question of the means or instruments to be employed to achieve the objectives. In the environmental economics "toolbox" we can find three types of instruments:

- environmental taxes, which are related to the Pigouvian analysis of externalities and the need for their internalisation [Pigou, 1920] ;
- tradable emission permits (or "pollution rights" or "transferable quotas") the origin of which can be found in the Coasian approach to property rights on the environment (Coase, 1960), whose transferability is proposed by Dales [1968] ;
- norms and standards, anchored in the implementation of environmental policies actively developed since the 1960s in the United States.

To these three categories one can be added the “hybrid instruments”: “standards and penalties” or *“standards and charges”* according to Baumol and Oates [1971]; “compliance payments” or *“safety valve”* according to Resources For the Future [Kopp et alii, 2000]. These hybrid instruments attempt to combine, in an appropriate manner, the respective advantages and disadvantages of regulation through prices and through quantities. Public investment in infrastructures or R&D constitutes a final category of instruments, but studies based on economic models are only now beginning to touch on this area.

It must be admitted that models, whether sectoral or “general equilibrium” models, are essentially based on strictly economic instruments (taxes and permits) to evaluate and help define national policies. There are two reasons for this. First, assessment of these instruments has historically been based on observations, real or supposed, of the economic ineffectiveness of standards. Second, the introduction of standards in an economic model generally poses problems, since although the theoretical effects are easy to take into account, the associated costs or the degree of compliance that might be expected are far less so. In the extreme case, scenarios can be constructed with strict standards, which are assumed to be respected because of their obligatory nature or thanks to the virtuous behaviour of the actors. Thus it is possible to use a model to obtain significant environmental results at low or no cost. But the risk of bias in the evaluation then becomes high.

The reason why model studies are based on economic instruments is that they are part of an approach that favours incentives rather than direct constraints from the State and one that does not assume that the actors involved will act willingly. However, the debate continues, for example, in the process of preparing domestic programmes for tackling climate change: should sectoral “ Policies and Measures” be set up and economic instruments mobilised only as a last resort? Or instead, should a global incentive framework be set up on the basis of taxes or emission quotas, with public policies then being used to reduce the adjustment costs imposed on the different actors?

What is involved here are the conceptions underlying the modalities of public action, in the form of State intervention or State incentives. It is clear that the contribution of other social sciences regarding the determinants of consumer behaviour and the relative acceptability of “negative incentives” (environmental taxes or emission permits) in relation to the systems of standards or constraints could significantly enrich the conclusions of the models with respect to policy design.

Within the strictly economic approach to the problem, the debate is continuing: is it better to regulate through prices or through quantities, that is through taxes or emission permits? The debate within the discipline – following the seminal contribution of Weitzman [1974] – is rich, vigorous, and not yet over. But there is no real problem of modelling here and the reason that economic assessment studies are generally based on the hypothesis of an international permit market is because such a hypothesis is particularly well adapted to the nature of the Kyoto Protocol. The same models could be used to obtain coherent results concerning the introduction of national or international taxes.

Outside this debate internal to the discipline, the following point is worth noting: while sometimes taxes are seen as providing additional means or room for manoeuvre for the State, emission permit systems are perceived as more market-oriented solutions and as such are condemned as a new extension of market rationality in an area where it is not be legitimate: the accusation is that nature is being turned into a commodity.

It is important to mention here that the issues involved in the debate are more complex:

- the constraint imposed by permit systems directly concerns quantities, and the cost is uncertain, while in the case of a tax, the uncertainty relates more to the environmental result;
- The allocation of emission rights or emission permits generally follows on from a “no rights” situation where each individual, but especially the most powerful, makes free use of environmental goods.
- Thus, any constraint on emissions raises important questions of equity at both the national and international level. Such questions must be dealt with upstream in the case of permit allocation and can only be settled downstream in tax systems.
- Finally, permits, if they are auctioned, can also constitute the basis of an “ecological fiscal redeployment”.

In short, it is possible to defend the thesis that permit systems require both more involvement from the State – exercising strong but distant constraints – and more from the market to ensure an effective adjustment of the behaviour of the actors.

1.3 Economic models and international climate negotiation

First, we should remember that the questions raised above – concerning cost-benefit or cost-effectiveness analysis and the comparison of instruments – can also be found in modelling studies undertaken in support of climate negotiations.

While achievements in this area were few in 1992 when the Framework Convention on Climate Change was adopted, and remained so in 1997 when the Kyoto Protocol was signed, since then the development of analytical frameworks and tools has enabled negotiators to draw increasingly on economic models [the Energy Journal, special edition, 1999]. In particular, the costs of attaining the different arrangements of objectives and of implementing the regulatory framework have been better defined: if the results of the models remain dispersed with respect to estimates of abatement costs, fairly broad consensus is often reached within the economic modelling community when it comes to assessing the relative effects of the different arrangements.

Even so, it would be wrong to say that economic models fully drive international negotiation. At best, they occasionally help negotiators who are aware of them to modify – upstream of the process – their perception of what is and is not desirable, of what is and is not acceptable.

But in this area, the real problem is undoubtedly that of identifying frameworks for agreements that are likely to be both attractive to the negotiating parties and effective in terms of compliance with the commitments. There is still much work to be done in this field and economic analysis of abatement costs alone will not be sufficient to identify ways of constructing a climate regime or system of governance[1].

Game theory may bring a contribution in this area. However, as long as all the costs and benefits of abatement policies for each Party have not been completely assessed – and, as we have seen, this assessment is far from complete – the contribution of game theory can only be fairly general or abstract. In the present situation, the States must commit themselves to the costs of defending a global public good, but without knowing the actual nature of the damage thus prevented at the global or national level. Aside from the classic problems of ”free riding” associated with the management of collective goods, the situation where assessment of the benefits of the action is incomplete clearly does not constitute an incentive framework from a strictly economic point of view.

International political economy or the approach in terms of international relations can on the other hand be helpful for analysing the process of constructing international agreements. In particular, lessons might possibly be learned from international regimes for other environmental issues or from methods of international governance by those working not only to identify the terms and conditions of future international protocols on climate change but also to assess, with the help of economic models, the costs and acceptability of such protocols for the different parties.

If this is to happen, a link must nevertheless be built between the positive approaches that aim to provide a description of the dynamic interactions between the many categories of actors (States, NGOs, industrial lobby groups, etc.) concerning complex policy issues that are rich in “hidden agendas” and the prescriptive and necessarily simplifying approach of economic models.

1.4 A hegemony of the economic approach?

In its interactions with the other social sciences – where such interactions exist – economics is sometimes seen as imposing its approach and methods. In fact, beyond the dissensions that divide them, economists seem on the one hand to adopt a prescriptive approach and on the other to share the same preoccupation for efficient action.

[1] Note here that until the withdrawal of the US from the Kyoto Protocol the arrangement of objectives seemed more or less stabilized for 2010 and most of the studies concerned the long-term conditions of inclusion of the developing countries in a global regime. Today, uncertainty has “infiltrated” the short-term horizon.

Their common obsession for the "equalisation of marginal abatement costs" in particular can sometimes be perceived as an excessively simplified way of approaching the question of policy definition. However, if equalisation of marginal costs is always a factor in economic studies and if it structures the way in which economic models are used, it is because such equalisation at the national or international level results in a much improved efficiency and thus a substantial reduction in policy costs.

This constant concern for efficiency obviously reveals the pregnance of the economic paradigm, but it could also be interpreted as the corollary of strong targets for environmental protection: the more ambitious the policies the more important it is for them to be implemented in an economically efficient way. Otherwise there is a high risk that such policies will end up being rejected – because of their excessively high cost – whether by a State, industrial players or citizens.

If the other social sciences can share this point of view and if economists are able to accept that striving for efficiency is a necessary condition, but one that nevertheless does not solve the problem of developing sound environmental policies, then dialogue among the disciplines will be able to develop and lead to fruitful cooperation.

2 GOVERNANCE FOR THE GLOBAL ENVIRONMENT: THE ISSUE OF INTERNATIONAL RULES AND INSTITUTIONS

Climate change is clearly a global environment problem since it concerns a "global public good", that is a sustainable climate system, acceptable for human societies on our earth. As mentioned above, all the studies carried out by climate scientists indicate that this "good" is now endangered as a result of the accumulation of greenhouse gases in the atmosphere.

How can this planetary problem be managed? How can collective action be organised (or not) in order to "produce" or preserve the climate, in the absence of a world government? To pose such a question is to pose the question of a "global governance", in the sense reported by Le Prestre and Reveret [2000] : *"governance is a way of solving the problems of collective action defined as the capacity to coordinate interdependent activities and/or achieve change without the legal authority to command"* [2].

In the absence of a supranational State [Young 1994], the global public good is managed under a system of States that have differing interests and preferences in terms of their goals and methods and the intensity of the action to be taken. Analysis of international negotiations on climate change provides lessons which complement those we can learn from economic analysis of the ways and means of implementing a collective solution.

On the basis of the observation of climate negotiations and their main achievements, we shall consider that the type of cooperation established corresponds to an international regime (one of the methods of governance). Here we will borrow the definition of the international regime from the theories of international political economy that define an international regime as an institution, in a particular field of international relations, in which the States are the principal operators. It is characterised by a set of principles, standards, rules and procedures for making decisions. Depending on the standards and rules chosen, a regime can be classified as strong or weak.

Historically, the "climate regime" has been based on the development and then the implementation of the Kyoto Protocol. One of the main features of this Protocol is the definition, for all the industrialised countries, of *quantified emission limitation and reduction commitments (QELRCs)*, expressed in terms of the emission levels that will be tolerated in 2010.

The problems encountered concerning the methods and rules of implementation of the Protocol – including the difficult task of determining real criteria of compliance – and above all the withdrawal of the US from the process in March 2001, six months after the 6th Conference Of the Parties in The Hague (COP-6), marked the beginning of a period of rising uncertainties. The question is thus open to determine what new configurations will be used as a basis for international cooperation in controlling greenhouse gas emissions. The emerging climate regime is already in a crisis: can it be righted, or will

[2] Translation by the authors.

it be replaced by another regime or another method of governance, with characteristics that would probably be less restrictive?

One of the necessities when analysing the concrete case of climate change and the way it is managed is to identify the framework of the definitions, paying particular attention to the question of quantified emission targets: the existence, or non-existence, of these targets – which potentially represent real emission rights/quotas[3] – would in fact appear central to the effectiveness of international policies on climate change. On this basis, we examine the following three points: 1/ the initial methods for setting up a "strong regime", 2/ the "QELRCs system" as an achievement of past negotiations, but also a source of fragility for the emerging international regime, 3/ possible scenarios for "ending the crisis" of the climate regime.

2.1 The initial "strong international regime" with quantified emission targets

The international climate regime which started to emerge in 1988 is characterised by the following features:

- The setting up of a regime is based on the *creation of dedicated international rules and institutions*. The UN Framework Convention on Climate Change is the central standard of this emerging regime. But it is a "soft" standard, essentially because it does not contain any "legally binding" objective. The need affirmed at the international level to tighten up the standard resulted in the creation of the Kyoto Protocol in 1997, followed by the Marrakech agreement at the end of 2001, which was to enable international ratification of the Protocol, but without the US[4]. The creation of standards goes hand in hand with the creation of new intergovernmental institutions: one scientific institution, the IPCC, and the political, technical and financial institutions of the Convention, which, although relatively light and not very costly, have achieved remarkable results given the resources available to them.
- *The principal actors are the States*, which from a legal point of view are the "Parties" to the negotiation and the sole guarantors of the emission targets and holders of emission rights with the freedom to distribute them internally through their domestic policies[5]. These States group together, negotiate and confront each other in an intense diplomatic game in order to define new rules and institutions. In more detailed studies [Berthaud, Cavard, Criqui, 2003] the groups are characterised by their preferences in terms of international cooperation, by their initiatives and responsibility concerning the issue of climate change.
- *Emergence of leadership*: In the decisive period of strengthening of the international regime (1995-2000), the US played the role of leader through its "structural power" to set out new rules. Throughout this period, the US in fact imposed almost the entire content of the emerging rules. Thus, the central provisions of the Kyoto Protocol reflect the American proposals: specific quantified emission reduction objectives, implemented with flexibility mechanisms, including emission trading systems, joint implementation and the Clean Development Mechanism, between countries of the North and of the South. The US also obtained the addition of three extra greenhouse gases to the three main gases and the possibility of including sinks (absorption of CO2), albeit in a limited way. The only notable item that was missing with respect to US demands was an article on the possibility of voluntary commitments from developing countries.

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[3] We need not be reminded here that a "right" is by definition both an authorisation and a limit. This is true of all "rights to pollute".

[4] Note that at the time of writing, September 2004, 125 countries have ratified the protocol but its implementation depends solely on its ratification by Russia, taking into account the rules enacted.

[5] Admittedly, other actors (the lay community), environmental NGOs, large industrial groups and representatives from branches of industry, have played an important role at different stages, but this role has involved influencing government decisions. This situation is now changing, with initiatives from companies and NGOs, in cooperation with States or international organisations, to create methods of action, such as a carbon fund or the design of emission rights markets.

2.2 The emission quotas commitment system: a positive achievement of international negotiations but the cause of present difficulties

A decade of international negotiation has produced unquestionable results that have led to the creation of an emerging regime, but one that is at the same time potentially in danger.

The negotiation process, lasting close to ten years, has led to numerous cognitive and organisational achievements as well as experience in negotiating. For example, there has been progress in knowledge and scientific consensus, the system of reporting on national data and international assessment, which is the necessary basis for checking compliance with obligations, the start of emission trading and other mechanisms. Certain progress has also been achieved in integrating developing countries, such as the introduction of the Clean Development Mechanism, the new adaptation funds, etc. New knowledge has also been acquired concerning possibilities for action in the different countries.

A major achievement of the negotiations, which some believe to be contestable, is the modality of action based on quantified emission limitation and reduction objectives. Historically, another choice could have been made. Our hypothesis is that the creation of an international climate regime with emission limitation objectives agreed upon by the States is still the prerequisite of any international action *of a certain scope and effectiveness* to control greenhouse gas emissions.

- *The "missed compromise" at the 6th Conference Of the Parties in The Hague*

Failure of the attempted agreement between the US and Europe at the sixth Conference of the Parties in December 2000 called into question these achievements and marked an end to the comprehensively international character of the negotiations. At The Hague, while agreement had already been reached on the principles of the main modalities of action, negotiations came up against a stumbling block when the US and their allies demanded greater flexibility (unrestricted operation of emissions trading markets and addition of carbon sinks). Admittedly, these demands meant that the efforts to combat domestic emissions and reduce costs were somewhat diminished, but they retained the key elements making up the climate regime. Let us not forget either that six months later, the agreement concluded at the talks in Bonn included the demands that had caused failure at The Hague. But during this time, the final blow was delivered by President Bush's announcement in March 2001 that the Americans were withdrawing from the Kyoto process.

In 2002, President Bush presented his federal strategy to combat Climate Change, the Global Climate Change Initiative (or the "Bush Plan"). This strategy is quite different from the Kyoto method [Blanchard 2003] in that it gives priority to technological investment as a response to the environmental problem and rejects the system of fixed reduction targets:

- The quantified reduction objectives are retained, but they are no longer absolute targets or quotas but rather "dynamic objectives" for reducing the intensity of emissions, measured as the ratio "emissions/GDP".
- These targets are voluntary and are not the fruit of international negotiations; furthermore, they are not restrictive in the sense that there is no associated penalty mechanism.
- Finally, emphasis is placed on technology through renewed funding to institutions for technology and scientific research.

- *After Marrakech, the elements of a partial international climate regime*

A set of principles and standards was established by the Convention. It was completed by a set of rules and procedures provided for in the Protocol and its implementation agreements decided in Bonn and Marrakech [Berthaud et alii, 2003]. This successfully completed institutional structure nevertheless has two major flaws. The first relates to rules, and comes from the weakness of the system of compliance. The way compliance may be obtained, with reductions that have not been achieved being carried forward to the next period, means that targets might not be reached at all and decision-making for the other stages may be compromised, especially if efforts have to be stepped up. The second flaw is the institutional imbalance created by the withdrawal of the US, still the largest emitter of greenhouse gases and, as described above, former leader of the process. Since the decision of the US to withdraw from the Kyoto process, the development of international institutions to control climate change has entered into a phase of uncertainty. The prospect of ratification *by all the partners* of a protocol with quantified reduction targets is no longer on the agenda, at least in the foreseeable future. So what are the possible scenarios?

2.3 Can the international community do without a strong climate regime based on emission targets ?

At least four hypotheses or scenarios must probably be examined:

i Anarchy (no international cooperation). This does not mean that States and other actors abandon all action in favour of the climate, but that they only act individually (this is what the Bush Plan claims to do).

ii A protocol under European leadership, with partners from the Umbrella group (Canada, , Japan and New Zealand) and developing countries, but initially without the US. This would be the path of a regime that would amend the Protocol to make it more attractive and provide more incentives, without betraying the "spirit of Kyoto". This would be a strong, but partial, regime.

iii The replacement of restrictive targets by a more flexible device, with a focus on adopting "best practices", in particular with respect to Research and Development for new technologies. This is the preferred scenario in the US and would result in a "weak regime" based on the expected long-term effects of technical progress. This could even become a hegemonic regime if the United States managed to get other countries to endorse new principles, based on their own preferences.

iv Integration of climate problems into a wider context of "global governance", which would link climate change with other global environmental and development problems. A trend in this direction was observed in Johannesburg (WSSD, Rio+10) and at the New Delhi Conference in December 2002, where global environment problems were placed at the same level as concerns for development and the local environment, and where the methods of action became more diversified.

Each of these scenarios is possible and would only bear fruit under certain conditions, which need to be examined. For example, in the first scenario - a regime under European leadership - the effective implementation of an emission abatement policy, the introduction of a certain form of regulation of emission rights trading, the negotiation with Russia, which have some degree of monopoly power in this field, and the enlargement, in the long term, of the base of the Protocol towards the developing countries.

Which of these four scenarios should be considered as the most likely? Today, the game seems to be wide open. While scenario 1 – anarchy – does indeed seem improbable in the medium- to long-term, given that some form or other of cooperation will be necessary if we are to avoid climate change, the likelihood of the other scenarios is more open to discussion. Indeed, it is by no means certain that the developing countries will be ready to commit themselves, with Europe, to a "strong climate regime" which in the long term would logically lead to adoption of restrictive objectives for themselves, rather than following the United States along the path of a "weak regime", especially if they were financially compensated, as evoked by S. Barrett [2001] or if it constitutes compensation in another deal. It is therefore quite legitimate to consider the risk that the emerging climate regime might disappear if it were integrated *before it was properly consolidated* into the complex problem of creating a system of "global governance for sustainable development".

Why not consider a last possibility, that of the formation and coexistence of different competitive regional regimes? One regime would try to perpetuate Kyoto under European leadership, but within a restricted space. The other would try to internationalise the characteristics of US policy within the framework of another partial international regime based on technology. In this perspective, the ability to convince the major developing countries would be a decisive factor. In any case, the two approaches will have to converge in the long term if the world is to ensure an appropriate response to the challenges of climate change.

Conclusions

Analysis of the creation of international institutions to combat climate change in the 1990s, and of the crises these institutions have experienced since the beginning of 2001, helps identify a few key questions which particularly concern the ability of Europe to impose its vision at the international scale:

Since Bonn and Marrakech, the European Union seems to have become an international leader with respect to climate change, but its position remains fragile. Will Europe be able to implement, on its own territory, effective emission reduction policies? This will surely determine its ability to maintain a leadership position in the long term.

Furthermore, will Europe be able to manage international relations to defend the Kyoto Protocol on three equally difficult fronts: with the United States, in such a way that they might eventually re-join the process, or at least adopt a non-destabilising policy; with Russia, to monitor the problem of “hot air” which upsets the prospects of emission trading; finally, with the developing countries, so that they too would be ready to commit themselves to emission reduction objectives.

If one of these challenges were not met, the entire structure would be in danger. For certain actors, this would perhaps not be a bad thing and the Kyoto regime could give way to a new structure. Our argument today is that the alternative solutions have every chance of providing a framework of incentives that would be less efficient in ensuring that effective emission abatement actions are implemented both rapidly and at the appropriate scale.

An international protocol on R&D would concern only a limited number of production-conversion or energy consumption technologies and may not be sufficient to ensure the necessary mobilisation of all the economic actors. This would probably also be the case if the management of climate risks was postponed until the introduction of “global governance” or “global federalism”, to use the terms of Dani Rodrik [2000]. In this last scenario, the nation-states would step down in favour of an alliance between the business world and international civil society. However, if nation-states are not accountable for their emissions, who will be responsible for the global public good that climate represents, before the creation of a global regulatory authority that may take a long time to be implemented?

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