

Conference « Finance et développement durable : opposition ou partenariat? »

“The Economic Design of Climate Institutions and Policies”

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In the terminology of economists, the quality of the climate is a public good. “Chacun en a sa part et tous l’ont tout entier”¹. These words of Victor Hugo were in this instance referring to the love of a mother for her children, which for economists is also a public good, but in our jargon, a “local” public good: it concerns a community, the localised and small scale family. Conversely, the quality of the climate, as soon as it makes sense to conceive of it on a planetary scale, is associated with a world or global public good. What is damaging the quality of the climate today, namely the growing atmospheric concentration of greenhouse gases, is not a public good but is its opposite, a negative externality or a general or global public bad. Every molecule of carbon dioxide, whether it be emitted in Monaco or Singapore, will spread through the atmosphere and contribute equally to the growth of the atmospheric concentration of carbon dioxide, which has risen from 270 ppm_v at the beginning of the 19th century to 380 ppm_v at the beginning of the 21st century and could reach two or three times the pre-industrial level by the end of the century.

The market, which provides appropriate signals for the production of private goods, is not clearly suited for the provision of public goods and still less so for the avoidance of negative externalities. In economic textbooks, public goods and externalities are referred to in the chapters on these categories as “market failures”. At the beginning of his report, Sir Nicholas Stern strongly emphasises that the growth of the atmospheric concentration of greenhouse gases, which underlies the climatic changes already observed and the more dramatic changes expected, is the “most spectacular market failure” ever recorded. If I have here introduced terminology familiar to economists that is somewhat technical, it is to underline that the economics of climate policy, the subject that I am concerned with here, lies within the framework of traditional thinking, while also immediately emphasising that the dimensions of the problem, both spatial and temporal, lead either to using traditional ways of thinking up to the limits or to shattering their framework. We are therefore faced with a series of intellectually unprecedented problems to resolve a real issue that is also unprecedented.

The theme “the economic conception of climate policy” can be discussed under two main headings. The first is the strategy of climate policy, the second concerns its institutions. Under the heading strategy of climate policy I put the question of its intensity: the reduction in emissions to aim for and the pace of its implementation, in other words the temporal deployment of abatement efforts. When should this begin? Should the efforts be applied progressively or without delay? And so on. The question of institutions addresses the best means of establishing international cooperation, which to be effective must be global. Such questioning places traditional issues of environmental policy in different light: what should be the respective roles of regulation, prices and quantities?

¹ Possible translation “Everyone has a share in it and we all have it as a whole”.

The strategy of climate policy

On the first question, the strategy of climate policy, I shall be brief, for reasons I shall explain. Firstly, let us appeal to the precautionary principle. This states – according to the formula that appears in Barnier’s law² – that “the absence of certainty, given the actual state of scientific and technological knowledge, should not delay the implementation of policies, aiming at preventing the risk of serious and irreversible damages to environment”. Unless this is seen as a fundamentalist, and untenable, demand immediately to cease all emissions, or a less brutal one, but still untenable, to stabilise concentrations at the current level, the operational value of the principle seems to be limited. The addition of the rider: “at an acceptable economic cost”, as in the Barnier law, does not make it more informative. But it places the ball in the court of economic expertise, which has the task of balancing the benefits of policies against their cost. In some ways, the Stern Review, whose author will be speaking to us shortly, consists of a huge cost-benefit analysis of climate policies. The benefits of climate policies are of course the economic, social and environmental costs they avoid. To be specific, there are major uncertainties on these and all the more so as the time horizon in relation to which climatic effects are estimated recedes. One of the great strengths of the Stern Review is its placing of this considerable uncertainty at heart of the analysis, while previous studies, if not evading it, have at least relegated it to second place. There are other questions too, upstream of the economic calculation that is the key to determining climate policies, which are addressed in the Stern Review and in the literature – the cost of policies, and the thorny question of the value placed on the well-being of close or distant future generations – all of them meriting further discussion.

There is, however, one point bearing on the strategy of climate policy that I would like to raise, on the one hand because it provides a good introduction to questions of governance and institutions that I shall discuss in depth, and on the other hand because it raises a question the answer to which should not be subordinate to implementing the whole apparatus of economic calculation I have referred to. This is the question: should we commit ourselves to reducing emissions today or bank on the reduction which tomorrow will result from fossil fuels (oil, gas, coal) being replaced by carbon-free energy sources, either developed by the improvement of existing techniques, such as photovoltaic and nuclear power, or radically different techniques such as hydrogen and nuclear fusion? The debate acquired new intensity when the United States decided not to ratify the Kyoto protocol. Indeed the Bush administration announced a climate programme in which the first option, immediate emissions reduction, was absent altogether, but which laid significant emphasis on the second, the effort to develop alternatives. This asymmetry was quickly recognized and justified by its supporters as a recognition of evidence, namely that the solution to climate problems lay in research and not in the effort to reduce emissions. In their view, salvation will come from the arrival and general use of revolutionary techniques, new generation photovoltaic or nuclear energy, an economy in which energy for transport will be provided by hydrogen rather than by fossil fuels. Conversely, the countries committed to the Kyoto protocol planned to devote most of their efforts to emissions abatments.

I am not indifferent to the argument for increasing research and I stated in my report for the Conseil d’Analyse Economique (Economic Analysis Council) commissioned by the French prime minister³ that, the Kyoto signatory nations should have intensified their research even if

² Loi Barnier, 1995.

³ « Les enjeux économiques de l’effet de serre », p. 1-90, in « Kyoto et l’économie de l’effet de serre » ourty, dir. R. Guesnerie, La Documentation Française, 264 p., 2003

it meant, at given level of effort, cutting back their abatement ambitions. It is no less the case that the “all research” argument, as it was then put forward, is completely pernicious. What is needed is both research and emissions reduction.

Sophisticated reflection on the most general strategy of climate policy, its timing, its extent, cannot do without a series of hypotheses to feed economic calculation – assessment of damage and costs, frequency of updates, option value – which will affect it in a possibly crucial way. However, the argument I am going to present here, and its conclusion that significant efforts to reduce emissions must be combined with significant research efforts, is robust to the precise hypotheses that allow to “fine tune” the abatement strategy profile. There are three reasons for this.

First, research and emissions abatements are complements rather than substitutes. Reducing emissions entails a cost, but also, through economic tools such as taxation and emission trading permits provides costs signals whose extrapolation is particularly useful for evaluating the extent to which research pays off. The reduction policies that are beginning to be set up are already a powerful stimulant to research, both because they provide initial profitability records and also, and perhaps above all, because they are a strong and credible signal of political will, the best guarantee of the future of climate policies.

The second reason to immediately start making significant emissions reductions stems from the life cycle of energy technologies. This is from thirty to more than fifty years for a thermal power station. If one thinks today about the energy needs that are going to arise in the next twenty years, especially in developing countries which have succeeded or are on the way to succeeding in taking off, it is clear that any delay in the shift away from carbon-based energy will have considerable consequences.

My third point is based on Robert Socolow’s article which appeared in *Scientific American*)⁴. In this article, Socolow puts forward 15 climate policy tools, corresponding to the 15 wedges in the diagram below, each of them supposedly contributing equally to the reduction of greenhouse gas emissions.

⁴ and was reprinted, in *Pour la Science*, last year.

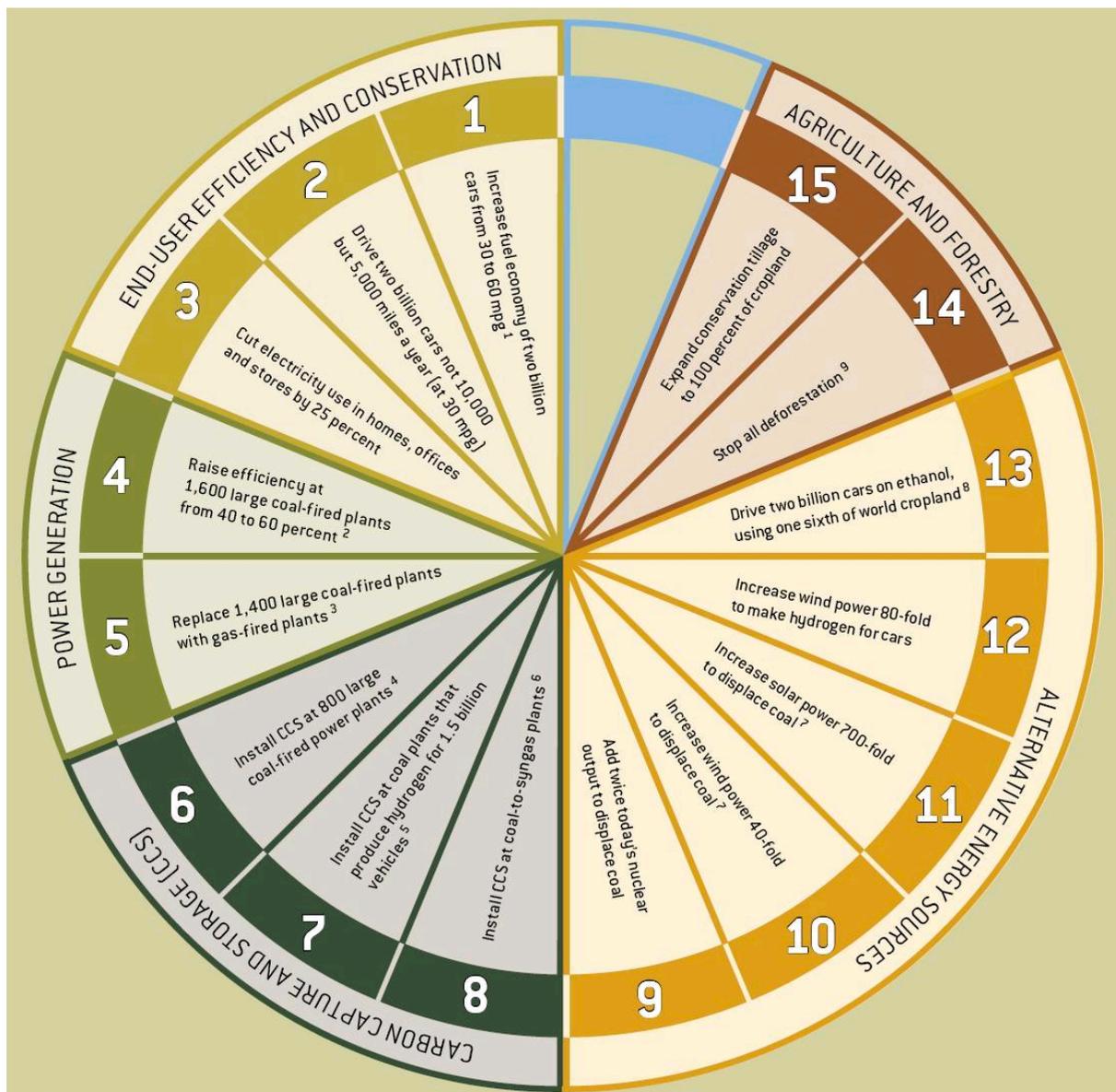


Figure 1. 15 Ways to Make a Wedge, Socolow & Pacala, Scientific American, September 2006

According to Socolow, the simultaneous implementation, over of the next half century, of just seven of the tools shown would enable the concentration of greenhouse gases in the atmosphere to be stabilised by 2050. Yet such actions are often based on existing technologies (nuclear, wind), which can certainly be improved between now and 2050, but often only to a marginal extent. The same goes for the improvement of energy efficiency, requiring resolute action using procedures that are no doubt perfectible but are already in place. It is only after 2050 that the technological breakthroughs referred to above could be achieved or at least move on to the industrial stage. Research in the areas concerned (photovoltaic, nuclear, hydrogen, carbon sequestration) is of course essential but it answers to only part of the problem and does not does meet our immediate needs. Undertaking resolute action to reduce emissions and extensively investing in research are not mutually exclusive alternatives but are both levers for creating synergy.

This brings me to the core of my remarks, which concerns the institutions of climate policy. Without being wholly independent of the previous question – that of the strategy for action – it is largely distinct.

Designing Institutions

Discussion about institutions unquestionably brings us back first of all to existing institutions and arrangement, to be specific, the Kyoto protocol. This has three features which should be dwelt on.

- First, the Kyoto protocol imposes binding commitments only on a sub-group of countries, namely rich, high-emission countries (annex B).
- Second, these commitments are quantitative, limiting emissions over the period 2008-2012 to a level indexed on the 1990 level (approximately 5% less than the 1990 level). Each country is given an emissions quota.
- But, and this is the third point, these quotas are negotiable. A country that reduces its emissions beyond its quota will be able to transfer it, for a payment, to a country whose emissions exceed its quota. Therefore the Kyoto protocol sets up on a planetary scale an emissions permit market, so far tested out in only a small number of instances (the most well known of which is the sulphur dioxide permit market in the United States at the end of the nineties).

This reminder of the features of the Kyoto protocol calls for a number of comments.

- The Kyoto protocol, despite its standardising logic (objectives fixed in all countries according to a base year) imposes considerably different efforts on the participating countries. The most flagrant case is that of Russia: after the dismantling of part of Soviet heavy industry, emissions have fallen way below their 1990 level. Without any particular effort, Russia will do much better than the quota imposed on it. It will therefore have what in the jargon is called “hot air” and will be in an offering position on the emissions permit market. Two questions follow. First, how will Russia’s near-monopolistic offering position affect the functioning of the market? Second, the ratification of the Kyoto protocol by Russia – which at least initially will obtain certain benefits from climate warming – has been greatly facilitated by this special treatment. Hence the question: should not the quotas, rather than being uniform, be differentiated, in order to reflect not only the differences in cost borne by countries but also their different exposures to climate risk?
- This leads me to my second comment. The setting up of an emissions market, a proposal introduced into the negotiations by the United States, was initially strongly resisted, in particular on the part of the European Union, which after finally agreeing to a formula became its main advocate, but also and most emphatically by part of the ecologist movement. The “commodification of nature” that resulted from it was condemned in principle, but the formula was also charged with allowing rich polluters (the United States) to get off lightly through exemption from part of the effort. Outside of a fundamentalist vision of the defence of the environment and a refusal of the market principle, these objections carry little weight. Using economic instruments and

action on prices to achieve an environmental objective in a market economy is a condition for efficiency. The emissions permit market enables abatements to be undertaken where their cost is lowest. Also, the effort that can be imposed in any given country depends on the political conditions of the negotiation and of the good will of parties. An emissions rights market does not enable a polluter to be constrained if he does not want to be. But, it does make him accept a higher objective than he would accept in the absence of the market.

- The third remark is that the Kyoto protocol, in economists' jargon, is a quantity policy. It is a quantity policy since the control variable is the total quantity of emissions. Whatever how the reductions are carried out, and therefore whatever the quota exchanges between the participant countries, the sum of the emissions of participant countries, except in the event of a breakdown of the system, must be equal to the sum of the quotas initially agreed. In this sense a quantity policy can be opposed to a price policy, which, for example, would be based on setting up a harmonised carbon tax among the participant countries. A quantity policy guarantees in principle the result targeted, but the cost of achieving the target is uncertain beforehand. A price policy, involving a fixed carbon tax for the period at a well-defined level, gives in principle good prior visibility of the costs of the policy but leaves uncertain the emissions reduction target that will be attained.

Following the withdrawal of the United States from the Kyoto protocol, the debate on the respective merits of price policies and quantity policies was reopened. In a historical irony, the sides of the debate were reversed. Europe, on the initiative of France, had in the 1990s proposed a harmonised tax, which the United States had refused. The Kyoto architecture owes much, as has already been said, to American influence. With Kyoto adopted, but rejected by the United States, it became the focus of criticisms from across the Atlantic. These criticisms claimed that a quantity policy, in a situation of uncertain costs, requires an overly rigid effort and that a harmonised carbon tax at a negotiated but fixed level was preferable.

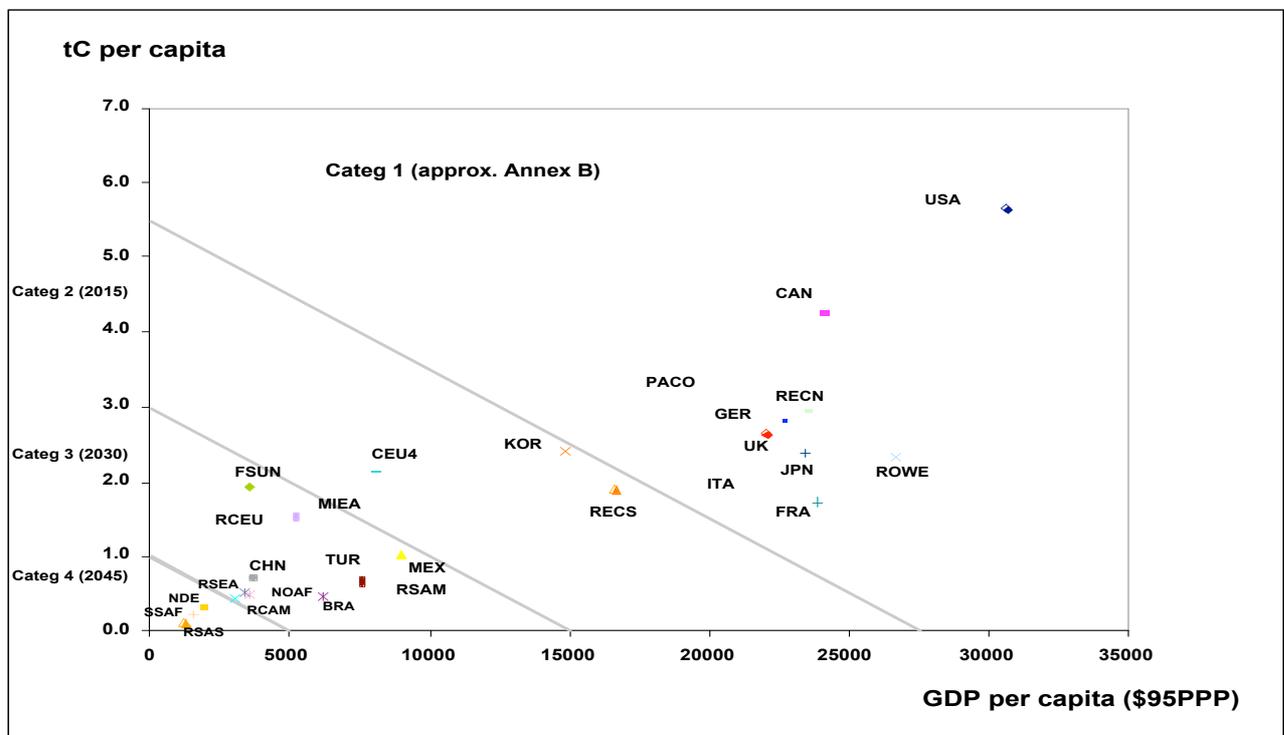
The nature of the debate should be clearly understood: the Kyoto protocol does not lead to giving up price-based economic mechanisms. On the contrary, it is designed to produce a world carbon price which will serve as a reference for economic agents. It also leads to setting up either a carbon tax, of which the climate-energy proposal put forward in France by "le Grenelle de l'Environnement" is the concrete expression, (if the emphasis is placed on the climate factor), or permit markets, which, when the quotas are not allocated free of charge, generates revenues of the same nature as tax revenues. But these prices are liable to be set at different levels depending on the cost scenario, while the reduction goal is in principle intangible; conversely a harmonised carbon tax regime would specify an intangible level for the tax. Three remarks on this debate.

- It is difficult for a non-economist to understand that emission volumes are not control variables for climate policy, since our knowledge of climate risk links it to the concentration of greenhouse gases in the atmosphere, which depends on the accumulation of emissions. However, the argument in favour of price policies is echoed by some economists (it was recently taken up by Joseph Stiglitz).
- As I told J. Stiglitz, when commenting his proposition in Paris, last January, I personally believe that a harmonised carbon tax without some direct attempt at

mastering the emissions volume, (and quite apart from the difficulty of defining and setting up the harmonised tax), is a third best policy. The merits that are attributed to it are put into question by a suitable analysis of the interactions between carbon taxation and the price of fossil fuels. Indeed, it is the sum of oil price, (I take oil as an example) plus carbon tax and not only the carbon tax that determines the strength of the price signal. In a static world, taxing a non-renewable resource has no effect on its final price. It simply transfers the producers' rent to consumer countries. In the complex world we live in, however, the effects of a carbon tax on the final price of oil or other fossil fuels are difficult to predict but in any case must depend in a sensitive and subtle way on the evolution of the tax over time. In contrast to what the standard classical analysis says about "prices versus quantities", the uncertainty as to costs of a price policy, when one takes into account the fossil fuel market, is probably greater than that of a quantity policy⁵.

- An ideal architecture would probably have to combine minimal harmonised taxation and reduction goals going beyond what this "basic" tax allows us to hope for and whose realization would involve setting up economic mechanisms or additional regulations. In terms of economic theory it would remain a quantity-based policy whose "brutality" could in addition be mitigated by establishing, though difficult institutionally, a safety valve to limit possible erratic cost overshoots of policies.

My first three comments have born on the logic of Kyoto, the allocation of quotas, on the logic of quota markets and on the debate on the control variable of the policy, whether price or quantity. This leads me on to what is clearly the most serious shortcoming of the Kyoto protocol: the extent of the carbon market it establishes is limited to the developed countries.



⁵ See my paper forthcoming in "The design of climate policies", R. Guesnerie, H. Tulkens eds, MIT press, 2008.

Figure 2. Emissions and development (Blanchard et al., 2000)

Certainly, as the above graph shows, greenhouse gas emissions come primarily from the developed countries (six tons of carbon per person per year in the United States, less than two tons in Sweden and France, the best European performers in this area, and less than half a ton for India). But the situation is changing rapidly. The total emissions from developing countries will before long overtake those from developed countries. When I wrote my first report for the Economic Analysis Council in 2002, the date expected for this shift was 2025; we are now talking of 2015 or before. The situation therefore is going to become critical. Commitments are in annex B, while paradoxically the most strategic decisions, relating to the rapid development of a long duration energy-producing capability and the least costly emissions abatements are outside annex B. Existing mechanisms for incorporating reductions outside of annex B, such as the Clean Development Mechanism, are dramatically insufficient for the task. It is imperative that what may be called metaphorically the “carbon tax” space be broadened.

How is this goal to be achieved? The most intellectually attractive solution would be to open the Kyoto agreement to developing countries under conditions that are acceptable to them. The basic position of developing countries is extremely clear and a priori discouraging: the accumulation of greenhouse gases in the atmosphere is the historical responsibility of the developed countries; they have exhausted their accumulated emissions credit, which now remains open for developing countries. Even if we forget the argument of the ecological debt the developed countries would have contracted, the fact must be faced that developing countries are not ready to make significant financial effort, still less to curb their own development, for a climate policy.

Are there any solutions? Yes, for one can imagine the inclusion of developing countries in a revised Kyoto through the allocation of suitable quotas. In my report for the Economic Analysis Council, relying on IEA earlier suggestions, I made various proposals along these lines : either quotas sufficiently generous to be in fact non-binding or unilateral quotas, which could be put on the global permit market when reduction performance leads below the quota, and without entailing any financial sanction in the contrary case. By extending the carbon market area to the whole world, these proposals would be likely considerably to improve the effectiveness of climate policy. They would entail possibly high resources transfers from developed countries to developing countries. But they would also be win-win solutions, with the developed countries setting themselves more stringent quotas but getting access to wider and less costly sources of reduction.

This proposal which seems suggested by common sense backed by economic theory is nonetheless problematic. Why? The first reason is that certain developed countries are opposed to setting up partly uncontrolled financial flows toward developing countries. This was in any case the US position some years ago. The second reason, which stems from what has been called the ratchet effect in Soviet planning, is that it is unlikely that developing countries would accept a generous quotas scheme without the assurance that today’s generosity will not be succeeded by severity tomorrow, in other words without any discussion of commitment and the medium-term target. Without agreement on the principles of medium to long term sharing of effort, which again gives rise to the question of egalitarian sharing (for example in the form of identical per person quotas worldwide), it is implausible that developing countries would accept the formulas, seemingly attractive for them, that I have

just outlined. I will add that these formulas are probably less attractive to them than they appear, since the benefits that can be drawn from them depends very much on the capability – which is often limited – to get available and master economic tools.

What then is to be done? We should first of all ask ourselves what chance there is of establishing climate policies within a limited “carbon tax” space. Just as certain people were wondering a little less than a century ago about the possibility of building socialism in one country, we can ask ourselves whether a climate policy in a single country or group of countries makes any sense.

When I speak of resolute policies, I am thinking of what is called factor 4, that is, the goal of dividing by four the emissions per capita in developed countries by 2050. It can be assumed that the introduction of a carbon tax in a limited area will have major consequences for the competitiveness of the industries subjected to it. The cost to competitiveness will have to be added to the internal costs of the climate policy associated with emissions reduction and research. In the absence of a worldwide carbon market, the advantages of the policy will be also affected by “carbon leakages”. First, demand for a number of products, will naturally tilt toward countries with low ecological standards; second, the asymmetry of the situation will lead to a certain number of companies and industries relocating to countries where ecological standards are less stringent. Demand switch plus relocation will deteriorate the environmental benefits of the whole policy. Qualitatively, nothing precludes the action of the ecologically virtuous countries leading to serious reduction of competitiveness while increasing global pollution. A very poor state of affairs....

Beyond such qualitatively very open prospects, what can be said in quantitative terms today? What are the facts of the situation? The competitiveness of specific industries would be affected very differently. Current calculations suggest that with a 30 euro carbon dioxide tax, which would amount to 100 euro per ton of carbon – which is low in relation to the Factor 4 goal – on an industrial quota market, including the electrical industry, as is the case for the European market, the price of cement would increase by 115%, steel by 30% and aluminium by 18%, though these aggregate figures within industries reflect considerable disparities in their product ranges. The effect on competitiveness is therefore significant. How about the environmental impact and the intensity of leaks? We have few studies for the moment, but they suggest that this effect is potentially serious⁶. Whatever the objective reality, it is likely that the combination of the competitiveness effect and the leaks effect would weigh heavily as a major political risk for support for climate policies in the virtuous countries.

What then is to be done? I shall speak briefly, without attempting to examine the problem in depth, of two conceivable solutions that are currently being envisaged: one, border adjustments and, two, sectoral agreements. Let us note first that the problem I have just raised – the counter-productive international effects of limited area climate policies – would have a simple solution if it were possible to impose an “carbon added tax” within the “virtuous” groups of countries, using a levying system analogous to “value added tax” (VAT) and which, like VAT, could be removed at the exporting stage and imposed at the importing stage. Unfortunately the idea seems difficult to put into practice.

Border adjustment is thus an imperfect substitute for such a seemingly hard-to-implement carbon added tax. This could take various forms, depending on the formula adopted for

⁶ See the study by Demailly-Quirion on the cement industry, forthcoming in “The design of climate policies”, R. Guesnerie, H. Tulkens eds, MIT press, 2008.

removing the carbon tax for exports or retaining carbon taxation for import. Indeed, this latter question creates very tricky technical and political problems. One technical problem is how to assess the carbon content of an imported product, in particular because it can vary considerably from country to country. There is also a political problem which echoes the arbitrary nature of the measurement and brings us back to the standard rules of international exchange governed by the WTO. Within the framework of the European Trading Scheme, which allocates quotas to part of European industry and establishes a carbon price, a border adjustment which would reimburse the quota price at the time of export and would make importers pay the equivalent of the quota cost would probably not infringe current WTO rules. But this formula probably only fully makes sense if initial quotas have to be paid for. Any more ambitious scheme would probably reopen discussion of the rules that govern the environmental aspects of trade, and might even lead to rethinking a global trade/environment compromise for the 21st century.

Another line of thinking involves setting global sectoral agreements applying, in a pragmatically differentiated way, to all the major sectors: steel, cement, refineries, aluminium, chemicals and power. It would be a matter of establishing, not a single world carbon market, but several world carbon markets that could be unified later. The conditions for the political arrangements for such sectoral agreements are at present uncertain, and the place that nation states and producers' organisations should take in it is far from clear and varies according to the sector. The technical forms of the agreement are also much open: whether they should be agreements on absolute reductions, or relative reductions, in terms of emissions intensity and not of total volume. The handling of the major differences between production systems (wide array of technological vintages) in different countries also gives rise to formidable problems.

At this point I bring my overview to a close, without seeking a conclusion. I simply wanted to give an idea of the diversity of viewpoints that need to be taken into consideration to evaluate the economic design of climate policies at least in relation to climate policy institutions. Building efficient climate institutions is a key challenge, which is likely to remain before us for one of several decades. The implementation, within such institutions, of efficient climate policies, is a question which will probably dominate much of the 21st century.