Long-term climate targets: To each his own quota

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While the Kyoto Protocol may represent an important political achievement, its expected impact on the climate is marginal at best. The agreement is nowhere near sufficient for stabilizing or reducing the concentration of greenhouse gases in the atmosphere, partly because developing countries have not committed to reducing their emissions in this round. Future climate negotiations must therefore contain more ambitious targets as well as the participation of developing countries. In attempt to realize this aim, the Global Commons Institute has proposed that emissions entitlements be allocated on a per capita basis.

In 1990, the Global Commons Institute (GCI) drew up a proposal regarding "equity for survival." The proposal was based on the idea that the climate problem couldn't be resolved without reducing the ever-growing gap between the rich and the poor. In terms of abatement, a fair burden-sharing scheme would place much of the responsibility on the shoulders of the industrialized countries since they have historically been responsible for most of the emissions. As a result of this growing political awareness, GCI developed a method for reducing emissions of carbon dioxide (CO_2) based on "equity for survival." The method, called "contraction and convergence" (C&C), was first developed by Tony Cooper and Aubrey Meyer in the spring of 1996. A team from GCI then presented the idea to the second Conference of the Parties (COP 2) in Geneva, in July 1996. Since then, the idea has garnered support from more and more governments and NGOs.

The basic idea is that we need a long-term, global agreement about controlling the total emissions budget of CO_2 and how this budget should be fairly divided between all countries. The emissions budget will be consistent with a given concentration of CO_2 in the atmosphere by 2100. C&C defines a formula for allocating future tradable CO_2 quotas for all countries based on a gradual transition to per capita shares.

Reduction

The method assumes that, in the light of the Precautionary Principle, there will be a collective agreement to reduce emissions of CO_2. The principle is reflected in Article 3.3 of the Rio Convention, which states that lack of scientific certainty should not be used as a justification for postponing measures when there is a danger for serious or irreversible damages.

To avoid dangerous climate changes, the concentration of CO_2 in the atmosphere must be stabilized. In 1990, IPCC's Working Group I declared that the global emissions of CO_2 should be reduced relatively quickly by 60–80% from current levels just to simply be able to stabilize the future concentration at a level higher than the present. The C&C method assumes that the total anthropogenic emissions of CO_2 in the period 1990–2100 should not lead to the atmospheric concentrations of CO_2 exceeding certain levels, e.g., 450, 550, and 650 ppmv (total molecules of a gas per 1 million air molecules). Ideally, atmospheric concentrations should be kept as close to present levels as possible. Emissions from 1860 to the present are probably already causing damage, and the concentrations of greenhouse gases are not stabilized until long after the actual emissions have been stabilized or reduced. The size of GCI's emissions budget initially results in a concentration of 450 ppmv, but emphasis is put on keeping the budget flexible. This is because it could turn out that a concentration of 450 ppmv can lead to unacceptably high damages and that more stringent targets could be necessary. In comparison, it is worth noting that the concentration of CO_2 in the atmosphere today is slightly less than 370 ppmv.

Convergence

Just as important as determining the emissions budget is determining how this budget should be divided up. The burden sharing described in Annex B of the Kyoto Protocol is not based on any particular allocation criteria, but rather is presented as an outcome of negotiations between the individual delegations and chairman Raúl Estrada. A long-term climate agreement will have to follow a more systematic burden-sharing scheme, and will also have to include developing countries. This is particularly important for the US ratification of the Kyoto Protocol and future protocols. A long-term climate agreement cannot be achieved unless it is seen as both fair and feasible.

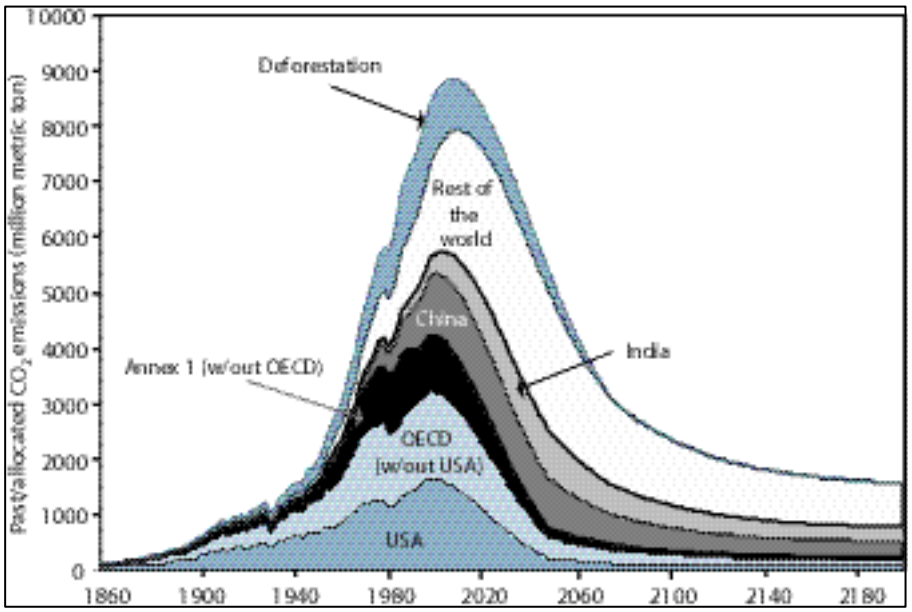
The convergence aspect is based on the idea that each person should be entitled to emit the same amount of CO_2. This means that the annual emissions budget is divided between the countries of the world so that all countries converge towards the same per capita emissions within a certain time period. Countries that cannot manage to keep within the allocated emissions can purchase emissions entitlements from countries that emit less than the allocated quota. The timing for convergence must be determined beforehand, and after that time, quotas will be allocated on the basis of equal per capita emissions. GCI has chosen the symbolic 2045 as a convergence year, since it also represents the 100-year anniversary of the United Nations.

Population estimates will naturally have a significant impact on each country's allocation of quotas. For the first period, the UN averages are used to project population growth, but after a certain year, the population sizes will be "frozen." This means that the population will be treated as a constant so that there will be no incentive for countries to increase their populations in order to receive more emissions quotas. While there is a logical argument for introducing a population "freeze" as soon as the agreement enters into force, there appears to be agreement on allowing a certain adjustment period.

Results

On GCI's home page (http://www.gci.org.uk(contconv/cc.html), there is a downloadable, spreadsheet-based C&C model where the parameters can be changed and the results can easily be illustrated graphically. The results shown in figures 1 and 2 are based on a global emissions budget that gives a CO_2 concentration not exceeding the 450 ppmv limit. The convergence year is set for 2050 while the population is "frozen" in 2030. Figure 1 demonstrates that emissions of CO_2 in 1990 were at a good 6 gigatons (GtC), while the peak of about 9 GtC is reached around 2015. For atmospheric concentrations to not exceed 450 ppmv, the industrialized countries must reduce their emissions significantly (see figure 2). It is also clear that developing countries will increase their emissions and be responsible for a much higher share of the global emissions in, e.g., 2070 than in 2000.

Figure 1. Past / allocated CO_2 emissions from 1860 to 2200.



The effect this has on the Annex B countries is also clear from figure 3. The emissions quotas allocated to the United States has decreased from 6 metric tons per capita to 1 metric ton per capita between 2000 and 2050, which will necessitate significant social changes. Norway will also be allocated significantly fewer quotas per capita. The C&C method will allow Norway to emit just as much CO_2 in 2010 as in 1990, while the Kyoto Protocol permits an increase of 1% for all greenhouse gases in the same period. In the long term, however, there will be additional cuts in Norway's allocated emissions budget. In 2020 the allocated CO_2 quotas will represent a 20% cut in emissions from 1990 levels, while the comparable quotas for 2030 and 2040 are 40% and 60% lower, respectively, than 1990 levels. Developing countries such as China and India initially have much lower per capita emissions levels and these can be increased in the first period. The emissions will converge in 2050 and be gradually reduced in the rest of the period.

Figure 2. CO_2 concentration (ppmv) from 1990 to 2200

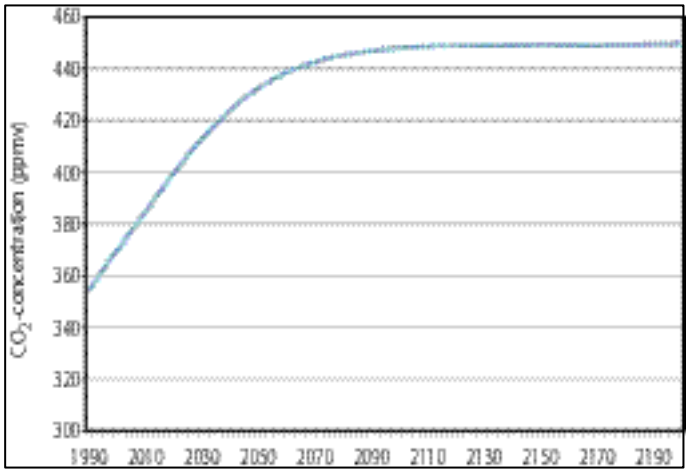
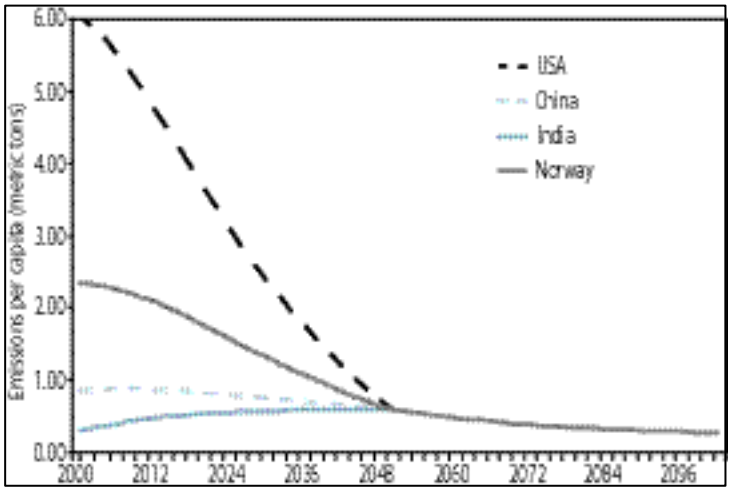


Figure 3. Per capita allocated emissions quotas in the period 2000–2100



Compromise?

The starting point of the C&C method—that all citizens have the right to emit the same amount—is undoubtedly popular with the developing countries. If their emissions are lower than the allotted quota, they can sell the surplus to countries that are not able to meet their commitments merely through domestic reductions. The industrialized countries, on the other hand, support allocation on the basis of past emissions. These two perspectives are so far removed from one another that a compromise between them can be necessary to reach an agreement on burden sharing. One alternative is therefore the burden-sharing scheme used in a study in which CICERO participated. This study assumed that emissions quotas were determined by weighing allocation based on per capita emissions against allocation based on past emissions. The weighting gives each person an equal value so that the final allocation will more resemble the per capita allocation.

Current per capita emissions

The C&C model covers only CO_2, but it sufficiently illustrates the point about continually reducing the emissions budget and converging per capita emissions. In 1999, the Australia Institute published a study with data on per capita emissions of greenhouse gases (CO_2, CH_4, and N_2O). The per capita emissions of selected Annex B countries (metric tons CO_2 equivalents) are listed below:

Australia		26.7
Canada	20.6	
Denmark		14.9
England		11.3
France	7.8	
Germany		12.6
Japan		9.5
The Netherlands		14.4
Norway	8.7	
Poland	10.3	
Russia	10.3	
Sweden		4.2
USA		21.2

Source:

Turton, H., and C. Hamilton, 1999. Greenhouse gas emissions per capita of Annex B Parties to the Kyoto Protocol. The Australia Institute.
http://www.tai.org.au/publications/percapita2.shtm