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The equitable sharing of atmospheric and development space

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In the quest for an international climate agreement on actions to address the climate change crisis, three aspects have to be the basis simultaneously: the environmental imperative, the developmental imperative and the equity imperative. This EDE formula requires that the different pieces of the climate negotiations be seen and addressed in a holistic way. In particular, setting the global goal for emission reduction has to take account of the environmental imperative, and also deal with the emission reductions of Annex I and non-Annex I parties. A global carbon budget of how much more emissions should be allowed between now and 2050, and how that budget should be allocated especially between developed and developing countries, should be determined.

Thus the fixing of a temperature target and of a global emission reduction goal must be done within a paradigm or framework for the equitable sharing of the atmospheric space and the development space. The sharing of the mitigation efforts, and the support (finance and technology transfer) that must accompany this sharing, is a most critical piece of the jigsaw puzzle.

The United Nations Framework Convention on Climate Change (UNFCCC) recognises the equity principle; that developed countries take the lead in emission reduction, and that developing countries have development imperatives, and their ability to undertake climate actions depends on the extent of support they receive from the developed countries. Annex I countries will also meet the agreed full incremental costs of implementing developing countries' climate policy measures.

The carbon budget and its sharing

The historical situation

Between 1850 and 2009, about 1,280 gigatons of carbon dioxide (CO_2) were emitted, thus adding to the stock of CO_2 in the atmosphere. To achieve a 67% probability of limiting temperature rise to within 2°C, CO_2 emissions in 2010-50 must be

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kept to below 750 Gt; a 75% probability requires a 600 Gt budget.

In the historical situation, estimates for the fair share for developed and developing countries are based on proportion of population for 1850-2008. Cumulative global emissions have totalled about 1,214 Gt in 1850-2008. Annex I countries accounted for 878 Gt or 72% of the total. Their share of population was about 25%, so their fair share was 310 Gt and their overuse was 568 Gt. Non-Annex I countries accounted for 336 Gt or 28% of the total. Their fair share was 904 Gt and their underuse was 568 Gt.

The carbon debt of Annex I countries was thus 568 Gt for the period 1850-2008. They are still accumulating debt because their actual emissions as a group in 2009 still exceed their fair share.

Budget sharing

In sharing the remaining carbon space in 2010-50, two concepts need to be taken into account: (1) the allocation of carbon space according to rights and responsibilities; (2) the actual carbon budget (and related physical emission reduction schedule) that countries eventually put forward as what they can physically undertake.

There could be a difference between the allocation of responsibilities and rights, and the actual emission reduction or related budgets. Countries that cannot meet their allocated budget or emission cut can compensate for this unmet part of their obligation, and countries that do not make full use of these rights can obtain the funds for their actions.

In any calculation of the sharing of remaining carbon space, the carbon debt owed by Annex I countries as at 2009, i.e., 568 Gt of CO_2, should be taken into account. Thus in the 2010-50 carbon budget: If a total budget of 750 Gt is taken, and the population ratio of Annex I countries to the world population is 16%, then the Annex I countries' fair share is 120 Gt. However, to fully discharge their carbon debt as at 2009 (568 Gt), their allocation for 2010-50 should be a negative budget of 448 Gt. Developing countries with an average population ratio of 84% would have a fair share of 630 Gt of the total 750 Gt budget. However, since they have a credit of 568 Gt in 2009, their allocation for 2010-50 would be 1,198 Gt. A similar calculation can be done for other budgets (e.g., 600 Gt).

Critique of existing proposals on global emission reduction

The main proposal (from some Annex I parties) is for a 50% global emission cut by 2050 (compared with 1990) and an 80% cut for Annex I parties. This proposal has several problems. Firstly, the 50% global cut is environmentally not ambitious enough. It would correspond to a carbon budget far above 600 Gt or 750 Gt in 2010-50.

Secondly, the implied distribution of the carbon budget is unfair. It gives Annex I countries a budget share of 30-35%, compared with their 16% share of the world population in this period. Thirdly, acceptance of this proposal means not only accepting the unfair distribution of the 2010-50 carbon budget, but also writing off the 1850-2008 cumulative debt of developed countries. Fourthly, accepting these figures (50%, 80%) implicitly entails acceptance of a specific emission cut target for developing countries, and locking in this whole distribution of the carbon budget and set of emission cuts.

In 1990 the global emissions of all greenhouse gases were 29.7 Gt (per capita emission of 5.6 tons). Annex I emissions were 18 Gt (15.3 tons per capita) or 60% of the total. Non-Annex I emissions were 11.7 Gt (2.9 tons per capita).

By 2050, a global cut of 50% from 1990 would bring global emissions down to 14.9 Gt (1.6 tons per capita). An 80% cut by Annex I countries would then result in the following in 2050: Annex I emissions would go down by 80% to 3.6 Gt. Non-Annex I emissions would go down by 5% to 11.4 Gt; their per capita emission would be 1.5 tons or 50% below 1990 levels. Non-Annex I countries would thus have to drastically cut their per capita emission levels by half. The non-Annex I cut is even higher when compared with the 2005 level; it would be 42% (absolute) and 60% (per capita).

So, in order to fulfil the environmental goal of a global cut of 50% to 85% (and the upper end is more appropriate to approach the required global carbon budget), it is clear that developed countries will have to go into "negative emis-

sions" territory in order that the developing countries can have a decent degree of "development space" through being allocated allowed emissions sufficient to cushion their path to low-emission growth. For a global cut of 50% below 1990 levels, the following are some conclusions:

- If the Annex I countries cut emissions by 80%, then developing countries would have to cut their per capita emissions by 50%, to 1.5 tons. To avoid a per capita emission cut by 2050, developing countries would retain a level of 3 tons per capita; Annex I countries would have to cut their total emissions by 147%, i.e., cut by 100% to zero and then cut by another 47% to reach a level of negative 8.4 Gt.

- If a goal is set for developing countries to double their per capita emission (to allow for development space), Annex I countries have to cut their aggregate emissions by 277%. This frees the space to enable developing countries to have 46 Gt of emissions.

- If Annex I countries cannot realistically meet the targets set especially at levels higher than 100%, then the mechanism of compensatory payment to developing countries to assist in fulfilling the allocated targets can be used, as discussed earlier.

Per capita emissions and equity

Having equal emissions per person or country, though at first sight a good principle, in fact would not result in an equitable outcome, as countries and persons have different capacities as a starting point. Developed countries have far better developed infrastructure built using cheap fossil fuels, superior levels of technology, greater human and organisational capacity, and higher incomes.

Thus, if a level of 1 ton per capita is chosen as a "sustainable" level, developed countries have the capacity to reach this level while retaining present levels of per capita income. However, a country that now has a per capita emission of 1 ton or below may retain that level and not be able to climb up the income scale, so that its economic level remains low. Also, developing countries that are currently at moderate emission levels of 3-8 tons per capita would find it difficult to reduce their emissions and maintain economic growth.

Thus, to oblige different countries to have the same per capita emission level (say, by 2050) would be to "lock in" the economic disparities. On the other hand, the concept of per capita emissions equity is a useful one if all countries are at the same or similar levels of development. One possible approach is to retain the aim of having equal per capita emission by a certain year, but to provide countries with coefficients. Thus a country that is much poorer and lacks in infrastructure and technology could have a "multiplier" of 5 or 10 to apply to its coefficient of 1.

The greatest challenge to developing countries is to decouple conventional economic growth from emission growth. This can be achieved adequately only with international cooperation in transfers of finance and environmentally sound technology. Higher levels of finance and technology transfer would lead to greater efficiency in terms of lower emissions per capita while allowing income per capita to grow, and enable mitigation actions by developing countries.

The finance issue in the equation

Resolution of the climate debt

One method of discharging the climate debt obligation (568 Gt at end-2008) is to assess its value and plan its repayment. The economist Nicholas Stern has said: "If the allocations of rights to emit in any given year took greater account both of history and of equity in stocks rather than flows, then rich countries would have rights to emit which were lower than 2 tonnes per capita (possibly even negative). The negotiations of such rights involve substantial financial allocations: at $40 per tonne CO_2e a total world allocation of rights of, say, 30 Gt (roughly the required flows in 2030) would be worth $1.2 trillion per annum."

A carbon debt of 568 Gt, valued at $40 a ton, would be worth $23 trillion. An amount like this, contributed to a fund to be accessed by developing countries, would go a significant way towards supporting and enabling their climate actions. Divided into 40 instalments, this is a sum of $600 billion a year or 1.5% of

the current gross national product of developed countries.

Financing for mitigation

The World Bank estimated that: "In developing countries mitigation could cost $140 to $175 billion a year over the next 20 years (with associated financing needs of $265 to $565 billion)." If the stabilisation target is more ambitious than the 450 ppm chosen, the mitigation costs to developing countries would go up correspondingly.

A study in India (by the Centre for Science and Environment) of the six most emissions-intensive sectors to determine India's low-carbon growth options concludes: "There is no real way we can reduce emissions without impacting growth once we cross the current emissions-efficiency technology threshold ... It is for this reason that India (and all other late entrants to the development game) must not give up on their demand for an equitous global agreement." For the power generation sector, a low-carbon strategy could reduce emissions in India cumulatively by 3.4 Gt by 2030-31. The additional cost of generating power from renewable technologies in the low-carbon strategy over business-as-usual until 2030-31 is estimated at 8,470 billion rupees ($203 billion) at 2010 constant prices, or about $10 billion a year. This also means an average cost of 2,500 rupees or $60 per ton of CO_2 emissions avoided, a rate far above what has been previously estimated by other studies for developing countries (for example, a UNFCCC report on financial flows concluded that most of the emission reduction potential in developing countries can be realised at a cost of below $25 per ton).

Financing for adaptation

Most of the studies on adaptation funding needs are limited in scope. A recent World Bank report estimates the cost at $75 billion to $100 billion a year. In its scenario of $102 billion adaptation cost, the costs are $29 billion for East Asia/Pacific, $23 billion for Latin America and the Caribbean, $19 billion for Sub-Saharan Africa, $17 billion for South Asia, $11 billion for Europe and Central Asia, and $4 billion for the Middle East and North Africa. The Bank's estimate is higher than that of the UNFCCC's financial flows report (at $27 billion to $66 billion a year).

The most comprehensive estimate is from an International Institute for Environment and Development (IIED)-Imperial College study led by Martin Parry. It found that the UNFCCC report had significantly underestimated adaptation costs because it left out several sectors and understated the costs in the sectors it covered by 2 to 3 times. Using the methodology and figures of this study, the adaptation cost for developing countries may come up to $450 billion annually.

Financing for technology cooperation and transfer

The UNFCCC's Expert Group on Technology Transfer (EGTT) estimates the total finance needs at $300-1,000 billion a year, with developing countries' additional funding needs being $182-505 billion a year for deployment and diffusion of technology. This does not include research and development or demonstration costs in developing countries.

Implications for negotiations

Shared vision

In the negotiations on shared vision, developing countries have argued that a decision on a global goal (whether temperature limit or global emission reduction) should be in the context of equity and be preceded by a paradigm for the equitable sharing of the atmospheric space or resource. This should also be the case for the wording on a global peaking year.

This is a correct position because the global goals for temperature and emission reduction have implications for the responsibilities of developing countries or for their options in their emissions and thus their economic pathways. This principle of equity in the sharing of atmospheric space has to be operationalised with the use of carbon budget and debt concepts. The data on fair shares and actual emissions and thus on debt/surplus also have major implications for the sharing of the carbon space in the 2010-50 period, and thus for the allocation of emission obligations and rights as would be expressed in

the shared vision's important element of "global goal for emission reduction."

Mitigation

The concepts and figures on cumulative emissions and carbon debt/surplus make it clear that Annex I parties must continue to "take the lead" in emission reduction. Thus in the current negotiations for the mid-term up to 2020, and even in the discussion on 2050 targets, there should not be an "escape" from this leadership responsibility by arguing that certain developing countries have to join in the effort if there is to be a binding obligation on Annex I parties. Or that they would not want to have a binding commitment on emission reduction because developing countries are "not prepared to join in". The reiteration of historical emissions and historical responsibility and carbon debt are relevant in an argument in favour of binding targets for developed countries, for the continuation of the Kyoto Protocol and for comparable effort by those Annex I parties that are not in the Kyoto Protocol.

It must be recognised that if developed countries undertake only weak targets for the next commitment period and their emissions are reduced by only a little (or even increase), then there is even less carbon space left for developing countries. The present pledges made either in the Copenhagen Accord or previously compiled (by the Secretariat) in the Kyoto Protocol working group are simply inadequate. Various analyses show that the Annex I (including the US) pledges add up collectively to only a 16% reduction (by 2020 compared with 1990) at best, and if loopholes (through LULUCF and AAUs) are taken into account, there can even be a 6.5% increase in Annex I emissions.

Finance

One way in which the historical carbon debt that developed countries hold may be discharged is through compensation into a UNFCCC fund. This could be a lump-sum payment or payments over the 40-year period 2010-50 in annual instalments. Besides this, the developed countries have obligations under the UNFCCC to meet mitigation, adaptation and capacity-building expenses. The quantum of funds for discharging the carbon debt and for meeting the additional costs is large, but this is to be expected since the financial requirements of adaptation, mitigation, capacity building and technology are massive. The amounts so far announced ($10 billion a year from 2010, and $100 billion by 2020) are inadequate.

Technology transfer

To play their extremely ambitious and difficult role, developing countries need a tremendous technological leap involving access to climate-related technology at the most affordable rates. The following measures are proposed:

(1) They must have the maximum access at least cost to the best technologies;

(2) Barriers to technology transfer must be addressed, including the issue of intellectual property rights;

(3) Developing countries must be assisted in the development of endogenous technology and to undertake their own R&D and develop innovation, with international support;

(4) R&D activities should be financed by UNFCCC funds, and the products from these should be in the public domain;

(5) Sufficient funds should be provided for technology development and transfer to developing countries;

(6) A Technology Policy Board or Council should be set up under the UNFCCC to address the technology issues.

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There has not been any updating of the data (for example, on emission levels, carbon budget or financing needs) or on developments in the climate negotiations (for example, on the adoption of the Paris Agreement in 2015). Nevertheless it was felt that it would be useful to reproduce this paper.