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Future mitigation commitments: differentiating among non-Annex I countries

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Abstract

In the long term, any definition of adequacy consistent with UNFCCC Article 2 will require increased mitigation efforts from almost all countries. Therefore, an expansion of emission limitation commitments will form a central element of any future architecture of the climate regime. This expansion has two elements: deepening of quantitative commitments for Annex B countries and the adoption of commitments for those countries outside of the current limitation regime. This article seeks to provide a more analytical basis for further differentiation among non-Annex I countries. To be both fair and reflective of national circumstances, it is based on the criteria of responsibility, capability and potential to mitigate. Altogether, non-Annex I countries were differentiated in four groups, each including countries with similar national circumstances: newly industrialized countries (NICs), rapidly industrializing countries (RIDCs), 'other developing countries', and least developed countries (LDCs). Based on the same criteria that were used for differentiating among non-Annex I countries, a set of decision rules was developed to assign mitigation and financial transfer commitments to each group of countries (including Annex I countries). Applying these decision rules results in (strict) reduction commitments for Annex I countries, but also implies quantifiable mitigation obligations for NICs and RIDCs, assisted by financial transfers from the North. Other developing countries are obliged to take qualitative commitments, but quantifiable mitigation commitments for these countries and the LDC group would be not justifiable. As national circumstances in countries evolve over time, the composition of the groups will change according to agreed triggers.

Keywords: Equity; Differentiation; Mitigation commitments; Developing countries; Non-Annex I countries; Kyoto Protocol

1. Introduction

International climate policy is at a crossroads. The entry into force of the Kyoto Protocol marked an important step in international climate policy. At the same time, there is a lively debate on

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options for the mid- and long-term development of the climate regime, and a growing recognition that such a development is of utmost importance. The challenge of future climate negotiations will be to embed the next steps in a long-term framework aiming at an adequate and equitable global climate agreement that recognizes the right to sustainable development of all countries. A package capable of constituting such an agreement will need to address both responses to the problem of anthropogenic climate change, namely mitigation and adaptation. Support for adaptation to the impacts of climate change will have to gain a far more prominent role in the evolution of the future climate regime, as the effects of mitigation measures taken now will not be seen for years to come. However, while some adaptation will be necessary to deal with climate change to which the world is already committed, ultimately mitigation is the best form of adaptation (Yohe, 2001). The focus of the ultimate objective of the United Nations Framework Convention on Climate Change (UNFCCC) in Article 2, namely 'to achieve stabilization of greenhouse gas concentrations in the atmosphere' under specified constraints, indicates a consensus among Parties to take action for mitigation. The problem the world is facing is not whether mitigation is important, but who mitigates and how much. What is required in thinking beyond 2012 is, therefore, further and more systematic differentiation among countries, also in the South. This article outlines an analytical approach to differentiate among non-Annex I countries and to assign commitments to mitigation and financial transfers.

2. Context: the place of further differentiation in an overall agreement

2.1. Meeting the climate challenge

What is required for a climate regime to be adequate is clearly defined in the ultimate objective of the UNFCCC. Greenhouse gas (GHG) emissions must decline sufficiently to allow atmospheric concentrations to stabilize at a level 'that would prevent dangerous anthropogenic interference with the climate system', within a time-frame that will allow ecosystems to adapt naturally, not threaten food production, and enable sustainable economic development (UNFCCC, 1992: Article 2). However, although ambitious and encompassing, this objective falls far short of being an *operational* definition, as it is not easily translated into constraints on society's GHG-emitting activities.

Many scientific and political institutions have proposed that the term 'dangerous' be defined for the purposes of Article 2 as 'a temperature increase of 2ºC compared to pre-industrial levels', including the European Union (EU Council, 2005), the German Advisory Council on Global Change (WBGU, 2003), and the Climate Action Network (CAN, 2002). In view of the objective of the UNFCCC, aiming at development below 2°C appears to be reasonable, taking into account the following considerations.

- A temperature rise of 2°C already commits the Earth to significant climate change (IPCC, 2001; Hare, 2003; Leemans and Eickhout, 2004; Thomas et al., 2004). Adaptation measures therefore would have to be undertaken, starting in the near term, which raises the issues of compensation and liability.
- Climate science cannot yet tell us with any certainty that a temperature increase exceeding 2°C will not produce 'serious or irreversible damage' (Hare, 2003).

- There is considerable uncertainty in the temperature rise that would actually result, even if our best estimates suggest that we are on a '2°C trajectory' (Caldeira et al., 2003).
- It appears possible to embark on this trajectory without prohibitive economic losses (Schneider and Azar, 2001).

However, the target to stay below a temperature increase of 2°C globally poses an unprecedented global challenge. Profound infrastructural transitions would be needed to allow global emissions to peak by 2020.[1] The complexity and cost of this transition increase with each passing year of business-as-usual development, as society continues to invest in capital that embodies a commitment to years or even decades of continued GHG emissions: vehicles with 10-year lifetimes, industrial facilities with 30-year lifetimes, homes and office buildings with 100-year lifetimes, and urban/peri-urban development patterns with almost indefinite lifetimes. Earlier actions pay off in the long run, including change of development paths and consumer behaviour.

Facilitating the sustainable economic development of the South along a low-GHG path starting in the very near future is an intrinsic part of meeting the climate challenge. Substantial financial and technological transfers from the North will be necessary to enable the degree of mitigation effort required in the South to protect the climate while enabling development. This points to the central role of equity in addressing the climate challenge.

2.2. Developed countries must continue to take the lead

Commitments contained in the Kyoto Protocol are only a first step towards achieving the objective of the Convention. Any definition of the adequacy of commitments consistent with UNFCCC Article 2 will require increased mitigation efforts from virtually all countries, i.e. deep emissions cuts in industrialized countries and the avoidance of emissions (compared with business-as-usual trends) in developing countries, and ultimately emissions reductions for some. Therefore, emission limitation commitments will form a central element of any future architecture of the climate regime.

The first level of differentiation contained in the Convention, that between Annex I and non-Annex I, remains valid. It is difficult to imagine any action by non-Annex I countries if Annex I countries do not reduce emissions. To put it plainly, there is little chance of meaningful mitigation action by developing countries without the USA taking on a quantified reduction commitment.

There are at least three major reasons why Annex I countries need to continue to lead in reducing emissions. Firstly, from the point of responsibility, Annex I countries are responsible for the majority of GHG emissions in the past, which has caused the current climate change. The difference in emissions per capita is even more marked. It would be patently inequitable if the Annex I countries, by virtue of being wealthier and consuming more fossil fuels both historically and currently, were to deplete the atmosphere's rapidly diminishing capacity to serve as a safe sink for GHG emissions. Secondly, they are wealthier and therefore have greater financial and technological resources to mitigate. Thirdly, from the point of mitigation potential, Annex I countries have more 'luxury' emissions, compared to emissions from activities related to basic human needs. For example, reduction in the use of automobiles in Annex II countries would have less impact on their basic human needs than reduction of fuel use for cooking in a non-Annex I country.

Considering these reasons, it is obvious that emissions reductions in Annex I countries must be strengthened considerably in the period after 2012. Emission targets set by the Kyoto Protocol

were only a first step in inflecting the curve of growing emissions, and the next steps must involve much more ambitious targets (Brouns and Ott, 2005). Some Annex I countries have recognized the urgency of action and set such targets. The UK's energy white paper 'Our Energy Future', for example, recommends a 60% reduction of industrialized countries' GHG emissions by 2050 (UK, 2003) and the French 'Plan Climat 2004' even aims at a 75% reduction in the same time period (France, 2004). What is needed are deeper cuts in emissions by Annex I Parties as a whole.

Apart from reducing their emissions, Annex I countries must also provide financial and technological resources to help enable what needs to happen in non-Annex I countries – development with low emissions.

2.3. Some developing countries must take on mitigation commitments

Based on the principle of 'common but differentiated responsibilities and respective capabilities', emissions from non-Annex I countries have not been subject to quantitative emission commitments up to now. To achieve the objective of stabilizing atmospheric concentrations, increased efforts to reduce greenhouse gas emissions will be required from a larger group of countries. Emissions from at least some non-Annex I countries will need to start to decrease in the fairly near future compared with business-as-usual trends to complement the dramatic reductions that the North needs to undertake.

While the primary responsibility of Annex I countries is widely accepted, it needs also to be stated that emissions from non-Annex I countries have been rapidly increasing. For example, CO_2 emissions from fuel combustion in non-Annex I countries have increased 38.9% over the 1990–2000 period, resulting in a share of 40% of annual global emissions in 2000 (WRI, 2003). At the same time, some non-Annex I countries have also rapidly developed in economic terms. For example, GDP per capita of some non-Annex I countries such as Singapore, the Republic of Korea and Qatar is getting close to – or exceeding – the level of some Annex I countries. It appears reasonable to assume that the responsibility, capability, and potential of those countries to take mitigation actions are increasing as those countries become further industrialized.

In order for the world to achieve the ultimate objective of the Convention, it is necessary at least for some non-Annex I countries to start taking mitigation activities to limit their GHG emissions. As most non-Annex I countries are still on their way to meeting the welfare needs of their populations, limitations on emissions must not require sacrificing sustainable development. This implies two things. First, every opportunity should be taken to decouple emission growth from economic growth, by relying on more efficient and lower-GHG technologies and processes, thereby enabling non-Annex I countries to leapfrog the GHG-intensive development path taken by the Annex I countries. Second, to the extent that mitigation activities in non-Annex I countries require additional financial and technological resources, these resources should be provided by those countries which have the capability and the responsibility to do so, i.e. Annex I countries.

Given that there is a large diversity among non-Annex I countries in terms of national circumstances, as reflected in the wide range of values against all criteria shown in Table 1, there is little reason to think that all non-Annex I countries would act the same way in responding to climate change. In order to take forward the negotiation process, there is a need for further differentiation among non-Annex I countries. Differentiating among these countries analytically does not imply that the 'G77 + China' should not negotiate together, but is intended to outline different implications for taking action on climate change.

Table 1. Criteria for differentiating countries

	Annex II	Annex I, but not Annex II	non-Annex 1 (NAI) *for information only*	NICs	RIDCs	Other DCs	LDCs
Analytical basis	Defined in UNFCCC, includes the most highly industrialized countries	Defined in UNFCCC, includes less highly industrialized countries	Defined in the UNFCCC	Highest among NAI countries NAI (without LDCs) in terms of an index of potential, responsibility and capability	Less high on the index, but GDP growth over the last decade > 2% and high income relatively to other NAI Countries	NAI countries (without LDCs and NICs) with GDP growth < 2% and/or low income relatively to other NAI countries	Defined by UN
Potential to mitigate CO_2/GDP, 2000 (in t CO_2 / Mill. US$)							
– Range	210–706	385–1768	17–2325	481–2325	109–867	86–1833	17–1015
– Group average	476	1090	537	908	567	424	134
	Medium	Very high	Medium	High	Medium	Medium	Low
GHG/capita, 2000 (in t CO_2 equiv.)							
– Range	7.1–24.9	4.4–14.0	0.2–67.9	4.5–67.9	1.3–19.8	1.0–11.5	0.2–5.7
– Group average	15.9	10.0	3.3	12.0	4.3	2.1	1.5
	Very high	High	Medium	High	Medium	Low	Low
Responsibility to mitigate Cumulative CO_2/capita, 1990–2000 (in t CO_2)							
– Range	58.4–240.2	29.1–151.2	0.1–521.8	26.7–521.8	8.4–84.6	2.2–80.0	0.1–12.3
– Group average	134.9	95.4	19.2	92.3	27.4	10.1	1.4
	Very high	High	Low	High	Low	Low	Very low

Table 1. Criteria for differentiating countries (*Continued*)

	Annex II	Annex I, but not Annex II	non-Annex 1 (NAI) *for information only*	NICs	RIDCs	Other DCs	LDCs
Capability to mitigate GDP/capita, 2000 (in US$.PPP)							
– Range	16530–53410	3980–16530	450–23700	1700–23700	3740–20330	860–8900	45–5650
– Group average	27526	7011	3686	10701	5025	2602	1205
	Very high	Medium	Low	Medium	Medium	Low	Very low
HDI, 2000							
– Range	0.88–0.94	0.75–0.88	0.28–0.90	0.73–090	0.57–0.88	0.43–0.81	0.28–0.74
– Group average	0.93	0.81	0.63	0.81	0.77	0.65	0.46
	Very high	High	Medium	High	Medium	Medium	Low
Total GHG emissions, 2000 (in Mt CO_2 equiv.)							
– Sum	13622	3829	15630	1714	8695	4095	945
– Top five	USA: 6932	Russia: 1905	China: 4967	Korea (South): 526	China: 4967	India: 1854	Bangladesh: 122
	Japan: 1334	Ukraine: 522	India: 1854	Saudi Arabia: 330	Brazil: 841	Indonesia: 495	Sudan: 100
	Germany: 972	Poland: 375	Brazil: 841	Uzbekistan: 181	Mexico: 511	Pakistan: 285	Myanmar: 82
	Canada: 714	Czech Rep.: 143	Korea	Kazakhstan: 159	Iran: 439	Venezuela: 241	Cambodia: 69
	UK: 662	Romania: 135	(South): 526	Unit. Arab.	South	Egypt: 178	Ethiopia: 63
	[EU (15): 3978]		Mexico: 511	Em.: 108	Africa: 413		

HDI data for Bosnia and Herzegovina are as of 2001.

No HDI data available for Afghanistan, Cook Islands, Iraq, Kiribati, Korea (North), Liberia, Nauru, Niue, Palau, Serbia and Montenegro, Tonga.

No emissions/GDP data available in WRI (2003) for Somalia and Tuvalu (both LDC) and Liechtenstein and Monaco (both Annex II).

Source: UNCTAD (2002); UNDP (2002, 2003); WRI (2003).

3. Differentiation among non-Annex I countries

The differentiation among Annex B countries in the Kyoto Protocol was hardly systematic and can only be described as an ad hoc burden-sharing approach. Even Raúl Estrada, chairman at COP-3 and often called the father of the Kyoto Protocol, is cited as 'still looking for the basis of these figures' contained in Annex B (Oberthür and Ott, 1999: p. 120). A continuation of the ad hoc approach exemplified by Kyoto in future commitment periods is assured of being inequitable.

The challenge in defining an adequate and equitable global climate agreement for the future is to find 'a logical, top-down and long-term resolution in the context of a political process that is inherently illogical, bottom-up and mostly concerned with the current or next round of commitments' (Grubb et al., 1999: p. 273). In a negotiating regime characterized by dramatic disparities in negotiating resources and geopolitical power, it is vitally important that differentiation be deliberated on the basis of an open, transparent, analytically-based framework rather than relying totally on a non-transparent bargaining process that is highly political and often coercive. It is with the objective of working toward such a framework that we outline a transparent differentiation proposal in this section.

3.1. Responsibility, capacity and potential

To achieve the objectives of UNFCCC Article 2, the question is who should mitigate how much. To be both fair and reflective of national circumstances, an analytical framework for differentiation among countries should be based on the criteria of *responsibility*, *capability* and *potential* to mitigate. We propose that these three characteristics be integrated into a differentiation framework in the following way.

Responsibility has been defined in the 'Brazilian proposal' directly in relation to the contribution to temperature increase (Brazil, 1997; La Rovere et al., 2002). In this analysis, cumulative per capita emissions of fossil CO_2 over the period 1990–2000 is used as a proxy indicator of responsibility. The relatively recent period avoids 'punishing' countries for historical emissions, when the consequences were less widely known. At least since the IPCC's First Assessment Report in 1990, the implications can be said to be well-known internationally.

Capability as a criterion recognizes the fact that a country's capability to reduce emissions might be quite different from its level of responsibility. A country may have high responsibility for contributing GHG emissions, but nonetheless be too poor to devote resources toward mitigation and/or it might not have access to the needed technologies. Emissions do not have to be linked to human development, but under given socio-economic and technological conditions, a certain level of emissions will be necessary to guarantee a decent life for poor people (Pan, 2002). Two indicators of capability are considered: the Human Development Index (HDI) and Gross Domestic Product on the basis of purchasing power parities (GDP-PPP) per capita. Countries with higher levels of national income and a higher rank on the HDI would be expected to carry a higher burden of mitigation.

Potential to mitigate can be related to two factors – emissions intensity and emissions per capita.[2] A high value for CO_2/GDP would suggest high potential to mitigate. The more efficient an economy already is (lower CO_2 emissions per unit GDP), the less potential there is (at a given cost) to mitigate further through efficiency. However, the level of emissions per capita needs to be taken into account as well. High per capita emissions suggest unsustainable consumption patterns, which should provide the potential to mitigate without endangering a basic level of development, e.g. through lifestyle changes. National circumstances such as resource endowments also influence mitigation potential, but are not easily dealt with analytically.

3.2. Grouping of non-Annex I countries

Quantitatively assessing the indicators for responsibility, capability and potential for all countries clearly captures the dramatic differences between them (see Table 1), and suggests the different levels of commitments to which an equitable regime should oblige them. The current climate regime, which lumps all developing countries together as non-Annex I, obscures the huge variety of countries included in this group.

Non-Annex I countries cover a very wide range of values for each of the three criteria, always including very low values and sometimes some of the higher values as well, as shown in Table 1. Responsibility to mitigate is radically lower on average for non-Annex I countries than for Annex I countries. The non-Annex I group includes all the countries with less than 0.5 t CO_2/person emitted between 1990 and 2000,[3] but also the only country (Qatar) with greater than 500 t CO_2/person. For capability as reflected by GDP per capita, non-Annex I includes the least wealthy country, with $450 per person in 2000 (PPP US$), but also two countries (Singapore and the United Arab Emirates) whose per capita incomes exceed the Annex I average of $22,000. Potential to mitigate can be very low, at 17 t CO_2/million $ GDP, but ranges all the way to the highest value across the row of 2,325 t CO_2/million $ GDP (again, Qatar).

Given this diversity of national circumstances, there is little reason to think that all non-Annex I countries should respond in the same manner to the climate challenge (Winkler et al., 2002b). While recognizing that the 'G77 + China' remains an important vehicle for solidarity, developing countries will need to identify different forms of climate action for different members if the climate challenge is to be successfully addressed.

Groupings of countries can be defined both politically and analytically. Some political groupings are well-established in the climate process. As explained in Section 2.2, the differentiation between Annex I and non-Annex I remains valid as the first level of differentiation. At the other end of the spectrum the group of least developed countries (LDCs) are also well defined by the UN but also the Convention, and have recently acted in a concerted fashion in the climate negotiations, e.g. in the LDC fund for adaptation.

As well as these two levels of differentiation, the analysis here seeks to provide a more analytical base for groupings of (non-Annex I) countries (see Box 1). Countries were categorized according to the three criteria mentioned above, thereby identifying some new groups, such as newly industrialized countries (NICs) and rapidly industrializing countries (RIDCs), that are seen as particularly important in taking the next round of climate negotiations forward.

The process for identifying the groups of NICs and RIDCs started with all non-Annex I countries, as well as non-Parties to the UNFCCC. Using the CAIT (climate analysis indicator tool)[4] (WRI, 2003), we created an index combining responsibility, potential and capability – equally weighting cumulative fossil fuel CO_2 emissions per capita, the HDI and an indicator of potential (derived from equally weighted CO_2/GDP and GHG/capita). LDCs, which by definition have low potential, low capability and low responsibility, formed a distinct analytical group. The remaining non-LDC–non-Annex I countries were ranked by this index.

NICs were identified as those countries with an index value more than one standard deviation above the mean, i.e. those with the highest aggregate score. The next group of countries (RIDCs) was differentiated by focusing on those non-Annex I countries with a medium index value (mean plus/minus one standard deviation). Among these countries RIDCs can reasonably be defined as having relatively rapid industrial growth in the last decade and relatively high income. RIDCs

were therefore identified from the remaining non-Annex I countries with medium index values, as those with higher per capita GDP-PPP than non-Annex I average and with higher than 2% annual GDP growth in 1991–2000.[5]

Finally, the remaining 39 non-Annex I countries that are neither NICs/RIDCs nor LDCs are grouped as 'other developing countries'. They are at a very early stage of industrialization but are not as poor as those countries defined as 'least developed' – just 'regular' developing countries.

Altogether, non-Annex I countries were differentiated in four groups each including countries with similar national circumstances with respect to the three criteria (see Appendix for composition of groups). At this stage, the approach described above merely identified groups – which are shown in Table 1 with their characteristics for responsibility, capability and mitigation potential. Before turning to the types of mitigation and financial commitments, clear decision rules are outlined.

Box 1. Analytical process for differentiating non-Annex I countries

I Start with all non-Annex I countries (and non-Parties to the UNFCCC):

- LDCs form a distinct group.

II. Create an index equally weighting responsibility (cumulative CO_2/cap in last decade), potential (CO_2/GDP and GHG/cap) and capability (HDI).

III. Rank remaining countries by index, and define 1 standard deviation above and below mean.

- If more than 1 standard deviation above mean ⇒ NIC
- Within 1 standard deviation above or below mean ⇒ RIDC

  But lower cut-off additionally defined by GDP/cap above NAI mean and > 2% GDP growth in last decade

*Remaining countries (not NIC, RIDC nor LDC) ⇒ 'other developing countries'.

3.3. Decision rules for assigning types of commitments

For the purpose of determining type(s) of commitments for each group of countries, a set of decision rules was developed based on the three criteria applied for the differentiation of countries: potential, responsibility and capability (see Box 2). It is important to note that the term 'commitment' refers not only to mitigation obligations (quantitative and qualitative) but also to obligations to provide financial and technological resources.

Two basic principles underlie the decision rules:

1. **Potential to mitigate determines the level of mitigation activity in a given country.** This mitigation activity refers to either absolute emissions reductions, or avoidance of future emissions through cleaner and more efficient development.

2. **Responsibility and capability together determine the scale of financial and technological resources a country is required to devote to mitigation activity.** Accordingly, countries with high responsibility and/or capability will undertake mitigation activity domestically to the extent that they also have potential. Beyond that, they will provide support for mitigation activity in countries that have potential but comparatively little responsibility and/or capability.

The first principle seeks to ensure that the climate regime is economically efficient, in the sense of directing mitigation efforts toward those groups of countries in which there is the most potential for mitigation. The second principle seeks to ensure fairness, in that it requires that financing mitigation activities by countries is dependent on the respective responsibility for causing climate change and their capability to provide financial and technological resources to address that threat.

The decision rules derived from these principles are shown in Box 2, and can be explained as follows.

The '*potential to mitigate*' determines the amount of reductions to be carried out domestically. Low potential implies that domestic reductions are not a priority. A country with a high/medium potential, however, would be obliged to exploit this potential, i.e. to accept quantitative commitments to reduce or limit domestic emissions. These commitments are in the context of a climate regime where financial and technological resources for mitigation are assured. Therefore, the level of mitigation efforts as determined by this rule does not imply that countries would necessarily have to pay for their mitigation efforts themselves.

Box 2. Decision rules for determining commitments

Potential to mitigate

High potential	→	Reductions of domestic emissions
Medium potential	→	Limitation of domestic emissions
Low potential	→	No quantitative but qualitative mitigation commitments.

Capability to mitigate

High capability	→	Financial transfers for mitigation activities to 'low/medium capability' countries
Medium capability	→	Co-sharing: mitigation partly funded by 'high capability' countries
Low capability	→	All mitigation activities funded by 'high capability' countries.

Responsibility to mitigate

High responsibility	→	Binding absolute reduction target
Medium responsibility	→	Quantitative commitments only binding if all 'high responsibility' countries take on commitments and conditional on transfer of adequate financial and technological resources
Low responsibility	→	Optional/voluntary mitigation commitments.

The amount a country is obliged to pay toward mitigation is determined by '*capability to mitigate*' in combination with '*responsibility to mitigate*'. Countries having high capability (and responsibility) would be obliged to pay for all their emission reductions, and also to provide financial and technological resources for mitigation in other countries with medium/low capability (and responsibility).

In addition, higher levels of responsibility suggest not only a higher level of resources devoted to mitigation, but also a legally binding form of the mitigation commitment. Commitments for those with medium responsibility would only be binding if all 'high responsibility' countries have taken on mitigation and funding commitments, while low responsibility suggests mitigation action of a voluntary nature.

3.4. Assigning commitments to groups of countries

Applying the decision rules to the six groups of countries identified (see Table 1, two groups in Annex I, four in non-Annex I) result in (strict) reduction commitments for Annex I countries, but also imply quantifiable mitigation obligations for some non-Annex I countries enabled by financial and technological transfers from the North (see Table 2). It is worth emphasizing that Annex I countries would still have to take the lead in combating climate change. However, at least some non-Annex I countries – those that are higher-emitting and wealthier – would have to contribute substantially more to global mitigation efforts in the near future than they have in the past.

A closer look at the resulting commitment reveals the following: both Annex I groups retain Kyoto-style commitments that mean quantified (absolute) emissions reduction obligations, with targets for Annex II countries being more demanding than Kyoto levels.[6] The latter would also be committed to financial and technological transfers to non-Annex I countries, particularly to those with low to medium capability to mitigate.

Box 3. Commitments for Annex I countries

Annex II	→	Binding (strict) absolute reduction targets, domestic reduction
	→	High direct payments to non-Annex I
Annex I, but not Annex II	→	Binding absolute reduction targets, domestic reduction
	→	low / no payments to non-Annex I

But not only Annex I countries would have to take on quantitative mitigation commitments. Countries belonging to the group of NICs and RIDCs would have to do so as well – although subject to the conditionality of additional agreed triggers that lead to the start of developing country quantitative emission targets. While these triggers can be quantitatively defined, even more important is getting political agreement on what they should be. They differ from 'graduation' triggers in that they include conditions for both developing and industrialized countries.

Applying the decision rules to the four groups of (formerly) non-Annex I countries results in absolute limitation or reduction targets for NICs due to their high responsibility and potential to mitigate. However, these commitments are subject to the conditionality that all major Annex I countries take on quantified emission reduction commitments and fulfil their commitments to provide financial and technological resources.

While NICs will have access to financial and technological resources (from Annex II countries) for part of their mitigation activities, this share is expected to be a smaller part of incremental costs than for RIDCs, in accordance with their relative capabilities. Also the latter would be obliged to take on absolute limitation targets. However, the conditionality concerning Annex I participation in the regime is also valid for RIDCs, as well as the availability of agreed full funding of incremental costs for mitigation activities by Annex II countries.

Regardless of whether the terms of conditionality for quantified commitments are fulfilled, NICs as well as RIDCs would engage in qualitative mitigation commitments (see Table 2). This type of

Table 2. Differentiated commitments for groups of countries

	Annex II	**Annex I, but not Annex II**	**NICs**	**RIDCs**	**Other DCs**	**LDCs**
Potential to mitigate						
CO_2/GDP, 2000	Medium	Very high	High	Medium	Medium	Low
GHG/capita, 2000	Very high	High	High	Medium	Low	Low
Responsibility to to mitigate						
Cumulative CO_2/capita, 1990–2000	Very high	High	High	Low	Low	Very low
Capability to mitigate						
GDP/capita, 2000	Very high	Medium	Medium	Medium	Low	Very low
HDI, 2000	Very high	High	High	Medium	Medium	Low
Mitigation commitments						
Type of quantitative commitment	Binding (strict) absolute reduction targets, domestic reduction	Binding reduction targets, domestic reduction	absolute limitation or reduction target, domestic mitigation*	Absolute limitation target, if funding and technology provided from Annex I*	No targets	No targets
Qualitative action			SD-PAMs (obligatory), Sector CDM, Non-binding RE & EE[a] targets	SD-PAMs (obligatory, co-funded), Sector CDM, Non-binding RE & EE targets	SD-PAMs (obligatory, co-funded), Sector CDM, Non-binding RE & EE targets	SD-PAMs (optional, funded), Sector CDM, Non-binding RE & EE targets
Commitments to provide financial and technological resources to support mitigation activities	High direct payments (out) to non-Annex I	Low / no payments	NIC co-funds mitigation, but some transfers from Annex II	High direct payments from Annex II	Direct payments from Annex II	Direct payments from Annex II

* Targets only could become binding if all major Annex I countries have binding QUEROs.

[a]RE & EE (renewable energy and energy efficiency).

SD-PAMs: Sustainable development policies and measures (Winkler et al., 2002a). For sector CDM and other approaches, see Baumert et al. (2002).

Source: UNDP (2002, 2003); WRI (2003).

commitments will also be obligatory for the group of 'other developing countries', but quantifiable mitigation commitments for these countries and the LDC group would not be justifiable – and not in line with the decision rules (until their status changes).

The approach chosen for differentiation among countries in order to assign different kinds of commitments is not static. As national circumstances in countries evolve over time the composition of the groups will change. As a country exceeds (or falls below) a certain threshold in all of the three criteria (potential, responsibility, capability), it will move from one group to another group and, as a consequence, will have to take on other types of commitments (see Figure 1). We defined the trigger for graduating as (exceeding) the average value of an index for 'potential to mitigate'

Box 4. Commitments for non-Annex I countries

NICs	→	Absolute limitation or reduction targets, domestic reduction*
	→	Qualitative commitments (see Table 2)
	→	Some direct payments from Annex II
RIDCs	→	Absolute limitation targets (conditional to funding)*
	→	Qualitative commitments (see Table 2)
	→	High direct payments from Annex II
Other DCs	→	No quantified commitments
	→	Qualitative commitments (see Table 2)
	→	Direct payments from Annex II
LDCs	→	No quantified commitments
	→	Qualitative commitments (see Table 2)
	→	Direct payments from Annex II

* Targets only could become binding if all major Annex I countries have binding QUEROs.

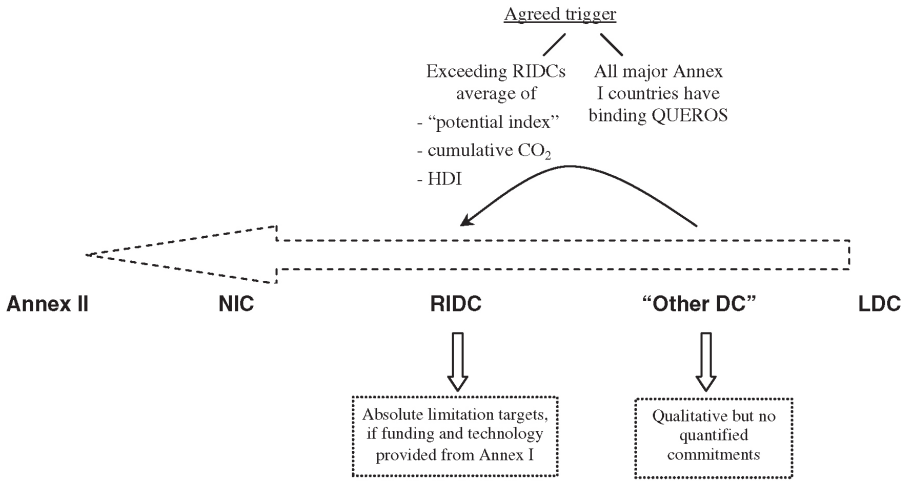

Figure 1. Graduation example: moving from 'other DC' to RIDC.

(equally weighting GHG emissions per capita and CO_2/GDP), cumulative CO_2 emissions per capita and the HDI data of the next higher group.[7] Therefore, after each commitment period, the composition of the groups may need to be modified, implying a re-calculation of the trigger afterwards.

4. Conclusions

The analysis here seeks to provide a more analytical base for further differentiation among non-Annex I countries. To be both fair and reflective of national circumstances, it is based on the criteria of responsibility, capability and potential to mitigate. Altogether, non-Annex I countries were differentiated in four groups each including countries with similar national circumstances: newly industrialized countries (NICs), rapidly industrializing countries (RIDCs), 'other developing countries', and least developed countries (LDCs). Based on the same criteria that were used for differentiating among non-Annex I countries, a set of decision rules was developed to assign mitigation and financial transfer commitments to each group of countries (including Annex I countries).

Applying these decision rules results in (strict) reduction commitments for Annex I countries, but also implies quantifiable mitigation obligations for some non-Annex I countries, assisted by financial transfers from the North. A closer look at the resulting commitment reveals the following:

- Both Annex I groups – Annex II and others – retain Kyoto-style quantitative commitments, i.e. quantified (absolute) emissions reduction obligations with targets for Annex II countries being more demanding than Kyoto levels. The latter would also be committed to financial and technological transfers to those non-Annex I countries with low-to-medium capability to mitigate.
- Countries belonging to the group of NICs and RIDCs would have to take on quantitative mitigation commitments as well – although subject to the conditionality that all major Annex I countries take on quantified emission reduction commitments and fulfil their commitments to provide financial and technological resources. NICs, due to their high responsibility and potential to mitigate, would have absolute limitation or reduction commitments, but will also have access to financial and technological resources (from Annex II countries) to help them fulfil the commitments. RIDCs would also take on absolute limitation targets, and would have access to an even greater share of resources, consistent with their lower capacities. Regardless of whether the terms of conditionality for quantified commitments are fulfilled, NICs as well as RIDCs would engage in qualitative mitigation commitments.
- Qualitative mitigation commitments (policies and measures) will also be obligatory for the group of 'other developing countries', but quantifiable mitigation commitments for these countries and the LDC group would be not justifiable – and not in line with the decision rules (until their status changes).

There must be agreed triggers (like 'binding obligations for all major industrialized countries') that would lead to the start of developing country quantitative emission targets. While these triggers can be quantitatively defined, even more important is getting political agreement on what they should be. They further differ from graduation triggers in that they may include conditions for both developing and industrialized countries.

The approach chosen for differentiation among countries in order to assign different kinds of commitments is not static. As national circumstances in countries evolve over time, the composition of the groups will change. If a country exceeds (or falls below) a certain threshold in all of the three criteria (potential, responsibility, capability to mitigate), it will move from one group to another group and, as a consequence, will have to take on other types of commitments. Therefore, after each commitment period, the composition of the groups may need to be modified.

In the long term, any definition of adequacy consistent with UNFCCC Article 2 will require increased mitigation efforts from almost all countries. Therefore, an expansion of emission limitation commitments will form a central element of any future architecture of the climate regime. This expansion has two elements: the deepening of quantitative commitments for Annex B countries and the adoption of commitments for those countries outside of the limitation regime. This article has provided one analytical approach to the grouping of countries which might make a small contribution to an equitable and adequate global climate agreement.

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Notes

1 Aiming at a maximum temperature increase of 2°C would most probably require atmospheric greenhouse gas concentrations to stabilize well below 550 ppm CO_2 equivalent (Hare and Meinshausen, 2004). To reach lower concentration levels such as 400 or 450 ppm CO_2 equivalent would require global emissions to peak at around 2015–2020 even if a temporary 'overshooting' of the stabilization level is considered (den Elzen and Meinshausen, 2005).

2 Both indicators are only a rough proxy for the mitigation potential of a country and country-specific bottom-up analyses would be more suitable. However, the complexity of these analyses could conflict with requirements of political negotiations.

3 Countries with cumulative emissions from 1990 to 2000 of 0.5 t CO_2/person or less include Cambodia, Chad, Ethiopia, Mali and Uganda.

4 Downloadable from http://cait.wri.org/.

5 Due to a lack of GDP data in the early 1990s, the period 1995–2000 was used for Bosnia and Herzegovina.

6 The focus of this article is the analytical basis of differentiation among NAI Parties. This should be understood as part of the overall proposal (Ott et al., 2004), which assumed that differentiation between the Annexes would continue and that deep cuts in the North will be necessary for any adequate climate change regime. Results in Table 1 for the potential of the two Annex groups are ambiguous, with Annex II having higher potential by GHG/capita, but not by CO_2/GDP. Further work on Annex I Parties taking the lead has been conducted by Brouns and Ott (2005).

7 Countries might move more than one group. In particular, many NICs might move directly to Annex II.

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Appendix

Lists of countries included in groups

	Annex II	NAII Annex I	NIC	RIDC	Other DC	LDC	
1	Australia	Belarus	Bahrain	Algeria	Armenia	Afghanistan	1
2	Austria	Bulgaria	Brunei*	Antigua and Barbuda	Azerbaijan	Angola	2
3	Belgium	Croatia	Cuba	Argentina	Bolivia	Bangladesh	3
4	Canada	Czech Republic	Israel	Bahamas	Cameroon	Benin	4
5	Denmark	Estonia	Kazakhstan	Barbados	Congo	Bhutan	5
6	Finland	Hungary	Korea (South)	Belize	Cook Islands	Burkina Faso	6
7	France	Latvia	Kuwait	Bosnia and Herzegovina	Côte d'Ivoire	Burundi	7
8	Germany	Lithuania	Qatar	Botswana	Dominica	Cambodia	8
9	Greece	Poland	Saudi Arabia	Brazil	Ecuador	Cape Verde	9
10	Iceland	Romania	Singapore	Chile	Egypt	Central African Republic	10
11	Ireland	Russian Federation	Suriname	China	Gabon	Chad	11
12	Italy	Slovakia	Trinidad and Tobago	Colombia	Georgia	Comoros	12
13	Japan	Slovenia	Turkmenistan	Costa Rica	Ghana	Congo, Dem. Republic	13
14	Liechtenstein	Turkey	United Arab Emirates	Cyprus	Guatemala	Djibouti	14
15	Luxembourg	Ukraine	Uzbekistan	Dominican Republic	Honduras	Equatorial Guinea	15
16	Monaco			El Salvador	India	Eritrea	16

	Annex II	NAII Annex I	NIC	RIDC	Other DC	LDC	
17	Netherlands			Fiji	Indonesia	Ethiopia	17
18	New Zealand			Grenada	Jamaica	Gambia	18
19	Norway			Guyana	Kenya	Guinea	19
20	Portugal			Iran	Kyrgyzstan	Guinea-Bissau	20
21	Spain			Jordan	Libya	Haiti	21
22	Sweden			Lebanon	Macedonia, FYR	Kiribati	22
23	Switzerland			Malaysia	Moldova	Laos	23
24	United Kingdom			Malta	Mongolia	Lesotho	24
25	United States of America			Mauritius	Morocco	Liberia	25
26				Mexico	Namibia	Madagascar	26
27				Oman	Nicaragua	Malawi	27
28				Panama	Nigeria	Maldives	28
29				Peru	Pakistan	Mali	29
30				Philippines	Papua New Guinea	Mauritania	30
31				Saint Kitts and Nevis	Paraguay	Mozambique	31
32				Saint Lucia	Seychelles	Myanmar	32
33				Saint Vincent and Grenadines	Sri Lanka	Nepal	33
34				South Africa	Swaziland	Niger	34
35				Thailand	Syria	Rwanda	35
36				Tunisia	Tajikistan	Samoa	36
37				Uruguay	Venezuela	Sao Tome and Principe	37
38					Vietnam	Senegal	38
39					Zimbabwe	Sierra Leone	39
40						Solomon Islands	40
41						Somalia	41
42						Sudan	42
43						Tanzania	43
44						Togo	44
45						Tuvalu	45
46						Uganda	46
47						Vanuatu	47
48						Yemen	48
49						Zambia	49

Due to a lack of data, Cook Islands, Iraq*, Korea (North), Marshall Islands, Micronesia, Nauru, Niue, Palau, Serbia and Montenegro, San Marino and Tonga, are not included in any list.

* Non-Party to the UNFCCC.

Data source: (WRI, 2003). Groupings are based on authors' analysis and Ott et al. (2004).