# Major Changes urgently needed to Global Climate Change Public Policy

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## Abstract

The paper firstly reviews the most recent evidence which indicates the global climate crisis is even more severe than that outlined by the Intergovernmental Panel on Climate Change (IPCC) Reports in 2007. It then briefly reviews process by which Global Climate Change Public Policy has been developed and the failure of that process to develop policy to effectively address the climate change problem.

In order to have a high probability (70%-85%) of maintaining global warming below 2°C above pre-industrial levels will require a 2ºC emergency pathway with total global emissions peaking in 2013 and falling by 2050 to 80% below 1990 levels. This level of emission reductions is not going to be achieved by international politics as usual. It then outlines the major problems in negotiating an effective Global Climate Change Public Policy agreement by the time of the Climate Summit in Copenhagen in late 2009 or soon thereafter.

What kind of agreement on global public policy will ensure that global emissions stabilise soon and then rapidly reduce, even while the developing world vastly scales up its use of energy in its ongoing fight against endemic poverty and in order to enhance human development? Developing countries will refuse to pay the additional costs of low-carbon energy technology until their ongoing global poverty crisis brought under control and their most pressing human development needs have been met. An effective agreement therefore has to have a mechanism whereby those with the capacity to pay and the responsibility for emissions already in the atmosphere provide the financial and technological assistance necessary to safeguard the right to development.

One such approach is the Greenhouse Development Rights Framework. It seeks to measure capacity and responsibility as a way of sharing the substantial costs of responding to the climate change emergency. The Greenhouse Development Rights framework allocates to the wealthy and high emitting consumers in the developed and developing world, the costs required to rapidly reduce greenhouse gas emissions and to fund adaptation costs. It does this by identifying the proportion of the country's population that is above the specified development threshold

(US$7500 per capita income – Purchasing Power Parity adjusted) and therefore has the capacity to contribute to the measures necessary for the climate emergency.

An effective international agreement to avoid dangerous climate change will require a much greater willingness to cooperate and more radical policies than those adopted so far in the international climate change agreements. The agreement needs to provide an effective mechanism, such as the Greenhouse Development Rights framework, whereby those with the capacity and responsibility fund decarbonised development for the global poor. The developed countries need to make a clear commitment to do this and to dramatically reduce their own emissions.

## Introduction

The paper firstly summarises the most recent evidence which indicates the global climate crisis is even more severe than that outlined by the Intergovernmental Panel on Climate Change (IPCC) Reports in 2007. It then provides a short review of the failure of our Global Environmental Governance systems to effectively address the climate change problem. The paper then describes the Greenhouse Development Rights (GDR) Framework (Baer et al. 2008), as representing the type of radical approach needed to address the extremely complex, multifaceted, wicked problem of climate change. It illustrates the potential economic impact of the GDR framework on groups of countries and particular major countries. It then briefly compares the GDR approach with some other proposed international approaches or frameworks. It concludes with a short discussion of the problems of getting an approach such as GDR internationally adopted, despite the urgent need for an emergency response to global climate change.

## Dangerous Climate Change

> *"If humanity wishes to preserve a planet similar to that on which civilization developed and to which life on Earth is adapted, paleoclimate evidence and ongoing climate change suggest that CO2 will need to be reduced from its current 385 ppm to at most 350 ppm" (J. Hansen et al. 2008: p1).*

The European Union, the International Climate Change Taskforce (2005) and many business and civil society groups propose a temperature cap of 2°C to avoid dangerous anthropogenic interference with the climate system (Baer & Mastrandrea 2006).

> *"Current proposals to establish caps of 2°C or 3°C as reasonable for avoiding dangerous climate change are not being informed by the likely impacts and the most recent scientific research, but have been shaped by the world of diplomacy, political tradeoffs and compromises driven by narrow, short-term and national needs" (Spratt 2007a: 8).*

> *There is little doubt that an average warming of 3°C would be disastrous and it is clear to minimize the risk of dangerous climate change that the further below an average warming of 2°C that we stabilise the climate the better (Baer & Athanasiou 2004; Spratt 2007a).*

A recent report that reviews the most recent scientific evidence on setting targets for greenhouse gas reductions reaches the following conclusion.

> *"The only conclusion to be drawn is that the loss of the Arctic sea ice, in all likelihood at an increase of less than 1ºC in global average temperature compared to pre-industrial levels, unambiguously represents dangerous human interference with the climate; and therefore we already have too much greenhouse gas in the air, and we need to find the means to engineer a rapid massive drawdown of current greenhouse gases to a safe level. It is now not so much a question of "how much more greenhouse gas can we add to the atmosphere?" but "by what means, at what speed and to what extent can we draw down the current levels of greenhouse gases to a safe level?" (Spratt 2007a: 7).*

Open ocean waters absorb almost ten times more solar radiation than sea ice, a phenomenon known as the ice-albedo feedback (Newton 2007). Scientists have warned for years of the potential negative feedback loop from global warming where melting ice and snow expose more

land and ocean, which then absorb more heat from the sun, triggering further warming and snow and ice melt. There is little doubt, that this occurred in the Arctic in the northern hemisphere summer of 2007 (Spratt 2007b) and again in 2008.

Scientists have demonstrated that we can power our current and future global economy from renewable energy sources with minimal greenhouse gas emissions, albeit at a higher cost (Sorensen 2004). In view of danger now posed by global warming, the building of another coal fired power station could therefore be viewed as a crime against humanity, as there are alternatives production sources for electric power already available.

We are now forced to accept some degree of danger, as totally avoiding the risk of dangerous climate change completely is no longer feasible. The focus needs to be on decarbonising the global economy as quickly as possible while continuing to meet or exceed the poverty reduction targets included in the Millennium Development Goals (UN 2005).

> *"We'd all vote to stop climate change immediately, if we only believed that doing so would be so cheap that no country or bloc of countries could effectively object. But we do not so believe. Thus we're forced to start trading away lives and species in order to advocate a "reasonable" definition of "dangerous" (Baer & Athanasiou 2004).*

There is, however, a major danger that a weaker precautionary approach than that which is required to minimise the risk of dangerous climate change is being taken by politicians in various countries. They see the huge emission reductions necessary as endangering business-as-usual and market driven economic growth in their countries, thus threatening their re-election prospects. Some early mainstream economic analysis (e.g., Nordhaus 1994) has also reinforced the idea that only modest emissions reductions are economically "efficient", although more recent economic analysis by Stern (2006) has indicated that substantial emission reductions can be economically justified. Furthermore, some parts of the fossil fuel industry, directly and through various Business NGOs and "independent" think tanks are still keen to further delay policy measures to reduce emissions despite the planetary emergency caused by their products (Exxonsecrets.org

2006; J Hansen 2007; Union of Concerned Scientists 2007). The global financial crisis is also now being used by politicians and some business groups as reasons for delaying action.

## The Failure of Global Climate Change Policy

In 1988, the Toronto Conference on the Global Atmosphere, hosted by the Canadian Government and attended by many eminent climate scientists and government officials from many countries, concluded "humanity is conducting an unintended, uncontrolled and globally pervasive experiment whose ultimate consequences could be second only to a global nuclear war" (Bodansky 1994: 49). The Conference recommended a 20% reduction in global CO2 emissions from 1988 levels by the year 2005. As the Conference Statement states, since developing countries will need to increase their energy use "significantly," industrialised countries would therefore need to reduce their emissions by more than 20% by 2005 in order to achieve this global target (Bodansky 1994).

In 1990, the IPCC published its First Assessment Report which "predicted that if states continue to pursue 'business as usual,' the global average surface temperature will rise by 0.3C per decade…a rate of change unprecedented in human history" (Bodansky 1994: 57) This was despite successful attempts at the final IPCC plenary session by the US, Saudi and Soviet delegations, encouraged by the fossil fuel industry, at "watering down the sense of the alarm in the wording, beefing up the aura of uncertainty" (Leggett 2001: 15).

Despite these and many subsequent warnings, our current global environmental governance process has totally failed to provide an effective response to global warming. By 2007, global greenhouse gas emissions were more than 30% above 1990 levels (IPCC 2007) and since 2000, CO2 emissions have been increasing at a faster rate (Raupach et al. 2007) and global average temperatures continue to rise (IPCC 2007). Given this failure, is there reason to hope that the current negotiations based on the Bali Action Plan (UNFCCC 2008) due to be concluded at the Conference of the Parties on the UN Framework Convention on Climate Change (UNFCCC) in December 2009 will be successful? In the lead up to the negotiations, Yvo de Boer, Executive Secretary of the UNFCCC said "Politicians have to act on the information provided by the

science" (Wilkinson & Skehan 2007). Politicians have, however, failed to act effectively on the science for almost 20 years.

The current indications are that the negotiations scheduled to be concluded in December 2009 in Copenhagen will not deliver sufficient emission reductions to ensure that we avoid more than 2°C of average global warming over pre-industrial levels. Underlying the Bali Action Plan on which these negotiations are based is an oft-cited target for 25-40% reductions by developed countries by 2020. Given that now 50% of global emissions are not from developed countries and these emissions are growing (IPCC 2007; Raupach et al 2007), the outcome of Copenhagen looks unlikely to get global emissions to begin reducing by 2015, widely argued to be the minimum that is required to put the earth on a pathway to avoid dangerous climate change (Baer & Mastrandrea 2006; Spratt 2007a). In order to put the earth on a pathway back to the 350ppm, the best estimates indicate we need emissions to peak in 2011 and then rapidly decline to zero net emissions (Athanasiou 2009).

## What is Needed?

The science is clear and unambiguous; the more quickly we reduce greenhouse gas emissions the more likely we are to avoid more serious dangerous climate change. As discussed previously, we already have dangerous human interference with the climate. The key issue is how we minimize the risk of more severe and dangerous global warming. Our current economy is currently emitting over 100 million tonnes of global warming pollution into the atmosphere every day. The ideal therefore would be to stop all human activities that result in greenhouse gas emissions tomorrow; that would, however, result in social and economic chaos, so it is not a feasible option. Given that science shows that we should cut greenhouse gas emissions as much and as quickly as possible, the critical question is how quickly can we cut greenhouse gas emissions without causing social and economic chaos and how do we get international agreement to do this?

Human ingenuity, creativity and problem solving abilities are immense given the opportunity to address a challenge, such as landing a man on the Moon or a robotic vehicle on Mars. To address the climate emergency, we need to create a framework that encourages all nations to cooperate to

address the emergency while ensuring that those on the planet who are struggling to find food, clothing and shelter are not adversely affected by the redirection of the world economy towards rapid decarbonisation. As is shown in Figure 1 it will require substantial reductions in greenhouse gas emissions by both Annex I (developed countries) and developing countries (non-Annex I) in order to stabilise atmospheric concentrations of greenhouse gases at a level likely to avoid 2°C of warming.

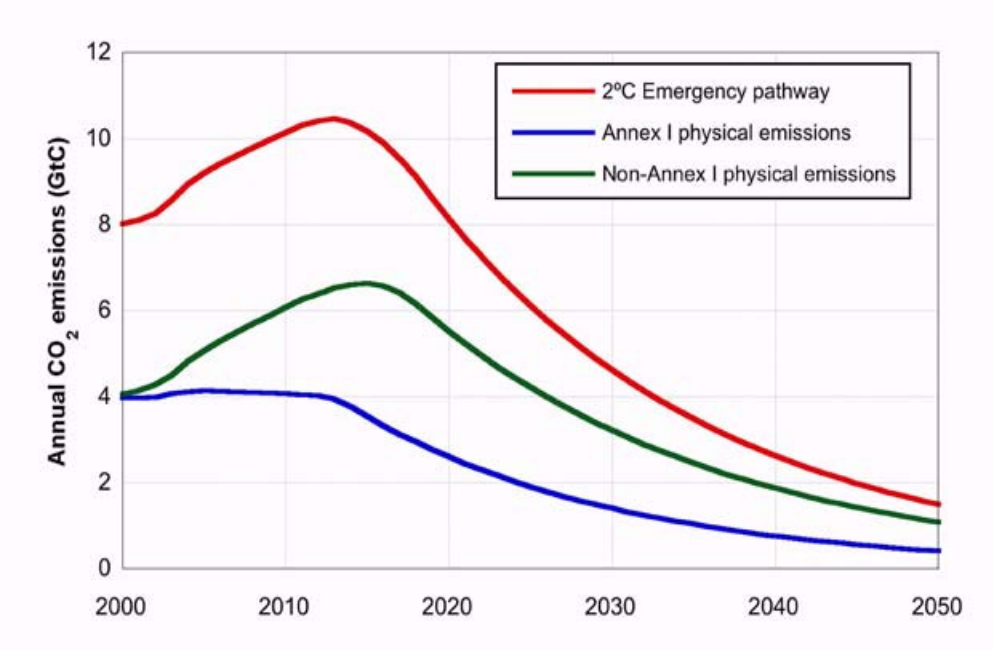


**Figure 1: Non-Annex 1 emissions also have to reduce substantially**

- based on (Baer, Athanasiou & Kartha 2008, p2)

Under the 1992 UN Framework Convention on Climate Change, the developed (Annex I) countries aimed to return emissions of greenhouse gases to their 1990 levels. Very few of the Annex I countries have achieved this and in the case of the largest emitter among Annex I countries, the US, its greenhouse gas emissions were by 2005 16% above 1990 levels. The Annex I countries have yet to show a serious commitment to making the required reductions in greenhouse gas emissions, particularly the US which has not committed to meeting even the modest Kyoto Protocol reduction targets. This is making it harder to get an effective international agreement on reducing greenhouse gas emissions.

Developing countries, especially those with large national emissions, particularly China and India, are also critical for an effective international agreement. Both India and China, however, have per capita emissions that are less than one-quarter of US levels and are therefore unlikely to be willing to commit to emission reductions until it is clear that the Annex 1 countries are clearly committed to and have begun to take serious measures to reduce greenhouse gas emissions. Different approaches to the negotiations are also likely to be taken by the non-Annex 1 countries.

What is needed is a climate regime that will allow for global emissions to come rapidly under control, even while the developing world vastly scales up energy services in its ongoing fight against endemic poverty and to enable human development. Developing countries will, quite reasonably, refuse to pay the additional costs of low-carbon energy technology until their most pressing human development needs have been met and the ongoing global poverty crisis brought under control. An effective agreement therefore has to have a mechanism whereby those with the capacity to pay and the responsibility for emissions already in the atmosphere provide the financial and technological assistance necessary to safeguard the right to development.

## Precautionary Approach – Greenhouse Development Rights

One framework that may be effective in helping to engender the international cooperation needed to address the climate emergency is the Greenhouse Development Rights (GDR) framework, as it aims to overcome the inherent critical tension between the global climate crisis and the global development crisis. Given the most recent scientific reports, the GDR proposal's initial target of holding global warming below 2°C will need to be strengthened, resulting in an emergency climate protection pathway that reduces emissions even more steeply than the 2°C emergency pathway shown in Figure 2. This pathway still has a 17-36% risk of breaching the critical 2°C limit. It will not stabilise the climate at well below 2°C; it does, however, still require substantial global emission reductions of up to 6% pa starting in 2015 (Baer, Athanasiou & Kartha 2007).

In Figure 2, the top line is a 'Business-as-Usual' trajectory, which extrapolates the historical approach to energy conservation, renewables, fossil fuel subsidies, pollution controls etc and is based on the International Energy Agency (IEA) (2007) projections. The second top line is a 'No-Regrets' trajectory, a projection of the global emissions pathway taking account of negative and zero-cost emissions reduction options were successfully captured (modified after (Enkvist, Nauclér & Rosander 2007) – see Baer et al., 2008) . These represent free and profitable emission reductions, which are large, though far from large enough to bring emissions all the way down to the 2°C emergency pathway, the bottom line.

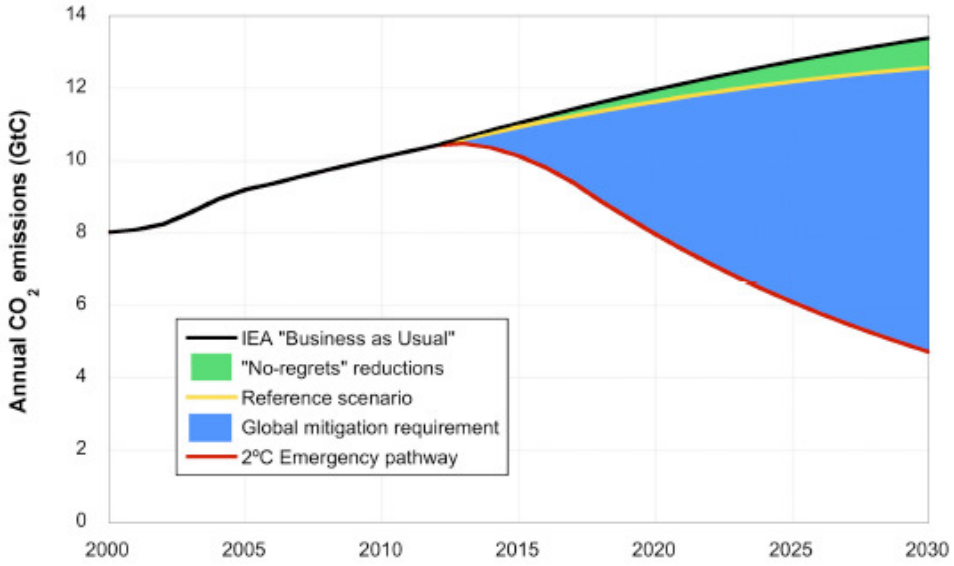


**Figure 2: The 'mitigation gap' (middle wedge) between a 'No-Regrets' baseline (line at bottom of top wedge) and the 2ºC emergency pathway' (bottom of middle wedge) -** adapted from (Baer, Athanasiou & Kartha 2007, p37)

What might be reasonable goals for a pathway more consistent with the most recent risk estimates? An emergency stabilization pathway of a 50% reduction of global greenhouse gas emissions by 2025 and a transition to a decarbonised economy by 2050 are targets consistent with setting stretch goals to harness and direct humanity's expertise, knowledge and resources to achieve this task. It can also be viewed as a backcasting approach which enables policy-makers to consider how to get to a desired end-point (Mander 2001; Robinson 2003).

The GDR approach provides a framework for implementing an internationally agreed emergency stabilisation pathway of emission reductions while safeguarding the right of all people to reach of dignified level of sustainable human development. This standard of living, which could be described as that of a 'global middle class,' is significantly higher than the global poverty line, but lower than the northern middle-class standard (Baer, Athanasiou & Kartha 2008, p3).

It does this by recognising the right to development and the corresponding right to be exempt from global emission reductions as belonging to poor people, not to poor countries. It then aggregates individuals to quantify national responsibility and capacity to act and uses this to calculate national obligations to pay both the costs of an emergency mitigation program to reduce emissions and to fund strenuous adaptation efforts. This is done for all countries in a manner that takes income disparities within countries into explicit account. By so doing, it seeks to secure for the world's poor the environmental space and resources needed for low-carbon development (Baer, Athanasiou & Kartha 2008, p4).

## Capacity to Contribute to Addressing Climate Emergency

The GDR framework allocates to the wealthy and high emitting consumers in the developed and developing countries, the costs required to rapidly reduce greenhouse gas emissions and to fund adaptation. It does this by identifying the proportion of the country's population that is above the specified development threshold (US$7500 per capita income purchasing power parity (PPP) adjusted) and therefore has the capacity to contribute to the measures necessary for the climate emergency. This is illustrated below for three countries, India, China and USA. The US$7500 level of the development threshold is just below the global average per capita income in 2005 (Baer, Athanasiou & Kartha 2007, p29).

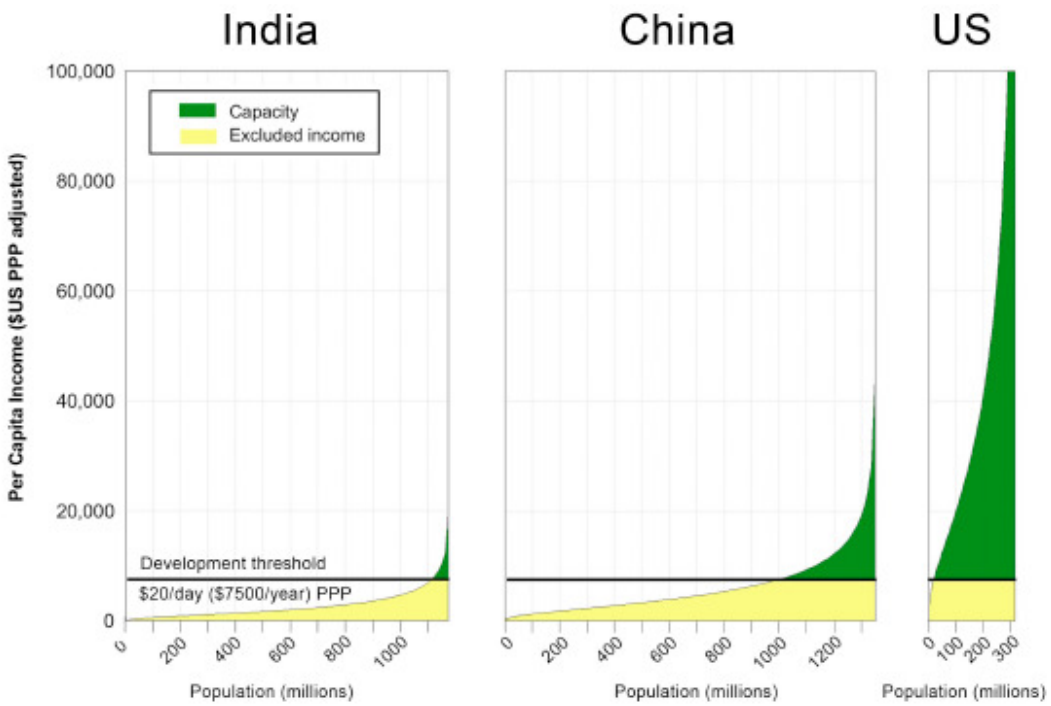


**Figure 3: Capacity/Development need chart for India, China and the US in 2005, with $7500 income per capita (PPP) development threshold** - based on (Baer, Athanasiou & Kartha 2008, p4)

In Figure 3, the length of the x-axis is proportional to the population. At each point on the x-axis, this curve shows the income of the corresponding percentile (one percent) of the population, measured in US dollars per capita (PPP adjusted). The top section representing capacity to fund mitigation and adaptation can therefore be directly compared. It shows that almost all of the US population have the capacity to contribute and also that China also has a significant population with the capacity to contribute. Australia shows a similar pattern to the US, with over 90% of the population above the threshold. 27% of the world's population in 2005 were above this development threshold with almost 15% of these living in high-income countries and 11.5% in medium-income countries. Less than 1% were from the low-income countries where 37% of the world's population live (Baer, Athanasiou & Kartha 2007, p31).

## Historic Responsibility

The GDR framework proposes that cumulative per capita $CO_2$ emissions from fossil fuel consumption since 1990 is a reasonable measure of historic responsibility, largely because emissions made prior to this date were usually made in ignorance of their harmful effects, and because of the high correlation between wealth and total emissions since the industrial era began. Figure 4 shows this measure of responsibility for selected countries and regions; the total bar is the total national cumulative emissions figure (from 1990 project to 2010), while the darker bar includes the adjustment to account for the exclusion of emissions below the development threshold. The adjustment is straightforward, based on the assumption that (within any given country) emissions are proportional to consumption, which is in turn proportional to income (Worldwatch Institute 2002).

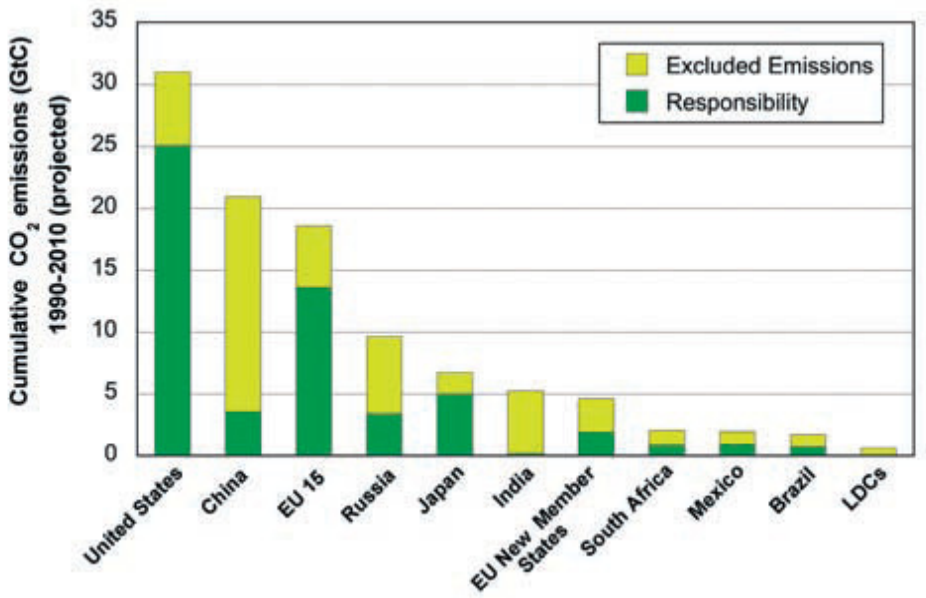


**Figure 4: Cumulative per capita $CO_2$ emissions from fossil fuel combustion, 1990-2010; 'responsibility adjusted to account for the exclusion of emissions below the development threshold** - from (Baer et al 2008; 53)

This then raises the question of how capacity and responsibility should be combined into a single obligation indicator, which can then drive the allocation of the global responsibility to each country.

## The Responsibility and Capacity Indicator (RCI)

The GDR framework's "Responsibility and Capacity Indiator" RCI is developed in order that among countries with the same capacities but different responsibilities, the country with greater responsibility has the greater obligation. It also ensures that among countries with the same responsibility but different capacities, the one with the greater capacity must have the greater obligation. There are many formulae, which have this property. The preferred approach uses a simple weighted sum of responsibility and capacity, in a way that allows different weights to be given to each:

$$RCI = aR + bC$$

It specifies that the weights a and b sum to 1, which confers the property that, as the paired weights go from a=1 and b=0 towards a=0 and b=1, the RCI goes from being exactly equal to responsibility (*R*) to being exactly equal to capacity (*C*) (Baer, Athanasiou & Kartha 2007, p41).

In the reference case shown in Table 1, the GDR Framework uses a = 0.5 and b = 0.5, which weights capacity and responsibility equally. This is just one of many possible choices of possible weightings for capacity and responsibility.

**Table 1: Global percentage shares of population, income, and capacity, cumulative emissions, responsibility, and RCI for selected countries and groups of countries** – based on (Baer et al 2008: 55)

| GDR results for selected countries and groups of countries | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 2010 | | | | | 2020 | 2030 |
| | Population (%) | GDP (per capita) $PPP | Capacity (%) | Responsibility (%) | RCI (%) | RCI (%) | RCI (%) |
| **EU 27** | 7.3 | 30,472 | **28.8** | **22.6** | **25.7** | **22.9** | **19.6** |
| EU 15 | 5.8 | 33,754 | **26.1** | **19.8** | **22.9** | **19.9** | **16.7** |
| EU +12 | 1.49 | 17,708 | **2.7** | **2.8** | **2.7** | **3.0** | **3.0** |
| **United States** | 4.5 | 45,640 | **29.7** | **36.4** | **33.1** | **29.1** | **25.5** |
| **Japan** | 1.9 | 33,422 | **8.3** | **7.3** | **7.8** | **6.6** | **5.5** |
| **Russia** | 2.0 | 15,031 | **2.7** | **4.9** | **3.8** | **4.3** | **4.6** |
| **Australia** | 0.3 | 33,880 | **1.4** | **2.0** | **1.7** | **1.5** | **1.4** |
| **China** | 19.7 | 5,899 | **5.8** | **5.2** | **5.5** | **10.4** | **15.2** |
| **India** | 17.2 | 2,818 | **0.7** | **0.3** | **0.5** | **1.2** | **2.3** |
| **Brazil** | 2.9 | 9,442 | **2.3** | **1.1** | **1.7** | **1.7** | **1.7** |
| **South Africa** | 0.7 | 10,117 | **0.6** | **1.3** | **1.0** | **1.1** | **1.2** |
| **Mexico** | 1.6 | 12,408 | **1.8** | **1.4** | **1.6** | **1.5** | **1.5** |
| **LDCs** | 11.7 | 1,274 | **0.1** | **0.0** | **0.1** | **0.1** | **0.1** |
| **Annex I** | 18.7 | 30,924 | **76** | **78** | **77** | **69** | **61** |
| **Non-Annex 1** | 81.3 | 5,096 | **24** | **22** | **23** | **31** | **39** |
| **High Income** | 15.5 | 36,488 | **77** | **78** | **77** | **69** | **61** |
| **Middle Income** | 63.3 | 6,226 | **23** | **22** | **22** | **30** | **38** |
| **Low Income** | 21.2 | 1,599 | **0.2** | **0.2** | **0.2** | **0.3** | **0.5** |
| **World** | 100 | 9,929 | **100%** | **100 %** | **100 %** | **100 %** | **100 %** |

One notable feature of these results is that the US has the largest share of global capacity, the largest share of global responsibility, and the largest share of combined RCI. However, this result is extremely important, in that by any reasonable standard of common but differentiated

responsibilities (as agreed under the UNFCCC), the United States would have to pay the largest share of the global climate 'bill.' But, despite the fact that the American people have largely come to accept the need for concerted action to stabilize the climate, that action is still conceived in almost entirely domestic terms. Indeed, when it comes to preparing the ground for US international obligations, the American climate movement has largely failed, having barely begun to even explain the necessities of emergency global action to its people (Baer, Athanasiou & Kartha 2007).

## Calculating national bills for climate change mitigation and adaptation

The overall global cost of mitigation and adaptation is hard to estimate, however, the following table gives an estimated cost per 1% of GWP (Gross World Product) that is required to fund the combined cost of mitigation of, and adaptation to climate change. If 2% of GWP is required the cost would be double this, 3% of GWP triple this etc.

**Table 2: GDP, capacity, and obligation, projected to 2020 - these figures assume that the total cost of the global climate program is 1% of projected GWP, or about $944 billion in 2020** - based on (Baer, Athanasiou & Kartha 2008: 58)

| | National Income (Billion $ ) | National Capacity (Billion $) | National Capacity % GDP | National Obligation (Billion $) | National Obligation % GDP |
|---|---|---|---|---|---|
| **EU 27** | $19,327 | $15,563 | 80.5% | $ 216 | 1.12% |
| EU 15 | $16,752 | $13,723 | 81.9% | $ 188 | 1.12% |
| EU +12 | $ 2,574 | $ 1,840 | 71.5% | $ 28 | 1.09% |
| **United States** | $18,177 | $15,661 | 86.2% | $ 275 | 1.51% |
| **Japan** | $ 5,071 | $ 4,139 | 81.6% | $ 62 | 1.23% |
| **Russia** | $ 2,905 | $ 1,927 | 66.3% | $ 41 | 1.40% |
| **China** | $13,439 | $ 5,932 | 44.1% | $ 98 | 0.73% |
| **India** | $ 5,814 | $ 972 | 16.7% | $ 11 | 0.19% |
| **Brazil** | $ 2,535 | $ 1,376 | 54.3% | $ 16 | 0.64% |
| **South Africa** | $ 706 | $ 422 | 59.8% | $ 10 | 1.42% |
| **Mexico** | $ 1,744 | $ 1,009 | 57.9% | $ 15 | 0.84% |
| **LDCs** | $ 1,549 | $ 82 | 5.3% | $ 1 | 0.06% |
| **Annex I** | $50,368 | $40,722 | 80.8% | $ 652 | 1.29% |
| **Non-Annex I** | $44,037 | $18,667 | 42.4% | $ 292 | 0.66% |
| **High Income** | $49,279 | $40,993 | 83.2% | $ 655 | 1.33% |
| **Middle Income** | $41,546 | $18,190 | 43.8% | $ 286 | 0.69% |
| **Low Income** | $ 3,579 | $ 206 | 5.8% | $ 3 | 0.08% |
| **World** | $94,405 | $59,388 | 62.9% | $ 944 | 1.00% |

The wide range of these national obligations reflects the widely different degrees of responsibility and capacity in different countries. These figures make no assumptions about the fraction of any national obligation that could reasonably be discharged domestically, as opposed to internationally. A range of institutional, political and governance mechanisms would be necessary were such obligations to be codified in international law, collected, and actually channeled toward mitigation and adaptation activities.

Military budgets of the world's major economies represent 2% of GWP and global consumer expenditure on "luxuries" as opposed to necessities is even higher. A spending of a similar or even higher level is easily justified to defend the world against the danger of climate change. The GDR framework gives an approach on how the global costs of mitigation and adaptation could be reasonably fairly shared.

## National Greenhouse Gas Emission Targets

As is shown in Figure 5, which is based only on CO2 emissions, USA and China are clearly critical to any effective international agreement that substantially reduces global greenhouse gas emissions.

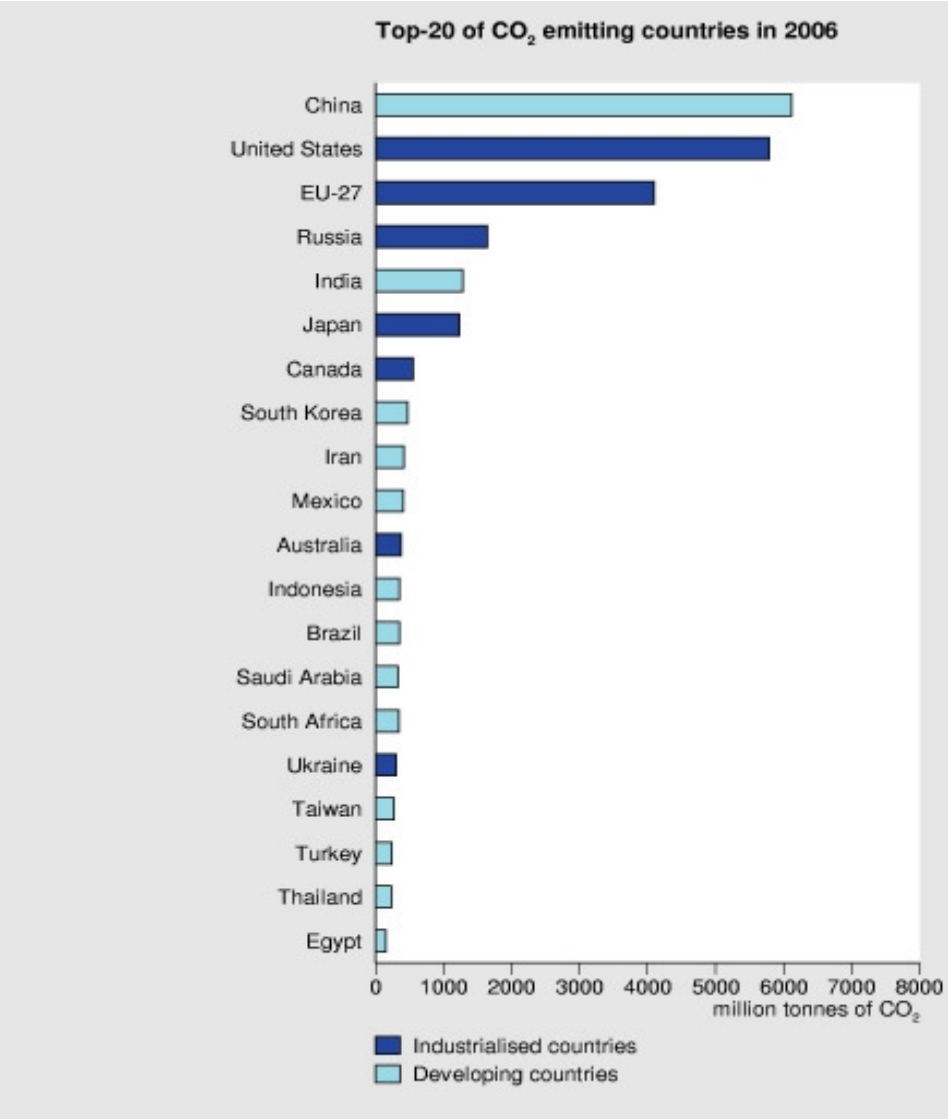


**Figure 5: CO2 Emissions in 2006 (in million tonnes – Carbon) –(Netherlands Environmental Assessment Agency 2009) based on UNFCCC and IEA**

The rankings of some countries change when emissions associated with land-use change, particularly deforestation, are included: by this measure, Indonesia and Brazil would be included in the top ten emitters (Worldwatch Institute 2009).

### The example of the United States

Figure 5 shows a similar calculation for the US to the global reductions projection shown earlier. But instead of showing a reduction wedge that thickens to 6% per year (reflecting the global rate in the climate emergency trajectory), it shows an even more ambitious USA domestic reduction trajectory that reduces national emissions to 90% below 1990 levels in 2050. Even this ambitious '90% by 2050' trajectory would only satisfy a portion of the USA's total obligation, the rest of which would have to be satisfied by funding international reductions (Baer, Athanasiou & Kartha 2008).

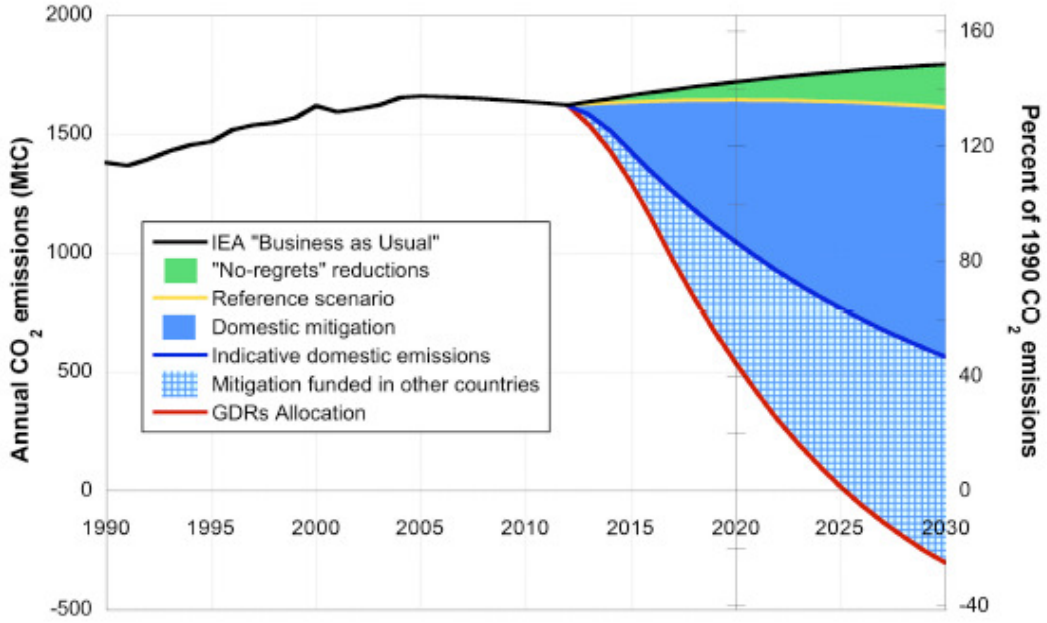


**Figure 6: The US business-as-usual trajectory, reference trajectory, mitigation obligation, and emission allocation** - based on (Baer, Athanasiou & Kartha 2008: 7)

Beyond its no-regrets reductions (top green wedge), US mitigation obligation includes domestic reductions (blue wedge - 2nd from top), showing reductions that will bring emissions to 90%

below 1990 levels by 2050) and international reductions funded by the US (blue cross-hatched wedge), which together fulfill the US mitigation obligation.

## The example of China

The complement to the situation illustrated above for the USA is China, the world's second largest national emitter of greenhouse gases. Due to the much lower RCI calculated for China (shown in Table 1) its national mitigation obligations are smaller than the 6% per annum reductions required globally by the emergency 2ºC trajectory.

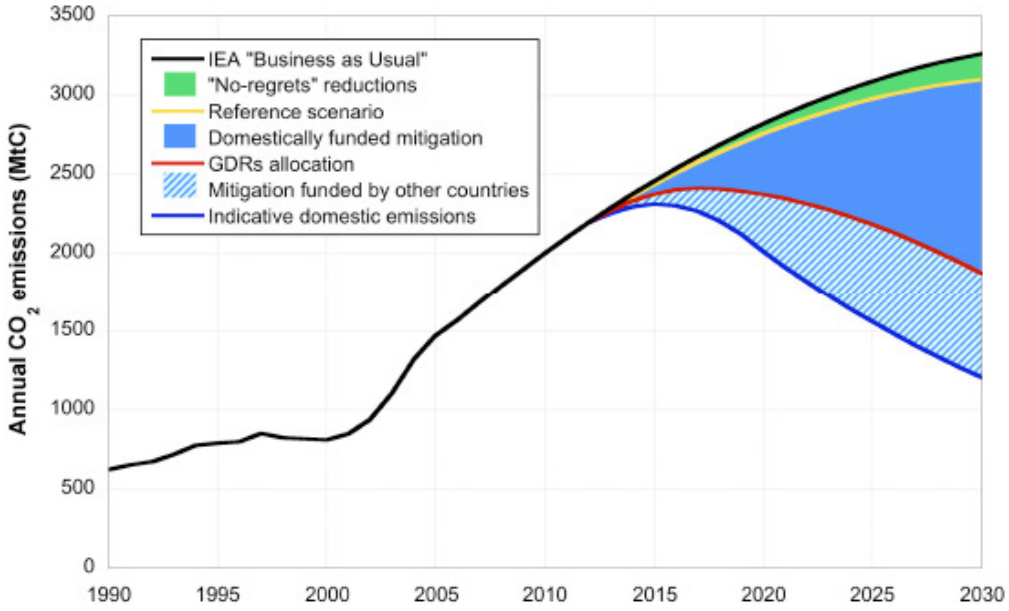


**Figure 7: China's emissions including mitigation funded by other countries**
- based on (Baer, Athanasiou & Kartha 2008, p7)

Here, again, the top green wedge represents no-regrets reductions. The 'Business-as-Usual' trajectory (the top line) is taken as an extrapolation of China's historical emissions growth, a choice that seems appropriate given its atypical rate and recent momentum. But note that China's domestic mitigation obligation, calculated as it is on the basis of China's RCI, is not particularly large, despite the projected continuation of China's unusually rapid economic growth. The

bottom striped wedge represents mitigation in excess of China's obligations that are required to reduce China's emissions in a manner consistent with the global 2ºC emergency pathway.

In Figure 6, we also see what GDRs seeks to achieve – a hypothetical instance in which a large amount of additional emissions reductions (the bottom striped wedge) are made within China, but financed by wealthy developed countries in need of offsets. These reductions are absolutely necessary, for China's emissions are large, and making full use of its mitigation potential is essential if we are to keep within the climate emergency trajectory. Fortunately, under the GDRs framework, there is a strong incentive for China to reduce beyond its national obligation by, in effect, selling mitigation potential to wealthy and middle-income countries such as those in the EU and the USA that need it to fulfil their mitigation obligations. Or, to put it another way, in a cap and allocate system, China would, in principle, be able to sell reductions at an international price that is greater than its marginal cost and by so doing earn the revenue needed to finance its own required reductions, at least partially and perhaps wholly.

The GDRs framework is, regrettably, outside the spectrum of proposals now being negotiated for a post-2012 regime. But at the same time, it is clear to put in place an effective international climate change regime that will reduce greenhouse gas emissions as quickly as is needed to minimise the risk of dangerous climate change will require honesty, boldness and a radical approach. In this context, the GDR framework can serve as a useful standard of comparison – a 'reference framework' that clearly marks out a set of essential core elements, elements that must be a critical part of any even potentially successful international post-2012 climate regime.

## Could this type of agreement be achieved?

As outlined previously, we need rapid reductions in greenhouse gas emissions to begin as soon as possible if we are to minimise the risk of dangerous climate change. Due to the problem mainly being caused by the fossil fuel emissions of the developed world, it is reasonable that the developed countries cover most of the costs of moving the world to a decarbonised economy and of funding adaptation to the global warming already caused.

Given that this will require massive investment in energy efficiency, renewable energy technologies and other technologies in all countries of the world, the challenge will be to get the political leaders and citizens of the developed countries to accept the responsibility to fund the transition not only domestically but also in the developing world. Appropriate governance mechanisms will also be required to ensure that the funds are effectively spent on reducing greenhouse gas emissions and appropriate adaptation. Many problems have already occurred with the projects funded under the Clean Development Mechanism(CDM) of the Kyoto Protocol (Carbon Trade Watch 2005).

The climate crisis also suggests that we are likely to have to finally acknowledge that there are limits to economic growth, and begin to re-direct the global economy from GWP to global happiness and quality of life in order to achieve Ecologically Sustainable Development (Czech 2000; Daly 2003). These will therefore represent the type of radical changes to our current system of international political economy required to avoid dangerous climate change.

## How does GDR compare with other approaches?

There have been many different kinds of proposals for global climate policy frameworks that resemble GDRs in some fashion, going back to the idea of equal per capita entitlements that emerged around 1990 (Agarwal & Narain 1991; Grubb 1989). A series of more-or-less detailed proposals for "multi-stage" frameworks were developed in the years between the Bonn/Marrakesh accords in 2001 and the Bali Action Plan in 2008 (Climate Action Network 2004; Climate Protection Programme GTZ 2004; Höhne, den Elzen & Weiss 2006). And as we discuss below, new attention has been drawn to responsibility-based allocations, including frameworks based on equal cumulative per capita emissions rights.

A comparison of GDRs with these frameworks would highlight a few key similarities and differences. Crucially, all of these approaches take it for granted that equity is an indespensible aspect of an international climate agreement, and that responsibility, capacity and need should in some way govern fair burden sharing.

The ideal of equal per capita emissions rights still has a wide appeal as an ethical norm and the basis for practical policy (e.g.,Singer 2009). India in particular has focused on the idea of equal current per capita allocations by agreeing that it will never exceed the average of Annex I per capita emissions [1]. The well-known “Contraction and Convergence” approach continues to enjoy a substantial following, particularly in the UK [2]. However, given the small carbon budget associated with a high likelihood of staying below even 2ºC of warming, there simply isn’t enough “environmental space” for the necessary growth in energy use in the developing countries under an equal per capita approach (to say nothing of slow convergence) (Baer et al., 2008).

One obvious response - and not at all new - is to argue that allocations should be based on equal cumulative per capita emissions. A variety of gestures at such a basis for the allocation of emissions rights has come from Chinese researchers and policy-makers recently (e.g., Teng 2009 ), and the idea also underlies strict historical responsibility calculations such as those presented recently by the Bolivian delegation in the context of mitigation obligations (UNFCCC 2009: 44).

One very important feature that GDRs shares with cumulative per capita approaches is the possibility of negative emissions allocations for wealthy or high per capita emissions countries. The concept of negative allocations can appear counter-intuitive and politically implausible, but it’s important to realize that, given common assumptions about the economics of mitigation, negative allocations are effectively just a further increase in monetary costs. Indeed, a system in which an industrialized country has a net negative allocation - on the assumption of tradeability of emissions rights - looks little different in economic terms from one in which a positive allocation of emissions rights is combined with an additional funding obligation for mitigation in developing countries.

A variety of other specific proposals for "burden sharing" or the allocation of emissions rights have also been published in the last few years, most drawing on the same basic

possibilities for equity principles (see Baer and Athanasiou, 2007). Most of these seem to be of primarily academic interest, as it were. However, it is important to note that the particular trajectory of the UNFCCC negotiations, which is speeding towards Copenhagen with the North/South impasse unresolved, constrains the discourse about equity severely. Proposals that might work today must essentially preserve the Annex I/Non Annex I distinction, which plainly is no longer an adequate map of global responsibility and capacity. If we are able to "cross the Copenhagen bridge," if you will, a much broader range of possibilities for principle-based burden sharing will emerge, and previously marginal approaches might become credible.

For the time being, the GDR approach is particularly useful in highlighting the 'equity' dimension of the climate change problem and in providing a reference framework against which other proposals developed in the international negotiations can be assessed. Without an unprecedented level of global cooperation, the 2°C emergency pathway, or anything like it, will quickly recede out of range. To effectively address climate change will require an unprecedented level of cooperation by developed and developing countries.

## Conclusion

The effective international agreement that is urgently required to avoid dangerous climate change will require a much greater willingness to cooperate and more radical policies than those adopted so far in the international climate change agreements. Such an agreement – likely only fully achievable after a bridging agreement of some kind in Copenhagen – needs to provide an effective mechanism, such as the GDR framework, whereby those with the capacity and responsibility fund decarbonised development for the global poor. In Copenhagen the developed countries need to make a clear commitment to do this as well as committing to dramatically reduce their own emissions. But in a more comprehensive agreement, something which also fairly allocates obligations to the wealthy in the developing countries will be necessary.

The GDRs framework represents the type of ambitious approach that is necessary to gaining international agreement to implement the emergency climate program necessary to avoid

dangerous climate change. It compares favourably with other frameworks proposed for the post-2012 period, particularly in terms of environmental justice issues for the global poor and it therefore provides a viable framework for substantially reducing the risk of dangerous climate change. The problems with having it adopted are more political and governance issues rather than technical feasibility. This or a similar radical approach to changing the international political economy is also required to move humanity towards Ecologically Sustainable Development.

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## Notes

[1] See for example the text of the speech by Prime Minister Manmohan Singh on release of India's Climate Change Action Plan on June 30, 2008, available at http://pmindia.nic.in/lspeech.asp?id=690.

[2] See the website of the Global Commons Institute, http://www.gci.org.uk

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