Climate realism and moral limit in international climate change politics

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Abstract

Climate realism identifies a moral limit after which collective action on climate change becomes politically implausible, regardless of the international architecture. Given the magnitude of international resource transfers envisioned as well as the current international strategic environment, relative-gains concerns have become politically salient. After a certain point, states will favour attempts to increase their own adaptive capabilities because domestic adaptation is more secure and independent of the dilemmas facing international mitigation and adaptation. A secondary goal is to deploy climate realism toward the evaluation of the political viability of alternatives to the carbon markets such as climate funds which rely on public funds to a greater degree. Carbon markets are argued to be more effective because, in their greater appeal to the self-interest of domestic private sector actors, they cultivate political will to withstand political forces identified by climate realism and push towards and more closely approach the moral limit.

Introduction

A consensus is emerging that a comprehensive international regime for cooperation on climate change is not within reach (Ostrom 2010; Keohane and Victor 2011). In explaining this, particular criticism has been directed towards the idea of a comprehensive international carbon market, which is at the heart of the Kyoto Protocol to the UN Framework Convention on Climate Change (UNFCCC). The justification for a carbon market is the prospect that engagement with emerging economies and developing countries on climate change mitigation drastically reduces total costs (Ellerman and Decaux 1998:17; Barrett 1998:25; Nordhaus 2007:33; Climate Group 2009). Yet the prospect of trading 'hot air' with Russia and other post-Soviet countries under Kyoto's international cap-and-trade system has provoked considerable criticism (Victor 2001; Schwarze 2002). More recently, criticism has been directed at the Kyoto Protocol's Clean Development Mechanism (CDM), which allows developed countries to generate carbon credits by investing in low-carbon activities and carbon sequestration in emerging economies and developing countries (Victor 2001; Olsen 2007; Pielke et al 2007; Prins and Rayner 2007; Schneider 2007; Wara 2008; Wara and Victor 2008; Bumpus and Liverman 2008; Paulsson 2009; Anonymous 2010). To be sure Kyoto's is not the only carbon market, with a number of other government and private initiatives underway with varying degrees of success (Green 2008; Bernstein et al 2010; Hamilton et al 2010). But given its size and scope, the CDM is indicative of the challenges facing carbon markets as an international institution to engage emerging economies and developing countries on climate change.

While acknowledging the many imperfections of Kyoto's and other carbon markets, I question whether it is institutional problems with carbon markets, per se, that are responsible for the lack of significant progress on climate change, or rather fundamental state interests in addressing the international dimensions of climate change which are a prerequisite to any such progress. Indeed, the overwhelming attention paid to the international climate change regime has left other important dimensions of climate

change politics in the shadows. Nearly thirty years ago, Strange argued that regime analysis 'encourages academics to practice a kind of analytical chiaroscuro that leaves in shadow all the aspects of the international economy where no regime exists and where each state elects to go its own way…The reality is that there are more areas and issues of non-agreement and controversy than there are areas of agreement' (Strange 1983:349). This paper's main goal is to articulate a theory of these shadow politics to be known as climate realism. Here, I extend Strange's argument to the study of climate change politics, which to date has tended to emphasize global climate change mitigation to a greater degree than adaptation, where each state can go its own way. I argue that a full appreciation of climate change politics must assess the balance of costs and benefits of both mitigation *and* adaptation and their resulting implications for state behaviour.

Politics in the Shadows

Climate realism's principle contribution is to provide an explanation for a lack of significant cooperation on climate change. It does so by identifying a moral limit (sensu Price 2008) after which collective action on climate change becomes politically implausible, regardless of the international architecture. This moral limit is based on power in terms of material capabilities, including the capability to adapt to the adverse impacts of climate change: highly industrialized states will be willing to engage in international cooperation on climate change, but only up to a point where the magnitude of resource transfers triggers relative-gains concerns. Relative-gains concerns arise because, while the benefits of international efforts towards mitigation and adaptation are to be distributed globally, the costs are expected to be borne largely by rich, industrialized countries. Although relative-gains need not always impede cooperation, the global strategic environment has evolved to make them more salient in climate change politics for various reasons, including improved understanding of the costs of mitigation and adaptation, the prospect of catastrophic climate change as well as increased sensitivity to international

resource transfers because of the rise of emerging economies, particularly China. Given the magnitude of international resource transfers envisioned for mitigation and adaptation, highly industrialized countries decide that it is more prudent to conserve those resources for the uncertain needs of the future, including domestic adaptation. Accordingly, climate realism asserts that states will favour attempts to increase their domestic adaptive capabilities—that is, power—because domestic adaptation is more independent of the dilemmas facing international mitigation and adaptation.

This paper also used the lens of climate realism to evaluate the political plausibility of international carbon markets relative to alternative approaches to incentivize action on climate change, particularly climate funds for mitigation and adaptation. As Underdal has emphasized, the effectiveness of any international regime should be gauged against two counterfactuals: the collective optimum and the non-cooperative situation that would have come about in the absence of the regime (Underdal 2001b:7-9). I argue that critiques of the carbon markets too often compare their performance against an ideal, collective optimum. But because such alternatives exist largely as counterfactuals, there is a risk that the political conditions for their attainment have not been rigorously considered (see Price 2008:199-200). The evaluation undertaken here suggests that carbon markets, in their appeal to the self-interest of the domestic private sector, are likely to be more successful than other approaches because, according to climate realism, states will increasingly be reluctant participants in direct transfers for international mitigation and adaptation efforts.

A Need for Climate Realism

Realist arguments are rare in the literature on climate change politics, though recognizing important recent contributions by Grundig (2006) and Vezirgiannidou (2008). Rather, its most dominant strain, neorealism, has been challenged by constructivism and neoliberal institutionalism. Paterson, for example, has held neorealism to be inadequate in explaining climate change politics because of its

denial of the influence of domestic actors and international epistemic communities as well as its questionable ontological foundations, particularly the denial of change (Paterson 1996:67-71). I argue that constructivism and neoliberal institutionalism overlook an important systemic variable that helps explain the lack of cooperation on climate change: the distribution of material capabilities. Acknowledging some of the critiques of neorealism, however, climate realism subscribes to a more neoclassical realism that recognizes that international relations are co-determined by systemic and domestic-level politics (Sterling-Folker 1997; Rose 1998; Kirshner 2010; Taliaferro et al 2009).

Limits of Constructivism

Much of the constructivist literature on global environmental politics has stressed the ability of transnational ideas and norms about environmentalism, cosmopolitanism and climate science to affect political change. The epistemic communities theory of Haas (1992) has been particularly important in demonstrating how improved scientific knowledge provided the basis for international action to prevent the destruction of ozone layer. Other constructivists have identified limits to the effects of environmental ideas and norms. For example, Bernstein and Okereke both find that environmental norms have only been successful when they achieve a degree of 'fitness' with the global social structure currently delineated by the (neo)liberal economic order (Bernstein 2001:129; Okereke 2008:28).

For constructivists such as Wendt, the explanatory significance that neorealists attribute to anarchy and the distribution of material capabilities is actually due to the underlying, immaterial 'distribution of interests' (Wendt 1999:104). The neorealist response to Wendt's 'distribution of interests' has been to question states' capacity to know how the 'distribution of interests' will unfold into the future. Such uncertainty compels states to be prudent in their deployment of material capabilities because of the possibility that other states will become aggressive in the future (Copeland 2000:205-206). This is the 'material objection' to constructivism: that the distribution of material capabilities has behavioural

effects on states—compelling them to be cautious and prudent in international politics—independent of the distribution of interests (Sorensen 2008:11). But this material objection is in itself not incompatible with constructivism. Adler has maintained that constructivism 'seizes the middle ground because it is interested in understanding how the material, subjective and intersubjective worlds interact in the social construction of reality' (Adler 1997:330). A similar integration of how material capabilities and ideas together explain climate change politics is also necessary.

Climate realism seeks to explain limits to cooperation on climate change by reference to material capabilities: that states will be reluctant to partake in international efforts that will result in a significant redistribution of resources. But in doing so, climate realism does not deny the importance of ideas nor the possibility for normative transformation leading to change in state interests making significant action on climate change possible. Rather, climate realism posits that there are constraints on the rate of political change. Such constraints are important in the discussion of climate change politics because sufficient time may simply be unavailable for a fundamental normative shift before climate change triggers global ecological positive feedbacks that accelerate and lock-in the process (Lenton et al 2008).

Limits of Neoliberal Institutionalism

The neoliberal institutionalist interpretation of climate change politics emphasizes the need for appropriate institutions to realize global benefits of climate change mitigation. Because all states stand to benefit from the prevention of dangerous climate change, it is assumed that states will find it in their interests to cooperate to reduce emissions. Inappropriately designed institutions such as the Kyoto Protocol have however prevented states from realizing this collective interest. Victor has argued: 'The problems with Kyoto are not merely a matter of mustering the 'political will' to swallow a bitter pill. Rather, Kyoto's troubles originate with its architecture—strict emission targets and trading' (Victor 2001:109). The collective interest in climate change mitigation is extremely difficult to realize through a

comprehensive, international carbon market because '[i]t is difficult to design effective regulatory systems in the context of a multiplicity of cooperation problems, a broad and shifting distribution of interests, extreme uncertainty about which measures governments are willing and able to implement, and ambiguity about how to craft viable linkages' (Keohane and Victor 2011:15). These authors suggest that a more decentralized institutional approach would be more effective.

There are, however, two key realist critiques of neoliberal institutionalism which are relevant for climate change politics. The first, made under neorealism, is found in the absolute-relative gains debate (see Grieco 1988; Powell 1994). In many interpretations of climate change politics, absolute-gains prevail. In the Stern Review, one of the most influential climate policy publications of recent years, the costs of climate change are reported in absolute terms: 'the estimated effects of even ambitious climate change policies on economic output are estimated to be small—around 1% or less of national and world product, averaged across the next 50 to 100 years' (Stern 2006:248). Accordingly, because upfront costs of mitigation will be outweighed by future global benefits, Stern concludes that concerted efforts towards mitigation now are warranted. From the neoliberal perspective, scientific understanding about the global impacts of climate change have revealed a global collective interest: the prevention of dangerous climate change. Neorealism emphasizes however that states are concerned not with absolute-gains, but the possibility of losing their position in the international system relative to other states (Mearsheimer 1994:12). But, in turn, neoliberal institutionalists have pointed out that not all redistributions are significant in terms of their relative-gains effects. Snidal has demonstrated that relative-gains are insignificant in international trade negotiations (Snidal 1991). Powell and Keohane have argued that it is actually the strategic environment in which the cooperative venture takes place that determines whether relative-gains are significant or not (Powell 1994:334-338, Keohane and Martin 1995:44-45). However, in presenting climate realism below, I argue that the strategic environment for climate change has evolved such that relative-gains concerns are relevant.

The second critique of neoliberal institutionalism, this time emanating from neoclassical realism, is that cooperation is assumed to be the ineluctable consequence of participation in international institutions (Sterling-Folker 1997). Once states become involved in an international institution, the virtues of cooperation become self-evident—here, the prevention of dangerous climate change—and states should be disposed to greater and greater cooperation despite starting from widely divergent domestic political interests. In this way, neoliberal institutionalism grants international political processes greater causal weight than domestic politics in a states' determination of whether or not cooperation is in its' best interests. With demand for international cooperation thus assumed, neoliberal institutionalists resolve themselves to the design of appropriate institutions to supply it. Under neoclassical realism, however, domestic politics determine state behaviour and whether or not a state will partake in international cooperation. As in evolution though, states that fail to make the right domestic policy decisions will eventually be selected against by the international system (Sterling-Folker 1997:17-19). While the short-comings of the Kyoto Protocol's carbon market are real and important, arguments claiming that there are more effective institutions too often assume that there is political will to do so.

Climate Realism

Climate realism suggests that cooperation in climate change politics will remain difficult because the magnitude of international resources necessary for addressing climate change triggers relative-gains concerns amongst key states. The concern is that international transfers will draw down material resources which states believe are more prudent to conserve for future contingencies, including domestic climate change adaptation. As a consequence, climate realism asserts that at a certain point states will favour attempts to increase their domestic adaptive capabilities at the expense of international cooperation because domestic adaptation will be more secure and independent of the dilemmas facing international mitigation and adaptation. It cannot be assumed that all states will

conclude that their interests are tied to the global collective optimum to prevent 'dangerous' climate change, such as a 2°C target,[2] because what constitutes 'dangerous' varies amongst states based on their domestic adaptive capability.

In this section, climate realism is presented. To do so it is first necessary to reconceptualise power in climate change politics in order to identify a link between power and domestic adaptation. Second, I explain how efforts towards climate change mitigation engender relative-gains concerns as the result of both patterns of redistribution of gains and also changes in the strategic environment.

Power in Climate Change Politics

Underdal makes an important contribution to global environmental politics by drawing attention to the two faces of power: (i) autonomy, or control over events important to oneself, and (ii) hegemony, or control over events important to others (Underdal 2001b:29-33). However, the bulk of his discussion of different international environmental regimes relates to power as hegemony. For example, a number of environmental regimes, including for fish conservation, radioactive waste and whaling, all demonstrate that powerful states can coerce others to adopt environmental agreements—even those that serve powerful states better than the group at large (Underdal 2001a:450).[3] I submit however that in climate change politics, power must also be understood as the power to produce and exchange goods and services (see Boulding 1989:10) in order to ensure a state's autonomy in the face of local resource scarcities.

A paradox about environmental politics is that the means of environmental resilience—the economic power to produce and exchange goods and services to compensate for local resource scarcities—are coupled, at least today, with environmental degradation. In other words, greater economic resources derived from the degradation of the environment provide means to circumvent this very same environmental degradation. Such a conception of power extends to climate change. For example, Victor

observes that 'countries that have the greatest capabilities to respond to changing climate and which are also, in general, the largest emitters (at least on a per-capita basis) are also those most proofed against vagaries in the climate' (Victor 2006:93). Other critics of the Kyoto protocol consider economic growth a more appropriate strategy for addressing climate change because it gives those who are now vulnerable the capacity to adapt in the future (Lomborg 2007:48; Schelling 1997). In other words, 'richer is safer' (Wildavsky 1980).

Homer-Dixon's 'ingenuity gap' model offers an explanation for why richer is safer through a reframing of the debate between Malthusians and Economic Optimists (Homer-Dixon 1999:28-46). Malthus, as is well know, predicted that human population would outstrip resource supply. But Malthusians have consistently overlooked the possibility that resource scarcities actually increase the supply of ingenuity that allow environmental scarcities to be resolved. Economic Optimists emphasize that markets influence ingenuity because rising scarcities can generate price signals that serve to incentivize advancements in technological alternatives. In response, Homer-Dixon's ingenuity gap model demonstrates that while scarcity can increase ingenuity, it can also be prohibitive where the magnitude of scarcity resulting from rapid environmental change is such that it overwhelms the very institutions needed to supply the ingenuity necessary for solving the scarcity problem.

It is implied in Homer-Dixon's work that states should strive towards some combination of aggressive mitigation and adaptation measures because climate change threatens to overrun global and national institutions needed to solve the resulting scarcity problems. In other words, climate change promises not just local resource scarcities, but global ones that will over-run the market's ability to supply resources at costs even the richest of countries would find reasonable. He writes 'My analysis…puts a premium on prevention of scarcity, not on subsequent adaptation…We are taking a huge gamble if we follow the path [Economic Optimists] suggest, which is to wait until environmental scarcities are critical

and watch human ingenuity burst forth in response' (Homer-Dixon 1999:126). But it is also possible that states will favour attempts to increase their domestic adaptive capabilities—that is, power—instead of mitigation because domestic adaptation is more secure and independent of relative-gains concerns facing international mitigation and adaptation, issues to which we now turn.

Relative-Gains Concerns in Climate Change Politics

Patterns of Redistribution

Regulation of emissions may result in significant international resource transfers. This can occur through carbon markets as well as via other means, such as relocation of international business because of competitiveness issues. In terms of competitiveness, it is clear that if imposed only on OECD countries, emissions regulations would result in the relocation of energy intensive industries to China, India, and elsewhere in East Asia (Babiker 2005). Such distortions are one reason for a comprehensive approach. Global carbon markets result in important resource transfers because of variation in the marginal costs of reducing emissions across states. This is true of the Kyoto carbon market (Ellerman and Decaux 1998:17), where not all states have emission reduction targets. But resource transfers also remain salient in a situation where all states do. A recent analyses of the expected effect of international emissions trading under a regime of 'perfect' coordination concludes that while all actors are better off with international emissions trading, China and India will benefit significantly more than the EU, Japan or US (Underdal et al 2011:11).[4]

The above highlights relative-gains concerns arising from asymmetry in the upfront costs of international transfers for mitigation and expected benefits thereof. There are two issues here. First, from the perspective of individual states, relative-gains concerns are important because the benefits of mitigation only partially accrue to those states expected to bear the costs. As Grundig (2006) has

demonstrated, the large upfront resources transfers considered are likely to trigger relative-gains concerns because benefits are non-excludable. Posner and Sunstein make a similar observation:

> *Suppose also that the United States is less vulnerable than many other nations to serious losses from climate change, and that the expected damage, in terms of health and agriculture, for example, is comparatively low—and that in those terms other nations, such as India and those in Sub-Saharan Africa, are likely to lose much more. If so, the United States might be a net loser from a specified worldwide carbon tax even if the world gains a great deal (Posner and Sunstein 2008:1568).*

In contrast with the international trade regime, where relative-gains are weak because cooperating states can effectively keep the benefits amongst themselves (Snidal 1991; Vezirgiannidou 2008:44), the benefits of emissions mitigation are non-excludable. Those countries taking on the economic burden of emission reductions cannot restrict benefits from being enjoyed by non-parties.

Secondly, climate change time lags means that the realization of the benefits of mitigation will only occur over the range of 100 to 200 years (Meehl et al 2005). This is complicates the argument that cost-benefit analysis favours action on climate change (Stern 2006), whereby the upfront costs of mitigation will be outweighed by future global benefits. For realists, even as climate change unfolds over the next century, states must be prepared for other events requiring material resources including war. Thus even if there is a long-term symmetry between costs and benefits of climate change, the upfront resource transfers are still capable of generating relative-gains concerns in the short term that inhibit cooperation.

Change in the International Strategic Environment

A redistribution of the gains from international cooperation does not necessarily make it politically salient. Rather, the strategic environment in which the cooperative venture takes place determines whether relative-gains are significant (Powell 1994:334-338; Keohane and Martin 1995:44-45). I posit

however that the international strategic environment has changed in a way that makes relative-gains more salient since climate change first emerged as a political issue. First, the costs of climate change are better understood and larger than first believed. Second, the threat of significant future damages resulting from catastrophic climate change puts greater emphasis on retaining resources for future domestic adaptation. Last, the rise of emerging economies has made established powers, particularly the US, more sensitive to international resource transfers, such as to China (Fung et al 2006; Vezirgiannidou 2008; Drezner 2009). Taken together, international action on climate change could be perceived as draining highly industrialized countries of material resources, which are increasingly important to domestic adaptation, to the benefit of rising powers.

Just what is the magnitude of resources required for climate change? The UN has estimated that between $200-$340 billion per year in additional finance will need to be directed towards mitigation efforts in the developing world (UNFCCC 2007:6; 2008a:54). As for adaption in developing countries, such finance has been estimated at between $67-$130 billion per year *in addition* to current levels of official development assistance (ODA) (UNFCCC 2007:8; Parry et al 2009:14). Altogether, total costs for mitigation and adaptation range from 0.7% to 1.2% GNI of the twenty-three countries of the OECD's Development Assistance Committee—this is 2-3 times as large as their current ODA contributions (UN 2009: 48-49). Importantly, the magnitude of these costs is much greater than in the most successful example of multilateral environmental cooperation, the Montreal Protocol. In that case, rich industrialized countries agreed to pay incremental costs in order that developing countries convert to ozone-friendly technologies. But the budget for doing so has remained approximately $166 million per year (Multilateral Fund 2010)—orders of magnitude smaller than the hundreds of billions of annual financing for climate change (see Grundig 2006:783).

Moreover, estimates of the costs of future climate change damages are increasing and there is concern that current emissions trends could cause positive feedbacks that accelerate and lock-in climate change (IPCC 2007:15-18; Lenton et al 2008). The prospect of catastrophic climate change could have a regressive impact on cooperation if it compels states to conclude that international mitigation efforts would not only be too costly, but ineffective because climate change has become self-reinforcing. Recalling our discussion of power, under such circumstances, it would be logical to focus on domestic adaptation. On such terms, Václav Klaus, current president of the Czech Republic, has dismissed mitigation efforts as unrealistic and unnecessary: 'If we accept global warming as a real phenomenon, I believe we should address it in an absolutely different way. Instead of hopeless attempts to fight it, we should prepare ourselves for its consequences' (Klaus 2007). Ideally, such adaptation efforts would entail significant transfers to the developing world to help them adapt. But if the magnitude of international resource transfers necessary for adaptation are large enough, highly industrialized countries may instead focus on their own domestic capabilities for adaptation.

Ultimately, the extent to which highly industrialized countries will act to address climate change will be based on a political calculation that weighs the costs and benefits of global mitigation and adaptation against the costs of domestic adaptation. Because adaptive capacity is reflected in material power, it is reasonable to expect that convincing powerful states to undertake mitigation efforts to a level beyond their capacity to adapt will prove difficult because domestic adaptation is more secure and independent of the dilemmas facing international mitigation and adaptation. Under such circumstances, approaches which would reduce relative-gains would become more salient, including of geo-engineering (Victor et al 2009) and efforts towards the reduction of costs of low-carbon technologies through research and development (Galiana and Green 2009). These latter two strategies are indeed becoming increasingly attractive as policy tools. However, they still face important uncertainties, such as unintended consequences of geo-engineering (Robock et al 2009) and the uncertain effect of technological

innovation on absolute emissions levels (Alcott 2005). For these reasons, their relationship with international mitigation and adaptation efforts remains unclear.

Is the Carbon Market Failing?

In the Copenhagen and Cancun Accords, developed countries agreed to deliver $100 billion per year by 2020 to support mitigation and adaptation activities in developing countries (UNFCCC 2009:para.8, UNFCCC 2010a:para.98). Where these resources will come from remains unclear. The *UN Secretary-General's High-level Advisory Group on Climate Change Financing* has identified four broad sources of climate finance (see Table 1) including (i) public sources such as revenues from auction emission allowances/domestic carbon taxes, removal of fossil fuel subsidies in developed countries, and ODA; (ii) multilateral development banks; (iii) international carbon markets; and (iv) private finance (UN 2010a:22-28).

With mounting criticism of the Kyoto Protocol's CDM, there have been calls to consider alternative policies instead. The US Government Accountability Office suggested 'that it may be possible to achieve the CDM's sustainable development goals and emissions cuts in developing countries more directly and cost-effectively through means other than the existing mechanism' (GAO 2008:8). A global conference hosted by the Government of Bolivia concluded 'The finance required [for climate change] must be provided from public sources, and must be new and additional to ODA, to bilateral assistance, and to funds flowing outside the UNFCCC…The carbon market shall be eliminated as source of financing' (World People's Conference on Climate Change 2010). But because alternative sources of finance have largely not yet been implemented and exist largely as counterfactuals, there is a risk that the political conditions for their attainment have not been rigorously considered and exist as an ideal in comparison to the international carbon markets (Price 2008:199-200). Climate realism as elaborated above is helpful in assessing the political plausibility of alternatives to the international carbon markets.

The assessment undertaken here considers the CDM and voluntary carbon offset systems in relation to climate funds for mitigation and adaptation. The CDM is the primary international carbon market and also the primary multilateral finance mechanism for engaging the developing world. However, a number of voluntary carbon markets are also operating in parallel. Under the Kyoto Protocol, the CDM has also been tied to the financing of the Adaptation Fund through a 2% tax on CDM credits (IIED 2009). Climate funds have recently gained prominence as an alternative means of engaging developing countries. Some have been initiated as a response to the commitment made in Copenhagen and formalized in Cancun towards $30 billion in new and additional 'fast-start' finance for the 2010-2012 period to be allocated equally between mitigation and adaptation (UNFCCC 2009:para.8; UNFCCC 2010a:95).[5] Finally, I use ODA as an example of the politics of direct budget contributions from developed countries to international finance, although recognizing that ODA is not uniquely directed to climate change. Following Bernstein et al. (2010), I conclude that carbon markets, as institutions that appeal directly to the self-interest of private sector actors, are likely to be more successful than other approaches for leveraging international climate finance because they cultivate domestic political interests that serve as a countervailing force to political pressure predicted by climate realism.

International Carbon Markets

The CDM is the primary carbon market that engages developing countries. Investments into the CDM are expected to result in nearly 2,764 million tonnes of carbon credits by 2012.[6] If those carbon credits represent real emission reductions, they would reduce emissions of highly industrialized countries (excluding the USA) by approximately 8% below their 1990 baseline levels by 2012. But a minimum of 20% of CDM credits are likely not to represent real emission reductions (Schneider 2007; Au Yong 2009) and uncertainty about credit 'additionality' remains a major challenge (Wara 2008; UNFCCC 2010b). Nevertheless, investments in the CDM represent a significant transfer of resources from highly

industrialized countries to emerging economies and developing countries. The CDM credits generated over 2004-2009 are valued on the CDM primary market at more than $25 billion (Capoor and Ambrosi 2006; 2007; 2008; 2009; Kossoy and Ambrosi 2010).[7] The distribution of CDM projects is highly uneven with China (54%), India (16%), Brazil (6%) and South Korea (4%) generating the vast majority of CDM credits.[8]

The voluntary carbon market is becoming increasingly important (Figure 1). Omitting the US-based Chicago Climate Exchange, which was closed in 2010 (Gronewold 2011), the voluntary carbon markets have generated 186 million tonnes of carbon credits over the period 2004-2009 (Hamilton et al 2010:iii) Developing countries have accounted for 40-70% of this supply, though showing similar geographic distribution as the CDM (Hamilton et al 2009:8; 2010:vii). The 2008 financial crisis has seen the primary CDM market contract by nearly two-thirds in volume from 2007 to 2009; the voluntary market (omitting the Chicago Climate Exchange) has retracted since 2008 but to a considerably lesser extent (Figure 1).

While it is appropriate to wait until the end of Kyoto's first commitment period in 2012 before making final judgments, the distribution of CDM credit holdings by highly industrialized countries is noteworthy. In absolute terms, Figure 2 shows that Japan and Germany have so far acquired the most CDM credits. Japan is recognized to have the highest emissions abatement costs amongst industrialized countries (Ellerman and Decaux 1998; Peterson and Klepper 2007). However, Germany is also making the most progress domestically in reducing emissions, *independent* of the carbon markets— even below the -21% target it assumed under the EU Burden Sharing Agreement (EEA 2009:72). (For purposes of such a comparison, Figure 3 presents emission trends independent of carbon credits.) Indeed, six countries are in effect holding surplus credits because their domestic emissions are already below their emission reduction targets and/or EU emissions burden sharing arrangement independent of the carbon markets: Germany, UK, Sweden, Belgium, France and Greece. More importantly, other large emitters party to the

Kyoto Protocol such as Canada and Australia hold little or no CDM credits. In addition, while the US is ineligible to participate in the CDM, firms in the US are the largest collective purchaser of carbon credits on the voluntary carbon markets (Hamilton et al 2008; 2009; 2010: 94-95).

Finally, while the CDM ostensibly prohibits any diversion of ODA towards the carbon market, the use of public spending for everything except the final purchase of CDM carbon credits has been approved the OECD's Development Assistance Committee (OECD-DAC 2004). Over $44 million has been spent on CDM capacity and institution building, only a small part of which flowed to sub-Saharan African countries and most focused on large emerging economies (Michaelowa and Michaelowa 2007:12). However, while the CDM cannot claim to be a 'pure' market mechanism, voluntary carbon markets can.

Climate Funds

Approximately $26 billion have so far been pledged towards various climate funds.[9] In terms of allocations to climate funds, Japan, UK, US, Germany and Norway lead pledges (Figure 4). Two types of climate funds can be distinguished, those designed to grant developed countries public finance to attract private investment towards climate-friendly technologies and strategies in the developing world and those designed explicitly to solicit international investment. The first approach was pioneered by the Global Environmental Facility (GEF), though most of the recently established climate investment funds adhere to this model (see First Climate 2010). Since its inception in 1991, the GEF claims to have leveraged $17.2 billion in cofinancing from $2.7 billion in donor and claims to have reduced more than 1000 million tonnes of emissions (GEF 2009). The largest multilateral climate investment fund, the Climate Technology Fund, is projected to leverage $27 billion in co-financing from its current $4.4 billion allocation (CIF 2010). Apart from the Clean Technology Fund, the most significant climate investment funds are the GEF ($2.4 billion), the Pilot Program for Climate Resilience ($1.0 billion) and the Forest Investment Program ($0.6 billion).[10] However, not all such climate funds are multilateral. Japan's $15

billion Hatoyama Initiative is the largest financial commitment yet made towards technical assistance for climate change, almost entirely to mitigation.

In contrast, funds designed to solicit international climate finance identify sectors in their economy where emission reductions; international finance is then directed towards projects with the lowest marginal abatement costs with knowledge that the resources invested would lead to a certain amount of reductions economy (see Wara 2008:1800-1802). An important example is the Brazilian Amazon Fund established in 2008 under the Brazilian Development Bank (BNDES) to reduce deforestation.[11] The Amazon Fund is also noteworthy in that, in exchange for financial contributions, BNDES issues certificates which quantify emissions reductions achieved though differing from carbon credits in that they are 'nominal, non-transferable and do not generate rights or claims of any nature'.[12]

Climate funds are still skewed towards mitigation. Because of the overlapping mandates of the various climate funds, it is difficult to interpret *a priori* whether they will target mitigation or adaptation. But of the $7.8 billion in climate funds already disbursed, nearly all (80%) are committed towards mitigation and an additional 5% towards the reduction of deforestation; only $1.0 billion (13%) have been disbursed towards adaptation.[13] Finally, it is not clear that climate funds represent 'new and additional' money but instead represent shifts from existing ODA budgets. Of the total amount pledged under the Hatoyama Initiative, nearly half ($7.2 billion) is to be classified as ODA.[14] All GEF financing is considered ODA.[15] Funds pledged to the Clean Technology Fund and Pilot Program for Climate Resilience are both administered by the World Bank, and are likely also to be classified as ODA.[16] All things considered, there is nothing wrong in directing ODA towards climate change. The question is whether, into the future, ODA contributions will rise to meet the new objectives of climate change or by e transferred from other issues.

Official Development Assistance

Historically, ODA flows are less volatile than foreign direct investment, but they are generally of much lower volume (Morrissey and Osei 2004:45). Over 2004-2009, ODA contributions from the OECD have actually increased in absolute terms from $88 to $116 billion. However, ODA contributions have plateaued at around 0.35% GNI. This is well below the pledged 0.7% GNI target agreed to as part of the 2002 Monterrey Consensus (UN 2002:para. 42) and recently reaffirmed in the Doha Declaration on Financing for Development (UN 2008). Looking to the future, the effect of the financial crisis on ODA is unclear. Historical precedent suggests ODA is cut back significantly, though not immediately, after a financial crisis (Roodman 2008; Mold et al 2009; UNCTAD 2009a). If ODA contributions decline into the future, government contributions towards climate change will either be limited or increase only at the expense of other development efforts.

Moral Limit in Climate Change Politics

Climate realism provides a theoretical framework to predict the plausibility of different forms of climate finance described above. With the emergence of climate funds and a discourse stressing the need for increased adaptation financing, it may appear counterintuitive to be making a case for climate realism. The threat of catastrophic climate change, it would seem, is compelling states to cooperate. State pledges of greater financial resources to climate funds, particularly those for mitigation, are evidence of this trend. However, this is not incompatible with climate realism. Climate realism suggests that cooperation will to increase in scope and complexity until a threshold will be crossed, referred to here as a moral limit, after which such cooperation becomes politically infeasible.

Because of their greater reliance on public sector financing, climate funds are expected to be less robust than carbon markets to political forces identified by climate realism—the reluctance of states to commit

resources to international adaptation and mitigation efforts because of relative-gains concerns. Carbon markets can be expected to broaden the domestic political base for action on climate change by more directly appealing to self-interest of the private sector. In this way, carbon markets can help push towards and more closely approach this moral limit. In what follows we first compare the performance of the carbon markets with carbon funds, presented above, before considering each in relation to the political forces identified by climate realism.

Carbon Markets versus Carbon Funds

How does the CDM compare to climate funds in terms of financial transfers and emission reductions? Direct comparison is problematic because of less systematic monitoring and reporting of climate funds. But a few observations are possible. CDM credits are valued on the primary market at more than $25 billion and represent 2,764 million tonnes of carbon credits. Actual deposits into various climate funds to date have totalled $11.3 billion—less than half the pledged amount.[17] Except for the US and Norway, countries most committed to climate funds are the same as those most invested in the CDM. It should be recalled however that, while ineligible to participate in the CDM, firms in the US are the largest buyer of voluntary carbon credits. On the other hand, Norway has not invested in the CDM but has contributed almost exclusively towards climate funds, such as the Amazon Fund.[18] All of the Amazon's Funds current funding has come from government donations: $375 million from Norway and $29 million from Germany.[19] Finally, in terms of adaptation financing, the $1 billion sourced through climate funds more than doubles resources available under the Kyoto Protocol' s Adaptation Fund, which is in part fund through a tax on CDM credits (IIED 2009). But in both approaches, adaptation financing is only a fraction of that allocated to mitigation.

As for emissions reductions, the 1000 million tonnes of emissions reductions claimed by the GEF since 1991 is considerably less than what the CDM claims to have achieved over a shorter period of time.

However, monitoring, reporting and evaluation of GEF projects have also been much less rigorous than under the CDM. For example, monitoring of UNDP's GEF portfolio do not use standardized emissions monitoring procedures (see UNDP 2002). In contrast, the CDM has emphasized much more exacting methodologies in order that carbon credits might be exchangeable.[20] There are certainly problems with estimates of emissions reductions claimed by CDM projects (Wara 2008; Wara and Victor 2008; Schneider 2007; Au Yong 2009). But because of the greater rigor of its monitoring efforts, more confidence can be had in the CDM's claims of emissions reductions than the GEF's.

ODA, Climate Funds and Moral Limit

Climate funds for mitigation and adaptation are expected to be more vulnerable to political forces identified by climate realism than carbon markets because of their reliance, to different degrees, on government financing. Adaptation financing is particularly vulnerable, first of all, because of its near complete reliance on ODA and lack of significant appeal to the private sector. Our review of ODA has shown it to be consistently underfunded: ODA levels remain below the 0.7% GNI target agreed internationally. Prospects for significant increases in ODA are unlikely as a result of the global financial crisis. With regard to ODA contributions, the *UN Secretary-General's High-level Advisory Group on Climate Change Financing* reports that 'political acceptability of such sources will depend on national circumstances and on the domestic fiscal environment, which has currently put many developed countries under extreme pressure' (UN 2010a:6).

Secondly, strategic interests to justify radically increased adaptation and development financing are also not readily apparent. Schelling's (1997) allusion to the post-World War II Marshall Plan as a template for climate and development finance is vulnerable to such criticism. It is widely acknowledged that the Marshall Plan's primary objective was not simply a humanitarian one to rebuild Europe after World War II but rather to contain Soviet influence (Leffler 1988). But for the same reasons that states are highly

vulnerable to climate change, they can also be expected to be of less strategic importance. From realist view, ODA always has a strategic component (Morgenthau 1962).

Third, it has been suggested that there exists a possible link between climate change and international security that would justify greater state action (see Deudney 1990; Brown et al 2007). Climate change is attracting the attention of defence analysts. Recently, the US Department of Defense concluded that 'While climate change alone does not cause conflict, it may act as an accelerant of instability or conflict, placing a burden to respond on civilian institutions and militaries around the world' (DoD 2010:85). But as Waever (1995) has argued, the 'securitization' of environmental issues might trigger a state-centred response that contrasts with the internationalism expected by global environmentalism. It is not inconceivable that adaptation financing take the form of increased military expenditures to ensure stability. For example, a number of respected US retired military officers offered the following warning:

> *[Africa] is becoming an increasingly important source of U.S. oil and gas imports. Already suffering tension and stress…Africa would be yet further challenged by climate change. The proposal by DoD to establish a new Africa Command reflects Africa's emerging strategic importance to the U.S., and with humanitarian catastrophes already occurring, a worsening of conditions could prompt further U.S. military engagement (CNA 2007:47).*

If climate change is deemed a security issues, this does not necessarily translate into greater efforts towards mitigation while the adaptation efforts could take on a more military character.

Climate investment funds for mitigation are better designed to attract private sector interests and less reliant on ODA. But this approach really represents a return to the strategy that underpins the GEF: using public financing to leverage additional private sector investments for global environmental benefits. But to the extent that they are still reliant on ODA seed money, climate investment funds will be exposed to the political forces identified by climate realism. Furthermore, if climate investment funds continue to use less rigorous monitoring and reporting procedures like the GEF, their emission reduction

claims will also be more tenuous. This explains why much of the current discussion at the UNFCCC has turned on the issue of monitoring, reporting and verification (see Breidenich and Bodansky 2009)—climate funds and carbon markets imply significantly different levels of effort and transaction costs.

If climate funds designed to solicit international climate finance seek to engage more directly with the private sector, they come to resemble carbon markets. For example, the Amazon Fund grants non-transferable certificates which quantify emission reductions associated with donations, in pointed contrast to carbon credits issued in the carbon markets. Will such a limit to commodification permit climate funds to attract sufficient private sector involvement? As discussed above, the Amazon Fund has succeeded in attracting financing only from the governments of Norway and Germany. But if governments remain the sole investor in climate funds, the approach may only replicate the politics of ODA. Rather many interpret the Amazon Fund, including its no-transferable certificates approach, to represent the evolution of Brazil's deforestation policy towards an engagement with the carbon markets (May 2009). If the certificates are only a precursor for exchangeable carbon credits, then the Amazon Fund and other such climate funds will be similar to the carbon markets. The CDM is also considering broad reforms that would see a standardized, sectoral approach (UNFCCC 2010b). Importantly, a standardized approach is likely to relieve some of the problems with 'additionality' and, consequently, boost confidence in the system (Figueres 2006; Wara and Victor 2008).

Carbon Markets, Self-Interest and Domestic-Level Politics

In contrast to climate funds, carbon markets are expected be more effective in mobilizing international finance for climate change because they broaden the domestic political base for action by engaging the private sector. By appealing to the self-interest of private sector actors and not their moral sensibilities alone, carbon markets are able to push more closely towards the moral limit. The carbon markets counteract those with an interest in resisting mitigation efforts (Bernstein et al 2010:170). The

additional transaction costs of the carbon markets, referred to above, would be justified if this affords greater political engagement.

This argument finds support in patterns of CDM holdings presented earlier (Figure 2), which suggest that those states acquiring CDM credits tend to also be making the most progress at reducing emissions domestically in the absence of the carbon markets (Figure 3). This is contrary to the 'moral hazard' that many have predicted. Neuhoff and Vasa, for example, have claimed that the 'inflow of CDM credits into [highly industrialized] countries' emissions trading schemes decreases [their] domestic efforts' (Neuhoff and Vasa 2010:1). There are various alternative explanations for these patterns, many rooted in institutional issues identified by neoliberals. European countries could be holding surplus credits as a strategic hedge against future compliance. Furthermore, European countries are obliged to limit their use of CDM credits to a percentage of their emissions targets (Höhne and Ellermann 2008). Finally, the low participation by other countries could be interpreted as a lack of confidence in the carbon markets. For example, the Canadian Minister of Environment explained during a 2006 Parliamentary committee that '[the Canadian government] will not be using taxpayers' money to play in [the carbon] market…[t]he emissions trading markets are still relatively new'.[21] Nonetheless, such explanations are incomplete because they overlook relative-gains concerns identified by climate realism. For example, at the same Parliamentary committee mentioned above, the Minister continued 'We first of all want to ensure that industry sectors are making investments in their own in-house technology, in-house reductions. Second, we will hopefully put in place compliance mechanisms that will see money stay within the country'.[22] The possibility that states lacking political will to address climate change domestically may also be hesitant to address it internationally would be predicted by climate realism.

Research into market-driven environmental governance (Cashore et al 2010:12-16), such as forestry certification schemes and voluntary carbon markets, suggests a process by which carbon markets are

able to push more closely towards the moral limit. The key feature of all of these schemes is that they address unforeseen obstacles to international environmental cooperation through learning (state takes adopting the scheme once it has been demonstrated) or 'symbiotic' interactions (where private and government efforts remain distinct, but reinforcing each other) (p.14). The carbon markets therefore have several features that allow them to 'pull' governments towards greater efforts. This is consistent with our analysis of the CDM which, though not a pure market mechanism, is distinguished by its greater reliance on the private sector. Importantly, this does not violate climate realism's assumptions which, through its basis in neoclassical realism, recognizes the importance of domestic as well as international politics.

Carbon markets are also expected to be more effective because they avoid overdue reliance on morality to motivate socially desirable behaviour. In the West, the modern period might be best thought of as having legitimized self-interest as a way to promote the public good. As Hirschman (1977/1997:12-15) has explained, this was precipitated by thinkers such as Machiavelli and Spinoza who argued that moral politics failed to provide guidance in the 'real' world where human behaviour is driven more by lust for power and money. The alternative that eventually prevailed was not to deny the passions but to harness them. Strategies for international development financing have undergone a comparable transformation. Sustainable development was put forward as a means to integrate business interests into international development financing after years of disappointment with ODA (Thérien 2007). The carbon market is an extension of this. While there are concerns about sustainable development in the CDM (see Olsen 2007), by opening up the carbon markets to accreditation for emissions reductions involving non-fossil fuels such as deforestation and promoting forest and other terrestrial carbon sinks, engagement with less developed countries could deliver significant co-benefits under appropriate governance conditions (Boyd et al 2009; Purdon 2010; Phelps et al 2010). In light of climate realism, such co-benefits from the carbon market would be expected to be more reliable than international adaptation financing.

Conclusion

Current financial mechanisms established to address climate change are insufficient. This paper has sought to explain this as a political failure, not simply the failure of the international carbon markets as an institution for international cooperation. Climate change is an issue whose apparent solution requires some level of sacrifice from rich countries. Under these circumstances, the political process could follow the logic of climate realism where powerful states conclude that, given the costs, it is not in their interests to pursue a mitigation effort that would compromise their capacity to respond to future contingencies, climate change being only one among many. Climate realism suggests that any international financial transfers for climate change will prove controversial and ultimately reach a moral limit because the magnitude of the resources considered triggers relative-gains concerns. But the grounding of climate realism in neoclassical realism acknowledges the influence of domestic-level politics, while also maintaining that the distribution of material capabilities has systemic effects.

In light of climate realism, this paper has suggested that carbon markets offer more unique advantages over alternative approaches proposed for engaging with emerging economies and the developing world because they can help push towards and more closely approach the moral limit by rallying the private sector. Through their reliance on public sector financing, it is not clear that alternative instruments for international climate finance acknowledge to the same degree the importance of self-interest as a motivating factor for progressive action in climate change. In conclusion, the criticisms directed towards carbon markets which encourage the pursuit of alternative policies such as climate funds *instead of* the carbon markets appear inappropriate. The carbon markets do not preclude other mitigation nor adaptation strategies. Nor are the CDM and voluntary carbon markets not in need of reform. But the carbon markets offer important political advantages by mobilizing domestic actors to contest political forces identified by climate realism.

Notes

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[2] The UNFCCC (1992) sets as its ultimate objective the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (Article 2). A 2°C target has been referenced in the Copenhagen in relation to this objective (UNFCCC 2009:para.1) though less clearly in the Cancun Accords (UNFCCC 2010a:para.I.4).

[3] It is worth noting that the international climate change regime was not amongst those investigated and it is unclear how its inclusion would have affected Underdal's findings.

[4] Under a global harmonized carbon tax, developing countries with low marginal abatement costs would forego carbon finance inflows from the trade of carbon credits while also facing higher absolute welfare costs (Peterson and Klepper 2007:20-23). But for these reasons, a global harmonized carbon tax would be resisted in the developing world (see Ojha 2009) and would either be restricted to highly industrialized countries or require some form of international transfer payments (Hovi and Holtsmark 2006:141).

[5] Because of a lack of systematic reporting on 'fast-start' finance and clarity on linkages with climate funds, climate funds are here assessed on their own terms. For example, one of the largest funds, Japan's Hatoyama Initiative, will be disbursed over a ten-year period and disbursements for 2010-2012 remain unclear (Ballesteros et al 2010).

[6] UNEP Risoe Centre, *March 2011 Update of CDM/JI Pipeline Overview Spreadsheet: Analysis, Table 2* (http://www.cdmpipeline.org/publications/CDMpipeline.xlsx, (15 March, 2011)).

[7] The CDM primary market (to which project developers sell) better represents net resources transfers to developing countries than the CDM secondary market (where resellers sell to final buyers).

[8] UNEP Risoe Centre, *March 2011 Update of CDM/JI Pipeline Overview Spreadsheet: Analysis, Table 4* (http://www.cdmpipeline.org/publications/CDMpipeline.xlsx, (15 March, 2011)).

[9] ClimateFundsUpdate.Org, *Graphs and Statistics*, (http://www.climatefundsupdate.org/graphs-statistics, (10 March, 2011)).

[10] *Ibid.*

[11] BNDES, *Donations* (http://www.amazonfund.gov.br/FundoAmazonia/fam/site_en/Esquerdo/doacoes.html, (1 February, 2011)).

[12] *Ibid.*

[13] ClimateFundsUpdate.Org, *Graphs and Statistics* (http://www.climatefundsupdate.org/graphs-statistics, (10 March, 2011)).

[14] ClimateFundsUpdate.Org, *Hatoyama Initiative* (http://www.climatefundsupdate.org/listing/hatoyama-Initiative, (10 March, 2011)).

[15] ClimateFundsUpdate.Org, *GEF Trust Fund - Climate Change focal area* (http://www.climatefundsupdate.org/listing/gef-trust-fund, (10 March, 2011)).

[16] ClimateFundsUpdate.Org, *Climate Technology Fund* (http://www.climatefundsupdate.org/listing/clean-technology-fund, (10 March, 2011)).

[17] ClimateFundsUpdate.Org, *Graphs and Statistics* (http://www.climatefundsupdate.org/graphs-statistics, (10 March, 2011)).

[18] BNDES, *Donations* (http://www.amazonfund.gov.br/FundoAmazonia/fam/site_en/Esquerdo/doacoes.html, (1 February, 2011)).

[19] *Ibid.*
[20] UNFCCC, CDM Methodologies (http://cdm.unfccc.int/methodologies/index.html, (8 March, 2011))
[21] Ambrose, R. (2006) *Meeting 16 of the Canadian Standing Committee on Environment and Sustainable Development, 39th Canadian Parliament, 1st Session* (5 October), available at: http://www.parl.gc.ca/HousePublications/Publication.aspx?Language=E&Mode=1&Parl=39&Ses=1&DocId=2386186&File=0 (11 January, 2011).
[22] *Ibid.*
[23] Source: UN (2010a:22-28)
[24] CDM primary market (Capoor and Ambrosi 2006; 2007; 2008; 2009; Kossoy and Ambrosi 2010); voluntary market (Hamilton et al. 2010: iii)
[25] Holdings of CDM credits derived from Table 5(a) of 2009 & 2010 Standard Electronic Format (SEF) country reports submitted as 'Supplementary information under the Kyoto Protocol to the UNFCCC' (http://unfccc.int/national_reports/annex_i_ghg_inventories/national_inventories_submissions/items/4771.php, (10 March, 2011)).
[26] UNFCCC, *Total aggregate greenhouse gas emissions of individual Annex I Parties, 1990-2008* (excluding LULUCF) (http://unfccc.int/ghg_emissions_data/items/3800.php, (10 February, 2011)).
[27] ClimateFundsUpdate.Org, *Graphs and Statistics* (http://www.climatefundsupdate.org/graphs-statistics, (10 March, 2011)).

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Tables and Figures

Table 1: Potential sources of finance identified by the *UN Secretary General's High-level Advisory Group on Climate Change Finance*[23]

Source of Finance	Amount (Billion USD)
Public Sources	**$45-115**
-Auctions of emission allowances with up to 10% allocated for international climate action	$8-38
-Levies on carbon offsets	$1-5
-Carbon pricing for international transport	$6-12
-Wires charge	$5
-Removal of fossil fuel subsidies in developed countries	$3-8
-Redirection of fossil fuel royalties in developed countries towards international climate action	$10
-Domestic carbon taxes with up to 10% allocated for international climate action	$10
-Financial transaction tax	$2-27
-Direct budget contributions (ODA, contributions to multilateral development banks)	NA
Multilateral Development Banks	**$11**
Carbon Market Finance	**$8-24**
Private Finance	**$20-24**
-Use of instruments to compensate private investor for high-risk investments	
-Capacity-building for implementation of climate policies in developing countries	
Total	**$84-164**

Figure 1: Comparison of volumes of CDM credits and voluntary carbon offset market (Chicago Climate Exchange and other) credit volumes, 2004-2009[24]

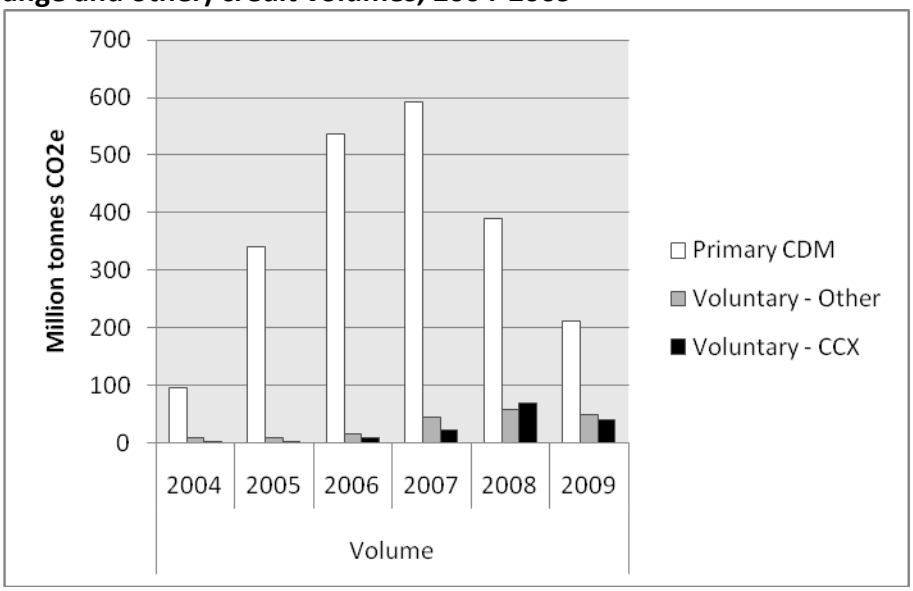
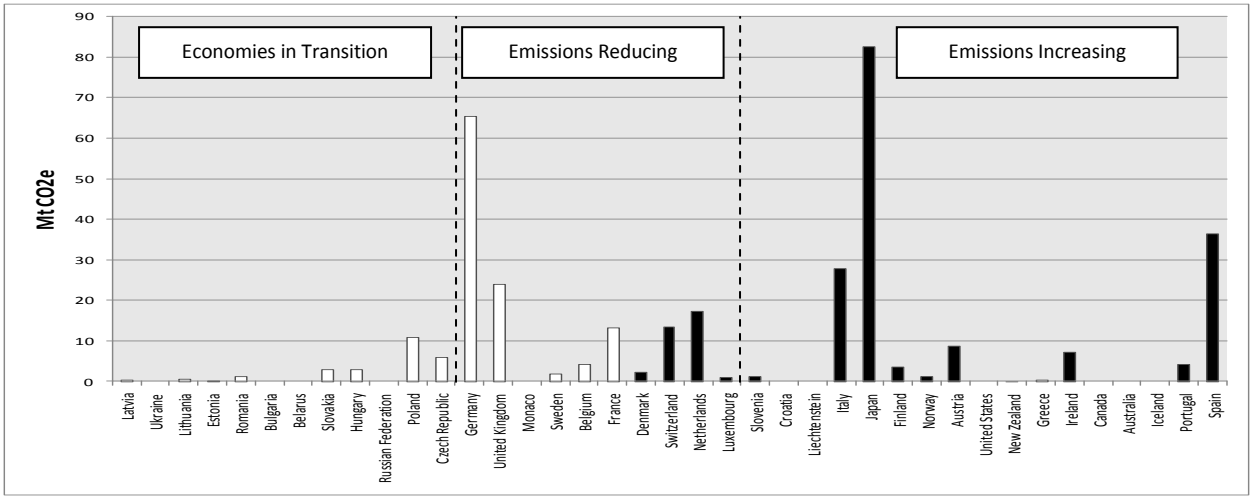


Figure 2: Net holdings of CDM credits, 2008 and 2009 (MtCO2e)[25]



**White bars indicate countries already below their emission reduction targets of Kyoto/EU burden sharing agreement independent of the carbon markets and domestic forest carbon sinks.*

Figure 3: Emissions trends (no LULUCF) independent of carbon credits, 1990-2008[26]

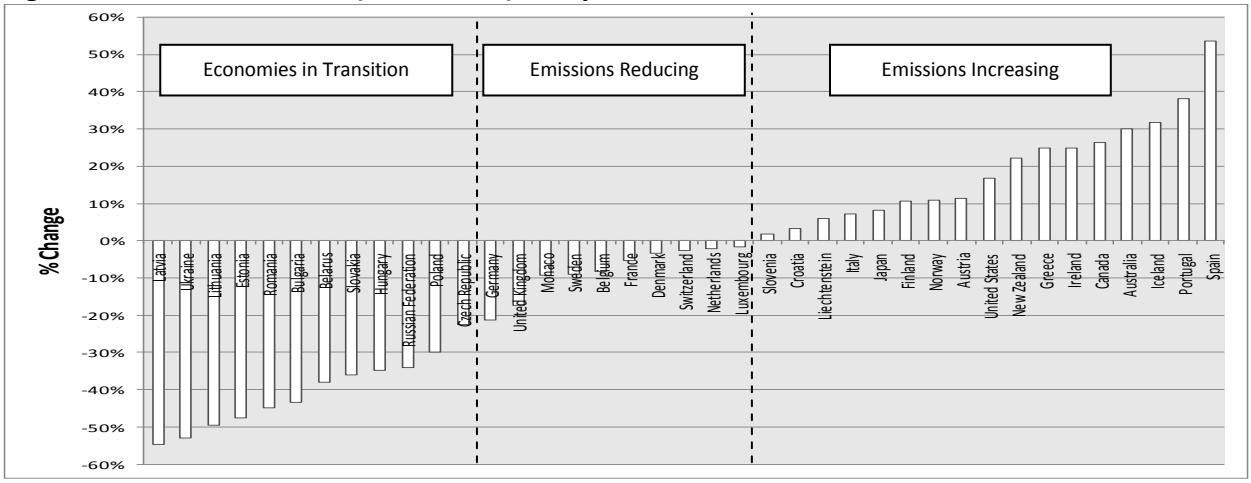
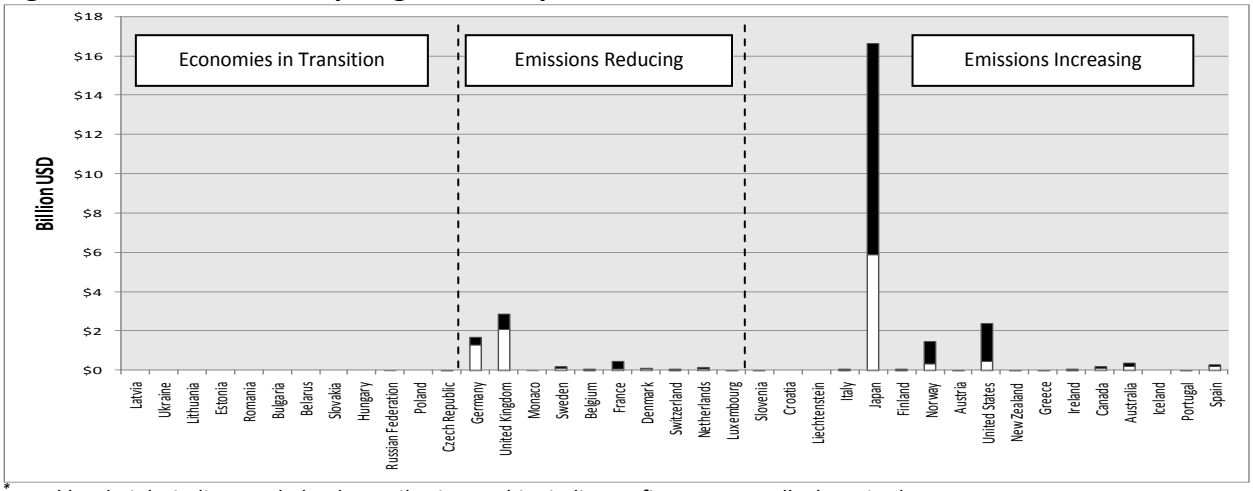


Figure 4: Total resources pledged and deposited to climate funds[27]



Total bar height indicates pledged contributions; white indicates finances actually deposited