The political economy of the
Clean Development Mechanism

Barriers to capital, crisis displacement, and the second contradiction

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Honours Thesis: Submitted as partial requirement for the Bachelor of Economic and Social Sciences (Honours), Political Economy, University of Sydney, 29 October 2010.
Plagiarism declaration:

This work contains no material which has been accepted for the award of another degree or diploma in any university, and to the best of my knowledge and belief, this thesis contains no material previously published or written by another person except where due reference is made in the text of the thesis.
Acknowledgements

Sincere thanks to Joy Paton for all her insight and advice throughout the writing of this thesis, and for being such an all-around wonderful supervisor. Thanks also to Stuart Rosewarne and the Political Economy Department for their guidance. Thanks to Huon Curtis for his generous edit, and to Eleanor, Jess, Dean, Alex M. and Alex H. for their friendship. Lastly thanks to Kara for her never-ending love and support all year.
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<th>Acronym</th>
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<tbody>
<tr>
<td>CAN</td>
<td>Climate Action Network</td>
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<tr>
<td>CDM</td>
<td>Clean Development Mechanism</td>
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<tr>
<td>CER</td>
<td>Certified Emission Reduction</td>
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<td>CO2</td>
<td>Carbon dioxide</td>
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<td>CO2-e</td>
<td>Carbon dioxide-equivalent</td>
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<tr>
<td>DNA</td>
<td>Designated National Authority</td>
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<td>DOE</td>
<td>Designated Operational Entity</td>
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<td>EDF</td>
<td>Environmental Defense Fund</td>
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<td>EU</td>
<td>European Union</td>
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<td>GWP</td>
<td>Global Warming Potential</td>
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<td>HCFC</td>
<td>Hydrochlorofluorocarbons</td>
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<td>HFC</td>
<td>Hydrofluorocarbon</td>
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<td>IPCC</td>
<td>Intergovernmental Panel on Climate Change</td>
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<tr>
<td>ITL</td>
<td>International Transaction Log</td>
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<tr>
<td>NGO</td>
<td>Non-governmental organisation</td>
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<tr>
<td>PDD</td>
<td>Project Design Document</td>
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<tr>
<td>REDD</td>
<td>Reducing Emissions from Deforestation and Forest Degradation</td>
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<tr>
<td>SANDRP</td>
<td>South Asian Network on Dams, Rivers, and People</td>
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<td>UN</td>
<td>United Nations</td>
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<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<td>UNFCCC</td>
<td>United Nations Framework Convention on Climate Change</td>
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A defining dynamic of global environmental politics has been the dominance of ‘free’ market instruments as legitimate state responses to the critical issue of climate change. It seems that not even the “greatest and widest-ranging market failure the world has ever seen” is too great for a market-fix (Stern et al. 2006:i). The Kyoto Protocol, signed in 1997, is to date the most comprehensive international climate change agreement as the only treaty to mandate quantitative greenhouse gas emission reductions for developed countries. It was also the first global agreement to institute market-based instruments for ‘carbon trading’, first at the behest of the United States, but soon embraced by the European Union (Newell & Paterson 2010:27). The Kyoto Protocol defines three specific market instruments, known as ‘flexible mechanisms’, as the institutional means for developed countries to meet their Kyoto targets. The first is ‘Emissions Trading’, which permits the trading of Kyoto ‘allowances’ between developed countries. The second is ‘Joint Implementation’, which allows developed countries to operate carbon emissions reducing projects in partnership with other developed countries, mostly in Eastern Europe.

This thesis conducts a critical analysis of the third and most extensive Kyoto market instrument, the Clean Development Mechanism (CDM). The CDM encourages developing country ‘participation’ in the international climate change regime by creating opportunities for carbon pollution reducing ‘projects’, which are designed to contribute towards sustainable development. CDM projects in turn produce carbon credits which are traded and then used by states and capital in developed countries to meet emission reduction requirements. This study comes at a particularly important

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1 The terms ‘developed’ and ‘developing’ countries are used throughout this thesis, in line with the terminology used by the United Nations Framework Convention on Climate Change (UNFCCC).

2 This thesis uses ‘carbon emissions’ and ‘carbon pollution’ as generic terms for all human-induced greenhouse gas emissions.
time for the political development of the CDM. The future existence of the CDM in a post-Kyoto climate change agreement is a current focus of international negotiations, as is the integration of the CDM with domestic climate change policies. However, there is also a lack of critical analysis on the CDM to inform this political economic context, which is a deficit this thesis redresses from an ecological Marxist perspective.

As alluded to, there are two formal purposes to the Clean Development Mechanism (CDM). The first is to “assist” developed countries in meeting their Kyoto commitments (UNFCCC 1997:11). This occurs through the production of carbon credits known as ‘Certified Emission Reductions’ (CERs), which represent a quantity of greenhouse gas emissions deemed to have been ‘reduced’ by a project. Common project types include hydropower dam and biomass waste renewable energy projects, industrial greenhouse gas destruction factories, carbon sequestration from tree plantations, and energy efficiency installations. For example, a hydropower project in India will produce CERs on the basis that the project is less polluting than a coal-fired power station that would otherwise be operating without CDM revenue. CERs are either sold directly from project developers, or traded in secondary global financial markets. When surrendered, CERs contribute to the emissions reduction requirements of developed states, such as France, or companies in developed countries, such as a natural gas producer in England. The second purpose of the CDM is to “contribute” to ‘sustainable development’ in the developing countries that are hosting projects (UNFCCC 1997:11). Sustainable development requirements are defined by developing country governments, and are often used to direct investment towards priority industries.

The ‘CDM market’, which encompasses both the project and trading phases of the CDM, has expanded rapidly since the first project was registered in 2005. There are currently 2,456 registered projects which have produced over 448 million Certified Emission Reductions (CERs) (UNFCCC 2010a). There are 3,040 additional projects awaiting registration, which in conjunction with already operating projects are projected to produce 1.83 billion CERs by 2012 (UNEP 2010b). The distribution of projects is heavily skewed towards the largest developing countries, with China, India, Brazil, and
Mexico accounting for over 75 percent of total projects (UNEP 2010b). The CDM has generated a considerable volume of ‘carbon finance’. The total price value of CERs sold in 2008 was US$6.5 billion and US$2.6 billion in 2009, after the CDM market contracted from the global economic crisis. Secondary market trading of CERs totalled US$23 billion and US$17.5 billion, in 2008 and 2009 respectively (Kossoy & Ambrosi 2010:37).

Carbon credits produced in the CDM have also made significant contributions to the publicly reported greenhouse gas reductions of states and businesses. However, the role of carbon offsets is often overlooked in (important) public debates over headline emissions targets, the distribution of those targets between countries and industries, and appropriate domestic mechanisms such as emissions trading schemes or taxes. For example, the CDM is extensively integrated into European climate change policies. At least 88 percent of total emissions reductions in the current phase (2008-12) of the European Union (EU) Emissions Trading Scheme can be achieved though the purchase of CERs from the CDM (WWF-UK 2007:3). The CDM therefore deserves critical scrutiny because a large proportion of greenhouse gas emission reductions that are attributed to developed countries are actually taking place in CDM projects in developing countries.

In the context of a global stalemate in international climate change negotiations, the expanded use of carbon offsetting instruments is one of the few points of general agreement between and within developed and developing states. For example, the Copenhagen Accord (UNFCCC 2009:2-3), from the United Nations climate conference in December 2009, embodies a commitment to developing a Reducing Emissions from Deforestation and Forest Degradation (REDD) scheme in an otherwise indefinite document. REDD is a new carbon offsetting mechanism that plans to produce carbon credits from ‘avoided deforestation’ projects that ‘protect’ existing forests in developing countries. The demand for CDM credits until 2020 has also been guaranteed in the next phase (2013-20) of the EU Emissions Trading Scheme, which allows at least 50 percent
of total emissions reduction to be met through Certified Emission Reductions (CERs) (Pew 2009:2).

However, despite broad in-principle support by states for offsetting mechanisms, the World Bank has described the CDM market as at the “crossroads” (Kossoy & Ambrosi 2010:38). This is because the future of the CDM depends on two broader institutional developments that are the subject of significant social contestation and which cannot be assumed will come into effect. Firstly, the state-supported nature of the CDM is such that its long-term existence depends on a post-Kyoto international climate change agreement (CDM Watch 2010a:6). There has been minimal progress to this end in international negotiations in the lead-up to the next major United Nations climate conference in Cancun, Mexico in December 2010 (Sehlleier & Michaelowa 2010a:1). Secondly, the continued expansion of the CDM depends on the enactment of further domestic emissions trading schemes because they provide the demand for CERs. However, outside of Europe, and aside from the recently operational scheme in New Zealand, the governments of the United States, Japan, and Australia have been unable to pass emissions trading legislation (Kolesnikov-Jessop 2010). The impasse in each reflects the contradictions of the CDM’s embeddedness in broader political and economic processes.

Given these complexities, it is important to develop a critical understanding of the thirteen-year history of the CDM, including the six years of registered project activities. A large volume of academic, business and non-governmental organisation (NGO) publications already exist on different aspects of the CDM. However, in terms of the academic literature, there is a considerable lack of depth from a political economic perspective. The vast majority of approaches engage with the CDM entirely on its own terms, rather than problematising the instrument itself. In a comprehensive review of this literature, Paulsson (2009:66) found that articles commonly assess whether the CDM has been successful in fulfilling its ‘double goal’ of emissions reductions and sustainable development. A regular argument across disciplines is that the CDM in its current form favours the lowest-cost projects, often with questionable emissions
reductions, and to the detriment of the promotion of sustainable development (Paulsson 2009:70). However, in most cases this argument simply forms the background for uncritical proposals for the institutional “fine-tuning” of the CDM, in order to promote better outcomes towards the double goal in a post-Kyoto climate change agreement (Paulsson 2009:76).

There is a small body of work which is notable for its more critical approach to the CDM. These are critical interventions from above, which examine the political and economic dynamics of states and capital that drive the CDM, and from below, which chart the realities of actual CDM projects and the social movements that have resisted them. For example, Bachram (2004) argues that the CDM is a form of neo-colonialism which exacerbates global inequalities and provides fraudulent profits for large corporations. Bumpus and Liverman (2008) draw attention to the extensive role of international and national state actors in the commodification of carbon in offset form. Lohmann (2006) provides a critique of the neo-classical economic foundations of the CDM market, which facilitate the further extraction and combustion of fossil fuels. Böhm and Dabhi (2009) collect extensive case studies on the negative impacts on the local communities and environments that surround CDM projects, including the dispossession of land, pollution of ecosystems, and human rights abuses.

This thesis makes a political economic contribution towards a more critical and theoretically informed understanding of the CDM. It problematises the CDM by considering whether it is an environmental or economic instrument. To this end, the thesis combines an understanding of the historical tendencies and essential relations of the capitalist-dominated social formation, with an appreciation of the contingencies and socially contested nature of its future development. The overarching narrative is informed by the socialist ecology of James O’Connor’s (1998) project on the ‘second contradiction of capitalism’. O’Connor’s theory, and subsequent interventions, form an ‘ecological Marxist’ framework for studying the general tendency of capitalism to degrade the natural environment, as well as human labour power, and spatial infrastructure. The second contradiction theorises the role of capitalist social relations
and productive forces in undermining the natural environment, and the social forces that contest and constitute the process.

Following the ecological Marxist tradition, the thesis argues that the CDM is a dynamic state-led means for permitting the accumulation of capital through the potential social barriers that surround the politics of global warming. While O’Connor’s theory is strong in its investigation of state restructuring and barriers to production, it is underdeveloped in terms of the importance of spatial configurations to these processes. This thesis makes a theoretical contribution towards the integration of spatial dynamics into O’Connor’s theory by using the CDM as a case study for exploring the ways that capitalism restructures global and local space in order to displace second contradictions through space and time. However, the social and ecological impacts of this displacement, and the continual contestation between states, capital, and social movements, define the process as inherently contradictory. Qualitative and quantitative evidence is used to illustrate the arguments, and is largely drawn from United Nations statistics, scientific reports, field studies by civil society groups, academic accounts of international negotiations, and media sources.

The scope and argument of the thesis is developed over four chapters. Drawing on O’Connor’s project, Chapter one constructs the theoretical framework underpinning the thesis. It defends O’Connor’s theory against criticisms that it is capital-centric, state-centric, and determinist, but integrates criticisms on the importance of agency in order to develop a theoretical framework that emphasises the contingency of social processes surrounding crises of the second contradiction. The chapter then applies the theory to the practical concern of climate change by conceptualising fossil fuels, land, and the climate system as conditions of production. It discusses the contradictions between capitalist social relations and the climate system, and the idea of potential natural barriers to capital, as the context for understanding the social processes that produced the CDM.
Having established the problem of climate change, Chapter two continues its application of O’Connor’s theory by conceptualising the climate system as an object of political contestation. It analyses the CDM as a response to climate change in the context of the contestation over the climate system between states, capital, and social movements at the international level. The chapter argues that the CDM is an instrument created by pro-active states to overcome potential social barriers to capital from the demands of social movements, by permitting the accumulation of capital through crisis. It demonstrates how the CDM uses global space to restructure the climate system as a productive force, and specifies, in contradiction to its ideological foundations as a market instrument, the new forms of state-supported social relations that are required for the functioning of the CDM market.

Chapter three shifts to an empirical examination of CDM projects. In particular, it focuses on the negative impacts caused by the displacement of the climate change crisis through space to the level of CDM projects. It argues that the accumulation imperatives of the CDM are based on a particular capital-nature relationship: the capitalisation of nature. However, the CDM institutes only a partial capitalisation of nature, which restructures local space surrounding CDM projects. This has resulted in the development of a dual character in the CDM, whereby the capitalisation of carbon sinks depends on the appropriation of nature. A case study of Indian CDM projects is used to illustrate the negative impacts of this appropriation on local communities and ecosystems surrounding projects, and the role of ‘sustainable development’ discourse in facilitating and legitimising the process.

Finally, Chapter four evaluates the temporal dimensions of the CDM as a response to climate change, and considers the implications of some current social struggles over the CDM. It argues that in addition to the partial capitalisation of nature, the CDM only notionally capitalises carbon sinks. This renders the CDM an ultimately false means of maintaining the climate system, and therefore displaces the climate change crisis through time by intensifying future global warming. Secondly, it analyses instances of social contestation between states, capital, and social movements at the international,
national, and local levels. The chapter argues that these conflicts represent emerging contradictions within the state social structures which wholly support the CDM market.

In concluding, the combination of the capital accumulation imperatives of the CDM and its negative social and ecological impacts, define the CDM as an economic rather than environmental instrument. However, the contradictions of such instruments, which characterise the current state of global climate change politics, demonstrate the role of ever-present contestation in shaping the dynamics of the CDM, and underscoring the continual social construction of second contradictions.
Chapter one

Global warming and the second contradiction of capitalism

James O’Connor’s formulation of the ‘second contradiction of capitalism’ theorises the contradictions between capitalist social relations and the natural environment. This framework forms the conceptual basis of this thesis because of its insight into the environment as an object of social contestation. The first section of the chapter articulates an understanding of the second contradiction which appreciates the tendency for capital to impair its own conditions while emphasising the contingency of the surrounding social processes. The section explicates the meanings of ‘conditions of production’ and ‘crisis’ in O’Connor’s theory, and engages with criticisms that the framework is capital- and state-centric, determinist, and downplays the importance of agency. This discussion is used to develop a theoretical position which stresses the agency of social movements, capital, and states as social forces in capitalist social formations and whose contestation can constitute crises of the second contradiction.

The second section of the chapter begins to apply this framework in an ecological Marxist account of climate change. The account is framed around two general questions posed by O’Connor (1998:165), with respect to the specific concern of global warming. First, “does capital create its own barriers and limits by destroying its own production conditions?” Second, “why does capital impair its own conditions?” The section conceptualises climate change in terms of the use values of fossil fuels, land, and the climate system as conditions of production. It argues that global warming represents an emerging socially and naturally constituted second contradiction of capitalism. This forms the contextual basis for the critical analysis of the politicisation of the climate
Developing a theoretical framework

O’Connor’s theory\(^3\) of the ‘second contradiction of capitalism’ extends Marxist crisis theory to ecological concerns. Specifically, it focuses on the tendency for capital to impair its own conditions of production, and the natural and social forces that surround this process. The notion of ‘conditions of production’ or ‘production conditions’ is based on a synthesis of the ideas of Karl Marx and Karl Polanyi. Three production conditions are identified in different parts of Marx’s writings: “personal conditions”, which refers to labour power; “general conditions”, which refers to human-made infrastructure and space; and “external physical conditions”, which refers to the natural environment (O’Connor 1998:145-6). O’Connor (1998:144) recognises that Marx used the notion of production conditions in differing ways, and therefore borrows from Polanyi’s notion of ‘fictitious commodities’ to systematise the concept. Polanyi (1944:72) identified land, labour, and money as fictitious commodities because capitalism organises them in commodity form, but their essence is as nature, human beings, and purchasing power, rather than as produced commodities. Polanyi’s conceptualisation clarifies the term ‘production conditions’ to mean “everything that is not produced as a commodity but that is treated as if it is a commodity” (O’Connor 1998:125). Therefore, conditions of production are all human, spatial, and natural requirements for capitalist accumulation that are immediately produced and reproduced outside of the circuit of capital.

The second contradiction of capitalism is crisis theory which pertains to the conditions of production. The second contradiction is additional to, but interrelated with, the ‘first contradiction of capitalism’, or realisation crisis, in Marxist theory (O’Connor 1998:126).\(^3\)

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\(^3\) Refers to O’Connor’s ‘ecological Marxist’ work, beginning with O’Connor (1988) and collected in O’Connor (1998).
A realisation crisis is a demand-side crisis with its basis in the capital-labour contradiction. The contradiction is due to the dual character of wage labour as both a cost of production and a source of demand. The sum of individual capitals depressing wages as a cost of production can manifest as an ‘overproduction of capital’ more generally because there is limited scope for the realisation of surplus value (Marx 1957:316n, O’Connor 1998:176). On the other hand, a crisis of the second contradiction is a supply-side crisis with its basis in the capital-conditions contradiction. The contradiction is due to the general tendency of capitalist productive forces and social relations of production to impair rather than reproduce the human, natural, and spatial conditions of capitalist production (O’Connor 1998:164). Environmental damage can in turn endanger the accumulation process due to increased costs to capital which can result from social demands for environmental protection, or the hindrances of operating under impaired conditions. These circumstances may require the diversion of increasing quantities of surplus value away from more productive uses, potentially resulting in an ‘underproduction of capital’ (O’Connor 1998:177).

The cause of impairment and its social and natural implications has been the subject of many critiques of O’Connor’s project. One form of criticism questions the specific relationship between capitalism and ecological damage. Toledo (1992:86) cites historical examples of ecological damage in non-capitalist ancient Greece and Rome and ex-socialist bloc countries to question the “ecological guilt of capitalism”. O’Connor’s theory does not deny non-capitalist drivers of damage, but does identify a number of specifically capitalist reasons why capital degrades the environment. In the abstract these include capital’s self-expanding nature and its lack of ownership of the conditions of production (O’Connor 1998:165). Capital’s requirement for quantitative expansion through time and space means that capitalism’s use of the natural environment is likely to progressively intensify and therefore degrade essentially qualitative natural materials and processes (Altvater 1994:77, Kovel 2002:38). Secondly, because natural materials and processes are conditions of production, they are produced and reproduced ecologically and therefore fall outside the control of single

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4 Ecological systems are qualitative in the sense that material and energy levels remain at the same quantities but are changed qualitatively through natural or human ‘regrouping’ (Altvater 1993:199).
capitals, which both cannot and have no reason to individually maintain them (Altvater 1993:219-20, Kovel 2002:40, Lebowitz 1992:93). It is important to recognise these specifically capitalist drivers of second contradictions due to the dominance of the capitalist mode of production in the global social formation, without assuming that capitalism is the only driver of ecological damage. Secondly, it is fundamentally capitalist-dominated societies that are confronting ecological damage, regardless of its cause. O’Connor’s project is rich as a framework for analysing the dynamics and contradictions of these processes in the climate change problematic.

O’Connor (1998:176) also stresses that the particular way in which the abstract ‘laws’ of capitalism manifest in the concrete is always a social and political question and needs to be investigated as such. A misreading of this method has led others to criticise O’Connor’s theory as deterministic. Foster (2002:10-11) argues against perceived “feedback mechanisms” from the natural environment and social movements which increase costs to capital and push capitalism towards sustainable practices. Instead of a crisis of underproduction, he asserts that capital can accumulate in spite of ecological destruction and even profit from it through environmental clean-up industries. However, there are no automatic mechanisms involved in O’Connor’s formulation of the second contradiction. Instead, the manifestation of a particular form of ecological damage, in interaction with the totality of ecological crises, as a cost or opportunity to capital, an economic crisis, or any number of other potential possibilities, depends on social, political, and ideological contestation (O’Connor 1998:165). This point reflects this thesis’ more nuanced understanding of crises of the second contradiction as processes which are uneven in their effects and are the subject of continual and concrete social construction and contestation.

While there is no inevitability of outcomes in O’Connor’s formulation, Rosewarne (1997) has argued that O’Connor’s theory demonstrates an inadequate appreciation of the import of agency within its emphasis on social contestation. One side of this critique is based on O’Connor’s focus on natural limits rather than social processes as the primary path towards the second contradiction (Rosewarne 1997:114). Natural barriers
to production are undeniably one of the two paths to the second contradiction. They arise when impaired natural conditions decrease the flexibility of capital by presenting as physical hindrances and increased costs to a particular production process\(^5\) (O’Connor 1998:242). But the danger in focusing on natural barriers is that it reduces any social contestation to a “reactive process”, rather than indicative of a proactive agency of civil society that can be the basis of, rather than a response to, a crisis of the second contradiction (Rosewarne 1997:112). This thesis emphasises such agency on the part of social movements, capital, and states, as underpinning the social contingency of the historical development of the Clean Development Mechanism (CDM).

Social contestation between active forces represents the second path towards a second contradiction of capitalism. The demands of social movements have the potential to manifest as a social barrier to the flexibility of capital’s relationship with nature, through direct actions or public campaigns, as well as from state regulatory restrictions (O’Connor 1998:242). The place of structure and agency in these demands is the subject of a second side of Rosewarne’s (1997:105) critique when he argues that O’Connor’s theory structurally privileges labour movements to the detriment of the agency of ‘new social movements’. O’Connor (1998:12,26) contends that the place of the working class is structurally defined in struggles over production conditions because the impairment of production conditions is a concrete labour process and therefore the maintenance of those conditions is in the interests of labour. Similarly, the place of social movements such as environmental and indigenous groups is also structurally defined because production conditions are “more than class issues” in that they are conditions of life itself (O’Connor 1998:14). However, while structural positioning and the existence of interests is important for underscoring the possibility of contestation, active engagement is always contingent on the agency of relevant actors (Rosewarne 1998:110). The importance of class struggle in the development of global warming is acknowledged,

\(^5\) Natural barriers from second contradictions are, by definition, barriers of ‘second nature’ because the impairment of natural conditions by capital denotes the transformation of natural materials and processes by human beings (Rosewarne 1997:115). Also, natural barriers are always socially constructed because they are relative to the particular requirements of individual capitals (Rosewarne 1997:116).
but this thesis focuses primarily on environmental, indigenous, and peasant movements whose agency is evident in their engagement with the politics of the CDM.

Social movements are afforded further importance due to the significance of states in struggles around the second contradiction, which defines conditions of production as politicised to sites outside of the immediate production process (O’Connor 1998:152). States must regulate capital’s access to and use of conditions of production because natural conditions like fossil fuels are produced and reproduced outside the circuit of capital (O’Connor 1998:148). Indeed, securing access for capital to nature, labour power, and infrastructure has been one of the central ‘functions’ of states (O’Connor 1998:149). This role means that states are both partly responsible for any impairment of the natural conditions of production, but also central to any possible “reconstruction” of those conditions (O’Connor 1998:155). States often reconstruct both natural conditions as “productive forces” and the “social relations of [their] reproduction” as a result of potential social and natural barriers to capital (O’Connor 1998:167-8). Kabra (1992:89) has argued that O’Connor’s formulation tends to be “state centric” in this regard, to the detriment of alternative social arrangements to ecological issues. The CDM is fundamentally an example of state-based restructuring and this point is emphasised in the thesis. However, the state is conceptualised in non-functionalist terms as a contested social relation and an active and dynamic social force in the development of the CDM and the constitution of climate change as a second contradiction of capitalism.

An ecological Marxist account of climate change

Nature has use values to capital as a “tap” for material inputs to production and as a “sink” for waste outputs from production (O’Connor 1998:185). Use value refers to the qualitative and quantitative utility of a “thing”, such as a commodity or fictitious commodity, for a particular “use”, such as production or consumption (Marx 1976:125). The use values of fossil fuels, land, and the climate system as taps and/or sinks are useful in conceptualising these elements as conditions of capitalist production, and
understanding how and why the use values of fossil fuels and land to capital have resulted in an impairment of the use values of the climate system.

**Fossil fuels as a tap**

Fossil fuels, such as coal, gas, and oil, are natural conditions of production because they are produced through natural processes but treated by capital as if they are commodities. They are natural conditions because they are produced outside the circuit of capital through geological processes which concentrate and store carbon energy that is absorbed by plants (Gautier 2008:60). Fossil fuels are conditions of production in the form of a tap because they have use values in increasing labour productivity and as material inputs for capital and consumer goods. Capitalist accumulation is a process of continual self-expansion through a circuit of capital in which surplus value is produced by labour then reinvested again (O’Connor 1998:178). The combustion of fossil fuels aids the production of surplus value by increasing relative surplus value. This is because fossil fuels facilitate technological change by powering machinery and transport which increases labour productivity by replacing concrete labour (Clark & York 2005:405, Harvey 1982:29-31). Fossil fuels also have use values as material inputs to many capital and consumer goods and an exchange value as tradable commodities. For example, oil is an input in plastics and fertiliser, and is traded as a separate commodity in its own right (Gautier 2008:124).

The historical development of industrial capitalism has been dependent on fossil fuel-based energy sources, which in physical terms are particularly useful to capital because they can be stored and used independently of the time and place of their source (Altvater 2006:41). In social terms, capital’s access to fossil fuels in desired quantities and qualities and at the required time and place has been underpinned by states. For example, this was explicit in the title of the Australian Government’s (2004) most

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Relative surplus value is derived from higher labour productivity in one company, often technologically driven, relative to the social average. When taken up by other companies through competition, there is a reduction in socially necessary labour time and an increase in profit rates in an industry as a whole (Harvey 1982:30-31, O’Connor 1998:178-9).
recent energy White Paper *Securing Australia’s Energy Future*, which sought to assure low-cost access to fossil fuel energy sources through state policies such as large subsidies for offshore petroleum exploration\(^7\). National and international also states use ‘soft’ and ‘hard’ measures ranging from free-trade diplomacy at the World Trade Organisation to military operations by the United States and allies in oil-producing territories (Altvater 2006:51). However, these historically state functions have been the subject of considerable resistance by peace, ecology, and anti/alter-globalisation movements.

*Land as a tap*

Land is also a natural condition because its component parts, such as soils, nutrients, and trees are produced and reproduced by ecological rather than labour processes. It is a condition of production in the form of a tap because it has use values as an element of agricultural production, a source for the extraction of forest products and minerals, and in providing the general space required for all capitalist production (Marx 1971:774). For example, more fertile soils increase labour productivity in agriculture and therefore aid the production of surplus value by increasing relative surplus value (Harvey 1982:335). Like fossil fuels, land itself also has an exchange value in the form of rent accrued to landowners. But land use *per se* has not been as intertwined with the history of industrial capitalism as the use of fossil fuels. Rather, land has been a condition of all human life from the hunter-gatherer phase of human history that began over one hundred thousand years ago, to the development of agriculture around twelve thousand years ago (Boyden & Dovers 1997:14-21). Indeed, around the onset of industrial capitalism in 1750, six to seven percent of the Earth’s surface was cultivated for agriculture, which had reduced total global forest area by four to seven percent (IPCC 2007a:182-3).

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\(^7\) This form of state support is replicated around the world. De Moor (2001:168-9) estimates that between 1995 and 1998 governments around the world gave fossil fuel industries US$151 billion in subsidies such as direct grants, bail-outs, tax concessions, provision of infrastructure and research and development.
However, the historical development of capitalism has been intertwined with private property in land, which excluded people from land as a necessary pre-condition for the existence of wage labour (Harvey 1982:343-4). Private ownership of land does not automatically translate to purely capitalist relations on that land, and nor is all land private, with state, communal, and customary forms of land remaining in existence (Harvey 1982:344). Nonetheless, the history of industrial capitalism has coincided with significant growth in both the spatial reach and intensity of land use, and continues to do so in Latin America, Africa, and south and south-east Asia (IPCC 2007b:182). By 1990, 30 to 35 percent of global land area was used for agriculture, and 20 to 29 percent of global forest area had been deforested (IPCC 2007b:182-3). Like fossil fuels, states have had a significant role in securing land as a natural condition of production for capital. For example, Australian colonial and national states used the ‘Torrens title’ land registration system as a legal protection for mining, agricultural, and forestry interests against Aboriginal land claims (Anderson 2010:12). However, these processes have also been socially contested by a series of Aboriginal land rights movements beginning in the early nineteenth century (Reynolds 1992:81).

*The climate system as a tap and sink*

The climate system is condition of capitalist production in the form of a tap in providing necessary climatic conditions and a sink for greenhouse gas emissions. The climate system includes five main components: the atmosphere; oceans (hydrosphere); ice sheets and glaciers (cryosphere); land surface; and plants and animals (biosphere) (IPCC 2001:87). The components interact with each other outside the circuit of capital through complex geological, biological, and chemical processes. One of functions of these processes is to absorb, exchange, and store naturally and socially occurring carbon emissions, which regulates radiation levels from the Sun on Earth based on the level of greenhouse gases in the atmosphere (IPCC 2001:89). This ‘radiative balance’ is one of the determining factors for the climate, which includes long term temperature, wind, humidity, and rainfall patterns (Whitaker 2007:23). These climatic conditions define the climate as a “life-support service” for the capitalist economy as a whole and the whole

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8 British, French and Belgian colonial states used the same model across Africa from the nineteenth century to secure land for ‘settlers’ (Dickerman et al. 1989:viii-ix, Anderson 2010:12-13).
of life itself (Hamilton 1997:54). For example, as a condition of production, nuclear power stations require the climate system to regulate water temperatures to below a certain level needed for their cooling (Stern et al. 2006:5). More importantly, the Earth’s particular climatic conditions combine in a unique way in the known universe to produce “the suitable conditions for life” (Whitaker 2007:11).

The process of absorbing, exchanging and storing greenhouse gases, also defines the climate system as a natural condition of production in the form of a carbon sink. This is a use value to capitalist production and consumption because the concrete labour processes ofcombusting fossil fuels and various land use practices results in the emission of greenhouse gases, such as carbon dioxide and methane, into the atmosphere. The most relevant component parts of the climate system to the temporal scope of this study are the atmosphere, land and ocean (Gautier 2008:70). The ocean acts a sink because it dissolves carbon at colder temperatures, but also releases carbon at warmer temperatures (Le Quere and Metzl 2004:243). The biosphere, which is made up of predominantly living organisms including plants, animals, and soil absorbs carbon through photosynthesis and releases carbon through respiration (Foley and Ramankutty 2004:279). The relationship between the ocean and biosphere carbon sinks regulates greenhouse gas levels in the atmosphere’s carbon sink.

The impairment of the climate system

The climate system has been impaired as a condition of production in the form of a carbon sink. On the one hand, the greenhouse gases emitted from capital’s use of fossil fuels have exceeded the carbon sink capacity of the oceans and the biosphere. Similarly, capital’s use of land for agriculture and forestry has caused the biosphere to act as a net source of carbon emissions since 1800. On the other hand, capital’s use of fossil fuels has reduced the carbon sink capacity of oceans due to the acidification caused by carbon emissions. Secondly, capital’s use of land, particularly deforestation, has reduced the carbon sink capacity of the biosphere (IPCC 2007b:37, Sabine et al. 2004:367-70). Capital in developed countries has been the principal, but not only cause of this impairment. On one the hand, developed countries have contributed to about 56 percent
of total greenhouse gas emissions since 1950 (Roberts 2001:501). On the other hand, there has been a large exporting in greenhouse gas emissions from developed to developing countries. For example, essentially all growth in carbon dioxide emissions in the ‘less developed countries’\(^9\) between 1980 and 1996 was due to foreign capital investment (Grimes & Kentor 2003:267).

This flooding of a contracting carbon sink resulted in approximately 43 percent of greenhouse gases emitted by human activity between 1800 and 1994 remaining in the atmosphere (Sabine et al. 2004:370). Correspondingly, the level of atmospheric carbon has risen from about 280 parts per million in 1750 to about 379 parts per million in 2005 (IPCC 2007b:37). The impairment of the climate system as a carbon sink is causing a warming and changing of the climate which in turn is impairing the climate system as a climatic tap. The growth in atmospheric carbon levels has increased both global surface and ocean temperatures over the past one hundred years. Global surface temperatures are projected to increase by up to 6.4 degrees Celsius by 2100 compared with 1990 levels (IPCC 2007b:45).

Climate change represents an emerging natural barrier to production because it will undermine the quantity and quality of each type of production condition – natural, general, and human – currently required by capital at particular times and places. For example, the quantity and quality of water available to capital as a natural condition of agricultural production will be affected due to a decreased availability of freshwater, altered rainfall patterns, and increased water pollution, particularly in arid and semi-arid climates (IPCC 2007b:36,38,42). Labour power will be impacted from the negative health impacts of climate change, such as rising malnutrition, diarrhoea, malaria, and cardio-respiratory diseases, particularly in tropical developing countries (IPCC 2007b:43). Likewise, spatial production conditions such as transport facilities will be damaged by a higher incidence and severity of extreme weather events and sea level rises, particularly in coastal urban areas (IPCC 2007b:40). These examples are potential

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\(^9\) Defined as countries with a per capita GNP of less than US$15,000 in 1980 (Grimes & Kentor 2003:267).
natural barriers to production because they represent concrete physical hindrances to production, relative to the particular requirements of capital. One prominent estimate of the costs associated with such impacts is five to ten percent of global gross domestic product by 2100 (Stern et al. 2006:ix). Despite clear inadequacies in the calculation of such figures\textsuperscript{10}, its magnitude demonstrates the potential for an underproduction of capital crisis on the scale of a second contradiction of capitalism.

Capital has threatened its own conditions of existence by triggering global warming because of its self-expansionary nature, and its lack of ownership of production conditions (O’Connor 1998:165). The capitalist drive for expansion subordinates use value to exchange value, and concrete labour to abstract labour (O’Connor 1998:327). As outlined above, fossil fuels and fertile land have use values in increasing labour productivity. This pushes concrete labour closer towards abstract labour by reducing the socially necessary labour time for the production of individual commodities like cars or cotton. Pending the state of the first contradiction, a reduction in socially necessary labour time increases the total quantity of surplus value that can be produced and realised, which augments the total circuit of capital. This dynamic of continual expansion overrides the negative use values from climate change (as well as depletion of resources and soil quality) that may push costs up for capital more generally. One of the key reasons for this subordination with respect to natural conditions of production is because their reproduction falls outside of the control of individual capitals. Therefore, no individual capital has a short-term interest in the reproduction of the climate system if the costs associated with impairment and reproduction can be shifted (Lebowitz 1992:93). The analysis of the CDM in the following chapters demonstrates the prevalence of such cost shifting in the politics of climate change.

\textsuperscript{10} One of many reasons is because aggregate GDP measures do not distinguish between defensive or positive expenditures. For example, clean-up operations appear as a positive in GDP terms, without increasing ‘welfare’ or taking into account the ‘opportunity cost’ from the loss of more productive expenditure. Furthermore, it does not indicate the distribution of costs, which will be particularly unequal for a global GDP figure (Splash 2007:711-2).
Conclusion: Bringing in society and the state

While capital has undermined its own conditions of existence in effecting global warming, capital’s damaging use of production conditions can be restricted if “society forces it to do so” (Marx 1976:381 [quote], Lebowitz 1992:93). One of the key drivers of such demands is the assertion of alternative conceptions of production conditions as conditions of life by social movements, such as environmental groups. The threats to the conditions of production that were outlined above can be, and are, conceived of as threats to life more generally. Water, human health, and coastal land are all conditions of life that are supported by the climate system. Notwithstanding the many instances of successful community regulation of environments throughout history (Angus 2008), the institutions to which the demands of social movements are directed, and which also have the capacity to coordinate the reproduction of the climate system, are national and international states. This chapter has conceptualised climate change as a second contradiction of capitalism, which has been aided by state support of fossil fuels and land (O’Connor 1998:155). Conversely, the following chapter considers the possibility of states, as contested social relations that are shaped by the demands of social movements and capital, instituting a restructuring of the capital-climate system relationship in response to the problem of global warming.
Chapter two

The origins of the Clean Development Mechanism: Overcoming social barriers to capital

The previous chapter argued that the environmental and social impacts of climate change will manifest as natural barriers to capitalist production. An ecological Marxist perspective must also analyse the social forces that constitute and contest all second contradictions. This chapter focuses on the development, design, and operation of the Clean Development Mechanism (CDM) as the product of social contestation over global warming at the international level. It does so in the context of a third question: “why do social struggles against the destruction of production conditions...potentially impair capital flexibility and variability?” (O’Connor 1998:165-6). The question signals the change in emphasis from natural barriers to social barriers to production. The first section examines how the climate system became politicised around the negotiation of the Kyoto Protocol, and why this social contestation had the potential to materialise as a social barrier to capital. The second and third sections analyse the development of the CDM, arguing that the CDM is a state-led means for capital to overcome potential social barriers by accumulating through those barriers. The fourth section conceptualises how the CDM uses the global space to restructure the climate system as a productive force. Lastly, the fifth section argues that in contradiction to its ideological underpinnings as a market instrument, the CDM market is underpinned by social relations that are wholly constituted by states.
The politicisation of the climate system

Social movements played an important role in politicising the climate system to the level of the United Nations. The necessary role of states in regulating and provisioning the conditions of capitalist production embeds those conditions in civil society. Consequently, the provision and regulation of production conditions is a contested process between states, capital, and also social movements (O’Connor 1998:152-3). Therefore, any restructuring of conditions of production as a result of impending social or natural barriers to capital, such as those thrown up from the impairment of the climate system, is contingent on social, political, and ideological contestation (O’Connor 1998:165). Contestation over state provision of fossil fuels and land as production conditions by anti-war and indigenous movements is one such example. During the 1980s, the politicisation of these conditions extended to the climate system in response to mounting scientific evidence of global warming (Paterson 1996:29).

The politicisation of the climate system was driven by the active public campaigning of environmental groups in the late 1980s, which impelled the addition of global warming alongside deforestation and biodiversity loss as a popular environmental concern of the time. The largest was the Climate Action Network (CAN), which was established in 1989 as a conglomeration of many of the large environmental NGOs, mostly from developed countries, such as Greenpeace International and the Environmental Defense Fund (Newell 2000:126). One of the priorities of CAN was to put significant pressure on national governments, especially the United States, to successfully negotiate an international climate change convention in the lead up to the United Nations Earth Summit in Rio in 1992 (Newell 2000:130). In developing countries, groups such as the Centre for Science and Environment in India were developing another political current that would be significant for the CDM, stressing equity principles such as historical responsibility and warning against “environmental colonialism” (Agarwal & Narain 1991).
The politicisation of the climate system was also the first instance of ‘displacement’ that has characterised many climate change policies, including the CDM. The political nature of conditions of production causes immediate environmental and economic crises to be “displaced” to the level of states, transforming “crises of capitalism” to “political crises within capitalism” (Hay 1994:85, italics in original). This was the political strategy of the environmental movement, which was successful in displacing climate change on to the international state level at the United Nations Earth Summit in Rio in 1992. Displacement to states is both necessary and problematic. It is necessary because a global response between states represents the central possibility for addressing global environmental issues like climate change. It is problematic because states have also developed strategies of “crisis displacement”, which prevent them from addressing root social and economic causes of those issues11 (Hay 1994:85,89).

The Earth Summit set the parameters for the proceeding international contestation over the climate system by producing the United Nations Framework Convention on Climate Change (UNFCCC). The objective of the convention is the “stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system” (UNFCCC 1992:4). The objective represented a recognition by states of the need to restructure the capital-climate system relationship to prevent its further impairment. The boundaries of the objective are specified in the Convention’s three general goals. First, that the climate system as a condition life itself; “allow[s] ecosystems to adapt naturally”. Second, that the climate system as a condition of human livelihoods; “ensure[s] that food production is not threatened”. Third, that the climate system as a condition of capitalist production; “enable[s] economic development to proceed in a sustainable manner” (UNFCCC 1992:4). The latter goal was the dominating parameter in the negotiation of the CDM.

11 An example of a state strategy of crisis displacement is the disposal of ‘e-waste’ from disused electronic goods which contain toxic chemicals. It is estimated that the United States, which has not ratified the ‘Basel Convention’ on hazardous wastes, exports 50-80 percent of its e-waste to countries like China and India. The United States displaces the problem through space, rather than addressing its cause, such as through mandating less toxic production, or challenging consumerism (Greenpeace International 2009).
The negotiation of the Clean Development Mechanism

In contests over conditions of production, livelihoods, and life itself, the demands of social movements represent potential social barriers to the flexibility of capital’s relationship with nature. Conversely, inflexibility is inimical to the self-expansionary drive of capital as a social relation. At the interface of this tension is the state, due to its role in regulating access to and use of production conditions (O’Connor 1998:153). The CDM was negotiated as part of the Kyoto Protocol to the UNFCCC. Parties to the UNFCCC are all national states, and therefore in the last instance the CDM was a product of negotiation between states. The previous chapter gave an account of the role of states in securing fossil fuel energy and land as conditions of capitalist production. Drawing on James O’Connor’s (1973:6, italics in original) previous work in the Fiscal Crisis of the State, this regulation can be understood in terms of “two basic and often mutually contradictory functions – accumulation and legitimisation”.

In seeking to fulfil the accumulation function, states are ‘capitalist states’ (O’Connor 1998:154). Capitalist states provide capital with access to a quantity and quality of production conditions, such as labour or oil, at a time and place required for the accumulation of capital. In contrast, the legitimacy function means that states must also be ‘states in capitalist society’ (O’Connor 1998:154). States in capitalist society, particularly democratic societies, are required to regulate production conditions in a

12 The discussion of states in this thesis refers to both national states, such as the Brazilian state, and international states, such as the United Nations, which is both made up of national states, and has its own institutional structure.

13 The Fiscal Crisis of the State was a study on post-World War II United States, but the two state imperatives identified by O’Connor in 1973 remain applicable today.

14 In a new Introduction to the book, O’Connor defended his work against critics that labelled the identification of ‘functions’ as ‘functionalist’. O’Connor (2001:107-8, italics in original) defines functionalism as the belief that “the system generates certain needs and also the political, administrative, and fiscal means by which these needs can be met or fulfilled”. The use of the term ‘functions’ in this chapter is not a functionalist understanding of the state, because while capital needs state support, there is no reason to believe that support will necessarily be forthcoming or effective.
manner that is viewed as legitimate by civil society within and across state borders. These functions are contingent on social construction because there are many potential paths for capital accumulation, and many interpretations of legitimacy. Ultimately, dominant paths and interpretations will be decided by the political power of social movements, capital, and states (O’Connor 1998:165). In such contests, states not only respond to the demands of capital or social movements, but are an active and dynamic force in creating new paths for capital accumulation, and in shaping definitions of legitimacy.

The legitimacy function explains why one of the “crisis displacement strategies” of states is to address “subject perceptions of crisis” (Hay 1994:88). Climate change debates were, and continue to be, framed around numerical emissions reduction targets and their distribution between countries and industries. Indeed, the public campaigns of Climate Action Network (CAN) in the lead up to, and at, the Kyoto conference focused on highlighting developed countries’ historical contribution to climate change, and pushing for binding targets of 20 percent emissions reduction from 1990 levels by 2005 (Newell 2000:126, Betsill 2002:53). Kyoto’s final target of an average 5.2 percent reduction in the volume of greenhouse gas emissions from 1990 levels between 2008 and 2012 was a compromise between the positions of negotiating states. European states pushed for absolute reduction targets of up to 15 percent from 1990 levels by 2008, whereas the United States (US) pushed for targets that reduced emissions by 30 percent only from their projected levels for 2010 (Grubb et al. 1999:86, International Institute for Sustainable Development 1997:5).

While the final Kyoto target was significantly below that pushed by CAN, the negotiation of the numerical target by states was a direct result of the success of social movements in defining the legitimacy of the Protocol in terms of numerical emissions reduction commitments. The popular focus on targets and distribution was evidenced by

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15 And well below levels required to stabilise atmospheric greenhouse gas emissions. Soon after Kyoto it was estimated that thirty additional Kyoto’s would be required to meet the objective of the UNFCCC (Malakoff 1997:2048).
the media response following the signing of the Protocol. For example, the leading story in *The New York Times* following the Kyoto deal ran the headline figure of 5.2 percent, but continually highlighted the absence of developing country targets (Stevens 1997:1). The latter point was an articulation of the Byrd-Hagel Resolution (1997) that passed the US Senate in the months prior to the negotiation, resolving that the US would not become Party to a Protocol that did not restrict developing country emissions. This point justified the subsequent non-ratification of the Kyoto Protocol by the US, and its popular coverage demonstrates the role of the US state in shaping its own legitimacy function.

The other side of the Kyoto target, at one-quarter of that pursued by CAN, is that states fulfilled their accumulation function by securing the climate system as a carbon sink for capital at near pre-Kyoto levels. Nonetheless, if enforced, the 5.2 percent reduction target had the potential to represent a barrier to capital as a socially prescribed limit on capital’s use of the climate system as a carbon sink. In this sense, by framing public debates around targets, environmental groups successfully equated social perceptions of climate change - to which states are most likely to respond - with the need to restrict the flexibility of capital through an international political agreement between states. However, the concept of absolute social barriers runs contrary to the expansionary logic of capital. In relation to the first contradiction of capitalism, Marx (1973:334) wrote that “capital is the endless and limitless drive to go beyond its limiting barrier. Every boundary is and has to be a barrier for it...and beyond which it constantly seeks to go”. Because the Kyoto targets were potential social barriers rooted in the second contradiction of capitalism, capital required support from states to overcome Kyoto’s limiting barrier. This support was provided in the form of the CDM.

The original form of the Clean Development Mechanism (CDM) actually had the potential to support the Kyoto Protocol as a social barrier. Initially, the Brazilian state proposed a ‘Clean Development Fund’ (Lohmann 2006:51), which was premised on principles of compliance and compensation. It would levy financial penalties on developed countries for not meeting their reduction commitments. Penalties would be
placed in the Fund with the purpose of financing climate change mitigation and adaptation projects in developing countries, out of recognition of differing historical responsibilities for global warming (Oberthür and Ott 1999:167). The Clean Development Fund would therefore have strengthened Kyoto as a social barrier because it enforced costs for non-compliance to the Kyoto targets. However, while the proposal was supported by the Group of 77 developing countries and the Chinese state, it was opposed by the United States. Instead, the United States proposed a modified version in which a ‘command and control’-like fund was transformed into a market-based mechanism (Grubb et al. 1999:102-3). Hence, a Clean Development Mechanism was defined in Article 12 of the Kyoto Protocol, allowing the production of ‘Certified Emission Reductions’ (CERs) in ‘project activities’ in developing countries, which could be used by developed countries to meet their reduction targets.

The proposal and negotiation of the CDM occurred in the context of contestation between and within coalitions of states, capital and social movements. Coalitions of capital representing industries that are heavily reliant on fossil fuels, such as the Global Climate Coalition, were active throughout the negotiations. They lobbied against any strict compliance measures, such as the Clean Development Fund, which they perceived as a threat to their profitability, instead stressing the need for ‘flexibility’ (Levy & Egan 1998:346). Other coalitions of capital, such as the Business Council for Sustainable Energy, were advocating flexibility mechanisms as an opportunity for profitable business activities, such as for finance capital in emissions trading, and the export of technology by renewable energy capital (Vormedal 2008:43).

Conversely, the official position of CAN was to oppose the inclusion of flexibility mechanisms (Betsill 2002:53). In contrast to the framing of such mechanisms in terms of ‘opportunity’ or ‘efficiency’ by capital, environmental groups such as Greenpeace framed them as “loopholes” to domestic action by developed states (Hare 1999:2). The notable exception in CAN was the Environmental Defense Fund (EDF), one of the designers of the United States sulphur dioxide trading scheme (Gulbrandsen & Andresen 2004:65). EDF’s pro-market ideological position afforded them greater
political power than other CAN groups such as Greenpeace. Whereas EDF worked closely with both the United Nations and United States at Kyoto, other environmental groups like Greenpeace have been locked out of informal meetings at climate negotiations where concrete proposals are agreed upon (Newell 2000:132,136). One of the problems faced by environmental groups opposing the CDM during its development was the difficulty in appealing to public legitimacy over the technical means of achieving greenhouse gas emissions. This difficulty was compounded by the perceived success of the United States sulphur dioxide trading scheme, which provided legitimacy for market mechanisms (Lohmann 2006:71). Hence, United States negotiators were successful in turning an idea based on principles of compensation and compliance to one based on investment and flexibility for non-compliance. In embodying these principles, the CDM provided a means for capital to overcome the potential social barriers of the Kyoto targets.

Capital accumulation through crisis

The CDM fulfils the state’s accumulation function on two fronts. Firstly, the CDM defends the profits of fossil fuel-intensive capital operating in developed countries by making the Kyoto targets a voluntary proposition. The CDM allows states and capitals in developed countries to avoid curtailing carbon pollution from domestic operations by purchasing carbon credits, known as Certified Emission Reductions (CERs), from project activities in developing countries. In fact, the Kyoto Protocol does not mandate any domestic emissions reductions because neither the Kyoto Protocol, nor any subsequent United Nations decisions, places a quantitative limit on the use of CERs in meeting emissions reduction targets\(^\text{16}\). Therefore, states instituted a mechanism through which they could fulfil their accumulation function by continuing to provide capital with the climate system as a condition of production in the form of a carbon sink. In

\(^{16}\) Vague qualitative language is used instead. The Kyoto Protocol states the CDM will contribute to “part” of developed countries emissions reduction requirements (UNFCCC 1997:11). The Marrakech Accords clarified this to mean “supplemental” to domestic actions (UNFCCC 2001:51).
doing so, states responded directly to the flexibility demands of coalitions of capital like the Global Climate Coalition by developing a mechanism to overcome the potential barriers they were facing.

Secondly, the CDM is more than a passive state response to the demands of capital. It is the product of dynamic states that actively created CERs as a new form of ‘commodity’ production and trade. The CDM is a state-led instrument for capital to accumulate through social barriers to production. This is because the CDM uses the Kyoto targets, which were potential social barriers from an emerging second contradiction crisis, as the driving force in the production of CERs. Therefore, the demands of social movements themselves were transformed from potential restrictions to capital, to providing the impetus for a new form of capital accumulation and a more dynamic capitalism.

The CDM market has two distinct sides: the project phase and the trading phase. The project phase, which produces CERs, is explicitly concerned with the promotion of capital accumulation, based on the principle of ‘additionality’. Additionality is defined in general terms in the Kyoto Protocol as the requirement that the emissions reductions from a CDM project are “additional to any that would occur in the absence of the certified project activity” (UNFCCC 1997:12). This is ostensibly a safeguard to ensure that emissions reductions are “real, measurable, and long-term” (UNFCCC 1997:12). However, in practice, the principle is used to ensure profitability. In order for a project to be certified as additional, it needs to prove that it requires revenue from the sale of CERs to ensure profitability in absolute terms, or to be relatively more profitable than other more polluting options, such as coal-fired power plants (Michaelowa 2010:252). Therefore, the underlying principle of the CDM seeks to promote the expanded reproduction of capital that would not have occurred without CDM revenue. The revenue from the sale of CERs can then be reinvested by project developers to augment further capital accumulation. For example, it was reported that the revenue gained by Gujarat Flourochemicals for selling CERs produced in their industrial gas destruction CDM project was invested in a new (and polluting) caustic soda and Teflon factory (Ghouri 2009).
The second phase of the CDM market concerns the trading of CERs. The sale of CERs in ‘primary’ markets direct from project developers, or the trading of CERs in ‘secondary’ markets, is essential for the realisation of revenue from CERs. It also provides opportunities for finance capital, such as large investment banks, which have actively invested in CDM projects, to profit from trading CERs on financial markets. This process is underpinned by a second fundamental principle: ‘equivalence’. The principle of equivalence uses Global Warming Potentials (GWP) to measure potency of different types of greenhouse gases in comparison to carbon dioxide (UNFCCC 1997:6). This measure provides CDM projects with an accounting logic, and a means of comparing a diverse range of projects and greenhouse gases, as a homogenous CER commodity. CERs represent one tonne of carbon dioxide-equivalent, which allows them to be integrated with other carbon trading schemes (Newell & Paterson 2010:86). For example, equivalence allows a methane avoidance CDM project in Brazil to produce CERs that can be traded to offset carbon dioxide emissions from a coal-fired power station in England. Those CERs can then be used in compliance with emissions targets under the European Union Emissions Trading Scheme.

Spatial restructuring of the climate system

Underpinning the production of CERs in the CDM is a spatial restructuring of the climate system as a productive force, and the social relations of its reproduction. In relation to the former, the CDM uses global space to restructure the climate system through the production and trade of carbon sinks in commodity from. The intellectual source of the CDM as a market instrument is orthodox environmental economics and its neo-classical underpinnings. But the free-market ideological foundations of the CDM are in stark contradiction with the social relations of reproduction that facilitate the spatial restructuring of the climate system. This is because states not only instituted the CDM, but constitute the functioning of the entire CDM market in cooperation with capital.
In response to the natural and social barriers that surround second contradictions, states and capital often restructure production conditions as productive forces (O'Connor 1998:167). The CDM restructures the climate system as a productive force by instituting the production and trade of representations of instances of carbon sink capacity. CERs are produced through the ‘as if’ or technological reduction of greenhouse gas emissions. ‘As if’ projects, such as renewable energy projects, represent the highest number of total projects. They produce CERs because they purport to emit a lesser quantity of greenhouse gases than would otherwise be emitted without the CDM. For example, a wind farm project will produce CERs if project developers are able to demonstrate that in the absence of CER revenue, a more greenhouse gas-intensive natural gas station would instead be providing the power. The CERs from this form of project are therefore an ‘as if’ removal of greenhouse gases from an alternative scenario. Technological project types do remove real greenhouse gases, mostly through the destruction of industrial greenhouse gases using incineration technologies. This form of project type has produced the majority of total CERs. The use values of CERs in offsetting emissions and meeting emissions reduction requirements alters CERs from representations of ‘emission reductions’, to representations of a particular instance of ‘carbon sink’ capacity. This is because CERs are used by states and capital as additional carbon sink capacity for their real greenhouse gas emissions that exceed socially imposed limits, such as from the Kyoto targets or the European Union Emissions Trading Scheme.

If the demands of social movements provided the impetus for states to develop the CDM as a path of capital accumulation, the social restructuring of global space is used for its execution. The circuit of production, exchange, and use of CERs operates through the socially constructed division between developing and developed countries at the level of global environmental politics. It is used in order to construct an external space in developing countries where carbon sink capacity can be produced and an internal space in developed countries where carbon sink capacity can be consumed. This is a social restructuring of the climate system as a productive force because natural processes of carbon cycling do not adhere to the CDM’s internal-external restructuring.
Indeed, the basis for it lies not in an appreciation of natural systems, but rather in the neo-classical economic notion of ‘substitutability’ of resources through the price system and technological advance (Simon 1981:38-9, 221-2).

There are three main ways such substitutability is envisaged by neo-classical economics. Firstly, through developments which increase efficiency in the usage of natural resources. Secondly, through the substitution of natural resources with technological alternatives. Thirdly, in the use of technology in increasing available resources through new discoveries or assisting access to known resources (Hamilton 1997:49). Each of these rationales is used in the CDM. ‘As if’ CDM projects are based on increasing the fossil fuel efficiency of a particular commodity, such as electricity, through the use of ‘supercritical’ rather than ‘subcritical’ technology in coal-fired power stations. Technological CDM projects, most commonly industrial gas destruction, are premised on a concrete substitution of natural sinks which absorb and cycle carbon in the climate system, with technologies that destroy greenhouse gases, such as ‘thermal oxidation’ technology. Both of these forms of substitution, when represented in commodity form as CERs, are then used in the third way, by increasing the social availability of carbon sinks as a condition of production for states and capital in developed countries.

The social structure of markets

The design of the CDM as a market instrument is underpinned by environmental economics and its neo-classical economic foundations. The Kyoto targets incompletely change the climate system’s carbon sink capacity from a public good to a private good, by partially restricting the quantity of its allowable use. The rationale behind such instruments is that carbon pollution can be optimally allocated through the price mechanism to its highest exchange value uses (Hamilton 1997:49, Pearce 1976:103). The corollary of this principle is that the price mechanism efficiently allocates responsibility for reducing pollution to its lowest exchange value uses. This is the basis
of the rationale of the CDM, because carbon reduction projects are understood to have a lower marginal cost in developing countries than in developed ones (Markandya 1994:53-4). To this end, while science was a powerful social force in impelling social movements to demand the protection of the climate, the idea of least cost emissions reductions has been assisted by the scientific community. Demeritt (2001:316) has argued that the use of “physically reductionist” climate modelling means climate scientists have tended to frame climate change as a problem of the “physical properties” of greenhouse gases, abstracted from their social context. Such framing supports the rationale behind the CDM because if the problem of global warming is simply too many physical particles in the atmosphere, the place of their reduction is immaterial in a global-scale problem like climate change17.

The Kyoto targets, and subsequently the European Union Emissions Trading Scheme, are indicative of the contemporary environmental economics understanding of global warming as a problem of an “incomplete allocation of property rights” in the climate system as a public good (Hamilton 1997:41). In accordance with the neo-classical tradition, the assigning of a certain quota of property rights by states that are tradable by private actors in markets is an appropriate role for state authorities (Pearce et al. 1989:165). States were dynamic in not only affording capital the possibility of trading a socially imposed limit on property rights, but also the ability to produce additional property rights in the CER commodity form. However, in practice, the role of states in the CDM market goes far beyond that which is suggested in orthodox environmental economics. Rather, the entire functioning of the CDM market is constituted by a state-based social structure.

The role of states in underpinning the CDM reflects the second dimension to the restructuring of production conditions. In conjunction with restructuring production conditions as productive forces, O’Connor (1998:168) identifies the need to restructure the “social relations of [their] reproduction”. Such restructuring has the “aim of

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17 The spatial and temporal consequences of this social abstraction are discussed further in the following two chapters.
exercising...more planning” over production conditions, and requires “new forms of cooperation” between states and capital (O’Connor 1998:167-8). The academic literature regularly praises the CDM for its embrace of private self-interest in driving ‘clean development’ through ‘public-private partnerships’ (e.g. Streck 2004:313). However, the partnership is a very unequal one in that the profits made by individual capitals involved in the CDM are driven and therefore effectively subsidised by states. This support is evident in both the project and trading stages of the CDM market.

Every moment of the CDM project stage is constituted by states\(^{18}\). CDM projects must be registered by the CDM ‘Executive Board’, comprised of 10 representatives of national states. Prior to registration, cooperation between businesses is required, but the cooperation is entirely determined by states. Firstly, ‘project developers’, which are the investors, owners, and managers of prospective CDM projects, hire a private consultant to prepare a ‘Project Design Document’ (PDD). The purpose of the PDD is to demonstrate that the project corresponds with the extensive and technical CDM regulations and methodologies. These rules were developed by states at international climate negotiations, particularly the Marrakech Conference in 2001, as well as the Executive Board and the Methodologies Panel. Projects also must be validated by one of thirty-four private consultancies, known as a ‘Designated Operational Entities’ (DOE) that have been accredited by the Executive Board (UNFCCC 2010b). Prior to registration by the Executive Board, CDM projects require approval by both the ‘host’ government from the developing country in which the CDM is taking place, and a developed country government ‘sponsor’. Once registered, a different Executive Board accredited DOE is required to monitor and verify ‘emissions reductions’ in CDM projects. But as a non-material commodity, CERs can only be ‘issued’ by the Executive Board.

Host country governments, particularly the Chinese government, utilise their approval role as a means to channel CDM finance into “priority sectors” of the economy (Schroeder 2009:372). The pattern of CDM investment - heavily skewed towards the

\(^{18}\) Stages of the CDM project cycle are sourced from CDM Watch’s (2010a:8-14) *CDM Toolkit*. 
large developing countries of China, India, and Brazil - also suggests that sponsoring governments use the CDM to support existing strategic trade and investment patterns. The experience of Gujarat Fluorochemicals Ltd (GFL), the project developer for the first CDM project, demonstrates the effectiveness of state support in underpinning the profits of capital in developing countries. GFL increased its net profit by 41 percent in its first year of CDM trade by selling 3.9 billion Indian rupees (approx. AU$90.6 million) worth of CERs. This represented 67 percent of the company’s total sales revenue, more than supplementing its production of refrigerant gases and demonstrating the effective integration between CER and other commodity production (GFL 2007:27,40,52).

States have also supported the participation of capital based in developed countries in both the CDM project phase and the CER trading phase. One of the most prolific private businesses involved in the CDM is Ecossecurities, owned by JP Morgan Chase. It is the company that has prepared the most PDDs as a consultant, and has purchased the most CERs direct from projects (UNEP 2010b). The role of Ecossecurities, a company without greenhouse gas reduction requirements, which therefore does not require CERs in its own right, indicates the potential for companies in trading CERs on financial markets. But this stage of the CDM market is also coordinated by states through the UNFCCC’s ‘International Transaction Log’ (ITL). The ITL records all CER transactions between project developers, carbon funds, and states in order to monitor their use in accordance with Kyoto rules (Bumpus & Liverman 2008:140). Finally, as was argued above, the CDM is a means to accumulate through the Kyoto targets, which provide a use value and demand for CERs. Since Kyoto, the actions of national states within the European Union (EU) have driven most CER demand. In 2004 EU states agreed to a ‘Linking Directive’ where CERs from the CDM could be surrendered under the EU Emissions Trading Scheme (Newell & Paterson 2010:104). This decision has proved to be the lifeblood of the CDM, underscoring 90 percent of global demand for CERs (Captor & Ambrosi 2008:23).
Conclusion: The CDM as a spatial fix

The elaborate state structures that support the CDM market facilitate the operation of the CDM as a spatial fix to the emerging climate change crisis. Indeed, the history of capitalism has been characterised by the constant seeking of spatial fixes to its internal contradictions. Notably, this has occurred in response to the first contradiction of capitalism, where spatial fixes to demand-side crises have been pursued by expansion into hitherto external markets as an outlet for surplus capital (Harvey 2001:369). The CDM is undoubtedly related to the first contradiction, by providing investment opportunities for businesses such as Ecosecurities to invest in new markets, both in terms of territory and commodity forms. But primarily, the CDM follows this logic as a spatial fix to the supply-side crisis of climate change as a second contradiction of capitalism. This chapter has argued that the CDM uses global space to restructure the global climate system in order to overcome social barriers to capital’s use of natural carbon sinks in developed countries. It also promotes capital accumulation for participants in the CDM market in both developed and developing countries. Spatial fixes to a first contradiction of capitalism are designed to temporarily resolve a crisis in the internal region by shifting the crisis to the external (Harvey 1982:427). Similarly, as a spatial fix to a second contradiction of capitalism, the CDM displaces through space the political, economic, and ecological crises that are developing around climate change to the CDM project level. The following chapter takes up the question of displacement in terms of its consequences for the local communities and ecosystems that surround CDM project sites.
Chapter three

Displacement through space and the partial capitalisation of nature

The Clean Development Mechanism (CDM), as argued in the previous chapter, is a state-instituted spatial fix which promotes capital accumulation by displacing responses to climate change to CDM projects in developing countries. However, environmental and other social movements have documented significant negative impacts of CDM projects on local communities and ecosystems. This chapter analyses these impacts by continuing the incorporation of a spatial dimension into the dynamic of the second contradiction. The chapter argues that in displacing the climate crisis through space to the level of CDM projects, those projects have created new site-specific crises for local communities and ecosystems surrounding projects. This is due to the specific form of capital-nature relations underpinning the accumulation imperatives of the CDM: the partial ‘capitalisation of nature’ (M. O’Connor 1993, 1989). The CDM’s partial capitalisation of nature restructures local space around CDM projects, resulting in a dual character whereby the capitalisation of carbon sinks depends on the appropriation of uncapsulated nature. The negative impacts on local communities and ecosystems surrounding CDM projects are a direct result of this relationship. The tension between capitalisation and appropriation, and the role of ‘sustainable development’ discourse in facilitating and legitimising the process, is illustrated by a case study of India’s extensive CDM project market.
The partial capitalisation of carbon sinks

The CDM socially restructures the climate system as a productive force through a spatial division between developed and developing countries. The previous chapter demonstrated that states use this division to displace responses to climate change to the level of CDM projects in developing countries. These projects produce representations of carbon sink capacity that can be filled by the carbon emissions of capital in developed countries. This process is embedded in a particular set of capital-climate system relations based on the ‘capitalisation of nature’. Capitalised nature is defined by Martin O’Connor (1993:8, italics in original) as “the representation of the biophysical milieu (nature)...as reservoirs of ‘capital’ and the commodification of these stocks as property tradeable ‘in the marketplace’ ”. This is the essence of Certified Emission Reductions (CERs), which are commodified representations of a specific capacity of the climate system to act as a carbon sink for one tonne of carbon dioxide-equivalent. The capitalisation of nature represents a change in the capital-nature relationship because nature is internalised as capital, rather than the traditional notion of capital acting on external nature (M. O’Connor 1989:35). Correspondingly, capital accumulation becomes equated with the management of nature, because the reproduction of capital is also the reproduction of nature (M. O’Connor 1993:18).

The traditional notion of capital acting on external nature was described by Marx (1971:745) as “the free gift of Nature to capital”. The use values of nature, as a condition of production, are produced through ecological processes rather than wage labour19, and are therefore “freely appropriated” by capital20 (Burkett 1999:94). The account of climate change developed in Chapter one reflects this relationship. The use

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19 The utilisation of the use values of natural conditions often does require wage labour. For example, the utilisation of heat from coal requires a furnace, which is the product of wage labour. But the productive force itself is the product of ecological processes (Burkett 1999:94).

20 Burkett (1999) stresses that ‘free appropriation’ refers to capitalism’s reduction of value to abstract labour time. Because natural conditions are not produced by labour as commodities, they ‘cost nothing’ to capital.
values of fossil fuels, land, and the climate system as a carbon sink have been freely appropriated by capital, which in turn has impaired the use value of the climate system as a climatic tap. Specifically, the use value of the climate system as a carbon sink has been freely appropriated because greenhouse gas emissions are absorbed and cycled by (second-) natural processes between the (second-) natural components of the climate system.

The CDM alters this from a relationship of free appropriation to the capitalisation of carbon sinks. To be sure, the Kyoto Protocol largely codified the continued free appropriation of natural carbon sinks by capital operating in developed countries. However, the carbon sink capacity that is required by capital but restricted in terms of free appropriation by the Kyoto or other targets can instead be capitalised through the CDM. This process of capitalisation is essential in allowing capital to overcome the potential social barriers represented by emission reduction requirements. The process of capitalisation also underpins the accumulation imperatives inherent in the production of CERs. The capitalisation of carbon sinks through the production of CERs marks a significant break with capital’s relationship with the climate system as a condition of production. Unlike natural carbon sinks which are produced outside the circuit of capital and freely appropriated, CERs as representations of carbon sinks are produced inside a circuit of capital in commodity form, principally by technological means.21

At an abstract level, Martin O’Connor (1993:17) extends the process of capitalisation to its logical conclusion of a “global system of capitalised nature” in which all natural materials and processes are capitalised. However, the CDM does not represent a complete system, but rather a partial capitalisation of nature. It is partial because carbon sinks are capitalised in abstraction from both the natural carbon cycle, which remains largely uncapitalised, and from the ecosystems and societies which are inextricably interdependent with the component parts of the climate system.

21 However, it will be argued in the following chapter that this is a transformation at the ideational level only, in order to facilitate continued appropriation of the natural climate system as a carbon sink.
The socially constructed spatial division between developed and developing countries is an abstraction from the global carbon cycle described in Chapter one, but is necessary for the proper functioning of the CDM market. Like all use values, space is a material characteristic of the natural climate system as a carbon sink (Harvey 1982:375). Greenhouse gas emissions are absorbed and cycled through a set of concrete processes by the component parts of the climate system which function in particular spaces. However, the businesses that ultimately surrender CERs to offset carbon emissions by definition emit greenhouse gases in a different geographical location to the carbon sinks capitalised in CDM projects. Therefore, like all forms of exchange, the sale and trade of CERs requires a means of “spatial integration” between project developers, traders, and final purchasers (Harvey 1982:375). The principle of equivalence achieves this integration by homogenising different types of greenhouse gases, irrespective of the social relations that led to their emission or reduction, according only to their Global Warming Potential22 (GWP). Partial capitalisation through abstraction from the natural carbon cycle is therefore necessary to overcome the spatial constraints of the climate system. It also permits capitalisation to take place on the basis of expected realisation of profits from the exchange of CERs, rather than environmental integrity.

Capitalisation occurs through the ‘as if’ or technological removal of greenhouse gases on a project-by-project basis, independent of the component parts of the climate system. However, the component parts of the climate system are completely interrelated with ecosystems and societies, because they possess a myriad of potential use values as natural conditions of production and life, in addition to their roles in the climate system. For example, oceans are a natural condition for the fishing industry, the atmosphere provides oxygen, and land has spiritual significance for communities. Trees, soil, rivers and fish, which all have roles in the carbon cycle, also form interdependent parts of ecosystems. Therefore, in abstracting from the climate system as a whole, CERs

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22 The use of GWPs is itself a deeply unequal measure, because the capacity of the climate system to act as a carbon sink depends on present concentrations of carbon, which means that GWP is biased towards historical emitters, and biased against those which have contributed little (Demeritt 2001:316-7).
abstract from the ecosystems and communities in which the component parts of the climate system are embedded.

**Capitalisation and appropriation: The dual character of the CDM**

While homogenous CER commodities are abstracted from all social and environmental contexts, and exchanged in the relative space of financial markets, their production occurs in real geographical space. Harvey (2003:176) argues that there is a “dual character” to capital accumulation between “expanded reproduction and accumulation by dispossession” [which] are organically linked, dialectically intertwined. A similar dual character has emerged in the geographical space around CDM projects, in which the internalisation of carbon sinks as capital depends on the appropriation of nature. The manifestation of this tension between capitalisation and appropriation represents the CDM’s restructuring of local, as well as global space. This dual character is structurally defined in the CDM’s partial capitalisation of nature, and has ensured that in displacing the climate crisis through space to the level of CDM projects, those projects have created new site specific crises with devastating impacts on local communities and ecosystems.

The size and nature of CDM projects is such that they necessarily require land, ecosystem sinks, and raw materials around CDM projects. However, like all natural conditions, the ecological materials and processes necessarily appropriated by CDM projects have alternative use values as conditions of livelihood and life. The

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23 Harvey’s notion of ‘accumulation by dispossession’ is a reworking of Marx’s notion of ‘primitive’ or ‘original’ accumulation, and Rosa Luxemburg’s study of the links between the colonisation of non-capitalist societies and ‘underconsumption’ crises in capitalist societies. It describes a range of processes, including commodification and privatisation, which forcibly redistribute resources held in common to capital as a means to overcome crises of overproduction (Harvey 2003:137-182).

24 ‘Local’ refers to the geographical and ecological spaces directly affected by CDM projects, but which both shape and are shaped by regional, national, and international dynamics, such as UN CDM rules.
appropriation of these conditions has therefore resulted in significant negative impacts on the livelihoods, health, and social structures of local communities, and the state of the local ecosystems. The dynamics of these impacts are exemplified in the case study of Indian CDM projects.

Case study: Indian CDM projects

India was the first country to participate in the CDM and has the second largest number of registered CDM projects behind China, with 532 registered projects (UNFCCC 2010c). Indian CDM projects have received over 79 million CERs, also second behind China (UNFCCC 2010d). By 2012, India is projected to have produced 486 million CERs from over 965 projects (UNEP 2010a, 2010b). The four project types examined in the greatest depth by the case study - energy efficiency, industrial gas destruction, renewable energy, and waste-to-energy - are among the most common in terms of both total project numbers and total CERs issued. The exception is the HFC-23 industrial gas destruction project, which is a project type that represents only 0.4 percent of total CDM projects but has been issued with 51 percent of total CERs (UNEP 2010b). In addition to its large quantity of representative CDM projects, India is a useful case study because its projects have been subject to the greatest level of civil society scrutiny.

Evidence from Indian coal power and industrial gas destruction projects demonstrates that the internalisation of carbon sinks as capital necessarily relies on the appropriation of land and ecosystem services. The specific local contexts of this appropriation have resulted in serious negative impacts including dispossession of land, loss of livelihoods, pollution of local ecosystems, and damage to human health. These impacts are manifestations of the dual character of the CDM, which is structurally defined in the partial capitalisation of nature.
The dual character of CDM projects between capitalisation and appropriation has been most pronounced with the issue of land. Land is “the space required as an element of all production and all human activity” (Marx 1971:774). Here Marx appreciates that land has multiple use values as a condition of production and the basis for other activities not necessarily part of the capitalist production process, such as shelter. As a result there is great potential for conflict over access to land for different uses. The nature and scale of many CDM projects intensifies this potential because the capitalisation of carbon sinks, in conjunction with other commodity producing activities, requires the appropriation of large areas of land to the exclusion of all other uses. The dispossession of communities that can result from such appropriation is evidenced with the case of the Sasan ‘supercritical’ coal project in Madhya Pradesh, India. The project entailed the appropriation of a total of 946 hectares of land, which resulted in the dispossession of some of India’s most vulnerable communities from state land.

The particular ways that CDM projects dispossess communities from land are always site specific and historically contingent. In the case of the Sasan coal project, the dispossession of the already disadvantaged Scheduled Caste (lower caste/dalit) and Scheduled Tribe (indigenous) communities was due to a history of displacement in the region, and the role of the state authorities in facilitating the appropriation of state land. 30 percent of the land appropriated for the project was state land that was lived on and cultivated for agriculture by Scheduled Caste and Scheduled Tribe communities. Many people had been displaced onto the land from the recent construction of the National Thermal Power Corporation power plant. Others had been similarly displaced 15 years earlier by the Rihand Dam. Some had been granted access to state land in 1960 in recognition of social disadvantage (Nandi et al. 2009:44). These were the historical circumstances that led to 1,283 families from three villages (Siddikala, Siddhi Kurd and Harhara) being displaced from government land. The state had a significant role in this appropriation and dispossession. The construction of the project was awarded to Reliance Power as part of a Government of India tenure process. The District Magistrate spearheaded the task by giving notices to the communities to vacate state land, while the State Forest Department cancelled the historical access they had granted on the basis
that community cultivation was “encroachment” (Nandi et al. 2009:41,43). Hence, the appropriation and dispossession of land was a state-sanctioned process.

Similar forms of dispossession have been replicated throughout CDM projects. The MSPL Limited wind power project in Karnataka, India, appropriated a total of 96 hectares of state forest and village land, erecting fences which locked communities out of land that was previously used for cattle grazing and the collection of firewood (Mate & Ghosh 2009a:32-3, Ghosh 2009:2). Likewise, the Plantar charcoal production project in Minas Gerias, Brazil, appropriated 23,000 hectares of land for its monoculture eucalyptus plantation. The project has dispossessed indigenous and peasant communities from previously productive land, while drying up and polluting local water supplies (Lohmann 2006:204). The particularities of each case are site specific, but dispossession from land is directly linked to the CDM’s structurally defined partial capitalisation of nature. This is because the capitalisation of carbon sinks in power stations, wind farms, or tree plantations necessarily requires the appropriation of large areas of uncapitalised land to the exclusion of all other uses.

The appropriation of ecosystem services

In addition to the appropriation of land, the CDM’s dual character is also evident in the appropriation of ecosystem services. The nature of many CDM projects is such that the capitalisation of carbon sinks requires the appropriation of ecosystem services as sinks for waste products. This has resulted in some very damaging impacts to the functioning of ecosystems that surround CDM projects. In turn, ecological damage has caused some significant negative impacts on local communities because, like land, ecosystem services have multiple use values, such as supporting agricultural livelihoods and human health. The Gujarat Flourochemicals Ltd (GFL) HFC-23 destruction plant in Gujarat, India, the first of all CDM projects to be approved under the Kyoto Protocol in 2005, illustrates both the necessity of appropriating ecosystem services and its negative effects on ecosystems and dependent communities.
The project capitalises carbon sinks on the basis that it destroys the potent greenhouse gas HFC-23, which is a by-product of the production of a refrigerant gas. The project installed the necessary technology on the existing GFL site and therefore did not exclusively appropriate any new land (GFL 2005:9). However, the process of ‘thermal oxidation’ which destroys HFC-23, results in the release of pollutants toxic to humans, animals, and ecosystems, including carbon monoxide, sulphur dioxide, nitrous oxide, and other dioxins (GFL 2005:9). Secondly, the process of HFC-23 destruction requires large quantities of water for cooling and neutralisation purposes, which is subsequently recycled or discharged as effluent (GFL 2005:9,56). Thirdly, the process also requires fossil fuel-based energy to generate temperatures necessary for gas incineration (GFL 2005:9). The project therefore necessarily appropriates and impairs natural conditions of production including water and fossil fuels as input taps, and ecosystem services as waste output sinks, in order to capitalise carbon sinks.

Four villages (Nathkuva, Jitpura, Kankodakoi, and Ranjitnagar) with populations of approximately 1,200 people are within a two kilometre radius of the GFL project (Dabhi 2009:141). These communities have reported significant air and ground water pollution, which has impacted agricultural productivity and human health in the poor and rural area (Ghouri 2009). White films on the water and white crusts on the soil can be observed in the vicinity of the project. Laboratory testing of this soil and water has found dangerously high levels of fluoride, chloride and other contaminants that are consistent with the project’s HFC-23 destruction operations (Ghouri 2009). Local villagers have complained of significant impacts on human health, including clusters of birth deformities, and endemic skin and joint ailments. They also claim that crop and fruit productivity has significantly declined, and village cattle have reduced milk production and have developed health problems such as tumours (Dabhi 2009:142).

The impacts of CDM projects also need to be understood in conjunction with the primary commodities produced. The destruction of HFC-23 is possible because it is a by-product of HCFC-22, a refrigerant gas which is the primary commodity produced by GFL. The production of HCFC-22 is also a highly polluting operation, which the local
Community has fought since 1996, including in an unsuccessful case to the Gujarat High Court (Dabhi 2009:143). Therefore, it is not only the CDM project activity that requires the appropriation of ecosystem services, but also the primary form of commodity production. The two cannot be separated from the CDM because the destruction of HFC-23 waste gas depends on the production of HCFC-22, and the revenue from the sale of CERs supports the production of HCFC-22, thereby exacerbating existing social tensions between the community and the project developer.

Reliance on waste from otherwise polluting industries is an endemic feature of the CDM. For example, the Agrosuper project in Region IV, Chile, claims CDM credits from the capture and combustion of methane from pig manure. However, the project relies on the continuing operation of the factory’s water- and fishmeal-intensive production in order for the generation of methane to capture and capitalise as carbon sinks (Alarcon 2009:75). The GFL and other projects illustrate another side of the restructuring of local space by the dual character of the CDM. The capitalisation of carbon sinks through HFC-23 destruction depends on the appropriation of ecosystem services outside the project’s boundaries. However, GFL’s natural conditions of production are also conditions of life itself. In displacing the climate crisis to the CDM project level, the GFL project has created new crises in the state of the local ecosystems, and in the local communities that rely on ecosystem services.

The role of sustainable development

The CDM’s partial capitalisation of nature immediately discredits any purported equation between the accumulation of capital through the production of CERs, and the reproduction of nature as a whole. The CDM’s capitalisation extends only to carbon sinks, and therefore any equation is immediately limited to the reproduction of the climate system25. Instead, the structure of the CDM is formally designed to protect local

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25 The impact of CERs on the climate system is analysed in the following chapter.
communities and uncapitalised ecosystems from any negative impacts of projects through the concept of ‘sustainable development’. Indeed, sustainable development is given a high priority in the Kyoto Protocol, listed alongside the reduction of greenhouse gases as a ‘double goal’ of the CDM. However, evidence from Indian wind power and waste heat energy projects illustrates that in practice, the notion of sustainable development has facilitated the appropriation of nature and the resulting negative impacts. This is due to an application of the dominant understanding of sustainable development which - like the capitalisation of nature – conflates sustainability with economic growth (Paton 2008:95).

The United Nations Framework Convention on Climate Change (UNFCCC), which embodies the Kyoto Protocol, is a product of the Rio Earth Summit in 1992. The application of sustainable development principles in Indian and other CDM projects has very much been a product of the sustainable development discourse developed in the Agenda 21 document adopted at the same conference. Earlier notions of sustainability, such as those from the ‘steady-state’ and ‘eco-development’ traditions, stressed the contradictions between economic growth and nature, and promoted ideas of ecological sustainability and social justice (Paton 2008:96-7). On the other hand, the Rio Summit “made economic growth the means for achieving” environmental and social goals (Paton 2008:105, italics added). This position was central to the development of the CDM at an international level, and has been faithfully adhered to in the approval process for individual CDM projects. Under the CDM, approval of sustainable development is the domain of each host country’s Designated National Authority (DNA) (UNFCCC 2001:81). India’s DNA, CDM India, which is within the Ministry of Environment and Forests, has four criteria for judging sustainable development: social; economic; technological; and environmental well-being (CDM India 2010). In practice, each indicator of sustainable development is understood to be achieved through the economic activity of CDM projects.

Projects with serious negative impacts arising from the appropriation of nature use dominant sustainable development discourse to gain CDM approval. In particular,
project developers appeal to the general links between economic growth and societal progress that the CDM project will create. For example, the Tata Motors wind power project in Maharashtra, India, appealed to the general ‘trickle down’ effects of the project in its Project Design Document. It states that the project assists sustainable development by “increasing income security of vulnerable sections of the society through redistribution benefits on account of the economic activities associated with the project” (Tata 2006:3). The appeal to poverty is significant in the context of Agenda 21. The document upheld that poverty alleviation through economic growth was conducive to sustainable development because poverty was one of the principle causes of environmental damage (Carruthers 2001:99-100). However, rather than some sort of general economic uplifting, the economic activity of the CDM project has had a specific negative impact on the poor local communities. In appropriating 900 hectares of village and government land, it has dispossessed a large Scheduled Caste community (Mate & Yasmin 2008:32-3).

The project also promised to provide some specific social benefits in the form of employment for the local community (Tata 2006:3), but this is discouraged by the CDM’s structure of partially capitalised nature. Indeed, the promise of employment was a major factor in landowners agreeing to sell their land for below-market rates. However, while jobs were extended to a large number in the community during constructions, only five people have gained ongoing employment (Mate & Yasmin 2008:33). Similarly, during construction of the Xiaoxi hydropower dam in Hunan, China, which displaced at least 7,563 people from water submersion, local business owners reported revenue booms from the large quantity of construction workers. However, because hydropower dams require little labour during operation, the rise in economic activity quickly subsided once construction was complete (Lea 2008:8-9). The non-enforcement of ‘sustainable development’ promises, such as employment, is a vestige of the partial capitalisation of nature in the design of the CDM. Emissions reductions are continually monitored to calculate quantities of capitalisation, whereas sustainable development only needs to be signed off by the DNA in the design phase. Furthermore, employment during construction often coincides with the appropriation of
land and other negative impacts, and is therefore an effective means of overcoming social resistance in poor communities.

Sustainable development discourse has also been used to facilitate the appropriation of nature and the resulting negative impacts by making social and environmental initiatives conditional on the economic activity of a CDM project. This crude application of the conflation between economic growth and sustainability is illustrated by the JSW Energy sponge-iron project in Karnataka, India. The project’s activities release toxic effluent including heavy metals into groundwater, dumps solid waste, and pollutes the air with fly ash (Lohmann 2006:260). On the other hand, the project developers promised to use income derived from the project to supply electricity, construct roads, operate health clinics, and provide employment opportunities, on top of the project’s reduction in greenhouse gas emissions from the generation of electricity from waste gases (Mate & Ghosh 2009b:28). The provision by private companies of social services that are conditional on economic activity reflects an acceptance of the Rio discourse that embraced private actors as the drivers of sustainability (Paton 2008:109). None of the ‘sustainable development’ pledges were carried out by the company (Mate & Ghosh 2009b:28). However, the piecemeal nature these promises also demonstrates an understanding of sustainability that is devoid of any notion of ecological and social interdependencies. Even if each of the initiatives was carried out, the ecological destruction caused by toxic pollution cannot under any measure be considered to be offset by a health facility. Piecemeal and conditional social and environmental protections or services, which reflect dominant understandings of sustainable development, facilitate negative impacts if they are not pursued as a whole.

The partial capitalisation of nature in the CDM also works against the adoption of production practices that may reduce pollution other than greenhouse gas emissions. In 2008 the Karnataka State Pollution Control Board noted that none of the sponge-iron plants in the Bellary region, including the JSW Energy project, were employing technologies, such as ‘electrostatic precipitators’, that reduce pollution by filtering the fine metals and gases which are discharged from the factories (Mumtaz & Yasmin
Similarly, the AT Biopower project in Phichit, Thailand, which burns rice husk to generate electricity, has dumped its ash waste in local communities, rather than recycling it for its potential use in cement production (Gilbertson 2009a:69). In both cases, the CDM’s partial capitalisation of nature worked against the less polluting alternatives. Only carbon sinks are capitalised under the CDM, and therefore in the absence of state regulation, and the non-enforcement of sustainable development criteria, CDM projects simply appropriate ecosystem services as waste sinks for non-greenhouse gas pollution if represents the least-cost option.

Conclusion: Legitimising crisis displacement

The experience of Indian CDM projects illustrates the serious negative impacts on local communities and ecosystems that results from the displacement of the climate change crisis to the level of CDM projects in developing countries. The CDM’s partial capitalisation of nature restructures local space around CDM projects through its dual character whereby internalisation of carbon sinks as capital depends on the appropriation of uncapatilised nature. Rather than protecting ecosystems and communities from the costs of the CDM’s crisis displacement, the concept of sustainable development has both facilitated the negative impacts and provided the process with significant legitimacy. It has facilitated the negative impacts because the dominant understanding of the concept confits the economic activities of CDM projects with sustainability. However, the concept also retains widespread legitimacy, courtesy of its popularly recognised meaning as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (Meadowcroft 2000:270, WCED 1987). The notion of sustainable development therefore not only facilitates crisis displacement but also legitimises the CDM at the national and international levels. The following chapter turns to the temporal dynamics of the CDM by analysing the role of the capitalisation of carbon sinks in displacing climate change as a crisis of the second contradiction through time.
Chapter four

Displacement through time and emerging contradictions

The appropriation of uncapitalised nature, instituted by the dual character if the Clean Development Mechanism (CDM), has caused significant negative impacts on local communities and ecosystems at the CDM project level. The first section of this chapter analyses the other half of the CDM’s dual character - the capitalisation of carbon sinks - and the implications of capitalisation for the climate change crisis. Using examples from ‘as if’ and technological CDM projects, the section argues that the CDM is based on a notional capitalisation of carbon sinks and consequently reproduces the climate system at the level of social imagination only. Therefore, as a partial and notional capitalisation of nature, the CDM displaces the climate crisis through space and time, because it contributes to a future intensification of global warming as a second contradiction of capitalism.

The social and environmental impacts of the CDM’s spatial and temporal displacement have engendered a growing social resistance from social movements towards states. Juxtaposed with this resistance has been conflict between and within capital and states over the institutional developments required for the continued existence and expansion of the CDM. The second and third sections of this chapter analyse the different currents of this contestation at the international, national, and local levels, in terms of democratic state strategy by social movements, and the conflicting interests for different fractions of capital inherent in the accumulation imperatives of the CDM. Together, these conflicts represent emerging contradictions within the state-based social structures that wholly support the functioning of the CDM market, and demonstrate the role of the agency of social forces in continually shaping the dynamics of second contradictions.
The notional capitalisation of nature

The capitalisation of nature represents a “rhetorical harmonisation” between the accumulation of capital and the reproduction of nature because “capital is nature and nature is capital” (M. O’Connor 1993:18). However, Martin O’Connor (1993:24) also contends that in the concrete global political economy, the capitalisation of nature has principally occurred at the “social imaginary level”, corresponding with “largely imaginary management”. The CDM follows this logic through a notional capitalisation of carbon sinks which represent an imaginary management of the climate system. First, ‘as if’ projects remove projected greenhouse gases from imaginary future scenarios that are socially constructed using flawed assumptions. Second, technological projects remove real, but by-product, greenhouse gases which produce Certified Emission Reductions (CERs) that are outweighed by the climatic impact of the primary greenhouse gas for which there is no technological carbon sink.

‘As if’ carbon sinks

‘As if’ CDM projects do not reduce greenhouse gases emissions in real terms. Instead, carbon sinks are capitalised because projects claim to emit a lesser quantity of greenhouse gases than would have occurred without the CDM project. These projects therefore operate ‘as if’ they are removing greenhouse gases from a future scenario. The ‘reduction’ in greenhouse gases by CDM projects is calculated using a ‘baseline methodology’ which constructs counterfactual ‘business-as-usual’ scenarios of emissions trajectories. ‘As if’ carbon sink projects only notionally capitalise carbon sinks because they reduce emissions from a socially constructed scenario of emissions that is either fraudulent, or more fundamentally, does not need to exist because of a poverty in the understanding of historical development in the design of CDM baselines.

There is strong evidence that a large proportion of renewable energy projects, which represent the majority of ‘as if’ projects, as well as 60 percent of total CDM projects,
are producing fraudulent CERs (UNEP 2010b). These projects only notionally capitalise carbon sinks because it can be proved that the greenhouse gas emissions from which CERs are calculated would never have existed. For example, the Project Design Document of the Allain Duhangan Hydroelectric Project in Himachal Pradesh, India, claims that without CDM status, future power requirements would be met through fossil fuel-based sources (ADPL 2007:5). This has been demonstrated as a false claim by the South Asian Network on Dams, Rivers and People (SANDRP) because the project has been in the process of development since 1993, well before the advent of the CDM. Referring to the CER revenue it is set to receive, SANDRP has labelled the project the “75 million dollar fraud” because it would have been built regardless of CDM revenue and therefore the emissions from fossil fuel energy sources were never going to exist (Thakkar 2008:1). This form of ‘non-additionality’ is endemic in renewable energy projects more generally. For example, in 2007 International Rivers found that over 96 percent of China’s then 236 large hydropower projects were under construction before CDM registration was pursued (Haya 2007:6).

Beyond non-additional ‘fraud’, all ‘as if’ CDM projects fundamentally only notionally capitalise carbon sinks due to the flawed assumptions inherent in baseline methodologies. CERs are calculated according to the difference between the smaller quantity of greenhouse gas emissions resulting from the CDM project, and the larger quantity of greenhouse gas emissions that would have occurred from the alternatives to the CDM project. However, the ‘would have occurred otherwise’ is socially constructed using inadequate economic models which assume that historical development is entirely determined by rational companies responding to market forces, in abstraction from the concrete social formation. The key principles informing the construction of baseline scenarios are the need to be “realistic” and “credible” (UNFCCC 2008:5). But the interpretation of realism and credibility is restricted to the reading of market forces by the private consultancy firm26 that prepares the Project Design Document, according to whether the alternative scenarios are “economically or financially attractive” (UNFCCC 2008:5). This represents an inadequate understanding of the contingency of historical

26In UNFCCC terms, a Designated Operational Entity (DOE).
development, which also proceeds from a complex combination of non-market social forces and the political construction of market forces.

The fallacy of excluding social considerations is illustrated by the AT Biopower project in Phichit, Thailand, which earns CERs by generating electricity from rice husk, a ‘waste’ product from rice production. The Project Design Document used an ‘investment analysis’ to find the only “credible” alternative scenario is the methane-emitting practice of “uncontrolled burning or dumping” of rice husk (ATB 2007:17,29). Contrary to this scenario, rice husk is used by communities surrounding the project to absorb animal manure which in turn is used as a natural fertiliser, or as an input for traditional brick manufacturing (Gilbertson 2009a:59). The project is projected to ‘reduce’ 41,881 tonnes of carbon pollution over seven years (and produce the same number of CERs) by avoiding methane emissions from rice husk that would be dumped or burned in a world of rational profit-seeking actors (ATB 2007:35). However, in the Sa Luang community alongside the biomass project, the use of rice husk is contingent on other social forces such as traditional agricultural practices (Gilbertson 2009a:58-59). Such abstraction is useful in maximising the production of CERs, but can only be conceived of as a notional capitalisation of nature.

*Technological carbon sinks*

Unlike ‘as if’ CDM projects which reduce greenhouse gases from imaginary baselines, technological projects remove actually existing greenhouse gases from the atmosphere through industrial destruction processes. The most common form of this type of project is HFC-23 industrial gas destruction projects. There are only nineteen operational HFC-23 destruction projects, but they represent a disproportional 51 percent of total CERs issued to date (UNEP 2010b). HFC-23 destruction projects only notionally capitalise carbon sinks because the destruction of HFC-23 depends on the production of a primary greenhouse gas which outweighs the carbon sink capacity of the technologically produced CER.
HFC-23 is a greenhouse gas by-product from the production of the refrigerant gas HCFC-22 (McCulloch 2005:iii). HFC-23 is a potent greenhouse gas with a 100-year Global Warming Potential (GWP) of 11,700 (IPCC 1995:121). This means that one tonne of HFC-23 is equivalent in its contribution to global warming to 11,700 tonnes of carbon dioxide. HFC-23 is destroyed through a ‘thermal oxidation’ process which converts the greenhouse gas into salt form (McCulloch 2005:iv). However, HCFC-22 is itself a potent greenhouse gas, with a 100 year GWP of 1,500 (IPCC 1995:119). Hence, the capitalisation of carbon sinks through the destruction of HFC-23 is wholly reliant on the production of another type of greenhouse gas, which is also an ozone depleting substance under the Montreal Protocol (EIA 2010:2). Furthermore, the destruction of one tonne of carbon dioxide-equivalent of HFC-23 requires the production of approximately 3.12 tonnes of carbon dioxide-equivalent of HCFC-2227. Therefore, the CERs produced in HFC-23 destruction projects are only notional carbon sinks because they are outweighed in climatic terms by the necessary production of HCFC-22, for which there is no technological carbon sink under the CDM.

Notional sinks for real carbon

The problems associated with the notional capitalisation of carbon sinks by ‘as if’ and technological CDM projects are compounded when CERs are used to offset real carbon emissions by capital and states with emissions reduction requirements. For example, the

27 Author’s calculation based on least efficient (i.e. maximum possible emission reduction) HCFC-22:HFC-23 ratio and IPCC (1995:119,121) GWPs.

1 tonne of HCFC-22 has a GWP of 1,500.
The production of one tonne of HCFC-22 produces between 0.0137 and 0.04 tonnes of HFC-23 waste gas (McCulloch 2005:iv).
Producing 1 tonne HCFC-22 produces 0.04 tonnes of HFC-23 using least efficient ratio.
HFC-23 has a GWP of 11,700.
0.04 tonnes of HFC-23 has a GWP of 468.
The destruction of 468 tonnes of CO2-e of HFC-23 requires the production of 1,500 tonnes of CO2-e of HCFC-22, because 1 tonne of HCFC-22 has a GWP of 1,500.
Therefore, destroying 1 tonne of CO2-e of HFC-23 is outweighed by the required production of 3.12 tonnes of CO2-e of HCFC-22.
This is an underestimate because it also assumes all HFC-23 is destroyed and excludes other fossil fuel-intensive energy used in the production of HCFC-22 and the destruction of HFC-23.
100,678 CERs produced by the AT Biopower project discussed above have been purchased by companies including Chubu Electric Power in Japan, which surrenders CERs to offset emissions associated with their fossil fuel-based power stations (UNFCCC 2010e, ATB 2007:5, Chubu Electric 2006). This use value defines the CDM as an instrument which facilitates an immediate increase in overall greenhouse gas emissions, because it permits the continued free appropriation of natural carbon sinks by capital in developed countries.

Contrary to the rhetorical harmonisation between capital accumulation and the reproduction of nature, the CDM is an imaginary means of managing the climate system. All CERs are fundamentally based on the assumption that greenhouse gas emissions, from the combustion of fossil fuels in ‘as if’ projects and the production of HCFC-22 in technological projects, are justified by the existence of market demand. This is the same rationale that underpins the displacement of responses to climate change to CDM projects in developing countries, because the polluting activities of capital in developed countries are more profitable. Hence, the CDM facilitates an immediate increase in greenhouse gas emissions, and reinforces the notion that pollution is legitimised by market forces, despite being a social and political decision which can, and must, be restricted if the impacts of climate change are going to be reduced. Together, these points combine towards an intensification of the social and ecological crises caused by future climate change. Therefore, the CDM contributes to a displacement of global warming as a second contradiction of capitalism through time.

Emerging contradictions between social movements and states

In struggles surrounding second contradictions, social movements are the principal agents of social transformation (O’Connor 1998:161). The negative impacts of CDM projects, coupled with its imaginary management of the climate system, have engendered a growing resistance from social movements. Karl Polanyi’s (1944:130) concept of the socially protective “counter-movement” is useful in understanding the
dynamics of these resistances. Polanyi (1944:76) argued that nineteenth century history was characterised by a “double movement” in which the extension of free-market principles to ‘fictitious commodities’ – land, labour, and money – was restricted by the counter-movements of society due to the social and natural dislocations that were caused. The “principle[s] of economic liberalism” that advocated these nineteenth century extensions were evident in the development of the CDM as a means for achieving economic efficiency in managing the climate system (Polanyi 1944:132). But just as the “self-regulating market” - in large part due to social counter-movements - was only ever a “utopian” vision, so too are the free market principles that underpin the CDM (Polanyi 1944:141).

Chapter two argued that the CDM market is constituted by a vast social structure underpinned by cooperation between states and capital. Various environmental groups have operated within this social space as counter-movements to aspects of the CDM in response to the social and environmental damage it has caused. James O’Connor (1998:308,310) argues that all social movements contesting conditions of production must engage with the state and all implicitly have the same fundamental goal of “democratising the state”. Democratising the state through participation in state processes is a current that runs through each of the struggles discussed below, although with different political goals and strategies. Differences stem from the varying interests at the local and international levels, although each level informs the other. Local resistance is often an immediate defence of livelihood, whereas international struggles have tended to resist the imposition of free market principles as the guiding force in climate change policies. Counter-movements directed towards the state and against the CDM represent emerging contradictions within the state-based social structures which support the use value and exchange value of Certified Emission Reductions (CERs). On the other hand, social movements have encountered difficulties in their resistance stemming from the political power of states and capital, in part due to conflicts between different social movements. These differences are evident in the alternative visions of democratisation in each struggle, which include state accountability, specific or wholesale democratic production of state content, and distributional equity.
A first form of international counter-movement attempts to make United Nations CDM institutions more accountable through project-by-project submissions. In order for a project to be validated and then registered, a United Nations approved consultant must subject the Project Design Document to a 30-day public comment period (CDM Watch 2010a:15). Environmental non-governmental organisation (NGO), International Rivers (2010) has submitted comments on at least twenty-five proposed hydropower projects under these regulations. Each comment argues that an individual project should not be validated on the basis that it does not adhere to CDM rules, such as additionality (e.g. International Rivers 2009), stakeholder consultation (e.g. International Rivers 2008), or sustainable development (e.g. International Rivers 2007). The participation by International Rivers represents a counter-movement because the organisation is challenging the role of market profitability as the driver of the capitalisation of carbon sinks by appealing to alternative environmental and social standards. International Rivers is informed by evidence gathered from local resistances, and supports those resistances in their immediate political goal of preventing individual projects gaining CDM registration. There has been some success to this end. Of the sixteen projects commented on which have come to a final decision, seven have been denied validation (International Rivers 2010, UNEP 2010b).

International Rivers is attempting to democratise the international state institutions that govern the CDM by making them more accountable to their own rules. This threatens the CDM market at the project stage because there is no guarantee of the state-granted CDM status that is required for the production and realisation of profits from CERs. However, the project-by-project nature of this counter-movement poses difficulties arising from disparities between civil society resources and the state. For example, the Chinese state plans to install 100 gigawatts of hydropower capacity between 2010 and 2015 (Sehleier & Michaelowa 2010b:4). The plan equates to 3,048 average-sized

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28 It is not possible to know the direct influence of comments because Designated Operational Entities, unlike the Executive Board, do not publically publish reasons for non-validation publically.
Chinese CDM hydropower projects\textsuperscript{29}, and demonstrates the resource and power imbalance problems associated with project-by-project resistance, due to the many projects which are not subject to the enforcement of state accountability.

\textit{Producing the content of the state}

A second form of international counter-movement goes beyond state accountability according to pre-existing rules, to challenging and producing the content of specific aspects of those rules through democratic participation. CDM regulations have provisions for reviews into the rules that govern CDM projects (CDM Watch 2010a:13-14). CDM Watch has taken advantage of this social space to trigger a state review into the HFC-23 project regulations. In a review of company documents, the NGO found that current regulations have allowed projects to increase their production of HCFC-22 purely in order to maximise their issuance of CERs through the destruction of the HFC-23 by-product (CDM Watch 2010b:2). CDM Watch’s (2010b:2,12) immediate political goal of bringing about a major revision to HFC-23 regulations seeks to limit the quantity of fraudulent carbon sinks produced in the CDM. Governing institutions have also been responsive to this political end. The Methodology Panel accepted each of CDM Watch’s concerns as “major issues that require attention” (UNFCCC 2010f:2). The Executive Board has indicated it will make a decision on a revision to the HFC-23 methodology in the November 2010 meeting, and has placed on hold the issuance of CERs for all HFC-23 projects (UNFCCC 2010g:8, 2010h).

The form of counter-movement instigated by CDM Watch attempts to strengthen environmental and social standards by producing the content of specific CDM state rules. It poses a threat to the functioning of the CDM market because the non-material nature of CERs means that it is state rules which finally determine the production of CERs as tradable commodities. Indeed, if CDM Watch’s revision of those rules succeeds, 90 percent of currently allowed HFC-23 CERs will not be issued in the next

\textsuperscript{29} On 1 September 2010 there were 454 registered hydropower project activities in China, with an average size of 32.8 MW (UNEP 2010b).
crediting period (CDM Watch 2010c:1). This will have serious implications for the CDM market because HFC-23 projects represent 51 percent of total CERs issued to date (UNEP 2010b). However, the threat to profitability has triggered concerted opposition. In particular, the World Bank (2010a, 2010b) has initiated a counter-campaign to defend the legitimacy of HFC-23 projects.

The World Bank’s T1 Umbrella Carbon Facility has financed two Chinese HFC-23 projects, purchasing 129.3 million CERs worth over 1.7 billion Euros at current market prices. This financing is on behalf of government carbon funds, investment banks, and large energy companies, including the Danish Carbon Fund, Deutsche Bank, and Tokyo Electric Power Co. (World Bank 2010c). These are institutions with considerable political power and significant economic rather than environmental and social interests in preserving the CDM market in its current form. CDM Watch’s resistance is further complicated by alternative political strategies from other environmental NGOs that avoid this form of direct engagement with the state. For example, fifty-one environmental NGOs, led by the World Wide Fund for Nature (WWF), in partnership with carbon finance companies such as Merrill Lynch Commodities, have developed a ‘Gold Standard’ system of parallel CDM rules. The system certifies ‘premium’ CERs according to stronger emissions reduction and sustainable development standards, but on a voluntary basis only (GSF 2010).

Democratising the international climate change regime

A third form of international counter-movement aims to for a wholesale democratisation of state content by campaigning for the abolition of the CDM in the context of a stronger international climate change regime. The ‘climate justice movement’ has been active in this regard. Chapter two discussed the ‘Linking Directive’ which integrates the CDM into the European Union (EU) Emissions Trading Scheme, underpinning 90 percent of international demand for CERs. The de facto governance

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30 CER market price at 13 September 2010 was 13.69 Euros (Jenkin 2010)
31 Refers to ecology, indigenous, and other social justice groups associated with the principles of the Climate Justice Now! Network and the Durban Declaration on Climate Justice (CJN! 2010, DGCJ 2004).
that this affords the EU over the CDM meant that the ‘Climate and Energy Package’, the basis for EU climate policy from 2013-2020, was proactively contested by climate justice groups. Friends of the Earth, Europe used public consultation provisions to completely oppose the use of CERs in achieving compliance with emissions reduction targets (FoE-EU 2008:2, Girling 2010:5). The position was consistent with Friends of the Earth, UK’s wider campaign for states to abandon the CDM and all other forms of offsetting (Bullock et al. 2009:28).

The Linking Directive provides CERs with a state-sanctioned use value for meeting emissions reduction requirements.32 Friends of the Earth’s immediate political goal of a total ban on CER integration would significantly reduce the CDM market because it would remove most of the state-instituted demand for CERs. However, the resistance was not successful in preventing the use of CERs as the final package allows at least 50 percent of reductions to be met through CERs, worth up to 65 billion Euros (Pew 2009:2). One reason for this lack of success is the widespread support for ‘flexible mechanisms’ by national and international states, discussed in the Introduction and Chapter two. Indeed, most national state members of the EU were against any offset limits in the original Linking Directive (Flam 2008:28). In this context, and compared to the 88 percent limit in the current phase (2008-12), the contestation by Friends of the Earth and other environmental groups resulted in some restriction of the use of CERs, and demonstrates the role of the agency of social movements in the continual construction of the CDM market.

Local defence of livelihood and tradition

The negative impacts of CDM projects on communities and ecosystems, illustrated by case studies in this and the previous chapter, have generated waves of local opposition by affected peoples. Joan Martinez-Alier’s (2002) notion of the ‘environmentalism of the poor’ is useful for understanding this opposition because the struggles are

32 Another less important use value is for companies wishing to publicise their ‘green’ credentials as ‘carbon neutral’.
fundamentally over the distribution of the ecological impacts of state policies. Environmentalism of the poor is a current of environmentalism that arises when indigenous, peasant, rural and urban groups, mostly in developing countries, resist disproportionate environmental impacts of economic activities (Martinez-Alier 2002:11). The immediate political means and goals of this form of resistance are site specific, and indeed are multiple between different social groups at specific sites, but share common themes. In particular, like counter-movements at the international level, the nature of the CDM means that all environmentalisms of the poor must confront states. In turn, the pursuit of state democratisation in terms of distributional equity is hindered by the unequal power relations between affected communities, states, and capital that are behind the negative impacts of CDM projects.

Environmentalisms of the poor, including local resistances to CDM projects, are generally characterised by a defence of tradition and/or livelihood (Martinez-Alier 2002:11). For example, indigenous groups have appealed to the links between tradition and nature in occupying the site of the Dardanelos Hydropower Project in Mato Grosso, Brazil, which is situated on a traditional burial ground (The Age 2010). Similar direct actions have been used to assert interests in nature as a means of livelihood by communities affected by CDM projects. For example, community members of Sarona village attempted to physically block the construction of the Bhilangana Dam in Uttarakhand, India, because the dam was upstream from the village’s essential irrigation systems (Gilbertson 2009b:22). However, the state-capital ‘partnerships’ rationale that drives the CDM intertwines resistance against capital with resistance against the political, and sometimes violent, force of the state. In the case of the Bhilangana Dam, the resisting villagers were repeatedly arrested and jailed, and the project was constructed and registered (Gilbertson 2009b:22). Problems which stem from confronting the political power of states are common in local CDM counter-movements. The Sasan supercritical coal power project discussed in the previous chapter was awarded from a Government of India tendering process, and the appropriation of land was carried out by the District Magistrate (Nandi et al. 2009:46). Community members seeking increased compensation through government appeal processes are therefore facing the difficulty of appealing against the disposessing institution itself.
On the one hand, the dual character of the CDM between the capitalisation of carbon sinks and appropriation of nature has resulted in serious negative impacts on local communities. On the other hand, the physical requirement of land for the capitalisation of carbon sinks provides a geographical space for local resistances to disrupt the production of CERs in individual CDM projects. Local resistance is also intertwined with the international level. For example, the South Asian Network on Dams, Rivers, and People (2006) documented the social and environmental issues of the Bhilangana Dam in comments submitted to the Executive Board. However, many of the problems associated project-by-project resistance, such as the resource disparities between social movements and states, are more acute in local resistances. The ‘clean development’ narrative that surrounds CDM projects is a powerful discourse in the context of climate change. It underscores the paradox of the state-based structure of the CDM, which both provides political space for social counter-movements to contest, but also creates power imbalances because contestation is against the political power of states in clean development partnerships with capital.

Emerging contradictions between capital and states

In addition to contestation between social movements and states, conflict between and within capital and states represents a considerable emerging contradiction within the state-based social structure of the CDM market. At the United Nations, national states have not negotiated the binding international climate change agreement that is needed to provide legal grounding for the CDM after the Kyoto Protocol period expires in 2012. Nor have domestic legislators in the United States (US) enacted a ‘cap and trade’ scheme that is required for the future expansion of demand for CERs. There is widespread support by states for offsetting mechanisms in principle, as well as significant profit-making opportunities for capitals which participate in the CDM market. However, the current state of affairs is due to a contradiction in the social structure of the CDM. The contradiction is that the demand for CERs, above what is
compensated for by states, must be underpinned by state regulation of greenhouse gas emissions that is costly for fractions of capital which are fossil fuel-intensive.

This contradiction is symptomatic of one of the fundamental contradictions of capitalism between use value and exchange value. A commodity must have an exchange value in order for production to occur, and a commodity must also have a use value in order for it to be purchased (Jessop 2002:16). CERs are commodities with both an exchange value to be realised in the CDM market, and a use value for states and capital with socially imposed carbon emissions reduction requirements. As demonstrated in Chapter two, states have cooperated to overcome this contradiction by providing social structures which underpin the production, exchange, and demand of CERs. To date, the potential costs of emission reduction targets have been financially subsidised by states. In particular, the current phase of the EU Emissions Trading Scheme gives 92 percent of EU carbon credits to polluting companies for free (Newell & Paterson 2010:101), which in turn effectively subsidises the cost of CERs. However, in recent times national and international states have been unable to extend these state-based social structures due to conflict between and within states and capitals.

Conflict between the US and China has been popularly attributed as the reason national states have failed to negotiate a successor to the Kyoto Protocol (Bond 2010:14). Others have characterised it not as conflict, but rather a tacit agreement between “powerful conspirators” for the “right to pollute” (Narain 2010). The essential relations behind this impasse can be understood with the example of the failure of US emissions trading legislation, which holds the greatest potential for an expansion in the CDM market, to pass the US Senate. The ‘Waxman-Markey’ bill that passed the US House of Representatives in 2009 had provisions for up to 1.5 billion international offsets, such as CERs, to be used each year (American Clean Energy & Security Act 2009:742). This yearly quantity is greater than the total issued CERs to date and would therefore create a significant expansion of the CDM market. However, the US Senate has not voted in favour of any of the corresponding bills needed for the emissions trading scheme to become operational (Kirk 2010).
The high quantity of offsets, subsidies to polluters, and the removal of Environmental Protection Agency powers drew opposition from climate justice groups (Bond 2010:18). However, the failure of Congress to pass the bill has been primarily due to opposition from fractions of capital that are fossil fuel intensive. The Waxman-Markey bill was supported by finance, biotechnology, and renewable energy capital, set to profit from the emissions trading scheme, including participation in the CDM (US House 2009). But this and other climate legislation has been opposed by other fractions of capital that are fossil fuel-intensive. The opposition is due to the fact that at least some of the financial gains from fractions of capital set to benefit from the CDM, will materialise as costs to those companies with (albeit minimal) emissions reduction requirements. This is because the demand for CERs is derived from social barriers to capital in the form of greenhouse gas targets. While the CDM provides a means to overcome such barriers, it cannot wholly overcome them. This is because, beyond that which is subsidised by the state, the purchase of CERs represents an increased cost to the individual capitals which finally surrender them. It has been estimated that the oil, coal, and gas companies and their industry groups have spent US$532 million in lobbying against the proposed legislation over the course of the one-and-a-half year public debate (Weiss et al. 2010). Much of this opposition has been in the form of direct donations to legislators, as well as channelled through neoliberal think-tanks. For example, the Competitive Enterprise Institute, has effectively labelled the most recent US Senate bill a “cap and tax” scheme that will reduce US international competitiveness (Murray & Yeatman 2010). Such opposition was successful in forcing the Senate in July 2010 to defer any consideration of an emissions trading scheme until 2011 (Sehlleier & Michaelowa 2010c:1).

Conclusion: The contradictions of planned markets

Extensive roles for states in markets create tensions between capital flexibility and state planning. The World Bank (2010d:3) has lamented that “rules, modalities, and procedures, which were developed to ensure a rigorous project approval process and the
issuance of credible emission credits, have inadvertently resulted in excessive delays and bottlenecks”. An eighteen-month registration process with the United Nations, and then at least one more year before issuance of CERs, can run contrary to the expectations of individual capitals which invest in World Bank carbon funds. This demonstrates the contradictory nature of the state social structures of the CDM market because they are both necessary for a functioning market in natural conditions like carbon sinks, but at odds with the time-compressing logic of capital. This contradiction extends to the political space provided by state-structures for contestation between and within social movements, states, and capital. This chapter has argued these conflicts represent emerging contradictions to the CDM’s accumulation imperatives and supporting state social structures that were described in Chapter two. They also demonstrate that the social contestation which produced the CDM is an ever-continuing process that continues to construct the CDM market based on the political power of states, capital, and social movements. Some of the implications of this contestation for global warming in the current political economic context are considered in the conclusion to this thesis.
Conclusion

The Kyoto Protocol ostensibly defines the Clean Development Mechanism (CDM) as an *environmental* instrument for preventing “dangerous anthropocentric interference with the climate system” (UNFCCC 1992:4, 1997:11). However, this thesis has applied an ecological Marxist framework to argue that the CDM is a state-led *economic* instrument designed to permit the accumulation of capital through the emerging climate change crisis. The significant profits made by capital participating in the CDM market, and the avoidance of costs for capital facing greenhouse gas emission restrictions, demonstrates that crises of capital underproduction stemming from second contradictions are contingent on social contestation. While the demands of social movements in the context of the Kyoto Protocol had the potential to contribute towards such a crisis, those demands were used by states as the impetus for the institution of Certified Emission Reductions (CERs) as a new form of commodity production. Capital has therefore been able to overcome its potential social barriers by accumulating through them.

However, the process of overcoming barriers to capital has not been without costs. The peoples and environments in developing countries - which are projected to be most affected by climate change - have also been most affected by the CDM as an instrument to ‘mitigate’ the impacts of climate change. The CDM has displaced the climate change crisis through space to the level of CDM projects in developing countries, and in doing so has shifted the costs of restructuring to local communities and ecosystems around CDM projects. This displacement underpins the capital accumulation imperatives of the CDM as an economic instrument by permitting the continued free appropriation of the climate system as a carbon sink by capital in developed countries. It also renders the CDM as an ultimately false means of maintaining the climate system, which therefore displaces the global warming crisis through time by intensifying future climate change as a second contradiction of capitalism.
The use of space and time as a means for capital to overcome the first contradiction of capitalism is commonly understood by Marxists. Harvey (2003:115), for example, has theorised “spatio-temporal” fixes to overproduction as a “particular kind of solution to capitalist crises through temporal deferral and geographical expansion”. This thesis has used the CDM as a case study to demonstrate that capitalism also restructures global and local space to attempt to overcome crises of the second contradiction. Themes of spatial configurations are present in O’Connor’s project, but they remain somewhat underdeveloped. Firstly, O’Connor (1998:145) lists human-made space alongside human labour and the natural environment as one of the three conditions of capitalist production, although his focus is primarily on the latter. Secondly, O’Connor (1998:167) emphasises the restructuring of natural conditions in order to overcome crises of the second contradiction, which implies a spatial element. Thirdly, O’Connor (1998:51,273-4) discusses the site-specificity of ecological problems and struggles. However, he warns against the equation of site specificity with the purely local, because the local is shaped by regional, national, and global scales, which are interdependent.

This thesis has more thoroughly extended these spatial themes into the theoretical framework of the second contradiction. The CDM uses global space to restructure the climate system according to the divide between developed and developing countries that materialises in global environmental politics. A further spatial tension exists at the CDM project level whereby the capitalisation of carbon sinks requires the appropriation of nature. The impacts of this dual character, including the dispossession of land and the toxic pollution of ecosystems, are to a certain degree site-specific. However, this restructuring of local space is also constituted by global dynamics. It is structurally defined by the CDM’s partial capitalisation of nature instituted at the United Nations, and facilitated and legitimised by globally dominant understandings of sustainable development.

In combination, the CDM’s restructuring of global and local space form spatial conditions of capitalist production. As spatial configurations, they underpin the accumulation imperatives inherent in the production of CERs, as well as the
commitment to the unfettered accumulation of capital embodied in the surrendering of CERs as capitalised carbon sinks. While this restructuring is organised through the CDM market, it is the product of national and international states. Indeed, each moment of the CDM market is wholly constituted by state structures, in contradiction to the CDM’s ideological basis as a free market instrument. Like natural conditions of production, spatial conditions enter into dialectical relationships with societies and the natural environment. The spatial conditions that organise the CDM are socially constructed by states, but have also reconstructed local communities, ecosystems, and the climate to devastating effect.

Continuing the dialectic between conditions of production and society, the CDM’s spatial and temporal displacement of the climate change crisis has engendered a growing social resistance to the CDM from social movements. Conversely, opposition from fractions of capital threatened by the climate change policies that underpin the demand for CERs, illustrates that spatial fixes to barriers to capital are not without their own contradictions for capital. This thesis has demonstrated that the social contestation between and within states, social movements, and capital over the climate system, which produced the CDM, is an ever-ongoing process. In conjunction with (second-) natural processes, this contestation continues to construct the dynamics of climate change as a second contradiction of capitalism. On the one hand, contestation represents an emerging contradiction to the state social structures necessary to secure the existence and extension of the CDM market. On the other hand, the conflict is in the political economic context of United Nations climate change negotiations and domestic climate change policies, which will be major determining factors in the extent of social and ecological damage caused by global warming.

The reduction in carbon pollution trajectories in developing countries will be an important component in an effective global response to climate change. However, the means for achieving this goal must be embedded in principles of social justice and ecological integrity. The capitalisation of carbon sinks is completely incompatible with these requirements. The critique in this thesis of the CDM’s partial and notional
capitalisation is not a defence of genuine capitalisation of nature, because the capitalisation of natural conditions can only ever be partial and notional. In contrast, the ecological and social damage caused by the CDM’s capitalisation of carbon sinks, and its deepening of the global warming crisis, will inevitably be replicated by the inclusion of the CDM, or offsetting instrument successor, in a post-Kyoto climate change agreement.
References

A.T. Biopower 2007, Project design document: A.T. Biopower Rice Husk Power Project in Phichit, Thailand,
http://cdm.unfccc.int/UserManagement/FileStorage/12OT9XDEU9M0A8BK5P62P06OG8P24C>


Allain Duhangan Hydropower Ltd. 2007, Project design document: Allain Duhangan Hydroelectric Project (ADHP),
http://cdm.unfccc.int/UserManagement/FileStorage/LYZSN7J5RUYN08DZTC236SF3POYNWK>


American Clean Energy and Security Act 2009 (H. R. 2454).


CDM Watch 2010b, *Revision to AM0001 to address methodological issues*, <http://www.cdm.unfccc.int/UserManagement/FileStorage/STUR14YZ5UMGCDHK37VWA2P89QFL>


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Gulbrandsen, L. & Andresen, S. 2004, 'NGO influence in the implementation of the Kyoto Protocol: compliance, flexibility mechanisms, and sinks', Global Environmental Politics, vol. 4, no. 4, pp. 54-75.


Haya, B. 2007, *Failed mechanism: How the CDM is subsidizing hydro developers and harming the Kyoto Protocol*, International Rivers


Mate, N. & Ghosh, S. 2009a, 'Wind power projects in Karnataka', Mausam, vol. 1-2, no. 2-5, October 2008 to September 2009, pp. 30-34.


Rosewarne, S. 1997, 'Marxism, the second contradiction, and socialist ecology', *Capitalism Nature Socialism*, vol. 8, no. 2, pp. 99-120.


Spash, C. 2007, 'The economics of climate change impacts la Stern: novel and nuanced or rhetorically restricted?', *Ecological Economics*, vol. 63, no. 4, pp. 706-713.


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<http://cdm.unfccc.int/Statistics/Registration/NumOfRegisteredProjByHostPartiesPieChart.html>

<http://cdm.unfccc.int/Statistics/Issuance/CERsIssuedByHostPartyPieChart.html>

<http://cdm.unfccc.int/Projects/DB/DNV-CUK11749092412/view>

<https://cdm.unfccc.int/Panels/meth/meeting/10/044/mp44_an02.pdf>.

United Nations Framework Convention on Climate Change 2010g, *Request for the Meth Panel to continue work on HFC projects (Version 01)* Executive Board, 44, Report, Annex 2
<http://cdm.unfccc.int/UserManagement/FileStorage/3TUHR8XDFPGYI62CJ5MQK14LSW7EBO>


<http://energycommerce.house.gov/Press_111/20090515/hr2454_support.pdf>


