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The Political Ecology of Carbon

Commodification, colonialism and debt in carbon offsetting under the Clean Development Mechanism

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Abstract

The Kyoto Protocol's Clean Development Mechanism (CDM) is a market-based attempt to mitigate global greenhouse gas emissions. At the same time, the mechanism is said to contribute to sustainable development in the Global South. This essay examines the forestry sector of the CDM, with the aim to illuminate the problematic nature of letting the market solve climate issues. By approaching the case from a theoretical framework of political ecology, a multidimensional understanding for the implications CDM projects have across scales is enabled. The analysis shows that the outcome of this is a reinforced North-South power imbalance, resulting in opportunities for some actors to dominate and exploit weaker actors and environments. By further analyzing the projects through the concepts of carbon commodification, carbon colonialism and carbon debt, the CDM is placed within the material, socio-political and historical contexts in which it has emerged. Such multidimensional understanding serves to demonstrate that the CDM is shaped by a neoliberal logic and a capitalist mode of production, and that through the projects, winners and losers are produced in the name of climate policy.

Key words: Political ecology, CDM, carbon forestry, power, carbon offsetting
Words: 9911

List of abbreviations

A/R	Afforestation/Reforestation
CDM	Clean Development Mechanism
CER	Certified emissions reductions
EIT	Economies in transition
ETS	Emissions trading system
EU ETS	The European Union emissions trading system
GHG	Greenhouse gases
OECD	Organisation for Economic Co-operation and Development
PDD	Project design document
tCER	Temporary certified emission reduction
tCO_te	Tonne of carbon dioxide equivalent
UNFCCC	United Nations Framework Convention on Climate Change

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1 Introduction

1.1 The problem

Contemporary responses to change change issues tend to be focused on how to achieve mitigation while still stimulating economic growth. In accordance with the neoliberal paradigm[1], numerous market-based solutions have emerged, one more controversial than the other (Narain 2009: 1). With little evidence that this brings the positive results often claimed, one could wonder why such trust for the market as a solution still appear to dominate the climate regime.

This essay critically examines one of the more contested market-based solutions of the global carbon economy: the Kyoto Protocol's[2] Clean Development Mechanism (CDM). The purpose of the mechanism is defined under article 12 and can be divided into the main objectives of 1) assisting developing countries in achieving sustainable development, and 2) assist Annex I-countries[3] in accomplish their emission targets (UNFCCC 1997: 18-19). To invest in CDM projects opens up possibilities for industrialized countries to outsource their emissions reductions to places where mitigation is more cost efficient. The problem though, is the injustice underpinning this lucrative system, in which new possibilities for exploitation are created and taken advantage of (Smith 2009: 3).

1.2 Situating the problem in a research context

My interest in this topic first emerged when realizing that much of the negative implications of CDM carbon offsetting were obscured under a "win-win"-narrative of delivering on the one hand environmental and social benefits (mitigation and sustainable development), and on the other hand financial benefits (continued economic growth) (Mert 2013: 30). I find this paradoxical, and wish to bring understanding for the broader structures and politics of power embedded in this system.

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[1] With the neoliberal paradigm I refer to an ideological conviction about the market as a solution to most problems. In terms of climate change, this implies finding cost-efficient solutions within the capitalist system (Alarcón 2009: 82).

[2] The Kyoto Protocol is an international agreement with internationally binding emissions reduction targets, linked to the United Nations Framework Convention on Climate Change (UNFCCC). It is often considered one of the most important steps towards a global stabilization of GHG emissions (UNFCCC 2014a).

[3] "Annex I Parties include the industrialized countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Eastern European States." (UNFCCC 2014b).

In fact, critical voices argue that the CDM exhibit no such "win-win"-solution as proposed above.

One of the most prominent and outspoken critics is Lohmann (e.g. 2006, 2009, 2010), who argue that the CDM as a policy tool is fundamentally flawed. He means that the carbon market, and particularly the CDM, is an expression of corruption and exploitation, and that carbon trading is a disaster of enormous scope (Lohmann 2009: 175; 2010: 25, 35). Bachram (2004) takes the claim of exploitation even further. She stresses how carbon offsetting creates opportunities for fraud and new forms of colonialism, which she calls "carbon colonialism". Another key reference in the critical literature of CDM is Böhm and Dabhi (2009b). With a focus on the political economy of carbon, their book *Upsetting the Offset* (Böhm & Dabhi 2009b) attempts to highlight why and how carbon markets in general, and the CDM in particular, is a global failure. In opposition to the critics, some authors argue that even though the CDM might be flawed at the moment, this does not mean that the system as such is not working, but rather that the design of it has to be changed (e.g. Michaelowa 2011). Newell (2012) on the other hand, claim that even though this might in theory be possible, it would require governments to enforce such tough targets and strict limits on the use of offsets, that it is unclear whether it is feasible in the current world system based on a free-market ideology.

The critical literature on carbon markets is, as intended to demonstrate by the above examples, rather heavy. However, despite of all the critique, CDM is still operating as a policy tool in climate governance. This forms the base for my paradox. Why is a system with clearly devastating social and environmental consequences, and highly questionable possibilities in actually achieving mitigation (Lohmann 2006: 2, 143-144), still functioning in the name of climate policy? Consequently, this leads to the focus of this study: to illuminate the problematic and ineffective reality of the CDM. For this purpose, the afforestation/reforestation (A/R) sector of it, work as an empirical example for the analysis, since I (among many others, e.g. Carrere 2009; Lang 2009) find this way of carbon offsetting particularly problematic.

However, as I started to search within the political science field for theories that could bring understanding for this paradox, I was struck by the limited attention paid to the interpretation of how power relationships are constructed and reproduced on a multi-scalar and multidimensional level, in the global carbon economy. In order to better understand the situation, I realized the need of applying perspectives and theories from other fields. Therefore, the essay draws upon a theoretical framework of political ecology, first developed in the field of geography (Lane & Stephan 2015: 7). By mobilizing concepts and perspectives from other schools of thought, political ecology enables understanding for how power and political structures are interrelated with the environment across scales, and further how this affects actions and policy making. (Newell & Bumpus 2012: 52; Robbins 2012: 84). Placed in a research context, this essay builds upon earlier work on the matter, but with the aim to provide new perspectives and insights for how to understand climate issues within political science. By approaching the problem through the framework of political ecology, I strongly believe opportunities for developing and enrich the interpretation of CDM carbon offsetting occur.

1.3 Objectives and research question

The overall objective of this study is to introduce a perspective of a political ecology of carbon, into the field of political science. By this, I wish to add a new dimension to the theoretical understanding of carbon offsetting under the CDM. Often when critically analyzing the carbon market, the perspective of political economy is used as the main analytical tool (see for instance Böhm & Dabhi 2009b). Political economy is useful in order to analyze links between climate change, carbon emissions and development, as well as for bringing understanding for how carbon markets operates and are constituted. However, the perspective fails in illuminating how power relations among actors are ever-present and reproduced in politicized environments, particularly within the global carbon economy. Political ecology therefore works as a good complement for analyzing climate change issues within wider frames (Newell & Bumpus 2012: 51, 53). By introducing a political ecology of carbon, I wish to bring about new knowledge concerning the broader implications of implementing marked-based solutions to climate change issues, as well as adding a new perspective of the interrelation between politics, power and the environment.

In political ecology, the concept of power is key when examining the politicization of ecological systems (Bryant & Bailey 1997: 39). Power is therefore of central concern in this essay. However, focus is not on the concept of power as such, but rather on how power relations are deeply embedded in the features of CDM carbon offsetting. In order to achieve understanding for this, the analysis draws upon three key theoretical concepts: carbon commodification, carbon colonialism and carbon debt. The purpose with this approach is to enable a conceptualization that captures a multidimensional context of contemporary climate policy. Consequently, the research question for this paper is formulated as follows:

How can political ecology contribute to a more nuanced understanding of carbon offsetting under the Clean Development Mechanism?

1.4 Philosophy of science

This essay is based on a critical entry point, grounded foremost in the assumption that power relations are constructed and reproduced in a way that benefit some people and environments on the expense of others. To begin a research process with a preconception is in fact not very problematic, since no one is ever completely objective. However, it is important to be transparent about this fact, in order to achieve intersubjectivity (Bergström & Boréus 2012: 42-43). In terms of the critical dimension, I draw largely upon Cox (1981: 129-130), in the sense that I undertake the critical approach with the aim to understand the larger picture of a whole, as well as questioning the prevailing order and how that has come about.

Moreover, as formulated in the research question, the essay seeks foremost to bring understanding, rather than to provide explanations. The quest for understanding as a principal objective can nevertheless be controversial in social sciences, especially within the positivist tradition (Methmann et al 2013: 9). From a post-positivistic approach on the other hand, to seek understanding for a problem can be just as relevant as to undertake an explanatory ambition (Hollis 2002: 16). Hence, to account for the ontology and epistemology underpinning the research is important, since this implies certain ways of thinking and structuring the process.

In regard to this, the essay undertakes an interpretative approach, and builds foremost on a hermeneutic philosophy of science. Central in hermeneutics is the strive to understand the meaning of actions, rather than to search for explanations of a phenomenon. Consequently, it is assumed that the social world can not be understood from the outside, but must be viewed in relation to the social actors within it (Hollis 2002: 16-17, 143). In this essay, actors, or more precise the power of actors, is of central focus. In order to reveal underlying power relationships, it is important to understand the meaning of certain actions. For instance, the process of turning carbon into a commodity on the global market involves a range of political actions. How can the meaning behind these actions be understood, and what does that tell us about the power relations embedded in this process? In terms of the CDM in general, an interpretative approach can serve to reveal how meanings and actions affect the system's qualities as a political solution. Further, its implications as a policy tool can be better understood. The objective of bringing understanding does not, however, imply a rejection of explanations. Rather, it means an awareness of the importance to first understand the different dimensions of a phenomenon, before trying to explain the paradoxes it gives rise to (Methman et al. 2013: 4, 10).

However, the essay does not adopt completely to a hermeneutic philosophy, particularly not in terms of the epistemological dimension. This has to do with the fact that in its purest shape, hermeneutics rejects all kinds of structural explanations (David & Sutton 2011: 79). As is further outlined in section 3.2, political ecology is largely influenced by Marxist theories (Robbins 2012: 59). The structural foundation thus needs to be taken into consideration. Consequently, to combine a hermeneutic approach with theories rooted in Marxism could possibly be problematic. To overcome this problem, the essay draws upon a less strict form of hermeneutics, first developed by Max Weber. In this approach, the interpretative epistemology takes some structural insights into consideration (Weber 1968: 4-22). The importance of understanding a material and structural base is thus acknowledged. However, through the combination of hermeneutics and Marxism, the broader meaning of this foundation and its superstructure can be further understood, since it opens up for studying how power- and dominance relationships are produced within it (David & Sutton 2011: 79).

1.5 Outline of the study

The essay is divided into 6 main chapter, with corresponding subchapters. In order to provide guidance for the reader, a short outline of the essay disposition will follow:

After this first introductory chapter, the theoretical departures of this essay are outlined. The aim with this chapter is to demonstrate the importance of placing climate change issues within wider frames, in order to bring through new interpretations of the power that structure contemporary climate politics.

In chapter three, the key concepts (carbon commodification, carbon colonialism and carbon debt) are defined in a political ecology context, in order to transform them into analytical tools.

Chapter four outlines for the methods and material used in the essay. A scheme with questions related to each of the key concepts, that the analysis builds upon, is presented here.

Chapter five first presents a brief overview of the research case: carbon offsetting under the A/R sector of the CDM. Subsequently, the case is analyzed in the context of each key concept. The analysis scheme is here used as a guide for scrutinizing the empirical material. The analysis draws upon the theoretical and conceptual findings from chapter two and three, and the analytical results are discussed ongoing in the chapter.

In chapter six, the findings from chapter five are more profoundly discussed, and some final conclusions are made.

2 Theoretical departures: Power and the political

2.1 Power in political science

In order to add a new perspective to the theoretical understanding of CDM carbon offsetting, the concept of power is key (Bryant & Bailey 1997: 39). However, to be able to demonstrate what a new interpretation of power can add to the context, this section first untangles how power commonly is understood in the political science field. The purpose with this is to stress how conventional perspectives fails in making certain structures of power visible. This in turn serves to justify the application of political ecology.

Different theories and perspectives all provide their own perception of power, which makes it impossible to define some kind of core meaning, not least for the scope of this essay. Important literature when studying power is for instance Lukes (1974), and his definition of power as "three faces", Weber (1964), with a focus on the interrelation of power and social relationships, and Foucault (1980), who highlights the power of discourses. Even though generally defining how power is understood in political science is somewhat risky (since there are no such general definition), this section will to some extent intend to to that. However, in order to delimit this description to its minimum, focus lies on critical thinkers and their interpretation of power, since it is the critical conception this essay aims to develop.

Critical theories emanate from various schools of thought, for instance Marxism, poststructuralism, feminism and postcolonialism. They have different analytical foci, but share some common thoughts about how the world is constituted. In broad terms, this implies a critique of the capitalist world system and the free-market ideology (Robbins 2012: 54.56, 80). In Wallerstein's world systems theory for instance, this critique is further explained in terms of a deeply unequal relationship between producers and those with political and economic power. The world system is further interpreted as a power hierarchy, which divides the world into core-areas (politically and economically strong) and peripheral-areas (politically and economically weak) (Wallerstein 2004: 24, 28). The key assumption then is that power in world politics can be conceptualized in terms of structural inequalities. In environmental politics this provide explanations for how the physical consequences of climate change are unequally distributed on a global scale (Paterson 2006: 64-65).

Another common focus to be found in critical perspectives is that of accumulation. Economic growth is then often referred to as the origin of climate change, and to promote growth is seen as the main interest of political elites. From such perspective, power is defined foremost in terms of policy-making, since those with

power have the ability to organize environmental policy-making in certain directions. This approach of critical research is closely interrelated to the field of political economy, which critical analyses of carbon markets often tend to draw upon (Paterson 2006: 67, 68). In general, those who adopt a political economy approach are foremost concerned with how carbon markets have developed within the broader capitalist system (Lane & Stephan 2015: 8). In order to understand how carbon markets operates, such approach is convenient since it provides explanation for the constitution of the markets, as well as for the government arrangements that support them (Böhm & Dadhi 2009a: 14, 20). However, political economy fails in recognizing the broader structures and processes in which power relations are present and reproduced within the global carbon economy, and subsequently what the consequences of this are (Newell & Bumpus 2012: 51, 53).

Power is undoubtedly a key concept in political science in general, as well as in political ecology, but how power is conceptualized differ. In political economy for instance, the power of things, such as capital or commodities, is central. Power is thus interpreted within the frames of a neoliberal approach to climate change, for example in the process of turning carbon into a commodity on the global market (Lohmann 2010: 25). In political ecology however, the focus lies rather in the power of actors, and it is emphasized that power can not be understood exclusively in materialistic terms (Bryant & Bailey 1997: 39, 46-47). Political ecology can therefore serve the aim to place climate issues within broader frames, and thus help to gain deeper understanding for its socio-environmental outcomes (Robbins 2012: 84).

2.2 Power in political ecology

In order to theorize the CDM and carbon forestry, and further to reveal its embedded power relations, political ecology serves as a good starting point. As a theoretical framework, it covers a lot of different viewpoints and varieties of traditions, and should not be misunderstood as representing a single theory. Rather, political ecology mobilizes concepts and theories from various schools of thought. The broadness of the perspective further opens up possibilities to adapt the approach after the problem, and thereof to make visible structures and characteristics that other theories and perspectives fails in recognizing (Robbins 2012: 84-85; Bryant & Bailey 1997: 2).

In general, political ecology can be summarized as a field of critical research, underlining the fact that ecological systems are political. Studies usually aim to reveal how winners and losers are produced through climate policy or in climate issues in general. Furthermore, a core idea is that costs and benefits from climate change is unequally distributed among actors (Robbins 2012: 20).

The perspective is influenced by a Marxist philosophy. However, political ecology is usually not as devoted to materialism as most Marxist theories, even though it accepts some materialist assumptions (Robbins 2012: 59, 80). The critical attitude that characterize political ecology is often described as very specific and somewhat

radical. Political ecologists are highly skeptical to the status quo, and underlines that we need to adopt a better, less exploitative, way of solving climate issues (Robbins 2012: 20, 85; Bryant & Bailey 1997: 3-4). Robbins (2012: 86) describes political ecology at large, as a perspective that "simultaneously constructs and deconstructs, criticizes and defends, listens and argues". In this essay, emphasis lies in building up a criticism based on the deconstruction of key concepts. This in turn makes approaching the problem from the perspective of political ecology highly relevant.

Moreover, political ecology creates space for in-depth analysis of power flows in North-South environments. Carbon offsetting under the CDM is a feature in the climate regime that particularly creates and reproduces such flows. A political ecology scrutiny of the CDM system can thus serve to make visible what the consequences of this are (Bumpus & Liverman 2011: 219). The North-South dimension has an important role in studies of environmental issues. Throughout history, conflicts about for example responsibility, justice and equity has affected North-South relationships in climate politics, and there is a clear polarity between developed and developing countries. Regarding the CDM, and particularly the A/R sector, an understanding for this dimension is important since it gives rise to certain features caused by, or at least deeply affected by, unequal power relations (Bulkeley & Newell 2015: 37). Analyzing the system through the lens of political ecology further helps illuminating those power relations and its outcome. Such analysis can be done for example by studying carbon offsets as a commodity, and examine how the commodification process creates new kinds of North-South linkages among actors and markets (Bumpus & Liverman 2011: 204).

The commodification of carbon is a global process. However, one of the main advantages with political ecology is the possibility to analyze issues on various scales, and thus capture the multi-scalar politics of carbon offsetting (Bryant & Bailey 1997: 33; Newell & Bumpus 2012: 52). On the local level, North-South linkages are often expressed through an exploitative relationship caused by emission trading. This in turn opens up possibilities for carbon colonialism, a phenomenon that imply the use of climate policy as a way to find new ways to dominate the Global South (Bachram 2004: 10, 12). In addition to this, power relations in the North-South dimension of climate issues are expressed through the claim of carbon debt or climate injustice. The root of this is to be found in the fact that those who have contributed the least to climate change, are those suffering its worst effects (Bulkeley & Newell 2015: 49). Carbon debt is in this sense an expression of how carbon offsetting creates winners and losers. In terms of this, political ecology provides understanding for the uneven distribution of consequences caused by climate issues, as well as by climate policy (Robbins 2012: 87).

3 Towards a political ecology of carbon

3.1 Choice of concepts

The three concepts briefly introduced in the previous section: carbon commodification, carbon colonialism and carbon debt, are all expressed through the CDM system and carbon forestry, and can be analyzed and conceptualized from the perspective of political ecology. In order to provide for a more nuanced understanding of CDM carbon offsetting, departing from political ecology, these concepts are fundamental. Carbon commodification is what makes carbon offsetting even possible. Carbon colonialism adds a critical perspective that is important in order to understand the local implications of CDM activities. The concept of carbon debt demonstrates the need for a revision of the power balance that currently shapes climate policy. Other concepts have been considered, but due to the time and scope of this study delimitations have to be made. I would argue that the integration of these concepts capture the most fundamental dimensions of carbon offsetting. Furthermore, this serves to bring understanding for how policy making that benefits some on the expense of others, gets justified within climate politics by the often unquestioned claim of bringing "win-win"-solutions.

This chapter account for defining each concept in the context of political ecology and in terms of power. The purpose of this approach is to transform the concepts into analytical tools, that subsequently are used as indicators in the analysis of the empirical material. A scheme over how this transformation is made is presented in section 4.2.

3.2 Carbon commodification

Carbon commodification is a process in which carbon is transformed into a tradable unit (Descheneau 2015: 171). To exchange and trade carbon on the global market is made possible by turning it into a quantifiable "thing". However, carbon is not only conceptualized as a commodity, but in many contexts also as a currency (Lövbrand & Stripple 2011: 194). In order to turn carbon into a commodity, an economic value of it is required. Although before that, a fixed unit has to be established. In the negotiations of the Kyoto Protocol, a basic unit for all carbon markets was agreed on: the tonne of carbon dioxide equivalent (tCO_2e). The tCO_2e subsequently

works as a basis for the creation of specific units within a particular carbon market. Under the CDM, carbon credits are traded and valued in a unit called Certified Emission Reductions (CERs). However, a carbon unit is usually not expressed as being carbon itself. Instead, it is based either on a right to emit carbon, or a promise not to emit carbon (Paterson & Stripple 2012: 571, 574-575). Furthermore, tCO_2e is a fictional unit, and the idea is that it is interchangeable, in the sense that differentiated forms of carbon units and greenhouse gases can be exchanged for each other, by using one tonne of carbon as a baseline indicator (Lövbrand & Stripple 2011: 194; Bumpus 2012: 15).

Paterson & Stripple (2012) suggests that carbon commodities can be divided into two divergent forms: 'Boutique' carbon and 'Walmart' carbon. 'Boutique' carbon implies that the relationship (negative or positive) between buyer and seller matters significantly. Carbon units are thus associated with particular emissions reductions, often connected with a story about its benefits (sustainable development, local empowerment etc.). An example of this is the different kinds of carbon standards that have emerged as a way to assure the quality of carbon credits. The most ambiguous one within the CDM is the Gold Standard. This certification indicates that the carbon units are of very high quality, resulting in a higher trade price than for other carbon credits. 'Walmart' carbon on the other hand, implies that the carbon units are detached from its conditions of production. Carbon can thus get abstracted from its climate change context, and further be treated as an empty unit (Paterson & Stripple 2012: 565, 574-579).

In the process of carbon commodification, the calculation part is central. This involves processes of determining how carbon units should be measured, quantified, demarcated and statistically aggregated. However, carbon commodification is more than a technical process. It is a way of detaching carbon from the realm of nature, and transfer it into the social and political context. By focusing on the calculation part of carbon commodification, it becomes possible to study how nature is constructed as a domain for political and economic control (Lövbrand & Stripple 2011: 188-189).

To conceptualize carbon commodification as a process of calculation implies a focus on the materiality of carbon. By adding a perspective of political ecology, space is created for understanding also how actors construct meaning for the commodity as such, for instance by connecting the carbon unit to other stories or values ('boutique' carbon). Such approach entails studying carbon both as a material, quantifiable, object. And on the other hand how meaning is constructed beyond its material characteristics (Descheneau 2015: 174; Paterson & Stripple 2012: 570). This makes it possible to analyze power relationships from various dimensions in the context of commodification, which further enables understanding for the rationale underpinning carbon commodification.

3.3 Carbon colonialism

The concept of carbon colonialism is fundamentally linked with processes of commodification for two main reasons. Firstly, carbon commodification enables carbon offsetting under the CDM. The CDM in turn opens up possibilities for industrialized countries to use climate policy as a new way to dominate countries in the South (Bachram 2004: 10). Secondly, commodification of other resources, as for instance forests, facilitates exploitation of land (Lyons & Westoby 2014: 14, 17). Hence, carbon colonialism is a concept of dominance and exploitation. In this context, carbon offsetting becomes a tool for reinforcing the current hegemonic world order. Furthermore, carbon colonialism is an expression of unequal power relations, as well as of environmental and social injustice (Bachram 2004: 12). In order to reveal the meaning of power in the concept, the spatial dimension needs to be considered. Offsetting under the CDM should further be understood in relational terms. The relationship between the carbon emitter and the carbon reducer is central in order to understand the implications of carbon offsetting, on a local as well as on a global scale (Bumpus & Liverman 2011: 212).

When talking about CDM as an expression of carbon colonialism, carbon forestry is often considered particularly problematic. To turn forests into carbon sinks creates complicated links between metropolitan and peripheral areas (Dalby 2013: 44). These links are expressed through increased power inequalities and reinforced North-South dependencies (Bachram 2004: 12). From a political ecology scrutiny of the matter, carbon offsets can be analyzed as a new commodity that creates new forms of linkages between parties in the North and in the South (Bumpus & Liverman 2011: 204). These linkages are further characterized by powerful actors who benefit on the expense of disempowered actors, making the imperialistic and colonial dimensions of carbon offsetting visible (Bachram 2004: 20). The power dynamics within A/R CDM activities are further illustrated by local communities' lack of negotiating power, resulting in their inability to ensure that their interests and needs are met. In addition, a common outcome of carbon forestry under the CDM, is that local citizens gets re-defined as encroachers or illegal trespassers. This is further an expression for the kind of unequal power relationships illuminated by the concept of carbon colonialism (Lyons & Westoby 2014: 18-19).

3.4 Carbon debt

The CDM embodies not only imperialistic and colonial dimensions, as outlined in the previous section, but also dimensions of deeply rooted political, economic and environmental injustice. The concept of injustice is further linked with the com-

plexity of a historic responsibility for emissions, often expressed in terms of Northern countries owing a huge ecological debt to the Global South (Cabello 2009: 192; Bulkeley & Newell 2015: 50).

According to Joan Martinez-Alier (2002), a leading scientist on the issue of ecological debt, the meaning of the concept is twofold. Firstly, the debt has occurred do to an excessive use of the environmental space, enabled by a free use of natural carbon sinks. Secondly, it is caused by an exploitation of natural resources and raw materials from relatively poor countries. The disproportionate use of environmental space can be defined in terms of a carbon debt. The carbon debt can further be expressed in terms of money, by calculating the (unpaid) costs of a free disposal of carbon dioxide and other greenhouse gases (Martinez-Alier 2002: 213, 228). However, it is likewise a concept of responsibility, in the sense that climate change today is largely caused by the rapid and improvident development in the North. Ironically, however, it is the poorest countries in the South suffering its worst effects (Bulkeley & Newell 2015: 37, 50). When analysing carbon debt as a concept of responsibility, political ecology provides tools for understanding what implications North-South power dynamics, in terms of a historic responsibility for emissions, have on questions regarding justice. Furthermore, it enables an understanding for the unequal distribution of climate change consequences between countries (Robbins 2012: 54-55, 87).

The concept of carbon debt is important since it adds an historical dimension to the understanding of climate politics (McLaren 2003: 32). However, likewise important is the spatial dimension of the concept. In regards of the CDM, the system is often seen as an attempt to compensate for the debt, in the sense that the mechanism in theory places a responsibility on industrialized countries (Bulkeley & Newell 2015: 49; Narain 2009: 3). In practice, however, the CDM rather displaces this responsibility onto Southern actors, without carefully investigating future implications, debts and risks of non-permanence[4] (Ervine 2013: 655). In this context, carbon debt highlights questions about the spatial dimensions of power, making visible how global solutions might displace both responsibility and consequences onto local, often disempowered, actors. Hence, the concept is relational, raising questions about who takes responsibility for the unforeseen (Parks & Roberts 2006: 331, 347).

[4] Non-permanence is the risk that emission removals are reversed, for instance by cutting down forests or due to catastrophic events (fires, pests etc.) (CDM Rulebook(b)).

4 Methodology and materials

4.1 Research design

This essay is of a single case study design, where the A/R sector of the CDM represents the case. The choice of adopting such research design is motivated by two reasons. Firstly, a case study entails an openness for in-depth, multidimensional studies of a single problem, preferably by using a combination of different methods (Yin 2009: 4; Denscombe 2009: 61). This holistic approach is of specific relevance for the purpose of this essay, due to the focus of developing a multi-scalar and multidimensional understanding of the subject matter. The second reason regards the role of theory-building, which is a central part of a case study design. Since the objective of this study is to develop and enrich the theoretical understanding of carbon offsetting under the CDM, the case study's openness for theory-building serves well. However, a common critique of the case study is its alleged lack of generalizability. This is based on the assumption that a single case can not serve as a sample representing a larger population. In this essay, however, the goal is rather to expand and generalize the theory, not the case itself. Such an analytical generalization is further possible to achieve by adopting a case study design (Yin 2009: 15, 35).

The case for this study is selected based on the rationale of a representative, or typical, case (Yin 2009: 48). The A/R-sector can be considered a typical case since it shares characteristics with other CDM sectors. For instance, in order to host an A/R project, the same general eligibility requirements as for all other CDM projects must be met (CDM Rulebook(a)). The findings can thus be assumed to be informative also in a wider context of the CDM. However, the A/R-sector should not be misinterpreted as a sample. Rather, it serves as an empirical example that is generalizable to theoretical propositions, not to populations (Yin 2009: 15, 48).

4.2 Methods and materials

In accordance with what is recommended for case studies, this essay uses a combination of methods (Denscombe 2009: 61). A comprehensive review of earlier research on the subject matter underlies the theoretical and conceptual discussions. Subsequently, in order to apply the theoretical findings on the empirical material, a method that draws upon the technique of a qualitative content analysis is employed.

The first of these methods implies a scrutiny and selection of secondary material (David & Sutton 2016: 29). A systematic search for relevant documentation and

data is important throughout the process of a case study (Yin 2009: 103). The purpose with this approach is to untangle what has already been said about the subject matter, in order to find out in what way that information can be used in the own research. Further, this provides an overview of both theories and empirical knowledge on the matter, as well as creates space for identifying and subsequently filling in the gaps (Esaiasson et al 2012: 20). In accordance with how secondary data should be assessed, the material used in this essay is examined in order to bring forth new interpretations, conclusions and knowledge in regard to the research problem and the objectives (David & Sutton 2016: 29). In addition, all secondary material is selected after careful consideration of its credibility as a source.

The findings of the literature review are subsequently triangulated with the qualitative content analysis. For this, five project design documents (PDDs) are selected. The PDDs constitutes the empirical material of the study, which the analysis is based upon. A qualitative content analysis implies asking questions to the text and answering them. By doing this, the text can be reduced into smaller fragments in which patterns can be identified. To approach a text in this way creates space for interpretations of what is "hidden" behind the actual words. When aiming to reveal power relations, as is the objective of this essay, a reduction of the text is often necessary (Esaiasson et al. 2012: 210; David & Sutton 2016: 271). The questions that form the base for the analysis are related to the three theoretical concepts outlined in chapter 3. In order to capture the broader picture, they are rather open, serving as a guideline for scrutinizing the PDDs.

The analysis builds on the following questions:

Concept	Questions
Carbon commodification	How is carbon measured, quantified, demarcated and statistically aggregated? Which stories or other values are connected to the carbon units? ('Boutique' carbon)
Carbon colonialism	Which signs of domination and/or exploitation of land and the local community can be seen? How are local citizens defined? How is their right to the land area expressed?
Carbon debt	How are issues of non-permanence addressed? Who takes responsibility for unforeseen events, such as environmental damages and/or socio-economic consequences?

In total there are currently 66 registered projects in the A/R sector of the CDM (UNFCCC 2016). Due to practical limitations all of these can not be analysed. However, I have briefly looked through some PDDs that are not included in the analysis, in order to make sure the findings are not limited to the selected projects. Therefore, I do not consider the choice of only including five PDDs reducing the validity of the study. I argue that in this case it is beneficial to limit the number of projects to

five, since this makes it easier to present the results. A large number of projects would, on the contrary, make it more complicated for the reader to interpret the tables where the findings are presented. Moreover, the five PDDs are selected in accordance with the principle of simple random sampling, by using a random number table (see Appendix 1) (Esaiasson et al. 2012: 177).

5 Analyzing carbon forestry

5.1 Overview of the case

The global carbon economy covers a range of different tools and systems that have been created with the aim to reduce GHG emissions in different ways. These includes for instance emissions trading systems (ETSs), carbon pricing mechanisms and carbon taxes (The World Bank 2016: 19). Within the carbon economy, two broad categories of carbon trading systems can be distinguished: The baseline-and-credit system and the cap-and-trade system[5] (Lohmann 2006: 47). In the baseline-and-credit system, of which CDM is included, countries and companies are given the possibility to invest in emissions reductions projects in developing countries, as an alternative to cut its emissions domestically. The emissions reduced are then calculated from a baseline level, which is an imaginary level of emissions reductions without certain investments in the project (Lohmann 2006: 48). The baseline-and-credit system is furthermore divided into two kinds of markets: the compliance market, which includes the CDM, and the voluntary market, which is similar to the CDM, but less regulated and not covered by the Kyoto Protocol (Böhm & Dabhi 2009a: 12).

To get approved as a CDM project, the additionality of the project needs to be accounted for, as well as the expected sustainable development benefits[6]. The additionality is calculated from the baseline level. For an A/R CDM project to be additional, the actual net GHG removals after project implementation needs to exceed what the changes in carbon stocks would have been in the absence of the particular project. Hence, a carbon forestry project is additional if actual net GHG removals is higher than baseline net GHG removals (UNFCCC 5/CMP.1 2005: 66). Nevertheless, the additionality is often complicated to ensure, particularly regarding A/R projects. What foremost makes this complicated is that the baseline for A/R projects is extremely hard to calculate. This in turn creates difficulties in estimating how much carbon in fact is sequestrated by a new forest. Hence, there is a high risk of miscalculating the additionality, and thus the carbon credits generated by the project (Bumpus & Liverman 2011: 206-207). Consequently, afforestation activities could in fact generate in increased emissions instead of reduced, making the rationale of such projects highly questionable (Lohmann 2006: 239-241).

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[5] The most developed cap-and-trade system is the EU Emissions Trading System (EU ETS), in which each installation covered by it is given a cap of GHG they are allowed to emit. Companies can then buy, sell and trade emissions allowances within this cap. The purpose of the system is to bring about a flexibility that will ensure that emissions are cut in the most cost effective way (EU 2016).

[6] It is up to the project host to determine whether the activity contribute to sustainable development (CDM Rulebook(c)).

5.2 Carbon forestry and commodification

When analysing carbon forestry in terms of commodification it is crucial to study the material nature of how baselines, additionality and tCO_2e:s are calculated, for instance by analysing which methodology that is used (Bumpus 2012: 17). However, by looking beyond the material characteristics of the process, further understanding for how 'boutique' carbon stories affect the value of certain carbon credits, is enabled.

The problem with calculating baselines and demonstrating additionality for A/R projects is that this requires valuations about the estimated GHG emissions reductions without a particular project. This means that future imaginary emissions reductions needs to be calculated for, in various possible scenarios, including appreciating eventual leakages and displacements effects (Paterson & Stripple 2012: 576). Hence, carbon commodification is based on imaginative facts, both in terms of creating a commodity and value of a piece of nature that does not actually exist, as well as in terms of estimating potential future scenarios (Bumpus 2012: 17). Moreover, to measure how much carbon a new forest will absorb is extremely complicated, due to for instance changing weather conditions, uncertain permanence of sequestered carbon and monitoring issues, resulting in very complex methodologies (Bumpus & Liverman 2008: 135).

In the PDDs analysed, it is evident that several estimations based on uncertain assumptions are made. The baseline GHG removals for instance, is in three of the five cases assumed to be zero (see Table 1). This makes proving additionality easy. Several rough assumptions are nevertheless made in order to set the baseline at zero. For instance, when implementing an A/R project on degraded land, the methodology allows for baseline removals to be considered insignificant in comparison to project removals (UNFCCC, AR-AM0004/Version 04: 3). However, Hajdu et al (2016) argue that degradation narratives commonly are used inappropriately to legitimise carbon forestry projects. Claims of degradation are in many cases not sufficiently ensured through CDM regulations, and thus used in line with interests of powerful actors in order to obtain project approval (Hajdu et al. 2016: 413). Moreover, calculations of actual net GHG removals by project activity has to take into consideration the risk of some sequestrated carbon possibly getting released do to eventual catastrophic events (fires, pests etc.). (PDD 4466, 2010: 11; Bumpus & Liverman 2008: 135). To calculate for such imaginative risks is extremely complicated, resulting in uncertainties about the credibility of quantifying net GHG removals.

The CDM is very much based on a logic of "because we can, we should" (Paterson & Stripple 2012: 577), meaning that since we *can* make emissions reductions more cheap elsewhere, why do it at home? The wish to reduce emissions as cheap as possible is further in direct conflict with difficulties of correctly quantify and measure carbon, resulting in uncertainties and ethical tensions (Paterson & Stripple 2012: 576-577). The uncertain mitigation effects of the projects are, however, often neglected in the PDDs, or overlooked by claims of social and environmental benefits (see Table 1). By connecting the projects, and thus the carbon credits it entails

in, to stories about sustainable development benefits, a relational dimension is added to the value of carbon. In this sense, a unit of tCO_2e obtains its actual value not only through calculations of its material nature, but also in relation to the benefits it is claimed to contribute to. Bumpus (2012: 19) expresses this as follows: "carbon reductions must be conceptualised relationally: it is only within the historical, material and social contexts in which it exists that we can understand "what" is the carbon we are reducing, how is it being reduced (if at all), who stands the benefit from its commodification and with what consequences". The political ecology framework further enables an integrated analysis of these dimensions. This in turn open up possibilities for a broader understanding of the logic underpinning carbon commodification, both in terms of the material (because we can, we should), and the non-material (value created by 'boutique' carbon).

Table 1. Summary of the calculation part of carbon commodification for the five selected A/R CDM projects, and of the carbon stories connected to each project.

Project	**How is carbon measured, quantified, demarcated and statistically aggregated?**	**Which stories or other values are connected to the carbon units? ('Boutique' carbon)**
Namwasa central forest reserve reforestation initiative	Baseline net GHG removals is assumed to be zero due to degradation. Net greenhouse gas removals = sum of changes in carbon stocks - increase in GHG emissions (measured in tCO2e), resulting from the project activity (PDD 7949, 2013: 60, 65, 102). The highest amount of cumulative net GHG removals is estimated to be achieved year 17, after that a decrease is assumed to occur (PDD 7949 Appendix 3).	Enhanced community engagement, positive socio-economic impacts (income generating activities, improved access to potable water, improved infrastructure, schools. Boost of the gross domestic product due to employment opportunities and increased tourism (PDD 7949, 2013: 118, 124).
Nerquihue small-scale CDM afforestation project	Baseline net GHG removals is assumed to be zero. Number of tCERs (temporary carbon credits) = estimation of net GHG removals first 10 years, then aggregated in a slower rate (PDD 3338, 2009: 19, 35, 45).	Employment opportunities, poverty alleviation and improvement of living conditions, as well as preventing rural emigration (PDD 3338, 2009: 2, 47).
Uganda Nile Basin reforestaion	Baseline GHG removals is assumed to be zero. Net GHG removals (measured in tCO2e) by the project is transformed into tCERs (PDD 4466, 2010: 11, 13, 15)	Employment opportunities, increased access to markets through improved infrastructure, increased access to financial resources (PDD 4466, 2010: 29)
Rehabilitation of degraded wastelands at Deramandi	Baseline net GHG removal assumed to be constant at 261.21 tCO2e/year. Net GHG removal = actual net GHG removal – baseline net GHG removal (PDD 9549, 2012: 25, 50)	Re-employment of ex-servicemen, eco-restoration of degraded land (PDD 9549, 2012: 2-3)

Assisted natural regeneration of degraded lands in Albania	Baseline calculation takes into consideration a few already growing trees (estimated to an annual average of 312.49 tCO2e). Actual net GHG removal is highest year 8, to then decrease continuously (PDD 2714, 2009: 34, 53, 69)	Increased livelihood options for the rural poor, employment benefits, increased participation and inclusiveness of women (PDD 2714, 2009: 3).

(Sources: PDD 7949, 2013; PDD 3338, 2009; PDD 4466, 2010; PDD 9549, 2012; PDD 2714, 2009, PDD 7949 Appendix 3)

5.3 Carbon forestry and colonialism

As mentioned in section 3.3, the CDM opens up possibilities for using climate policy as a new way of dominating the Global South (Bachram 2004: 10). In carbon forestry this is particularly evident, since the projects often lead to displacements of local livelihood activities, such as cattle grazing and cultivation. In the PDDs analysed, all projects lead to some kind of displacement of varying degree (see Table 2), which express local citizens' lack of power to ensure that their interests and needs are met. When talking about displacement of pre-project activities in the PDDs, this is foremost considered in terms of potential leakage, and not in terms of the impact it has on local citizens (see Table 2). This raises questions about priorities, further demonstrating how the needs of villagers often gets neglected in order to ensure project additionality.

However, signs of carbon colonialism are expressed in the PDDs not only through displacement scenarios, but also through the definition of villagers as encroachers or illegal grazers (see Table 2). This demonstrates the exploitative nature of the system, and reveals an imbalance in the power dynamics. To understand how power relations creates opportunities for carbon colonialism, linkages between actors (mainly in the North-South dimension) are central. These linkages further need to be understood as relational, since it is the relationship between actors (extending from the local to the global scale), that enables the kind of domination that carbon colonialism is an expression of (Bumpus & Liverman 2011: 212). The PDD analysis reveals that such relationships are characterized by inequality, since global solutions (the CDM in this case) to climate change issues, has negative implications on local communities (see Table 2).

Moreover, the fact that carbon colonialism is expressed in the PDDs in various ways, strengthen the argument that environmental problems needs to be understood in the political and economic context within which they have emerged. The political ecology framework enables such an understanding (Bryant & Bailey 1997: 28). Opportunities for dominating the disempowered can thus be seen as created through the implementation of CDM projects, as a result of the current economic and political world order. Further, signs of carbon colonialism demonstrates how the CDM reinforces this order.

Table 2. Summary of how carbon colonialism is expressed in the PDDs of the five selected A/R CDM projects

Project	What signs of domination and/or exploitation of land and the local community can be seen?	How are local citizens defined? How is their right to the land area expressed?
Namwasa central forest reserve reforestation initiative	Displacement of agriculture, grazing and fuel-wood activities. Opportunities for exploitation of forest resources due to poorly market project boundaries. Labourers complain about delayed payments, low salaries and poor availability to health services (PDD 7949, 2013: 23, 41, 130-130).	Local citizens who uses the area for cattle grazing and cultivation are defined as encroachers. They are claimed to be using the land illegally (PDD 7949, 2013: 2).
Nerquihue small-scale CDM afforestation project	Some grazing activities are displaced, leakage considered negligible (PDD 3338, 2009: 9, 12).	Not particularly defined.
Uganda Nile Basin reforestaion project	No people living within the project boundary, but close outside. Areas within the reserve have been used for subsistence agriculture and grazing. Project implementation displaces such activities. Possible leakage from displacement is accounted for (PDD 4466, 2010: 10, 29, 25).	Local citizens who graze their herd within the project boundary are defined as illegal grazers, whom will loose their right to "free" grazing land. (PDD 4466, 2010: 29).
Rehabilitation of degraded wastelands at Deramandi	Some displacement of grazing animals. However, this is considered negligible in terms of leakages (PDD 9549, 2012: 49).	Local citizens are said to be encroaching the area and illegally using it for mining activities and grazing (PDD 9549, 2012: 2, 30).
Assisted natural regeneration of degraded lands in Albania	Displacement of grazing and fuelwood collection activities. The issue is approached in order to minimize leakage. Villagers expresses concern over the impact of grazing restrictions in the area. How to deal with such concerns are nevertheless not particularly addressed (PDD 2714, 2009: 34, 129).	The land is owned by the state but given for communal use. However, local citizens are said to be using the area illegally, for wood collection and grazing (PDD 2714, 2009: 29, 43).

(Sources: PDD 7949, 2013; PDD 3338, 2009; PDD 4466, 2010; PDD 9549, 2012; PDD 2714, 2009)

5.4 Carbon forestry and debt

The carbon stored in trees is dependent on the permanence of the forests, to not get released back into the atmosphere. According to the CDM rules, an A/R project therefore needs to address the risk of non-permanence (CDM Rulebook(b)). For all the projects analysed, concerns of non-permanence is addressed through the issuance of tCERs (temporary certified emission reductions) (see Table 3). This implies

that non-permanence is dealt with by assuring that the carbon credits issued by a particular project is replaced by other credits at the end of the commitment period (CDM Rulebook(b)). However, only two of the five PDDs specify that in the case of unexpected releases of carbon, an equivalent quantity of tCERs needs to be replaced (see Table 3).

The PDD analysis exhibit two problems related with CDM permanence. Firstly, accounting for eventual reversal of stored carbon do to unforeseen events implies projecting imaginative future scenarios. Secondly, non-permanence has to be accounted for infinitely. However, non of the PDDs specifies how to deal with monitoring after the crediting period. These two factors make the permanence of carbon forestry projects impossible to determine in practice. Lohmann (2006: 239) point out that forest authorities often do not know for how long time the investing companies plan to monitor that sequestered carbon stays stored in the forest. In the case that a forest would be cut down or destroyed, all the emissions reductions would be reversed. Since guaranteeing the continued growth of a forest is impossible, accounting for a long term uptake of carbon becomes problematic (Paterson 2009: 246). Through carbon forestry projects, industrialized countries are given the opportunity to exceed their environmental budget, resulting in the risk of an increase in the carbon debt (Martinez-Alier 2002: 232).

Moreover, the analysis exhibit uncertainties regarding responsibility in case of catastrophic events that could result in a release of sequestered carbon. In one case (PDD 4466, see Table 3), the responsibility is transferred completely onto community groups, even though all rights to produced emissions reductions falls onto the project host. This demonstrates how winners and losers are produced through the implementation of carbon forestry projects, and for how Northern actors displaces responsibility onto Southern, less powerful, actors. This in turn expresses how the unequal allocation of power between actors is reproduced through climate politics. In order to reveal the logic behind this, the encounter between capitalist objectives, responsibility and inequality needs to be analysed in terms of power (Martinez-Alier 2002: 271). Placed in the context of political ecology, power in this sense is not static, but constantly in flux in between scales and dimensions. Further, power needs to be understood in the historical context within which the carbon debt has emerged (McLaren 2003: 32). This involves an understanding for how the current power dynamics have been created in a market obsessed world order, and how this has skewed climate politics.

Table 3. Summary of how the five selected A/R CDM projects addresses the risk of non-permanence and unforeseen events.

Project	How are issues of non-permanence addressed?	Who takes responsibility for unforeseen events, as environmental damages and/or socio-economic consequences?
Namwasa central forest reserve reforestation initiative	Through the issuance of tCERs (PDD 7949, 2013: 20).	Several possible negative impacts that could endanger the permanence of sequestered carbon, as risk of fires and natural hazards, are listed. Monitoring actions for how to avoid this are set up, al though nothing is said about who takes responsibility in case such events occur (PDD 7949, 2013: 119-120).

Nerquihue small-scale CDM afforestation project	Through the issuance of tCERs (PDD 3338, 2009: 16).	The area has historically been subject to fires. However, no negative environmental impacts are envisioned, wherefore no monitoring of eventual non-permanence is considered needed (PDD 3338, 2009: 8, 46)
Uganda Nile Basin reforestaion project	In the case of non-permanence of sequestered carbon, an equivalent quantity of tCERs will be replaced (PDD 4466, 2010: 11)	Community groups are in charge for protecting the plantations from fire, even though the project host (NFA, National Forestry Authority) has all rights to the produced emissions reductions (PDD 4466, 2010:3).
Rehabilitation of degraded wastelands at Deramandi	Through the issuance of tCERs (PDD 9549, 2012: 22).	Risk of fire and leakages considered insignificant (PDD 9549, 2012: 52). Responsibility for non-permanence is not specified.
Assisted natural regeneration of degraded lands in Albania	In the case of non-permanence of sequestered carbon, an equivalent quantity of tCERs will be replaced (PDD 2714, 2009: 32).	Risks of fire, pest infestation, drought and floods are acknowledged and any such event would require that a monitoring team assesses the area affected, in order to minimize impact on remaining carbon stocks (PDD 2714, 2009: 154). How to deal with/account for reversed carbon is nevertheless not specified.

(Sources: PDD 7949, 2013; PDD 3338, 2009; PDD 4466, 2010; PDD 9549, 2012; PDD 2714, 2009)

6 Conclusions

"The invisible hand of the free market is not going to neatly sweep up the mess that it has created in the first place", argue Smith (2009: 4), in an attempt to highlight why the CDM is nothing but a dirty deal for the South. The results of this essay strengthens that argument, by showing that carbon offsetting under the A/R sector of the CDM, reinforces the North-South power imbalance that the market obsessed world system has created. Even though the empirical material is delimited to carbon forestry projects, I would argue that the analytical results are theoretically generalizable onto other CDM-sectors for two reasons. First, the case is considered typical. Secondly, the results provide new theoretical insights which can be expanded and generalized. The findings can thereby be assumed to be informative in a wider context of the CDM. This creates an opportunity to draw conclusions about how power relationships affect carbon forestry projects, as well as CDM carbon offsetting in general.

A summary of the key findings will follow below, this in order to establish the answer to the research question. The analysis shows that political ecology, serving as a theoretical framework, contributes to a more nuanced understanding of CDM carbon offsetting by mobilizing fundamental concepts of the global carbon market, and deconstructing them in terms of power. This enables knowledge regarding the logic underpinning the CDM, as well as about the implications that CDM activities results in across scales. The content of this result is threefold and dependent of the analyzed concepts, although I would argue that each part is equally important.

Firstly, political ecology contributes with understanding for how the value of carbon is created beyond its material characteristics, within the process of carbon commodification. By connecting the carbon units to stories about its benefits, the value increases without the commodity as such being changed. This goes in line with a capitalist mode of production and a neoliberal logic. Moreover, it demonstrates how powerful actors have the ability to shape climate politics to their advantage, by turning nature into a domain for political and economic control.

Secondly, to conceptualize offset activities as an expression of carbon colonialism provides understanding for how the CDM reinforces the current economic and political world order, in which powerful actors benefit on the expense of the disempowered. The analysis shows that A/R CDM projects creates opportunities for domination and exploitation. Political ecology further provides understanding for how such behaviour gets justified by claiming "win-win"-situations and sustainable development benefits. This underlines a North-South power imbalance in which some actors have the ability to control the environment of other actors. This further strengthens the preconceived idea this essay is based on: that power relations are constructed and reproduced in a way that benefit some people and environments on the expense of others.

Finally, the concept of carbon debt raises important questions about who takes responsibility for the unforeseen. The concept is relational, emphasizing the need to analyze the relationship between capitalist objectives, responsibility and inequality in terms of power. The analysis shows that power in the CDM is constantly in flux in between scales and dimensions, creating opportunities for some actors to exceed their carbon-budget, by displacing their responsibility through carbon offsetting.

The above findings reveal what each concept separately contributes to the overall understanding. However, it is through the integration of these findings that the CDM phenomenon is placed within both the material (in terms of carbon commodification), socio-political (in terms of carbon colonialism) and historical (in terms of carbon debt) contexts in which it has emerged. Through such multidimensional understanding, enabled by political ecology, it is made visible how a relational, actor-based power is present and reproduced within the CDM. In addition, the integrated conceptual understanding illuminate the spatial dimensions of power, in the sense that the politics and power that structure the climate regime have effects across scales and environments.

To conclude, political ecology contributes with understanding for how actors use carbon as a mean to serve their own interests, as well as to increase their own political and economic power. By creating carbon stories and displacing responsibility, emissions reductions can be done as cost efficient as possible, without the implications of this being questioned. One can argue that this is an unethical and unsustainable way of responding to climate concerns, which more likely will increase North-South inequalities and dependencies, rather then solving issues of emissions. Moreover, the analysis demonstrates that the CDM reinforces the power relationships that shapes the current economic and political order. Power in this context is a relational concept with spatial dimensions. I would suggest that conceptualizing power as relational is important in order to emphasize the *current* unequal power balance. However, there is an opportunity for the dynamics that creates this imbalance to be transformed. For such change to occur we nevertheless need to understand the local effects of global processes. This in order to learn and make progress. Furthermore, political ecology underlines the importance of adopting a less exploitative way of solving climate issues. This is turn challenges the market obsession that characterize the current world order. The consequences from market-based climate solutions clearly affects foremost the already disempowered. To demonstrate this fact illuminates the problematic nature of CDM carbon offsetting. This in turn is important in order to critique and provoke change.

Finally, I would argue that the political ecology framework enriches the political science field by providing understanding for the local implications of carbon offsetting projects in developing countries. Such understanding is essential, in order to emphasize the need for a revision of the current power (im)balance that shapes climate politics. In order to strengthen and expand the theoretical understanding provided, it would be interesting to apply the findings onto other sectors of the CDM. This, however, has to be left for future studies.

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Appendix 1: Simple random sampling

The number table below is randomly selected from the publication *A Million Random Digits with 100.000 Normal Deviates* (Rand Corporation 2001: 4). The sample selection starts at third row, far right, with number 49.

00150	94015	46874	32444	48277	59820	96163	64654	25843	41145	42820
00151	74108	88222	88570	74015	25704	91035	01755	14750	48968	38603
00152	62880	87873	95160	59221	22304	90314	72877	17334	39283	04149
00153	11748	12102	80580	41867	17710	59621	06554	07850	73950	79552
00154	17944	05600	60478	03343	25852	58905	57216	39618	49856	99326

Source: Rand Corporations. 2001. *A million random digits with 100,000 normal deviates*, MR-1418-RC, Santa Monica

Below follows a list of the selected projects. The projects are numbered in accordance to the order in which they are listed in the CDM Project Search Database (UNCCC 2016). The search is limited to include only registered projects and is sorted by registration date. As shown in the list below, the PDD is missing for one of the selected projects (number 17). In order to include five projects one extra has thus been selected.

Project number	Project name
49	Namwasa central forest reserve reforestation initiative
15	Nerquihue small-scale CDM afforestation project
31	Uganda Nile Basin reforestation project
17	*No PDD uploaded at the CDM project search database*
48	Rehabilitation of degraded wastelands at Deramandi in southern district of national capital territory of Delhi
12	Assisted natural regeneration of degraded lands in Albania