

# Abstraction, Developmental Failures, and Financialization of Carbon Markets

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**Abstract.** Carbon markets are seen as an attractive policy mechanism for states to encourage the reduction of carbon emissions through the conventional neoliberal framework. They set a price on carbon to encourage polluters to reduce emissions, while providing flexibility mechanisms in the form of tradable credits and offsets. This paper argues that instead of promoting real emissions reduction, carbon markets allow polluters to avoid reducing emissions through the abstraction of reduction methods and the use of offsets that have negative impacts on the global South, while enabling a market for carbon-based financial products that create the conditions for another economic collapse.

## Introduction

On November 4, 2016, the global climate movement hit an important milestone. The Paris Climate Agreement was ratified by the European Union, giving it enough parties to go into effect ahead of schedule. The 193 countries that have signed the agreement must now begin implementing their plans to meet their targets. The policy instruments they choose to pursue will make an important difference in whether or not they meet their objectives.

The signatories to the Paris Agreement have pledged to take the necessary action to hold the global temperature below 2°C, with the goal of limiting it to 1.5°C, but time is running short for drastic action to be taken if these targets are to be met. By 2012, the atmosphere had already warmed by 0.85°C above pre-industrial levels (Hartmann et al., 2013: 161-62), while the temperature anomaly surpassed 1.5°C for the month of July 2016 (Climate Central, 2016). The latter temperature is only a fluctuation, not the new normal, but it indicates that the planet is reaching dangerously high levels of warming. The level of carbon dioxide in the atmosphere permanently passed 400 parts per million in September 2016, a level where scientists expect unpredictable changes (Kahn, 2016), and scientific studies suggest that the pledges made under the Paris Agreement will still lead to warming in excess of 2.7°C (Falkner, 2016: 1108). Not only do countries need to meet their targets, but they need to exceed them, the prospect of which already seems unlikely, and is made even less so with recent developments in the United States. The election of Donald Trump to the presidency and the passing of both chambers of Congress into Republican control will ensure the federal government will take little to no action to reduce global greenhouse gas (GHG) emissions. Trump has called climate change a hoax fabricated by the Chinese, and a significant number of Republicans continue to engage in climate denialism to confuse the public about the issue and further delay any efforts to challenge the fossil fuel industry.

The accelerating pace at which the planet is warming and the growing concentrations of GHGs in the atmosphere, paired with the prospect of inaction by the world's second largest emitter, amplify the need for effective tools to reduce GHG emissions. Putting a price on carbon is generally regarded as a fundamental component of a comprehensive climate policy, though there

has been significant debate over whether countries should pursue a carbon tax or an emissions trading system (ETS). The latter is preferred by some countries because it can be easier to sell the idea to the public, since the price is typically applied to industry and not directly to citizens, and it can be favoured by industry because of the flexibility offered by the trading of emissions credits, which have often been distributed for free (Harrison, 2010: 508). The United States may now be less likely to launch a national ETS, but that does not mean that more environmentally-conscious states will not join the existing system established by California or create their own; China is due to launch its own national ETS in 2017. However, despite the growing adoption of carbon trading, there remain very real concerns about whether such systems are an effective means of reducing GHG emissions. For example, the European Union (EU) ETS has been hailed by some but roundly criticized by others.

This essay will argue that there are significant distributional problems and systemic risks associated with carbon markets, and that they are not an effective means of achieving real emissions reduction. Instead, they perpetuate neoliberal economic myths that allow for further commodification and financialization of the environment, but do little to address the problems that the world is collectively trying to solve. The first section will give a brief overview of emissions trading and the offset mechanism that has been paired with it, as these concepts are fundamental to the arguments that follow. The second section will show why the use of carbon markets abstracts the problem of emissions reduction through the use of market mechanisms, incentivizing actions that do little to move away from fossil fuel energy generation and delay the necessary structural changes that will need to occur to reduce emissions in the long-term. The third section will demonstrate how the use of markets and offsets creates significant distributional problems, as they allow the countries primarily responsible for climate change—those in the global North—to pay the countries least responsible—those in the global South—to take a disproportionate burden of the responsibility for emissions reduction, generating negative social consequences in the process. Finally, the fourth section will show how the market aspects of emissions trading allow for the same price volatility and risk of a crash as any other financial market.

### **Carbon and offset markets**

Carbon markets became a major part of the debate around the different policy tools that could be used to achieve emissions reduction when the United States pushed for market mechanisms to play a significant role in the 1997 Kyoto Accord (Paterson, 2009: 143). This was in part due to the country's previous experience with a cap-and-trade system for sulphur dioxide (SO<sub>2</sub>) emissions in the 1990s, which was hailed as a success, but has been questioned by some scholars. Larry Lohmann contends that the SO<sub>2</sub> market was only effective because of its relative simplicity compared to the EU ETS and the absence of offsets (2008: 362), while Patrick Bond demonstrates that the trading system was not nearly as effective at reducing SO<sub>2</sub> as the regulatory approach taken in Europe, and it continues to have negative impacts on black communities (2011: 689).

After the United States failed to ratify Kyoto and became a global pariah on the climate change file, the EU took up the mantle for promoting emissions reduction and adopted its ETS in 2005—the very mechanism it had initially opposed when the US began pushing for its inclusion in Kyoto (Christiansen and Wettesand, 2003: 5). The EU ETS allowed member states to distribute emissions permits to polluters within their respective jurisdictions, and the permits could then be traded so companies that emitted more than their allocation could buy credits to make up the difference, while those that emitted less could sell them and make a profit. The vast majority of

these permits were distributed at no cost to polluters, which has been a major point of contention with the EU ETS, as permit auctions are still uncommon and major polluters have earned billions of dollars in profits from free credits (Christiansen and Wettesand, 2003: 9-10; Lohmann, 2012: 92-93).

The other important aspect of the EU's climate regime is the Clean Development Mechanism (CDM), one of the flexibility mechanisms included in the Kyoto Accord at the urging of the United States, which governs the offset market and the distribution of offset permits. This body approves emissions reduction projects in the South that are financed through private capital, which are then provided with Certified Emissions Reduction (CER) units in accordance with the tonnes of carbon dioxide-equivalent (tCO<sub>2</sub>e) emissions reduction.

The failure of the EU ETS has largely been attributed to the overallocation of permits, paired with the high number of CERs, which are separate from the capped level of allocated permits. Kate Ervine explains that Phase I of the EU ETS was overallocated by 125 million tonnes above business-as-usual levels, while Phase II was overallocated by at least 900 million (2014: 732). This overallocation, paired with the approximately 813 million CERs issued by the end of 2011, placed little urgency on polluters to reduce their emissions, leading the price of permits to fall from €30 per tCO<sub>2</sub>e in 2008 to €2.46 per tCO<sub>2</sub>e in April 2013, and the price of CERs to fall from €23 per tCO<sub>2</sub>e in 2008 to €0.30 on the secondary market or €0.12 on the spot market in December 2013 (Ervine, 2014: 731-34). Due to these factors, the EU's emissions reductions are better explained by the region's mild winters and the global recession, not the EU ETS (Ervine, 2014: 733).

### **The abstraction of emissions reduction**

Major emitters pushed for the inclusion of market mechanisms in the Kyoto Accord in order to have more flexibility in how they reduce their carbon emissions. Had governments taken a regulatory approach, there would have been no way to escape the investments necessary for long-term emissions reduction or elimination because they typically involve the government mandating polluters to take specific actions. In contrast, setting a price on carbon allowed emitters to choose their own methods of emissions reduction—either through investments to eliminate fossil fuel dependence or by simply taking a number of smaller and less costly measures to lower emissions without fundamentally changing the nature of production. In addition, the use of emissions trading instead of a carbon tax made it even easier for emitters not to pursue real reductions as they were granted free emissions permits up to a business-as-usual level, could purchase additional credits at a fluctuating price, and could invest in offset projects in the South to get credit for purported emissions reductions thousands of kilometres away. This should already begin to paint a picture of how market mechanisms abstract the issue of emissions reduction, and make it easier for emitters to make it seem as though they are reducing emissions when they really do nothing of the sort.

In order to end or significantly reduce the dependence of industrialized economies on fossil fuels, a significant effort will need to be made to find innovative solutions to continue to provide a high quality-of-life for citizens, while reducing the amount and changing the kinds of energy that will be needed. Such a significant shift in energy profiles will require structural changes to the way modern societies operate, but when emissions become a commodity to be managed through a market mechanism, actions to reduce emissions in the short-term and larger structural shifts in the workings of society are treated the same—even though the latter will enable greater reductions in the long-term and are more expensive to achieve. Carbon markets provide no incentive to move

societies away from fossil fuel dependence, but instead to seek out the easy, low-cost mitigation solutions (Lohmann, 2012: 91).

This market approach creates an equivalence between all kinds of carbon reductions, which means that a reduction in the North is treated the same as a reduction in the South; that a reduction from a slightly more efficient generation process which continues to burn fossil fuels is the same as producing electricity from renewable sources; and that the conservation of forests and other natural spaces to act as carbon sinks is no different than keeping fossil fuels in the ground (Lohmann, 2012: 93). It is quite clear that carbon markets, like the EU ETS, do little to end society's dependence on carbon energy but instead allow major emitters to find other ways to show emissions reductions without having their business models threatened by a tough regulatory approach (Lohmann, 2012: 97).

There are further issues with equivalence, particularly when the CDM and the CERs it generates are brought into the equation. For all types of GHGs to be traded on the same ETS, they need to have a "global warming potential" (GWP) so they can each be measured in tCO<sub>2</sub>e (Ervine, 2014: 734), however the methods used to come to these equivalences are questionable due to how the compounds can behave differently in the atmosphere and last for varying time spans (Lohmann, 2012: 93-94). These GWPs provide perverse incentives to target compounds that will deliver the greatest possible reward, such as nitrous oxide (N<sub>2</sub>O) with a GWP of 310 or HFC-23 with a GWP of 11,700. In April 2012, only 0.3% of CDM projects accounted for HFC-23 elimination, but they delivered 45% of CERs, while 1.3% of projects were for N<sub>2</sub>O and delivered 22% of CERs (Ervine, 2014: 735). GWP equivalencies create the incentive to game the system, as the reduction of a small amount of HFC-23 can result in significant profits, and has, in some cases, become a form of subsidy for major emitters in the South, which increase production of HFC-23 and other pollutants to later destroy them for CERs (Ervine, 2014: 735; Böhm et al., 2012: 1622-23).

Emissions reduction becomes difficult to achieve once this abstraction through equivalence has taken place, as it makes CO<sub>2</sub> reductions appear far more expensive than reductions in compounds with higher GWPs, such as N<sub>2</sub>O and HFC-23. However, the use of these market mechanisms also allows business-as-usual to be presented as a carbon reduction, as is the case with emitters who increase emissions to game the system, and it ignores the possible negative impacts of offset projects because it is limited by its focus on what is measurable. Böhm et al. (2012) explain how this occurs through "technology transfer," which is supposed to be a positive initiative to help the South reduce emissions, but can often have unanticipated consequences. In the case of Thailand, they describe a situation where the "waste" from rice husks was burned to create electricity, producing carbon credits, yet that "waste" was previously used by local peasants to manufacture bricks and as a natural fertilizer. After the offset project took the "waste," locals had to switch to chemical fertilizers and experienced health problems as a result of the burning that was taking place (Böhm et al., 2012: 1623). Unaccounted negative impacts have emerged as a major trend in the critical research that has been done on offset projects, and hint at larger imbalances in the actual beneficiaries of these developments.

### **Developmental impacts on the South**

The wealthy, highly developed countries of the global North—consisting of North America, Europe, the most developed parts of Asia, as well as Australia and New Zealand—have a far greater responsibility for climate change than the poorer and less developed countries of the global South because they underwent industrialization at a much earlier time, and thus have been emitting

high levels of carbon for much longer. Despite this historical responsibility, Northern countries and corporations are doing everything in their power to reduce the actions they need to take to cut their emissions and to assist the South to mitigate and adapt to climate change. While the Kyoto Accord required only wealthy Annex I countries to make emissions reduction pledges, the United States demanded the participation of the South in any future agreement. This became an important aspect of the Copenhagen Accord and was formalized in the Paris Agreement (Falkner, 2016: 1116-17). However, with that participation came the promise of \$100 billion a year in climate finance by 2020 to fund measures promoting mitigation and adaptation, though the money has been slow to roll out. In the era of government austerity, the CDM has become the “largest source of carbon finance to the global South,” delivering billions for offset projects since 2005 and reducing the pressure on governments in the North to dedicate public money (Ervine, 2013: 657; Ervine, 2014: 725), but this has not been without consequences.

Despite the image presented of CDM projects assisting the impoverished South with development and mitigation, the reality has not been nearly as positive. Where projects have been established with the stated intent to improve living standards and mitigating carbon emissions, there have often been unintended consequences that have made locals worse off. In some cases, this failure has been the result of low levels for funding for what was trying to be achieved, while in others it was due to a set of obligations set by the donor that were far more focused on getting offset credits than helping the people on the ground. Hannah K. Wittman and Cynthia Caron (2009) document how this occurs in their examination of offset projects in Guatemala and Sri Lanka. In the case of the forestry project in Guatemala, locals were largely excluded and subsistence activities like firewood gathering were criminalized, while the organization overseeing the project was forced to shift its focus to meeting the donor’s objectives rather than helping the locals. The project in Sri Lanka is different, yet had similar negative outcomes. The managing organization pursued a loan-based program to install solar-home systems to reduce the use of kerosene lamps, but in the process indebted the locals to the estate at which they worked in slave-like conditions for an additional five-year period. Not only did the projects do little to help the locals, but they largely failed to meet the mitigation targets they were mandated to achieve.

These issues are not just present in few isolated cases, but are trends seen through a whole range of offset projects. Reducing Emission from Deforestation and Forest Degradation (REDD), an offset program similar to the CDM included in the Copenhagen Accord, has been criticized for promoting the enclosure of forests in Africa, Asia, and Latin America by financiers who see land grabs as an opportunity to earn credits. The displacement of indigenous peoples and the seizure of their lands has become a major part of this, continuing a neo-colonial legacy of indigenous displacement (Bond, 2011: 695-96; Lohmann, 2012: 97-98). Further, since these offset programs consider actual emissions reduction to be the same as avoided emissions, projects can still earn credits by increasing the rate of deforestation, as long as they make a convincing case that there would have been greater deforestation had they not participated in the program (Lohmann, 2012: 96).

There are significant flaws in the structure of these offset programs which, despite their stated goal to help the impoverished while promoting mitigation, do little of either. The poor see little improvement from offset projects, and are far more often victims than beneficiaries. The corporate-sponsored projects that seek to use offsets to avoid making real emissions reductions in their operations do not look at what the people on the ground need or how their lives could be improved by their projects. They wish only to do what is necessary to get their credits and avoid making the necessary investments for long-term emissions reduction. It is clear that the EU ETS has not

promoted emissions reduction, and Bond chronicles how it was still incredibly profitable for major emitters and placed the greatest burden on the poor (2011: 691-92), yet it is wrong to think that only the North has benefited. The North wants to push as much of its responsibility onto countries in the South as possible (Ervine, 2013: 655), but that does not mean Southern elites should be denied agency, as they have taken advantage of the CDM for their own benefit.

As of 2012, more than 70% of all registered CDM projects were located in Brazil, China, and India. Instead of focusing on elevating the living standards of the poor, many involved the industrial plants of Southern elites who profited from the CDM, while the people and ecosystems in close proximity to the plants had to deal with the negative effects (Böhm et al., 2012: 1631). The structure of the EU ETS and the CDM incentivizes Southern elites to delay mitigation actions or even to increase emissions to maximize the credits they receive once they apply for CERs (Lohmann, 2012: 98). Since the elites in Brazil, Russia, India, China and South Africa (the BRICS) also have significant capital, they have joined the Northern financiers in buying up vast swathes of land, which Böhm et al. have taken to calling “sub-imperialism” (2012: 1629). The CDM should not be seen as China’s primary motivation in buying land in Africa, for example, but it has been leveraged as a form of financing to aid in its sub-imperialist motivations.

It should come as no surprise that most CDM projects are undertaken by the North or the BRICS, as the cost of participation is incredibly high, and the risk has greatly increased with the volatility in the price of offset credits. The cost of verification for a CDM project between July 2010 and June 2011 ranged from \$72,102 in Africa to \$52,018 in Asia, pricing out many projects that would have only had a small mitigation impact. In an effort to reduce the financial barrier, the UN Framework Convention on Climate Change introduced a loan program for the least developed countries, but this only serves to trap the poor in unpayable debts due to the high risk that small producers will not be able to recoup their investments if the price crashes (Ervine, 2013: 665-66). Buyers are increasingly demanding floating price structures in their agreements with producers, which means that if the price of offsets falls, it is the producer in the South that has to bear the risk and any potential losses from market volatility (Ervine, 2013: 664-65).

The CDM is structured in a way that allows the elite in the North and some of the rapid-growth countries in the South to benefit at the expense of the poor and disenfranchised Southern masses. They are being made worse off by the offset projects that are supposed to be helping them, while even the projects’ success at mitigating emissions is questioned as major emitters and developers have found ways to continue business-as-usual practices while presenting their actions as a positive change to profit from the CDM. The marketization of mitigation means that even when the poor try to participate, the inherent volatility and their lack of power ensures the burden of risk and high loads of debt are placed on their shoulders, while the elite reaps the benefits.

### **The risks of financialization**

The effort to create carbon markets instead of simply using a regulatory approach or a fixed carbon price is the result of a sustained effort by industry and financial groups, both of which had incentives to push governments to embrace marketization. Their lobbying efforts were helped by the fact that this approach fit the dominant neoliberal ideology, which advocated increased privatization and financialization of public goods (Lohmann, 2010: 86-87). For financial traders, in particular, carbon markets were a way to create new financial products from which they hoped to make high returns as such markets were embraced nationally and globally. After crashes in emerging markets in 1997-1998, the dot-com bubble of 2001, and the property collapse of 2008-

2009 that initiated the “Great Recession” (Bond, 2011: 688), financiers recognized that they needed to extend the reach of the capitalist system to create a new market, and carbon came along at the perfect time.

Carbon markets have given big banks and speculators, which are among the largest buyers of carbon credits (Lohmann, 2010: 88), a new way to earn commissions and fees, but also a new product to bundle into securities and derivatives. However, these financial products are problematic because they hide the risk inherent in the production of carbon credits, since little has been done to make derivative or securities trading more transparent since the 2008 crash.

Just as mortgage-backed securities concealed from distant buyers and sellers the economic realities bearing on lower-income neighbourhoods in Detroit or Phoenix, so too such financialized carbon-commodity packages, with their even longer value chains, conceal the heterogeneous climatic and social impacts and conditions of assemblages of, say, hydroelectric projects in India, cookstove projects in Honduras, or schemes burning off methane from coal mines in China and industrial pig farms in Mexico (Lohmann, 2010: 88).

The greater the number of offset projects included in a carbon security, the riskier it becomes. Further, the risk is elevated above that of other types of securities, like the mortgage-backed securities that were responsible for the 2008 crash, because the commodities that they are bundling together are entirely fictional. The knowledge and technology to provide the necessary verification of emissions reductions and avoided emissions that are the basis of offset credits simply does not exist, which, when paired with a lack of effective regulation, makes it easy for corporations to keep building up carbon credits while doing little to actually mitigate emissions (Lohmann, 2010: 99). This will inevitably lead to a carbon bubble that will crash the same as other markets have in the past, but it could be worse due to its fictional underpinnings. Given that the global carbon market is expected to reach \$3 trillion by 2020, with trillions more in derivative trading, its collapse would have severe economic consequences (Bond, 2011: 688; Lohmann, 2010: 99).

The dangers of financialization should be taken very seriously, as they present the prospect of yet another significant economic collapse, especially as more countries around the world adopt their own ETSs. However, one thing that carbon markets illustrate even more clearly than other markets is the fact that, contrary to neoliberal assertions, markets are political constructs, not natural phenomena (Ervine, 2014: 732). It is evident how every aspect of them has been designed by governments and corporate interests over the past few decades, including the commodification of the environment, the scientifically questionable concept of equivalence, the dubious system of offsets that encourages enclosure and land grabs, and finally their integration into the financial system to give traders a new means of speculation. Financialization alone presents significant risks inherent in carbon markets, but when taken with its other issues, it seems difficult to advocate such a policy.

## **Conclusion**

As the global carbon market expands with more countries adopting their own ETSs, there is a much greater chance that its volatility could have a negative impact on the global economy. It is quite clear that carbon markets are not effective at delivering emissions reduction, as there is too great an incentive for states to appease major industries by distributing free carbon credits and allowing flexibility through the CDM and other offset programs, which make overallocation inevitable.

In order to marketize carbon mitigation, dubious equivalencies have been made between different GHG compounds and any kind of emissions reduction or avoidance, leaving little incentive for industries to make the investments necessary to eliminate fossil-fuel dependence in the long-term. Indeed, the abstraction made possible through equivalence makes it easier for emitters to make it seem as though they are reducing emissions on paper, while in reality they do not.

As more elite actors have come to benefit from carbon markets, their desire for them has grown. The EU moved from opposition to support, and as the BRICS have come to benefit from the CDM, they have done the same. It should be clear that their support is not a result of the ability of an ETS to promote emissions reduction, but because they have seen how they can financially benefit from their institution and expansion. The same is true of the financial sector.

As the carbon market grows, so too does the profit of financial institutions which not only sell carbon credits, but also bundle them into riskier financial products that will only compound the negative impacts when the carbon market collapses. When all aspects of how carbon markets function are considered, it is absolutely clear that their inherent risks far outweigh any chance of mitigation rewards. They provide the opportunity for further profitability for major emitters and financial institutions, while doing little to reduce emissions or help those who are most susceptible to the negative impacts of climate change. There are undoubtedly better means to reduce emissions that actually produce results without risking another global market crash.

Governments wishing to place a price on carbon could instead look at carbon taxes as an alternative to markets. While they can still abstract the methods taken to reduce emissions, carbon taxes contain no means of trading emissions credits, paying for offsets in the South, or financializing the environment to make short-term profits before an inevitable market collapse. Further, regulatory schemes even eliminate the abstraction of reduction methods, allowing governments to set out the specific actions that polluters must take, essentially forcing them to make the necessary long-term investments for carbon reduction and elimination. Carbon markets may be easiest to sell politically to industry and to the population, but what is currently needed are policy instruments that will deliver real emissions reduction in a relatively short timeframe—something they cannot accomplish.

## References

- Böhm, Steffen, Maria Ceci Misoczky and Sandra Moog. 2012. “Greening Capitalism? A Marxist Critique of Carbon Markets.” *Organization Studies* 33: 1617-1638.
- Bond, Patrick. 2011. “Emissions Trading, New Enclosures and Eco-Social Contestation.” *Antipode* 44: 684-701.
- Christiansen, Atle C. and Jørgen Wettestad. 2003. “The EU as a frontrunner on greenhouse gas emissions trading: how did it happen and will the EU succeed?” *Climate Policy* 3: 3-18.
- Climate Central. 2016. “Earth Flirts with a 1.5-Degree Celsius Global Warming Threshold.” *Scientific American*, April 20. <https://www.scientificamerican.com/article/earth-flirts-with-a-1-5-degree-celsius-global-warming-threshold/> (November 10, 2016).
- Ervine, Kate. 2013. “Carbon Markets, Debt and Uneven Development.” *Third World Quarterly* 34: 653-670.
- Ervine, Kate. 2014. “Diminishing Returns: Carbon Market Crisis and the Future of Market-Dependent Climate Change Finance.” *New Political Economy* 19: 723-747.

- Falkner, Robert. 2016. "The Paris Agreement and the new logic of international climate politics." *International Affairs* 5: 1107-1125.
- Harrison, Kathryn. 2010. "The Comparative Politics of Carbon Taxation." *The Annual Review of Law and Social Science* 6: 507-529.
- Hartmann, D.L., A.M.G. Klein Tank, M. Rusticucci, L.V. Alexander, S. Brönnimann, Y. Charabi, F.J. Dentener, E.J. Dlugokencky, D.R. Easterling, A. Kaplan, B.J. Soden, P.W. Thorne, M. Wild and P.M. Zhai. 2013. "Observations: Atmosphere and Surface." In *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, eds. T.F. Stocker, D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley. Cambridge: Cambridge University Press.
- Kahn, Brian. 2016. "The World Passes 400 PPM Threshold. Permanently." *Climate Central*, September 27. <http://www.climatecentral.org/news/world-passes-400-ppm-threshold-permanently-20738> (November 10, 2016).
- Lohmann, Larry. 2008. "Carbon Trading, Climate Justice and the Production of Ignorance: Ten examples." *Development* 51: 359-365.
- Lohmann, Larry. 2010. "Neoliberalism and the Calculable World: the Rise of Carbon Trading." In *The Rise and Fall of Neoliberalism: The Collapse of an Economic Order?*, eds. Ken Birch and Vlad Mykhnenko. London: Zed Books.
- Lohmann, Larry. 2012. "Financialization, Commodification and Carbon: The Contradictions of Neoliberal Climate Policy." *Socialist Register* 48: 85-107.
- Paterson, Matthew. 2009. "Post-Hegemonic Climate Politics?" *The British Journal of Politics and International Relations* 11: 140-158.
- Wittman, Hannah K. and Cynthia Caron. 2009. "Carbon Offsets and Inequality: Social Costs and Co-Benefits in Guatemala and Sri Lanka." *Society & Natural Resources* 22: 710-726.