Constructing Carbon Market Spacetime: Climate change and the onset of neo-modernity

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Abstract. Climate change represents a new era in the development of capitalism, whereby humanity has become such a force of nature so as to destabilize its own environment and ultimately threaten its survival—neo-modernity. This paper explores the creation of markets to control greenhouse gas emissions. Carbon markets are an important infrastructure to enable humanity to integrate nature into its socio-political and economic organization. The carbon markets are the embodiment of a process designed to reorganize human activities, but also to organize and assimilate the natural environment. As with other eras, the key to success in neo-modernity is organizing complex and divergent human activities across space and time. Using an institutional approach, built on case-studies and close dialogue with market participants and policy makers in the United States and Europe this paper analyzes the construction of carbon market infrastructure, including how the markets organize environmental impacts in space and time. Particular attention is paid to the compressions of the spacetime of carbon commodities through the establishment of platforms, exchanges and verifiers. The paper concludes that markets are coordinating networks—the epitome of neo-modernity infrastructure, and the beginning of a process through which the natural environment will become valued only in the context of further capitalist expansion.

Keywords: Carbon Markets, Spacetime, Neo-modernity

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Introduction

Climate change marks a new challenge to the progression of capitalism. Capitalist development can be framed in two eras with distinctive (if overlapping) socio-political, economic and cultural features—modernity and post-modernity (Harvey, 1989). Each era can be defined by humanity's struggle to overcome a greater challenge to progress. Modernity's challenge was to emancipate the individual from the monarchy, religion, and tradition of the Middle Ages (Berman, 1983). It established a new system of hierarchy and order, marked among other things by scientific pursuit of ultimate truth, industrialization and individualism. Post-modernity constituted a readjustment, a backlash against the hierarchy, linear-order, and supreme 'truth' (including the extremes of fascism and totalitarianism) that arose in modernity. Integral to the framing of these eras is also the position or balance between humanity and nature. Prior to modernity, humanity was subject to the forces of nature. Under modernity humanity strove to dominate and master nature. During post-modernity humanity began to recognize the fragility of nature. The environmental movement was born out of a counter narrative to the damage of unrespited capitalism. Constant throughout each era however, has been the drive to increase control of collective organization in space and time (Bell, 1976; Jameson, 1991). It is as though with mastery over space and time, humanity could overcome any threat, or achieve any modernizing goal (Foucault, 1977; Giddens, 1990).

I argue for the possibility of framing a new era of capitalist development—a 'neo-modernity.' In some ways neo-modernity represents a continuation of the drive for progress, but like post-modernity it also represents a response or backlash to prior periods. Under neo-modernity, human civilization is coming to realize the dire consequence of anthropogenic climate change. As in previous eras, the key to addressing this great challenge seems to lie in exerting ever deeper mastery of human organization in space and time. In neo-modernity, this mastery takes the form of the coordinated decarbonization of the activities of billions of people. The distinction between post-modernity and neo-modernity lies in the identity and scope of capitalism. Post-modernity represents efforts to limit capitalist operation, restricting the use of conserved areas and limiting the extent of particular environmental damage. [1] The natural environment, if ever diminished in size, maintains a unique, non-capitalist identity. Neo-modernity, in contrast represents efforts to fully integrate nature into the operation of capitalism. The existence of nature is now becoming neither a mere input to production, nor a bounded area of restricted operation, but a priced and controlled element of the system of capitalism.

This article posits the introduction of neo-modernity by exploring the creation of carbon markets. These markets are developing around the world as a governance mechanism to reduce greenhouse gas emissions (Carr & Rosembuj, 2007; Hasselknippe, 2003). A number of schemes are in existence including the European Union Emissions Trading Scheme (EU ETS) and the Regional Greenhouse Gas Initiative (RGGI) in the northeastern United States (MacKenzie, 2007). I argue that carbon markets are coordinating networks—the epitome of neo-

[1] I recognize that the term 'post-modernity' carries contested conations with significance for art, literature, and culture. The framing proposed here focuses on relationships between society and nature in time and space and is not intended to engage with cultural and literary debates. Rather the framing is intended to highlight the changing nature of capitalism's relationship to the natural environment, as epitomized by carbon emissions markets, and to comment on the significance of these changes. With respect to the natural environment, the term post-modernity could also be substituted by 'neo-romanticism.' It encompasses recognition of the need to protect the environment from complete capitalist damage.

modernity infrastructure—which enhance our ability to organize our activities, and to organize use of the environment in space and time. Carbon markets need artificial spacetime to reduce greenhouse gas emissions in part because carbon pollution is itself spatially and temporally unbounded. The markets are in this respect environmentally unique, however the concept of the markets is being expanded to encompass virtually all other intangible components of the natural environment from biodiversity to ecosystem services.

The arguments of the article are supported by the use of cases studies with market institutions, which used close dialogue (Clark, 1998). More than 100 interviews with experts from banks, brokerages, intermediaries, legal firms, consultancies, power companies and political institutions in Europe and the United States were conducted to understand the development, operation and significance of carbon markets. The interviews provide insight into the social construction and operation of the markets, as well as the intent of market actors not readily available from open source data. Each interview has been qualitatively cross-checked with other interviews to verify the findings. The case study approach is well suited to describe and conceptualize the developing carbon markets and their relationships in space and time (Quattrone, 2006). However, since perspectives and experiences of individuals are not always accurate representations of actions or facts, the data were triangulated with company documents and websites to confer rigor and credibility to the conceptualization (Strauss & Corbin, 1998). A key prerequisite for this rigor and confidence in the findings is access to key market and decision makers (Goldstein, 2003). To gain access these individuals were guaranteed anonymity; therefore interlocutors are reported anonymously.

This article proceeds in four sections. The second section examines the meaning of spacetime and built infrastructure, highlighting the contributions of Manuel Castells and David Harvey. The third section explains the nature of spacetime in carbon markets. The fourth section examines the creation and operation of infrastructure to sustain carbon markets, including conventions, registries and exchanges. The article concludes by suggesting that carbon markets are the beginning of a process through which the natural environment will become valued only in the context of further capitalist expansion.

Spacetime and the Infrastructure of Control

Seminal works by David Harvey (1989) and Manuel Castells (1996) seek to theorize the essence of space and time in social interaction. Harvey and Castells are both concerned not so much with space and time as physical embodiments, but as social phenomenon at the heart of human organization and as phenomena constructed through economic processes. The history of social and economic development has been one in which spatial relationships are compressed, and the rate of interaction and spatial transformation is accelerated. Harvey (1989) refers to this acceleration as time-space compression. Time-space compression is a capitalist phenomenon that enables the shrinking of physical distance and enhances our ability to overcome time constraints. It is a process designed to speed economic scale and productivity.

Each era of capitalism has been concerned with mastering space and time or reducing spacetime barriers to production to establish a global economy. Castells refers to this as network society, which is a “mixing of tenses to create a forever universe, not self-expanding but self-maintaining, not cyclical but random, not recursive but incursive: timeless time, using technology to escape the contexts of its existence and appropriate selectively any value each context could offer to the ever-present” (Castells, 1996, p. 433). The ability to appropriate value from any context (spacetime) and bring it into the present is a form of control over spacetime.

As with any form of spacetime manipulations, the construction of timelessness, of instantaneous telecommunications and financial markets, requires the construction of infrastructure.

The physical manifestation of struggles to overcome space and time are preserved in the infrastructure of a society, whether the cables that link global time in the 19th century or the freeways that compress space in the 20th century. Architecture and infrastructure are the material demonstration of the wealth and collective achievement of a civilization (Orlikowski, 1992). Infrastructure has form which records the composition, the struggles, and the development of the civilization that created it. It also has function which organizes society, and thereby embodies the civilization that creates it (Fligstein, 2001).

Infrastructure development in the last two-hundred years has performed the function of compressing spacetime and building a network society. Modernity achieved the synchronization of clocks to create simultaneity through Einstein's theory of relativity (Galison, 2003). Post-modernity used the construction of vast networks of roads, railways, automobiles, airplanes, and finally fiber optic cables to link disparate localities around the globe and make them instantly accessible. Technological infrastructure has created a society of flows, a space of timeless time, capable of integrating both past and future time into the present. Virtual financial markets allow for the utilization of the future events with instruments such as derivatives (Tickell, 2000). Social space and time has been virtually subsumed into network society. [2]

The last point of resistance is what Castells refers to as 'glacial time', or the natural environment (Castells, 1996, p. 467). Regardless of social organization and spacetime compression, the environment exists according to its own timeframe. It sits at the edge of Castells' forever time, and holds back the spread of 'eternal ephemerality.' The environment has always been a stable point of reference in capitalist development against which humanity has positioned itself. Modernity represents the pursuit of mastery of the natural environment. Post-modernity to an extent represents the embrace of chaotic and organic characteristics of the natural environment, as well as the need to protect segments of it. However, neither era fully takes account of its effect on the environment. As a result capitalist progress has drastically altered environmental cycles, and faces destabilization under anthropogenic climate change. Capitalism's response—the integration of the environment into network society—is the beginning of neo-modernity. It is an era which will reorganize human and natural functions in space and time. Yet in the capitalist assimilation of the natural environment, neo-modernity is less a path to addressing environmental destruction and more a path to enabling the continued expansion of capitalism.

This article explores the infrastructure of the markets that allow for the integration of the environment to occur with ever greater control of space and time. Like Einstein's clock network, environmental markets are a broader symbol of order in neo-modernity. Although this article explores only the development of carbon markets designed to reduce greenhouse gas emissions, the principle of these markets allows them to be applied to other environmental areas such as waste, water, ecosystem services and biodiversity. [3]

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[2] It should be noted that the argument here is not intended to imply that network society is universal nor equally shared. Castells (1996) recognizes that there are still communities without access to the network, and control of the network is anything but egalitarian. Production (or as directly explored here, market construction) is furthermore still very much a material project which requires proximity and social connection.

[3] TZ1, an Australian registry, has already begun to develop and sell habitat conservation credits (Fogatry, 2007).

The nature of spacetime in developing carbon markets

The post-modern condition or network society has been dedicated to producing technological innovation, economic growth and operation of greater economies of scale, which require coordinating expansion of human productive activities. To achieve expansion it is necessary for financial markets to control and value future time because the value of future time creates coordinated and dedicated investment. In coming to terms with glacial time, it is necessary for the network society to coordinate the reduction of environmental impact as a result of human productive activities. To achieve reduction it is not only necessary for markets to value future time; it is necessary for them to value non-time. Reduction ultimately produces value for something that never happens. The carbon markets are the infrastructure of coordinating and globalizing emissions reductions.

Emissions reductions have neither real space nor real time since the emission never occurs. The reduction is rather a mere reflection of the counterfactual, of what might have otherwise occurred. Both its space and time must be constructed. The construction uses virtual space and blends time. The utilization and pricing of future events is not new, but in other eras it was restricted to events that at some point would happen. Secondary financial markets already manage future events with futures, swaps and options. Carbon markets control things that never happen, by giving value to the prevention of a future occurrence (see Figure 1). The non-occurrence is rewarded by giving it both virtual spacetime existence and artificial value.

[Figure 1]

Giving positive value to the absence of the emission creates automatic negative value for the existence of the emission. The utility of making the absence of emissions fungible is that it coordinates productive activities across otherwise disconnected temporalities and among otherwise disconnected actors. The absence of emissions in China is financed in Europe, with the recognition that eliminating an atmospheric externality is universally beneficial (Bumpus & Liverman, 2008). At face value, the exchange allows for the creation of the lowest cost emissions reduction. More importantly, in both places the environmental externality is valued and the development of emissions reduction activities is encouraged. Furthermore, in making a reduction a valued and tradable commodity, the interests of unassociated parties, such as banks, brokerages, low exposure firms seeking a Corporate Social Responsibility (CSR) or Public Relations (PR) benefit is captured, and the drive for additional reductions is created (Knox-Hayes, 2009).

Carbon markets represent yet another level of management of spacetime. If carbon markets are successful in reducing emissions, additional markets for externalities like polluted water or ecosystem damage will be created. Controlling environmental impact by valuing externalities could be seen as a retreat of network expansion. Yet, breaking down the glacial time barrier by integrating environmental impact is a further incursion of network society, not only into human activities and organization, but into environmental productivity as well (Lash & Urry, 1994). The goal of a low carbon economy is after all still greater production and expansive economic growth, albeit with controlled environmental inputs and outputs.

The Infrastructure of Carbon Emissions Markets

Leaving aside ethical considerations or the potential for real success, there are practical concerns for building the infrastructure that can manage artificial spacetime. Valuing, connecting and coordinating emissions reductions between places like China and Europe requires the development of advanced infrastructure—what might well become the hallmark of neo-modernity. In particular, it requires the creation of conventions, platforms and registries and exchanges to create, verify, track and trade emissions reduction commodities.

Conventions: Establishing and Verifying Emissions Reductions

The creation of a carbon commodity requires complex procedure and the construction of considerable infrastructure. The primary source of reductions which can offset carbon emissions from regulated facilities is the Clean Development Mechanism (CDM). CDM carbon projects must demonstrate that the planned offsets are financially and environmental additional, that they would not occur without the project being developed or without the incentive provided by emission reductions credits. Establishing additionality is particularly controversial because it requires justifying a project against what would have otherwise happened. For example, a carbon aggregator can go to China and build a combined cycle gas fired power plant, which produces 5,000 tonnes of CO_2 emissions per year. The aggregator then argues that if the gas fired power plant were not built, a less expensive coal fired power plant would be built. The coal fired power plant would produce 15,000 tonnes of CO_2 emissions per year. The aggregator thereby claims a reduction value of 10,000 tonnes CO_2 equivalent per year, but this value is measured against something that does not actually happen.

Producing additional reductions relies more on social infrastructure—the creation of conventions—than on the construction of physical infrastructure. One of the biggest contentions with the CDM is that additionality is very difficult to prove (Greiner & Michaelowa, 2003). Some studies show that the use of additionality in the CDM likewise does not lead to projects which directly enhance sustainable development (Olsen, 2007). Determining what would have otherwise occurred, in either an ecological context or a developmental context, is always subjective. One of the interlocutors suggests that subjectivity creates widespread distrust for the process.

> The CDM does not specify up front what is or is not a qualified project. It is an unreliable process. Subjectivity comes in with additionality because it is so amorphous. That is why relationships with verifiers are important, but it creates distrust. —Director at Exchange, Chicago, 22 May 2008.

The determination of additionality is left to the discretion of Designated Operational Entities (DOEs) who validate and verify the projects. Yet the verification it is built on protocol and conventions, which are negotiated by party members. As a result, the CDM requires the negotiation of considerable procedure and conventions, which complicate emissions reductions schemes. A Europe-only scheme is easier to establish, monitor, and control. There is a level of technical certainty as to what constitutes an emissions allowance. Offsets require structuring non-spacetime, which is contentious. The economic argument for allowing offsets is that they allow emissions reductions at a lower price. But this is not the complete picture. Packaging altered spacetime as a commodity links and coordinates activities between otherwise disconnected areas. The United Nations Framework Convention on Climate Change created the CDM to engage and integrate the developing world into an emissions governance regime. The linking and coordinating effect goes even further than this however. Emissions reductions which do not qualify for certification under the CDM often become Verified Emissions Reductions (VERs) which are sold in voluntary markets to a host of other interested parties.

The direct value of an emission reduction is that it meets a regulatory requirement and avoids a penalty or fine. But it also creates a system of indirect value. The voluntary markets thrive off of the purchase of CERs and VERs by companies for corporate social responsibility or public relations, and by individuals seeking to reduce their carbon footprints (Hamilton, et al., 2008). The reductions link and coordinate activities among disparate temporalities. For example, offsetting a flight between London and New York can help finance the development of a wind farm in Latin America. Ultimately the value of these reductions is a measure of the social value placed on addressing climate change. That value is transported and shared through the creation of spacetime altered commodities. But the value of these reductions must be maintained through confidence in the rigor of verification, accounting, and tracking.

Platforms and Registries: Tracking Reductions

Commodities like gold are stored in reserves around the world. Carbon reduction commodities are held in electronic registries since they have no physical manifestation. These registries require both the construction of convention and infrastructure. The registry must track and record the entire lifecycle of a credit, including its creation, ownership, transfer and expiry. The registry performs two critical functions: 1) it substantiates the credit's existence, and 2) it ensures the integrity of each credit, so that it is not double counted for compliance. To do this the registry assigns each carbon unit with a unique serial number, and records its issue date (vintage), point of production, ownership, and the registries in which it has been held.

Smooth transfer of credits between different regions requires an integrated system of registries. Under the Kyoto Protocol, each Annex 1 (compliance) country has its own registry and the CDM has a registry. The registries are linked through an International Transaction Log (ITL), which verifies transactions first through national registries. The ITL is also linked to the Community Independent Transaction Log (CITL), which serves as the community registry for the EU ETS. The ITL performs a secondary check on all transactions through the CITL (Figure 2). The linkage of these registries requires considerable convention and coordination, but it also allows companies as well as individuals to set up user accounts in national registries and access carbon account information from their desktops.

[Figure 2]

The registry system for the Kytoto Protocol has taken six years to develop and has become a massive infrastructure, requiring the coordination of its 36 Annex 1 countries, and the CDM Executive Board. The registries can lean on already established internet infrastructure, but still require new servers, hubs, technicians, and software. In addition, the conventions that create, record, transfer, and expire reductions have taken years to develop. As established in the previous section, the value of a reduction credit is that it allows for the connection of different spacetimes and redirection of future development. All of the coordinated effort of the Kyoto member states is therefore dedicated towards building infrastructure which enables the connection and transfer of directed spacetimes. One of the technological service providers interviewed commented on the nature of registries and the importance of common frameworks of operation:

> Every step of the lifecycle works through the registry. It keeps records public even when credits retire …you need registry-interoperability because each standard has its own registry…A global registry would be ideal, assuming, and it would be critical, to guarantee principal information. —Market Director at a Market Technology Service Provider, New York, 12 May, 2008

There are a number of standards which can produce reduction credits. The only way to track these electronic commodities is to link the registries that record their existence. The ITL is as such a considerable representation of neo-modernity. It enables users to access, engage, and move specific environmental temporalities through user accounts from virtually anywhere in the world.   It is an infrastructure which accomplishes greater awareness of and control of human activity in space and time. Although the registry tracks only regulated carbon markets, its concept can easily be expanded to encompass voluntary markets and developing markets for other developing environmental commodities including forestry and biodiversity credits.

Exchanges: Trading Reductions

Between 70 to 80 percent of carbon reductions are sold over-the-counter (OTC), which means buyers and sellers identify themselves, often through brokers and working with intermediates or banks (Capoor & Ambrosi, 2008). OTC trading is inefficient in that it takes time for the brokers to match buyers and sellers. As with other types of commodity and financial exchanges, carbon exchanges provide a virtual space in which buyers and sellers can meet and trade directly. A number of exchanges have developed to trade carbon including the Chicago Climate Exchange (CCX), the European Climate Exchange (ECX), Eurex, the Asian Carbon Trade Exchange and Bluenext. Established exchanges such as the New York Mercantile Exchange (NYMEX) and Nordpool are also beginning to trading carbon products. Exchanges play three main roles: they increase access and build liquidity, they hedge counter party risk, and they develop sophisticated instruments to provide price forecasting.

The primary role of the exchange is to move emissions reductions in space and time. Like registries, the exchanges operate from virtual platforms, so that carbon can be brought and sold from desktops located virtually anywhere. These exchanges enable EU ETS compliance parties to trade European Union Allowances (EUAs) and to move CER credits from the developing world to the developed world. The exchange provides a more liquid marketplace, because buyers and sellers can find each other anonymously. It enhances the accessibility of trading because many more institutions and people have access to the marketplace through an exchange account, which opens the carbon trading beyond big financial institutions.

The second role of the exchange is to hedge counterparty risk. Often the exchange serves as a clearinghouse and as such bears the risks of failure to deliver for a service fee. When serving as a clearinghouse, the exchange does not trade seller to buyer, but rather they collect the entire sell and buy bids, group the risks and clear them as a total unit. The exchange takes the counterparty risk, since each buyer or seller is dealing exclusively with the exchange as opposed to other buyers and sellers. If a single buyer or one seller fails to deliver, the impact is minimized through collectivized risk. For large exchanges like the MYMEX, this is the most effective way to hedge risks.   The exchange bears the risk, but receives a considerable service fee to compensate.

The third role of the exchange is to enable the development of more sophisticated financial instruments such as futures options and swaps. These instruments allow companies to hedge their risks by locking in a future price on the reduction with an option to either to sell or buy at that price. Futures products incur a more expensive transaction price, but they are a way for companies to hedge the risk of carbon in their cost accounting because they lock in a specific price.   A number of exchanges were interviewed for the study. An interlocutor at a large financial exchange highlighted the importance of price signaling:

> The two main roles of the exchange are price reference and to allow easy access to market participants. The third role is to set up a stable infrastructure. … You need to have stable infrastructure with long-term

> objectives to have a secondary price. The timeframe of building a nuclear plant is 5 to 8 years for investment to integrate the price of CO_2. —Director of Business at an exchange, Paris, 17 June 2008

As the director suggests, futures instruments have indirect benefits as well. Having a future price on carbon sends a signal to the rest of the market that there is continued value to invest. Futures instruments allow individual participants to gauge the confidence of the group as a whole. The futures instruments thus serve as another form of communication between different localities, or a collectivization of different local interests. This is particularly important because of the regulatory uncertainty that comes with carbon markets. Most schemes are undetermined past 2012. So the liquidity that a future price provides stabilizes the market. However, only a limited number of financial players such as large exchanges and banks are capable of providing the future price. Their coordination through the development of exchanges expands the infrastructure of neo-modernity, not only in space but in time as well.

Conclusion

Capitalist development has proceeded with ever greater control of human organization in space and time. During modernity, human organization was restricted to a linear movement of time across space. Economic expansion required the development of a system to synchronize time, to make the operation of ever greater economies of scale possible. During post-modernity, human organization became a two-dimensional movement across time and across space, bringing the past into present, and stabilizing the present with the future. Neo-modernity is an attempt to become multi-dimensional—organizing human (as well as environmental activity) in both time and non-time as well as in both space and non-space, making capitalist development instantaneous and virtual, with enough extension to direct and shape future trajectories (Figure 3). Neo-modernity also represents a change in the relationship between capitalism and the environment. Whereas a post-modern natural environment is a bounded space from which capitalist production is restricted or prevented; a neo-modern natural environment contains a calculated existence which ultimately is exchangeable.

[Figure 3]

Carbon markets are the beginning of an infrastructure designed to accomplish this organization. Carbon market infrastructure produces control over carbon production activities by giving their absence value and making this absence traceable and tradable. The infrastructure is a means as well as a product of considerable coordination among capitalist societies. If climate change is to be mitigated the development of this infrastructure may well play a critical role. However, ultimately carbon markets are designed to continue capitalist development and expansion. The implication of these markets and what they signal for the balance between humanity and nature should be of greater consideration. Many of the market participants interviewed suggested that pricing and generating new technology is the key to solving climate change.

> As a more widespread approach, the market approach drives down cost to society, and allows the private sector to seek out the least cost methods of reducing emissions. It allows and focuses the economy on finding the least cost emissions reductions and creates investments into new technologies. We are reducing emissions by putting a price on carbon capture as an externality. The market decides the price. If we had a $100 per tonne price, we wouldn't have a climate change problem. — Director of Carbon Asset Development Company, New York, 2 of November 2007.

There is widespread belief that climate change is a result of failure to adequately price environmental externalities. If we could price the natural environment adequately we could prevent its destruction. Fundamentally, this ignores the underlining imbalance between capitalism and the natural environment. Capitalism is driven to greater rates of spacetime operation, which overruns environmental cycles of generation and regeneration. Furthermore, as many interlocutors highlighted carbon is just the beginning. The goal is to conscript and manage all aspects of the natural environment under pricing systems.

> This is the first time that environmental objectives are being achieved and driven by a market. Finance people are making money out of saving the environment. That is the only way to get large investment flows…There is a problem with waste, water resources, perhaps water trading rights. Forestry is also big and connected to the CO_2. The question is how to get finance flow from banks in London to the rainforest? You turn that environmental asset into financial value. I can see market leaders, academics, high level policy makers at the EU/UN level pushing this agenda forward and thinking how else can we create environmental markets? What sort of instruments can put in place environmental objectives? —Partner, Legal Firm, London 3 July 2008

Climate change represents a warning about the impact of capitalist productivity on the natural environment. The danger of the neo-modern approach is that climate change becomes not a problem of too much capitalism, but too little. The economic system cannot account for impact on an independent natural environment. Rather than address this problem, the solution is to convert the environment into something that capitalism can value and trade—conservation of forest credits or survival of biodiversity units. Transferring the environment into capitalism is seen as the only viable way to save it. Neo-modern capitalism thereby claims ownership of the existence of the natural environment and demands that it produce profit.

Carbon markets suggest that capitalism can address climate change while continuing the logic of never-ceasing economic growth and expansion. These markets restructure the human-nature relationship, such that all environmental impacts and attributes can ultimately be controlled by capitalism. Credits to protect biodiversity are already being sold and the next phase of carbon market development under negotiation in the Kyoto Process is a program called Reducing Emissions from Degradation and Deforestation (REDD) (Miles & Kapos, 2008). The program would tie forests conservation to the finance of carbon markets by valuing the carbon sink of forests. At least in the short term, REDD may be the only way to conserve some of the world's largest and oldest remaining forests. Yet it sets a precedent that the value of a tropical rain forest, or indeed the biodiversity it contains, only exists to the extent that it is calculated and controlled as part of the system of capitalism. Pricing the natural environment converts all intrinsic value to exchange value. It distorts the meaning of the natural environment. Can a $5 per tonne price (or a $100 per tonne price for that matter) ever truly capture the value of 10,000 years of forest growth, and at what point will it no longer be sufficient to protect the forests?

This in its essence is neo-modernity. Climate change represents a challenge to further capitalist expansion (as fueled by carbon fuel sources), but also it signifies a tipping point in the human-nature balance. The solution we have created to address climate change is to assimilate nature into socio-economic processes. This is accomplished through tighter social organization and greater spacetime control. Capitalist ingenuity and coordination may overcome the challenge of climate change by building vast markets or networks to manage environmental impact. The price signal which creates social value for the absence of carbon emissions may eventually be significant enough to produce a global transition to alternative energy sources. However, the goal of energy transition is still to break down barriers (in this case climatic) to the expansion of capitalism. Attaining this goal comes at a cost. If the markets are successful in creating low carbon economy, capitalism will prolong expansion with the illusion that we have overcome climate change, one of the greatest environmental problems humanity has faced. In the meantime the natural environment will continue to lose meaning and value beyond the extent to which it can be integrated and controlled.

Figure 1. Demonstration of non-spacetime or artificial spacetime of carbon commodities

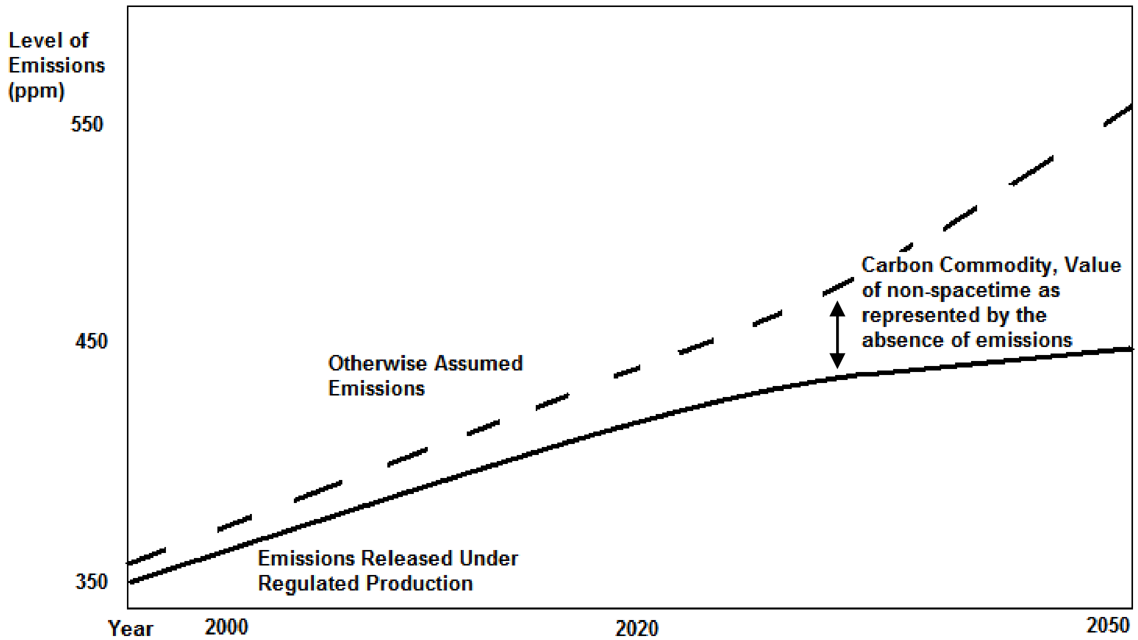
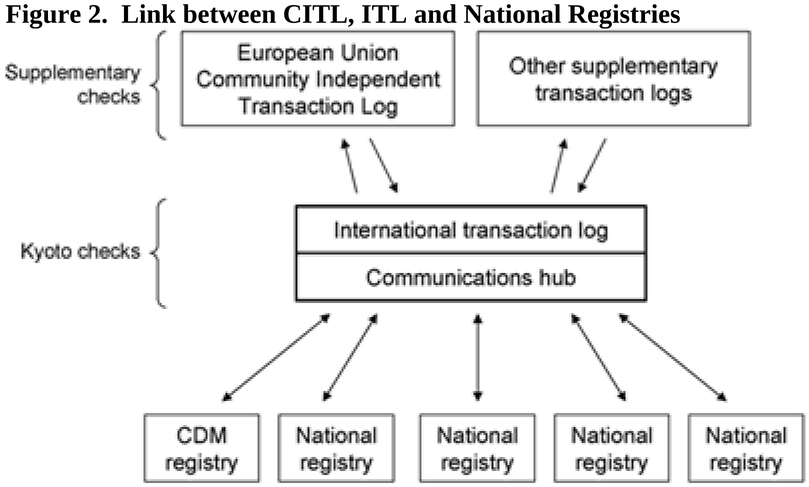


Figure 2. Link between CITL, ITL and National Registries



Source: UNFCC Secretariat http://unfccc.int/kyoto_protocol/registry_systems/items/2723.php

Figure 3. The Defining Characteristics of the Eras of Capitalism

	Human-Natural Environment Relationship	**Organization in Space and Time**
Modernity	Drive to conquer nature. Search of ultimate truth, individualism, industrialization	Space Time Compression. Bringing past into present
Post-Modernity	Attempt to conserve components of nature and limit the scope of damage. Incorporation of organic, chaotic, multiplicity in social and scientific pursuits	Network Society. Utilizing past, present and future
Neo-Modernity	Conscription of nature into socio-economic productivity	Virtual networks. Controlling future events by valuing non-spacetime

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