

# Mapping Value in a ‘Green’ Commodity Frontier: Revisiting Commodity Chain Analysis\*

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## ABSTRACT

Analysis of commodity chains has provided important insights on how power, resource and market access mediate the distribution of benefits and risks. Given this analytical potential, Commodity Chain Analysis (CCA) is now being applied to the study of biofuels and carbon markets to gain systematic insight into the circumstances, relationships and transformations involved in their production and exchange. By building on and adapting this approach to three distinct case studies (biofuels in Madagascar and forest carbon in Cambodia and Laos), this article contributes new insights on the emergence of value within market environmentalism. The analysis highlights methodological challenges in applying CCA to commodified forms of nature, and the significance of knowledge and value negotiations. All three cases illustrate that it remains highly uncertain whether or not market exchange can ultimately be realized. As in the case of traditional commodities, pre-existing conditions of power and access shape modes of production and network configuration. Parallel and intersecting commodity networks (e.g. for land and timber) also require us to think beyond the traditional single-commodity focus. Thus, we call for an expanded analytical focus in applying CCA to non-material ‘green’ commodities that places greater emphasis on value negotiations and connections within new ‘commodity frontiers’.

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### *First unnumbered footnote*

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## INTRODUCTION

Commodity chain analysis (CCA) has opened new theoretical and empirical opportunities to examine how power and social relations coalesce around commodities, their modes of production, transformation and consumption (Bair, 2009; Gibbon and Ponte, 2008).

Emerging mainly from World Systems theory, commodity chains were defined by Hopkins and Wallerstein as ‘network[s] of labour and production processes whose end result is a finished commodity’ (1986: 159). These early CCA theorists adopted a lens of core and periphery to explain vertically integrated structures of production and consumption and international divisions of labour (Bernstein and Campling, 2006; Gereffi and Korzeniewicz, 1994). Subsequent iterations of CCA have since emerged, including global commodity chains (GCCs), global production networks (GPNs) and global value chains (GVCs). While these approaches share a central concern with tracing the ‘biographies of commodities’ (Hartwick, 1998: 424), their strength lies in mapping macro-economic linkages of production and consumption by placing a different analytical emphasis on the organization of and competition between firms (Gereffi et al., 2005; Gereffi and Korzeniewicz, 1994; Gibbon and Ponte, 2008; Storper, 1997).<sup>1</sup>

CCA has also been criticized for its limited ability to capture the full complexity of commodity relations (Bair, 2009; Hughes and Reimer, 2004; Raikes et al., 2000). It has been labelled as deterministic, linear, structurally rigid and weak on gender (Dicken et al., 2001; Gibbon and Ponte, 2008; Leslie and Reimer, 1999). Nonetheless, rather than withering away into academic obscurity, CCA still holds resonance for development scholars and practitioners alike. This broad-based critique has strengthened CCA’s theoretical and applied value in observing global relationships, transformations and mediating institutions that enable a typical commodity’s production, distribution and end use (Moore, 2010; Neimark, 2010; Ribot, 1998). Yet, the global emergence of ‘market environmentalism’ — broadly defined as ‘selling nature to save it’ (McAfee, 1999) — has facilitated the roll-out of new forms of commodified nature which are produced and exchanged in attempts to make conservation profitable (Melnick et al., 2015).<sup>2</sup> These new forms of commodified nature include carbon

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<sup>1</sup> For this article, CCA encompasses an array of commodity chain approaches, such as GCC, GVC and GPN, used in economic geography, development studies and policy. For a more detailed discussion of the continuities and differences between them, see Bair (2009); Gibbon and Ponte (2008).

<sup>2</sup> We understand that labelling new forms of commodified nature as ‘green commodities’ is problematic given the instability and the fragility of the markets themselves, but we use this as a shorthand term for *discursive* commodification rather than to suggest the existence of actual market exchange.

credits, ecosystem services, biodiversity offsets, and biogenetic derivatives for fuels and natural products (Milne and Adams, 2012). Unlike traditional ‘hard’ commodities (i.e. coffee, timber), many of these products are non-material, highly regulated and speculative. Critical questions then arise as to what new theories and methods are needed to analyse the social, political and ecological relations coalescing newly commodified forms of nature and to better understand the material consequences of their implementation into conservation and development programs (Baka, 2014; Cavanagh and Benjaminsen, 2014). Up until now, few studies have been conducted on CCA and new commodity creation within market environmentalism (Lansing, 2012; Mahanty et al., 2015). Drawing on three case studies, we undertake a theoretical and empirical re-evaluation of CCA to better understand the socio-material relations of emerging biofuel and carbon markets. In doing so, we hope to contribute unique insights to scholars and policy makers on the fragility of commodified nature in an era of accelerated green marketization.

Theories of access (see Ribot, 1998; Ribot and Peluso, 2003) and the notion of a ‘commodity frontier’ (Moore, 2010; 2015) are elements of CCA which have the potential to illustrate the socio-spatial relations and material foundations (e.g. in land and other natural resources) of these emerging green commodities and markets. Nonetheless, as capital increasingly moves to extract and/or preserve resources in remaining ecological frontiers, we aim to critically engage and improve CCA by means of a more detailed spatial understanding of value creation in market environmentalism. Traditional CCA is a less effective analytical tool in the absence of clearly recognizable and spatially fixed commodities and fails to adequately deal with the fact that value creation and processes of commodification are embedded within much larger political economies and parallel networks of governance, such as development agencies and environmental organizations.<sup>3</sup> Methodological adaptations are therefore needed to better capture the spatial and discursive complexities of green commodity ‘production’ and their relationship to material resources.

The three selected cases are emblematic of different types of market environmentalism that are promoted across Africa, Asia and Latin America by means of major global interventions such as the Business and Biodiversity Offsets Programme, The Economics of Business and Biodiversity (TEEB), the UN’s Reducing Emissions from

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<sup>3</sup> Buyer-driven commodity chains and consumers of particular have been a central focus of CCA for some time (Gereffi et al., 2005; Gereffi and Korzeniewicz, 1994; Gibbon and Ponte, 2008). In this article we do not discuss traditional producer–buyer relationships; instead our focus is largely on the making of green commodities by development agencies and other environmental governance institutions.

Deforestation and Forest Degradation (REDD+) and the EC's Bioeconomy Programme. All three case studies were conducted through extensive field research and the use of intensive mixed research methods including in-depth interviews with local 'producers', mid-level managers, regional and international administrators and other direct and indirect actors. The collection of primary and secondary socio-economic data occurred during multiple trips to several sites of intervention in Laos, Cambodia and Madagascar. We do not present a full analysis of that data here. Rather, we present critical reflections encountered in our attempts to use CCA as an analytical tool and put forward new theoretical and methodical insights for others trying to broaden their understanding of green commodity networks.

The next section, section two, sets out the theoretical basis for our initial use of CCA. We highlight its strengths and shortcomings. Section three raises questions regarding the continuities and differences between traditional resource commodities and 'green' commodity relations, in our case biofuels and carbon forestry. Section four reflects upon our recent empirical work, with a particular focus on commodity production and questions of access and power in biofuels (Madagascar) and carbon production (Laos and Cambodia). In the final sections, the discussion and conclusion, we argue that advanced CCA continues to provide a useful empirical and theoretical framework for evaluating the actors and transactions involved in commodity production and exchange. However, CCA falls short with respect to assessing the speculative and non-material 'nature' of 'green' commodities in these emerging economies, and thus needs to be enhanced. In particular, careful attention is needed to pre-production and production dynamics, questions of knowledge, value creation and how these commodities sit within wider networks and political economies. We show that value is shaped not only by direct and parallel structures (environmental NGOs and development agencies) that govern the material resources involved in commodity 'production', but also by specific systems of measurement (carbon calculation) and authority (academics and research institutions) that are central to a green economy. The article contributes new insights on how value is shaped not only by direct and parallel structures that govern the material circumstances, but also by specific systems of measurement and authority that are central to green economy discourse

## **COMMODITY CHAIN ANALYSIS AND ITS DISCONTENTS**

Global commodity chain research is part of a long scholarly effort to connect patterns of consumption with corresponding material relations of production. Traditional CCA dealt with these issues on a macro-economic scale, documenting changes in the global division of labour and patterns of production and competition between industrial sectors and individual firms (Gereffi and Korzeniewicz, 1994). For others, CCA opens up more fine-grained examination of the 'social life' of commodities and exposes the exploitative social conditions of economic reproduction (Appadurai, 1986; Daviron and Ponte, 2005; Freidberg, 2004; Guthamn, 2004). We hold that the economy itself is a 'virtual' social construct, mainly because the arbitrary economic values attributed to green commodities are not representative of the complex and multi-layered meanings they hold with the local settings they are produced (Carrier and Miller, 1998; West and Carrier, 2004). This view contrasts with traditional CCA, which privileges Western market values over the non-market values and symbolisms other societies attach to commodities (Miller, 2002).

We build on two main threads of commodity studies in this article. The first includes natural resource theories of access (Ribot, 1998; Ribot and Peluso, 2003) and the second is Moore's (2010) commodity frontier. Ribot's networked or *filière* approach examines how property, access, authority and power intersect (Ribot, 1998; Ribot and Peluso, 2003; Neimark, 2010; Sikor and Lund, 2009). Ribot problematizes development policy's myopic focus on individual property as sole method of accessing or being able to extract valuable resources and the benefits that derive from commercialization. He describes a host of extra-legal mechanisms, such as favouritism, coercion, bribery and threats, which help powerful actors access valuable resources. These bundles 'crystallize' within different social and economic 'nodes' in the chain and must be 'adequately unpacked' to trace how 'benefits are distributed' (Ribot and Peluso, 2003: 159). Recently, analysis of value production has been elaborated upon through the lens of parallel 'circuits' and 'conjunctures' as opposed to fixed points or nodes. This reflects the co-constructed nature of value through and in relation to commodities' socio-cultural and symbolic meanings (Foster, 2006).

Yet, the mainstreaming of new market-based environmentalism raises questions about how we theorize access around new highly speculative efforts to commoditize and exchange the intangible 'services' of nature. Historical understandings of resource access are based on traditional notions of formal property rights (Ribot, 1998). Yet, establishing property rights is an initial requirement, which relies strongly on authoritative (social or politico-legal institutional), reciprocal, and, at times, conflicting claims (Sikor and Lund, 2009: 2). This results in a 'grey zone' between people's formal rights to resources, their ability to access

those, and the institutions that exercise power and authority over these arrangements (ibid.). Reflecting on our own work below in biofuel and carbon markets, often powerful individuals and organizations, such as environmental NGOs (Corson, 2011) and scientific research institutions (Neimark, 2012; Neimark and Wilson, 2015), mediate between formal and informal rights and access (Sikor and Lund 2009). As green commodity chains develop, powerful actors and their institutions strongly influence markets, value and knowledge regimes as previously un-commodified nature become part of spheres of capital accumulation.

Much like previous commodity crops, such as cotton and sugar, green commodities now restructure through a deepening and widening of capital relations in peripheral environments in developing countries (Moore, 2000: 411; 2015). As with Moore's World Systems approach, we also highlight how 'place-specific commodity production interacts with "social-spatial expansion" and its interactions with Marx's "law of value"' (Moore, 2000: 411). The concept of the commodity frontier, moreover, sheds light on the ways in which place-specific commodity production, such as new certification schemes and restructuring of labour regimes, shapes and is shaped by market expansion (Moore, 2000; Mutersbaugh, 2005).

Following this socio-spatial thread, Bair and Werner (2011: 989) hold that commodity chain research should go beyond assessing only inclusion and exclusion of production, and also address the externalization of social difference and 'layered histories and uneven geographies of capitalist expansion, disinvestment and devaluation' (e.g. De Angelis, 2001). It should shed light on the 'instabilities', unevenness and spatial 'margins' of global production networks (Bair et al., 2013: 2544). These points are taken up in our case studies, which emphasize how local resource appropriation and relations of production connect with global and regional governance.

Beyond the specific commodities under discussion, we find that such critical studies provide an opportunity to illustrate the political economic processes surrounding commodity relations in neoliberal capitalism (Büscher, 2014; Raikes et al., 2000). Building on radical critiques, such as that of Starosta, we agree that many commodity-centric studies misread the influence of broader political economies (Starosta, 2010: 447); it is through a focus on a

Marxist-inspired ‘law of value’ (ibid.: 440) that the overall circulation of capital and formation of commodity relations can be better understood.<sup>4</sup>

## **CHARACTERIZING NEW COMMODITIES UNDER MARKET ENVIRONMENTALISM**

Central to CCA is the highly relational entity of ‘commodity’. The preceding section discussed how CCA has centred on the character, form and function of commodities within, through and across networks. But how does the concept of ‘commodity’ translate within new and speculative markets for abstract ecosystem services, as opposed to only material commodities? A simple definition of commodity might amount to the production of ‘things’ in nature (raw materials or primary products) in order to be bought and sold in some system of exchange. This interpretation is limiting, however, as it neglects the relational nature of commodity production: the process by which the use value of goods is substituted for their exchange value, such that things in nature are exchanged less in terms of their functional characteristics than a designated price (Bernstein, 1979).

As with material commodities, new visions of natural capital reflect a trajectory by which the social meaning and values of the commodity gradually become alienated from the material context of production. As with other commodities, the values of and control over green commodities are embedded in and constituted through local social relations, economy, and environment (Berry, 2009; Mahanty et al., 2013; Ribot and Peluso, 2003). Yet these values are progressively stripped or transformed from commodities as they take on a fungible form for market exchange. As such, various producers may be so bypassed by the ‘onward’ circulation of commodities, they will never know who consumed elements of what they produced, where and why (Ong, 2010).

Polanyi proposed that as commodity relations expand, the fundamental things in nature — land and labour — that are not meant to be the ‘product of industry’ become ‘fictitious’ commodities subject to the vagaries of the market (Polanyi, 1957: 79).<sup>5</sup> He

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<sup>4</sup> Marx’s (1976) theory of value attributes the economic value of a commodity to the amount of labour used to create it.

<sup>5</sup> We use the term ‘fictitious’ (and later ‘phantom’) here as a signifier of the non-material and fragile character of the new forms of nature and markets now emerging under market environmentalism. This does not mean that they are not ‘real’. In contrast, we show quite clearly below the effects of the labour, knowledge creation and policy work done in materializing or making the commodity real.

foresaw the emergence of a ‘double movement’ where both civil society and state would play a role in re-embedding economy in society (1957: 79). New market conservation approaches take this fiction to a new level, bypassing land, or abstracting from it, and focusing on intangible ‘ecosystem services’. They simultaneously intensify and by-pass multiple ‘double movements’, accelerating processes of alienation, wherein state and civil society actively partner with private sector interests to intensify commodification. In this context, it is important to consider the time–space dimensions of how and why fictitious commodities emerge historically and in today’s economy (Bakker 2005; Mutersbaugh, 2005).

Although all commodities are imbued with social meaning, the abstract and immaterial nature of green commodities places particular importance on knowledge; technologies, branding and circulation (see Brockington et al., 2008; Hughes, 2005; Wark, 1994). Things in nature can move from being valued for their material properties or characteristics to an expected or speculative value founded in certain assumptions, categories, metrics and beliefs. Symbolic value, brandings, knowledge and ideologies discursively frame and define value from a distance amounting to a form of ‘virtual commodification’; that is, commodity relations extend to produce and assign an abstract market value on ‘things’ in nature based in speculative assumptions, categories and representations of how nature should be or ought to become for and by humans within and beyond local environments (Hughes, 2005; Wark, 1994).

Complex processes of knowledge production and institutional assemblage thus gain foundational importance for market conservation, to account for and ‘produce’ legitimate, commensurable and exchangeable units out of nature (Turnhout et al., 2014: 582). These processes of measurement are inherently power laden, as they determine what constitutes a legible and measurable object of interest, and also facilitate scrutiny and control of local processes by remote actors (ibid.). The nexus between knowledge and power stems not only from individual capacities, but also from networked relationships, and specific strategies and practices (Hess, 2009). We later discuss how access to specialist market technologies can privilege those actors most able to grasp rapidly evolving standards and policy, and with the capacity to wield such knowledge in green commodity production.

Through these processes of knowledge production, rural economies mix with, but are partly supplanted by, tertiary production controlled from afar (e.g. ecotourism, businesses, advertisements, carbon governance, etc.). We then see the onset of virtual commodification through the emergence of ideas and assumptions that value things in nature speculatively in abstract market terms, involving the representation of things in nature through images,



symbols and brands, but mediated and valued monetarily (Hughes, 2005). The process of virtual commodification is thus less material than it is discursive and predictive; the valuing of things in nature ultimately distances nature by monetizing ideas, beliefs and images through speculative assumptions derived from ‘economic activity [that is] abstracted from social relations’ (and nature) at a comprehensive scale (Carrier and Miller, 1998: 2), ‘collapsing any divide between simulation and reality’ (Castree, 2005). While particularly pertinent to the abstract nature of the green economy, the process of virtual commodification is broad, encompassing diverse commodities in an era of globalization.

Finally, the governance assemblages in market environmentalism deserve special comment, as they provide the means to classify, codify and assign values to certain commodities in ways that can reassign meaning and diminish local access to material resources. At the same time, transnational modes of governance may in some cases diminish state control and autonomy over commodities across scale, while in others state authority is re-legitimized. The creation of commodified forms of nature therefore raises questions about the role of national resource laws and policies (Goldman and Turner, 2011). Furthermore, environmental governance regimes and flows intensify the circulation of ideas, knowledge and capital in ways that further alter the meaning and value of commodities — an aspect of CCA that has considerable analytical and theoretical potential, but has so far not delivered (Castells, 2000). The hybridized production of value along such circuits can make it difficult to trace and identify the ‘origins’ of value, as value emerges in a highly syncretic manner (Spaargarden et al., 2006). Such hybridized value production is complicated as several actors may be rendered redundant and less visible along circuits and flows. As such, new approaches to CCA must look beyond ostensibly clear structures that capture the beginnings and ends of commodity chains in diffuse transnational governance systems.

In essence, CCA’s analytical structure can help to uncover how local ‘production’ and exchange becomes entangled in the process of virtual commodification of nature, and how prescriptive aspects manifest as both material and immaterial impacts. In this sense, combining CCA with the material and virtual analysis of commodification can re-embed these more abstract processes within local contexts. Given the characteristics of newly commodified forms of nature discussed above, it is important to consider governance, authority, technology and scale as factors in CCA which to date have not been a major focus.

## **APPLYING CCA TO FOREST CARBON AND BIOFUELS: CASE STUDIES**

Below we present three geographically distinct case studies that apply versions of CCA to understand emerging biofuel and carbon markets and institutional infrastructure. In each of the cases, CCA is used either as a methodology to conduct the study or as an analytical frame to reflect on findings. As shown, each elucidates the strengths and drawbacks of the approach and the value of incorporating alternative theories that in their own way help to understand commodity creation, access dynamics and power relations. The first case examines the particular significance of transnational technologies/governance in the construction of a market for forest carbon in Laos. Similar dynamics can be seen in the second case of Cambodia's voluntary carbon market, where the forests and land targeted for carbon conservation are part of wider networks of commodity circulation; the case reveals the significance of knowledge negotiations and parallel/intersecting commodity networks. The final case on biofuel cultivation in Madagascar highlights how the purported 'green' fuel can embody both abstract ecosystem services and tangible material resources. It asks how the complex underpinnings of speculative production and its material effects can be addressed in the biofuel market.

### **Carbon Governance in Laos: Establishing Markets, Reinforcing Rural Production and Market Conditions**

Like the Cambodian project discussed later, this Laos case draws on research undertaken for a project on carbon commodification in mainland Southeast Asia (2012–15). Rather than explore a fully-fledged carbon commodity chain, the case discusses the value of applying CCA to the interventions that establish the livelihood and market foundations in advance of carbon trading. It outlines the political and economic conditions within which 'REDD+ Readiness' interventions (Reducing Emissions from Deforestation and Forest Degradation) unfold locally to gear farmers toward low-carbon resource production over time. These interventions aim to transform swidden-based livelihoods to more intensified agricultural production associated with other market chains to supposedly spare forests and conserve forest carbon for eventual trading. This REDD+ 'Readiness pathway' adopts a 'No Net Loss' approach (see Sullivan and Hannis, 2015), rewarding farmers who shift from forest-based livelihoods to low carbon alternatives. The Lao case thus emphasizes the pre-production of commodities in socio-political context, which supports broader processes of carbon

commodification, something beyond the usual remit of CCA. We explore how the boundaries of CCA might be expanded to capture the ‘shifting configurations’ of commodity production in parallel with other market economies (Moore, 2000: 410). An invigorated CCA could better engage the pre-design phase so crucial to reconfiguring rural livelihoods in support of carbon commodification and associated state ideals of rural modernization.

The central Lao state is currently negotiating transnational governance for the market-based mechanism, REDD+. The associated transnational–state interactions sees the intervention adjusted to align with national land use policies that support intensification and low carbon livelihood pathways in the name of rural development. Through their interactions, bilateral donors and subnational actors have laid the groundwork and stimulated the enabling conditions for subsequent ‘imagined’ markets, institutional structures and rural productivity. Drawing on the Japan International Cooperation Agency (JICA)-funded ‘Participatory Land and Forest Management Project for REDD’ (PAREDD), we show such interventions at once construct and reinforce locally a ‘less forest-reliant’ market system that better supports carbon trading. It is a system that has swidden farmers zoned out of primary forest, zoned within fixed plots and incentivized to become low carbon farmers. In the process, farmers who adopt new market activities associated with low carbon production and, eventually, carbon trading align with new hopes that such interventions might offer new livelihoods and exchange relations. In the end though, many locals still find the exchange dynamics in support of carbon commodity chains ambiguous and abstract.

Despite recently adopting REDD+, Laos is already in the course of adopting a parallel carbon finance economy, gaining over US\$ 90 million for Readiness programmes. Long considered a ‘transitional’ post-socialist state, multi- and bilateral donors, NGOs and others now invest heavily in institutional capacity building, sectorial coordination and accountability to support the adoption of REDD+ in Laos (DOF, 2011: 1). In practice, however, REDD+ governance activities work through and reinforce rural development policies and interventions that support agricultural intensification and market expansion in line with donor and state development agendas.

REDD+ followed donor–state interventions which had been underway since the mid-1990s to manage and modernize rural people and landscapes. These aimed to reinforce rural sedentarization along with commodity production with ‘safeguards’ for affected communities. Meanwhile, frontiers were (and are) subject to extractive enclosures and industries — partly influenced by donor projects themselves (Baird and Shoemaker, 2007). These governance interventions became both potential ‘solutions’ to complex processes of

resource over-exploitation and, at the same time, renewed opportunities for market expansion in rural areas of the country (Duckworth et al., 1999; Sikor and Lund, 2009).

With global interest in REDD+, the Lao state harmonizes REDD+ governance ideals with existing policy designs and interventions in rural, upland areas. As such, REDD+ Readiness pathways became the means by which state agendas were achieved ‘on the ground’, laying the livelihood and land-use foundations for carbon commodification. Like the Cambodian case, the Laos REDD+ economy has been driven more by donor financing than ‘payments’ from carbon sales, providing an important catalyst for negotiations between state, NGOs and bilateral donors. Bilateral assistance from the GiZ (German Federal Enterprise for International Cooperation), JICA and the Finish Government released, for example, more than US\$ 54.8 million in Readiness activities, while multilateral funding from the World Bank’s FCPF, the Asian Development Bank and the International Financial Corporation amounted to just over US\$ 33 million since 2010.<sup>6</sup>

The JICA-PAREDD site in Luang Prabang province illustrates the local dynamics surrounding the establishment of carbon commodity chains through the interaction of transnational, state and local policies. Since 2009, the Japan International Cooperation Agency (JICA) and the Government of Lao PDR have jointly implemented the programme Participatory Land and Forest Management for Reducing Deforestation in Lao PDR (PAREDD) through the use of a US\$ 4 million donation. The Department of Forestry (DOF), Ministry of Agriculture and Forestry (MAF), and the Provincial Agriculture and Forestry Office (DAFO), among others, implemented PAREDD to partly integrate smallholder agriculture (i.e. swidden) into government sanctioned upland development initiatives. REDD+ Readiness initiatives called for initiatives similar to the strategies of earlier interventions in order to lay livelihood foundations for subsequent carbon transactions and conservation. Through the support of more profitable sedentary livelihood activities, ostensibly the need to clear forests for swidden would decrease, whereby carbon stocks would be conserved as the basis of future financial incentives.

The PAREDD approach was heralded as the best way to do this. Implemented through newly crafted Land and Forest Management Committees in several villages, the project would promote low carbon livelihood activities with associated markets which, when integrated, would hopefully generate sustainable supply chains that curb carbon generation. As a future outcome, low carbon livelihoods would support carbon trading and subsequent

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<sup>6</sup> Much of the latter rise in revenue stems from Laos’ acceptance into the FCPF with its Preparation Proposal (R-PP) (October 2010) and then FIP approval in November 2011 (DOF, 2011).

financial rewards. The fortunes of such integrated commodity production were closely interlinked, with the low carbon livelihood development focusing on known commodities, such as cassava and livestock, alongside the less familiar and intangible carbon units.

These low carbon livelihood interventions aligned with earlier policy models to reduce forest dependency, based on market sales, profit margins and fund repayments (e.g. revolving funds from agricultural and forest activities). Despite best intentions, however, the livelihoods that were to lay the foundation for an expanded carbon commodity chain failed in many respects. Much livestock, for example, died of disease or natural causes or were eaten by villagers. Moreover, maintaining livestock was confounded by the pre-existing social and political differences among existing social groups, their livelihoods and their land holdings. The income generated by PAREDD's piggery project sales was inadvertently drawn along ethnic lines between Khmu and White Hmong swidden farmers.

While these two social groups once lived and farmed swidden further apart in the uplands, upon being resettled under the government's FOCAL land use strategy, they became concentrated in one village and told to cooperate so as to take advantage of REDD-related benefit sharing.<sup>7</sup> However, higher status families in each group were quick to organize themselves and capture initial benefits at the expense of poorer, non-family members of their group. The chiefs and their families that steer and benefit the most from livelihood activities also became the local knowledge brokers on REDD+ and potential carbon trading. In this way, carbon's destiny closely intertwines with that of commodity markets supported through REDD+, as well as other historical policy interventions. The challenge for CCA is thus to untangle these connections in the context of project interventions in complex rural settings.

Thus, the Lao case highlights the complex social, political and historical factors that can underpin the initial (Readiness or) preparatory stages of carbon production. The REDD readiness phase of low-carbon livelihood pathways has brought together a historical mix of interventions as well as an interplay of current carbon-friendly and carbon marketing activities. However, as local leaders and programme coordinators raise hopes among the Khmu and Hmong participants of potential future returns, most are not entirely sure about exactly how carbon trading might unfold. In the end, then, as REDD+ Readiness phases affect local livelihoods and land uses, they matter as much if not more than the parallel carbon finance economy.

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<sup>7</sup> The zoning for the FOCAL site was established under Participatory Land Use Planning (PLUP) through the government's Forest and Land Allocation Programme (FLA) (Baird and Shoemaker, 2007).

Together, PAREDD and the state have facilitated benefit redistributions to offset different losses. In such instances, low carbon livelihood schemes and incentivized market exchange aim to compensate for livelihood losses and support carbon conservation while ensuring rural production unfolds accordingly (Sullivan and Hannis, 2015). The Readiness schemes' preparatory phase is critical. The initial marketing phase of carbon commodity chains must appear to compensate for any adverse outcomes from livelihood transitions toward low carbon production. Paradoxically, however, accelerated intensification and marketization can lead to increasing wealth for the locally powerful, and the expansion of higher-value crops and livestock production, with the ultimate outcome of possible losses in carbon storage. In this context, evidence points to the value of extending CCA to capture the convergence of multiple transactions and outcomes well before as well as along the road to carbon trading, to capture the tangible and intangible elements of carbon commodification.

### **Applying CCA to Cambodia's Nascent Voluntary Forest Carbon Market**

Like other global commodities, the production and trade of forest carbon in the voluntary market rests upon a complex network of actors and institutions (Appadurai, 1986) that extends from a specific locality to international buyers that are trying to offset their carbon emissions. As with other green economy 'products' however, the market for forest carbon is a deliberate construct, with the same 'phantom' and fetishized dimensions seen in biofuels below. The creation of verified carbon credits, the 'commoditized' form of forest carbon, begins in a place: a forested and often inhabited landscape. This process of carbon credit 'production' requires specialized institutions and knowledge, usually facilitated by international NGOs, donors and the private sector, with the agreement, if not active involvement, of state actors. To ensure that payments are only for 'additional' carbon stored, producers must demonstrate new actions or changes in behaviour from 'business as usual' scenarios around the use of forested land. Tradable units of forest carbon only exist after a project is validated and verified according to the now widely recognized market standards. A third party must then periodically verify the quantity of credits produced by the scheme to vouch for their continued legitimacy (see Bumpus, 2011; Lansing, 2012; Mahanty et al., 2013, 2015).

CCA was applied to Cambodia's voluntary carbon market due to its potential to facilitate a systematic analysis of complex social relations between diverse actors around a

commodity, and how they interact with prevailing political and economic relations (Ribot, 1998). The research departs from recent work on carbon markets, which either zooms in on local interactions with schemes to examine issues such as conflict, ‘green land grabs’, livelihoods and social displacement (e.g. Cavanagh and Benjaminsen, 2014; Corbera and Brown, 2010; Jindal, 2010); critiques the neoliberal assumptions that underpin REDD+ (e.g. Robertson, 2012), or takes a normative stance to determine conditions for equitable and efficient REDD+ design (e.g. Angelsen et al., 2012; Agrawal et al., 2011; Larson et al., 2013; Sunderlin et al., 2013). CCA provides for critical, multi-scalar analysis of REDD+, to examine questions of access (following Ribot’s access mapping approach) in a rigorous, empirically grounded way.

CCA also offered the potential to uncover how carbon markets meld with markets for other land-based commodities (e.g. timber, new agricultural commodities). Green economy advocates consider these as ‘opportunity costs’ faced by key decision makers at the international, national and corporate level as they deal with macro processes of economic and landscape transformation or a more localized scale where competing land uses are in play (e.g. Angelsen et al., 2012). By mapping the actors involved in REDD+ relative to these potentially competing commodity networks, we hoped to uncover where convergence and conflict might arise. For instance, might some actors be engaged in both extractive and REDD+ activities?

In Cambodia, we analysed two REDD+ schemes: a network of community forests in Oddar Meanchey province, and the Seima Protection Forest, Mondulkiri (Mahanty et al., 2015). We map the key actors involved in each of the schemes, their roles, ‘investments’ and access to possible ‘returns’ from carbon transactions. We then examine the role of different types and levels of standards and rules — the institutional and governance assemblage around this would-be carbon market — which include customary land rights, formal laws and policies mediating forests, land and carbon, and international standards to guide carbon trade. The political economy of forests and land were critical influences on the commodity chain, shaping access to the resources needed to ‘produce’ carbon credits. Finally, we looked for moments of value formation and value addition in relation to forest carbon. What were the mechanisms and actions that enabled a previously unvalued commodity to gain a market value, and how was this value multiplied and transacted?

The commodity chain for forest carbon differed from the typical pathways taken by other forest commodities, such as harvest, aggregation, value addition and marketing/exchange. The Cambodian case highlights that the ‘production’ of marketable

forest carbon is in itself a formidable feat, involving considerable time, diverse actors, negotiation of knowledge and institutional interplays, before forest carbon even becomes a tradable entity. Both projects took years to get to the point of ‘almost’ marketing their carbon (a state of limbo that also lasted some years). Analytical attention to the production phase (see Figure 1) is thus critically important for carbon as it is here that power-laden social relations and questions of access start to emerge. Indeed, the role of knowledge and associated power dynamics emerged as critical in the Cambodian case. For instance, technical actors (e.g. verifiers and technical advisors) were so central and highly valued that their services received an immediate financial reward, whereas many other commodity chain actors are still waiting to see payments from carbon sale.

**INSERT FIGURE 1 HERE**

Aside from uncovering the complexity, knowledge and power dynamics inherent in carbon production, CCA highlighted the fragility of carbon trade. In mapping the many actors and relationships required to produce and exchange forest carbon (e.g. local users of land and forests, external interlocutors with specific technical knowledge, international NGOs and various state actors with local through to national reach), it became clear that establishing and maintaining the commodity network was a feat of facilitation that in both projects were mainly conducted by international NGOs. Although critiques of neoliberal conservation often emphasize its hegemonic character, CCA brings out the fragile and contingent negotiations upon which new forms of nature rest, leaving them vulnerable to factors such as changes in personnel, and delays in reaching agreements and gaining payments.

Finally, by focusing on the institutional interplays around Cambodia’s nascent carbon market, our analysis highlighted the significant role of newly constructed institutions in mediating carbon trade, such as the Voluntary Carbon Standard and Climate, Community and Biodiversity Alliance standards. Unlike other analyses that see CCBA and associated requirements for Free, Prior and Informed Consent as social safeguards, analysing these institutions through a commodity chain lens highlighted their purpose in establishing the legitimacy of tradable carbon, whether in social or environmental terms.

In short, CCA opened up important questions about the ‘phantom’ dimension of markets for carbon markets and their ability to endure competing commodity networks, fragile social relations and dynamic demand and institutional configurations.



## **Biofuels and Speculative Land Acquisitions in Madagascar**

This study began in 2010 examining production of *Jatropha* sp. on Madagascar. We carried out a CCA to better understand the transformation of feedstock into biodiesel for global and domestic markets. Albeit helpful in understanding the global dynamics of *jatropha* on a macro-scale between Madagascar and consumer countries, it was rather limited for explaining structural dynamics at the local level. Difficulties in applying a CCA methodology directly became apparent soon enough. The first constraint stems not necessarily from the use of CCA, but similar to the other two cases in this article, from the lack of identifying any real market operating; and because of this, very little *jatropha* is produced. The second was the method's limited flexibility to adequately unpack the shifting valuation of the emergent and less traceable land markets which has become an 'accidental' by-product of failed biofuel production (Baka, 2014).

Global demand for alternative energy has grown in recent decades, in particular for biofuels such as plant oil, biodiesel, and bioethanol. This increased demand was spurred on in part by a twin set of policies including the EU Alternative Energy Mandate and the US Energy Policy Act of 2005 which created the Renewable Fuel Standard (RFS) (German et al., 2011). Analogous to the Laos and Cambodian cases on REDD+, biofuel production operates in accordance with international finance and development institutions and in sync with corporate sponsored market-based environmental strategies.<sup>8</sup>

As global excitement grew over the prospect of a form of alternative energy that could also kick-start rural development, aid agencies, such as USAID and the World Bank began to subsidize medium to large trans(national) companies, supplying them with tools, trainings and improved seeds to produce biodiesel feedstock. Dubbed by some as a 'silver-bullet' biofuel, initial research showed *jatropha* to easily propagate and establish on denuded soils and without direct competition with food crops. Donor assistance was accompanied by investment and land tenure laws meant to 'fast-track' foreign investment and help agribusiness firms gain crucial access to prime agricultural plots. Although some of the new tenure laws were intended to devolve state control over land and protect local resource users' customary rights, their clumsy implementation had the perverse effect of promoting an

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<sup>8</sup> For example, the oil giant BP showcased its Fuelling the Future programme during the 2012 London Olympics with a portfolio of biofuel offsetting programmes. See: <http://biomassmagazine.com/articles/7890/bp-to-showcase-biofuel-offer-biomass-carbon-offsets-at-olympics> (accessed 1 March 2014).

agribusiness ‘land rush’ and igniting fears of dispossession and forced evictions (Burnod et al., 2013; Li, 2014). One landmark deal provided the multinational Daewoo Ltd. 1.3 million ha for biofuels and export crops, helping fuel a political coup in 2009, now noted as a bellwether case of ‘land grabbing’.

What are the benefits of production, if any — and who captures these benefits and shares the burdens? Even before the political crisis of 2009 many agribusinesses were beginning to re-think their investment into biofuels. At this time, biofuels were subject to strong critique from academia and civil society who saw production as a cause of rainforest clearance, and questioned its ability to reduce greenhouse gas emissions (GRAIN, 2013). The realities of industrial-scale production included large land acquisitions and external inputs such as irrigation, fertilizers and pesticides reflecting the difficult challenges of ‘sustainable’ biofuel production. Following this, there was growing local resistance to foreign agribusiness due to fear of land dispossession (Burnod et al., 2013).

By the time we set out to do this analysis, jatropha in Madagascar had been transformed into a ‘phantom commodity’, or one used in company rhetoric and policy and development discourse, but does not materialize into any real market exchange or delivers on promised environmental and social benefits. In 2012, the total number of jatropha plantations for the top six biofuel producers was well below the intended or contracted size. For example, the total amount of land meant to be allocated for biofuels in Madagascar in 2011 was roughly at 800,000 to 1 million ha. Yet, within this range only about 60,000 ha were ‘reportedly’ producing biofuels and many were classified as either in preparation or temporary suspension phases of production (WWF, 2011).

In addition to these contracted plantations located in the north-west and south-central parts of Madagascar, there was also production through out-grower schemes in the ‘deep south’ in southern Madagascar. The difference in production is most noteworthy when taken into consideration alongside labour relations and land tenure dynamics. For example, out-growing is common in the deep south, where jatropha can be found growing wild on denuded hillsides. A firm manager who operates in the south explained that land leases are less common in this region, mainly due to the acknowledgment of strong customary tenure.<sup>9</sup> As for out-growers, most are paid per kilogram,<sup>10</sup> and although total numbers are difficult to estimate, the company reported working with at least 9,000 out-growers for a single season’s harvest. Yet, most of this was for the production of ricin oils and not jatropha.

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<sup>9</sup> Anonymous interview 19 (1 July 2012).

<sup>10</sup> One kilo of jatropha seed costs around 85–175 Ar. (US\$ 0.03–0.06).

In contrast, the ‘purported’ plantations in the north-west are located in areas where land leases are more common and where there is more familiarity with wage labour contracts for agribusiness. In these plantations, hired labour is meant to be locally sourced, although at certain times in the production cycle (preparing the fields, out planting, and harvesting the seeds) labour requirements can be quite high, with the result that in certain seasons plantations attract hundreds of migrants seeking income opportunities. This is an important livelihood opportunity as for some work offered by biofuel firms is the only income-generating activity in these rural areas. As such, it provided vital income during very difficult periods of the year when food crops are at their lowest levels (known locally as *periode de soudure*).<sup>11</sup> The four largest jatropha firms reported that on average-sized plantations (350 ha) they hired up to 350 workers, while a 2,000 ha plantation can hire up to 2,500 workers depending on the season (WWF, 2011).

However, jatropha still exists within parallel economies of expectations and appearances (Tsing, 2000) as investors in Madagascar maintain strong interests and investments in farmland and, alongside the global environmental community, continue to make promises of sustainable development. This ‘phantom production’ of biofuels is not uncommon, similar trends of which can be observed in carbon markets in REDD+ programmes, which highlights worrying trends of speculative capital driving value in an emerging biofuel economy. In Madagascar, this has led to increasing speculation in land and asymmetrical markets developing. As a result of all of this speculative hype around biofuels, land itself becomes the prize for investors and regional elites thereby transforming it into a commodity with increased value (see Burnod et al., 2013; Neimark, 2013).

The boom and bust of jatropha production and the creation of a speculative land market in Madagascar is instructive in a number of ways for scholars of CCA and overall commodity relations. To begin, jatropha is a classic example of a ‘bridge’ crop which links traditional commodities and those of new and emerging forms of speculative ‘natural capital’. Although not traditionally grown on a commercial scale, jatropha production alongside other biofuel crops holds similar structural components and networks of exchange to cash crops. It is tangible as its feedstock needs labour, land and processing similar to other hard commodities (coffee, cotton and sugar), but it operates within a constructed market of expectations of sustainability and economic development. Furthermore, given the significance of biofuels as part of a new wave of biodiversity offsetting interventions and its

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<sup>11</sup> Wages can vary between 3–5000 Ar. per day (US\$ 1.25–2.20). For a six-day working week at eight hours per day, this amounts to roughly 75,000 to 112,500 Ar. per month (US\$ 31.25–49.73).

global branding as transformative alternative energy, there is compelling reason to hold it up in relation to emerging carbon trading schemes and the land market. In this analysis a more networked or *filière* approach was required than the traditional linear outputs offered by CCA (Foster, 2006; Ribot, 1998).

CCA is restrictive at times in accounting for the commodification of previously uncommoditized nature and the ramifications of such transformative processes (De Angelis, 2001). CCA's linear structure is myopically focused on individual commodities, leaving out parallel commodity trajectories and social and environmental externalities (Bair et al., 2013; Moore, 2010). The valuation of land links to critical understandings of how previously uncommodified nature and labour are now being brought into capital circulation (Polanyi, 1957). Lands that hold important social, cultural and economic use value have been further drawn into production through international networks of capital exchange (Moore, 2010). The challenge was to expand our analysis in order to capture not only the benefits of production (usually found in value-chain studies), but the burdens of production including the effects of dispossession and loss of access to land.

## **DISCUSSION**

In theory, CCA offers important opportunities to uncover processes of market construction, social relations and institutional assemblages around biofuels and carbon, and their access implications. Analysing the 'production' and 'exchange' of commoditized forms of nature has provided important insights into key actors and socio-political relationships. However, the cases also reveal theoretical and methodological challenges that need to be addressed in applying CCA to green commodities.

First, we find that CCA helps to bring out some important differences between 'traditional' material commodities and non-material or fungible forms of nature. While all commodities are largely socially constructed and valued (Appadurai, 1986), the application of CCA has shone a powerful light on the absence of typical market transactions in the case of these 'phantom' commodities, where actual exchange of the promised green commodity has been notably absent. Practitioners might attribute this to the early stages of carbon production in Cambodia. However, we also need to consider and account for the material consequences of production and exchange as carbon and biofuel markets develop (Bair et al., 2013; Moore 2010).

Second, different types of knowledge and information take on a major role in green market construction. Like the weavers of elaborate but imaginary royal robes in the well-known children's tale *The Emperor's New Clothes*, practitioners (and others) must 'sell success' (Büscher, 2014) to create faith in new 'green' markets. Locally, practitioners sell their success in line with the intended beneficiaries' own reality, championing benefits that align with local livelihood needs and aspirations, or forest management practices. It is also accompanied by limitations on information sharing. For instance, facilitators of carbon projects saw information sharing in terms of market risk. What if fragilities in the scheme somehow reduced the value of the carbon credits, scared away buyers or worse, affect the scheme's accreditation? Critically, in a politicized landscape of 'land grabs', biofuel firms seek development capital and promote their work as delivering sustainable fuels and economic benefits. However, information on the delivery of benefits is limited and, as with carbon, the project's legitimacy remains at risk, along with the potential of an increase in resistance.

Third, mapping the actors and transactions involved in the production of new forms of marketed nature has helped to expose a vibrant secondary economy that feeds off the production of products such as forest carbon. Filer and Wood (2012) has dubbed this the 'forest carbon service economy', which, in the Cambodian and Laos cases, appears to have generated more tangible revenue flows than the sale of commoditized carbon. Meanwhile, other actors, notably the communities that have to protect forest areas or restrict their use of land and forest, must wait for future carbon sales in order to benefit from the scheme. These actors ultimately have little control over the enabling conditions for carbon production and exchange whilst remaining subject to their vagaries. The Lao case showed that transnational governance agendas as well as state interests were stoking markets for both green commodity production and rural modernization (Dressler et al., 2014). As such, green commodity production and exchange may also be shaped by hybridized national and transnational governance regimes which is not a typical area of analysis for CCA. To address this dimension, Ribot and Peluso's (2003) mechanisms of access or 'bundles of powers' that are used to gain, maintain and control a foothold on specific nodes of the developing market can be employed.

Fourth, given how recent these developments are, it has proven challenging to track commodity networks and exchange 'outcomes' in newly constructed markets. Unlike Ribot (1998) and others who have fruitfully applied CCA to critical questions of 'access', it was too early in our cases to identify winners and losers given the absence of data on markets, prices

and distribution. CCA did, however, help to flag the uneven distribution of benefits and burdens among the participants. In Madagascar, biofuel firms are cheaply able to access plots of prime agricultural land while touting the benefits of future income generation, which in many places rarely materializes. In the Cambodian case, those with technical and verification roles had already received compensation for their labour through donor finance associated with the set-up of green commodity chains, as noted above. In Laos, neither the initial phase involving the establishment of low carbon livelihoods nor the pathway leading to carbon commodification yielded any materially significant outcomes, such as livelihood remittances which are associated with a particular commodity production–exchange dynamic.

Fifth, in all three cases, the construction of value around carbon and biofuels interacted with existing commodity networks and values. CCA provided only limited insight into these parallel and intersecting relationships. Tracking the creation of value for forest carbon, for instance, highlighted the complex process of attributing potentially diverse and competing meanings to the materials and labours involved in its production. In Laos, carbon markets coincide with continued state efforts to reduce rural populations' reliance on land that have already had far-reaching social and political-economic impacts. CCA has traditionally focused on the financial values in commodity production and exchange, without considering how these combine or compete with the other social, cultural and subsistence values around land and forests. Furthermore, the focus on price and commodity value in CCA tends to foreground actors and transactions that are directly related to a particular commodity's production and exchange. In the forest carbon case, other key actors, such as timber barons, the military and concessionaires are clearly shaping the environment for (and ultimately the viability of) carbon trade in Cambodia. These competing commodity networks often intersect with forest carbon networks through their common actors and resources. Although invisible in the sense of fulfilling a specific role in carbon transactions, they clearly require attention in CCA as they often exert a strong influence on its configuration and/or viability (Foster, 2006).

This brings us to the final point. An important aspect of power that has been overlooked in existing approaches to commodity chain analysis is the power of 'hidden' actors and their tacit networks and techniques. Their actions, networks and strategies may strongly influence the marketization of green products and services, but they remain 'hidden' from the commodity chain as direct actors. Accordingly, Starosta (2010) questions CCA's lack of direct emphasis on social relations in the production and exchange of commodities. He suggests that the 'functional articulation' of global commodity chains can detract from an

understanding of capital accumulation processes, which are better explained by political-economic analysis (Starosta, 2010: 434). In the case of forest carbon, for instance, attention to the functional and structural elements of commodity exchange tends to privilege attention to direct market actors (e.g. conservation NGOs, brokers, government agencies, villagers, buyers of commoditized ecosystem services) and financial transfers (in the carbon case, these have mainly occurred during ‘market creation’ rather than through the sale of carbon credits *per se*). Yet there is a host of indirect but critical actors and processes that can strongly influence the viability of carbon markets, even though they do not participate directly in value formation and commodity exchange. In a sense they become ‘invisible’ to the commodity chain, although, as we showed in the Cambodian case, at a local level their presence has quite tangible social and material effects. Analysis of such actors and their effects on the green economy may be a critical new area of attention for CCA. In the context of our studies, we therefore see prior conditions, investment strategies and capital expansion working together to facilitate and often accelerate the production and exchange of newly commodified forms of nature.

## CONCLUSION

Is CCA up to the task of mapping the commodity frontier of market environmentalism? This article has endeavoured to respond to this question through three geographically distinct case studies of speculative biofuels in Madagascar and emerging carbon economies in Laos and Cambodia. We demonstrated that while CCA is still quite useful in linking production and consumption globally for material commodities, it must be supplemented with other commodity theories that allow for a broader better analysis of less familiar territory of environmental service-based and financialized forms of nature. We argue that a number of rather disparate commodity-based theories need to be integrated and employed to study this nascent ‘green’ market and the entrenched and expanding power relations that govern it.

Moving forward, we suggest a networked ‘access-mapping’ approach which better accounts for historical and material social relations and which broadens the analysis to include indirect or ‘hidden’ actors and the power-laden institutions and organizations that recursively shape commodity relations (Neimark, 2010; Ribot and Peluso, 2003). It is through bridging the structural and post-structural dimensions of CCA and associated theories in the context of market environmentalism that we find the greatest potential to

capture historical material relations — even though, as we showed above, there are times when the actual production and/or exchange of the commodity do not materialize. This approach can help to place the new commodification of nature and developing chains in their rightful context rather than focusing on a singular commodity (e.g. Foster's, 2006 'commodityscape'). Of particular importance is the recognition of key constraints to access and use, as well as the non-market social meanings and powers of fragmented global commodity flows, speculative financing and the green discourses through which non-material or fungible forms of nature are constructed.

In sum, we hold that the integration of CCA with other strands in commodity studies can provide new insights into the workings of expanding commodification in market environmentalism. We emphasize that future research on green commodity frontiers can utilize the benefits of a commodity chain approach, but must avoid falling into the trap of spatial and social conflation that has in the past lessened the effectiveness of CCA. There is scope for further engagement with multiple and overlapping forms of value including the interplay between material and non-material commodities (i.e. carbon credits vs. coffee or timber) and the significance of extraterritorial governance and power-infused knowledge negotiations in commodity 'production'. One method cannot achieve everything. Yet, through the integration of standard CCA with other critical commodity studies identified here, scholars and development planners and practitioners can better capture the full breadth and depth of complex social and material relations as they crystalize in the green economy frontier.

## REFERENCES

- Agrawal, A., D. Nepstad and A. Chhatre (2011) 'Reducing Emissions from Deforestation and Forest Degradation', *Annual Review of Environment and Resources* 36: 373–96.
- Angelsen, A., M. Brockhaus, W.D. Sunderlin and L. Verchot (eds) (2012) 'Analysing REDD+: Challenges and Choices'. Bogor, Indonesia: Center for International Forestry Research (CIFOR).



- Appadurai, A. (1986) *The Social Life of Things: Commodities in Cultural Perspective*. Cambridge: Cambridge University Press.
- Bair, J. (2009) 'Global Commodity Chains: Genealogy and Review', in J. Bair (ed.) *Frontiers of Commodity Chain Research*, pp.1–34. Stanford, CA: Stanford University Press.
- Bair J. and M. Werner (2011) 'The Place of Disarticulations: Global Commodity Production in La Laguna, Mexico', *Environment and Planning A* 43(5): 998–1015.
- Bair, J., C. Berndt, M. Boeckler and M. Werner (2013) 'Dis/articulating Producers, Markets, and Regions: New Directions in Critical Studies of Commodity Chains', *Environment and Planning A* 45(11): 2544–52.
- Baird, I. and B. Shoemaker (2007) 'Unsettling Experiences: Internal Resettlement and International Aid Agencies in the Lao PDR', *Development and Change* 38(5): 865–888.
- Baka, Jennifer (2014) 'What Waste Lands? A Critique of Biofuel Policy Discourse in South India', *Geoforum* 5: 315–23.
- Bakker, K. (2005) 'Neoliberalizing Nature? Market Environmentalism in Water Supply in England and Wales', *Antipode* 95(3): 542–65.
- Bernstein, H. (1979) 'African Peasantries: A Theoretical Framework', *Journal of Peasant Studies* 6(4): 421–43.
- Bernstein, H. and L. Campling (2006) 'Commodity Studies and Commodity Fetishism II: "Profits with Principles?"', *Journal of Agrarian Change* 6(3): 414–47.
- Berry, S. (2009) 'Property, Authority and Citizenship: Land Claims, Politics and Dynamics of Social Division in West Africa', *Development and Change* 40(1): 23–45.
- Brockington, D., R. Duffy and J. Igoe (2008) *Nature Unbound: Conservation, Capitalism and the Future of Protected Areas*. London: Earthscan Press.
- Burnod, P., M. Gingembre and R.A. Ratsialonana (2013) 'Competition over Authority and Access: International Land Deals in Madagascar', *Development and Change* 44: 357–79.
- Bumpus, A.G. (2011) 'The Matter of Carbon: Understanding the Materiality of tCO<sub>2</sub>e in Carbon Offsets', *Antipode* 43(3): 612–38.
- Büscher, Bram (2014) 'Selling Success: Constructing Value in Conservation and Development', *World Development* 57: 79–90.

- Carrier J.G. and D. Miller (eds) (1998) *Virtualism: A New Political Economy*. Oxford: Berg.
- Castells, M. (2000) *The of the Network Society. The Information Age: Economy, Society and Culture, Vol. 1*. 2<sup>nd</sup> edn. Oxford: Wiley.
- Castree, N. (2005) *Nature*. New York: Routledge Press.
- Cavanagh, C. and T.A. Benjaminsen (2014) ‘Virtual Nature, Violent Accumulation: The “Spectacular Failure” of Carbon Offsetting at a Ugandan National Park’, *Geoforum* 56: 55–65.
- Corbera, E. and K. Brown (2010) ‘Offsetting Benefits? Analyzing Access to Forest Carbon’, *Environment and Planning A* 42(7): 1739–61.
- Corson, C. (2011) ‘Territorialization, Enclosure and Neoliberalism: Non-state Influence in Struggles Over Madagascar’s Forests’, *Journal of Peasant Studies* 38(4): 703–26.
- Daviron, B. and S. Ponte (2005) *The Coffee Paradox: Global Markets, Commodity Trade and the Elusive Promise of Development*. London: Zed Books.
- De Angelis, M. (2001) ‘Marx and Primitive Accumulation: The Continuous Character of Capital’s Enclosures’, *The Commoner* 2(01): 1–22.
- Dicken, P., P.F. Kelly, K. Olds and H. Wai-Chung Yeung (2001) ‘Chains and Networks, Territories and Scales: Towards a Relational Framework for Analysing the Global Economy’, *Global Networks* 1(2): 89–112.
- Department of Forestry (2011) ‘Annual Review of REDD+ Activities in Lao PDR 2010’. Vientiane: Lao People's Democratic Republic.
- Dressler, W., S. Mahanty, J. Clendenning and P. To (2014) ‘Rearticulating Governance through Carbon in the Lao PDR’, *Environment and Planning C: Government and Policy*. DOI: 10.1068/c13200.
- Duckworth, J.W., R.E. Salter and K. Khounboline (1999) ‘Wildlife in Lao PDR: 1999 Status Report’. Vientiane, Lao: IUCN–World Conservation Union, Wildlife Conservation Society, Centre for Protected Areas and Watershed Management.
- Filer, C. and M. Wood (2012) ‘The Creation and Dissolution of Private Property in Forest Carbon: A Case Study from Papua New Guinea’, *Human Ecology* 40(5): 665–77.

- Foster, R. (2006) 'Tracking Globalization: Commodities and Value in Motion', in C. Tilley et al. (eds) *Handbook of Material Culture*, pp. 285–302. London: Sage.
- Freidberg, S. (2004) *French Beans and Food Scares: Culture and Commerce in an Anxious Age*. Oxford: Oxford University Press.
- Gereffi, G., J. Humphrey and T. Sturgeon (2005) 'The Governance of Global Value Chains', *Review of International Political Economy* 12(1): 78–104.
- Gereffi, G. and M. Korzeniewicz (1994) *Commodity Chains and Global Capitalism*. Santa Barbara, CA: Greenwood Press.
- German, L., G.C. Schoneveld and P. Pacheco (2011) 'The Social and Environmental Impacts of Biofuel Feedstock Cultivation: Evidence from Multi-site Research in the Forest Frontier', *Ecology and Society* 16(3)24.  
[www.ecologyandsociety.org/vol16/iss3/art24/](http://www.ecologyandsociety.org/vol16/iss3/art24/)
- Gibbon, P. and S. Ponte (2008) 'Global Value Chains: From Governance to Governmentality?', *Economy and Society* 37(3): 365–92.
- Goldman M.J. and M.D. Turner (2011) 'Introduction', in M.J. Goldman, P. Nadasdy, M.D. Turner (eds) *Knowing Natures: Conversations at the Intersection of Political Ecology and Science Studies*, pp. 1–23. Chicago, IL: The University of Chicago Press.
- GRAIN (2013) 'Land Grabbing for Biofuels Must Stop: EU Biofuel Policies are Displacing Communities and Starving the Planet', *Against the Grain* 1–24.  
[www.grain.org/article/entries/4653-land-grabbing-for-biofuels-must-stop](http://www.grain.org/article/entries/4653-land-grabbing-for-biofuels-must-stop)  
 (accessed 12 June 2013).
- Guthman, J. (2004) *Agrarian Dreams: The Paradox of Organic Farming in California*. Berkeley, CA: University of California Press.
- Hartwick, E. (1998) 'Geographies of Consumption: A Commodity-Chain Approach', *Environment and Planning D: Society and Space* 16(4): 423–37.
- Hess, M. (2009) 'Investigating the Archipelago Economy: Chains, Networks and the Study of Uneven Development', *Austrian Journal for Development Studies* 25(2): 20–37.
- Hopkins, T.K. and I. Wallerstein (1986) 'Commodity Chains in the World-Economy Prior to 1800', *Review* 10(1): 157–70.

- Hughes, D. (2005) 'Third Nature: Making Space and Time in the Great Limpopo Conservation Area', *Cultural Anthropology* 20(2): 157–84.
- Hughes, A. and S. Reimer (2004) *Geographies of Commodity Chains*. New York: Routledge.
- Jindal, R. (2010) 'Livelihood Impacts of Payments for Forest Carbon Services: Field Evidence from Mozambique', in L. Tacconi, S. Mahanty and H. Suich (eds), *Payments for Environmental Services, Forest Conservation and Climate Change: Livelihoods in the REDD?*, pp. 185–211. Cheltenham: Edward Elgar.
- Lansing, D.M. (2012) 'Performing Carbon's Materiality: The Production of Carbon Offsets and the Framing of Exchange', *Environment and Planning A* 44(1): 204–20.
- Larson, A.M. et al. (2013) 'Land tenure and REDD+: The Good, the Bad and the Ugly', *Global Environmental Change* 23(3): 678–89.
- Leslie, D. and S. Reimer (1999) 'Spatializing Commodity Chains', *Progress in Human Geography* 23(3): 401–20.
- Li, T.M. (2014) 'What Is Land? Assembling a Resource for Global Investment', *Transactions of the Institute of British Geographers* 39(4) 589–602.
- Marx, K. (1976) *Capital: A Critique of Political Economy, Vol. 1*. (transl. B. Fowkes) London: Penguin.
- Mahanty, S., A. Bradley and S. Milne (2015) 'The Forest Carbon Commodity Chain in Cambodia's Voluntary Carbon Market', in S. Milne and S. Mahanty (eds) *Conservation and Development in Cambodia Exploring Frontiers of Change in Nature, State and Society*, pp. 177–200. New York: Routledge.
- Mahanty, S., W. Dressler, S. Milne and C. Filer (2013) 'Unravelling Property Relations Around Forest Carbon', *Singapore Journal of Tropical Geography* 34: 188–205.
- McAfee, K. (1999) 'Selling Nature to Save It? Biodiversity and Green Developmentalism', *Environment and Planning D: Society and Space* 17(2): 133–54.
- Melnick, D., M.C. Pearl and J. Warfield (2015) 'Make Forests Pay: A Carbon Offset Market for Trees', New York Times 20 January. [www.nytimes.com/2015/01/20/opinion/a-carbon-offset-market-for-trees.html?\\_r=0](http://www.nytimes.com/2015/01/20/opinion/a-carbon-offset-market-for-trees.html?_r=0) (accessed 12 March 2015).
- Miller, D. (2002) 'Turning Callon the Right Way Up', *Economy and Society* 31(2): 218–33.

- Milne, S. and B. Adams (2012) 'Market Masquerades: Uncovering the Politics of Community-level Payments for Environmental Services in Cambodia', *Development and Change* 43(1): 133–58.
- Moore, J.W. (2000) 'Sugar and the Expansion of the Early Modern World-Economy: Commodity Frontiers, Ecological Transformation, and Industrialization', *Review* 23(3): 409–33.
- Moore, J.W. (2010) 'The End of the Road? Agricultural Revolutions in the Capitalist World-Ecology, 1450–2010', *Journal of Agrarian Change* 10(3): 389–413.
- Moore, J.W. (2015) *Capitalism in the Web of Life: Ecology and the Accumulation of Capital* London and New York: Verso.
- Mutersbaugh, T. (2005) 'Just-in-Space: Certified Rural Products, Labor of Quality, and Regulatory Spaces', *Journal of Rural Studies* 21(4): 389–402.
- Neimark, B. (2010) 'Subverting Regulatory Protection of "Natural Commodities": The *Prunus Africana* in Madagascar', *Development and Change* 41(5): 929–54.
- Neimark, B. (2012) 'Industrializing Nature, Knowledge, and Labour: The Political Economy of Bioprospecting in Madagascar', *Geoforum* 43(5): 580–90.
- Neimark, B. (2013) 'The Land of our Ancestors: Property Rights, Resistance and Alternatives to Land Grabbing in Madagascar' Land Deal Politics Initiative Working Article 26. Cape Town: Institute for Poverty, Land and Agrarian Studies.
- Neimark, B. and B. Wilson (2015) 'Re-mining the Collections: From Bioprospecting to Biodiversity Offsetting in Madagascar', *Geoforum* 66: 1–10.
- Ong, A. (2010) *Spirits of Resistance and Capitalist Discipline: Factory Women in Malaysia* (2<sup>nd</sup> edn). Albany, State University of New York Press.
- Polanyi, K. (1957) *The Great Transformation: The Political and Economic Origins of Our Time*. Massachusetts, MA: Beacon Press.
- Raikes, P., M.K. Jensen and P. Stefano (2000) 'Global Commodity Chain Analysis and the French Filière Approach: Comparison and Critique', *Economy and Society* 29(3): 390–417.
- Ribot, J.C. (1998) 'Theorizing Access: Forest Profits along Senegal's Charcoal Commodity Chain', *Development and Change* 29(2): 307–41.
- Ribot, J. and N. Pelsuo (2003) 'A Theory of Access', *Rural Sociology* 68(2): 153–81.

- Robertson, M. (2012) 'Measurement and Alienation: Making a World of Ecosystem Services', *Transactions of the Institute of British Geographers* 37(3): 386–401.
- Sikor, T. and C. Lund (2009) 'Access and Property: A Question of Power and Authority', *Development and Change* 40(1): 1–21.
- Spaargaren, G., A. Mol and D. Sonnenfeld (2006) *Governing Environmental Flows: Global Challenges to Social Theory*. Cambridge, MA: MIT Press.
- Starosta, G. (2010) 'Global Commodity Chains and the Marxian Law of Value', *Antipode* 42(2): 433–65.
- Storper M. (1997) *The Regional World: Territorial Development in a Global Economy*. New York: Guilford Press.
- Sullivan, S. and M. Hannis (2015) 'Nets and Frames, Losses and Gains: Value Struggles in Engagements with Biodiversity Offsetting Policy in England', *Ecosystem Services* 15: 162–73.
- Sunderlin, W.D. et al. (2013) 'How are REDD+ Proponents Addressing Tenure Problems? Evidence from Brazil, Cameroon, Tanzania, Indonesia, and Vietnam', *World Development* 55: 37–52.
- Tsing, A. (2000) 'Inside the Economy of Appearances', *Public Culture* 12(1): 115–44.
- Turnhout, E., K. Neves and E. de Lijster (2014) "Measurability" in Biodiversity Governance: Knowledge, Transparency and the Intergovernmental Science Policy Platform on Biodiversity and Environments (IPBES), *Environment and Planning A* 46: 581–97.
- Wark, M. (1994) *Virtual Geography: Living with Global Media Events*. Washington, DC: American University Press.
- West, P. and J. Carrier (2004) 'Ecotourism and Authenticity: Getting Away From it All?', *Current Anthropology* 45(4): 483–98.
- WWF (2011) 'Premiere Phase de L'etude Strategique du Developement du Sector Agrocarburant a Madagascar' ['The First Phase of the Strategic Development Sector Study of Biofuel in Madagascar']. Antananarivo: WWF.

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