

— Chapter 3 —

## CARBON AS VALUE

Four Short Stories of Ecological Civilization in China

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### Introduction: Blue Sky Promises

Pollution Season. Red Alert. Airpocalypse. These alarmist buzzwords sound like the work of science fiction. In China these terms describe annual events that deeply affect citizens' capacity to go about their daily lives, as factories stop production, schools close down, airplanes remain grounded, and cars are forbidden to drive. As smog, soot, and dust occlude the sky with noxious haze, citizens remain at home as much as possible, ideally with the comfort of domestic air purifiers, but at least with windowpanes shielding them and their loved ones from choking in the atmosphere thick with particulate matter. Over the past two decades these events have become routine. Yet they continue to generate potential antagonism, as citizens demand the right to breathe freely and healthily.

These events come at enormous economic cost: directly from disrupting production, and by proxy through health costs and the inability to work, study and generally be productive, both during periods of smog-filled skies and in the drawn-out fallout. The 'cost' of air pollution is notoriously hard to calculate. Pollution levels are measured and monitored as particulate matter in the atmosphere, and many citizens check this alongside the weather on a daily basis. The long-term 'cost' of anthropogenic climate change resulting from the changing chemical compositions of the atmosphere is even harder to evaluate. Carbon calculations, typically measured in tonnes of CO<sub>2</sub>

or equivalent greenhouse gases emitted, attempt to accomplish this type of accounting by placing a price on pollution.

In China the political consequences of atmospheric pollution and climate change epitomize a gamble by the Communist Party on state legitimacy that could overshadow any economic costs. Environmental action becomes increasingly pressing, as citizens around the country demand cleaner air, water, and land, such that calls to reduce environmental degradation launch a challenge to the authoritarian regime. The stifling pollution has kick-started a process of environmental restitution, with the CCP promising a coming “blue sky” (*lantian*) through the creation of an “ecological civilization” (*shengtai wenming*) that would reduce carbon and other greenhouse gas emissions (Aunan et al. 2017).

These environmental goals belong to a broader set of government attempts to achieve a “relatively comfortable society” (*xiaokang shehui*). This term was first brought forward in state policy by the post-Maoist Reform Era leader Deng Xiaoping during the market reforms from 1978. At the time, fostering prosperity through sustained GDP growth offered citizens the gratifications of market consumption after the demise of high socialist ideals with Mao Zedong’s passing. Nonetheless, the environmental turn reflects a change from earlier articulations of the policy *beyond* economic growth. Under President Xi Jinping the well-being model has shifted priorities. Greening no longer forms an epiphenomenon, but is a key component of the party’s platform (Hansen, Li, and Svarverud 2018). Xi even pledged to peak carbon emissions by 2030 and reach carbon neutrality for the world’s largest economy by 2060.

These promises are not pure pipe dreams. Although the Chinese economy, and especially its backbone in heavy industries, relies on coal for about two-thirds of its energy mix, the country also spearheads clean energy technologies, such as solar panels and wind turbines (Finamore 2018). While coal is by far the biggest culprit in this carbon bill, the destructive forces of fire, the sapping depletion of groundwater, and the dwindling drops of rainfall certainly beg the question of whether environmental risk, health damages, and economic processes can be rendered commensurable through carbon emissions and legible in terms of financial cost.



**Figure 3.1.** Decarbonizing the countryside with solar fields in Hubei.  
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## Carbon as Value?

Carbon quantification is central to this system. It provides a solution to the problem of the realization of value by allowing investment into production to continue, and enabling practices of consumption to grow. Calculating greenhouse gas emissions in everything from power plants to forestry reserves, and plastic toys to bicycle rides, carbon accounting renders environmental degradation quantifiable, legible, and monetizable. Highly diverse processes, objects, and activities thereby become commensurate and exchangeable, and subject to market mechanisms and financial speculation, especially in the form of carbon credits that put the right to emit tonnes of CO<sub>2</sub> and equivalent greenhouse gases up for sale. Finding a definitive explanation of what a carbon credit *is*, through analogies with trading in commodities, risk, and currencies, has been subject to debate (see Christophers 2018; Dalsgaard 2013; Descheneau and Paterson 2011; Günel 2016; Lohmann 2010; Newell and Paterson 2010). Yet the particularities of carbon quantification and emissions exchanges within the Chinese context from a value perspective begs the question of what carbon credits *do*.

Whether a particular value is alienable or inalienable (Godelier 1996), commensurable or incommensurable (Gudeman 2008), or calculable or incalculable (Guyer 2004) has been a long-standing focus for anthropologists who acknowledged that what cannot be sold, compared, or counted is often the most ethically, socially, or environmentally valued (Graeber 2001, see also Bohannon 1955). These Weberian, at times Maussian, approaches trace coexisting spheres, regimes or tournaments of value in their diversity (Appadurai 1986), yet nonetheless predominantly revolve around market principles or exchange relations in their estimation (Elyachar 2005). When considering the operations of climate capitalism through the carbon metric, the seeping of 'insidious capital' into everyday activities and vernacular formulations of value, including the metabolism of earth, nature, and life itself, looms large (Kalb, this volume).

Putting a price on carbon emissions, whether through markets or taxes, has been considered key to ameliorating ecological catastrophes arising from atmospheric toxicity and anthropogenic climate change in global environmental governance. And yet, price does not equate to value, and the exchange relations and market principles allegedly underpinning commodity prices in capitalist circulation do not exhaust the value relation. Rather than representing inherent value through a naturalized price, commodities circulating in the market detach from the social relations of production through their exchange value, with a price masking the exploitation, dispossession, and extraction underlying their origins, and alienating producers from the products of their labor. As such, a political economy analysis of the value relation from a Marxian perspective supports a pluralist value framework (Turner 2008), where notions of dignity and worth meet logics of production and circulation (Franquesa 2018), yet ultimately also drive vertical processes of accumulation (Kalb, this volume).

In a sense, beyond logics of markets, exchange, and accumulation, value may seem like an excess 'outside' of the value relation of political economy. And yet, as one moves along the scalar disjuncture between value, for instance as personal dignity or ecological worth, more encompassing notions of value emerge along the posited chain of value. Specifically, environmental conflicts bring fissures and contradictions between competing values into stark relief, with even practitioners themselves often engaging in explicit valuation arguments while championing a future world ecology (see Tsing 2004; West 2005). Global experts in the world of carbon finance routinely and explicitly welcome the 'added value' of this 'payment

for ecosystem services,' while the Chinese state hails enlightened 'ecologically conscious' (*shengtai yishi*) citizens to lead a 'low carbon life' (*ditan shenghuo*), and thereby help to realize the political project of 'ecological civilization' (Bruckermann 2023). Carbon as a value sits uneasily at the point where large-scale forms of accumulation from carbon finance meet personal commitments to environmental restitution. Not only does this juncture of 'insidious capital' generate the 'intimate contradictions' Don Kalb describes in the Introduction, but carbon as a value acts as both a 'driver of accumulation' and a 'form of attachment' that underwrites grand narratives of 'civilizational value.' Rather than an 'outside' of political economy, nature here emerges as a key vector of value within contemporary capitalism.

Carbon quantification also debunks the narrative of nature as a potential 'outside' of capitalism through debates over planetary boundaries and global commons, on the one hand, and debates about the value of labor, on the other. The process of carbon quantification could be naively construed as indicative of capitalism recognizing the planet as part of a 'global commons,' thereby imbuing the rise of carbon markets with utopian impulses. Yet, from this perspective, what carbon offers is simply privatizing these commons through property rights, especially when multiplying environmental dynamics are simply rendered as 'other' externalities to be brought into capital calculations. Considering the central role of a 'value regime' in the ecological crisis of capitalism brings clarity to this process (see Kalb, this volume). Moving beyond 'the commons' as an egalitarian and affective sphere of mutuality that stands in contrast to the calculative self-interested manifested in spheres of exchange (De Angelis 2007), the primacy of the value relation in capitalist processes of exploitation and extraction overcomes shortcomings of a limited labor theory of value (Elson 1979; Harvey 2018; Walker 2016, 2017).

Drawing on the insight that it is the withdrawal or refusal of labor, whether the living labor of the female domestic worker or the enslaved colonial subject, that crystallizes in contradictions and confronts capitalism with ongoing crises (Moore 2016), this chapter turns to the nexus of energy and labor within the shadows of apocalyptic contractions (Caffentzis et al. 1980). From the sixteenth century onward, various strategies of mapping land, utilizing energy, and quantifying labor allowed a new regime of value to emerge (Moore 2016). This enabled the exploitation of abstract labor through the wage relation, and simultaneously fostered the appropriation of abstract nature through the unpaid work and reproductive processes

of human and nonhuman nature (*ibid.*). Cheapening and devaluing living labor and nature subsequently legitimizes the intervention of capital to infuse value to labor and nature to which it has previously laid ‘waste’ (Franquesa 2018; Walker 2016, 2017; see also Peña-Valderama 2023). Yet here we come to the limits of the political economy of value in its quantifiable form, as degraded landscapes, polluted atmospheres, and inhumane livelihoods generate revolts of human and extra-human nature.

The economy of carbon credits, with its quantified metric of the emission for greenhouse gases into the atmosphere, sits at this node between value as an abstraction of the political economy, on the one hand, and values in their ethical diversity, cultural complexity, and ecological entanglement, on the other. This chapter argues that the efficacy of carbon does not lie in symbiotically realigning capitalism with nature, nor in generating an alternate source of value to capitalist logics. Instead, carbon masks contradictions between economic growth and environmental sustainability, capital accumulation and political legitimation, and financial debt and green credit, in highly uneven and extractive ways. Exploring the crux between value and values in carbon governance, and how the insertion of carbon into capitalist processes allows for processes of exploitation and extraction to continue, reveals human and extra-human resistance to continuing with business as usual, potentially bringing life as we know it to a halt.

The value perspective illuminates a central aspect of the carbon relation in climate science and environmental policy: carbon as simultaneously value and anti-value. Exchanges in carbon emissions reductions promise that humanity can save itself from ecological catastrophe without limiting economic growth. This assurance rests upon the idea that carbon pricing will limit ecological destruction through the financial incentives and cost deterrents dictated by the exchange value for environmental degradation. Despite the institutional framework the Kyoto Protocol set for allocating responsibility for atmospheric pollution and limiting global emissions reductions according to expert models, carbon markets around the world have failed to achieve ecological redress. Tracing experiences of the boom and bust of various emissions exchanges in China, I argue that carbon credits remain just that, credits, a form of ecological debt in which payment, and risk, is deferred until some point in an uncertain future.

While a debt repaid constitutes value, a default constitutes anti-value, potentially bringing the entire system to a halt (Harvey 2018).

But whether the carbon credit becomes realized as value or anti-value, the destructive work of capitalism on humans and the environment continues. Despite this failing in the system in terms of the purported outcome of carbon markets as reducing emissions, they nonetheless fulfill a mythic, even utopian, function. This redemptive impulse emanates from emissions exchanges as the socio-technical fix to the failure of capitalism to safeguard the reproduction of life through atmospheric composition and climatic constancy. This is because carbon markets allow the economy to grow, despite ecological degradation, and provide capacities for refinancing and bailing out failing emissions exchanges, as a succession of follow-up schemes soften the fallout of previous schemes.

Although carbon circulates globally, it hits the ground in highly uneven and unequal ways. As carbon flows in global, national, and local environmental governance, the metric reshapes landscapes, populations, and subjectivities. This manifests in projects for regional beautification and design infrastructure, from forging low-carbon landscapes to erecting forest cities, from green branding of hotels and tourism operations to the construction of energy efficient infrastructure, all in the name of forging 'low carbon life' as a mode of being. While carbon appears as if it solves the environmental-capitalist contradiction of endless growth and limited resources, it only does so within its own terms—that is, as an abstract and aggregate quantification unfolding under the rigorous yet distorted logic of abstraction. Concrete places and lives, both in capitalist production centers and in ecological compensation spaces, must be devalued as 'cheap' to legitimize the intervention of capital to exploit, expropriate, and deplete these regions. Meanwhile, the imaginary of the ecological green city inhabited by well-educated middle classes doing creative work does not exist beyond a sum of indicators, or as a future utopia elusively out of reach.

The developmental aspiration of a low-carbon civilization envisions an increasingly middle-class population concentrated in sustainable cities, with the countryside serving as a reservoir from which to exploit vital, and cheap, resources, such as labor, energy, and even clean air. To achieve this goal, the Chinese government is instituting emissions exchanges as mechanisms to balance and reduce pollution from industrial, cosmopolitan, and financial heartlands through sourcing sustainable energy and planting forests in peripheral green lungs. The resulting rural-urban transformation entrenches spatial, social, financial, and technological inequality in contemporary Chinese, and global, capitalism.

To approach Chinese carbon markets ethnographically, this research focuses on ‘critical junctions’ (Kalb and Tak 2005) where capital accumulation and value generation are not only created, but contested. Although environmental degradation contains the potential for uniting the shared interests of citizens across class divides, China’s pursuit of low-carbon development not only transforms, but also exacerbates the transformation of class inequalities. In particular, three classes of green citizens emerge through the institutionalization of carbon accounting: first, financial and political elites who stand to profit from the financialization of environmental processes, particularly through carbon trading and related activities as ‘green investors’; second, middle-class citizens seeking political intervention into pollution problems and environmental justice, who enter the carbon market as ‘green consumers’; and third, rural farmers, peasants, and workers who cultivate, profit from or become supplanted by carbon finance as ‘green producers’ of emissions reductions and offsets. In the following section I will present four ethnographic ‘carbon cases’ that illuminate relational struggles ‘from above,’ where capital and state classes seek to maintain their returns on capital; ‘from the middle,’ where citizens scramble to protect and uphold allegedly ‘freely chosen’ values; and struggles ‘from below’ that aim to challenge suppression, marginalization, and devaluation, sometimes with anticapitalist potential (Kalb, Introduction).

## **The Chinese Carbon Market and the Energy Sector**

Emissions exchanges establish a market for the right to emit greenhouse gases through buying and selling standardized, quantified, and monetized units of ‘carbon,’ one tonne of CO<sub>2</sub> or greenhouse gas equivalent. Often simply known as ‘carbon markets,’ these mechanisms establish a trade between carbon ‘debts’ accrued by emitting greenhouse gases, and carbon ‘credits’ produced by cutting or offsetting emissions with environmental practices, such as renewable energy and forestry projects. After experimenting with regional carbon markets since 2011, China finally launched its unified carbon market in 2021. Especially in the early 2010s, the price collapse of the UN-backed carbon market and the long-time ineffectiveness of the EU emissions exchange made anxieties and expectations for the Chinese carbon trade run high, as the largest emissions exchange in the world gradually expanded to encompass more industrial sectors. In the lead-up, the rollout of the national emissions exchange



was continuously deferred, and has now, initially, been limited in scope to the energy sector. In a sector dominated by state-owned enterprises, the state is effectively monitoring itself through the market mechanism.

The boom and bust of this succession of carbon markets, from the global UN framework to the regional EU emissions exchange, informed the rise of carbon markets in China, as the fear of stranded assets and the political pressure on the CCP to address pollution mounted. Under the direction of political cadres, think-tank researchers, carbon consultants, financial traders, environmental experts, software developers and energy engineers, the metric of carbon as a global market mechanism for environmental governance became entangled with national priorities focused on 'performance legitimacy' through the speculative futures of carbon, despite limited ecological efficacy. This chimes with attempts by the Chinese state to assuage citizens' demands for ecological justice, particularly in relation to atmospheric pollution and climate change as part of a new 'performative governance' (Ding 2020) that rests on the spectacle of environmental quantification as political accountability.

In the establishment of the national carbon market, priorities have shifted as the market has been repeatedly postponed and now unrolled in a far more limited form than previously anticipated. The State Council announced in 2017 that the national carbon market would initially only cover the energy sector, based on benchmarks and carbon intensity levels, and be limited to spot trading. It has also been demoted in national priority from the integrated National Development and Reform Commission to the more task-specific and less-powerful Ministry of Ecology and Environment. In parallel, a new focus on green bonds emerged that now absorbs and directs most carbon finance in China. This has led to a boom and bust in anticipation, aspiration, and speculation in carbon futures.

The central role of the state as the enforcer of its administrative mechanisms for carbon emissions exchanges bears consideration in China and beyond. As the Chinese state acts as both the environmental regulator of carbon-intensive sectors and the actual owner of potentially stranded assets, such as the coal industry, it leads to an internal clash of interests that brings out the contradictions between growth and sustainability even more sharply than in a classic 'neoliberal' context (Nonini 2008). Patrick Bigger (2015), for instance, has argued that the Californian carbon market creates barriers to production, or at least it hypothetically has the power to do so, through setting caps on carbon emissions. Rather than a freewheeling market,

this creates a kind of rationing system in which the state can accumulate capital by rent extraction from producers of the surplus value in circulation.

This is not the case for the Chinese carbon market, following the 2017 decision to have benchmark energy intensity targets, not absolute caps, for the allocation of carbon emissions permits to polluters (see IEA 2020). Carbon intensity targets connect emissions allowances to GDP growth, thereby providing shifting goalposts for compliance. Despite the large ceremony and fanfare that accompanied the 2017 announcement, the compliance period for the energy sector only began in 2021, and prices for one tonne of emissions languish at around 50 RMB. Despite the primary coverage for the coal and gas energy sector, long-term roadmaps show the gradual inclusion of further heavy industry sectors, such that a cement factory could be trading with a steel mill, and so forth. As it stands, the Chinese carbon trading system sometimes even acts as a fossil fuel subsidy, as many new coal-fired energy stations fall below the benchmarks and therefore have permits to trade at market prices. The decision against having an absolute cap was ostensibly based on government concerns over producing ‘stranded assets’ of fixed capital in the form of obsolete coal mines and power stations.

The Chinese carbon markets cover corporations that are often state-owned enterprises (SOEs). These are entities that engage in commercial activities on behalf of the state as their owner. Government ownership can vary from direct governmental control, like commercial branches of the state, to enterprises where state actors are the major stockholder but the entity is nonetheless publicly listed. SOEs often dominate sectors necessary for keeping the entire economy running, such as resource extraction, heavy industry, construction, and energy provision. But SOEs often include companies beyond those covered by the carbon markets. Like the early Shanghai stock market (see Hertz 1998), the regional flagship carbon exchanges in Beijing, Shanghai, Tianjin, and Guangzhou are joint ventures between local governments and various SOEs involved in finance, energy, oil, and gas (Lo 2016: 62). The same is true of the Shanghai Environment and Energy Exchange that hosts the national market.

Today, state-owned enterprises make up 102 of the largest enterprises across the country, employing some 40 million people, with assets of 50 billion RMB (Wu 2017). However, these companies are often plagued with low profits, high corruption, and oligopolies. Some news sources go so far as to refer to many as ‘zombie companies’ due to overcapacity in production and weakness in profitability

(Wildau 2016). For SOEs, the immediate profit motive and fast cycles of return are not necessarily their most immediate motivation. Instead, their situation often resonates with an argument Ching Kwan Lee (2014) has made regarding Chinese capital investments overseas, particularly in Zambian copper mining. Lee delineates two ideal types of capital with corresponding logics of accumulation: the familiar type is global private capital that maximizes profits for individual shareholders, but the second type is Chinese state capital that encompasses other types of return beyond capital accumulation, such as political stability and access to economic resources. The way many commentators address the use of carbon finance in China's new flagship infrastructural investment policy, One Belt One Road, suggests that this corresponds with China exporting carbon, as well as capital, beyond its borders.

Within the Chinese economy overall, and certainly within carbon markets specifically, various actors and their actual practices are embedded along a state–market continuum. This is not just the result of centralized capacities of the state, but is also due to the three ways that state actors permeate the economy and finance. First, there is the rhizomic character of state departments, bureaus, commissions, and think tanks managing many essential tasks of the economy, including carbon trading, through direct nested links to the government. Second, is the focus of the emissions market on the heaviest industrial polluters dominated by state-owned enterprises. Third, the state participates in China's banking sector, and even stock markets and carbon trading platforms, through state-ownership, joint-stock ownership, and joint ventures.

Contradictions emerge between the desire to reduce emissions and foster a low-carbon economy at the lowest possible cost, and the anxieties over the speculative character of financial instruments. This leads many carbon market actors in China to oscillate uneasily between encouraging a financialized market to determine carbon prices and the state administration prioritizing the stability and predictability of dictating emissions prices in line with related economic priorities of low-carbon growth. This fractures familiar narratives about private accumulation and state redistribution as representative of public interests enshrined in the standard ideology of liberal capitalism. In China, the situation in which the state and state-owned enterprises accumulate capital within a closed circuit lends itself to a theory of public accumulation.

The carbon market allows polluting industries to continue emitting while buying emissions credits, so that the problem of emis-

sions is not necessarily reduced, but simply pushed into the future. This becomes particularly acute when carbon benchmarks are based on historically high, or even artificially inflated, thresholds. In fact, corporations may profit from emissions exchanges when advantageous allocation means that they can trade their surplus credits on the market. For instance, Feiyu,<sup>1</sup> an employee involved in the carbon accounting of a Chongqing energy giant, boasted of the profits the corporation had made after buying into an increasingly diverse energy portfolio, and selling excess emissions credits. Rather than capping emissions on particular industrial facilities, Feiyu explained, the Chongqing emissions exchange had generously allocated emissions credits to energy corporations, frequently leading to high ‘compliance’ rates but also windfall profits for big energy players.

The contradictions surrounding these experiments of a “green transition” set them up to fail, though frequently with the saving grace of increased knowledge surrounding emissions accounting and the workings (or failings) of carbon markets (see Bruckermann 2023). Especially in the wake of the upheavals to production and supply chains catalyzed by Covid-19 since 2020, and the energy insecurity following the Russian invasion of Ukraine in 2022, many countries have increased emissions-intense coal in their energy mix. In the following ethnographic sites, the formal carbon expertise concocted in global boardrooms suffuses everyday lives on the ground, and reveals the ubiquity of the infiltration of ‘insidious capital’ into the ‘hidden abodes’ including: sites of production that enfold labor exploitation and resource degradation; spaces of the social reproduction that co-constitute individuals and communities; and the workings of nature, where the metabolism of the earth itself becomes an object of exchange and a driver of accumulation (Kalb, Introduction).

As aspirational horizons around social mobility and desperate hopes for environmental redress collide, the specter of ecological destruction hovers above carbon calculations. The instabilities from internal migration and forced displacement as a result of pollution and climate change, as well as widespread unemployment and the devaluation of industrial and agricultural labor, coincide with the Chinese turn toward a postindustrial low-carbon economy. Local events have also brought complications in forging low-carbon landscapes to light: carbon markets incentivizing the construction of new coal facilities; forest fires destroying green mountainsides and displacing local residents; rising energy prices leading to blackouts and protests in landscapes marred by extraction; and the depletion of groundwater in coal operations, as well as anti-desertification carbon

afforestation. This desire for low-carbon landscapes and the devaluation of degraded lives, livelihoods, and environments is particularly notable in Shanxi Province, a central province in Chinese coal country where we turn next.

## **Forging Low Carbon Lives in Chinese Coal Country**

The Chinese carbon trading system does not look likely to push coal out of the energy mix in the foreseeable future. The approval for new coal projects actually increased in 2020. A couple of contributing factors to this have already been discussed: first, the carbon intensity target that connects emissions allowances to economic growth through GDP, rather than instituting an absolute cap on emissions; second, the grandfathering of emissions based on past levels, which rewards increases in efficiency, for instance by building new coal power stations rather than replacing them with renewables. Moreover, while the carbon market may bring the 'externality' of greenhouse gas emissions into corporate balance sheets, it continues to rely on other 'externalities,' for instance the extraction of water needed to produce coal-fired energy. Carbon also acts as anti-value in ways that are harder to trace and grasp, including by wasting landscapes and livelihoods, for instance through forest fires and mine collapses, and even draught and desiccation that have the potential to disrupt life in the region. This section will turn to these processes of 'wasting' landscapes and livelihoods.

In Shanxi, decades of suffering atmospheric pollution and landscape degradation, followed by calls to decarbonize the economy, could result in mine closures and massive layoffs, exacerbating energy austerity amid a landscape marred by extraction. Many residents felt that they not only carried the burden for China's industrialization (in terms of health and labor) but now were potentially sacrificing even their livelihoods to deindustrialization. Yet a contradictory outcome of the emissions exchange was that the construction of newer 'cleaner' coal facilities in the province came to a halt not due to a lack of finances but to a lack of water, placing limits on coal excavation, fuel processing, and energy production. This 'externality' emerged in a region already deemed as wasted, degraded, and devalued by industrialization.

In a region where residents directly and indirectly depend on the coal industry for their economic livelihood, falling from the position as trailblazers of industrialization to the villains of the pollu-

tion crisis was accompanied by two downward trajectories: first, a process of devaluation; and second, a loss of dignity. In this way, it echoes the dual depreciation that Jaume Franquesa describes as a legitimization to the intervention and expansion of capital into ostensibly ‘peripheral’ regions where “certain places and peoples are constructed as waste—residual, barren, marginal, disordered—[so that] capital can justify the need to intervene and make them valuable” (Franquesa 2018).

As Shanxi struggled to decarbonize, residents who suffered from stomach cancers resulting from a diet grown in polluted soils to emphysema of the lungs caused by airborne particulate, began to actively point to degraded landscapes as symptomatic of their loss, from dried riverbeds to discolored sediment. Nonetheless, they often faced ethical dilemmas about their professional and personal involvement in coal, both in their family history and life trajectory. Fangdi, a real estate officer of an energy corporation, and the son of a former coal mining bureau inspector, once indicated to me a hillside hollowed out by mining and blasted for a strip stone quarry, and poignantly asked me: “You think this is a place to study ecological civilization?! Look at that, this is the place to study ecological destruction (*shengtai pohui*).”

With much of the groundwater contaminated or depleted, especially near lucrative coal seams, coal corporations shifted their concern from financial sources to water resources as the main scarcity factor placing a limit on their energy ambitions. The lack of rainfall in recent years had coalesced into worrying conditions for the spread of wildfires in the region, with the remaining forests heavily affected. Visiting Red Mountain village, the entanglement of coal, draught, and extraction entwined in understandings of family history and the local environment. Water in the area had vanished almost completely as mines used up the water underground and rainfall could no longer replenish the depleted resource. The site in the valley basin had once been famed for its production of luxury porcelain, which had all but disappeared as the water reserves dwindled. Driving up a dusty road alongside a snaking dried-out riverbed, we saw the remnants of water mills that once ran on the water gushing and gurgling into the valley. Now the concrete channels snaking up the hillside were dried and cracked from desiccation, yet still led the way to the temple for local water deities.

Before making our way up to the temple in the forested hillside, we passed a checkpoint by the forestry department, with the village’s designated forest guardian (*hulinyuan*) registering us on a formal list

and asking us a series of questions about flammable items we might be carrying, such as lighters, matches, candles, and incense, as a massive forest fire was spreading across a hillside nearby, and the dried forest was at its most vulnerable to fires. He confirmed that the local spring used to bring forth 1 ton of water per second, but now there was none, and every trickle had to be pulled out from the dwindling groundwater. This water was used for the coal industry, ostensibly expanding other industries. Nevertheless, the famed local ceramics factories had to close, and the farmers had to turn from rice to wheat, and increasingly corn, as the land dried up. With the ceramics factories moving increasingly downstream, residents tried to make ends meet by turning to machine production, giving up on the high-end handmade production, as business literally dried up. As the forest guardian summarized: “Villages without water are doomed.”

Later that evening in the nearby mountain village of Sweeping Cliff, Xing, a former industrial worker in a stone quarry, and his wife Sheng, a farmer, discussed the breakneck speed of development in the region. Due to this goal of rapid growth, Xing explained how pollution and safety often fell by the wayside in industrial facilities. Sheng pointed out that this year the family could only plant genetically modified corn. “It’s so dry and hot, there’s no water, no rain,” she said angrily, “so we cannot produce anything for family consumption, only corn to sell.” Their daughter, Sandan, worked at the coal washing station in the valley nearby, though unlike male miners, she did a lot of computer-based calculations in weighing coal and checking its quality. Her classmate pointed out in a cynical commentary that she was “making the big bucks,” poking fun at her paltry salary. However, good jobs beyond the energy sector were hard to come by. Her husband worked as a coal truck driver, which was considered dangerous work due to accidents on the dusty and crumbling roads, but the work was relatively lucrative.

Although Sandan worked in the coal sector, she refused to take up a job with the energy corporation that had dispossessed her family of their courtyard to develop tourism in the village. She was especially critical of this transition as she was particularly close with her paternal grandmother, the now deceased former owner of the family courtyard, for whom the home had been a materialization of her life’s achievements (see Bruckermann 2019: 65–70). Although she worked in the coal sector, Sandan was nonetheless concerned about the environment. For instance, through her individual ‘carbon account’ (*tan zhanghu*) on Alipay’s third-party payment service app, trees were planted in the northern Chinese desert, while, as she pointed out,

trees in Shanxi were burning to the ground. Yet her activism was highly individualized and personal, linked more to her own online life than the global environment. Turning to the people actually planting trees for carbon credits reveals the material immediacies and scarcities produced through these digital transfers in personal carbon accounting.

## Rural Green Producers in the Tengger Desert

Throughout China, there are low-carbon projects compensating for urban and industrial pollution by afforesting the countryside. In doing so, forest workers produced emissions credits that were in turn allocated based on the absorption of carbon dioxide in trees and plants. This newly established spatial hierarchy dispossessed some former farmers of their livelihoods in agricultural production as they became cheap labor reserves in a depopulated forest-dedicated countryside, or joined the swelling ranks of precarious wage laborers crowded into increasingly urbanized zones. This phenomenon was exacerbated in Southern China, where the Fujian pilot emissions exchanges set minimum quotas for forestry offsets, and professional carbon companies approach farmers with promises of lucrative land usage conversion deals (see Bruckermann 2020). Although shouldering the manual labor for carbon offsets that promised improved livelihoods from the carbon offset income, rural citizens' capacity to achieve a middle-class position through green production remains questionable.

To engage with the issues of environmental motivation beyond government policy and urban consumers, it is worth turning to a region in Northern China where, at least according to a lead official in the local forestry bureau, "everybody" was engaged in constructing "ecological civilization" and had attained "ecological consciousness" due to environmental hardship. Central Gansu Province, nestled between Inner Mongolia to its north and Qinghai to the south, is a region of illustrious historical prominence along the Northern Silk Road that has recently been heralded as an important point for 'One Belt One Road' development plans across Eurasia. An arid climate of scorching summers and biting winters is compounded with a net loss between precipitation and evaporation. Farmers must irrigate crops or concentrate on draught-resistance plants to wring agricultural products from the silty soil. The sandstorms in the Prefecture of Wuwei have forced the resettlement of 'environmental refugees'





**Figure 3.2.** A work team reforesting the desert in Gansu Province.  
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(*huanjing nanmin*). Further afield, the dustbowl contributes to high levels of particulate matter obscuring the sky as far away as Beijing. The border zones between the oases and the desert have become an expanding target area for ‘sand control afforestation’ (*zhisha zaolin*) (see Zee 2017). A variety of local actors attempt to keep the deserts at bay—most prominently, the forestry and environmental bureaus, but also forestry farms, corporate social responsibility programs, volunteer associations, and even some citizen activists.

The region has gained prominent notoriety through a cautionary campaign as an exemplar of the vagaries of both climate change and desertification. Minqin County, in particular, faces two encroaching deserts, the Tengger and the Badain Jaran, as golden sand dunes threaten cities, towns, and especially smaller villages. The area now serves as an experimental model for anti-desertification interventions, especially since Chinese premier Wen Jiabao visited in 2007 and promised not to let Minqin become a second Lop Nur, a huge lake in nearby Xinjiang autonomous region that was swallowed by the Gobi Desert in the 1970s. In addition to the government campaigns, Alipay’s Ant Forest campaign has put the region on the map in many mobile phone users’ imaginations, as Minqin County in

Gansu and the neighboring Alashan regions of Inner Mongolia have become a vibrant afforestation ground for mobile phone app users.

In August 2016, Alipay introduced carbon accounts for every one of its 450 million users. Complementing their conventional cash and credit accounts, the new carbon accounts track consumers' carbon usage, and match savings with afforestation projects of equivalent carbon value through the mini-app Aliforest. As of May 2018, about 350 million users had clicked into the Aliforest system, with about 40 million becoming hooked on the app. Alipay claims to have planted about 55 million trees and reduced nearly 3 million tonnes of carbon emissions through the app, as well as conserving 2,667 ha (40,000 mu) of protected lands. For their efforts, Alipay has been praised by the communist party and fintech aficionados, even attracting a high-profile collaboration with the UNEP on greening financial technologies. This is also how the region came to my attention, and only upon arrival in 2019 did the realization dawn on me that the whole area had been turned into a place for competitive company plantation projects, as well as a recipient of central state forestry funds, making afforestation a major employment sector.

The actual work of fighting the desert involves planting shrubs and trees to fix the shifting sandbanks. Workers begin stabilizing the sand dunes by laying grids of straw or nylon mesh that can hold the vulnerable and valuable seedlings. After digging holes in the sand, they implant the roots of sturdy bushes, trees, and other draught-resistant vegetation. They then water the seedlings from buckets, usually filled up from a nearby truck, before moving on to the next dune. Despite these precautions, survival rates for these transplants are often low, and depend on what patterns of rainfall, wind, erosion, and temperatures befall the area in the subsequent period.

The labor relations in the afforestation drives depend on the type of project being realized. State-owned forestry farms and forestry bureaus usually employ middle-aged women as manual workers, whose children have usually migrated to urban areas for work or study and whose husbands frequently work as industrial or manual laborers in nearby centers. Most work groups are headed up by a local foreman with forestry training, who manages operations and drives the supply vehicle along the work routes. Investors, such as Alipay's Ant Forest, often channel funds for these projects through more local environmental and forestry foundations, which, in turn, subcontract the actual afforestation to the forestry farms and bureaus. In addition to these large-scale employers, the Wuwei region also hosts various volunteering efforts and grassroots projects

for anti-desert afforestation. A small number of farmers have even taken anti-desertification measures into their own hands.

A family project like this is headed by Zhang Lao-mo who goes by a term of address that is short for *laodong mofan* (i.e., Model Worker Zhang), a designation bestowed upon him by Hu Jintao when he was invited to Beijing for the ceremony honoring him and his fellow ‘servants of the people’ in the Great Hall of the People on Tiananmen Square in the mid-2000s. When we met in 2019, Zhang was a squat and muscular man of fifty-one years, with a tanned face and calloused hands from a lifetime of planting trees in the desert. In the Wuwei District of Liangzhou he organized grassroots afforestation drives in which he acted as a foreman and teacher, depending on whether he was leading his village work team or visitors from nearby urban work units, political associations, or educational institutions.

Zhang felt fighting the desert was his life’s calling, and even as a child agonizingly completing four years of primary school, he was already drawn to manual labor (*laodong*) rather than studying. As a result of his short formal schooling, he considered himself ‘uncultured’ (*meiyou wenhua*). Nonetheless, he claimed great inspiration from, and admiration for, the wisdom of Chairman Mao, whose smiling poster hung above his desk of accolades, to remind him of “The great scholar, who understood both Marx and China, and transformed the masses into a force for the future.” He shared this passion for Maoism with his father, with whom he also played both songs of the desert and the ‘red’ songs of the Cultural Revolution, on matching Chinese spike fiddles, the *erhu*.

Jin, Zhang’s wife, also had a lifelong dedication to keeping the desert at bay. As one of nine children in the same commune as Zhang, she had grown up in a family that also afforested the desert, but in a different brigade from her future husband. Nonetheless, they had known each other their whole lives, and were dedicated to this cause, as well as to each other, from a young age. While they agreed that their lives and behavior followed the recommendations for leading a ‘low carbon life’, Zhang insisted their approach would be more aptly labeled the ‘peasant way of life’ (*nongmin shenghuo*), as it is built on scarcity rather than plenty. Although they received funding from carbon offset mechanisms, the Zhang family was critical of the logic of ‘carbon sinks’ (*tanhui*) to balance urban pollution. While one of their partner organizations, a prominent promoter of corporate carbon projects, came to calculate the CO<sub>2</sub> absorption of their trees and shrubs, the process by which these calculations were made,

and even their outcome in terms of absolute absorption, remained obscure to them.

Despite his ardent enthusiasm for anti-desertification afforestation, Zhang and his family members expressed uncertainty about the alleged aim of combating climate change through forest carbon, as well as the financing for such projects. Indicating to a sign awarded to them as part of an ongoing carbon sink project by a funding foundation, Zhang explained: “Look, the climate (*qihou*) is not our main priority. First, we look after our bodies and our health, and what the benefits there are from improving the environment. Second, we combat the desert, we stop the sand from encroaching and the desert expanding. These are our priorities.”

His father, Zhang Senior, described the process of quantification as one in which the carbon foundation attempted to calculate not just carbon, but labor time and wages. Zhang Senior considered this feat nonsensical in relation to their family’s way of working, which was based on lifelong dedication rather than work hours. Negotiations around the payment for the carbon afforestation with the foundation led to a sustained back and forth, with the eventual outcome that the foundation opted to measure and compensate for the size of the trees. Zhang Senior felt that the limits of calculation should include not just the time spent planting in the dunes, or the trees that resulted from these activities, but the overall costs of sustaining a life in the desert.

His wife, Zhong, agreed, describing an analogy between their approach to planting, growing, and raising trees, and a mother nurturing her children, such that it became impossible to reduce this to quantified value. Moreover, Zhong felt that even the measurements of carbon quantification were misguided, as she pointed out:

Like a mother feeds her children, we go to water the plants, so what this is worth is impossible to say. And while some children grow big and may be taller than others, a mother cannot be responsible for this. She wants them all to survive. With trees in the desert, this is difficult; the low survival rates of trees are not about neglect.

The unspoken implication was that survival in the desert was part of an ongoing livelihood struggle that could not be captured through a quantified carbon analogy, nor compensated through wages. Instead, it was part of an ongoing fight to safeguard extended families, with the analogies between seedlings and children.

## Individual and Household Carbon Accounting

The government's recognition of environmental imperatives echoes increasingly vehement ecological demands by Chinese citizens as they struggle to maintain their lives and livelihoods despite stifling air, soil, and water pollution, but who nonetheless aspire to middle-class lifestyles. Individual and household carbon accounting have spread throughout the country in recent years, increasingly tying ordinary citizens into emissions exchanges, sometimes even involuntarily. Experimenting politically, Guangdong governments have developed and piloted household carbon accounts across a variety of sites through an online application called Inclusive Carbon, including by tapping into data collection for utilities from the lowest form of governance, neighborhood associations, and issuing a carbon currency that can be exchanged for local goods and services as rewards for ecological behavior. Other mobile phone applications enable users to balance their personal emissions through buying into the same forest and energy 'offset' projects that large corporations use to cancel their emissions debt through emissions credits.

These carbon schemes do not take users to task for carbon actually emitted, but rather reward them for alleged emissions reductions, calculated by subtracting their activities from hypothetical baselines. The calculative mechanism thereby actually reduces their responsibility, rather than their emissions, through an imagined, fictive fantasy of carbon savings. The fetishization of CO<sub>2</sub> in climate science and in environmental policy in the last three decades has contributed to this contradictory apportioning and removal of responsibility by wedding cybernetic fantasies and neoliberal proselytizing (see Bruckermann 2022). In particular, current behavior, including carbon-emitting activities by corporations and individuals, is potentially elevated as a bearer of value that can be traded for profit, leading to analogies with other forms of waste (see Peña Valderrama 2023).

These contradictions are not lost upon the users and creators of these schemes and apps. Experts who tracked, traced, and traded emissions rights, and reflected upon the fictive nature of their calculations, often treated the data generated by the creation of carbon inventories and carbon accounting as potentially valuable for future decarbonizing efforts. Never mind that they do not deliver on actual reductions in the present. These temporal deferrals of ecological redress align with promises of the technological fix that validates current behavior, even carbon-emitting forms of transport, energy, and consumption.

Users of Alipay app described high levels of addiction, competition, and satisfaction from using the gamified carbon app, while experiencing guilt and gratitude for the capacity to participate in the ‘distance environmentalism’ the app provides. As Nianzhen, a recent university graduate and dedicated Aliforest user described: “When I see my [virtual, digital] tree grow I definitely feel some fleeting pleasure, and when I look at the [actual] trees that have been planted in the desert I also get a bit of pride. When friends make off with my energy, I get a bit sulky. I know it’s kind of embarrassing. At least I’m not alone in this addiction (*yintou*).” However, the true addiction was described by a carbon-footprinting specialist as the growing spiral between emissions production and consumer spending through the e-commerce platforms:

In these schemes you buy things and earn carbon credits, so actually this encourages more consumption, so . . . so there’s a kind of . . . I shouldn’t say this. . . well, there’s a kind of irony to this, that earning credits by consuming more is contradictory to the effort. The same basic debate appears with Inclusive Carbon as a platform that runs commercially and sells products to keep users on their social and financial platforms [like Alipay’s Ant Forest]. Transactions happen on the platform, encouraging manufacturers to sell and users to buy [the green products], so you get this elevation of consumption.

The carbon-footprinting apps highlight some sources of greenhouse gases, while diverting or concealing others. Moreover, it incentivizes consumption, as long as it can be accounted for as ‘green.’ This incentivizing function was a matter of concern for Aike, communications manager for the state-backed Inclusive Carbon scheme. He was even more explicit about what would be necessary for individual carbon caps to take effect:

To be truly effective, we would have to divide up the rights to emit carbon much more strictly. This would be like the past times of resource scarcity (*ziyuan kuifā*). You know, like in the [Great Leap Forward] famine years [in 1959 and 1961], when people had so little that they were forced by necessity to calculate, budget, and divide their food, giving portions to each member of the household, under conditions of extreme hardship.

While visions of environmental apocalypse frequently appear integral to capitalism, capitalist responses, such as the carbon coin schemes, frame these disasters and their solution from within. The individual carbon coin platform, much like corporate carbon accounting and emissions inventories, hide the environmental destruction of production, realization, and circulation of value within capitalism.

It does so by emulating the money fetish with a carbon fetish (c.f. Swyngedouw 2010). By quantifying and abstracting the environmental 'cost' through carbon calculations, social relations around emissions debt and credit become obscured, in parallel to those of carbon markets. Thereby, claims on natural resources become packaged as salable rights to destruction, the basic essence of carbon emissions trading, and then become folded back onto producers and consumers, the logic underlying individual carbon accounting (c.f. Dalsgaard 2013). Individual carbon accounting thereby brings carbon as a 'metric of the human' into sharp relief (Whittington 2016), while simultaneously connecting the citizen-subject to a state project of carbon as value.

By incentivizing virtual shopping, the carbon-footprinting apps stage and celebrate the circulation of value, while simultaneously assuaging users' guilt over an emerging green conscience. Although the carbon coins appear as 'low carbon' units of self-regulation, they actually enfold state aims of decarbonization into quantifiable, cheap, and exchangeable tokens. Carbon coins do more than foster a neoliberal subjectivity of docility and self-reliance by tying state promises of an 'ecological civilization' to citizen-led environmental redress, as the state thereby draws political legitimacy from local attempts to foster 'low carbon life' and bolsters claims of the instantiation of the coming low-carbon era in the national, and even global, arena.

## **Conclusion: Carbon as Value and Anti-value**

What do you mean, you are researching carbon as value, carbon is anti-value!

—Edward, research and development officer for  
China National Offshore Oil Corporation

If capital is value in motion, what is carbon doing? A misleading carbon 'theory of value' rests on the assumption of nature as simultaneously outside of, yet analogous to, capitalism. According to this logic, nature as 'outside' of capitalism bears ineffable 'value' that is not subject to the laws of capital and accumulation. At times, even carbon is championed as an alternative measure of value beyond the metrics of capital, despite its intended purpose of making polluters pay. Simultaneously, nature as 'outside' capitalism is blamed for making nature problematically disappear as an 'externality' in capitalist accounting, leading to its exploitation and destruction.

This frames nature's position outside of capitalism as the reason for ecological destruction, in a revamped 'tragedy of the commons' argument projected onto planetary pollution and fossil fuel addiction. The solution, according to carbon logics, is that nature, and its destruction, must be *brought into* the capitalist system. This is where carbon, and the monetizing of carbon, comes in. In short, the carbon 'theory of value' positions nature as analogous to capitalism, yet generative of non-capitalist value, and capitalism as the solution for saving nature.

Carbon logics subsume environmental processes to capitalist logics, and place faith in capitalism to save nature. While carbon is supposed to bring environmental degradation into economic calculations, carbon markets, in effect, often relocate ecological repercussions outside of their spatial limits or national borders, or defer them temporally into an uncertain future, thereby compounding climate risks. In situations where carbon logics break down, struggles over value arise. In critiquing a contradictory carbon 'theory of value,' resistances to the realization, circulation, and accumulation of value emerge through the potentially catalyzing effect of carbon that may culminate in revolts of living labor and nature.

In China the carbon metric has spread into the entire economic system, simultaneously facilitating and threatening the realization of value. Carbon allows investment into production and the continuity of growth in consumption, deferring this problem of the potential annihilation of value into the future, or outside its geographic boundaries. This is where 'anti-value' accumulates and generates potential antagonism. Value and anti-value have a temporal dimension as carbon's value is created immediately upon investment but takes time to realize, and threatens to reach an untenable tipping point and turn into 'anti-value.'

David Harvey (2018) argues that 'anti-value' hovers over the contradictory unity of production and realization of value in capitalism, as a potentially permanent disruptive force. For Harvey, a key example for anti-value is credit. Credit smooths over divergent turnover times of capital between different industries, so debt circulates in the credit system as interest-bearing capital—until it does not. And then the whole system grinds to a halt, and effects like the financial crisis ensue. Another example Harvey cites is labor, and how it allows value generation within the system of production. However, when labor is withheld, for instance in strike action or other refusals to work, it becomes anti-value embodied.

Carbon, like credit, allows economic growth to continue through temporal deferral and spatial displacement, despite environmental



risks. When carbon commensurability fails to deliver on promises for the smooth circulation and endless accumulation of capital, it can similarly morph into an anti-value that reorients personal and political projects—for instance, by disrupting future production or threatening living conditions. The constant deferral of the Chinese carbon market, or even how the carbon apps allow bubbles to hover endlessly over unfulfilled green action, reveal this tension. In addition to temporal deferral, value and anti-value also have a geographic dimension of displacement because the cost of ‘externalities’ of ecological degradation are displaced into other countries as an outside of carbon exchanges—for instance, as afforestation in China is paralleled with timber imports from other countries or regions.

Experiences of Chinese citizens, from seasonal pollution and sporadic sandstorms to deforestation and even desertification in times of climate change, cause harms that are difficult to evaluate in quantitative terms, whether through chains of causation with carbon emissions or in terms of the economic damages caused in monetary prices. The value or destruction of value that these crises lay waste to in their path clearly exceed the parameters of such calculations, from bodily suffering to the loss of dignity, or desolate land to inhospitable climates, where life struggles to reproduce.

The Chinese turn toward a postindustrial low-carbon economy coincides with instabilities from internal migration and forced displacement because of pollution and climate change, as well as widespread unemployment and the devaluation of industrial labor. As state-owned energy players profit from further emissions, coal corporations diversified their energy mix due to dwindling water supplies in degraded landscapes. Moreover, imbalances of carbon accounting brought to light how economic calculations clashed with logics of sustainability and survival among farmers planting carbon offset trees in the desert, while computer programmers found themselves caught in the logics of fetishized carbon coins. These cases shed light on how contestations around value could ultimately disrupt business-as-usual, and flip carbon into an anti-value to disrupt endless growth and foster political resistance.

A contradictory melding of value, in the abstract political economy sense as the driver of accumulation, and values, in the experiential, ethical, and affective sense of belonging, judging and aspiring, emerge in the carbon metric. Value in neither sphere can fully contain the other, yet neither realm of value generates an outside beyond the other, as the contradictions of capitalism suffuse both value and

values with ‘insidious capital’ and ‘intimate contradictions’ (Kalb, this volume). The quantified carbon metric and its twinned monetary price cannot capture or contain the environmental degradation, loss of livelihood, or dwindling of resources that sustain living labor and nature. Arguably, by entrenching the infiltration of the logics of capital, via the vehicle of carbon, into the ‘hidden abodes’ of production, reproduction, and nature, carbon exacerbates relational class struggles throughout. Yet resolving the current ecological crisis, with climate and carbon at its center, is not a matter of expanding this metric or paying nature for services in sustaining work, reproduction, and life. This is a clash between value and values that the carbon metric sutures, but cannot resolve.

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## Note

1. All names and some minor identifying information of individuals have been altered to protect anonymity throughout the chapter, unless otherwise requested by the research participants involved.

## References

- Appadurai, Arjun. 1986. “Introduction: Commodities and the Politics of Value.” In *The Social Life of Things: Commodities in Cultural Perspective*, ed. Arjun Appadurai, 1–63. Cambridge: Cambridge University Press.
- Aunan, Kristin, Mette Halskov Hansen, and Zhang Shuxiao. 2018. “Introduction: Air Pollution in China.” *The China Quarterly* 234: 279–98.

- Bigger, Patrick. 2015. "Environmental Governance in the Carbon Economy: Regulating Greenhouse Gas Emissions in California's Cap-and-Trade Program." PhD thesis, University of Kentucky.
- Bohannon, Paul. 1955. "Some Principles of Exchange and Investment among the Tiv." *American Anthropologist* 57(1): 60–70.
- Bruckermann, Charlotte. 2019. *Claiming Homes: Confronting Domicide in Rural China*. New York: Berghahn Books.
- . 2020. "Green Infrastructure as Financialized Utopia: Carbon Offset Forests in China." In *Financialization: Relational Approaches*, eds. Chris Hann and Don Kalb, 120–52. New York: Berghahn Books.
- . 2022. "There's an App for That: Ordering Claims on Natural Resources through Individual Carbon Accounts in China." *Capitalism, Nature, Socialism* 33(4): 95–114.
- . 2023. "The Pragmatism of Continual Failure: Environmental Policy as Experimentation in China." *Journal of the Royal Anthropological Institute* 29: 133–50.
- Caffentzis, George, Monty Neill, Hans Widmer, and John Willshire. 1980. "The Work/Energy Crisis and the Apocalypse." *Midnight Notes* 2(1): 1–29.
- Christophers, Brett. 2018. "Risking Value Theory in the Political Economy of Finance and Nature." *Progress in Human Geography* 42(3): 330–49.
- Dalsgaard, Steffen. 2013. "The Commensurability of Carbon: Making Value and Money of Climate Change." *Hau: Journal of Ethnographic Theory* 3(1): 80–98.
- De Angelis, Massimo. 2007. *The Beginning of History: Value Struggles and Global Capital*. London: Pluto Press.
- Descheneau, Philippe, and Matthew Paterson. 2011. "Between Desire and Routine: Assembling Environment and Finance in Carbon Markets." *Antipode* 43(3): 662–81.
- Ding, Iza. 2020. "Performative Governance." *World Politics* 72(4): 525–56.
- Elyachar, Julia. 2005. *Markets of Dispossession: NGOs, Economic Development and the State in Cairo*. Durham: Duke University Press.
- Elson, Diane. 1979. *Value: The Representation of Labour in Capitalism*. Atlantic Heights, NJ: Humanities Press.
- Finamore, Barbara. 2018. *Will China Save the Planet?* New York: Wiley.
- Franquesa, Jaume. 2018. *Power Struggles: Dignity, Value, and the Renewable Energy Frontier in Spain*. Bloomington: Indiana University Press.
- Godelier, Maurice. 1996. *L'Enigme du don*. Paris: Libraire Arthème Fayard. Translated by Nora Scott. 1999. *The Enigma of the Gift*. Chicago: University of Chicago Press.
- Graeber, David. 2001. *Toward an Anthropological Theory of Value: The False Coin of Our Own Dreams*. New York: Palgrave-Macmillan.
- Günel, Gökçe. 2016. "What Is Carbon Dioxide? When Is Carbon Dioxide?" *PoLAR* 39: 33–45.
- Guyer, Jane. 2004. *Marginal Gains: Monetary Transactions in Atlantic Africa*. Chicago: Chicago University Press.
- Hansen, Mette Halskov, Li Hongtao, and Rune Svarverud. 2018. "Ecological Civilization: Interpreting the Chinese Past, Projecting the Global Future." *Global Environmental Change* 53: 195–203.
- Harvey, David. 2018. *Marx, Capital, and the Madness of Economic Reason*. Oxford: Oxford University Press.
- Hertz, Ellen. 1998. *The Trading Crowd: An Ethnography of the Shanghai Stock Market*. Cambridge: Cambridge University Press.
- International Energy Agency (IEA). 2020. *China's Emissions Trading Scheme*, Paris. Retrieved 2 February 2021 from <https://www.iea.org/reports/chinas-emissions-trading-scheme>.
- Kalb, Don, and Herman Tak. 2005. "Introduction: Critical Junctions—Recapturing

- Anthropology and History." In *Anthropology and History beyond the Cultural Turn*, ed. Don Kalb and Herman Tak, 1–28. New York: Berghahn Books.
- Lee, Ching Kwan. 2014. "The Spectre of Global China." *New Left Review* 89: 29–65.
- Lo, Alex. 2016. *Carbon Trading in China: Environmental Discourse and Politics*. New York: Palgrave Macmillan.
- Lohmann, Larry. 2010. "Uncertainty Markets and Carbon Markets: Variations on Polanyian Themes." *New Political Economy* 15(2): 225–54.
- Moore, Jason. 2016. *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*. London: Verso.
- Newell, Peter, and Matthew Paterson. 2010. *Climate Capitalism: Global Warming and the Transformation of the Global Economy*. Cambridge: Cambridge University Press.
- Nonini, Donald. 2008. "Is China Becoming Neoliberal?" *Critique of Anthropology* 28(2): 145–76.
- Peña Valderrama, Sara. 2023. "Disappearing Waste and Wasting Time: From Productive Fallows to Carbon Offset Production in Madagascar's Forests." *Ethnos* 88(3): 491–511.
- Swyngedouw, Erik. 2010. "Apocalypse Forever?" *Theory, Culture & Society* 27(2–3): 213–32.
- Turner, Terrence. 2008. "Marxian Value Theory: An Anthropological Perspective." *Anthropological Theory* 8(1): 43–56.
- Tsing, Anna. 2004. *Friction: An Ethnography of Global Connection*. Princeton: Princeton University Press.
- Walker, Richard. 2016. "Value and Nature: From Value Theory to the Fate of the Earth." *Human Geography* 9(1): 1–15.
- . 2017. "Value and Nature: Rethinking Capitalist Exploitation and Expansion." *Capitalism Nature Socialism* 28(1): 53–61.
- West, Paige. 2005. "Translation, Value, and Space: Theorizing an Ethnographic and Engaged Environmental Anthropology." *American Anthropologist* 107(4): 632–42.
- Whittington, Jerome. 2016. "Carbon as a Metric of the Human." *PoLAR* 39: 46–63.
- Wildau, Gabriel. 2016. "China's State-Owned Zombie Economy," *The Financial Times*, 29 February. Retrieved 12 October 2017 from <https://www.ft.com/content/253d7eb0-ca6c-11e5-84df-70594b99fc47>.
- Wu, Wendy. 2017. "How the Communist Party Controls China's State-Owned Industrial Titans." *South China Morning Post*, 17 June. Retrieved 14 October 2017 from <http://www.scmp.com/news/china/economy/article/2098755/how-communist-party-controls-chinas-state-owned-industrial-titans>.
- Zee, Jerry. 2017. "Holding Patterns: Sand and Political Time at China's Desert Shores." *Cultural Anthropology* 32(2): 215–41.