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Financialising nature

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Introduction

The growing importance of financial markets, motives, actors, and institutions in the world economy – often referred to as "financialisation" – has significant implications for the environment and sustainability. There has been a burgeoning literature on the phenomenon of financialisation in the global economy in recent decades (e.g. Epstein 2005; Krippner 2011; van der Zwan 2014). Financialisation has been felt across a range of sectors, from manufacturing, to food and agriculture, to mining and energy. Certainly, the interest of financial capital in nature and natural resources is nothing new. Financial investors have long provided capital backing and received profit from the extraction of nature through economic activities such as mining, forestry, oil and gas production, water taking, and agriculture (see also Princen, this volume). In recent decades, however, we have seen the rise of new kinds of financial instruments that enable investors to profit from these sectors in novel ways – a key characteristic of modern-day financialisation – which, in turn, has important implications for environmental sustainability.

In this chapter, we examine the implications of financialisation for environmental sustainability. We outline the long attraction between financial investment and nature, and make the case that this relationship has seen important changes in recent decades as the process of financialisation has unfolded. In particular, financialisation has encouraged the rise of new kinds of financial instruments that are tied to natural resources and environmental change. We show that these new financial instruments have relied on an abstraction of nature from its material form, and have transformed elements of the natural world into purely financial assets. These kinds of new financial tools are often based on indexes or pooled funds that track the performance of real things, such as natural resources, land, carbon, or the weather. But the fact that nature ultimately forms the underlying base for this financial investment means that this financial activity can, and often does, have real world consequences. These effects, however, are often distanced from their financial origins, and are not always accounted for in sustainability policy and governance.

From finance and the environment to financialisation of the environment

Finance has long underpinned activities that have mattered for environmental outcomes. Dating back centuries, financial investors have provided funding for activities ranging from oil exploration, forestry operations, mining, and agricultural commodity trading – each of which has direct implications for environmental outcomes, including climate change, deforestation, toxic pollution, and land degradation. Financial investors have also provided project financing for infrastructure projects ranging from large-scale dams, to power plants, to road construction across the world, activities that have also historically been associated with environmental harm due to deforestation, biodiversity loss, and carbon emissions (Clapp and Dauvergne 2011). Because these kinds of activities were widely assumed to be important drivers of economic growth, the environmental costs associated with them were, until relatively recently, often considered to be simply the cost of doing business. In effect, for hundreds of years the environmental externalities associated with investment financing were neither priced nor accounted for.

It is only in the last 50 years that financial investment in these sorts of economic activities has been subject to closer scrutiny by policy makers for its environmental impacts. This concern rose to a head in the 1980s and 1990s, when the concept of "sustainable development" began to gain traction in environmental policy and governance. Activists began to target global financial institutions such as the World Bank over concerns about the environmental implications of its development lending (Rich 1994). Alongside efforts to "green" project lending by public international financial institutions, there was a push in the 1990s to encourage more environmentally friendly activities by private banks through initiatives such as the United Nations Environment Programme's Finance Initiative (UNEP FI 2012). Similarly, the Equator Principles, adopted in 2003, call upon the private banking industry to pledge to ensure its project lending takes environmental considerations into account (Wright and Rwabizambuga 2006).

Beyond a focus on lending institutions, financial investors themselves – individuals as well as asset management firms, pension funds, and other institutional investors – are now actively and routinely encouraged to invest in socially and environmentally responsible ways. As awareness has increased, there has been a recognition of the responsibility of investors to minimise any potential negative environmental effects from the activities their financing supports. Responsible investment initiatives emerged in the mid-2000s, including the UN Principles for Responsible Investment (UN PRI), which encourage investors to take environmental, social, and governance considerations under advisement before making investments in major firms. Such initiatives fall under the broad heading of socially responsible investing (SRI), which aims to reduce socially and environmentally harmful investments and is now well established amongst mainstream institutional investors (O'Donohoe et al. 2010; Geobey 2014). More recently, interest has grown in not merely avoiding the negative impacts of financial investments, but also in generating positive ones. This movement falls under the wide umbrella of "social finance" and includes a variety of tools and approaches such as impact investing, venture philanthropy, alternative currencies, ethical banking, and social impact bonds (Rizzi et al. 2018). The guiding rationale behind these approaches is that private sector capital must be mobilised in order to tackle the complex socio-ecological problems of our times.

At the same time as calls have grown for more sustainable investment finance, however, there has been an increased "financialization" of the economy, that is a growing importance

of financial actors, institutions, and motives in guiding key decisions within firms and in the economy more broadly (Epstein 2005; Krippner 2011). This growing role for finance in the economy is widely seen to be the product of neoliberal economic policies that became vogue across most governments in the 1980s, and which saw a significant scaling back of government regulations, including in the financial sector (Helleiner 1994). Financialisation has generated new investment tools that enable investors to accumulate profit in new arenas and sectors through complex derivatives and other financial products. Derivatives are financial instruments whose value is derived from the price of an underlying asset. For example, a futures contract, which arranges for the payment for an asset at a future date, is a common type of derivative. Although a derivative instrument is based on an underlying real asset, it is abstracted from those assets and is a purely financial instrument (Krippner 2011; van der Zwan 2014).

The development of new financial instruments that are designed to draw new revenue streams from natural resources and the environment creates a new arena for financial profit by investors. These nature-based financial products enable investors to speculate on the changing prices of natural resources and the costs of environmental change, and are based on what Loftus and March (2015) call "proxy commodities" that are purely financial in nature. Some of these new investment tools seek to profit from the development and use of traditional natural resource commodities such as energy, minerals, agriculture, and land. Others have sought to generate profit from efforts to address environmental problems such as water scarcity, weather risks, and climate change (Ouma et al. 2018). For these non-traditional commodities, markets did not previously exist and had to be created before the natural phenomenon could be financialised. In other words, water, weather, and climate had to be commodified, that is, given a price so that they could be traded on a market. As Sullivan (2012, 8–9) notes, the commodification of nature involves developing the means to measure it numerically, the attachment of monetary value to the units of measurement, and then the creation of markets for it, typically by governments. The creation of markets for environmental costs and services then paves the way for the financialisation of those markets by the private financial sector. Importantly, the rapid expansion of financialisation via novel investment tools has been associated with heightened levels of resource extraction and environmental degradation in a number of cases, even though these tools are marketed as purely financial and not as directly trading actual "things" like commodities, units of carbon, or water.

Large-scale institutional investors with long-term outlooks – including insurance companies, pension funds, mutual funds, hedge funds, sovereign wealth funds, commodity trading firms, and university and foundation endowments – have been especially interested in these new types of financial investment vehicles. These types of investors typically invest with what are termed "passive" investment strategies. That is, they prefer to invest in assets that have returns over the long term, but that do not require active management based on current market conditions. For this reason, these investors have been especially drawn to investment vehicles that pool funds managed by others, or that follow an established index that tracks various sets of underlying assets such as commodities, firm shares in specific sectors, or real estate. In these types of investment vehicles, investors are tracking the performance of an underlying real asset, without actually owning those real assets directly.

Below, we provide an overview of some of the new investment vehicles of this type that are in effect financialising nature by abstracting natural resources and the environment for the purpose of financial investment. We explain how these investment vehicles work, the forces behind their emergence, the size of these investments, and the key investors, as well as their implications for the environment and sustainability. Because these financial products

are several steps removed from actual commodities, the linkages between the financialisation of nature and its sustainability impacts are often obscured. Indeed, this distancing between finance and outcomes on the ground makes it challenging to draw a direct connection between a single financial investment and a particular outcome. Still, it is possible to identify the mechanisms by which the various nature-based investment tools affect economic activities, which, in turn, can have an environmental impact, and we try to do so for each type of instrument.

Commodity index funds

Futures contracts for commodities – such as agricultural products, minerals, and energy – have been traded by investors for hundreds of years on commodity exchanges around the world. Concerned about the potential for financial speculation to distort the markets for these commodities, regulators in the United States put rules in place that limited the number of commodity futures contracts that purely financial investors could hold, and required transparency in the form of reporting on such trades. These rules remained in place for over 60 years. But with the rise of neoliberal economic policies in the 1980–1990s, there was growing pressure to deregulate the activities of financial actors engaged in commodity markets. A series of deregulatory moves in the 1980s and 1990s was codified in the 2000 Commodity Futures Modernization Act in the United States, home to the largest commodity markets in the world (Ghosh 2010). With this new legislation, over-the-counter (OTC) derivatives were effectively exempted from regulatory oversight (Russi 2013). This move brought the US commodity futures markets more in line with European commodity markets, which had only light regulations (van Tilburg and Vander Stichele 2011).

Financial institutions pushed for deregulation in large part because they were keen to sell new kinds of commodity investment vehicles to investors, including what are known as commodity index funds (CIFs) (Clapp and Isakson 2018). CIFs track the performance of an index that includes the prices of futures contracts for a range of commodities, typically including petroleum products, minerals and metals, livestock, and agricultural commodities. Standard and Poor's Goldman Sachs Commodity Index (GSCI) and the Bloomberg Commodity Index (BCOM) are the most popular indexes on which this kind of investment product is based, and products based on these indexes are sold by financial actors such as asset management companies and investment banks (Meyer 2015). Some indexes focus on only agricultural commodities; some on only minerals; and some just on energy. Some commodity index funds are sold "over-the-counter" (OTC), that is, directly to investors, while others are traded on exchanges. The latter are known as exchange traded funds (ETFs) (Russi 2013). The novel feature of CIFs is that they create new arenas for financial accumulation that are open to a wider range of investors than was previously the case. Greater access to these investments has been facilitated by the fact that with these new investment vehicles, investors no longer need to own the commodity, or even any commodity futures contracts, to profit. Rather, they simply buy a share of a financial product through a financial intermediary.

Financial investors became especially interested in CIFs as a vehicle to diversify their investment portfolios after 2000 (Meyer 2010). Institutional investors, who typically have long-term outlooks, find CIFs attractive because they are low-maintenance investments that provide a hedge against inflation. As food and energy prices began to rise in the 2005–2012 period, investors moved into the sector in large numbers. Total financial assets under management in the commodities sector climbed from around US$10 billion in 2000 to US$150 billion just before the 2008 financial crisis. By 2011, it was worth over

US$450 billion (Meyer 2015; UNCTAD 2015, 21). Financial investment in commodity ETFs shot up markedly, from under US$10 billion in 2006 to over US$200 billion in 2012 (UNCTAD 2015). A decline in commodity prices after 2013 led to lower interest among investors, and the amount invested in commodities fell to US$161 billion by the end of 2015. However, financial investment picked up again in 2016 to reach US$235 billion in commodity assets (Hume and Sanderson 2016).

Although CIFs are purely financial products in that the investors do not own physical commodities or even commodity futures contracts, this does not mean that investment in them is neutral with respect to sustainability. On the contrary, investment in CIFs can bid up prices and encouraged new forms of physical extraction of those commodities. Indeed, over the 2007–2013 period, prices for fossil fuels, agricultural commodities, and minerals and metals all shot up markedly, sparking increased interest in oil extraction, biofuel production, mining, and agricultural commodity production, each of which have enormous environmental implications including carbon emissions, soil degradation, and biodiversity loss. Shale and tar sands oil production, for example, became economically more attractive as prices for fossil fuels rose, leading to widespread concerns about the ecological consequences not only of the extraction of these resources, which includes water use and toxin release, but also over the carbon released when burned (Willow and Wylie 2014). Biofuel production also increased, leading to concerns about deforestation from land clearing to increase the area available for the production of biofuel crops (Neville 2015). Because they are typically bundled together in CIF financial products, prices for these commodities are increasingly moving together (UNCTAD 2011). Thus, if one commodity sees a price increase, the others do as well. As prices for these commodities become increasingly entangled with one another, the environmental and sustainability implications can become amplified, as market dynamics for any one of the commodities in the index can drive heightened extraction, and, in turn, the environmental impact, of all of them.

Real estate investment trusts (REITs)

A REIT is a company that owns and usually operates income-generating properties whose shares are publicly traded on stock exchanges (Chiang et al. 2017, 2). REITs have transformed the investment landscape by rendering a traditionally illiquid and privately owned industry – the purchase and sale of physical land – into an abstract, liquid, and publicly owned one through the merging of several financial assets together into one instrument that is packaged and resold to investors (Chiang et al. 2017, 2). This financial instrument allows individual investors of more modest means to participate in landownership without having to own and manage the properties directly.

As Fairbairn explains, timberland REITs emerged in the 1980s as a result of "economic transformations that began in the 1970s – the increasing size and power of institutional investors and the corporate takeover movement" (Fairbairn 2014, 787). Institutional timberland investors include pension funds, insurance companies, foundations, and church institutions who "value the sustainability of this asset class but also the composition of the returns and the risk profile" (Aquila Group 2015). Moreover, because of the wide range of share values offered, individuals also readily participate in these investment vehicles.

Farmland REITs developed more recently and have attracted investors looking for new ways to capitalise on (narratives of) food and land scarcity. In the shadow of the 2007/2008 food and financial crises, there was a substantial increase in investor interest in agricultural land, as investors sought a secure place to invest capital (Visser 2017). Farmland fit the bill as

it is perceived as a low risk investment that helps to diversify and balance portfolios (Clapp and Isakson 2018). Hedge funds and private equity are also involved in REITs, particularly in the case of farmland. Farmland REITs are still small in number but hold staggering amounts of farmland. Farmland Partners REIT possesses approximately 150,000 acres of farmland across 16 US states, and the Gladstone REIT holds 54,000 acres in seven states (Clapp and Isakson 2018, 93).

Timberland REITs are often positioned as sustainable investments because of the vital role of forests in sequestering carbon from the atmosphere. As such, institutions may invest in a timberland REITs to satisfy environmental targets. The degree to which this is true varies across jurisdictions. In the United States, for example, forestry is regulated federally and by the state forestry commission, resulting in relatively tight guidelines. As a result, all of the timberland REITs in the United States have their land certified by either the Sustainable Forest Initiative or the Forest Stewardship Council (Lerner 2015). However, in the case of palm oil REITs in Malaysia, the sustainability track record is less positive due to the environmental challenges associated with palm oil production such as deforestation and biodiversity loss.

In the case of farmland REITs, these investments are still nascent and it is unclear exactly what their environmental impact will be. However, if the short-termism typical of speculative investment infiltrates the space, it could lead to "careless environmental governance" (Fairbairn 2015, 244). Moreover, the lack of farming expertise of many investors has meant that in some cases, industrial farming technologies have been applied in an irresponsible way, adding stress to the environment while contributing further to greenhouse gas emissions (Clapp and Isakson 2018, 101). Finally, the push for high returns may place pressure on farmers to adopt high-yield production methods and chemical use to control pests, rather than supporting slower growth but more sustainable production methods (Knuth 2015, 165).

Weather derivatives

Weather derivatives are a relatively new financial product that packages the weather so that it can be traded for profit. Because the weather *itself* cannot be traded, weather derivative contracts – assets like futures or options – rely on underlying values such as meteorological indices to create a market. Weather derivatives emerged in response to increased weather variability due to climate change, which presents new risks for firms in a variety of sectors and also creates a demand from investors to "climate proof" their investment portfolios (Isakson 2015, 575). The evolution of meteorological science that allows for more accurate measurement and forecasting enabled the commodification of information about the weather (Pollard et al. 2008, 619). Deregulation in the US energy industry in the mid-1990s, which exposed companies to greater weather-related risk (Pollard et al. 2008; Isakson 2015), prompted a number of energy utilities to develop the first privately negotiated, OTC weather derivative in 1997 by a US power company, Aquila Energy (Climetrix 2010, Clark 2010). Two years later, the Chicago Mercantile Exchange (CME) listed weather derivative contracts and is now the world's largest weather derivatives exchange, listing more than 60 contracts (Till 2014; Carabello 2018). Though OTC contracts still dominate the market, weather derivatives are now listed on a number of commodity exchanges.

The most commonly used weather index is based on average temperature but some derivatives track wind-speed, rainfall, and even humidity. According to Till, weather derivative contracts are priced "using actuarial analysis of historical payouts, factoring in recent weather trends and climatic trends" (Till 2014). These contracts differ from traditional insurance products in that weather insurance is geared towards high-risk, low probability events such

as hurricanes and floods, whereas weather derivatives focus on low-risk high probability events such as dry summers or warm winters (Pollard et al. 2008, 618). Firms use weather derivatives to hedge against weather-related losses but speculators also participate in the weather derivatives market. This strategy is considered more nimble and cost effective than traditional insurance products tied to disaster relief (Mandel et al. 2010).

The weather derivatives market is now valued at an estimated US$8 billion and is growing quickly (Carabello 2018). The market has expanded beyond the energy sector and now includes municipal governments, agrifood businesses, and event management companies (Seth 2018). Insurance companies, investment banks, commercial banks, commodity traders, and hedge funds are all actively involved in the weather derivatives market (Carabello 2018). As renewable energy generation becomes increasingly popular, new weather derivatives contracts for wind have emerged, though these are still in the early stages of development (Gandel 2017).

Index-based agricultural insurance (IBAI), which is a form of weather derivative, clearly illustrates the positive and negative ways in which these financial products interface with the environment. IBAI was developed in the late 1990s, with support from the World Bank, as a way to allow developing country farmers to reduce the impact of climatic variability on their crops (Clapp and Isakson 2018, 68). It is positioned as a benefit to poor farmers who may be ineligible for traditional forms of insurance as IBAIs typically do not require proof of assets, which reduces surveying costs and ultimately increases the affordability of insuring small plots of land (Isakson 2015, 270). At first glance this approach may appear to be a relatively benign and even efficient way of hedging risk. However, Isakson (2015) explains how IBAIs affect land-use patterns in troubling ways because of their interconnection to agricultural modernisation. In addition, this type of insurance is tied to the purchase of modern inputs – locking farmers into an industrial model of agriculture that is often insensitive to the ecological surroundings (Isakson 2015). In other words, the proliferation of weather derivatives is tied to agricultural modernisation, which tends to reduce the biodiversity of agricultural landscapes and their resilience to extreme weather events typical of climate change (Isakson 2015).

Water index funds

The privatisation of water utilities occurred globally during the 1990s, and was an enabling condition for financial investment in the water sector (Bayliss 2014). Today, the focus has shifted away from discourses of efficiency, towards water security, as awareness grows around the issue of water scarcity (Ahlers and Merme 2016, 769). According to some estimates, by 2035 nearly 3 billion people will be water stressed as a result of a changing and warming climate, growing demand from a widening variety of industries, and ballooning urban populations (Kaufman 2012, 470). This worrisome scenario has led to calls for large infrastructure projects to ensure a safe and consistent supply of water. These projects require enormous injections of capital, which is where financial investment comes into play. In this context, four water ETFs were launched in 2005 (Rompotis 2016, 104). These funds typically track the value of stocks of water-related businesses (Kaufman 2012, 470) such as those involved in water conservation, purification, and treatment (Rompotis 2016, 103). In the case of water index funds, actual units of water are not being traded. However, the recent launch of a water futures exchange in Australia suggests that such markets could become more mainstream over the coming decades (Curran 2014).

According to Bayliss (2014, 298), the four original water ETFs that ~~was~~ launched in 2005 had US$1.4 billion in assets under management by 2014. Today, more than 100 indices

are involved in tracking and measuring water-related stocks (Kaufman 2012, 470). This mushrooming market is attracting investors beyond the traditional public agencies and private water industry. Lenders, institutional investors, sovereign wealth funds, private equity investors, water funds, and new multilateral banks are also participating in the nascent market (Ahlers and Merme 2016, 767).

Since water is not being physically traded by ETFs (and more importantly, ETFs are tracking firms investing in water infrastructure, not water futures), these instruments have not directly affected the price of water (Bayliss 2014, 301). However, the connection between financial investment and large infrastructure projects such as dams has significant adverse impacts on the surrounding physical environment. The development of a global water futures market would likely lead not only to the price volatility seen in other futures markets (such as agriculture), but could also create a scenario where the highest bidder wins. As Kaufman (2012, 471) points out, "if the natural-gas industry can pay more for water than soy farmers, then the gas drillers will get the water and the soya will not." Such a market would not inherently produce water-conserving efforts. However, Australia has worked to ensure that its nascent water market is linked to its conservation efforts. It has done so by requiring that water rights be registered with Australian states that are in charge of managing water supplies. This serves to limit the aggregate drawdown of water, positioning the government initiative as a form of a cap-and-trade program (Curran 2014). Because the water futures market is still new, its sustainability impacts are merely speculative at this point in time.

Carbon derivatives

The rise of carbon markets in the past few decades as a state-sanctioned means to address climate change has been accompanied by the development of complex financial derivatives associated with carbon trading (Layfield 2013). Carbon markets operate based on a fixed number of permits to emit carbon (allowances), which requires firms to either reduce their emissions or purchase carbon emission rights or offsets (carbon credits that are verified units of avoided carbon emissions) from other firms if they are unable to meet their targets. The trading of carbon permits effectively sets the price of carbon, based on the supply and demand of allowances and credits. While the base of the market is the trade in carbon products between firms, there is also a demand for carbon-based financial derivatives that can help firms to manage risk associated with changing carbon prices (Bryant 2018, 610). This market in carbon derivatives – which includes financial products that bundle various carbon-based assets that, in turn, are marketed not just to firms but also to large institutional investors such as pension funds – is the fastest growing part of the carbon market (Layfield 2013, 908).

While some analysts have raised concerns about the emergence of financial derivatives based on carbon markets as an impediment to addressing climate change (Lohmann 2010), others have seen some promise in harnessing financial markets for the benefit of carbon reduction (Newell and Paterson 2010). In both cases, there was an expectation that the carbon markets would inevitably grow to be massive in size after they were endorsed as part of the Kyoto Protocol in 1997. However, after initial growth in the first years after the European Union (EU) Emissions Trading Scheme (ETS) was established in 2005, and the carbon credit provisions associated with the Clean Development Mechanism (CDM) of the Kyoto Protocol came into force in 2008, the markets shrank significantly and have remained stagnant in recent years despite various other carbon trading schemes being established in a number of countries around the world. Having reached a value of US$176 billion in 2011, the size of carbon markets ~~today sits at~~ approximately US$50 billion (Bryant 2018). While larger than weather derivatives, this

amount is significantly lower, for example, than standard commodity derivatives markets. According to Layfield (2013, 908), however, the value of financial and technical trades associated with the carbon markets, at least up until 2013, surpassed the value of actual trades in carbon permits for compliance purposes. Nonetheless, overall, carbon has not turned into the accumulation opportunity many had expected (Bryant 2018, 612).

The idea behind carbon markets, and ultimately the financial derivatives associated with them, is that this trade will support major reductions in carbon emissions by making it costly to obtain carbon emission permits, and attractive to reduce carbon emissions in developing countries for CDM credits, even as it opened up opportunities for financial actors to profit. But because carbon credits as a commodity are unique in that they are highly abstract – i.e. they represent something that is *not* emitted – it is extremely difficult not only to create a functioning market for carbon but also to measure and verify that it results in reduced emissions (Layfield 2013). A recent EU study (Cames et al. 2016) concluded that the carbon crediting procedures under the CDM have fundamental flaws, raising questions about the extent to which these credits really represent reduced emissions. And with the markets now stagnant, it is hard to see how they can make a significant dent in mitigating greenhouse gas emissions, at least in the near future.

Implications for policy and governance

As the earlier examples show, the current era of heightened financialisation in the global economy has spawned new financial instruments that are tethered to natural resources and the environment in novel ways. Some of these new financial instruments have attracted more capital than others, with more traditional commodities – agricultural crops, energy, minerals, timber, and land – garnering a greater share of investment than assets associated with more recently constructed markets such as carbon, water, and weather. But despite the unevenness, it is clear that nature and natural resources are increasingly viewed as arenas in which to build new regimes for financial profit-making. While these new investment products are purely financial in nature and attract financial investors who are far removed from the physical assets on which their investments are ultimately based, they nonetheless have the potential to generate ecological side-effects that are problematic for sustainability. As Bracking (2015) notes, the virtual nature of financial investments is not without material impact, as it enables powerful actors more access to and control over natural resources and energy systems. This, in turn, can result in increased extraction that is not always mindful of sustainability considerations.

Although analysts have pointed to the potential for negative environmental outcomes, efforts to put policy and governance into place to address those concerns have been extremely weak, and in some cases nonexistent. There are a number of challenges to addressing these policy weaknesses. First, the environmental impacts of these natural resources and nature-based financial instruments occur through a complex set of economic processes that are not always easy or straightforward to identify, making the connection between cause and effect fuzzy. The effects often occur through price signals and other economic incentives built into the instruments, which can influence rates of exploitation of the natural resource or the technologies utilised, as in the case of IBAI outlined previously. Moreover, the highly abstract nature of derivatives and other purely financial investment tools tends to increase "distance" between investors and outcomes, making it difficult to assign responsibility to any specific financial actor for any environmental degradation that occurs as a result of the investment (Layfield 2013; Clapp 2017, see also Pellizzioni, this volume, on the challenges associated with assigning responsibility in complex economic structures). And, in the case of new

financial instruments linked to markets for weather risk, carbon, and water, powerful actors portray these tools as key in solving environmental problems, without recognition of their potential negative impacts (Ouma et al. 2018, see also Brulle and Aronczyk, this volume).

Second, even if the linkages between financial investment tools associated with nature and natural resources and environmental outcomes were clear to regulators, it would be extremely difficult to put new financial rules in place to address them. As the battles over financial regulations in the United States and EU have shown following the 2007/2008 financial crisis, powerful financial lobbies fight hard to water down any legislation that may rein in their activities (Helleiner 2014). In this context, voluntary responsible investment initiatives have emerged as the primary response to the potential negative impacts of new forms of financial investment. Consequently, voluntary initiatives of this type have cropped up in some areas such as farmland (e.g. the PRI's Farmland Principles) and agricultural investment generally (e.g. the Principles for Responsible Agricultural Investment promoted by the World Bank, and the Food and Agriculture Organization of the United Nations (FAO) led Principles for Responsible Investment in Agriculture and Food Systems). But these initiatives do not specifically target financial derivatives, and more generally suffer from a number of weaknesses that limit their ability to ensure that investment protects the environment (for a review, see Clapp 2017).

Finally, advocating for stronger policies and governance initiatives to address the environmental side-effects of new financial instruments is harder than in the past because the number of participants in these types of investment is enormous. In the 1980s, activists were able to successfully target a very visible public lender, the World Bank, as it was concerned about its public image and consequently had to respond to calls for greater accountability. In the 1990s and early 2000s, the focus expanded to commercial banks, and while they are numerous, it was possible to get a significant number to sign on to a statement to ensure that their lending takes environmental concerns into account. With highly financialised investment in the current era, there are numerous players involved, many of which remain opaque to the public, including large institutional investors such as pension funds, hedge funds, sovereign wealth funds, and asset management companies, not to mention the millions of individuals whose money is also invested in pension funds and private savings. Because their investments are financial in nature, tracking an index rather than owning "real things," these investors typically do not see themselves as a problem. They are also often unaware of not only the impact of their investments but also the nature of their investments, because in many cases they have turned over their portfolios to professional asset managers.

In sum, given the challenges of enacting stronger policy and governance initiatives on this issue, we are faced with a continuation of a troubling dynamic in which the short-term demands of the financial sector for immediate returns tend to override the longer-term needs of ecological cycles and processes (Knox-Hayes 2013). In such a context, it is imperative that researchers continue to examine these dynamics, and bring them forward in ways that can make meaningful contributions to policy debates regarding the sustainability implications of the financialisation of nature and natural resources.

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