Commodification, labor, abstraction: Three key concepts to understand the many-headed hydra of biodiversity offsetting

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Abstract

Natural capital approaches to mitigating the impacts of construction projects, in which environmental harms and mitigations are calculated and then traded, have become dominant features of contemporary conservation. They are subject to considerable critique within the political ecology and radical conservation literatures on the grounds that they involve the commodification of nature. In the case of biodiversity offsetting, the commodification process in question is often described as involving forms of abstraction, pictured as a subtractive, reductive, 'lossy' process that reduces messy ecologies to quantitative and exchangeable credits. This article seeks to develop a different understanding of abstraction, pointing towards a more generative and creative account in which it creates a range of niches for different types of value extraction, including rent, labor exploitation and knowledge commodity creation. The aim is to provide a more precise account of when and where knowledge commodities are produced in credit creation, and to understand their relationship to a wider 'many-headed hydra' of value extraction from nature.

Keywords: offsetting, abstraction, commodification, labor, Biodiversity Net Gain

Résumé

Les approches fondées sur le capital naturel pour atténuer les impacts des projets de construction, dans lesquelles les dommages environnementaux et les mesures d'atténuation sont calculés puis négociés, sont devenues des caractéristiques dominantes de la conservation contemporaine. Elles font l'objet de nombreuses critiques au sein de l'écologie politique et des littératures radicales sur la conservation, au motif qu'elles impliquent une marchandisation de la nature. Dans le cas de la compensation de la biodiversité, le processus de marchandisation en question est souvent décrit comme impliquant des formes d'abstraction, dépeint comme un processus soustractif, réducteur et « perdant » réduisant des écologies désordonnées à des crédits quantitatifs et échangeables. Cet article cherche à développer une compréhension différente de l'abstraction, en s'orientant vers une approche plus génératrice et créative, créant une gamme de niches pour différents types d'extraction de valeur, notamment la rente, l'exploitation du travail et la création de biens de connaissance. L'objectif est de fournir une analyse plus précise du moment et du lieu de production des biens de connaissance dans la création de crédit, et de comprendre leur relation avec une « hydre à plusieurs têtes » plus vaste d'extraction de valeur de la nature.

Mots-clés: compensation, abstraction, marchandisation, travail, gain net de biodiversité

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Resumen

Los enfoques de capital natural para mitigar los impactos de los proyectos de construcción, en los que se calculan y comercializan los daños ambientales y las mitigaciones, se han convertido en características dominantes de la conservación contemporánea. Son objeto de considerables críticas en la ecología política y la literatura de conservación radical, argumentando que implican la mercantilización de la naturaleza. En el caso de la compensación de la biodiversidad, el proceso de mercantilización en cuestión se describe a menudo como un proceso de abstracción, descrito como un proceso sustractivo, reductivo y con pérdidas que reduce las ecologías desordenadas a créditos cuantitativos e intercambiables. Este artículo busca desarrollar una comprensión diferente de la abstracción, apuntando hacia una explicación más generativa y creativa que crea diversos nichos para diferentes tipos de extracción de valor, incluyendo la renta, la explotación laboral y la creación de mercancías de conocimiento. El objetivo es proporcionar una explicación más precisa de cuándo y dónde se producen las mercancías de conocimiento en la creación de crédito, y comprender su relación con una hidra multicéfala más amplia de extracción de valor de la naturaleza.

Palabras clave: compensación, abstracción, mercantilización, trabajo, ganancia neta de biodiversidad

1. Introduction: commodification, labor, abstraction

Biodiversity offsetting is a core strand within natural capital approaches to conservation. Somewhere between 69 and 108 countries now operate offsetting policies in which harms to nature are compensated through the production of habitats and more species-specific mitigations (Bull & Strange, 2018; see also Corbera *et al.*, 2021; Lockhart, 2015; Lockhart & Rea, 2019). The key assumption behind offsetting is that it is possible to establish a 'price' for ecological harm, and to use this to create a revenue stream for a market in conservation provision (Sullivan 2013; Buller, 2022; Helm, 2016, 2019). In so doing, systems of biodiversity offsetting 'sells nature in order to save it' (McAfee, 1999), picturing the harms of markets as 'externalities' that can be solved by the extension of capitalism to the natural world

The mechanics of offsetting have been extensively reviewed in academic debate for over 30 years, with a strong strand of political ecology work appraising not only the underpinning logics, but their practical consequences for nature and people. This article explores three key and interrelated concepts that are commonly used to describe the process of monetary valuation and marketisation that is involved. The first – commodification – is frequently used to describe the main ways in which offsetting frames nature, not always with a great deal of theoretical clarity. The second – labor – is oddly absent from many discussions, despite it being irrevocably connected to commodification in the Marxian theory that underlies many of these debates, where commodity production creates surplus value via a distinctive form of exploitation in which workers are paid less than the full value of their time. This is partly because the third term – abstraction – has come to 'stand in' for labor in some theorizations, as a way of describing the way that biodiversity units render ecologies fungible. In this piece, we will explore the ramifications of this dominant theorization, and offer an alternative reading of the types of extraction involved in offsetting. We will ultimately argue that offsetting uses abstraction generatively, as well as subtractively, to create a form of 'hydra capitalism', in which rent extraction from land, commodification, and development capital are coiled together in a serpentine and hybrid arrangement.

'Commodification' is used everywhere in the offsetting literature, but often in a vague, rather gestural manner. This is part of a wider trend: as Derek Hall has noted in a recent article, the argument that just about everything is being commodified has become common in the spatial social sciences, often in arguments that hover between hyperbole, indeterminacy of definition, and a well-meaning intention to signal a critical left-wing politics (Hall, 2023). Indeed, over twenty years ago, Castree pointed to this problem in early offsetting literature, and called for greater rigor on three main questions: "what is 'commodification'; what 'nature' is being commodified?; and what is the material and moral significance of nature's commodification?" (Castree, 2003, p. 274). His exegesis of the problem notes that the Marxian definition of commodification is relatively precise: it describes a process by which qualitatively different things are rendered equivalent through the medium of money in the market in a manner that conceals the fact that, ultimately, labor is the source of surplus value in commodity systems. However, Castree goes on to argue that the word is often used in the literature on nature

to describe other cognate processes: privatization, alienability (the ability to transfer an entity from one owner to another), individuation (the act of separating an entity from its context), monetary valuation, displacement (fetishism that makes the harms to people and the environment disappear behind the relations between things in the marketplace), and abstraction (whereby the qualitative is reduced to the quantitative).

However, this is a somewhat tangled list. While it's canonical to see privatization (or primitive accumulation) as a precondition of commodification, many of the other items describe elements that are inseparable from the commodification process itself yet also stretch beyond it. The problem is that, in endeavoring to itemize the core characteristics of capitalism, Castree has flattened what are in reality a series of interlinked and dynamic processes within the social and economic relationships that pertain under capitalism because of the commodity form's dominance. Monetary valuation, for instance, existed centuries before capitalism, but money nonetheless has become a vital component in enabling a new series of social and object relations in capitalism (Engster, 2014). The equivalences that it enables cannot be easily isolated from its abstracting function, or from the new kinds of social and object-relations (alienability, individuation, fetishism) which capitalism engenders. A more mobile and processual approach is therefore needed to see when and where commodification is occurring, and when and where other linked but non-commodified relations of exploitation are at work. The first objective we have in this article is to provide this kind of account, which means understanding when and where labor appears in the work of creating an offset.

However, if commodification is everywhere, labor is oddly absent from the offsetting literature. This is strange, considering that a key plank of Marx's theory is that commodity production entails new forms of exploitation, paying workers less than the full value of their time. Again, this is part of a wider trend: as La Berge notes, "labor as a site for investigation of the economy has receded from critical theory," to be replaced by, on the one hand, Foucauldian biopolitics, and on the other, a strand of Marxism that emphasizes "real subsumption," i.e. the creation of surplus value via technological innovation, as opposed to via the sweating of labor by increasing exploitation of the worker's time (LaBerge, 2019, p. 20). Paradigmatically, Hardt and Negri argue that the contemporary economy transforms so many activities into value-generating labor that the connection between surplus value creation and the temporal measurability of labor is ultimately severed (2001, 2004). In the arena of nature, too, the contribution of non-labor based natural processes towards surplus value creation has been theorized in numerous ways, notably Polanyi's concept of land as a "fictitious commodity" (1957); Jason Moore's (2015, 2016) notion of capitalism as a world-ecological system that treats nature much as it organizes socially reproductive labor; and Saito's idea that Marx late in his life came to see nature as itself value-producing, in contradiction of the labor theory of value (2023, 2024). What all these theories share is an assumption that conventional Marxism lacks the tools to explain our current situation, because exploitation now takes forms that go beyond labor exploitation. The second objective of this article is to challenge this view.

Our argument is that the hinge between this omnipresent sense of commodification and the peculiar absence of labor from offsetting analyses centers on a third concept: abstraction. This is a key term in critiques of offsetting, which focus on the view that such schemes sell nature in order to save it (McAfee, 1999). In the case of biodiversity offsetting in the UK a new market in biodiversity units has been created to enable another market to function: the development system, which requires the harms that urbanization processes do to biodiversity to be pictured as externalities that can be offset (Robertson, 2004, 2006, 2007; Sullivan, 2017; Büscher, Dressler, & Fletcher, 2017; Büscher & Fletcher, 2015; Bourmpoudakis, 2019, 2020; Castree, 2010a, 2010b; for a critique see Castree, 2011). Critic after critic has pointed to the ways in which offsetting functions via a process of abstraction that rips away deep and rich connections between and amongst the human and non-human worlds, reducing the complex, multi-dimensional qualities of place to credits for monetary valuation and exchange (for example, McCarthy & Prudham, 2004; Lohmann, 2011; Gómez-Baggethun & Manuel Ruiz-Pérez, 2011; Fletcher & Breitling, 2012; Fletcher, 2013; Dempsey & Robertson, 2012; Spash, 2015; Kelly & Peluso, 2015; Dempsey & Suarez, 2016; Dunlap & Sullivan, 2020; Pellizzoni, 2021; Kaiser *et al.*, 2023). Abstraction, in these accounts, is a conceptual process that creates a potential new frontier for capitalism by reducing nature to a commodity.

However, this raises significant problems for the theorization of labor. Firstly, the specificities of labor and the commodity tend to go missing in these analyses: despite many accounts noting the place and position of 'intermediaries' in the conceptual process of constructing credits, precise evaluations of when and where

labor and commodities appear, and when and where other processes of surplus value creation, such as rent extraction, are in operation, are lacking. Secondly, this argument about abstraction is associated with a theoretical problem, since it tends to treat nature itself (not labor) as a source of surplus value. This article seeks to put labor back into the picture by introducing a new perspective on abstraction, one that treats it not merely as a reductive logic of equivalence, but also as a generative process which has socially formative effects. To be clear, by suggesting that abstraction can work in this 'positive' way, we are not suggesting that it is in any way A Good Thing, either socially or environmentally. Rather, our intention is to open a more dialectical account that enables the places where commodification appears to be identified with more precision, and their relationship to other forms of surplus value extraction (particularly rent) to be noticed.

Our argument can be broken down into four main stages, across seven key sections of the article.

a) Conventional analyses of commodification processes in offsetting describe a conceptual process of credit construction, rather than a material process of production that involves labor.

After a brief empirical introduction to natural capital and our example of offsetting from England – Biodiversity Net Gain (BNG) in Section 2, Section 3 moves on to show how a specific conceptualization of commodification, exemplified by Robertson's highly influential contributions of the early 2000s, has tended to dominate the literature on biodiversity credits. This pictures commodification as a process of conceptual abstraction, in which messy, material ecologies are simplified into exchangeable biodiversity units. Robertson describes commodification as an overwhelmingly reductive process of translation from use value to exchange value, and commensurately from singularity, qualitative difference, and use value towards abstraction, quantitative equivalence, and exchange value. However, the location of labor in this account of commodification is vague and imprecise, opening it to the charge of fetishism, something noted by Apostolopoulou, *et al.* (2018).

b) The model of abstraction that is offered consequently focuses heavily on loss, reduction, and subtraction. The generative and creative aspects of abstraction by which the world is remade according to the abstraction are ignored.

This opposition between the qualitative, concrete and material and the quantitative, abstract and exchangeable is rife in the wider political ecology and geographical literature, and it is strongly inflected by an idea of abstraction as loss. The process, in this view, is inherently *subtractive,* "a withdrawal from the reality (or particularity) of the object of experience" (Osborne, 2004, p. 22). However, in Section 4 we will show that this is a one-sided version of Marx's account of abstraction, and that it is possible to take a more dialectical view, in which reductionism also fulfils a *generative* purpose, reshaping the material world in its image. We move on to a more nuanced account of abstraction, focusing on the difference between processes of abstraction associated with commodification and the conceptual abstractions of offsetting, showing that the latter enable forms of surplus value extraction that are based on ground rent rather than commodity production.

c) This leaves the ways in which labor interfaces with credit systems to be significantly undertheorized, leading to an empirical 'gap' around actual labor practices.

The dominant geographical model of abstraction-as-loss has tended to obscure the concrete, material, and generative role of labor under capitalism in producing knowledge commodities that enable the abstractive process of simplifying ecologies to biodiversity units. It is to these commodities that we turn in Section 5. We will show that the 'other side' of abstraction lies in its reshaping of labor and regulatory systems itself, transforming these into a site of surplus value creation. Offsetting introduces new niches for private sector consultancy firms to generate surplus value, via new forms of ecological and planning consultancy.

d) Focusing on labor can help us theorize more precisely where knowledge commodities are produced in credit creation, and to answer the question of whether biodiversity credits are themselves a commodity. It also enables us to explore the issue of transaction costs, which are a critical problem for supporters of natural capital.

We complete section five by offering a more material account of the creation of knowledge commodities produced within the new BNG system of biodiversity offsetting in England. Developers have two options when it comes to offsetting: to provide habitat on the development site itself or offsite, usually as part of a habitat bank. We will attempt to show that both onsite and offsite BNG units are *not* a commodity in their own right, but a conceptual platform that enables new forms of knowledge commodification and rent extraction via regulation. We theorize the place of knowledge commodities within Harvey's wider 'circuits of capital' model (1985), arguing that their production by consultancies forms a subsidiary commodity loop in the secondary circuit of capital (the development of space), and, further, that the labor involved is therefore productive rather than unproductive, in the sense that it forms an essential part of the process of constructing housing as a commodity. In Sections 6 and 7 we explore the implications for concepts of the 'fictitious commodity' and the consequences of consultancy labor for ideas of transaction costs in natural capital systems. We conclude by arguing that offsetting represents a hybrid 'hydra capitalism' that links very different processes of exploitation (rent extraction and commodification) in its enclosure of the natural world.

2. Biodiversity Net Gain in England

England is certainly not the first country to trial biodiversity offsetting: the US has been using the idea for many decades to manage ecological harm to wetlands (Robertson, 2000). However, the introduction of BNG to England in the spring of 2024 following extensive piloting (see Lockhart, 2015; Lockhart & Rea, 2019; Carver & Sullivan, 2017; zu Ermgassen *et al.*, 2021) means that the UK is now host to one of the largest biodiversity markets in the world, with some promoters predicting that it could attract as much as £2bn (about US$2.7bn) in conservation investment each year (Hatchett, 2024). This article uses the example of Biodiversity Net Gain in England to explore how one large-scale program of offsetting introduces new forms of commodification, rent extraction, and labor exploitation.

Operating through the land use planning system, BNG requires all eligible development to secure a 10% uplift in biodiversity, which should be implemented on the development site where possible, though use of "offsite" offsets is also possible. The approach is underpinned by a metric that enables different ecologies (in the form of habitat classifications) to be quantitatively compared according to a set of rules (most notably, the "biodiversity gain hierarchy," a relative of the "mitigation hierarchy" that is designed to protect the rarest and most valuable habitat types from being traded for lower quality habitat, (see Arlidge *et al.*, 2018). Critical academic literature has emerged about both the conceptual and ethical problems of BNG, as well as its practical implementation (Carver & Sullivan, 2017; Apostolopoulou, 2020; Apostolopoulou & Adams, 2019; Lockhart & Rea, 2019; Knight-Lenihan; 2020, zu Ermgassen *et al.*, 2021). In this article we focus on one area in particular: the philosophical model of abstraction that is used to describe the process of capturing and valuing nature, and the conceptualization of both commodities and labor that it entails.

An undialectical and one-sided account of abstraction, we will argue, has led to the neglect of labor in studies of BNG. Our argument is not, however, that the work involved in offsetting schemes has not been noticed by other scholars: indeed, it is common within the literature to find discussions that draw attention to the fact that there are a large number of intermediaries involved: in standardizing habitat valuation (Carver & Sullivan, 2017), in brokering agreements between landowners and developers (Sullivan & Hannis, 2015), in establishing legal agreements (Lohmann, 2011, 2012; Sullivan, 2013), in carrying out conservation work (Neimark, 2023), in acting as consultants (Wotherspoon & Burgin, 2009; Yearley, 1992), and in regulating and enforcing offsetting (Knight-Lenihan, 2020). What has not been noted, however, is that the loss-driven account of abstraction in the literature has tended to weaken the theorization of the relationship between labor and commodities in nature markets in these contributions, obscuring the ways in which different fractions of capital interrelate in the process of constructing biodiversity credits.

Let us begin, however, with a more straightforward empirical description. The BNG system in England requires a range of different labor inputs, which vary according to whether the offset is onsite or offsite. As Figure 1 shows, for *onsite* delivery of offsets, an initial ecological assessment is required, which is undertaken by a consultant ecologist and paid for by the developer. This requires a survey of the site, which becomes an ecological report (usually styled as a 'Preliminary Ecological Assessment' or 'Phase 1 Assessment'), and mapping of on-site habitat types with data on their extent and condition inserted into a spreadsheet containing the standardized BNG metric. The spreadsheet calculates the baseline number of 'biodiversity units' that the site is delivering prior to development, and the ecologist, in consultation with a landscape architect, drainage engineer, and the developer, will then calculate ways to achieve a 10% uplift in this number, to be delivered onsite after development. Separate ecological surveys (known as 'Phase 2 assessments') may also be required to assess the impact of the proposed development on protected species (such as bats and birds), and, where necessary, these will include plans for the mitigation of harms. The scale of consultant labor involved in producing BNG assessments and accompanying reports varies significantly depending on the size and ecological complexity of the site and may necessitate repeat visits at different times of the year for vegetative, bird, and bat data collection.

The consultant ecologists' work is then submitted to the Local Planning Authority, where it is reviewed by a local government ecologist and planner, who will raise any issues with the developer, often necessitating revisions and the addition of further information. The whole scheme is then considered for refusal or approval by local decision-makers (working with a large range of criteria, of which ecology is just one) who either grant or refuse planning permission. Where permission is granted, it comes subject to a list of conditions, one of which is the production of a Biodiversity Gain Plan and Habitat Management and Monitoring Plan by the consultant ecologist (again with the input of landscape architects, engineers, and developers). These plans set out the formal proposals for delivering net gain over a 30 year period and may need to be secured by a distinct legal contract (called a Section 106 agreement), requiring the input of a lawyer. Subsequently, the offset will require physical delivery, a process that can involve a whole variety of forms of manual labor, and, in some cases, follow-up monitoring by a consultant ecologist or land assessor. Payment for the physical material enhancements is usually delivered not by the developer, but by a management company that charges residents of new housing (or occupants of the development site) for these works, an issue to which we will return. Whilst elements of this labor occurred before BNG was formally introduced, its introduction has intensified the amount of work required, particularly in terms of producing metrics and plans to enhance sites.

For *offsite* delivery of offsets, the same surveys are carried out to assess habitats and species on the development site, but harms are offset on a separate site, which must itself be defined, surveyed, registered, and pooled into a habitat bank. Surveys are carried out by a consultant ecologist or ecologist working for a habitat bank, with land assessors and rural land advisors potentially inputting into the process and providing financial and investment advice to the landowner. The habitat bank also establishes mechanisms for marketing and promoting sites to developers, including entering into legal agreements (which of course requires specialist legal advice). Ongoing management and monitoring must also be arranged, which requires the involvement of regulators who maintain a statutory register of offset sites, and planners and local government ecologists, who review plans and the Section 106 agreement. As with onsite offsets, manual labor will of course also be required to physically deliver ecological enhancements on the offset sites. Currently, discussion of offsite credits dominates much of the research literature, not least because this model has been dominant in the US. This article provides a counterweight by also considering onsite mitigations, which, according to recent research represent far and away the most popular option with developers in England, with the majority of developments (perhaps up to 95%) electing to provide mitigation within the 'red line' of the development boundary (Rampling, zu Ermgassen, Hawkins, & Bull, 2024; zu Ermgassen *et al.*, 2021).

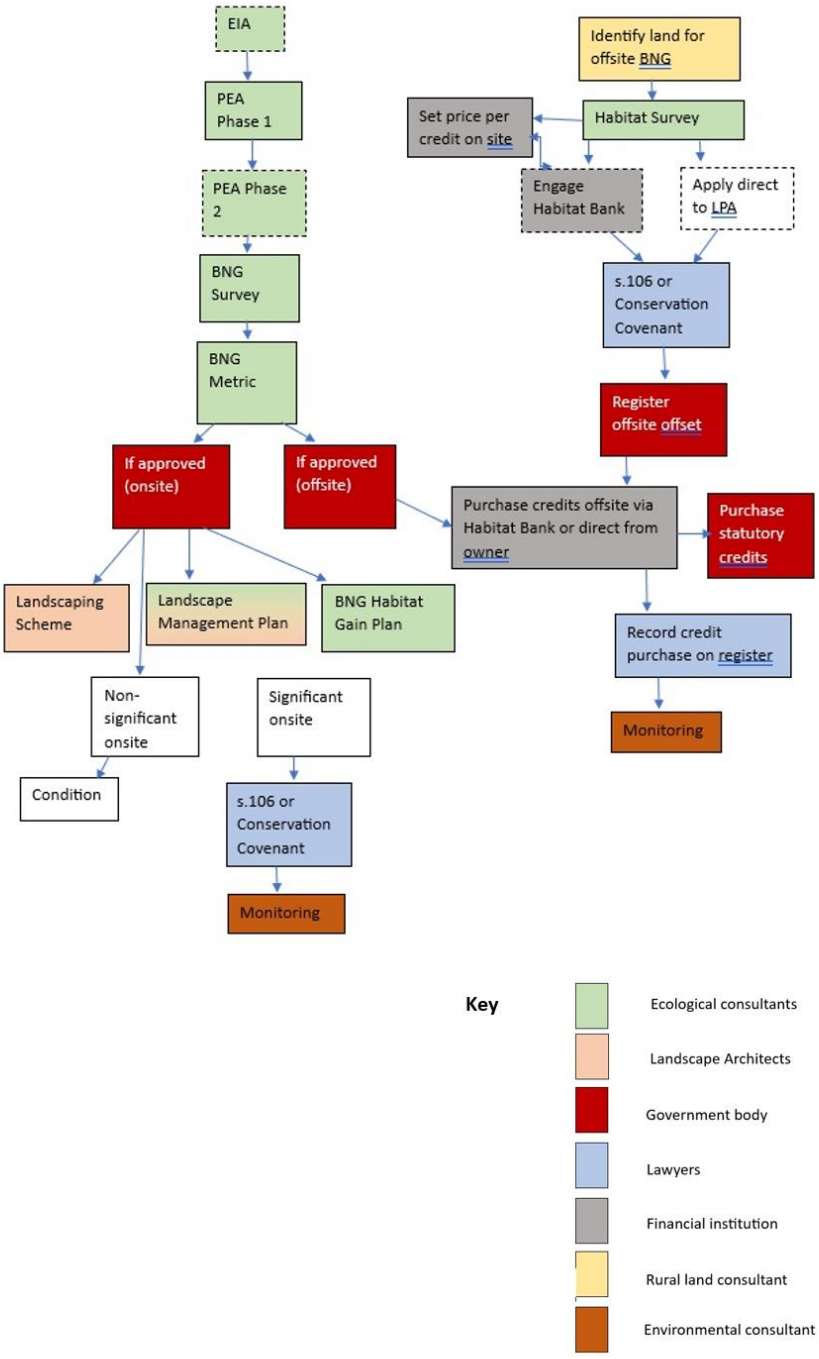

Figure 1: Consultancy labor in Biodiversity Net Gain

The case of BNG in England will enable us to explore when and where commodities are created via the exploitation of labor, and to contrast this with the generation of surplus value by other means, e.g. rent extraction. In doing so, we hope to supplement a literature that considers the transaction costs for the public sector of offsetting schemes (Fletcher & Breitling, 2012; Sullivan, 2013) by evaluating the extent to which consultancy labor and the knowledge commodities that it produces involve separate commodification processes to the abstractions involved in the construction of credits. In the next section, we begin by discussing the dominance of a limited view of abstraction in the literature, showing how it obscures the issues of labor and commodification within the literature on biodiversity credits. We focus on two specific contributions, by Morgan Robertson and Apostolopoulou, Greco, & Adams, for the simple reason that they engage most directly with issues of abstraction and labor, getting to the heart of the theoretical problem that we want to highlight.

3. Abstraction as loss: the dominant model of theorizing biodiversity commodification

Morgan Robertson's pathbreaking work on the establishment of US wetland credit schemes in the 1970s and 1980s made a seminal contribution that cemented a model of abstraction-as-loss into the literature on offsetting. Robertson describes a four-stage conceptual process by which the particularity of an ecology gets translated into a commodity for exchange. First, a particular parcel of wetland is categorized ecologically, which Robertson argues is a form of abstraction to functional categories. This is "an act of reference" as a "diverse and complicated site is codified by a set of characteristics considered relevant by the scientist, engineer, or developer" (Robertson, 2000, p. 472). As a known quantity, wetlands can then enter a second process, where their functional characteristics are ascribed monetary value, thus inserting them into the overarching logic of "net gain," which consists of pricing in externalities that have hitherto been ignored. A third process of spatial abstraction then occurs, which also loses place-based specificity, since it allows the destruction of a wetland ecology in one place to be compensated by a mitigatory gain in a completely different location. Finally, at the apex of the abstraction pyramid, there is exchange, moderated by various state and private sector institutions, which allows the creation of wetland 'banks' selling wetland 'credits' to mitigate the ecological costs of development.

However, in the emphasis on abstraction as a 'lossy' conceptual process, the labor involved in the construction of credits tends to get deprioritized. This is a theoretical problem, as much as an empirical one. One of the drawbacks with Robertson's four-stage process is that it divorces the ascription of monetary value to an ecology (stage two) from the act of exchange (stage four). Within a Marxian framework, the exchange value of a commodity can only really be quantified when it enters the marketplace (here recalling, of course, that exchange value is different from price). This initially appears to be a pedantic point, but when we explore it more closely, it quickly becomes aporetic. If a central tenet of the Marxian idea of the commodity is that the source of its value lies in labor, then what type of labor (as opposed to what kinds of functional abstraction) sits behind the creation of biodiversity offsets as a commodity?

Robertson's (2000) answer is to use an amalgamation of Polanyi and Latour to point firstly to the oddness of land as a commodity, and secondly to the idea that commodification as a process involves mediatory practices of reference. First, following the work of O'Connor, Robertson adopts Polanyi's famous concept of the 'fictitious commodity', which he interprets broadly as arguing that land is both thrust into exchange and impossible to exchange, because it can never be fully detached from the rest of life, stored, or mobilized. Biodiversity credits are inherently strange, then, because they involve trade in something that is not really tradeable. This theoretical move has been very influential and has subsequently been followed by many other writers on credit systems and in the field of radical conservation (Büscher & Arsel, 2012; Corson & MacDonald, 2012; Gómez-Baggethun & Ruiz-Pérez, 2011; Holmes & Cavanagh, 2016; Peluso, 2012; Roth & Dressler, 2012).

However, something more than a theory of land is required to explain the absence of labor, and Robertson fills this gap by turning to Latour, a thinker from a very different intellectual tradition to Polanyi, to argue that commodification involves a series of "acts of reference" that allow concrete ecologies to be represented as abstract credits. It is worth mentioning that the original version of this idea, in Latour's work, is primarily about epistemology: the idea of acts of reference is the cornerstone of the French theorist's endeavor to reframe the relationship between objects and words, moving away from the notion that they occupy different

ontological domains. In *Pandora's Hope,* Latour studies the way in which scientists use soil samples to understand a Brazilian forest edge ecology, and the types of representational practice on which their work depends (things like cartography, gridded quadrats, botanical samples, soil samples, and filing systems, all of which detach, separate, preserve, classify, reassemble, and redistribute elements within the ecology to enable the construction of knowledge). His contention is that knowledge is not a passive correspondence between world and word that must leap over a "gap between two different ontological orders," but is instead a long series of active practices that constantly shuttle between things and signs in a process that enables concrete complexity to become abstract knowledge. "Knowledge does not reflect a real external world that it resembles via mimesis," argues Latour, "but rather a real interior world, the coherence and continuity of which it helps to ensure. What a beautiful move, apparently sacrificing resemblance at each stage only to settle again on the same meaning, which remains intact through sets of rapid transformations" (Latour, 1999, p. 58).

In Robertson's hands, however, this ceases to be an epistemic theory about the relationship between representation and reality. Instead, it becomes a more straightforward theory of commodification via mediating abstractions: "Commodification involves an act of reference in which, through exchange, the abstraction is treated by actors as equivalent to the concrete, even though the two may differ in many important respects" (Robertson, 2000). This arguably places Robertson's work as an early example of a theoretical move that has since become more common: to read markets in terms of a "performance" of economic ideas (e.g. Berndt & Boeckler, 2009; Callon, 2007a, 2007b). Markets, in this view, are socio-technical assemblages or networks that function to frame commodity transactions and to set prices, often with an emphasis on technical and scientific kinds of knowledge-based work (for a cogent critique see Cahill, 2020, p. 29).

Apostolopoulou *et al.*, are quick to notice this weakness in Robertson's theoretical stance from a Marxian perspective. In their view, his use of Latour reduces biodiversity units to a "performative entity," meaning that value is something that can be created by "a socio-technical arrangement, a configuration of people, institutions and technologies which conducts the perforation of markets through calculative devices" (Apostolopoulou, Greco, & Adams, 2018, p. 868). This opens Robertson to a critique on the basis of fetishism: his analysis fails to account for the type or role of labor behind the construction of these new commodities, and therefore leaves "little space for engagement with the historical material reality behind appearances – the political, economic, and social structures that validate and naturalize the value system of capitalism, of which biodiversity offsetting is just an expression" (Apostolopoulou *et al.*, 2018, p. 869). To make matters worse, it is not just the Latourian elements that are the problem: the Polanyian ingredients are also open to this criticism, since the idea of "fictitious commodities" in Robertson's hands tends to become a performative framing device that allows markets to be created in land, labor, and money (Berndt & Boeckler, 2023; we will return to rethink this point in more depth at the end of the article).

Instead, Apostolopoulou *et al.* abandon a theorization of biodiversity credits that is based on ideas of commodification. In their view, biodiversity credits cannot be a commodity at all, because they do not embody human labor. Instead, they frame them as a construct of a regulatory, state-guaranteed equivalence between ecologies and prices, a form of interest-bearing capital in which nature is treated as a financial asset that belongs to those who own land. Biodiversity credits, in this view, represent a form of rent extraction that depends on subsidies, regulation, and monopolistic land and property rights:

> …offsetting does not involve the creation of a new commodity which would imply the erasure of a myriad of heterogeneous, non-substitutable and non-qualifiable use values of biodiversity entities, to sell them and in this way make them circulate as abstract value… It is, instead, a process of rent extraction, which means that the value here is rather extracted from other sector(s)... offsetting would be impossible without state intervention: it is the state that is in charge of defining the regime of property rights and enforcing the laws that allow for rents to be extracted (Apostolopoulou *et al.*, 2018, pp. 869–870).

Apostolopoulou *et al.* frame this argument in a manner that relies heavily on a model of offsite credits. It makes a vital point in relation to this particular type of offset: that they work to shore up the power that landowners

possess via their exclusive rights over space, enabling them to generate a surplus profit via their control of a natural resource, which is transformed into ground rent. As such, credits are aligned with the interests of the landowning classes, making them an element in rentier capitalism (supported by a state that favors the landed and propertied demographics in society). For these authors, this also means that they are a potential source of friction for the commodity-producing, and land-using fractions of capital. Like Robertson, Apostolopoulou *et al.*, support their argument with recourse to ideas of 'fictitious capital', but they offer a very different interpretation of this concept, locating it at the juncture of land ownership and financialized structures that underpin BNG. When land becomes organized into habitat banks, they argue, these function as "a particular branch of the circulation of interest-bearing capital," meaning that nature begins to act as a financial asset. Biodiversity credit systems thus represent a financial claim on the future, a way of drawing on "the interest on some imaginary, 'fictitious capital'", understood as a form of credit.

However, labor emerges as a problem for this theorization too. While Apostolopoulou *et al.* make a persuasive case that forms of rent are involved in offsite credits, their account does not function well as a description of the kind of onsite mitigations that represent the majority of BNG mitigations in England at the time of writing. To be clear, we are not criticizing this valuable contribution on these grounds, since it would be unfair to ask an article that produces an internationally valid conceptualization to deal with the details of the English system. However, onsite mitigations of the type that are prevalent in England (but are also found elsewhere) do not necessarily favor landowners in the same way as offsite offsetting does. Instead, the relationship between landowning and commodity-producing fractions of capital is that of the conventional development process. Here, BNG does not work in favor of landowners, since it actually means that the price of land as a transferable asset is *negatively* affected by offsetting. Developers pay a lower value for the land that they require, because less of it is available for the construction of the built environment commodities that generate profit. There is a 'land take' for ecological mitigation, in other words, that negatively affects land prices (this has been explored in the literature on Sustainable Urban Drainage Systems, see Payne *et al*, 2023). However, as we shall show in later sections, rent extraction from land is still operational in onsite offsetting, via the opportunities it creates for estate management companies to extract surplus value from the management of public open spaces.

However, despite these major theoretical differences, the underlying logic used by Apostopoulou *et al.* is surprisingly similar to that offered by Robertson. The same oppositions that characterize Robertson's work are reintroduced, though their analytical force points in a different direction. Both authors tend to oppose everyday life and ecology to abstraction and equivalence, arguing that credits are created by the imposition of a standardized and abstracted language to encompass living diversity at all scales, which ultimately levels difference. Both sides of the argument agree that biodiversity credits are abstracting and therefore must involve the destruction of particularity, understood as a disinterest in "local traditions and meanings, the uneven socio-economic consequences of land use change, the cultural importance of place, social ties between communities and particular habitats, access to green space and the diversity of both natural and social relations that social space contains" (Apostolopoulou *et al.*, 2018, p. 878). Both also argue that the result of equivalence is that places are not just economically interchangeable, but also spatially homogeneous and geographically undifferentiated (an argument that resonates with the work of Augé, 1995, and is clearly indebted to Lefebvre, 1991).

Much of the wider literature on credit systems follows in a similar vein, drawing on the same series of assumptions about the way that credits involve a process of abstraction that disembeds the particular, reframing the qualitative in quantitative terms. For example, Lohmann's insightful work on carbon credits describes them operating by a simplifying process, "wrenching abstraction and subsumption of qualitative to quantitative relations" (Lohmann, 2011, 2012, p. 89). More widely, a similar series of binary oppositions inflects recent literature on the underlying logic of BNG, natural capital and the neoliberal reconceptualization of conservation that it entails. For example, an influential group of scholars in this field conclude: "non-human natures tend to be flattened and deadened into abstract and conveniently incommunicative and inanimate objects, primed for commodity capture in service to the creation of capitalist value" (Büscher, Sullivan, Neves, Igoe, & Brockington, 2012, p. 23). Time and time again, the assumption is that, in the abstracting process, things are 'left out': "Many forms of value, appreciation, understanding and experience of non-human worlds simply are

incommensurable with economic pricing mechanisms, and are displaced or closed off completely in the process of pricing for monetized exchange" (Sullivan, 2009, p. 264).

We do not see this account of abstraction as 'wrong' but simply as one-sided. In the next section, we will outline a more dialectical theorization that sees abstraction as reductive at one level, but materially generative at another. Our aim is to balance this 'lossy' account of the way that exchange works, exploring its material impacts on the world, by returning to Marx's original theorization of abstraction.

4. A generative theorization of abstraction: making space for labor

Marx is often cited as the originator of the idea of abstraction as loss, a misconception that has its roots in his famous opposition between use value and exchange value. Yet a closer reading of Marx's account reveals a more dynamic and complex understanding of this key concept than that on offer in the offsetting literature in particular, and the geographical literature in general. Yes, the domain of use value, of the local, of labor, and of everyday life is rich in the particular and 'thick' private social relations of ordinary people, but for that very reason, Marx argues that it is *less* comprehensively and collectively social compared to exchange. When abstraction removes the concrete, sensuous aspects of commodities, this allows them to become both more socially promiscuous in the relations that they can create, and also more generative of a new series of social relations: the market. The only reason, however, that markets are needed is that the division of labor means that people's working lives are comparatively confined: "Only the products of mutually independent acts of labor, performed in isolation, can confront each other as commodities" (Marx, 1976, p. 132). While both objects and the human needs they serve are multiple and heterogeneous, labor, by contrast, is atomized and provincialized: for the worker "the social division of labor makes the nature of his labor as one-sided as his needs are many-sided" (Marx, 1976, p. 201). This imbalance between the spheres of production and consumption is ultimately the state of affairs that perpetuates the worker's subsumption by capital.

This process, however, is generative. Capitalism does not simply produce commodities; rather, the production of commodities remolds social relations in ways that affect production and labor as well as consumption (Finelli, 2015). Abstraction, in this sense, is not just a subtractive withdrawal from the world, but also power at its most productive. In *Capital* volume 1, Marx is explicit about this creative aspect:

> …the labor objectified in the values of commodities is not just presented negatively, as labor in which abstraction is made from all the concrete forms and useful properties of actual work. Its own positive nature is explicitly brought out, namely the fact that it is the reduction of all kinds of actual labor to their common character of being human labor in general, of being the expenditure of labor-power (Marx, 1976, p. 159- 160).

The system of averages that sits behind abstract labor time can therefore only emanate from the totalizing social perspective that is possessed by commodities in exchange. As Toscano and Kinkle perceptively argue, this gives abstractions a two-faced character. On the one hand, we have a system that is reductive and totalizing, but on the other we have a domain of exchange that is productive of a turbocharged sociality. Abstract labor time, and the chain of equivalences between different types of labor established by the market, effectively relate every individual worker to every other worker via the ratios in which things are exchanged: "Those abstractions that in one register are immaterial, mute and unrepresentable as the most arcane deities, reappear in another as loquacious, promiscuous, embodied" (Toscano and Kinkle, 2015, p. 40). And of course, in biopolitical terms, the power exerted by this hypercharged productive abstraction goes all the way down to the personal level too. As Marx writes, "individuals are now ruled by *abstractions*, whereas earlier they depended on one another. The abstraction, or idea, however, is nothing more than the theoretical expression of those material relations which are their lord and master" (Marx 1993, p. 164, emphasis in original).

However, to see both the reductive and the generative sides of abstraction, we also need to grasp that, while commodity production inevitably involves abstraction, not all forms of capitalist abstraction involve commodity production (after all, at base, Marxist analysis relies on a form of abstraction for its intellectual heft). It is important to be more precise, therefore, not just about the use of the term 'commodification', but also

about when and where abstraction appears, and how the abstractions of commodification relate to the wider abstractions that characterize a capitalist economy based on commodity production. The advantage of this is not just that it enables a more nuanced account, but that it may help us to track the changing shape of late capitalism more broadly, pinpointing its techniques for the enclosure of previously unmarketized entities, like nature in general, and biodiversity in particular.

In terms of biodiversity credit systems, Robertson rightly describes a process of abstraction at work, from unruly ecologies to monetizable biodiversity units. This conceptual process is, however, one of valorization rather than commodification. BNG units are not a commodity: they are instead a conceptual device to enable new forms of rent extraction from land. In the case of offsite offsets, landowners are paid to manage their land for nature, a process that enables them to continue to extract rent, often from land that is becoming marginal in terms of its agricultural competitiveness. In the case of onsite offsets, the conceptual device of 'biodiversity units' does not lead to a situation of trade or exchange, but merely to new ways of laying out development within the redline boundary of a particular site (the unit measurement is converted into a calculation of the compensatory habitats to be created onsite). However, the process still enables rent extraction via the practices that surround the ongoing management of these offsets. This is because public open spaces that serve as biodiversity offsets on new build housing estates are no longer adopted by local councils for the purposes of management. Instead, they are sold to estate management companies, who own and manage the land, including the biodiversity offsets, for the term of the contract. The charges for this service are passed on to residents of these new estates, who pay the company for the landscaping labor that is involved, as well as an administration fee. So in the case of both onsite and offsite BNG, the process of conceptual abstraction is separate from the process of commodification and primarily involves ground rent extraction.

However, this process of conceptual abstraction that enables new types of valorization of land *also* creates new niches for other forms of abstraction that are involved in commodity production. In other words, the non-commodifying conceptual abstraction that constructs the 'biodiversity unit' also acts as a generative force to create new niches for knowledge commodities, which are produced by an industry of private consultants. The next section discusses these as a separate and different type of surplus value extraction within the hybrid system of offsetting, showing how the conceptual abstraction of the 'biodiversity unit' relates to the material abstractions involved in the production of knowledge commodities. Our argument is that offsetting is not merely a process of reductive abstraction, but a system that enables hybrid, generative, and multiple forms of exploitation. In other words, it is hydra-headed.

5. Private consultancy and knowledge commodities

Within the global north, consultants now account for a sizable proportion of economic activity: for example, in the UK over 13% of the workforce is employed in this sector, which has grown 40% more rapidly since 2000 than all other economic sectors (Riley *et al.*, 2020). In the fields of conservation, environmental management, and planning, the role of consultant labor has become ever more important, employing greater proportions of professional planners, ecologists and environmental scientists to advise both private companies and state institutions (Inch, Wargent, & Tait, 2022; Linovski, 2019a; Snell & Oxford, 2021).

Much of the existing research on consultancy focuses on the internal details of organizations, including the deployment of expertise and the function of ideals of professionalism (see for example, Empson, Muzio, Broschak, & Hinings, 2015; Greenwood, Suddaby, & McDougald, 2006). More widely, academics have discussed the role of consultants within society, and particularly their relationship with the state and development (Ferguson, 1994). The rising "consultocracy" (Hood & Jackson, 1991) has been tied to ideas of state-sponsored neoliberal capitalism, in which regulatory institutions "govern the triplet of markets, society and state and the imaginary borders between them" (Levi-Faur, 2017, p. 290). For many, the role of consultants and professional services firms is vital to this form of capitalism (Raco, Street, & Freire Trigo, 2017; Ylönen & Kuusela, 2019), providing capacity, expertise, independence, and legitimacy (Abbott, Levi-Faur, & Snidal, 2017). In this view, consultants intervene in fluid and relational ways to change regulation in the interests of capital, a move that has been conceptualized as a lubricating force in markets, a form of 'liquid regulation' in favor of economic growth (Black, 2017; see also Krisch, 2017). However, this focus on consultants as

"regulatory intermediaries" (Abbott, Levi-Faur & Snidal, 2017) who are the handmaidens of emerging markets within planning (Bragaglia & Parker, 2024; Raco, Brill, & Ferm, 2022) and environmental consulting (Owen, 2021) has sometimes tended to obscure the ways in which consultancy has been able to enclose and generate surplus value from the planning system itself, by transforming the process of spatial decision-making into a market for new types of commodity, involving new types of knowledge labor.

We need to distinguish more clearly, therefore, between the conceptual process of abstracting from ecologies to exchangeable credits, and the material ways in which this process inflects commodification and labor as a new source of surplus value in a system focused on consultancy and knowledge commodities. In so doing, we want to connect the offsetting literature to recent studies that have sought to understand how consultants operate as neoliberal market actors, including the involvement of consultancies in outsourced public services (the 'parastate' [Raco, 2021]), the role of consultants in global policy transfer (McCann, 2011; Prince, 2012), the work of lobbying governments (see Akers, 2013; Keele, 2021; Linovski, 2019a, 2019b), and business practices of mergers and large consulting firms 'colonizing' new professional terrain (Linovski, 2019a; Suddaby & Greenwood, 2001, Spash, 2015).

Understanding this new labor force means grasping the role of knowledge-intensive work in offsetting systems, and particularly the role played by new 'knowledge commodities' in the construction of credits. Part of the problem with grasping their new role lies in a series of overlapping but not entirely commensurate distinctions (which inform Robertson, Apostopoulou *et al.* and the wider literature) between 'mental' and 'manual' labor, 'productive' and 'unproductive' labor, and 'immaterial' and 'material' labor. Knowledge work has sometimes been described as unproductive, immaterial, mental labor that exists outside of commodity circuits (Gorz, 2010; Gollain, 2016). Indeed, at first sight, it looks very different from the manual, material, factory-based labor that Marx describes as typifying commodity production, where the essence of exploitation lies in the fact that workers are paid less than the full value of their time to produce a material object, thus generating surplus value via the valorization of capital. This has led to attempts to theorize knowledge commodities as a challenge to the labor theory of value, i.e. in a manner that argues that it is no longer possible to measure the labor time of individual workers, let alone calculate the abstract labor time required to render labor equivalent (Lazzarato, 1996; Hardt & Negri, 2001, 2004; Gorz, 2010).

There is a fundamental confusion in these discussions between, on the one hand, the content of labor (mental/manual) and the form of the product that it generates (immaterial/material), and, on the other, the ideas of productiveness or unproductiveness. Confusion abounds, despite the fact that Marx himself is at pains to point out the difference: "neither the special kind of labor nor the external form of its product necessarily make it 'productive' or 'unproductive'" (Marx, 1963, p. 165; also see Tregenna, 2011). Instead, the distinction between productive and unproductive labor is about the *social relations* that surround the labor. Productive labor, for Marx, is labor that is inserted into the social process of surplus value creation for a capitalist. A factory worker would be a classic example, but jobs that appear to be service-based jobs can also qualify:

> The only worker who is productive is one who produces surplus-value for the capitalist, or in other words contributes towards the self-valorization of capital. If we may take an example from outside the sphere of material production, a schoolmaster is a productive worker when, in addition to belaboring the heads of pupils, he works himself into the ground to enrich the owner of the school. That the latter has laid out his capital in a teaching factory, instead of a sausage factory, makes no difference to the relation (Marx, 1976, p. 644).

To determine whether the labor involved in knowledge commodity production is productive or not, then, we need to know something about the wider social and economic relations in which these commodities sit. Ultimately, in the English system, this consultancy work is located within a circuit that produces value through land use change and the commodification of housing. In David Harvey's renowned 'circuits of capital' model, investment into the built environment functions as a secondary circuit to commodity production, as the spatial domain becomes a refuge for over-accumulated surplus value at periods of crisis (Christophers, 2011; Harvey, 1985). Housing developers invest in the built environment, accumulating surplus value from spatial processes

of land use change that produce housing as a commodity. The introduction of BNG essentially creates economic niches for the various consultants in Figure 1 to extract surplus value from this development system via the production of specialist knowledge commodities, in a subsidiary circuit that is created by the regulatory state and funded by development, an example of Peck and Tickell's idea of neoliberalism as re-regulation in favor of capital (2002). Since these commodities play an essential part of the generation of surplus value by development capital, this form of consultancy therefore also constitutes productive labor.

Returning to the case of BNG, we can view the ways in which the labor involved in producing these knowledge commodities is structured. By the definition above, large consultancies, such as the ecological companies who produce surveys and BNG assessments, are a straightforward example of productive labor and its exploitation by capital. The workers who do this labor are waged and are not only paid less than the full value of their time but are often subjected to intense forms of labor exploitation. Many junior ecologists work extremely challenging hours in difficult conditions, to the point that the sector has had to accept regulation of working conditions: bat surveys notoriously used to require dusk and dawn surveys, with very few hours in-between, during which many ecologists were asked to sleep in their cars; today, there are safer working practices but the survey season remains onerous for many. Clearly, the labor involved in these surveys is neither entirely mental nor completely immaterial, in any meaningful sense of those terms: creating or checking a BNG assessment involves travel to a specific site, and then the input of time, a degree of mental and physical energy, and the ability to draw on specialist professional *nous.* Exhaustion continues to be a very real problem, as survey work is intense and demanding. These are inherently material dimensions: as Carchedi (2014) has pointed out, mental labor can be productive labor that produces value, and knowledge labor *is* material (as anyone who has tried to write when they are unwell or physically exhausted can testify). The assessment that results may be intangible – an entry on a computer spreadsheet or a PDF report – but the output is still a commodity with a clear use value in the logic of the regulated development system, and a clear exchange value in the form of the consultancy fee charged for its production. There is also an abstract labor time average in place for these services, since consultants operate in a competitive marketplace, and the price that the company charges in comparison to other consultancies is one factor in whether the developer employs them. Finally, the surplus value generated by the labor is reinvested in the capital of the ecological firm.

But what of sole trader arrangements, where the ecologist is an informal one-woman band, rather than a waged worker? In this case, it is tempting to build a line of argument that what we have is simple or petty commodity production, of a kind that pre-dated capitalism by centuries, centered on a 'C-M-C' circuit rather than an 'M-C-M' circuit (see Bernstein 1988, 2006; Harriss-White 2023). But here we also need to consider the wider complexity of the development system, in which all types of consultancy labor associated with BNG sit. The professional labor created by onsite biodiversity mitigation policy does not enter the market completely independently but is a subsidiary element within development capital. It forms an absolutely necessary part of the process of producing housing as a commodity for the simple reason that it is required by the regulatory state as a part of the development process. It therefore cannot be a form of simple commodity production but is parasitic on a much wider circuit of development capital, which involves the production of built environment commodities.

6. Fictitious and real commodities

We have established that BNG is not a single process of commodification, but rather a conceptual abstraction that enables hydra-headed forms of value extraction, which include ground rent and via the production of real knowledge commodities within the consultancy industry. We are now in a position to return to the question that underpins much of the offsetting literature (see Section 3): is the idea of a 'fictitious commodity' useful to describe what is happening and, if so, when and where do fictitious commodities make an appearance in offsetting?

Let us first refresh an understanding of Polanyi's brief discussion of the fictitious commodity, of which there are three types: land, labor, and money. All three are fictitious because, unlike commodity objects (real or virtual), they are not objects produced by human labor for sale on a market. However, because labor, land, and money are essential to the functioning of the market, under capitalism, they must be organized according

to a market logic as commodities. At one and the same time, they are treated as commodities, while everybody knows full well that they are not commodities: land, for example, is not the creation of labor, but is clearly more primordial than any commodity, both historically and logically, and sits at the material base of social relations in a way that cannot be easily reduced to fungibility. This simultaneous assertion of two contradictory things is a kind of publicly recognized lie, a form of disavowal that results from the subordination of the social and political to the economic sphere. The consequence is a tendency towards contradiction and eventually crisis, as the destructive consequences of treating land, a vital part of the social system, as a commodity, start to appear in the social and economic spheres.

To restrain this crisis, the state therefore steps in and surrounds fictitious commodities with regulation:

> Social history in the nineteenth century was thus the result of a double movement: the extension of the market organization in respect to genuine commodities was accompanied by its restriction in respect to fictitious ones. While on the one hand markets spread all over the face of the globe and the amount of goods involved grew to unbelievable dimensions, on the other hand a network of measures and policies was integrated into powerful institutions designed to check the action of the market relative to labor, land, and money (Polanyi, 1957, p. 79).

For markets in land to function, then, there needs to be a simultaneous construction of fictitious commodities *as if* they were real commodities, *and* an open awareness that their fictional status means that they require regulatory management. At the heart of the double movement, the expansion of markets goes hand in hand with an increasing tendency to manage fictitious commodities, re-regulating in favor of capital. It is via the maintenance of this contradiction, in which two opposing positions are simultaneously asserted that the functioning of the market is assured.

Land as a fictional commodity makes an appearance in two places in our analysis. First, the illusion that land can fall into monopoly ownership is essential to the sale of land to developers. Second, the treatment of land as if it were an alienable commodity is essential to the extraction of rent that BNG enables (in the shape of the management of offsite offsets by landowners, and onsite offsets by estate management companies). These are the 'fictitious' sides of the double movement, the creation of systems that treat land as if it were a commodity.

However, biodiversity credits sit on the other, more regulatory side of the double movement. They are constructs that are required because of the crisis tendencies inherent in treating land as a commodity: they represent a historical recognition that the enclosure and exploitation of land, through processes of urbanization and agricultural intensification, has led to a situation of biodiversity loss that is now sufficiently severe that it threatens not only ecological disruption but deep economic instability, with one report estimating a 12% loss of GDP due to habitat degradation in the UK (Ranger *et al.*, 2024). However, what is novel about offsetting is the way that it transforms regulation itself into a source of surplus value, rather than a mechanism to restrain crisis. Offsetting as a form of regulation does not "check the action of the market relative to labor, land, and money," as Polanyi puts it in the quotation above; instead, biodiversity credits represent a second-level disavowal which emerges out of double movement, a secondary fiction that sits above the fictitious commodity but resonates with it. At its roots is the idea that the solution to the problems of markets lies in the generation of more markets, that the problems of capitalism can be solved with more capitalism. The fictitious commodity that is land thus acts as a platform for something new: regulation-as-extraction.

BNG thus uses the crisis generated by capitalism as the occasion for an intensification of capitalism, redeploying regulation from a restraining force on capital towards a mechanism that creates niches for further forms of extraction. The double movement of land as a fictitious commodity is duplicated at a second, higher level by the double movement of abstraction, at once reductive (from ecology to units) and generative (the new niches for knowledge commodities and the new forms of rent extraction from land, which create revenue for nature conservation at the social expense of widening inequality). This doubled 'double movement' shows the hybrid, hydra-like nature of the new regulation: every excess of capital becomes the occasion for a new serpentine circuit of surplus value creation. The reductive conceptual abstraction of the unit thus becomes generative, pulling increasing numbers of new entities into its exploitative coils.

7. A brief note about transaction costs

There are practical as well as theoretical implications to this hydra-like form of capitalism. As we noted above, consultancy forms a subsidiary and parasitic loop in Harvey's secondary circuit of capital: ultimately, the purpose of the knowledge commodities that it generates is to assist developers to produce the commodity of housing in a way that is acceptable from a regulatory perspective. The creation of each knowledge commodity is a transaction cost on the system of housebuilding, which also means that there is a very significant contradiction between the existence of this circuit of labor and the most basic logic of natural capital.

Natural capital approaches like BNG are underpinned by an approach that seeks to 'price in' negative externalities of development. The theory is often traced back to ecological economists like Herman Daly, Robert Costanza, and David Pearce, but further back in the 1960s, there is Ronald Coase's famous article, 'The problem of social cost' (1960), which is frequently cited by contemporary offset supporter Dieter Helm. Arguing against Arthur Pigou's earlier idea that negative externalities should be managed by taxation, Coase contended that a more efficient way was to use market-based processes to quantify the economic costs of environmental harms in monetary terms, and to use bargaining to find the solution to deal with it at the lowest possible cost. For Coase, this strategy was justified because production, however destructive or polluting, is a right, so that any restraint on it (e.g. to make it less damaging to humans or ecosystems) becomes reframed as a kind of 'harm.' Externalities, in this strangely deracinated logic, are therefore always reciprocal: a production process might do environmental harm but acting to reduce or prevent that harm also inflicts damage. The sacred cows that cannot be touched are economic growth, property rights, and the idea that everything can be valued in monetary terms: to trust Coasean logic, you must bracket these as unquestionable.

The Pareto efficient outcome produced by Coase's thought experiment relies on a key central presupposition: that there are no transaction costs to the bargaining process. Coase himself realized that this was "a very unrealistic assumption" (Coase, 1960, p. 850). In fact, the whole point of the second half of 'The problem of social cost' is to investigate what happens when we reintroduce transaction costs to the thought experiment, in particular how this might influence whether the government regulates, and whether deals are done within firms or externally in the market. Coase ends up showing that transaction costs represent a hefty problem in the functioning of markets: his main point, as Medema has argued, was not to show that markets always offer the most efficient solution, but to demonstrate a much more narrowly conceptualized problem with Pigouvian taxation (Medema, 2011). However, this did not prevent the Chicago School and, subsequently, the New Resource Economics and neoliberal think tanks to the present day, from seizing on the idea of a 'free market' solution to environmental crisis, and promulgating the idea that taxation and state regulation represented an unwieldy, inefficient, and even irrational 'command and control' form of intervention (for a discussion see Bonneuil, 2015; Felli, 2021).

The knowledge commodities that are generated by consultancies to manage the process of abstraction from messy ecologies to credits introduce significant transaction costs into this natural capital system. This potentially calls into question the deepest logic of natural capital, in particular the assumption that the pricing in of 'externalities' such as biodiversity loss represents a more efficient solution than 'command and control' taxation, or still more radical solutions that would challenge the inequities of land and property ownership *in toto.* More empirical work is needed to quantify both the financial burden associated with the fees charged by professional consultancies, but what is clear is that the sums charged by consultants are diverting a proportion of the funds that could otherwise be paid towards biodiversity conservation into this sector of capital. That said, it is difficult to imagine a system that would effectively mitigate harms yet not involve knowledge labor to some degree (in particular, ecological surveys).

8. Conclusions: hydra capitalism and nature

In this article, we have challenged the dominant theoretical model of abstraction that governs discussions of biodiversity credits. We have shown that problems derive in part from a misreading of Marx that views abstraction entirely as a process of subtraction, reduction, equivalence, and loss, leading to an emphasis on commodification as a process of loss, and a neglect of the place of labor in offsetting debates. This model offers

a view of offsetting as a kind of Charybdis, an all-engulfing monster who swallows difference into equivalence and similitude.

We have offered a re-reading of Marx that suggests an alternative, more dialectical view in which abstraction has a reductive but also a generative/creative moment. We used this to retheorize the place of both commodification and material labor in these debates, pointing to the hybrid and multiple forms of extraction that offsetting logic enables, and characterizing these as a proliferating, many-headed hydra rather than a reductive process of loss. In the process, we have also endeavored to refine the use of the concept of 'fictitious commodities' in offsetting debates, showing how offsetting acts as a second-tier fiction that sits above the treatment of land as a fictitious commodity. BNG thus transforms the regulative side of Polanyi's 'double movement', i.e. the impetus to check the excesses of capitalism, into an occasion for the introduction of new, hybrid extractive logics. Rather than a world-eating Charybdis that destroys difference, then, offsetting is a proliferating, many-headed Hydra, each serpentine head representing a different form of extraction, sometimes within different circuits of capitalism.

A greater understanding of the logic by which capital flows through these schemes should enable a better understanding of how we might engage with the current landscape of offsetting. We hope that it draws attention to the multiple ways in which diverse niches for surplus value creation are generated by these schemes. Further, our argument makes it clear that the interests of landowners and financiers who are seeking to develop a market in offsite offsets are different from those of developers, who are mostly opting for onsite BNG, which are different again to those of ecological consultants producing knowledge commodities. Sensitivity to the ways in which these interests exploit labor and extract rent from land can enable us to pinpoint more precisely how these schemes engage in different kinds of extractive practice, which can help target resistance. In the UK, there is growing disquiet about biodiversity offsetting, particularly amongst communities affected by urbanization (Fox, 2023; Community Planning Alliance, 2024), so identifying the 'winners' and 'losers' from different elements of the system can offer an important tool to these groups as they fight against the development of ecologically sensitive places.

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