

The political ecologies of "green" extractivism(s): An introduction

Alexander Dunlap^{1 a, b}

Judith Verweijen^c

Carlos Tornel^{d, e}

^a Boston University, USA

^b University of Helsinki, Finland

^c Utrecht University, Netherlands

^d CONAHCYT, Mexico

^e The Global Tapestry of Alternatives, Mexico

Abstract

What is so-called 'green' extractivism and where did it come from? The introduction to this Special Section examines the origins and implications of the concept, linking it to a long history of exploitation, dispossession and (neo)colonialism under the guise of green-washing notions such as 'sustainable development.' Conducting an in-depth literature review, we first revisit the concept of extractivism, exploring its origins, development and analytical purchase. We link extractivism to 'extra-action,' implying taking more than what is viable for ecosystems and argue for a supply-web oriented, rather than a point of extraction-focused understanding. Subsequently, we examine key theoretical frameworks in political ecology that paved the way to the study of 'green' extractivism, notably Ecological Distribution Conflicts (which we argue could better be labeled Ecological *Destruction* Conflicts) and green grabbing. Based on this, we discuss the core features of green extractivism, which are twofold: (1) the use of socioecological and climate crises to reinforce existing or generate new markets and profit-generation opportunities; and (2) the mobilization of claims of ecological sustainability and 'carbon neutrality' to legitimize and rationalize extraction. After outlining the Special Section contributions, we end by considering gaps in existing scholarship on green extractivism and suggest ways forward.

Keywords: Green extractivism, green grabbing, ecological distribution conflicts, sustainable development, renewable energy

Résumé

Qu'est ce que c'est le aujourd'hui connu comme l'extractivisme "vert" et d'où vient-il? L'introduction de ce numéro spécial examine les origines et les implications du concept, en le reliant à une longue histoire d'exploitation, de dépossession et de (néo)colonialisme sous le couvert de notions d'éco-blanchiment telles que le « développement durable ». En procédant à une analyse approfondie de la littérature, nous revisitons

¹ Dr. Alexander Dunlap, Institute for Global Sustainability, Boston University, USA & Global Development Studies, University of Helsinki, Finland. Email: aadunlap@bu.edu. Dr. Judith Verweijen, Assistant Professor, Human Geography & Spatial Planning, Utrecht University, Netherlands. Email: j.e.c.verweijen@uu.nl. Dr. Carlos Tornel, National Strategic Program for Energy and Climate Change, CONAHCYT & Global Tapestry of Alternatives, Mexico. Email: tornelc@gmail.com. We want to thank our reviewers, Franziska Müller, Simon Batterbury and Diego Andreucci for their comments and suggestions for this article. Furthermore, we are grateful for the extensive work Simon Batterbury, Casey Walsh, Judith Krauss and Jens Friis Lund are doing to make *JPE* a living example of what academic publishing can be without corporate profiteering from publishers. Finally, we would like to thank our animal partners Sabotage, Woef, Sonny and Werner. This is the introduction to **Alexander Dunlap & Judith Verweijen (eds.) (2023/4), The political ecology of green extractivism. Special Section of the *Journal of Political Ecology* 30 (743-873), 31 (436-585).**

tout d'abord le concept d'extractivisme, en explorant ses origines, son développement et son pouvoir analytique. Nous lions l'extractivisme à l'« extra-action », qui implique de prendre plus que ce qui est viable pour les écosystèmes, et nous plaçons pour une compréhension de l'extractivisme axée sur les réseaux d'approvisionnement plutôt que sur le point d'extraction. Nous examinons ensuite les principaux cadres théoriques de l'écologie politique qui ont ouvert la voie à l'extractivisme « vert », notamment les conflits de distribution écologique (qu'il vaudrait mieux appeler conflits de destruction écologique) et l'accaparement vert (green grabbing). Cela nous amène à discuter des principales caractéristiques de l'extractivisme vert, qui sont deux: 1) l'utilisation des crises socio-écologiques et climatiques pour renforcer les marchés existants ou en créer de nouveaux et pour générer des opportunités de profit, et 2) la mobilisation des revendications de durabilité écologique et de « neutralité carbone » pour légitimer et rationaliser l'extraction. Après avoir présenté les contributions au numéro spécial, nous terminons en examinant les lacunes des études existantes sur l'extractivisme vert et en suggérant des pratiques pour l'avenir.

Mots-clés: Extractivisme vert, accaparement vert, conflits de répartition écologique, développement durable, énergies renouvelables

Resumen

¿Qué es el llamado extractivismo "verde" y de dónde viene? La introducción a este número especial examina los orígenes y las implicaciones del concepto, vinculándolo a una larga historia de explotación, desposesión y (neo)colonialismo bajo el disfraz de nociones como "desarrollo sostenible." A partir de una revisión bibliográfica en profundidad, en primer lugar revisamos el concepto de extractivismo, explorando sus orígenes y desarrollo. Vinculamos el extractivismo a la "extra-acción", que implica extraer más de lo que es viable para los ecosistemas, y defendemos una interpretación orientada a las redes de suministro, en lugar de centrada en puntos específicos de extracción. A continuación, examinamos los principales marcos teóricos de la ecología política que formularon el camino al "extractivismo verde", en particular los Conflictos por la Distribución Ecológica (que, en nuestra opinión, podrían denominarse mejor Conflictos por la *Destrucción Ecológica*) y el acaparamiento verde. Esto nos lleva a debatir los rasgos centrales del extractivismo verde, que localizamos en primer lugar en el uso de las crisis socioecológicas y climáticas para reforzar los mercados existentes o generar nuevos mercados y oportunidades de generación de beneficios y, en segundo lugar, en la movilización de reivindicaciones de sostenibilidad ecológica y "neutralidad de carbono" para legitimar y racionalizar la extracción. Tras esbozar las contribuciones al número especial, concluimos examinando las lagunas existentes en los estudios sobre el extractivismo verde y proponiendo vías para avanzar.

Palabras clave: Extractivismo verde, acaparamiento verde, Conflictos Ecológico Distributivos, desarrollo sostenible, Energías Renovables

1. Introduction

In the early hours of May 26, 2021, on the outskirts of Berlin, Germany, an autonomous action group attacked the electricity supply for the Tesla Gigafactory construction site in Berlin-Grünheide by setting six main 110,000-volt cables on fire (Anonymous, 2021). This action was accompanied by a lengthy communiqué that associated "modernity" and "civilized progress" to the worldwide "murder of women" or "femicides" (Anonymous, 2021, n.p.). The Tesla Gigafactory, the anonymous authors contend, continues the catastrophic trajectory of modernity by producing "supposedly 'clean, climate-friendly' battery-powered vehicles in just a new contribution to the further destruction of the planet" (Anonymous, 2021). The communiqué rebukes the media for promoting narratives of progress and employment while ignoring the colonial and destructive nature of lithium and cobalt extraction and its supply-webs and, depending on sources, the millions of gallons of water consumed per year by the factory. "Our attack," the author(s) state, "is a call to attack the Green Deal," which they continue:

...is nothing but propaganda. The Green Deal means establishing climate protection as the green continuation of neoliberalism. It too makes the rich richer at the expense of others. Individual electric mobility does not stop ecological devastation, it continues and expands it. We are witnessing a technological offensive that also continues the economic colonialism of the imperial age in the form of the unabated mass exploitation of millions for luxury in the global North. In addition to material goods, it is now the luxury of clean air. Yet we know that this is an illusion: we all live on the same planet, breathe the same air (Anonymous, 2021, n.p.).

This action and communiqué illuminate—in theory and practice—the growing salience of what has been called 'green extractivism,' exemplifying the increasing critique and resistance to extractive projects branded 'green.' As we further elaborate below, we consider green extractivism to constitute a system of extractive development that harnesses climate change and other socioecological crises as profit-generating and re-branding opportunities. This Special Section deepens our understanding of this phenomenon theoretically and empirically, shedding further light on its diverse manifestations across the Global North and South. We build on over two decades of critical research on 'green capitalism' in political ecology, anthropology, human geography, critical development and critical agrarian studies. Before the Tesla sabotage action, which continues alongside a forest occupation today (Anonymous, 2024), research in these subfields showed the serious socioecological issues and violence related to projects labeled 'green,' 'environmental,' 'clean,' 'decarbonized' and 'sustainable.' Moreover it demonstrates how 'green' discourses work to expand capitalist relations, land control and extractivism to intensify modernist development and wealth accumulation (Banerjee, 2003; Kirsch, 2009; Sullivan, 2009; Fairhead *et al.*, 2012; Corson *et al.*, 2013). Research on green extractivism continues these lines of inquiry, critically examining the evolutions in contemporary capitalism and the related political-economic landscape that propel a rapid expansion of capitalism branded 'green.'

Because of its diverse manifestations—as well as the diverse understandings of extractivism—green extractivism has mostly been studied in a compartmentalized manner, divided by sector (e.g., minerals, agriculture, infrastructures, etc.) and often in the form of individual case studies. This Special Section aims to place the different manifestations of 'green' extractivism under a single analytical umbrella and develops a comprehensive theoretical approach, enabling an examination of the convergences and interplay between different types and dimensions of extractivism. As the Special Section demonstrates, green pretensions are advancing (neo)colonial and capitalist land control for extraction at an alarming rate. In addition, Green New Deals are rapidly colonizing collective imaginations with "lower-carbon" lifestyles, thereby advancing faulty climate change mitigation/adaptation strategies and preventing alternative postcapitalist and postdevelopment futures (Zografos & Robbins, 2020; Dunlap & Laratte, 2022; Gelderloos, 2023; Andreucci *et al.*, 2023; Vela-Almeida *et al.*, 2023; Lang *et al.*, 2024; Dunlap & Tornel, 2024). This rapidly growing body of scholarly output demonstrates how forms of green extractivism create new and intensify existing inequalities, injustices and a multiplicity of harms across the world. So-called sustainable development and climate change mitigation projects are leading to land grabbing, displacement, dispossession, ecological destruction, repression and elite profiteering (see Dunlap & Fairhead, 2014; Hunsberger *et al.*, 2017; Franco & Borrás, 2019; Mirumachi *et al.*, 2020; Temper *et al.*, 2020; Larsen, *et al.*, 2022; Andreucci, *et al.*, 2023; Deberdt & Le Billon, 2024). Branding land control, infrastructure and extractive practices 'green,' or ecologically friendly, therefore, constitutes a public and planetary problem.

Green extractivism, moreover, reproduces colonially shaped North-South relations or various forms of internal colonization² (Zografos & Robbins, 2020; Fjellheim, 2023; Vela-Almeida *et al.*, 2023; Dunlap & Tornel, 2024), advancing the intersecting processes of green and energy colonialism (Lang *et al.*, 2024; Lohmann, 2024; Müller, 2024). Exposing these detrimental effects is not only important in its own right; it is also crucial for working towards post-extractivist, postcapitalist and socioculturally appropriate degrowth futures that are grounded in real socioecological sustainability and renewability (Nirmal & Rocheleau, 2019; Dunlap, 2021b). We must remember that as long as the so-called 'green economy' remains fundamentally driven by (liberal) capitalism, sustainability and green labels will remain fig leaves attempting to cover up ecocide. Said differently, *all conversations about lower-carbon technologies and greening are pointless until capitalist growth imperatives are stopped.*³ *This demands the rethinking and reorganization of planetary existence to live in harmony with the land and our habitats.* A task, of course, that is easier said than done.

² Internal colonialism is employed in both a traditional and an advanced sense. The first sense refers to the subjugation and marginalization of Indigenous populations, and other minority groups, by a dominant culture, political authority and economy within a nation state. The other extends to include people recognizing and rejecting this dominant power as an occupying and colonizing force that circumscribes self-determination and different existential (onto-epistemological) possibilities. Said simply, people recognize and embody the historical and present reality of statism as colonialism (González Casanova, 2004; Dunlap, 2023c; Dunlap & Tornel, 2024).

³ Shareholder value and profit maximization laws must be overturned, meanwhile the organizational purposes of corporations—and states for that matter—need to reconceptualize their purpose and 'bottom line' to prevent extractivism and come into balance with the planet.

The remainder of this Special Section introduction proceeds as follows. First, we revisit the historical evolution of debates around extractivism and its definition to identify some of its core features, revisiting its narrow and extended definitions. We then conduct a similar exercise in relation to green extractivism, clarifying its relation to the overlapping concepts of ecological distribution conflicts and green grabbing, before defining and outlining its key characteristics distinguishing direct from indirect extractivism, which is key for a supply-web oriented approach to extractivism. Subsequently, we review the different Special Section contributions, which explore green extractivism in different megaprojects and policy discourses across the world, including conservation projects, tourism schemes, infrastructural development and mining. We end by considering gaps in existing scholarship on green extractivism and suggest ways forward.

2. The historical evolution of debates on extractivism

The term extraction comes from the Latin verb *extrahere* that means to "draw from" (Durante *et al.*, 2021: 21). Extraction, in the broadest sense, means to "get, pull or draw out, usually with special effort, skill or force" (Dunlap & Jakobsen, 2020: 7). Approaches to extractivism do not limit this to drawing or pulling from the soil, but conceptualize it in terms of *the appropriation* of resources (Gudynas, 2009). One of the first scholars to theoretically conceptualize extractivism in that way was Eduardo Gudynas, who labeled it "a style of development based on the appropriation of Nature." Gudynas' scholarship was situated in debates on the intensive rates of hydrocarbon and mineral extraction in Latin America (D'Angelo & Pijpers 2022; Lang & Mokrani 2013/2011), which emerged from dependency theory (Durante *et al.*, 2022; Hickel *et al.*, 2022). These debates eventually inaugurated the concept and study of extractivism (*extractivismo*) in the 2000s.

Defining the phenomenon, Gudynas (2009: 188) identifies four main attributes of extractivism:

- (1) the high volume of extracted material (e.g., timber, minerals, hydrocarbons)
- (2) the intensity of extraction within its socioecological context
- (3) the destination of the extracted material (abroad); and
- (4) the concentration of ownership by foreign or national industries (Lang & Mokrani, 2013; Gudynas, 2021).

Combined, these features lead to a high level of environmental degradation and deleterious labor opportunities and conditions, while also intensifying forms of (neo)colonialism (Gudynas 2009; Lang & Mokrani, 2013; Nygren *et al.*, 2022). Stemming from its roots in dependency theory, this first wave of extractivism scholarship strongly emphasizes how extractivism is tied up with capitalism's unequal global divisions of production and consumption. The concept, however, has wider applications.

Extending the notion of extractivism

Alberto Acosta (2013/2011, 62) further expanded the concept of extractivism by emphasizing that it is "not limited to minerals or oil. Extractivism is also present in farming, forestry and even fishing." The extension of extractivism outside the mineral and hydrocarbon sector to resources that are potentially renewable raised the question: what type of resource use is actually socioecologically renewable and sustainable? Even trees, soil, rivers, aquatic bodies and the life forms within them designated as "renewable" can become irreparably damaged, overexploited, contaminated and pushed to a point of ecosystemic elimination (e.g., ecocide) by extractive activities. Because of large-scale extraction "many 'renewable' resources, such as forests or soil fertility, are becoming non-renewable," Acosta (2013: 62) continues. Therefore, "the problems of non-renewable natural resources may equally affect all resources, renewable or not." Agro-extractivism (Veltmeyer & Petras, 2014; Tetreault *et al.*, 2021; McKay *et al.*, 2021) and forestry extractivism (Kröger, 2016; Ehnström-Fuentes & Kröger, 2018; Ramcilovic-Suominen *et al.*, 2022) have since come under the broad banner of green extractivism. More recently, these insights have been complemented by work acknowledging the diverse and dynamic lives of soil microorganisms and how they are denied, ignored and killed by industrial agriculture, giving rise to the notion of "soil extractivism" (Hokkanen, 2024). In sum, in the context of current industrial operations, the renewable/nonrenewable dichotomy in most instances does not exist (Dunlap, 2021b, 2023b). This demonstrates how green extractivism is fundamentally based on politico-psychological maneuvering, as it crucially hinges on the idea of sustainability and the renewability of 'resource' use.

The concept of extractivism was further developed to denote not only physical processes of extraction, but also their embodied and gendered impacts. The body, human or otherwise, Latin American decolonial feminisms have shown (Ulloa, 2016; Cabnal, 2018; Caretta *et al.*, 2020), is intimately connected to the territory they inhabit. When people, states or companies contaminate waters, kill trees and abuse the soil, this violence, among other acts, becomes embedded within bodies (Cruz *et al.*, 2020). The same applies to abusing, killing and traumatizing people and other beings. The result is fear, illness and erratic and harmful behavior, which can lead to hurting animals, forests, rivers, mountains, humans and other more-than-human entities. These entwined dynamics, explain Sofia Zaragocin and Martina Angela Caretta (2021, 1508) are known as body-territory (*cuero-territorio*), asserting "that there is no ontological difference between territory and the body" and that "what is done to the body is done to the territory and vice versa." These body/territory entanglements are visible in the way violence and chemicals are stored within DNA, RNA and muscles and, most of all, through how regardless of this fact humans continue to enact this violence against themselves and others (Marya & Patel, 2021). Extractivism, in short, remains the ideology of normalizing and executing violence against the body/territory that operates on multiple micro- and meso- scales as well as cumulatively on a planetary scale.

Moving into the cognitive realm, the concept of extractivism has been extended to capture its relation to diverse lifeways and knowledges and how these are consumed, repackaged, sold and destroyed through (neo)colonial processes and extractive development. For instance, Ramón Grosfoguel (2016: 126, 137) describes how extractivism is enabled by "an attitude of objectification" rooted in racial, colonial and capitalist logics that is justified by ideas of techno-industrial 'progress' (see also Von Werlhof, 2015; Neyrat, 2018; Dunlap & Jakobsen, 2020). These logics point to what Grosfoguel calls 'epistemic' and 'ontological' extractivism, relating to how one views and knows the world. Seeing different existences, beings and non-humans as 'resources' to be 'exploited'—instead of our 'relatives' whose existence is fundamentally interlinked with that of humans and bodies/territories—is a crucial psycho-social and ontological condition for justifying and legitimizing the violent degradation and elimination of ecosystems and diverse human and non-human beings (Kröger, 2022; L. B. Simpson, 2017; Simpson, 2019). Kröger (2022: 65) calls this the "political economy of existences," which examines how "extractivist expansions and projects influence existences," for example, by killing or replacing forests and transforming them into soy monoculture fields. Indeed, what the term 'extractivism' ultimately describes is a particular way of seeing and being in the world—it accurately captures how theft, looting and pillage remain constant in the political economy of capitalism, no matter its differing (statist) political and economic accumulation regimes.

The conditioning, manufacturing and teaching of these worldviews, knowledges and beliefs relates to the production of "extractive subjectivities" (Verweijen *et al.*, 2024). Taking inspiration from Foucauldian notions of governmentality, a focus on subjectivities implies looking at how people's mentalities, attitudes and conduct are shaped by and shape extractive activity. Extractivism, Judith Shapiro and John McNeish (2021) argue, is the result of a particular ontological assemblage which is animated by a mindset that shapes expressions, contestations, and logics for and/or against a singular worldview that sees human and nature as separate and (some) humans as more exploitable than others. In a similar vein, Chris Chagnon and colleagues (2022, 761) demonstrate that extractivism "forms a complex ensemble of self-reinforcing practices, mentalities, and power differentials underwriting and rationalizing socio-ecologically destructive modes of organizing life through subjugation, violence, depletion, and non-reciprocity."

Narrow vs. broader understandings of extractivism

This conceptual expansion of extractivism has received pushbacks. To maintain conceptual clarity, Gudynas (2021, 6) contends that the four 'classical' attributes mentioned above "must be met" if a project is going to be considered extractivist. This will help us avoid "falling into the trap of thinking that any activity with severe socioenvironmental impacts represents extractivism." Others, like Imre Szeman and Jennifer Wenzel (2021), have also voiced skepticism around an expanded understanding of extractivism. They argue that the concept has become overly broad when also encompassing symbolic and knowledge production. By including such diverse realms, they contend, important historical, geographical, and cultural distinctions are overlooked, hindering a comprehensive understanding of extraction's specific operations. Indeed, the primary concern of calling everything extractivism, as Gudynas (2021, 4) warns, is that "rigor and precision [will be] lost." A lack of rigor and precision generates "ambiguity," which—Gudynas (2021, 4) explains—allows advocates of mineral and oil companies, including states, "to insist that any use or abuse of Nature was

ultimately extractivism, and therefore it should be tolerated and protected as a fundamental condition for humanity [sic] survival." Dunlap (2021a, 2023a, 5) refutes this line of argumentation by reminding us that "the misuse and manipulation of information by mining companies and politicians *should never temper our criticisms or assessments*." Thus, the fact that corporations can use a broad interpretation of extractivism to their advantage should not limit a thorough discussion of its conceptual meaning and analytical purchase.

While the argument for conceptual boundary-making is understandable, we contend that the classic criteria for extractivism remain inadequate. They suffer from a nationalist and state-centered approach by focusing on the national economy, material export/import rates and how foreign influence shapes national policies. Consequently, they ignore the networked, multi-scalar nature of extractivism, which extends far beyond the point of extraction, interlinking people, places and nature(s) through global financial operations and complex supply-chains. A narrow focus on a single point of extraction obscures the prior extractive operations required to produce the technology, equipment and energy that enable this extraction (Dunlap, 2023a; Artiga-Purcell, 2024). The ubiquity of water-use within mining and industrial production indicates another point of networked and multilayered impact of conventional and green extractivism (Tetreault & McCulligh, 2018; Caretta *et al.*, 2020). Challenging Gudynas' (2021) distinction between non-extractive and extractive modes of resource appropriation, Alejandro Artiga-Purcell (2024, 5) notices how classic approaches to extractivism not only "overlooks the uneven geographies of production within countries" — such as far-removed points of processing or consumption—but also fails to account for the "analytical isolation, separation, categorization, and ranking of categories that typifies [the] taxonomic thinking" that shapes extractive activities like sand or gravel mining (Artiga-Purcell, 2024, 5). Classic approaches therefore lead to obscuring broader crises embedded in value chains of, for example, building materials like concrete or glass production⁴ and overlooking the relational politics of extractive activities.

Similar critiques have been raised regarding agrarian extractivism. Focusing solely on the classical (state-centric) attributes of extractivism (McKay, 2020; McKay *et al.*, 2021) leads to overlooking networked and accumulative regional impacts (Tetreault *et al.*, 2021), but also the entire supply-webs of agricultural mechanization, the production of chemical inputs and pesticides as well as the digital applications and surveillance integrated into plantations (Dunlap, 2021a, 2023a). Digital technologies are now notoriously central to agricultural production (Rotz *et al.*, 2019;). As Glenn Stone reminds us, these technologies "are becoming established as the next major external input into agriculture and are used on over 75% of corn acres in the United States, 80% of grain farms in Australia and two-thirds of all arable land in the Netherlands" (2022, 608). In sum, there is an extensive multi-sectorial, multi-scalar production network of extractivism(s) that enables agrarian extractivism to take place. Demonstrating the relevance of further developing and exploring digital extractivisms (Chagnon *et al.*, 2021, 2022; Brodie, 2024). Looking critically at these supply-webs implies expanding how we identify and measure the volume of extracted material and the intensity of extraction.⁵ It also implies looking differently at foreign influence and ownership, which we do not consider a determining factor for extractivism. National industry concentrations and processes of 'internal' colonization can be manifestations of extractivism without involving much foreign capital. Finally, a supply-web rather than *point-of-extraction-centered* understanding of extractivism(s) will extend accountability for ecosystem degradation and habitat loss. These observations show the unbounded nature of the material and the sectoral extent of extractivism, which deserves further unpacking and investigation.

Extractivism is fundamentally entangled with capitalism, which is another reason why bounding it—both spatially and conceptually— is challenging. As Jingzhong Ye and colleagues (2020) argue, one of the key features of extractivism is that it cannot be reduced to simply taking from the non-human world. Rather, extractivism entails an organized and internally coherent feature of capitalism—increasingly global in scope—that enables it to exert control over flows to maintain value extraction. In a similar vein, Sando Mezzadra and Brett Neilson (2019) and Martín Arboleda (2020) argue that technologies of financialization have blurred the boundaries between manufacturing and extraction, rendering extractivism an increasingly central feature of contemporary capitalism. The project of capital accumulation retains little-to-no respect for boundaries, whether of economic sectors or nation states. Limiting and "separating extractivism from the

⁴ Sand is processed for the development of glass used in urban building materials, dams, wind turbine foundations and solar panels (see, Lamb, 2023; Käkönen & Nygren, 2023; Stock & Ptak, 2024).

⁵ Markus Kröger (2022) offers a useful typology of extractive intensities, which deserves greater consideration and application within extractive conflicts.

dynamics of global capitalism," explains Facundo Martín (2017, 26), "leads to serious theoretical and methodological shortcomings."

The conceptual bounding of extractivism that the classical definition entails radically underestimating the pervasive, networked nature of the extractive activities required for the reproduction of technocapitalist societies. In fact, any single extractive operation—from a plantation to a mine—depends on a vast existing array of extractive infrastructures and (digital and non-digital) networks. This is why Dunlap (2021, 2023, 5) asks: "How can industrial capitalist operations not be extractivism?" Roads to enter rural areas; lower-carbon infrastructures; schools to train specialized labor; banks to facilitate monetary transactions; factories that produce mining equipment; police/military barracks⁶ and equipment to secure extraction sites all require extensive networks of extractivism and associated forms of exploitation. Therefore, extractivism can only be accurately grasped when exploring multiple direct and indirect forms (as described below), and intersecting extractivism(s) and their planetary ramifications.

Researching extractivism extends to the subsoils (Hokkanen, 2024), the deep sea (Childs, 2022) and outer space (Klinger, 2017), as well as to "solar extractivism" (Hu, 2023) "wind extractivism" (Dunlap & Marin, 2022, 7), recycling lower-carbon technologies (Sovacool *et al.*, 2020), and hydrological extractivism (Kelly, 2021; Post, 2022), which relates to constructing water desalination plants to dissuade conflict and justify extractivism (Dunlap, 2019b; Jerez *et al.*, 2021). It also pertains to 'green' hydrogen (Müller *et al.*, 2022; Vezzoni, 2024); the "renewable energy-extraction nexus" of battery storage technologies (Archer & Calvão, 2024, 6); "green data extractivism" complexes (Bresnihan & Brodie, 2021; Brodie, 2024, 6); and atmospheric geoengineering (Stephens *et al.*, 2023). So-called green extractivism depends on multi-layered and networked extractivisms, meanwhile taking on new dimensions and literal depths and heights. For these reasons, we argue that the initial *extractivisms* that underlie the supply-webs (Heikkinen, 2024, this Section), or *supply-places*,⁷ that provide the material for extraction—for instance, mining equipment, chemicals (for leaching ores or pesticides), warehouses and machines for manufacturing—deserve greater recognition within extractivism debates. Researching supply-webs indicates the methodological relevance of "political-industrial ecology" (Newell *et al.*, 2017), which applies mixed-methods to research industries. This indicates the challenge of where and how we can locate extractivism: where does it start and where does it end?

Key attributes of extractivism

An expanded interpretation of extractivism does not mean that the word becomes meaningless. Gavin Bridge (2023) reminds us that the concept of extractivism is far from 'mined-out.' He urges us to look not only at the '*ex*' of extraction—which manifests in the geographies of appropriation, removal, and resettlement of people—but also at the '*tract*,' emphasizing the technoeconomic practices and sociomaterial orders through which extraction secures its hold on the world (Bridge, 2023, 314). There are still large research gaps and, as the subsection above suggests, numerous ways to organize extractivism research.

While extractivism has often been described as a "mode of accumulation" (Acosta, 2013, 62; Perreault, 2013), it also encompasses what Diego Andreucci and colleagues (2017, 28) have labeled "value grabbing." Value grabbing differs from value creation through production processes (or accumulation) in that it entails "the appropriation of (surplus) value produced elsewhere through rent" (Andreucci *et al.*, 2017, 31). Value grabbing examines how "value is appropriated by means of dispossession and rent extraction rather than through the productive circuits of expanded capital valorization" (Andreucci *et al.*, 2017, 29; Tetreault & McCulligh, 2018). In other words, it entails rent extraction, which differs from 'capital assets' formed by (value-forming) labor in production processes. The relative importance of such production processes in extractivism has been contested. Referring to the hydrocarbon and mining sectors, Gudynas (2021:8) claims that "the label 'extractive industries' is a conceptual error," since extraction companies do not produce or manufacture anything. "Strictly speaking," Gudynas (2021, 8) explains, "an industry refers to the manufacturing sectors, which take raw materials or intermediate goods and process, modify and assemble them in order to produce other physical goods." Gudynas' comments, however, narrowly focus on the point of extraction. If we take a supply-web oriented approach to extractivisms, as explained above, we observe

⁶ See Dunlap (2022b) on a preliminary attempt to chart military and police material requirements.

⁷ Thankyou Professor Michael Bell for our conversations in Madison for raising issues with the technocratic-speak of the term "supply-chains" that discursively erase the places they occupy and depend.

that there are varying degrees of manufacturing (automation and skilled labors) involved, depending on the type of mining equipment, sector and stage of the production processes.

While value grabbing has always been a central dynamic to extractivism, its importance has increased with the growing financialization of the world economy from the 1980s onwards. This also applied to situations where the government took on an important role in financing, enabling and regulating extractivism, as occurred with "neoextractivism" in Latin America (Lang & Mokrani, 2013). With the rise of global commodity prices, (neo)extractivism involves governments extracting more rents and accumulated value (see Bebbington, 2012; Perreault, 2013), which, in the case of rentierism, advances the "collateralization" of national assets through legal-technical instruments (Rosales 2019, 1317). The importance of value grabbing within extractivism is only reinforced through the rise of green extractivism, which is importantly driven by processes of 'green financialization,' involving carbon markets, payment for ecosystems services and green bond markets (Lohmann, 2016; Andreucci *et al.* 2017; Bruna, 2022a; Büscher & Fletcher, 2015; Fletcher, 2024; Sullivan, 2013, 2023, this Section). Another key dynamic of green financialization is governmental 'de-risking,' or favorable private-public partnerships (PPA), which are currently being used to finance climate change mitigation and industry decarbonization projects. De-risking seeks to reduce, or eliminate, investment risks by leveraging public funds. In a recent report, Steffen Haag and colleagues (2024) demonstrate how lower-carbon energy projects, grid reinforcement and 'green' hydrogen, among other projects, are being 'de-risked' with public funds in a number of African countries, revealing how new 'green finance schemes,' such as Germany's Just Energy Transition Partnerships (JETPs), will be essential technologies in advancing green extractivism.

Green financialization is also key to ecotourism, a manifestation of extractivism almost purely driven by value grabbing (Andreucci *et al.*, 2017). This Special Section discusses ecotourism in relation to trophy hunting in Namibia (Sullivan, 2023), jaguar conservation in Mexico (Ruelas & Dunlap, 2023) and dams and carbon 'offsets' in Colombia (Feeney, 2024). While ecotourism aims for the preservation of biodiversity and ecosystems, rather than their depletion, it reinforces a system where many existences, notably Indigenous peoples and their knowledges, are excluded from protected areas (Marijnen *et al.*, 2021; Duffy & Brockington, 2022; Fletcher, 2024). The result is the commodification of ecosystems and the reorganization of relationships in the service of value extraction, which is frequently compounded by companies using conservation to justify mega-infrastructure projects and, frequently, mining (Büscher & Davidov, 2013; Le Billon, 2021). Green financialization plays a growing role in this, as ecotourism projects are enabled by finance from carbon markets and new technologies, such as block chain (Duffy, 2015; Le Billon, 2021; Tornel, 2023b, this Section; Ruelas & Dunlap, this Section). Extractivism, said simply, takes on various public and/or private forms to advance capital accumulation and 'grab' value.

Based on this extensive overview of core debates and features of extractivism, we identify three core features. The **first** feature relates to the *appropriation* of resources (Gudynas, 2009) and rendering them *legible*, specifically for the purposes of *value creation* (Moore, 2015). Appropriation has been an important focus within political ecology research (Fairhead *et al.* 2012; Leff, 2015; Andreucci *et al.* 2017; Cavanagh & Benjaminsen 2017; Tornel 2023a). Discussing green grabbing, James Fairhead and colleagues (2012, 238) define appropriation as "the transfer of ownership, use rights and control over resources that were once publicly or privately owned – or not even the subject of ownership – from the poor (or everyone including the poor) into the hands of the powerful." The appropriation of land, resources and ecosystems goes hand-in-hand with making them legible to capital. This process, generally driven by state-capital-science complexes (Moore, 2015), entails identifying, measuring, mapping, labeling and often quantifying phenomena in order to commodify them and render them governable and extractable (Scott, 1998; Li, 2014; Avila, *et al.*, 2022; Vidalou [2017] 2023). Both the production of legibility and appropriation generally involve different forms and degrees of coercion, manipulation and violence, ultimately serving to enable the accumulation of capital. As discussed below, green grabbing and extractivism therefore share overlap with *accumulation by dispossession* (Harvey, 2003), a term employed to extend Marx's notion of primitive accumulation (Perreault, 2013; Andreucci *et al.*, 2017). Green grabbing, following Fairhead and colleagues (2012), positions itself as green accumulation by dispossession.

A **second** core feature of extractivism is that appropriation and the related process of producing legibility always lead to *the breakdown of socioecological reciprocity*, implying the infliction of irreparable harm on socioecological systems. 'Harm' should be interpreted here in a broad sense, entailing one or multiple forms of homogenization of people and knowledges, socioecological degradation, depletion, destruction or

subordination to profit-generation of habitats, existences and social ecologies (Blaser, 2013; Kröger, 2022; Kallianos *et al.*, 2023), which can have genocidal/ecocidal effects (Short, 2016; Crook & Short, 2021; Dunlap, 2021d). The harm inflicted by creating socioecological disbalance is generally *externalized*, implying extractive corporations do not account for it, but they offload harms onto local ecosystems (e.g., habitats), the existences and peoples that constitute them and, of course, the public sector. The unequal distribution of harms combined with the unequal, adverse or highly limited benefit sharing, pointing to *ecological distribution conflicts* (EDCs), discussed further in the next section. Because of the severing of reciprocity, we interpret extraction to indicate *extra-action* that creates socioecological disharmony by *appropriating extra* (via rents or capital valorization), or simply consuming more 'resources' or existences than can sustain habitats and socioecological and epistemic vitality and diversity. This, as Anna Willow (2019) shows us, requires "*extra-Activisms*" to confront and attempt to remedy the imposition of extractivism.

A **third** core feature of extractivism is that it is not limited to processes of appropriation that lead to irreparable socioecological harm, but also relates to the broader and entwined political-economic and ideational systems that enable these processes. We thus agree with Grosfoguel (2016) that extractivism has important epistemological and ontological dimensions, including what Mario Blaser (2013, 15) calls "political ontology." This explores how worldviews and belief systems (e.g., ontologies) are normalized, critically examining how habitats and 'resources' are understood as inert materials to be managed, used and exploited to the benefit of putative civilized and modern societies (De la Cadena & Blaser 2018). Extractive, or green extractive, hegemony thus entails an "extractive gaze," as Macarena Gómez-Barris (2017, 4-5) argues, that is used to legitimize extraction by rendering certain beings, existences and lives of habitats invisible (Kröger, 2022; Hokkanen, 2024), meanwhile teaching people to think and see like an extractivist state or corporation (see Esteva, 2009; Zaragocin & Caretta, 2021; Gelderloos, 2023). Extractivism, whether 'green,' 'black' or 'gray' begins with objectifying and denying the lifeways of mountains, rivers, trees, plants, soils and people. As Chagnon and colleagues argue, "extractivism is premised on the onto-epistemological devaluing of most of the web of life" (2022, 777).

For us, then, extractivism can be described as a specific socioeconomic pattern (or structure of structures) and way of seeing and constituting the world (Chagnon *et al.*, 2022), leading to the organization of nature based on a classification system that creates a hierarchy between humans (and non-humans) that objectifies 'nature' and denies 'the scared' (see Benally, 2023). This worldview, categorical imposition and ideology is normalized, institutionally reproduced and, thus, becomes hegemonic. This entwined *socioeconomic/political-ontological* pattern or system is characterized by the appropriation of resources and existences and non-reciprocal relations with the planet, which are ultimately grounded in the objectification of rivers, trees, mountains, plants, soils and bodies. This system inscribes the expansion of capitalist techno/industrial production and economic growth as 'progress' regardless of the deleterious social/cultural/knowledge effects and the ecological and climatic devastations it entails. When, where and why, then, is this pattern labeled 'green?' In order to better understand what green extractivism is, how the academic debate about it has evolved, and how that debate builds on existing discussions in political ecology and cognate fields, we first examine how green extractivism relates to the notions of ecological distribution conflicts and green grabbing.

3. Ecological Distribution (or *Destruction*) Conflicts (EDCs) and green grabbing

We posit that green extractivism always entails Ecological Distribution Conflicts (EDCs) and green grabbing, although it is not limited to it. EDCs have been a central focus of political ecology. Joan Martínez-Alier (2002, 54), and later, in partial agreement, Arturo Escobar (2008, 6), have even defined political ecology as "the study of ecological distribution conflicts." Arnim Scheidel and colleagues (2018, 587) conceptualize EDCs as "social conflicts arising over the unequal distribution of environmental benefits, such as access to natural resources, fertile land, or ecosystem services [sic], as well as over unequal and unsustainable allocations of environmental burdens, such as pollution or waste." This leads to a research focus on "institutions of societies, which govern modes of *appropriation*, distribution and disposal of materials and energy" (Scheidel *et al.* 2018, 587; emphasis added). EDCs research often also examines center-periphery exchange dynamics undergirding asymmetrical distributions (Zografos & Martínez-Alier, 2009; Scheidel *et al.* 2018), akin to a dependency theory of the local. EDCs was the first theoretical framework to raise critical concern over wind energy development (Zografos & Martínez-Alier, 2009) and to systematically expose the harms behind so-called 'green', 'clean', and lower-carbon infrastructure projects (Avila 2017, 2018; Menton

et al. 2020; Temper *et al.* 2020; Batel & Küpers 2022). As such, it has opened up space for identifying and understanding processes of green extractivism.

The EDC framework, however, is not without controversy. The critiques of EDCs begin with recognizing that ecological struggles are not strictly limited to the 'distribution' of the 'costs' and 'benefits' of particular 'development' or extractivist projects (Álvarez & Coolsaet, 2020). Thinking in these terms points to an implicit statism—to mediate inequalities—in the EDC framework that does not represent autonomous Indigenous and non-Indigenous concerns (see Temper, 2019; Álvarez & Coolsaet, 2020; Dunlap, 2023a). The imposition of (modernist) development confronts greater cultural and political schisms than merely the 'distribution' of burdens and benefits. Such development inherently leads to "culturally privilege the capitalist (e.g., plantation) model of nature over the local diverse agroforest," explains Escobar (2008, 14; emphasis added), "sparking a *cultural* distribution conflict." This means that EDCs are informed by, and play out on, much broader dimensions and scales than the framework recognizes. As mentioned above, struggles over the cultural or, as Blaser (2013) shows, political-ontological understandings of nature are foundational to environmental conflicts, which are therefore, at root, ontological conflicts (see also Cruz *et al.*, 2020; Zaragocin & Caretta, 2021). Denying ontological realities, as mentioned above, can—and often does—result in the wounding or destruction of Indigenous and/or non-Modern worlds. This is why we ultimately perceive EDCs as Ecological *Destruction* Conflicts. EDCs, not only reflecting the uneven distribution of harms and benefits, but—in most instances—automatically accept the erasure of relations and, consequently, alternative ways of being, knowing, and doing within the world.

A political ontology lens also changes how we understand politics, by critically assessing the hegemonic modes of knowing that shape what is tolerated and allowed on the 'political menu' in policy debates or mainstream media outlets. Politics, in the modernist sense, preemptively eliminates certain socio/ontological concerns from political discussions, often from Indigenous, farmers, environmentalists and autonomists that view their habitats as living and sacred (Blaser, 2013; Cruz *et al.*, 2020; Kröger, 2022; Hokkanen, 2024). However, integrating alternative lifeways, knowledges and hostile practices into dominant institutions, public policy and the modernist grid of knowledge also presents concerns (see Kothari, 2001; Dunlap, 2019a; Altmann, 2020; Wiegink, 2020; Tornel, 2023b, this Section). "In effect, analysts may be trying to empower indigenous claims by bringing them into *reasonable politics* as culture claims or expressions of a different epistemology," explains Blaser (2013, 21), "but by doing this they end up reinforcing the modern ontological assumptions that are central to the very process by which indigenous worlds are being destroyed" (see also De la Cadena & Blaser 2018; Benally, 2023; Artiga-Purcell, 2024). EDCs were on the forefront of including social movements, or the "environmentalism[s] of the poor" (Martínez-Alier, 2002), not only as objects of study but also as knowledge producers who seek recognition for alternative valuation systems (Temper, *et al.*, 2015). Despite this emphasis on socio/cultural values, much EDC research has insufficiently recognized the political/ontological dimensions of destruction conflicts, being implicitly inscribed in state-centered developmentalism and a related materialist ontology. Mainstream environmental justice scholars, however, are moving away from this position (Temper, 2019; Menton *et al.*, 2020), while critical and decolonial incarnations are pushing decolonial and anti-colonial concerns front and center (Pellow, 2016; Álvarez & Coolsaet, 2020; Rodriguez, 2020; Tornel, 2023a; Dunlap, 2023a). As further elaborated below, green extractivism scholarship emerges from, but also goes beyond the EDC framework, redressing its limitations by centering the epistemological and ontological dimensions of extractivism.

Emerging alongside, or even intertwined, with EDCs has been a renewed emphasis on land grabbing and land control (Peluso & Lund 2011; White *et al.* 2012). This research soon began to focus on conservation, biofuels and sustainable development projects (Fairhead *et al.*, 2012; Corson *et al.*, 2013; Rocheleau, 2015; Núñez *et al.* 2022), eventually extending to dams (Franco *et al.*, 2013; Zerrouk, 2013), solar energy (Siamanta, 2017; Stock & Birkenholtz, 2019; Avila, *et al.*, 2022; Tornel, 2023b, this Section), wind turbines (Dunlap, 2019a, 2017; Avila, 2017; Siamanta, 2019; Singh, 2023, this Section) and marine territories (Bennett *et al.* 2015; Mallin & Barbesgaard 2020). This shift in focus led to the concept of green grabbing, defined by Fairhead and colleagues (2012, 238) as "the appropriation of land and resources for environmental ends." As explained above, green grabbing is the 'green' accumulation by dispossession, which overlaps with extractivism through the idea of appropriation (see Gudynas, 2009) and, as the same time, it "represents the proliferation of ecological distribution conflicts" (Dunlap, 2017, 18). Green grabbing also entails using deceptive and coercive scientific (e.g., surveying, studies, etc.), financial (e.g., capital investment) and material (e.g., machines, equipment, workers, fences) means to organize land enclosures and the capture and

commodification of (traditionally) rapidly regenerative and renewable natures, leading to the displacement, subjugation, or destruction of the human and non-human inhabitants of the targeted areas (Fairhead *et al.* 2012). Green extractivism indicates an entrenchment and systematization of green grabbing.

Green grabbing, Natacha Bruna (2022a, 142), explains, "focuses on the process of resource grabbing as a driver of dispossession and hidden accumulation agendas," while "the concept of green extractivism allows us to explore asymmetric exchange relations – including ecological relations – between actors and regions that feed accumulation." In this definition, green grabbing is relegated to "a process of resource grabbing" and acquisition, but *not systematized extractivism*. Bruna's (2022a) reference to "asymmetric exchange relations" further binds green extractivism and EDCs scholarship. The latter charts the asymmetrical distribution of costs and benefits, which also extends to center-periphery exchange dynamics. Green extractivism, nevertheless, goes beyond this by looking not only at processes and relations of extraction and distribution but also at the structures and broader conditions (material/political/ontological) that enable them. The relation between green grabbing and green extractivism can thus be understood by Patrick Wolfe's (2006, 388) famous quote on settler colonialism: "invasion is a structure not an event." Green grabbing is the logistical preparation, act or 'event' that encloses land; while green extractivism is the modality and structure that organizes continuous extraction of human and nonhuman natures in the service of state affirmation, capital accumulation and value grabbing, which in turn leads to the proliferation of ecological destruction conflicts.

Green extractivism, then, represents a successful and sustained process of green grabbing, where land, natures and existences are not only grabbed—appropriated, expropriated, enclosed and rendered legible—but minerals, wind, sun, water, biodiversity and forests become systematically integrated into circuits of capitalism and related forms of political control. Green grabbing is driven by and creates the conditions for green extractivism—it establishes and enables the complex supply-webs that sustain it, by promoting the successful commodification, marketization and extraction of humans, nonhumans (flora, fauna, etc.) and more-than-humans (river spirits, mountains, etc.) to propel the expansion of capitalist mentalities, development, and natures. This broader, multi-scalar and multidimensional structure of green extractivism has been well documented by political ecologists, who have conducted extensive research on green financialization, the ecotourism-extraction nexus, green/control grabbing, blue grabbing/growth and, more recently, green extractivism (e.g. Büscher & Davidov 2013; Corson *et al.*, 2013; Sullivan 2013; Siamanta, 2017; Dunlap 2019a; Marijnen & Schouten, 2019; Brock 2020b; Huff & Orengo 2020; Bresnihan & Brodie, 2021; Le Billion 2021; Ulloa, 2021 Nygren *et al.*, 2022). Said simply, political ecologists have been at the forefront of investigating green extractivism.

4. The history and meaning of green extractivism

A brief history of the concept of green extractivism

To our knowledge, the first time the term 'green extractivism' was mentioned was in 2017,⁸ discussing the intersection of wind turbines, coal mining and ecological offsets. Green extractivism was described as "green mining" and as "central to the reconciliation of industrial destruction with social and ecological 'sustainability' in the form of the 'green economy'" (Dunlap & Brock 2021 [2017], 99). Thea Riofrancos (2019) similarly interpreted green extractivism as being linked to mining for the so-called energy transition, for instance, lithium brines and ores for electric car batteries. Inspired by the Plurinational Observatory of Andean Salt Flats that monitors the 'Lithium Triangle' in Bolivia, Argentina and Chile, she described green extractivism as "the subordination of human rights and ecosystems to endless extraction in the name of 'solving' climate change" (2019, 7; see also Hernandez & Newell, 2022). Daniel Voskoboynik and Diego Andreucci (2021, 16) also analyze green extractivism in relation to the mining of 'transition minerals.' They explore the discourses through which such mining is legitimized, despite its high socioecological costs, observing how these discourses are shaped by "ecological imaginaries relating to climate change and decarbonization" (Voskoboynik & Andreucci, 2021, 3). For them, green extractivism

⁸ In 2017, there was a series of presentations and chapters by Dunlap & Brock. The book chapter was not published until 2021.

...represents a new phase in the complex relationship between mining and the environment, whereby [the] extraction and valorisation of mineral resources are rendered not only compatible with 'sustainable development', but necessary to it and the possibility of a 'low carbon' future. (Voskoboynik & Andreucci, 2021, 16).

This concept of 'transition materials' is based, and marketed, on the assumption that mining will actually result in a (real) energy transition from hydrocarbon dependence to wind, solar, biomass and hydrological energy generation. However, the current energy mix as well as the mining of 'critical' minerals continue to rely on hydrocarbons (see Dunlap, 2021b, 2023c; Dunlap & Marin, 2022), rendering the term 'transition minerals' nothing more than a public relations exercise by the mining sector—which has repositioned itself as a vital enabler of the energy transition—to justify and advance green extractivism. Moreover, the designation of raw materials as 'critical' is the product of Western military-industrial complexes' strategies to secure access and maintain a steady supply of these minerals under the guise of "transition" and climate change mitigation (Marin *et al.*, 2023). Scholars, unfortunately, have been slow to confront misleading green terminology.

Going beyond the focus on mining, Dunlap (2019a, 20) applies "green extractivism" to include forms of low-carbon energy production, such as wind energy development, demonstrating "continuity between conventional and 'green' extractive activities" (see also Dunlap & Jakobsen, 2020). Bruna (2022a, 2022b), in turn, further extended the concept to include "climate-smart policies," including Climate-Smart Agriculture (CSA) and Reducing Emissions from Deforestation and Forest Degradation (REDD+). She defines green extractivism "as a variation of extractivism that feeds capital accumulation through the appropriation of nature, mediated through differentiated levels of labor exploitation and through asymmetric and exploitative social, economic and ecological relations" (2022a, 14). This also covers the extraction, expropriation and transfer of emission rights (Bruna, 2022a, 839). Echoing the EDCs framework, green extractivism, Bruna (2022a, 142) continues, "connects micro and macro implications of [...] asymmetric exchange relations, including financialisation dynamics."

A broader interpretation of green extractivism has also been advanced by Andrés Núñez and colleagues (2022, 703), who employ the concept of "eco-extractivism" to describe how "extractivist investors" are now investing in conservation or sustainable development projects (see Brock & Dunlap, 2018; Huff & Orenco, 2020; Le Billon, 2021). In this Special Section, we maintain an even broader approach to green extractivism, reflecting our expansive interpretation of extractivism as outlined above. Thus, aside from mining, agrarian extractivism, low-carbon energy production, market-based conservation and REDD+, we include, following Bresnihan and Brodie (2021), Chagnon and colleagues (2021, 2022), Brodie (2024) and Archer and Calvão (2024), infrastructure development (see Brock, 2023, this Section), and intersecting forms of green digital extractivism and conservation (Ruelas & Dunlap, 2023, this Section). We also explicitly include the zinc supply-webs of the infrastructural, digital and battery sectors (see Heikkinen, 2024, this Section; Barbesgaard & Whitmore, 2024, this Section). This brings us to the question: when can extractivism be called 'green'?

Key features of green extractivism

We note four features of green extractivism, the first two of which distinguish it from extractivism. **First**, green extractivism differs from extractivism in that it uses socioecological, weather and climate crises to generate new or reinforce existing 'green' markets or profit-generating activities. Inspired by Deboom's (2021) assessment of "climate necropolitics," Deberdt and Le Billon (2024, 5) identify this phenomenon as "climate extractivism," where the climate crisis itself is mined to justify various extractive operations. Drawing inspiration from Klein (2007), Sullivan (2009) and Fletcher (2012), we interpret this as *disaster green extractivism* as the process of enlisting ecological catastrophes to advance extractivism ranging from ecotourism, data centers, deepsea mining, 'green' hydrogen, climate 'smart' agriculture and geoengineering to mineral mining to produce lower-carbon technologies. As Hanaček, Kröger and Martínez-Alier (2024, this Section) explain, such catastrophe extends to the melting of the Arctic, allowing for greater access not only to oil and natural gas, but also to rare earth elements, lithium and other materials necessary for lower-carbon infrastructures and the so-called green transition.

A **second** distinguishing feature of green extractivism is that it involves the mobilization of claims of ecological sustainability, 'carbon neutrality' and combating climate change in order to legitimize and

rationalize extraction. Such claims include relying on lower-carbon, or 'renewable,' energy systems, contributing to biodiversity conservation, promoting enhanced energy efficiency, producing electric vehicle systems, using digital ('smart') application systems and engaging in carbon offsetting or restoration. As further explained below, these claims obscure the fundamental entanglements between conventional and 'green' extractivism, making deception a central feature of the latter. So-called green projects extract—directly or indirectly—from ecosystems, and are often dependent on conventional hydrocarbon extractive projects (Dunlap, 2021b; Andreucci *et al.*, 2023; Marin *et al.*, 2023; Deberdt & Le Billion, 2024). The claims to 'sustainability', 'climate friendliness' and 'green-ness' harnessed by green extractivism are deeply inscribed in specific ontologies and epistemologies, further underscoring how extractivism inevitably entails political/ontological conflict.

While there are numerous examples, following Ivan Illich (1974), Cara Daggett (2019) and Larry Lohmann (2021, 2024), we want to highlight how categories such as "energy" (as opposed to electricity) and the epistemological approach of thermodynamics remain central to the ideology of (green) extractivism. As Lohmann (2024) reminds us, most energy researchers are reluctant to see the politics and coloniality 'inside energy' itself, instead focusing on alleviating "energy poverty" and Sustainable Development Goal (SDG) 7 that are designed to propel capitalist extractivism and developmentalism (Menton *et al.*, 2020; Larsen *et al.*, 2022; Tornel, 2023a; Müller, 2024). The concept of "energy" is a politico/scientific technology designed to advance extractive development. Opening the apolitical and universal assumptions that have conceptualized energy as an abstract, interchangeable and commensurable form of work reveals the extraction-coloniality nexus that persists behind concepts like 'energy transitions', 'renewable energy' or 'energy justice' (Dunlap, 2021b; Partridge, 2022; Tornel, 2023). Taken-for-granted categories like energy, and the science that affirms it (e.g. thermodynamics) therefore remain essential to advancing green extractivism.

Scrutinizing the epistemological and ontological views embedded in green-ness claims further reveals how green extractivism is propelled by "climate masculinities." Drawing on feminist energy researchers such as Daggett (2018) and Bell and colleagues (2020), Dunlap (2022, 154) conceptualizes climate masculinities as emphasizing grand scales and reductionist data, rooted in approaches to the scientific domination of the planet. These approaches marginalize or ignore other scientific methods, particularly those involving alternative ontologies and epistemologies (e.g. Cruz *et al.*, 2020; Zaragocin & Caretta, 2021). The dominant gaze of climate masculinities to intervene at a planetary scale (e.g. earth system science and geoengineering) combines with the ontological and physical invisibilization inflicted by 'sustainable development' projects built on notions such as *terra nullius*, which entail deploying a matrix of physical and symbolic violence to render certain people and places visible for extraction and exploitation thereby rendering others invisible (Scott, 1998; Li, 2014; Vidalou, 2023). This relates to ideas of "climate reductionism" (Gelderloos, 2023, 38) and "carbon tunnel vision" (Achakulwisut *et al.*, 2022), again demonstrating how green extractivism enacts (neo)colonialism.

A **third** core feature of green extractivism is that it is fundamentally entwined with conventional extractivism. Green projects also extract—directly or indirectly—from ecosystems, and are often enabled by capital from or tools and infrastructure produced by conventional hydrocarbon extractive projects (Dunlap, 2021b; Andreucci *et al.*, 2023; Marin *et al.*, 2023; Deberdt & Le Billion, 2024). There are entire equipment factories, mining operations, chemical processing facilities, smelting and manufacturing facilities that produce wind, solar, hydrological and tidal wave extraction technologies. Speaking to this obvious reality, Teresa Pierce—a resident being surrounded by photovoltaic solar projects in California—reminds us:

Every single piece of equipment that they have out here [at the solar energy project], uses diesel. All of it, how green is that? And if I get both of these [solar projects] in here, it's gonna take 3 years [to build]. And guess what? We're gonna be smelling diesel fumes the whole time, you know?⁹

The financial and material conspiracy between conventional and so-called 'green' projects runs deep into existing financial structures and production supply-webs and operates in plain sight with lower-carbon infrastructures spreading across fields, seas, rivers and cities. An important vector of the intersection between green and conventional extractivism is the increasing digitization of extractive operations through automated

⁹ Interview 3, 25-10-2023.

systems and artificial intelligence, managed from centralized control rooms of utility providers and/or energy companies.¹⁰

Furthermore, the majority of green extractivist projects are driven by corporations and states that also engage in 'conventional' extractivism. Therefore, much of the capital invested in 'green' projects is derived from conventional extractivist projects, whereas the profits of green extractivisms are reinvested in conventional extractive activities. Conventional extraction companies, we must acknowledge, have multiple 'green' investments, including British Petroleum Solar; RWE's lower-carbon energy division Innogy; BlackRock's investments in First Solar and Brookfield Renewable; and Shell, Exxon, Equinor and other oil companies' investment in lower-carbon infrastructures, hydrogen, carbon capture and storage and beyond (Dunlap, 2023c). The blurring of green and conventional extractivist capital flows only gets more complicated in relation to data centers, undersea cables, and the siting of wind, solar and other lower-carbon extraction projects (Bresnihan & Brodie, 2021; Dunlap & Laratte, 2022; Sovacool, *et al.*, 2022; Brodie, 2024). In sum, there are countless connections between conventional extraction and green extractive infrastructures, particularly when looking at capital, supply-webs and broader commodity chains.

A **fourth** key feature of green extractivism is that it rests on false assumptions regarding the renewability of 'resources,' or existences. Agriculture, forestry and, to a lesser degree, vital wind, wave and river current flows are assumed to be infinite and renewable. This assumption, however, is fallacious, as exploiting these resources can quickly lead to slow and progressive ecological/climatic degradations (Dunlap, 2021b). The high-modernist eye—and materialist ontologies it is grounded in—fails to, refuses, and simply cannot acknowledge or experience these progressive ecological degradations and changes. The Wet'suwet'en land defender, Freda Huson (2023 [2015], 107) describes this progressive degradation and the importance of socioecological reciprocity as follows:

We grew up like this, as traditionalists, learning how to only take what we need and how to always give back—industry doesn't do that. Logging companies have clear-cut massive sections and actually tripled their allowable cut. They use these machines that just tear up the ground. They say, 'Well, logging is a renewable resource because we plant trees back.' But they only put back the species that they plan to cut down again, like balsam, spruce, and pine.

It's quite dry and the soil is dead everywhere they've clear-cut. The same vegetation doesn't grow back. The whole ecosystem is out of balance because of it. It impacts all the animals; we've noticed there are fewer and fewer of certain species and when some of the forests are allowed to grow back, you see these species start resurfacing again. Then the company comes along and does more clear-cutting.

So-called renewability involves degradation, irreparable damage, and exhaustion. As mentioned above, agricultural plantations and soil extractivism exemplify these concerns (Kröger, 2022; Hokkanen, 2024), but so does hydrological, solar and wind extractivism (Kelly, 2021; Hu, 2023; Dunlap & Marin, 2022), the impacts of which are often difficult to observe, happen slowly and progressively over time.

False claims of renewability call for sustained inquiries into slow and progressive forms of extractivism, as well as the (re)production of infrastructural occupations (e.g. solar monocultures) and uneven distributional burdens emanating from energy transformers (Dunlap, 2020), high-voltage power lines (Dunlap & Laratte, 2022), battery energy storage systems (Archer & Calvão, 2024) and, most of all, so-called 'green' technologies (Chagnon *et al.*, 2021, 2022; Brodie, 2024). The latter include lower-carbon infrastructures, e-mobility, 'smart' technologies, agro-forestry, conservation and other sectors claiming to be 'green' or 'carbon-neutral' now or within the next decade. Said differently, when looking critically at supply-webs and renewability claims, distinctions between green and non-green extractivism begin to break down and appear to be based on questionable, culturally reinforced, assumptions.

¹⁰ Solar and wind energy extraction facilities are digitally monitored and managed to optimize the production of energy, which takes place in control rooms regionally or sometimes at great distances at the headquarters of extractive companies.

Distinguishing direct from indirect green extractivism

It is the importance of supply-webs that prompted Verweijen and Dunlap (2021, e5) to make a distinction between direct and indirect green extractivism, highlighting the persistent underestimation of lower-carbon infrastructure extraction zones related to wind, solar, hydrological and ocean kinetic energy extraction. While *direct green extractivism* indicates the extractive processes within sites of resource appropriation justified as 'green,' *indirect green extractivism* relates to the extractive operations—mines, smelting, chemical production, digital technologies—that enable this resource appropriation to take place. Said differently, indirect green extractivism is the means to fabricate 'green' energy and technologies. In relation to wind and solar energy production, depending on the topology, direct green extractivism entails the multi-industry scientific measurement of kinetic energy to be extracted; enclosing land and privatizing common resources; the clearing of trees and habitats; the draining of water tables for concrete foundations; the compaction of soils to widen existing or build new roads; the ecological byproducts of operation (e.g. leaking oil and the systematic killing of avian life); and, most of all, the process of vital or kinetic energy extraction and its broader effects (see Dunlap, 2019a; Siamanta, 2017, 2019; Willow, 2019; Batel & Rudolph 2021; Dunlap & Marin, 2022). The destructive and highly transformational effects of these activities have given rise to the idea of wind extractivism (Dunlap, 2019a) and solar extractivism (Hu, 2023).

Wind extractivism, as recounted previously (Dunlap, 2021b, 2023b, 2024), involves weather- and climate- altering effects with high concentrations of wind turbines. The "extraction of the wind's kinetic energy," Abbasi and colleagues' (2016, 1592) review study explains, are generating wind "velocity deficits of the order of 10% or more" downstream of onshore and offshore wind extraction sites (or 'wind extraction factories'), which result in "significant warming trends" that are creating changes in the climate. Weather and climate changes are documented empirically within wind extraction zones up to between 18-23 km downwind (Abbasi *et al.* 2016, 1594). Wind velocity deficits are breaking and dissipating wind flows that will affect the surrounding ecosystems. By analyzing satellite data between 2003-2011 in west-central Texas—home to the four largest-wind projects—Zhou and colleagues (2012) "found a significant warming trend of up to 0.72°C per decade" (Abbasi *et al.* 2016, 1594). This is why Abbasi and colleagues (2016, 1596-7) conclude that "evidence has emerged in recent years that large-scale use of wind farms may also cause climate change" and the "current or the projected energy demand may have impacts as severe as the ones caused by excessive fossil fuel use." The extractive reality of intense negative "externalities" only intensifies when exploring indirect green extractivism.

Indirect green extractivism refers to all that is necessary to produce direct green extractivism. It thus scrutinizes the factories and equipment that enable mining—or mining automation—for so-called 'green' or 'transition' materials, but also the entire supply systems related to mining, mineral processing, manufacturing and transportation. In addition, it links lower-carbon infrastructure and energy production sites to multiple places where land is occupied by mines, chemical facilities, factories, ports and centers of technological automation, including the labor issues, human rights violations (and potentially political terror) that are linked to them. The supply function is what dubs these forms of extractivism 'indirect'—because production processes are indirectly linked to the final product and the operation of wind turbines, solar panels, 'smart' digitalization schemes and so on. Indirect green extractivism thus refers to the supply-webs, or "supply-places" that are ignored, forgotten and made invisible by lower-carbon infrastructure marketing (see Ulloa, 2023, this Section), policy decrees and general enchantment with large-scale and innovative technologies. Indirect green extractivism also relates to the extractive realities behind military and police equipment used to protect mines, intervene in labor disputes, break strikes and much more. These examples again demonstrate the fundamental connection between different extractivism(s) and how green extractivism quickly becomes 'black,' 'brown,' and 'gray.' The concept of indirect green extractivism, moreover, seeks to reveal the connections between so-called 'green' and conventional industrial sectors to more accurately expose the extractivist realities underlying claims to 'greenness' and 'cleanness.'

To sum up, green extractivism leverages socioecological, weather and climate crises as investment and profit-generation opportunities. This is done by branding extractivist projects 'green' or ecologically sustainable that, when in reality, they are just extracting more from the earth and its inhabitants to advance industry, technology, and elite control, thereby enabling and disabling different possibilities for people and the planet. Green extractivist scholarship, in turn, aims to explore and unpack these fabrications, uncovering the intersections between different extractivisms as well as the blending of direct and indirect green extractivism. It is green extractivism, *not* 'green energy,' 'sustainable,' 'renewable,' 'clean' or 'decarbonized'.

This special Section seeks to further advance the study of green extractivism, inviting critical scholarship to bring to the fore the multiple and at times unsuspecting ways that green extractivism manifests and intersects with conventional forms of extractivism. We now turn to outlining how the contributions to the special Section take up this task.

5. Exploring green extractivism: Special Section contributors

The contributions to this Special Section explore different, and sometimes surprising spatiotemporal and conceptual manifestations of green extractivism. From the Arctic to the Indian subcontinent, and from the Namibian savannas to the jungles of Colombia and Mexico, the discourses of greenness, climate change mitigation, and the energy transition are reshaping territories. As Astrid Ulloa (2023, this Section) shows, the putative energy transition reproduces the same territorial, environmental, and sociocultural impacts as conventional forms of extraction, yet it makes dispossession fashionable, rendering it invisible, legitimate, and even agreeable. Examining one of Latin America's coal mining regions, La Guajira, Colombia, Ulloa argues that pressures to decarbonize have led to a proliferation of proposals seeking to incorporate wind and solar energy into the region, thereby depoliticizing territorial demands by the Wayúu people. Representations of wind energy as 'green,' 'clean' and 'sustainable' through marketing, furthermore, performs, as the title suggests, an "aesthetics of green dispossession." These 'green' narratives, Ulloa (2023, 760) shows, construct "landscapes of the future crossed by superimposed territorialities (transnational and national actors on local territories) or empty territories (without people)" in this way "contributing to the slow death of the Wayúu."

Similarly, David Singh (2023, this Section) demonstrates how the green transition not only conceals its extractive nature but also becomes entangled with forms of spatial reconfiguration, in this case, around nationalist projects. Focusing on India, Singh illustrates how an almost ready-made justification for the expulsion of Muslims from land is articulated in the emerging demand for so-called renewable energy, leading 'green' energy production to converge with Narendra Modi's ethno-nationalist project. He further argues that wind power infrastructures become key sites for the expansion of extractive development and the assertion of state sovereignty aligning with the ethno-nationalist political project of reshaping land and space along religious and caste lines. "Installed in sensitive Indian border landscapes such as in the Kutch district," explains Singh (2023, 783), "wind turbines merge with extractive imperatives to control and constantly occupy space and the performance of state sovereignty."

Sian Sullivan (2023, this Section) illustrates how 'greenness' is utilized as part of a neocolonial project consisting of the extraction of wildlife in the form of hunting trophies. The green discourse obscures the extractive nature of the trophy hunting industry, which is justified under the guise of its purported or potential 'green' outcomes related to conservation. Sullivan demonstrates how trophy hunting (re)produces violent land control relationships, while exhibiting classical extractive features in terms of animal corpse export. Consequently, trophy hunting emerges as an unsuspecting form of green extractivism, perpetuating extractive patterns historically established through colonialism. Sullivan further shows how elite access to 'recreational lands' for hunting exotic animals involves the dispossession of local people, alienating them from the land and creating 'securitized landscapes' to sustain this practice.

Alejandro Ruelas and Alexander Dunlap (2023, this Section) similarly focus on the extractive nature of conservation in the Mexican Yucatan. The authors reveal how jaguar conservation regiments environments, integrates market relationships, further justifying the so-called 'Tren Maya' megaproject—a 1,500-kilometer train in southeast of Mexico. Overall, it spreads energy and material intensive technologies. Ruelas and Dunlap describe how the complex interplay of voluntary carbon markets, NGOs, corporate financing, environmental policies, and blockchain technologies are used to further integrate ecosystems into the circuits of capitalist control and accumulation. The authors argue that jaguar conservation advances green extractivism, while greenwashing conventional extractive and infrastructural development schemes. This occurs through the tokenization of jaguars and their incorporation into *Tren Maya*, thereby promoting the injection of enormous amounts of capital to advance tourism, biofuel and other lower-carbon energy projects while also advancing military control of the region. In short, jaguars conservation enacts green extractivist practices while justifying conventional extractivism.

Looking closer at the lower-carbon energy projects around *Tren Maya*, Carlos Tornel (2023b, this Section) similarly exposes the extractivist realities on the Yucatan Peninsula. Tornel discusses how solar infrastructure is advancing capitalist modernity, as land for its deployment becomes 'legible' to investment and development through a regional and geopolitical reconfiguration brought about by financial speculation

from the *Tren Maya*'s so-called 'development poles.' These include a series of legal and extralegal means to integrate already existing projects, alongside the prospect of adding new solar and wind infrastructure on the Peninsula. The author challenges the notion of energy justice, revealing its roots in colonial objectives, capitalist imperatives and modernist developmental thinking. Tornel argues that it seems paradoxical to speak of energy justice as long as the concept, its formulations, and manifestations remain tethered to a Westernized conception of modernity. Energy justice, Tornel shows, risks reproducing injustices instead of resolving them.

Turning to Colombia, Jane Kathryn Feeney (2024, this Section) investigates the case of the Hidrosogamoso dam. Here, Feeney reveals how the implementation of neoliberal conservation tools by the government and private sector, such as environmental offsets, leads to the creation of both 'carbon' and biodiversity sacrifice zones necessary to secure access to natural resources as compensation mechanisms. Feeney illustrates how Colombia's reliance on the 'greenness' of large-scale infrastructure projects, in this case a dam, diverts attention from their extractive socioecological realities, which coincide with violent tactics to suppress dissent from local communities and environmental defenders. In the same vein, the author shows how discourses presenting humans, and peasants in particular, as invaders, further entrench (neo)colonial conservation policies —like offsets— that enable rather than hinder green grabbing and extractivism. The "strategies to control and divide communities at both the dam site and offset site," explains Feeney (2024, 480), "illustrate the coercive practices and violence that are central to green extractivism."

Directing our gaze towards the Northern Hemisphere, Andrea Brock (2024, this Section) reveals how environmentalists' enthusiastic endorsement of railway development was exploited by the UK government to justify the controversial High-Speed Two (HS2) trainline megaproject (which was radically scaled back in 2024). The HS2 project sought to cut through habitats and towns from London heading north. Brock contends that by portraying the project as 'sustainable,' 'green,' and 'necessary,' the government is benefiting the British construction industry, political and economic elites, affluent commuters, and the City of London, all while leveraging 'zero carbon imaginaries' to disregard the devastating socioecological consequences the project was due to have. These consequences include, for example, the destruction of ancient woodlands and the displacement of human and nonhuman communities along the route, which happen at a significant expense to taxpayers. Drawing on the colonial history of the British railways, Brock argues that state-building and state legitimacy require extractive infrastructures as a means of accumulation, political pacification, and the domestication of subjects. In this context, the 'greenness' of infrastructural extractivism serves as a tool to legitimize and rationalize the same injustices, violence, and social and ecological harms as other forms of industrial development.

Exposing the paradoxes of green extractivism, Anna Heikkinen (2024, this Section) contends that the expansion of zinc mining in the Peruvian highlands exacerbates climate vulnerabilities. Heikkinen underscores how zinc, alongside other 'transition minerals,' are crucial raw materials for wind turbines, solar panels, lithium-ion batteries, electric cars and other technologies positioned as central for mitigating the ongoing climate crisis. This has led to the paradoxical situation that the extraction of minerals to combat climate change exacerbates climate-related risks for marginalized populations in the Peruvian highlands by degrading sensitive ecosystems and undermining local livelihoods. "Across Cunas, the residents expressed their experiences of the intertwined impacts of zinc mining and climate change, particularly through alteration of the water cycle," explains Heikkinen (2024, 530), revealing the extent of these negative impacts. Employing the concept of indirect green extractivism, the article further demonstrates how Peruvian mining policies, actions, and discourses are intertwined with the global extractive apparatus and its power dynamics, perpetuating the contradictions inherent in green extractivism.

Conducting a review of 16 environmental conflicts across the Arctic region, Ksenija Hanaček, Markus Kröger and Joan Martinez-Alier (2024, this Section) reveal how historical colonial ties mediated by fossil fuels are closely linked to the rise of green extractivism and climate colonialism in the region. As climate change renders the Arctic more accessible for the extraction of transition minerals, the proliferation of mining infrastructure and increased extraction rates contribute to a form of climate colonialism. Thus mitigation strategies are employed to displace historically marginalized peoples from their land, disrupting diverse ways of life and knowledge systems. "While old and new transition metal mining, wastes, and toxic dusts are the 'new green' along with infrastructure projects," explain Hanaček and colleagues (2024, 553), "peoples across the Circumpolar North challenge and oppose the interconnected axes of green extractive practices and climate change impacts." Overall, the authors perceive the Arctic as a region rendered vulnerable to climate change

due to its long history of fossil fuel use and extraction, and now further exploited in efforts to address the climate crisis.

Finally, Mads Barbesgaard and Andy Whitmore (2024, this Section) draw on Jason Moore's (2015) analysis of capitalism's commodity frontier expansion to trace nickel mining operations in the context of the 'energy transition.' Exploring the connection between commodity frontiers and green extractivism, they examine the global accumulation strategies of Broken Hill Proprietary (BHP), the world's largest mining company, demonstrating that mining companies are seizing the 'opportunities' created by the climate crisis to 'widen' and 'deepen' their control over new mineral frontiers. Focusing on the physical expansion of mining operations and the corporate and investment strategies adopted under the guise of climate change mitigation and decarbonization, the authors trace how BHP has attempted and failed (until now) to benefit from the rising demand for energy 'transition minerals' that underpins current technologies for decarbonization (such as batteries and wind turbines). Their analysis draws attention to the need to take corporate agency seriously within the context of green extractivism as 'classic' extractivist companies develop varying strategies to reposition themselves in the emerging 'green' economy.

6. Conclusion

On March 5th, 2024 the Vulcano group claimed responsibility for yet another attack on the Tesla Plant near Berlin, Germany (Anonymous, 2024). The group asserts that constructing electric cars on a grand scale is neither ecological nor socially just. The attack prompted Elon Musk, one of the world's richest men and owner of Tesla to write on Twitter (X): "These are either the dumbest eco-terrorists on Earth or they're puppets of those who don't have good environmental goals." While we imagine the Vulcano group, and others, would easily throw these accusations back at Musk, what is important is that the fight in the German forests shows how permanent ecological struggle and occupation are becoming some of, if not the core, strategies of the fight against catastrophic ecological collapse (Dunlap, 2023a). The pursuit of real socioecological sustainability and renewability will require scholars, militants, concerned citizens and lawyers to shatter any expectations that more green extractivism, no matter how well-intended, will help mitigate or avert the polycrisis and ecological collapse.

The emergence of green extractivism has complicated and fragmented the fight against extractivism and concomitant dispossession and destruction (Dunlap, 2023b). It has created confusion and division within environmental movements and public debate by presenting supposedly 'just' green energy 'transitions' as the sole solutions to the capitalist/planetary crisis. As highlighted in this Special Section, concepts like 'energy justice,' 'biodiversity conservation,' 'transition materials,' 'critical minerals' and 'decarbonization' are used as strategies for accumulation that ultimately serve to sustain the unsustainability of capitalist modernity. The proliferation of ecological destruction conflicts (Scheidel *et al.*, 2020; Temper *et al.*, 2020), moreover, not only reflects the shortcomings of state-led forms of environmental justice, but also the erasure of life-worlds and, consequently, alternative ways of being, knowing, and doing in the world.

This erasure of worlds and knowledges necessitates the intensification of research on how so-called renewability leads to extractivism. *As it currently stands there is no such thing as 'renewable energy'* (Dunlap, 2021b). This, as mentioned above, extends to charting how extractivist activities entail slow and progressive forms of socioecological degradation, related to the quality and vitality of wind, wave, river and solar flows. It also entails exploring the long-term changes within habitats through a "political economy of existences" lens (Kröger, 2022, 65), looking not only at how different existences are killed, but also at how different knowledges, ontologies and existences are replaced by others. Such research is a precondition for holding conventional and green extractive industries accountable. It is therefore fundamentally important, not only scientifically but also in terms of political action, and public and international policy. Universities themselves remain extractive institutions (Giroux, 2014; Burawoy *et al.*, 2024), which require immediate socioecological transformation (see Dunlap *et al.*, 2023). Changing exploitative and extractivist practices demands concerted efforts by staff and students.

To properly investigate direct and indirect green extractivism, it is crucial to challenge what constitutes "data," the assumptions within models and their narrow sectoral nature. Data modeling, and the power it holds, needs to be challenged by political ecology, and infused with other knowledges and epistemologies to undo the skewed and reductive visions presented by models and their (mis)use within public policy (Dunlap, 2023b). The study of "political-industrial ecology" (Newell, *et al.*, 2017), we speculate, could likely become a natural companion in advancing to more extensive research on (green)

extractivism. There is a particular need for employing multi-scalar and mixed-methods approaches to critically investigate and generate new data on extractive supply-webs and the multiple places and industrial sectors impacted. Such an approach should target green and conventional extractive industries together (e.g. oil, gas, coal and nuclear), examining their infrastructures, equipment and energetic costs.

Finally, there remains an urgent necessity to, first, acknowledge the amount of hydrocarbons used within lower-carbon infrastructural systems and supply-webs (as researchers and the public are apt to ignore this) and, secondly, to begin documenting it. Ignoring the extractivist reality of lower-carbon energy production stifles and prevents people from adequately assessing the harms of modernity and, consequently, working towards creating sociopolitical systems based on genuine socioecological sustainability and renewability. If done well, it will help acknowledge the real socioecological/climatic costs of capitalist modernity, which will enable social movements, so-called 'insurgents,' lawyers and policy makers alike to better address the socio/ecological/ontological catastrophe we are currently experiencing. In sum, this research may contribute to efforts towards systemic transformation to (re)establish socioecological harmony and/or balance, which are vital to ensure continued existence on earth.

While green extractivism is a farce—it is just extractivism—we argue that it deserves greater analytical specificity and it remains a useful tool for conceptualizing capitalism's techno/industrial growth. We are witnessing a remarkable expansion of '*extra-actions*' accompanying the relentless, often brutal, and intensifying spread of extractivism into 'less developed' or previously inaccessible areas ranging from material sources at the bottom of the ocean, to the Moon, or even Mars, and mineral deposits at greater depths. This expansion includes indirect and so-called 'immaterial' forms of extractivism, such as global value-chains, logistics, financialization, and data-extraction algorithms required to sustain green extractivism. This proliferation of '*extra-actions*' can only be countered by an intensification of '*extra-Activisms*'. By understanding how ecological destruction conflicts proliferate and the role of green extractivism in their expansion, it is possible to see and reject the ideologies and political strategies used to legitimize extractivism and begin a process of healing and bringing balance to our social ecologies. While this is easier said than done, conducting research to accurately assess the root of our current socioecological predicament and working to remedy it remains a 'first step' within reach of the University system.

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