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Environmental Values

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Towards a Philosophy of a Bio-Based Economy: A Levinassian Perspective on the Relations Between Economic and Ecological Systems

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ABSTRACT

This paper investigates the fundamental idea at stake in current bioeconomies such as Europe's Bio-Based Economy (BBE). We argue that basing an economy upon ecology is an ambivalent effort, causing confusion and inconsistencies, and that the dominant framing of the damaged biosphere as a market-failure in bioeconomies such as the BBE is problematic. To counter this dominant narrative, we present alternative conceptualisations of bio-economies and indicate which concepts are overlooked. We highlight the specific contradictions and discrepancies in the relation between economy and ecology, and then work towards outlining a genuine and consistent conceptualisation of the BBE. The philosophical perspective of Emmanuel Levinas is employed to develop a more profound understanding of the tensions at stake; Levinas' work is compared with that of Nicholas Georgescu-Roegen's work on bioeconomics, and found to be of complementary value. Our hypothesis is that, rather than the impossible, absolute amalgamation of economy and ecology striven for today, a principal heterogeneity between humankind and nature must be acknowledged if a bioeconomy that truly operates within the carrying capacity of planet Earth is to be achieved.

KEYWORDS

Bio-based economy, circular economy, enjoyment, Georgescu-Roegen, Levinas, sustainability

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1. INTRODUCTION

One of the most important concepts for addressing environmental challenges is the ‘Bio-Based Economy’ (BBE) – a new economic system, into which the European Commission (EC) has already intensively invested (see McCormick and Kautto 2013, 2589–2593). This transitional concept faces many difficulties, however, as it currently remains ambiguous whether the BBE is primarily a metaphor (i.e. a rhetorical move inspiring merely minor recycling practices) or a necessary, *normative* goal of transforming the economic system towards one that operates within the carrying capacity of planet Earth (Pfau et al. 2014, 1232f; Asveld, Osseweijer and Posada Duque 2019a).¹ As this ambiguity is persistently present in the current, dominant understanding of bioeconomies, we seek to explore the precise nature of the relation between the biosphere and the economic sphere.

The EC itself repeatedly emphasises the current need for a ‘clear and unambiguous standard’, including a ‘common context’ for discussing how economic sectors and companies can be engaged in the BBE and an operationalisation of ‘all pillars of sustainability – environmental, social and economic’ (European Commission 2012, 13f). This call stresses, for example, that guiding concepts such as sustainability, Life Cycle Thinking and Circular Economy (CE) are still in need of thorough clarification. In consequence, it can be seen how the general project of establishing a bioeconomy might benefit significantly from the establishment of a common language, including a consensual vocabulary, more transparent conceptualisation and generally accepted semantics (Parada et al. 2018, 32–42). Therefore, providing a philosophy of the BBE will also contribute to understanding the challenges and developmental potential of the BBE within the natural and social sciences.

In this paper, we aim to contribute to a consistent and common understanding of the main idea of a bioeconomy: to base economy upon *bios*. We show how the BBE does not, currently, fulfil its supposed normative role. Recent studies indicate that although the idea of the BBE is promising, actual practices remain marginal. If companies adopt the BBE in their business practices, it is often still as a side event and not part of their core-business plan (Jonker and Faber 2017, 21). For most contemporary economic actors, the BBE is understood as a new way of doing business-as-usual, in which biomass is primarily understood as a source of added value for economic returns, e.g. ancillary recycling projects. Consequently, the concept of a BBE is still fundamentally determined by economic principles that hinder the transition into a system that

1. As opposed to guidelines or metaphors, which might merely serve as an inspirational model for sustainable practice, by ‘normative’ we here mean that it intends to prescribe a norm that should be, but is not yet, realised. A normative bioeconomy, for example, would imply hard obligations for actors.

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is inherently sustainable, i.e. based on the intrinsic limits and possibilities of the biosphere (Richardson 2012, 284f).

In what follows, we outline alternative conceptualisations of the notion of a bioeconomy, such as Nicholas Georgescu-Roegen's (1971; 1975a) vegetative version. We contrast these with contemporary bioeconomic models and provide an elaborate analysis of Emmanuel Levinas' (1963; 1969; 1998) phenomenological perspective on economy to clarify these discrepancies. Our hypothesis is that primary human tendencies directed towards 'enjoying life' conflict with tendencies to embed our living patterns sustainably into the carrying capacity of planet Earth. While these tendencies might explain the BBE's overly narrow focus on economic linearity in terms of growth, competition, production and consumption, they also provide insight into the ambiguity of contemporary policies and the principal impediments to mitigating climate change they cause.

Our paper starts by displaying – and disambiguating – the current conceptualisation of the BBE. We position ourselves within current debates and carry out an initial, descriptive investigation of the semantics currently at stake regarding the idea of a bioeconomy. Next, we explain our methodology, analyse Levinas' understanding of economy and pursue a comparative discussion of his conceptual contribution. The main analysis focuses on the relation between economy and ecology and uncovers a realm of qualitative concepts that are notably absent from current policy. In the final section, we summarise the outcomes of the research and display the main differences between models like the BBE and the concept of a genuinely bio-based economy.

2. THE BIO-BASED ECONOMY: THE CURRENT SITUATION

It is evident nowadays that linear economic systems based on fossil fuels and other non-renewable resources are rapidly depleting the Earth's ecological capacities and hitting insurmountable bioecological limits, resulting in the socioecological catastrophe that is human-induced climate change. In Europe, one of the major response strategies has been the transition towards a BBE. The European Commission has defined the BBE as a system comprised of:

Production paradigms that rely on biological processes and, as with natural ecosystems, use natural inputs, expend minimum amounts of energy and do not produce waste as all materials discarded by one process are inputs for another process and are reused in the ecosystem. (EC 2012, 22)

However, there are many concepts and definitions of importance surrounding the term 'bioeconomy', such as Circular Economy (CE), biomimicry and cradle-to-cradle (Bosman and Rotmans 2017). Furthermore, the concept of bioeconomy has itself been understood in many different ways.

In order to frame the scope of our inquiry, and to make general sense of the main conceptualisation at stake, we must first attempt to dismantle some ambiguities. The concept of bioeconomy has been recently classified into three types (Vivien et al. 2019, 189–190). Type I, coined by Georgescu-Roegen (1971), concerns a degrowth conceptualisation. This type of bioeconomy recognises the explosive nature of our exponentially growing economy and argues we should make fundamental, qualitative changes in our economic system and respect the ecological limits this system is founded upon to survive as a species. Type II is the ‘science-based bioeconomy’, in which technological innovation is seen as the key factor for solving ecological problems. This perspective is paradigmatic of contemporary tendencies but can also be seen to offer an ‘economy of promises’ (Jasanoff and Kim 2015; Vivien et al. 2019, 194). Finally, Type III is the ‘biomass-based economy’, which is closest to the strategy put forward by the EC. This type is not as technology driven as Type II, but focuses on forestry, agriculture, fishing, chemistry and the use of biorefineries, aiming to transform biomass from a diversity of resources. Type III is not yet fully fossil-fuel free but might become sustainable in the future (Asveld 2019b, 6f).

Types II and III currently dominate both the vision and practice of Type I – a situation that Franck-Dominique Vivien and colleagues (2019) define as the ‘hijacking of the bioeconomy’ (195). These types fit together closely (both to each other and to contemporary economic tendencies) and oftentimes intertwine or overlap. Though opting for relatively ‘weak’ sustainability, they receive by far the most attention, support, resources, energy and investments. Both seek to maintain traditional economic growth as well as general comfort and consumption, and put their hopes in potential future projects (see Birch, Levidow and Papaioannou 2010, 2903f). Although this might already give a clear indication as to why people might intuitively prefer II and III over I, we seek to deepen this understanding and connect it to principal tendencies within the human condition.

In recent years, the policy concept promoted most actively by the EU is the Circular Economy (CE) (EC 2014). This shift is justified and relevant, as both BBE and CE are design-principles with the shared goal of effectively closing material cycles, just as nature does with biomass. Furthermore, CE in general poses a stronger form of sustainability than bioeconomies of Type II and III (Ellen MacArthur Foundation 2015; Raworth 2017; Murray, Skene and Haynes 2017, 373f).² Yet, the addition of CE into the general conceptualisation of a bioeconomy only complicates the task of providing an encompassing

2. The Ellen MacArthur Foundation (2015) report, ‘Growth Within: A Circular Economy Vision for a Competitive Europe’, was produced in collaboration with the McKinsey Centre for Business and Environment, with sponsorship from the SUN Institute for Environment and Sustainability.

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definition further because CE is itself already being approached from a variety of perspectives.

Julian Kirchherr and colleagues (2017) have gathered and analysed 114 existing definitions of CE in 17 dimensions and formulated the following definition:

A circular economy describes an economic system that is based on business models which replace the ‘end-of-life’ concept with reducing, alternatively reusing, recycling and recovering materials in production/distribution and consumption processes, thus operating at the micro level (products, companies, consumers), meso level (eco-industrial parks) and macro level (city, region, nation and beyond), with the aim to accomplish sustainable development, which implies creating environmental quality, economic prosperity and social equity, to the benefit of current and future generations. (Kirchherr, Reiker and Hekkert 2017, 224)

There are two more concepts of importance here. First, the concept of ‘biomimicry’ has become a common denominator for the imitation of nature’s models in technological designs (see Benyus 2002; Blok and Gremmen 2016; Dicks 2017). Indeed, taking inspiration from nature has become a prevalent strategy in current technological innovation (e.g. surgical instruments based on octopus arms). The design of a ‘bioeconomy’ is nature-inspired as well, but on the macro-level of global systems and cycles, rather than specialised devices and mechanisms. Second, the ‘cradle-to-cradle’ concept forms an essential aspect within this analogy; it views ecological cycles, in which all resources are cyclically regenerated, as a primary inspiration for economic systems (McDonough and Braungart 2002, 13f). These systems should imitate natural patterns wherein no energy is lost in the transition from usage to depletion.

This multitude of fundamental concepts creates confusion and inconsistencies, as the EC admits (2012, 11). There is not yet a single, clearly framed ‘bioeconomy’ to focus joint efforts upon as, whether semantic, conceptual or in practice, each definition has its own shortcomings. In an attempt at conceptual unification, we present Figure 1. This, admittedly imperfect, yet both pragmatic and paradigmatic visual representation of the CE provides a first step towards comprehending the general, underlying idea of the concepts of BBE, CE, biomimicry and cradle-to-cradle. The depiction can be seen as a biomimetic effort to base human designs upon processes in the biosphere; systems of biological and technical nutrients (top) are aimed to function analogously, namely as ecological circularity. The biological ingredients – biomass – (left) can, after consumption (centre), be safely re-introduced into the biosphere, instead of resulting in redundant waste, similar to the energy reuptake from compost by vegetal species (cradle-to-cradle). Technical, non-consumed materials (right) cannot be recovered in the same way, yet the aim is to establish an analogous metabolism in which all used materials provide renewed inlet (far right) for the next production cycle. Such an objective is typical of Type II and

III bioeconomies, which – rather than adapting the internal economic system to fit ecological boundaries – pose a promise of sustainability through technological innovation and biomass-usage.

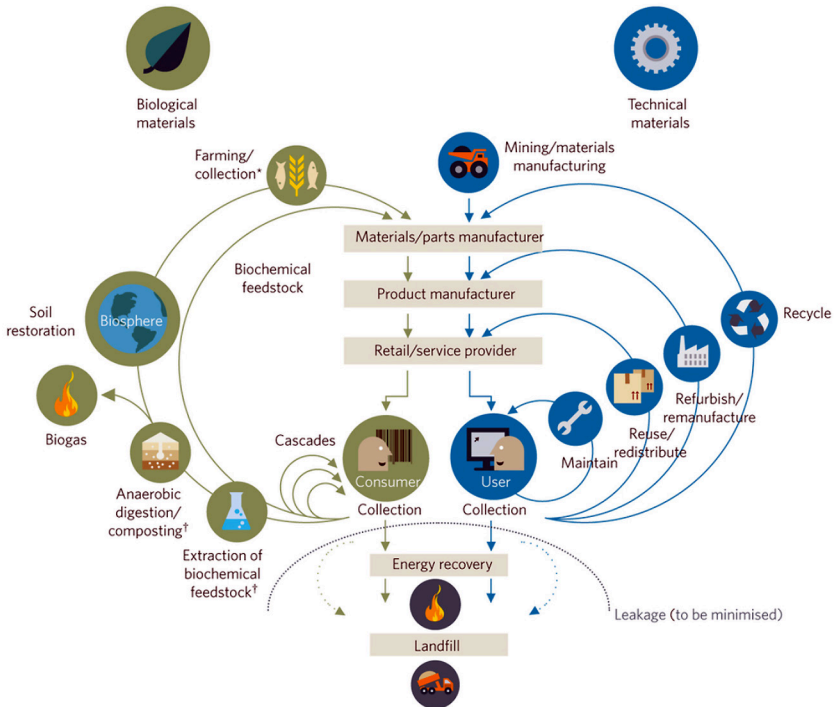


Figure 1. Schematic overview of the CE. Source: Ellen MacArthur Foundation, adapted from the ‘Cradle-to-Cradle’ Design Protocol by McDonough and Braungart (2014).

If we take this idea of reshaping current systems into cyclical and regenerative ones, based on and inspired by ecological processes, we can identify the central, underlying aim of both BBE and CE as connecting economy to ecology: that is, basing an economy on the biosphere.³ The main idea is to make (human) economy similar to biological processes, such as the circularity of natural ecosystems, energy cycles and the Earth’s carrying capacity, as these

3. A bioeconomy is an economic *system* comprised of economic *processes*. We seek to investigate here the general relation between everything economic and the biosphere, i.e. ecological systems and processes. We try to clarify each use of the term ‘economy’ in this paper semantically but, as we explain, some confusion and ambiguity is inevitable. Furthermore, with Levinas’ understanding of economy, we encounter a third, all-encompassing meaning of ‘economy’ as a category of the human condition.

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ecological lapses appear to be structurally renewable and in accordance with balanced ecosystems. This idea can be recognised in all projects and goals of describing economic and ecological cycles – whether producing and implementing biomass on as many levels as possible (e.g. agriculture, plastics, marine environment); replacing non-renewable resources; improving waste processing; transforming manufacturing; converting waste into value-added products; maintaining energy levels; or, innovating for technological solutions.

All types of bioeconomy (including CE, cradle-to-cradle and biomimicry thus involve design principles with the common goal of closing material cycles, just as nature achieves with regards to biomass. Currently, however, these principles mainly provide guidelines for future objectives, i.e. they are not yet optimally realised. The non-circular arrows that end in ‘landfill’, for example, show how the biosphere is only partially or metaphorically instructive for the technological cycle (see Figure 1). This difference between ideas and actual practice demonstrates how the aim of basing the *economic sphere* on the *biosphere* is essential in the transition towards an accomplished bioeconomy.

However, in order to adequately and consistently base an economy upon the biosphere, it should be transparent what this ‘basing on’ entails. Ecology and economy are certainly related, but the borderlines are blurred and their exact relation remains unclear. This is because the two spheres at stake in the BBE have both clear and fundamental differences (ecology refers to systems in nature, which humans affect by economic practices) *and* intriguing similarities – crucially, both concern the *oikos*: the house or environment in which a certain reciprocity between human and extra-human nature exists. This ambivalence has already resulted in a field of ambiguities and questions, such as what exactly it means to operate within the carrying capacity of our *oikos*, planet Earth (Jonker 2014; Wahl 2006; Muijsenberg et al. 2017). This leads us to ask three questions: how is the environment understood in the BBE? How are economic systems and processes understood in the BBE? And what can be said about the central idea of combining ecology with economy into create sustainable bioeconomies?

As the BBE is a vast, encompassing project, spread over a multiplicity of sectors and fields and comprising a total worth of about two trillion euros per year (EC 2012, 11), a significant amount of discussion already exists. The majority consists in analyses of specific parts of the BBE (biomass production, technologies, the food-fuel debate, use of genomics, etc.) with regard to the possibility and details of their practical execution (e.g., Asveld, van Est and Stermerding 2011, 109). Problems arise here regarding internal consistency, general clarity and agreement on key terms within the BBE as a comprehensive undertaking (e.g. Osseweijer, Landeweerd and Pierce 2010, 27f). Extensive analyses of the varying understandings of the BBE, e.g. biotechnology, bio-resource and bio-ecology have been made in an attempt to reach consensus (e.g. Bugge, Hansen and Klitkou 2016). Normative research has taken up

this general confusion to argue that the BBE's consideration of sustainability should be addressed in a more interdisciplinary and therefore more effective manner (e.g. Pfau et al. 2014, 1222). This kind of normative conceptualisation is shared by more fundamental critiques of discontinuity within the BBE paradigm, which insist on the vital importance of clarifying the basic relations between natural and economic systems (e.g. Benyus 2002; Dicks 2017).

The hiatus between economic and ecological systems is a common topic in literature on the BBE in relation to business ethics (Frazzetto 2003; Finegold et al. 2005). This literature is mostly focused on the social and political aspects of the BBE, such as governance, responsible innovation and differences between national economies (Benner and Löfgren 2007; Kitchen and Marsden 2011). Finally, literature that both investigates the BBE in an ad hoc fashion *and* considers the ethical aspects and fundamental relations at stake therein – for example, the relation between economy and energy (Zwier and Blok 2015), or between nature and technology (Blok and Gremmen 2016) – is upcoming, but still scarce. Especially relevant in this latter category is the work of Mario Giampietro (2019), who argues that the panacea being sought in bioeconomies – to simultaneously avert the ecological crisis and enable uninhibited economic growth – is unrealistic. Instead, he proposes the entropic perspective of Georgescu-Roegen to develop the necessary theoretical foundation for a true bioeconomy that understands the difference between economic narratives (business models) and thermodynamic narratives (biophysical constraints).

The relation between the biosphere and the economic sphere is highly complex, which partially explains the confusion and inconsistency in bioeconomy debates. Already, in the three different types of bioeconomy, we see three different conceptualisations of this relation: Type I is eco- or bio-centric, understanding ecology as a realm that encompasses and conditions all economic activity; Type II is techno-centric, considering technological (i.e. economic) innovation the best candidate to solve ecological problems; and Type III is biomass-centric, which means it deems biomass (as an ecological resource) to be of fundamental importance in practicing sustainable economics (Vivien et al. 2019, 191–193). As Type II and III are currently dominant, one might enquire whether they express the relation correctly.

The biosphere and the economic sphere are thus neither clearly distinct nor clearly similar. Firstly, an economy is, too, subjugated to natural boundaries: financial actors, like all organisms, have biophysical foundations and require oxygen, sleep and nourishment to function. This reality is nevertheless reversed in our everyday conceptualisation, which understands the biosphere as mere provider of resources for economic processes. Secondly, what we deem to be 'economic processes' – such as networks of trade, communication, house-holding and even management structures – can also be encountered in natural systems. For example, competition for light amongst trees (resource distribution), elaborate reciprocal reticulations between fungi and vegetation

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(forms of trade) and cooperation for survival in the animal kingdom (by exchanging services and/or manipulation) can all be recognised as economic realities (Oudemans and Peeters 2014). Thirdly, even if the two spheres were clearly distinct, economies cannot just blindly mirror ecological principles as entire species often become extinct in evolutionary cycles, which is unacceptable from an ethical perspective in human society (Blok and Gremmen 2016, 207f).

In light of the effect of human economic systems on natural systems through processes of pollution, temperature change, biodiversity decrease, energy depletion, etc., the ecological and economic spheres might seem fundamentally *opposed* (see Hamilton 2017). However, even this distinction is ambiguous, for it overlooks a fundamental similarity between the spheres: the prefix ‘eco-’, meaning *oikos* or home. Both economy (nomos-of-the-*oikos*) and ecology (logos-of-the-*oikos*) investigate the reciprocity between actors and their home-environment (*oikos*), ranging from living within a household to living within the eco-systems of planet Earth.

One cannot demonstrate the failure of an idea in itself; nevertheless, specific instances of the realisation of an idea *can* be investigated. These specific instances can, accordingly, show which underlying idea is at stake, both semantically and normatively. We choose as an example a quote from the EC’s policy on the bioeconomy:

To conquer this new frontier [seas and oceans], advanced knowledge on marine living resources is necessary to maximise its exploitable value in a sustainable way, optimise the response to climate change and mitigate human impacts on the marine environment. (EC 2012, 33)

From this, it can immediately be seen how BBE policies presuppose a very specific understanding of the relation between economics and nature, through which a language of technological control, efficiency, management and dominance is employed. However, it is clear how those semantics contradict the idea of ‘mitigating human impacts on the marine environment’, put forward in the same sentence that states we must ‘conquer’ the ocean and ‘maximize its exploitable value’ (ibid.). The relation between the biosphere and the economic realm is here notably and overtly *asymmetric*, as economic demands determine the manner in which the biosphere should receive assistance – assistance, *from humans* to help the ecosphere *cope with* humanity.

The section on sustainable fisheries in this document continues to take this asymmetric approach. For example, consider the following quote:

It can be expected that applications from blue biotechnology will contribute to the production of sustainable and healthy aquaculture products by ensuring better control of reproduction processes, developing innovative methods for selective breeding, feed ingredient optimisation (...) [and] energy production. (EC 2012, 34)

To sustain ocean-life (i.e. to not consume all fish at once, leading species and populations to decrease drastically or even go extinct), the policy suggests ‘ensuring better control’ over these populations (ibid.). Technology is put forward to establish controlled reproduction processes: managing, overseeing and manipulating the ecosystem will *help* these systems to be exploited in a repeatable manner. Ecology appears here as a dimension in need of assistance, control, regulation and exploitation, and never as a sphere with any intrinsic value.⁴ For example, the vassalage of the fish’s reproduction cycles is overlooked and implicitly deemed unproblematic.

The perceived need for *help* in and by ecological systems is consistently addressed through a strategy of manipulation, management and, ultimately, control. This can be shown by discussing another exemplary case of EU policy, this time in the context of agriculture:

Research and innovation will aim at increasing the adaptive capacity of plants, animals and production systems to cope with rapidly changing climate conditions and environments, as well as increasingly scarce resources. (EC 2012, 30)

The human reaction of *helping ecosystems* – in this case, to subsist within a changing climate – is developed and justified in the context of the increasing scarcity of resources. Trees are not discussed as vital components for Earth’s life-supporting ecosystem but, rather, deemed scant assets in a market. These semantics of scarcity are evident everywhere in the EU’s policies, which state, for example, that: ‘An important goal is to mobilise more wood in appropriate areas while safeguarding biodiversity and other public goods delivered by forests’ (EC 2012, 31). The biosphere is once again conceptualised as source of resources or ‘goods’ for human use, and the necessity of sustaining it is motivated predominantly by the perspective of economic return. Unhealthy eco-systems are, first and foremost, at risk of market failure (Blok 2018, 205).

Our preliminary analysis of the relation between the economic sphere and the ecological sphere in the BBE encounters a presupposed, univocal dominance of economic processes over ecological boundaries. The biosphere is consistently and solely discussed in the context of market competitiveness, economic growth, industrial purposes, stakeholder interest and technological innovation (symptomatic of Type II and III bioeconomies). These predominantly economic semantics are, in their context, understandable and sensible. Yet contemporary strategies harbour a paradox because, on the one hand, the idea of becoming ‘bio-based’ seems to imply a solid or even inherent connection between economics and the biosphere, while, on the other, the biosphere is understood as an extension of the economic sphere in which market failures are addressed. This onerous ambiguity must be clarified.

4. The eco-centric concept of intrinsic value holds that nature has value in itself, independent of any anthropocentric or economic functionality (Hill 2006; Preston 2001).

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3. LEVINAS ON ECONOMY AND ECOLOGY

Levinas' philosophical concepts have been influential in many different disciplines. His ideas reverberate through fields as diverse as medicine (Clifton-Soderstrom 2010), pedagogy (Zembylas and Vrasidas 2005), business ethics (Tajalli and Segal 2019), business administration (Blok 2018) and psychoanalysis (Todd 2003). Although his ethical work has been recognised globally (see, for example, Druker 2006), Levinas' *ontological* writings on economy and elementary nature have barely been employed in environmental philosophy. Importantly, Levinas provides an original account of what 'economy' means that is directly connected to its biological limits, whilst simultaneously explaining the human tendency to seek control over nature. However, whereas for example Martin Heidegger's (1954) ontological-phenomenological analyses have already been broadly used to consider notions such as degrowth and releasement with regards to threatening technology (see Heikkurinen 2018; Kerschner et al. 2018; Schomberg and Blok 2018; Blok 2020), Levinas' most crucial additions to this discourse remain largely untouched.

Edward Casey uses Levinas' (1963) notion of 'the Other' to discuss the human attitude towards nature. He writes:

Whatever the profitability of the situation may be in the eye of a logging company executive, there was undeniable disfigurement in the land: the aesthetic join forces with the ethical in this scene of destruction. My glance was drawn into the heart of its darkness. This is the moment of pain that calls for alleviation by the appropriate action. (Casey 2003, 200)

Casey's straightforward approach to making ethical claims for the *sur-face* of the Earth via Levinas' concept of the face of the Other is, however, a much-debated position in contemporary literature on the topic. Indeed, even in highly similar and related perspectives, it remains consistently problematic whether Levinas' ethics can be applied to the environment in this manner (Joldersma 2013; Nelson 2012; Diehm 2000; Welsh 1998). Yet, contrary to Casey, the ethical rupture between two human individuals is not the only original structure in Levinas' work; indeed, a similar separation occurs between his conceptualisation of the Self and nature. The ambivalent structure of said gap fundamentally underlies Levinas' ontological work (Derrida 1978; Cools 2015), and is therefore more adequate for discussing questions pertaining to sustainability and economics.

Ted Toadvine (2003; 2012) argues that it is possible to distil from Levinas' thought a heterogeneous conceptualisation of the relationship between man and nature that remains relevant today. More such advanced connections between (Levinassian) philosophy and environmental issues can also be found in books such as: *Eco-Phenomenology: Back to the Earth Itself* (Brown and Toadvine 2003) and *Facing Nature: Levinas and Environmental Thought* (Edelglass, Hatley and Diehm 2012). The former project provides the basis for

the approach taken here. Our aim is to demonstrate the relevance of Levinas' philosophy in the concrete context of conceptualising a bioeconomy.

First of all, it should be noted that Levinas did not discuss ecological sustainability directly. In fact, one of the only authors to explicitly discuss something like a (Type 1) bioeconomy in his time was Georgescu-Roegen. Nevertheless, Levinas provides us with an elaborate *phenomenological* perspective to strengthen and deepen our conception of these bio-based economic processes. For example, a Levinassian perspective raises the question of 'enjoyment' – the qualitative aspect of the human condition – as directly pertaining to the relation between the economic sphere and the biosphere.

The second part of Levinas' (1969) *Totality and Infinity* is titled: 'Interiority and Economy' (109–183). Here, his phenomenological discussion of economy is in the context of the (ontological) Self, or 'interiority', as opposed to the vast majority of his writings which aim to address the (ethical) Other, or 'exteriority'. Consequently, the 'economy' appears as a matter that must be discussed in the realm of egoic survival, quantitative existence and necessity. Moreover, Levinas' understanding of economy cannot be complete without considering his reference to the ecological conditions of economic realities.

Between the Self and nature there is, in Levinas' thought, a distinct ontological separation. Nature *in itself* constitutes a dimension from which humans are principally separated because Levinas deems an absolutely eco-centric perspective impossible for us as anthropocentric beings. Beyond our view is an unpredictable, unfathomable, interminable (bio-)sphere – nature itself – which Levinas calls the '*il y a*' (there is). Of course, we are dependent upon the biosphere to the extent that we require continual supplies of oxygen and food. However, as humans, we also fundamentally tend to overcome and transcend this dependence by establishing protective habitation and safeguarding resources through labour and other economic activity. For Levinas, economy is about the establishment of personal identity (the Self) within the vast biosphere, which entails securing the presence of nourishment via labour and living in a house to protect oneself from the elements of nature. The Self is thus constituted through both a natural metabolism of an economic character and human commerce with an inscrutable biosphere. This dual intercourse between economy (here, a category of the human condition) and ecology allows for an analysis of the '*il y a*' as the biosphere itself. Hostile, unknown, elementary nature is not an (infinitely) different person to be faced, but an ominous ecological enigma.

Economy, then, is the process by which the Self conserves its egoic existence, interacting with the world in order to stay alive. Principal interactions consist of acquiring nourishment and safeguarding shelter, both of which can be achieved through the effort of labour. Levinas (1969; 110) describes this economic process as one of *living-from*, arguing that the Self lives *from*

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the external world, deriving sustenance from nutrients, oxygen, housing, etc. *Living-from* indicates a certain kind of ‘metabolism’: economy for Levinas means living *via* the environment by consuming other organisms, seeking shelter and obtaining and trading resources (ibid.). These economic concerns about self-preservation originate from the uncertainties inherent to the vast, all-encompassing biosphere upon which the survival of the Self is dependent: will there be enough to eat tomorrow? Will I have a place to live? Will we be able to breathe tomorrow?

Levinas’ discussion of economy thus displays an intrinsic connection between economy and ecology. Overcoming fear of shortage through labour, for example, is directly linked to the uncertainties springing from an unpredictable, hostile environment in which only the fittest survive. From this perspective, the relationship between the two eco-spheres can be more specifically thematised as a form of reciprocity between ‘The I and the not-I’ (Levinas 1969, 87; 143f). Eating, for example, is the transferral of something from the external biosphere into the sphere of the Self: through the process of metabolism, parts of the surrounding world become part of and help sustain the Self. This back-and-forth between the Self and all things outside of it is a distinctive characteristic of economy for Levinas, because it is through *labour* that externalities are modified into individual preservation. By catching fish, to stick with a familiar theme, one takes from the external biosphere; labour is the economic means of translating or shuttling between the raw element (‘pure nature’, in this case the ocean) and the ultimate consumption of a specific sardine by a specific person. In the same way that the body processes the fish (or, the non-I) into energy for the Self, labour translates concerns for the future into controllable systematics. The economic structure of labour exists as a mediation of the biosphere into modes of self-preservation. Nature in this sense can, indeed, be controlled and translated into resources that support individual and societal continuity.

Yet this back-and-forth between the I and the not-I has clear limits for Levinas. Although seizure is a primordial structure of the Self, not everything can be grasped and usurped within a closed metabolism. For example: systematic fishing establishes a certain dominance over the ocean by helping to overcome fear of shortage; however, the ocean as such cannot be controlled in its entirety. As a primary element of the biosphere, the ocean has its own elemental shape and remains exterior, self-regulating and unfit for total human stewardship (NOAA 2019). For Levinas (1969, 169), this pure nature is never directly, ‘eco-centrally’ visible but, rather, is principally *beyond* human, anthropocentric knowledge. Economy is, certainly, in a strict relation with ecology, but they do not fully coincide: the biosphere (from which we originate and upon which we depend for our survival) is only conquered by economic practices to a certain degree. The impossibility of full dominance over the biosphere indicates an essential heterogeneity between economically controllable

nature and uncontrollable nature itself, making the relation between economy and ecology twofold.⁵

The connection between economy and ecology, and the limits therein, can be sharpened from Levinas' understanding of 'the house', *oikos*, or the place 'from-which' we live (ibid.). Living in the *oikos* or ecosphere means being dependent upon oxygen, food, water, etc. *Living-from* the economic house, on the other hand, means protecting oneself from the elements, modifying our place within the ecosystem, and constituting a fundamental domain of accommodation from which we depart and to which we return in daily, self-evident familiarity. In the same way that labour creates the bridge between raw nature and human consumption, the house translates the interminable, infinitely differentiated outside world into structures of exploitation, complacency, possession and seizure. Living in a house is not the objective of labour, but its condition: as the locus from-which one lives and works, and even through which one sees and understands the encountered world, the house is a prerequisite for typically human affairs such as hospitality, welcoming, visiting and withdrawing to privacy.

The house thus embodies the necessity of overcoming the anonymous, hostile ecosphere in which we live – altering and controlling it through specific economic structures. Ecology and economy share the aspect of *oikos* (eco-), as both terms indicate a locus of habitation, but Levinas' understanding of this 'living-from' demonstrates, once again, a strict difference between raw, unforgiving nature (*il y a*) and economically established comfort (*oikos*). Living-in a biosphere means being dependent upon an unfathomable outside world; living-from a house means having controlled certain aspects of nature, enabling a more worry-free existence.

In Levinas' conceptualisation, humans tend to overcome their natural habitat, and this reciprocity can be seen as a (morally neutral) metabolic process, concerned with the survival of the Self. This means that it is implied in our very ecological conditions that we seek to overcome those conditions (hostile, elementary nature) through economic practices. Economy for Levinas, then, is *sine qua non* of human life – of the constitution of the human Self – in that economic processes are necessary to overcome the anonymous, elemental biosphere that constitutes our origin. Nevertheless, being involved in an economic system does not necessarily coalesce with being-human; indeed, human life itself is always also something more than use, function, sense or objective. Beyond merely staying alive, finding nourishment and engaging in trade, Levinas indicates an independent dimension within which pleasantries can be enjoyed, but also where pain can be felt: the dimension of enjoyment (*jouissance*), or fulfilling the egoistic Self with life's content or meaning. Enjoyment is the completion of the constitution of the Self, located before

5. The contradictory semantics encountered in literature such as the European Commission's (2012) 'Sustainable Growth' report are symptomatic of this original juxtaposition.

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any ethics. To be a human individual means to originate from a constitutive biosphere, to overcome it through economic practice and, ultimately, to enjoy being human.

Levinas therefore marks a difference between the practice of *obtaining* food and nourishment as a mere means to survive or satisfy hunger, and the *enjoyment* of the food which cannot be reduced to such economic rationality since it does not have any metabolic functionality. Enjoyment emerges *from* economic commerce, but cannot be reduced *to* economic labour or the struggle for survival, as it consists in the very act of the corporeal ‘me biting into the bread’ itself (Levinas 1969, 111). The concept of eating as sensual experience transcends both the elementary biosphere *and* the labour aimed at obtaining resources for Levinas, because the act of sinking one’s teeth into food and enjoying it constitutes an absolute *independency* from any ecological necessity or financial concern. Enjoyment does not have a function, but it is valuable because it establishes the very independence that makes us human.

4. COMPARING LEVINAS AND GEORGESCU-ROEGEN

The value of Levinas’ analysis can be further understood through a comparison with Georgescu-Roegen’s ideas on bioeconomy. According to Levinas, we *live-from* the world in the sense of originating from a conditional biosphere upon which we, as an organic species, are dependent; in this sense, our economic practices are always already ‘bio-based’ in the literal sense of the word. Simultaneously, however, *living-from* means living *away from* in the sense of overcoming the elemental, hostile biosphere by transfiguring our natural being through economic structures such as labour and housing. Thus, from Levinas’ perspective, we must say that, on the one hand, *all* economy is bio-based – and not just in the specific sense of basing processes upon renewable resources – and, on the other, that a system of economy can never be *totally* bio-based because something like a BBE is conditioned by a *bios* that cannot be absorbed in the economy itself and must be lived away-from: the elementary nature, *il y a*.

Georgescu-Roegen (1975a) raises the issue of a bioeconomy when he points out how the ecological (that is, thermodynamic) law of entropy should be taken seriously in economics. Here, he points out a crucial distinction between the standard, mechanistic (neoclassical) model of production and consumption and actual biological energy-cycles, ranging from geological shifts to human metabolisms (see Giampietro 2019). In the process, he shows the faults of traditional linear thinking by demonstrating how this relies on a multitude of flawed notions, including eternal growth, immortality, stationary states and other such ‘Myths’ (Georgescu-Roegen 1975b, 347). He then explains how our economy actually exists within an ecological realm of entropic energy that governs everything with incomprehensible magnitude. For example, he writes

that ‘there is an astronomical difference between the amount of the flow of solar energy and the size of the stock of terrestrial free energy’, to the extent that all the solar power harnessed in fossil reserves ‘could produce only two weeks of sunlight on the globe’ (ibid., 370).

While biological life certainly evades the entropic degeneration of economic resources, it *never* controls it in full – in fact, it is not even close. Rather, it is increasingly clear that our economic behaviour has particular consequences for the future availability of energy, resources and humanly inhabitable conditions. As we become increasingly dependent upon external processes of self-regeneration and lifestyle enhancement, and continue to use all the available (and not just accessible) resources of the biosphere, we should expect a systemic failure of current economic models, which will never be epistemologically able to answer to the unpredictable, qualitative novelty bound to arise from the disrupted evolution-process (Georgescu-Roegen 1975b). In particular, Georgescu-Roegen focuses on the disturbed balance between the *natural* process of human evolution and the *exosomatic* technological objects that disrupt, accelerate and fundamentally alter this natural proceeding (Mayumi 2001)⁶. He indicates irreducible social conflict and inequality amongst exosomatic species as two of the major predicaments of current, traditional economic course (that is, exosomatic evolution), writing that:

The second change is man’s addiction to exosomatic instruments . . . It is because of this addiction that mankind’s survival presents a problem entirely different from that of all other species. It is neither only biological nor only economic. It is bioeconomic. (Georgescu-Roegen 1975b, 369; ellipsis added)

To avoid these predicaments, and depending on a multitude of economic asymmetries, would imply altering the course of increasing both production and consumption and producing new economic *processes* rather than mere commodities. For example, constituting a genuine bioeconomy would entail taking measures such as reducing surplus consumption, eliminating waste and luxury, aiding underdeveloped countries and other such drastic reversals of economic patterns (Mayumi 2009).

As shown in Table 1, there are numerous similarities between Georgescu-Roegen and Levinas’ viewpoints. First, Levinas takes biological metabolisms of energy-exchange (living-from) as a methodological start to conceive of economic behaviour and, like Georgescu-Roegen, draws analogies with their functionality. Second, Levinas understands this economy-ecology relation from a fundamental notion of the separation of mankind from the natural proceeding of time. Third, he indicates an epistemological ceiling when discussing the ecological counterpart of economic systems. Fourth, he understands the

6. Natural evolution occurs through a reciprocity between organism and environment. Exosomatic evolution is the process in which humans have technologically adapted their environment to the point that they now evolve in reciprocity with their own, man-made, anthropocentric technical surroundings.

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human tendency to control and comfort, expressed in economic behaviour and, fifth, he recognises a great danger in the unpredictable, unknown natural world that lies behind our scientific knowledge. Finally, he thoroughly understands the limits to human control when weighing rapid consumption against a more balanced, sustainable variant, based on the cycles of the Self.

Table 1. Conceptual Comparison of Levinas and Georgescu-Roegen

Conceptual Connection	Levinas	Georgescu-Roegen
Analogy metabolism to understand economy	Living-from	Evading entropic degeneration
Fundamental notion of separation	Il y a	Exosomatic evolution
Epistemological ceiling to our knowledge of nature/the biosphere	Anthropocentric	
Perspective	Principal novelty of technological advancement	
Tendency to control and comfort understandable from humankind	Overcoming nature & establishing house	Addiction to gadgets and exosomatic tools
Unknown nature poses danger	Elementary Nature	Systemic failure
Limits to human control over ecology	Egoic realm	Gaia is infinitely bigger
Focus on qualitative life in bioeconomy	Enjoyment	Anti-extravaganza

Nevertheless, a significant difference also exists between these two conceptualisations of bio-based economy. By proposing a dialectical approach beyond the traditional, arithmetic economic model, Georgescu-Roegen explicitly conceives of concrete economic strategies to counter emerging obstacles in the transition to a bioeconomy. Levinas, operating at the level of fundamental ontology, did not propose such concrete ideas of economic transformation; rather, the value of his conceptualisation lies in its phenomenological perspective. Complementary to Georgescu-Roegen, Levinas is able to explain how it is both necessary for humans to overcome the hostile, natural world by establishing trade, labour and housing (*oikos*) and, simultaneously, impossible to gain complete control over the biosphere. This juxtaposition can be experienced on a daily basis, for example, by driving a polluting car to work without intending to do ecological harm. Georgescu-Roegen provides such concrete, everyday examples explicitly, but the Levinas' phenomenological analysis is more thorough, substantial, elaborate and incorporates the unique dimension of experienced life.

This is the true value of Levinas' philosophical view: the manner in which he makes these topical themes comprehensible from an everyday, lifelike consumer perspective. This qualitative addition to the bioeconomy debate can be seen most sharply in Levinas' notion of enjoyment – the appreciative

dimension of human existence that can only exist on the basis of an ambivalent reciprocity between the biosphere and economic practice. Although Georgescu-Roegen (1975b, 353) also mentions enjoyment, writing that: ‘the real output of the economic process (or of any life process, for that matter) is not the material flow of waste, but the still mysterious immaterial flux of the enjoyment of life’, he does not elaborate on the precise meaning of this phrase any further. Levinas, on the other hand, explicitly connects the *qualitative* dimension of enjoyment (*jouissance*) to the economic process of self-preservation, and unpacks how both the structural, functional economic elements (*techno-oikos*) and the biological conditions for life are requisite constituents of the very human condition. From such a conceptualisation, it can be understood how humans are always already ‘bio-based’ and what that means today.

Levinas’ analysis of economy fits among several critical, heterodox accounts of biobased economy, such as Georgescu-Roegen’s. Those promoting Type I bioeconomies fundamentally argue for the need to shift our conceptualisation, to account for the fact that the biosphere is not a subsystem of our economic systems, but an all-encompassing, unfathomable realm that conditions us always. From this logic reversal, it immediately follows that future economies should focus much more on the qualitative elements of this biospheric ecosystem. Born from ecological conditions, man overcomes nature by practising economy in order, ultimately, to *enjoy life*.

In Figure 2, we display a representation of relevant and related concepts in Levinas’ analysis of economy. We see how, in its economic processes, mankind (left) is intrinsically conditioned by the principles of enjoyment and ethics, which are not directly relevant to the economy-ecology relation itself. Nature (right), on the other hand, is displayed as twofold: both partially controllable and ultimately uncontrollable. As we have already demonstrated, current bioeconomies such as Europe’s BBE are still located within the boundaries of a seemingly controllable *oikos* and are fully conceived of in terms of control, growth and production.

Comparing our model in Figure 2 with the Butterfly-diagram in Figure 1, it becomes clear that the two representations belong to two non-equivalent descriptive domains. Figure 1 attempts to depict the relation between flows of technological and biological nutrients in a controlled, economic metabolism, which includes the biosphere itself. The assumption is that there exists a common system of control based on the shared identity of the two metabolic systems: the biological nutrients on the left are assumed to be controlled by an anthropocentric metabolic cycle, while the flow of technological products on the right is presupposed to be controlled by human society. Europe’s BBE, for example, fully ignores the heterogeneity of and discrepancies between humanity and nature. Indeed, it is framed entirely in economic – i.e. human/social – terms, posing merely a human-based economy without conceptualising any facet of this humanity beside its functionality. In light of the inextricability

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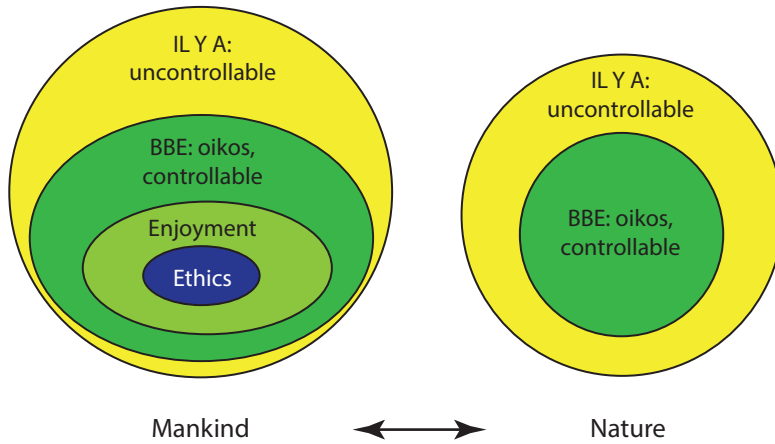


Figure 2. Levinas' concepts displayed relatively, and compared with the status of the relevant BBE-concepts.

of human economy and bio-ecology, this homogeneous, pristine amalgam is labouring under a critical misapprehension.

From heterodox accounts of bioeconomy, such as Levinas' (1969) and Georgescu-Roegen's (1971), we see that the two spheres are intricately connected, yet vastly distinct. From Levinas' analysis, it became clear that the two sets of metabolised flows in Figure 1 refer to radically distinct processes of self-preservation; indeed, Levinas draws an analogy between economic processes and ecological cycles, such as our own biological metabolism, making visible our primary tendency to overcome the natural world. That said, he also indicates very clear limits to human control. Levinas thus insists on the existence of a strict (ontological) heterogeneity of and/or separation between man and nature. Both the structural, functional, economic elements (*techno-oikos*) and the biological conditions for life (*oikos*) are required to constitute the human condition of enjoyment, without which any bioeconomy would be pointless.

Figure 2, on the other hand, is an attempt to depict the system of self-preservation in all the categories that are relevant for its success as indicated by Levinas and the thinking behind Type I bioeconomies. We need a consistent view of what identities are at stake in the transition toward an economic system that is truly based on the biosphere, aiming to take in all relevant facets, not just that which is humanly controlled. From our analysis, one can see how sensibility, consciousness, appreciation and the experienced quality of life (or, enjoyment) constrain the possibilities of the human *oikos* being practised

economically. We can never fully control elementary nature, and neither should we focus our aim on that sole purpose. The very tendency to overcome natural obstacles is founded in the constitutive aspect of ecology, as Levinas showed, yet it is now time to re-embed human behaviour within the limits of the planet, precisely in order to keep living here.

5. CONCLUSIONS

The argument in this paper has consisted of five steps. First, we demonstrated that the idea of the BBE – basing economic systems upon ecological processes – is highly susceptible to confusion, as both fundamental similarities *and* differences exist between economy and ecology. Second, the problematic consequences of such confusion were shown by pointing out how the economic sphere dictates ecology in current ‘bio-based’ economies: rather than a logical and direct consequence of economic growth, the broken biosphere is treated as a market-failure that is perpetually in need of help and further control. This attempted domination of the biosphere overlooks any intrinsic value of nature and is ultimately counterproductive in altering contemporary, problematic economic structures. Third, we brought Levinas’ conceptualisation into the equation; through an analysis of his non-ethical conceptualisation of economy, we gained a more profound understanding of the tensions between economy and ecology. As humans, we surmised, it is both necessary to overcome the hostile, natural world by establishing trade, labour and housing (*oikos*), and simultaneously impossible to gain complete control over the biosphere (*il y a*). Fourth, we extended Levinas’ conceptualisation into the discussion on bio-economies, comparing it to Georgescu-Roegen’s notions while highlighting complementarities. And, lastly, we demonstrated how Type II and III notions of bioeconomy such as the BBE are exceeded on both sides: before any human activity lies the (pre-)conditional, unfathomable biosphere, and beyond all economic value and functionality lies the human condition (enjoyment).

The relation between economy and ecology is heterogenous, ambiguous and contradictory. Aggregating the two – that is, basing an economy upon the biosphere – will pose a major challenge, and not only on the conceptual level. Current bioeconomic strategies and actions should consider fundamental dimensions of nature and mankind as an urgent priority, rather than the prevailing traditional economic models of growth and exploitation. Yet, the dominant thought on bioeconomy still seems to presuppose that all of the biosphere is an exploitable, controllable resource. Levinas insisted on an account of nature that is principally enclosed, untameable and beyond any societal domestication, and promoted an account of humanity as fundamentally qualitative, experiencing and enjoying life in every moment, and being more than just actors in a marketplace, trying to survive.

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