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The Post-Anthropocene Diet: Navigating Future Diets for Sustainable Food Systems

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Abstract: This article examines how future diets could reduce the environmental impacts of food systems, and thus, enable movement into the post-Anthropocene. Such non-anthropocentric diets are proposed to address global food systems challenges inherent in the current geological epoch known as the Anthropocene—a period when human activity is the dominant cause of environmental change. Using non-anthropocentric indigenous worldviews and object-oriented ecosophy, the article discusses changes in ontologies around diets to consider choices made in the present for sustainable future food systems. This article conceptually addresses, how can pre-Anthropocene ontologies guide an exit of current approaches to diets? Considering temporality, what post-Anthropocene ontologies are possible in future diets for sustainable food systems? Through the ontological positions defining three distinct temporalities, considerations for guiding future diets in(to) the post-Anthropocene are proposed. Indigenous ontologies are presented as pre-Anthropocene examples that depict humans and non-humans in relational diets. Underlying Anthropocene ontologies define current unsustainable diets. These ontologies are described to present the context for the food systems challenges this article aims to address. A post-Anthropocene illustration then employs object-oriented ecosophy along with indigenous ontologies as theoretical foundations for shifting from the dominant neoliberal paradigm in current ontologies. Ontologically-based dietary guidelines for the post-Anthropocene diet present the ontological turns, consideration of temporality, and outline technological orientations proposed for sustainable future food systems. This is a novel attempt to integrate non-anthropocentric theories to suggest possible futures for human diets in order to exit the Anthropocene epoch. These non-anthropocentric ontologies demonstrate how temporal considerations and relational worldviews can be guidelines for transforming diets to address public health concerns, the environmental crisis, and socioeconomic challenges.

Keywords: sustainable diets; Anthropocene; indigenous ontologies; temporality; sustainable futures

1. Introduction

Climate change is challenging food systems, livelihoods, and human and ecosystem health [1]. There is high confidence that the global food system is the most predominant contributor to current environmental degradation [1]. Led by agriculture, planetary boundaries have been surpassed in biosphere integrity, biogeochemical flows, and land-system changes [2,3]. Globally, 40% of land is used for agriculture [4] with unprecedented rates of expansion intensifying productivity and supporting increased consumption [1]. Impacting marine ecosystems, fishing livelihoods, and sustainable fisheries, 60% and 30% of global fish stocks are completely exhausted or over-fished, respectively [5]. Pasture and cropland conversion have been chief causes of species extinction and deforestation [6], and cropland

expansion results in larger declines in biodiversity [1]. Eutrophication from overuse of nitrogen and phosphorus [7] has been coupled with the consumption of 70% of the world's fresh water for agriculture [8]. Estimates of 25–30% of global greenhouse gas emissions (GHGs) are owed to livestock and agricultural production [9]. These GHGs have caused a rise in global temperatures, changes in precipitation, and a negative feedback loop impacting food systems [10].

Over the past several decades, the global food system has changed dramatically [11]. Increased demand for food, fuel, and fiber biomass "has been met by converting ecosystems into [global] production ecosystems" [12]. Highly-varied food production systems across the globe have shifted into supply chains that are increasingly more specialized, complex, and vertically integrated (i.e. corporations own intermediate means of production) [11]. With greater distances between producers and consumers, fewer people are growing their own food and more are buying from markets [11]. There is a transition from the direct consumption of raw ingredients to increased agricultural production for ultra-processed food ingredients [11]. Given such changes, the power of the private sector has increased, and labor, power, capital, and values have been concentrated in large agribusinesses and food industry [11]. At the same time, nutrition transitions in diets have set food production systems at odds with the provision of ecosystem services, increased the diet-related noncommunicable disease prevalence, and have contributed disproportionately to depletion of natural resources [13]. Reciprocally, many food system changes are driven or exacerbated by population growth, disparities in income distribution, urbanization, and dietary consumption practices [13].

The current environmental crisis has been much debated as a product of human action and has been called 'The Anthropocene' [14,15]. The Anthropocene is recognized as the current geological epoch catalyzed by substantial human impacts on the planet [16,17]. There is strong debate around the exact dates and definition of the Anthropocene concept [18–20]. Yet, the assertion of the Anthropocene as a distinct, human-centered geological era has pressed humanity to rethink our relationship to future generations and non-human entities in the world [19]. Turns in ontologies that underlie these relations are proposed as a novel means of approaching the end of the Anthropocene epoch [21].

Much literature focusing on sustainable future food systems give many, practical guidelines for how transformations can be made now. Such proposed actions include an increase in intensive production through efficient technological solutions, narrowing production yield gaps while minimizing negative externalities, avoiding overconsumption and food waste, and transforming diets to incorporate fewer animal-based, ultra-processed, and sugar-sweetened foods [13,17,22–25]. Though these are consistent and practical solutions, they fall short of addressing the deeper philosophical turn needed for humans to enact changes in reality.

Discussion of food systems and diets have generally only extended to 2050 [13,17,22,25]. To address the environmental crisis of the Anthropocene, several fundamental changes to the global food system and transformations in human action have been proposed. Such actions include full-supply chain policy interventions [26], redirection of finance for sustainability, radical transparency and traceability, and including keystone actors (e.g., transnational corporations) as global drivers of change [12]. However, movement beyond 2050 short-term recommendations will be needed for providing more temporally distant (i.e. several future generations) diets from future sustainable food systems.

The use of the term 'Anthropocene' is inherently an assertion of temporality and invokes the possibility of both a 'pre-' and 'post-Anthropocene'. Temporality means existing within and having relation to time. The timely issues of the Anthropocene related to sustainable diets have been addressed through the wisdom of indigenous peoples whose practices will exemplify a 'pre-Anthropocene' [27]. A time after the anthropocentric, consumptive dominance of the planet—a post-Anthropocene—is theorized as possible [28]. In this post-Anthropocene humans are de-centralized as the sole subjects of consideration in a sustainable food system. Such non-anthropocentric sustainable food systems remain within planetary boundaries where consumers have remade themselves more cognizant members of the global community through deeper ontological turns [11,17,29].

The transformation of current diets to sustainable diets has been widely promoted. Diet transformations have been proposed as one way to address the nutrition transition as well as the global food systems challenges contributing to the environmental crisis [13,17,22–24,30]. Diets are defined as the eating patterns across the lifespan and the types of foods consumed by a person habitually [31]. Sustainable diets are those with "low environmental impacts which contribute to food and nutrition security and to a healthy life for present and future generations" [32]. Since value-based social norms and self-efficacy will drive diet transformations more than pressures of perceived climate change or health risk [33], we argue deeper philosophical perspective shifts could help with the transition to sustainable diets.

Diets are one of the most profound, intimate connections humans have to their external environment. External realities—or ontologies—deal with the questions of existence and the nature of relations to what exists. The ontologies behind diets define the way people, as eaters, understand the nature of reality and their relation to that reality through the consumption of constitutive nutrients. Larger, systemic diet transformations may not come independently of turns in underlying world-views [34]. Possible approaches to the "require[d] radical shifts in deeply held values" [12] are suggested in this article through the guidelines for ontological turns (indigenous and object-oriented ecosophy), temporality considerations (past/future connection and present opportunity), and technological orientations (slow/low and high tech) for post-Anthropocene futures.

It must be recognized that the terms 'ontology', 'Anthropocene', and 'sustainability' are creations of the western academic canon. As Hunt [35] notes "western ontological possibilities are bounded in ways that limit their ability to fully account for indigenous worldviews". Recognizing these limitations, the terms are used here in the western context as a means to work towards commensurate discussions of the current environmental crisis—widely agreed upon by western scientists [36]. Through learning from indigeneity, western scholarship can go beyond current ontological limits for turning from anthropocentric worldviews [35].

Indigenous ontologies are proposed to respond to anthropocentric challenges we face. Indigenous ontologies outline diets where foods have significant relationships with human and nonhuman communities in temporally deep, spatially local, and complex ways [37]. Such ontological outlines are presented to give current consumption practices the ability to move to temporally distant consideration needed to exit the Anthropocene [21].

To connect indigenous ontologies to western academic contexts that have already proposed an Anthropocene exit, object-oriented ecosophy is also used in this article. Developed from object-oriented ontology and ecological philosophy, object-oriented ecosophy parallels much of pre-Anthropocene indigenous ontologies [21]. The theory of object-oriented ontology radically asserts that worldviews cannot solely consider human subjects but must also encompass other objects (e.g., crops, crude oil, oceans) and their fundamental characteristics [38,39]. Object-oriented ecosophy presents an outline for the transition to ontologies which both de-center humans and consider the relationality of objects [21].

There is a current—spatial and temporal—disconnect among the people, places, and things consumed and those entities impacted by that consumption [40]. The food system of the Anthropocene is predicated on anthropocentrism, excessive consumption, negative human and non-human externalities, and an irrational separation of actions and consequences [10,40,41]. The era of post-Anthropocene will need non-anthropocentric philosophies, practices, and institutions. We will need sustainable relations among humans and non-humans and internalization of the effects of anthropogenic influences. To exit this Anthropocene era, a deliberate connection of the time and space of current and future diets—including the food systems which provide those—will need interdisciplinary understanding and approaches that go beyond any one paradigm or system [20].

Assuming we are in the Anthropocene epoch and that we must exit this era for a sustainable future, the purpose of this article is to argue that turns in ontologies are needed, informing and driving transformations in diets. We conceptually address two central research questions: how can pre-Anthropocene ontologies guide an exit of current approaches to diets? And, considering temporality,

what post-Anthropocene ontologies are possible in future diets for sustainable food systems? To advance conceptual discussions of future diets, this paper draws upon literature describing indigenous food systems and the unsustainable Anthropocene context. We advance this discussion to address ontological turns for the post-Anthropocene. The theories and examples of indigenous worldviews paralleled with object-oriented ecosophy are used herein. This article addresses the philosophical paradigm shift needed to exit the Anthropocene through the conceptual discussion of eating, thinking, and being constituted of The Post-Anthropocene Diet.

2. The Pre-Anthropocene Diet: Indigenous Ontologies

2.1. What Is Pre-Anthropocene?

Sustainable food systems have already been in practice for millennia [27]. Indigenous food systems offer answers to the questions scientists and policymakers are asking today. How do we generate food for people while also maintaining natural resources, the environment, and biodiversity? How do we efficiently and sustainably use energy (i.e. food as caloric value) within the system? What multipurpose strategies build capacity for the generation of byproducts, shelter, and medicines?

The pre-Anthropocene is exemplified here through pre-colonial, indigenous ways of being and knowing [35]. We will call these ways of being and knowing indigenous ontologies. Indigenous ontologies underpin the diets of indigenous peoples, which are linked to food systems that provision those diets [37,42]. From the exploration of local foods to the incorporation of sustainable commercial foods, indigenous ontologies can model sustainable diets for larger populations [27,43]. Indigenous food systems are a globally-varied, diverse set of indigenous peoples' management, traditional practices, and temporally-deep cultural knowledge [27]. Such food systems generate food from the respective territories of indigenous communities.

The current environmental crisis is a challenge for all of humanity but a historically predominant challenge for indigenous communities. Whyte [37] claims that "in the Anthropocene, some indigenous peoples already inhabit what our ancestors would have likely characterized as a dystopian future". Whyte argues that the environmental crisis and destabilization is only the most recent challenge facing indigenous peoples, with their Anthropocene ignited by colonialism. Climate change is an issue of contemporary society. Yet, the environmental crisis is a "historically brief, highly disruptive moment" of the many and longstanding anthropogenic threats to indigenous peoples [37]. Such anthropogenic threats have served to systematically and rapidly force indigenous peoples to adapt or lose relationships with plants, animals, and ecosystems of their ancestors [37]. What western modernity characterizes as future dystopias of climate disaster—critically threatened species and ecosystems—is the present-day dystopia of indigenous ancestors [37]. Exiting the Anthropocene will require shared and saved ontologies for present action and future generations. We posit post-Anthropocene ontologies should parallel indigenous pre-Anthropocene.

2.2. What Are Pre-Anthropocene Ontologies?

Indigenous ontologies—though globally distinct and diverse—define indigenous diets. Provisioning diets is one of the primary interactions with non-human beings that comprise indigenous food systems. Indigenous ontologies form food systems through a holistic view that de-centers human beings and the production of food itself [27]. An indigenous food system encompasses "all food within a particular culture available from local natural resources . . . . It also includes the sociocultural meanings, acquisition/processing techniques, use, composition and nutritional consequences for the people using the food" [44]. A further distinguishing feature of indigenous food systems is that they instinctively avoid commercial orientation, combining shared production and consumption [45].

The ontological view of not differentiating between the needs of people and the environment alters the relationality inherent in indigenous diets. "We do not have the right to interfere with water's duties to the rest of Creation," asserts Anishinaabe scholar Deb McGregor [46]. In this First Nations

perspective on environmental justice, McGregor outlines an ontology where humans are not centered as the sole beings of ethical consideration. In the verb-based relational languages framing indigenous ontologies, the subject of the diet (i.e. food item) is made into an object alongside the eater (e.g., an apple tree is 'tree-ing', as a person would be 'be-ing') [47].

Food systems are complex, and indigenous ontologies recognize the relationality and connectedness of individuals, technology, and society. In the pre-Anthropocene, technological orientation differed from current practices through the use of slower and lower-tech means of ecological management for food provisioning [27]. Food preferences were accounted for given the deeply relational aspects of social and cultural structures [27]. Societies evolved around ancestral land stewardship and acknowledgment of the necessity of the care and connection to all other human and non-human beings [37].

The dominant colonial paradigm of ownership, borders, and superiority is challenged and dismantled by indigenous food systems [27]. What commercial food systems—and most human (extr)activities—regard as natural resources, indigenous ontologies perceive as spiritually embedded and intrinsic to sustaining relations with living and non-living beings [27]. Listening to and learning from the indigenous ontologies informed by the hundreds of years of their Anthropocene is valuable in that these ontologies "are not based on the dread of certain futures. Rather, they arise from indigenous perspectives on how to respond to anthropogenic climate destabilization based on having already lived through local losses of species and ecosystems" [37].

2.3. How Do Pre-Anthropocene Ontologies Consider Temporality?

Indigenous ontologies are temporal in practice. Such a practice defines relational consideration of temporally distant and proximal human and non-human beings. Relations, agency, and actions are considered through the 'seventh generation' pre-ceding and pro-ceding the present community [48]. The indigenous conception understands time as a relational opportunity in which to act [44]. Choices made in the present create a future. The future will someday be a part of ancestral history. Indigenous food systems, and diets by extension, already encompass this type of eating. The ancestrally relational quality of foods is the focus. There is the recognition that each being (human and non-human) is part of a temporally-deep system [27]. New conceptions of consumption through a theory of time and relationality can transform present diets to exit the Anthropocene. Through ancestrally-deep indigenous ontologies, we may be able to prevent consuming our planet's futures today [49].

2.4. What Are Examples of Pre-Anthropocene Diets?

Relational indigenous ontologies can be seen in the diets of pastoralists and nomadic hunters and fishers [27]. Central African and Asian hunters and gatherers have a code deeply rooted in the traditional knowledge of the community. Such codes form a food system composed of reticular spaces and nodular relations. Nodes are the collective points connecting humans and non-humans in the food system (e.g., spiritual and cultural community events, ceremonies, and conversations over feasts). Reticular spaces are places with different functions which cannot be understood without consideration of relationality (e.g., sacred fruit harvesting areas, emergency feeding spaces, tuber provision for/with neighboring communities) [27]. The food systems are maintained through relational mechanisms. Stratified, complex exchanges among elders, adults, and children delineate different tasks and knowledge for each group and each reticular area [27].

The ontological practice of indigenous diets promotes the preservation of ecosystems. For example, indigenous-led public events feature restoration programs of sturgeon, wild rice, and water. These public events have brought together members of settler society with indigenous people to learn about the importance and relationality of humans to the rest of their environment [37]. Diets incorporate territory-food linkages, cultural and spiritual relations, and traditional knowledge [27]. Such indigenous practices have been proposed as more efficient and sustainable than present agricultural methods [27].

3. The Anthropocene Diet: Anthropocentric Ontologies

3.1. What Is the Anthropocene?

The Anthropocene geological epoch is the era of human-driven impacts on the Earth System. There is a conflicting discussion on when exactly the Anthropocene officially started: in the Industrial Revolution with the steam engine [18], since early-twentieth-century global temperature rise [50], or in 1950 with the age of the atomic bomb post-WWII [16]. Despite how the beginning is defined, Anthropocene discourse consistently centers humans as the agents of geological change [15,16,51]. Human impacts have significantly altered global biogeochemical flows, atmospheric conditions, ecosystems, landscapes and oceans [2,14,15]. The human-centered era has influenced the global climate through activities that increase the levels of carbon dioxide and greenhouse gasses in the atmosphere, melt ice sheets, raise sea levels, and severely impact global biodiversity [15,16,51].

The Anthropocene describes an unsustainable structure and evolution of the food system. There are many main challenges, which describe the food system of the Anthropocene [17]. Food production is the largest anthropogenic pressure on Earth, causing threats to local ecosystems and global Earth System stability [17]. Risks to people and the planet are exacerbated by population growth and current trends in diets [17]. Though the concept and definition of the Anthropocene are debated, the anthropocentric nature and human-driven impacts of the current era are beyond certainty [36]. There is high confidence that the Earth System is past the point of any return to pre-industrial conditions [1].

3.2. What Are Anthropocene Ontologies?

The ontologies underpinning the Anthropocene are foundationally human-centric. The discourse around the Anthropocene asserts humans as the cause and agents of change [14,18,20]. Humans are the central agents and central beings impacted, which defines anthropocentrism. Anthropocentrism reinforces human-nature dualism and distinguishes humans as separate from nature.

As opposed to such 'Anthropocene ontologies', ecocentric theories recognize all human actions and values as situated within and subordinate to the global ecosystem [52,53]. We acknowledge that human-centered worldviews may lead to similar sustainability transitions. However, we propose an ecocentric approach as a first step in broadening worldviews. Ecocentrism de-centralizes humans in recognition of the central importance of the non-human world.

The human-nature, subject-object dualism in ecocentric thought is often problematized. Such privileging of humans as subjects over nature objects perpetuates the human-nature distinction. A distinction which is cited as a defining issue in the Anthropocene [21,37]. What such ecocentric perspectives lack is the consideration of equality and relationality of humans and non-humans.

We propose two ontological approaches here in response to the human-centered, neoliberal Anthropocene ontologies. Indigenous ontologies remove humans from their dominant, anthropocentric agency [54]. The indigenous approach reflects equality through recognizing that water, foods, ecosystems, etc. are living entities with rights to live and rights to not have their duties to other beings interfered upon by human action [37,46]. Similarly, object-oriented ecosophy "avoid(s) the human-nature dualism by considering each thing an object while still arriving at an ecologically relevant view of reality" [21].

3.3. How Do Anthropocene Ontologies Consider Temporality?

The consideration of temporality in Anthropocene ontologies is conspicuously short-sighted. The effects on the global environment have escalated in the past three centuries due to the rapid expansion of humankind, both in population and the gratuitous exploitation of natural resources per capita [14]. Decisions made in the Anthropocene have been characterized by a disregard for possible future impacts. The disregard for future temporalities in the Anthropocene has privileged uninhibited growth. A growth that has out-paced ecological boundaries for human and non-human wellbeing and equity on the planet [2,15,55]. Ontological turns toward decisions made with future temporal

realities in mind may catalyze the end of the Anthropocene. Such considerations of the future define sustainable, healthier, climate-secure, and ethical diets.

3.4. What Are Examples of Anthropocene Diets?

Diets in the Anthropocene are exemplified by the current, unhealthy, unsustainable nutrition transition. With the advent of colonialism, industrialization, globalization, and heavy processing, diets have transitioned [37,56,57]. Nutrition transitions have been seen across the globe to diets high in calories, heavily-processed, and animal-based foods with deficiencies in balance, diversity, and adequacy [11,17,57]. Without transformations away from the current dietary practices, there will be further increases in diet-related non-communicable diseases (e.g. obesity, heart disease, diabetes) and irreversible environmental degradation [17,23,24,58]. In transforming diets out of the Anthropocene, we need a paradigm shift to considering foods as objects in themselves. We propose placing decisions around food consumption and production in temporalities that seek post-Anthropocene realities.

4. The Post-Anthropocene Diet: Ecosophical Ontologies

4.1. What Post-Anthropocene Is Possible?

To exit the Anthropocene, we propose turns from the current anthropocentric ontologies. Though difficult to achieve, ontological turns will have to be made to exit the dystopia that is the Anthropocene. Ontologies underlying diets would outline consumption in the present while also balancing the consideration of the future. The dietary guidelines proposed here are not about food groups and portions. We propose guiding considerations that enable the epochal changes needed to exit the Anthropocene ontologically, temporally, and technologically.

Complexities will be present in post-Anthropocene food systems, which future diets will need to address. Context-specific environmental and socio-economic factors will be relevant to the post-Anthropocene diet [59]. Local food cultures, production possibilities, and seasonality must drive sustainable diets [59]. Supplementation and imported products will need to be coupled with potential novel food technologies to consider global production efficiencies and nutrient sufficiency [59,60]. Food security will remain an important consideration for sustainable post-Anthropocene food systems and diets [61,62]. Any socio-cultural, technical, or ontological transformations require consideration of the potential unintended consequences through interdisciplinary and multi-sectoral collaborations [59].

4.2. What Are Possible Post-Anthropocene Ontologies?

Ending the Anthropocene will mean turns in ontologies such as to object-oriented ecosophies. Through extending the theories of object-oriented [38,39] and ecological philosophy [63,64], Heikkurinen et al. [21] outline an 'object-oriented ecosophy'. Such an approach is used here to suggest ontological outlines for turning conceptions and consumption to post-Anthropocene diets.

Object-oriented ecosophy—mirrored previously in indigenous ontologies—illustrates three essential qualities of objects. Foods, and the systems that produce them, are seen as autonomous, intrinsic, and unique [21]. These essential qualities have both theoretical and practical implications for diet transformations central to the post-Anthropocene diet. All objects (i.e. foods) have a degree of autonomy, some more than others. This autonomy may be used to assign or explain varying degrees of moral agency [21]. The quality of intrinsicality implies that no object should be treated as a means, but they are ends in themselves. Recognizing intrinsicality releases objects from instrumental rationale or use without deeper value [21]. The uniqueness of objects recognizes their irreducibility and non-substitutability. This quality suggests that every object occupies a specific place and time, which is important for embracing the diversity of objects for organization and conservation [21].

What the application of object-oriented ecosophy means for diets is that foods and the environments that produce them are considered as objects—with relations inherent to other objects. The post-Anthropocene ontological turn of object-oriented ecosophy would erase the divisions of humans and non-humans. This ontological foundation proposes foods not merely as objects of consumption. Foods are part of the world-in-formation as they are intertwined in the process of becoming [65]. Such turns in ontology around consumption are proposed here to de-centralize humans. This would be a paradigm shift in diets for sustainable future food systems.

4.3. How Would Post-Anthropocene Ontologies Consider Temporality?

New questions of temporality will also define post-Anthropocene ontologies and diets. The application of indigenous and object-oriented ecosophy provides non-anthropocentric temporal outlines for exiting the Anthropocene. What this means practically is that, through our choices, there is an imagined narrative of the future that is interpreted and defined by our present reality [49].

To give an example of temporality considerations in turning ontologies, Robinson [49] presents the narrative of driving a car down a street. There appears a child playing next to the street, which alters the present reality when the driver conceives of a possible future where the child runs onto the road. The present is now redefined as a dangerous situation, requiring corrective, anticipatory actions where the driver slows down. Inserting existential threat, the driver temporally re-conceptualizes the very decision of purchasing the car in the first place to avoid the possibility of ever endangering that child [49]. In this scenario, present eaters and their diets are the drivers, and the future planet, people and all other non-human beings are the endangered child.

To give an example of the temporal consideration of post-Anthropocene thinking in diets we present a possible re-interpretation of consuming high GHG emissions-producing foods. Purchasing and consuming GHG emissions-intensive foods is given new meaning by the environmental crisis. The eater recognizes a possible future where climate change has devastated agriculture and compromised future generations' ability to grow food. This implies that future turns in ontologies have the ability to alter how we interpret "instrumental anticipatory consumption acts in the present" [49]. A post-Anthropocene diet would situate the eater in a chronologically responsible present, determined by the past and determining the future.

4.4. What Would Be Examples of Post-Anthropocene Diets?

Assuming humans will still be present in a post-Anthropocene, what would diets and their considerations look like? A post-Anthropocene diet would act and select foods that throw off the increasingly dominant, destructive capitalist tendencies of the Anthropocene. In practice, this post-Anthropocene diet perspective would be a re-definition of consumption. New definitions would incorporate and move toward activities that contribute to broader human and non-human outcomes. Choices would re-orient the eater to considering and deepening the meaning and practice of consumption. This means the selection of foods with other social benefit outcomes or from technological innovations with more efficient means of production. Technological solutions already exist for sustainable food options (e.g., vertical farming, cell-cultured meat, plant-based protein alternatives). More technologies will be developed which will allow for many different possible future diets from sustainable food systems.

A second example of a possible post-Anthropocene diet takes a slightly different approach, reconsidering the act of consumption altogether. Changes will not be led by technological innovations, but slower, lower-tech solutions will arise/reemerge. There will be a concentration on not only less consumption but consumption that arranges living frugally. Such concentration would adjust societal metabolism to centrally focus on foods as objects with their own essential qualities. The food systems provisioning diets will transform to de-centralize humans for a world where production and consumption are downscaled. Sufficient, slower food options of hunting and gathering will supplant the faster foods of efficiency. Consumers will step away from the globalized markets of superstores

and processed foods. Foods may be canned and processed once gathered, grown oneself, or shared with others in times of plenty. These actions would reconsider the temporality of diets.

5. Ontologically-Based Dietary Guidelines

A summary of the three temporal epochs presented through their ontologies, consideration of temporality in decision making, and practical examples of diets (Sections 2–4) is outlined in Table 1. The pre-Anthropocene is presented through indigenous worldviews. The Anthropocene defines a temporal worldview that disregards future generations through unsustainable diets. A proposed post-Anthropocene ontological turn is presented as paralleling the indigenous pre-Anthropocene. Such turns can work to define a new era through object-oriented ecosophy, reconsideration of temporality, and practical or technological transformations in diets.

Table 1 presents possible outlines for turns in ontologies to theorize and realize sustainable futures. This is partly an application of what Heikkurinen et al. [21] offer as an ontological outline—their object-oriented ecosophy—for the transition to a post-Anthropocene society. For them, this means the transition to ecological organization theory and the practice that reimagines object-object relations for "the peaceful coexistence of objects" [21].

For diets, this means using the inherent qualities of objects to reduce the instrumentalization of foods and natural resources. These diets outline an ontological future which releases the eater from anthropocentrism. It is proposed here that such an ontological turn is needed to reach a sustainable post-Anthropocene.

We recognize humans will still need to eat and use resources for the provisioning of those foods. Post-Anthropocene diets are proposed as those which reduce the bias of yield maximization, agricultural industrialization, and commercial food production. We propose an indigenous or object-oriented ecosophy that will position consumers with ontologies to catalyze a philosophical paradigm shift. Non-anthropocentric, pre-Anthropocene diets have been exemplified in indigenous food systems. These diets are informed by an indigenous ontology that has an inherent and relational understanding of how local foods are adapted to local environments.

It has been asserted that the indigenous ways of eating are more resilient in the face of climate challenges [27]. As ontologies turn, post-Anthropocene diets would be composed of fewer industrially monocultured foods. The post-Anthropocene diet will transition from foods furnished through unsustainable agricultural practices of the global-industrial Anthropocene. Diets will consist of sustainably produced, gathered, hunted, or fished foods. Consumption patterns would be led by seasonality and availability, which, though obvious, could be drastically different in a post-Anthropocene world given changing global climate conditions.

As a presentation of possible ways forward, we posit 'Ontologically-based dietary guidelines.' Potential ontological turns, temporality considerations, and technological orientations are recommended as guidelines for the post-Anthropocene diet. Firstly, the ontological turn requires a de-centering of humans. Such de-centering necessitates an understanding of the relationality of foods as objects given their essential qualities: autonomy, intrinsicality, uniqueness and/or through indigenous worldviews [21,44]. Secondly, diets may be considered through consideration of temporality: the questions of when and how much to act or consume are raised. The temporal considerations that embody the post-Anthropocene diet will be guided by asking (i) for what quantity of time in the future is this decision made for a sustainable future food system—to exit the Anthropocene? and (ii) for what quality of present or future is this decision to consume?

Table 1. Pre-, post-, and Anthropocene epochal descriptions.

Epoch	Pre-Anthropocene	Anthropocene	Post-Anthropocene
Ontologies/Worldviews	Indigenous wisdom (histories, stories, languages, artistry, spirituality), relational, connected to the land and all beings, all beings have rights in and of themselves, humans should not interfere with the duties of other beings to each other, protecting natural resources	Human-centered, perpetuated human-nature dualism, agential anthropocentrism, neoliberal, colonial, productivist, efficiency	Object-oriented ecosophy, systemic, complex and adaptive, all objects have intrinsicality, autonomy, and uniqueness, equitable ecocentrism, de-/post-colonial, sufficiency
Consideration of Temporality	Connected to ancestors and to progenitors, decisions are made for the seventh generation	Shallow, immediate gratification, efficient, future generations supplanted for present consumption	Present consumption regards the needs of/possible impacts on the future, is cognizant of historical context
Examples of Diets in practice	Wild food, hunting, gathering, food preservation (drying, salting, smoking, etc.), pastoralists, nomadic, identification, soil maintenance, ancestral seeds, medicinals, cultural cooking techniques	Highly processed, energy-dense, nutrient-deplete, sugar-sweetened, globalized, heavy carbonization, contributing to/leading the environmental crisis, cheap, fast foods, convenience, high food wastage	Local, seasonal, foraging, reduce food waste, 'sustainable', plant-based, within planetary boundaries, growing own food/permaculture, slow food, return to traditional/culturally appropriate, affordable, soil regenerative, technologically-produced ecological diets

We present low- and high-tech examples for understanding technological orientation in future temporalities. A slow or low-tech future may embrace gardening, canning, drying, and preserving foods. Sustainable production and extensive farming systems may be combined with hunting, gathering, and foraging for wild foods. Localization of markets and community-supported agriculture are models that embrace slower food futures. The technological orientation of high-tech futures may embrace sustainable production models of cellular agriculture, vertical farming, biotechnology, and 'smart' agro-technology. In-home or large-scale biodigesters that run on renewable energy and produce biofuels may become more common. These examples are presented around a future diet situated in high-tech and slow/low-tech solutions. Neither example is necessarily superior to the other but would both be equally possible outcomes of this line of reasoning and ontological turn for the post-Anthropocene diet. Future sustainable food systems would most likely consist of some amalgamation of both low- and high-tech futures.

There are limitations to adopting these worldviews and making decisions that redefine food systems outside of efficiency and productivity. It takes time and money to establish technologies for sustainable consumption. Further, there is not one single, simple, or all-encompassing technology that will transform diets for health and sustainability. Using cell-cultured meat as an example, several negative environmental outcomes can be reduced, but this technology requires large amounts of energy and comes at a high cost [66,67]. There are also barriers to entry and access to such technologies. Lack of individual knowledge and funding for more research are limitations in this field. Moreover, dependency on technological solutions still ties consumers to markets or spaces of production. This dependency may be lessened through owning smaller, home-based means of technological production, but again these come with barriers of money and resources.

It is also recognized that there are many challenges and restrictions on individual decision making for transforming diets. Many people are restricted by time, space, and knowledge to gather, grow, cook, and process their own foods. However, this article is set to challenge the centrality of constant growth, efficiency, and productivity and embraces now as the time to make transformations even if small but sustainable. Current diets can take small steps to de-centering humans in the food system. We can choose to move towards this epochal exit through consumption. Choices that leave more space for temporally and spatially distant humans and non-humans in the world to be their autonomous, intrinsic, unique selves.

The feasibility of ontological turns compared to more engineered steering of the global food system must also be considered. Policy interventions are possible. Yet, the correct actors need to be targeted, knowledge of effective changes is limited, and enforcement can be a challenge [26]. Redirecting finance and engaging keystone transnational corporations can be key leverage points for systemic transformations in global production ecosystems [12]. However, there is often an opaque link between financial flows and environmental change [12]. Such neoliberal expansion led by large corporations is asserted as a main driver of environmental degradation of the Anthropocene [10,40,41]. Radical transparency and traceability in sustainability issues may be influential in aligning consumer purchasing with sustainable thinking [12]. However, given "the urgency and complexity of this challenge" [12], the transformative change will also require radical shifts in current economic paradigms. Such change cannot come independently of transformations in deeply held values, education, and social structures underpinning consumer behaviors [12]. Ontological turns de-centering humans in diets presents one option for the feasible unfolding of reality where consumption behaviors can influence health and sustainability outcomes [21,68].

6. Conclusions

We conceptually addressed two central research questions: how can pre-Anthropocene ontologies guide an exit of current approaches to diets? Considering temporality, what post-Anthropocene ontologies are possible in future diets for sustainable food systems? This paper asks eaters to question, 'How should we make dietary choices (e.g., eat/consume) in the present and also balance

consideration of the future in a way that works to exit the Anthropocene?' As an answer, we present ontologically-based guidelines for the post-Anthropocene diet, proposing a philosophical paradigm shift needed to exit the Anthropocene. Through the conceptual discussion of eating, thinking, and being, a suggestion of how the Anthropocene might come to an end is made. Indigenous ontologies and object-oriented ecosophy are invoked to turn ontologies.

There are broader implications of this conceptual model for future diets and research. This article contributes an ontological perspective to the growing discussion (and debate) around the Anthropocene. Discussion of indigenous ontologies and object-oriented ecosophies adds novel contributions to conceptual papers of future sustainable food systems. Recent conversations around sustainable dietary recommendations have largely disregarded philosophical transitions. We hope to help initiate deeper considerations. We also add to a mostly natural sciences-based discussion of the Anthropocene through the interdisciplinary, conceptual approach of this work. There is a recognized need for both the natural and social sciences in facing the challenges of modernity and moving to sustainable futures.

Limitations of this approach include consideration of only temporality. Temporality as the outline for this discussion prevented the full consideration of the relational and spatial aspects of diets and food consumption. More discussion of relations within and among humans and food objects is needed. Complex systems theories may add to discussions of food systems and relationality. Spatial considerations of how food is grown and distributed in the globalized economy would add to this discussion. Deeper understanding, informed by more dimensions of reality, will allow for further turns of ontologies. More work is needed to find ways to practically apply theorizing presented here to go beyond philosophical navel-gazing.

We also recognize the potential of idealizing or appropriating indigenous ontologies. The intention here was to present indigenous ontologies, not as one, all-encompassing, distinct worldview. We recognize the myriad indigenous ways of knowing and seeing the world. These indigenous ontologies are used as edifying examples that work in the world and have practice consistently dealing with anthropocentric climate and cultural destabilization. The many indigenous worldviews are not to be romanticized or exoticized. Often neglected indigenous worldviews should be seen as dynamic contributions to the global discussion of how to live in and face the challenges of the present dystopic environmental crisis.

We present one set of guiding considerations to enable the epochal transformation needed to exit the Anthropocene. This work gives practical considerations for turning ontologies with examples of indigenous ontologies and object-oriented ecosophy applied to diets. In reality, such ontological turns are not so simple and practical. This work suggests a small piece for the larger puzzle of moving toward sustainable futures.

Suggesting we change worldviews is strikingly easier than actually changing them. Changes to education, policies, economic and social structures are required. More research on how to exit this epoch and how to turn ontologies is needed. This article suggests guidelines for one place to start. The conceptualization of the post-Anthropocene diet in this article is just one presentation of a small 'slice' of the larger model of ontologically-based dietary guidelines. There is much future work to be done to move eaters to diets for future sustainable food systems.

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