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Anthropocene Metabolism Natural Resources and Carbon Capture in the Age of Climate Crisis

Asmund Havsteen-Mikkelsen[1,*]

[1]*Independent Researcher, Denmark*

Abstract: This article explores the concept "Anthropocene metabolism," which refers to how the metabolism of the human body has changed during The Great Acceleration of the Anthropocene with huge consequences for domesticated animals and wild nature. Furthermore, the article explores the conditions for the metabolic processes of the body and the natural resources that go into providing food for the planet's eight billion inhabitants. The infrastructure around the consumption of food is shown to have been made possible by a vast and globalized "*Anthropocene arena*," defined by a huge dependency on fossil fuels. The article thereafter explores the climate crisis as a hybrid crisis and argues that the shift to a plant-based diet could reduce the environmental impact of our global metabolism and thereby free agricultural land for re-wilding and reforestation, allowing for massive carbon capture. Finally, it is assessed how the reforestation of approximately 28 million square kilometers would be able to mitigate climate change.

Keywords: Anthropocene, The Great Acceleration, natural resources, Anthropocene metabolism, *Anthropocene arena*, carbon capture, climate crisis

1. Introduction: Anthropocene Metabolism

The concept of the Anthropocene ascribes geological agency to humans as a collective force, enabling us to become aware of how we are constantly digging, mining, and changing the thin crust of the earth covering the planet. This is a "we" that is first and foremost a Global North that through extractive capitalism, neo-colonialism and globalization are transforming life on Earth, using natural resources to furnish its world, thereby creating a new sedimentary layer to the vast geological age of the planet [1]. Extraction must here be understood in a broad sense – ranging from open-pit mining and the clear-cutting of forests to the harvesting of photosynthetic energy from monocultural cropland and the extraction of animal-based products within the industrial-agricultural-food complex, the latter two to sustain our bodily metabolism as humans. "Metabolism" refers to the sum of life-sustaining biochemical reactions through which the body makes energy from the digested food available to run cellular processes. Bodily metabolism thus happens through digestion and the flow of substances through the blood. Lastly, the expulsion of waste products is also part of the metabolic process. The current eight billion people living on planet Earth can exist as bodies within the Anthropocene because they are constantly metabolizing, shielded by a vast built environment of materials extracted from somewhere on the planet.

The planetary impact of feeding all these humans is very visible when we consider The Great Acceleration within the Anthropocene [2]. This concept refers to a set of interlocking earth-system processes and socio-economic trends that have taken place over the last 70 years. These developments have been measured, covering 24 various growth patterns. Among those of importance here are the alteration of the nitrogen cycle, intensified use of fertilizers, the increase of carbon dioxide and methane in the atmosphere, the loss of tropical rainforest, and finally the increase in the world's population and farmed animals [3]. As a totality, these earth-system processes and socio-economic developments reflect a global trend regarding our food consumption especially in the Global North that has moved towards the American Diet: high in animal-based protein, fatty acids, and carbon hydrates characterized by being processed and often consumed as fast food. This landscape of food is defined by the widespread consumption of hamburgers, steaks, pizzas, pasta, sandwiches, French fries, chicken nuggets, ice creams, cakes, candy, sodas, and all kinds of snacks, ubiquitous in every urban fabric. It is a diet that also comes with several health hazards, such as diabetes, obesity, heart problems, and various forms of cancer [4].

The exponential growth in these earth-system processes correlates with a higher living standard and economic wealth for the middle class, especially in the Global North. However, since greater economic resources lead to an increase in demand for animal-based products, it is therefore assumed that the rising middle classes of South America, China, India, and Africa will result in an even higher demand for animal-based products.

The Anthropocene from the perspective of how we humans nourish ourselves demonstrates not only an age of unprecedented extraction of natural resources and alteration of the planet's

*Corresponding author: Asmund Havsteen-Mikkelsen, Independent Researcher, Denmark. Email: info@asmundhavsteen.net

atmosphere but also points to a privileged way of metabolizing as a human body. The privilege consists of having easy access to an abundance of especially animal-based food products. We see this when regarding the distribution in biomass between animals living in the wild and our domesticated farmed animals – the first group comprising 3% and the latter 65% of land-living vertebrates, the remaining 32% consisting of humans [3]. That we have this ratio today, created within such a short period, is due to the emergence of modern industrial farming, which is based on a high concentration of farmed animals of just one species (whether pigs, cows, or chickens) that are slaughtered, sold, and transported globally. Approximately 73 billion farmed animals are slaughtered worldwide due to the human demand for and consumption of meat products. This contemporary way of farming is in stark contrast to the historical farms of the past, which would have a small number of varied animals – horses, oxen, pigs, sheep, and chicken – reared for local consumption.

When combining all these various factors regarding how we as a global civilization feed ourselves, especially considering the developments within the food system over the past 70 years, it makes sense, therefore, to speak of an *Anthropocene metabolism* that as a concept refers to the bodily metabolism made possible within The Great Acceleration. Our bodies and how we nourish ourselves have changed. The BMI (body mass index) of especially Westernized populations follows the same curve as the other patterns within The Great Acceleration. Since 1970, "the prevalence of obesity in the United States has tripled" [5] and is estimated to continue. The bodies within the Anthropocene are in crisis: a moment of change between continuing to metabolize on an American diet or radically alter it towards a much more considered and ecologically sustainable way of nourishing oneself.

2. The Lived Consequences of the Anthropocene Metabolism

Conceptualizing the Anthropocene as an extraction of natural resources in this broad sense – aligning mining with the extraction of animal-based products – there is one crucial difference between these two extractive activities. The latter has *lived consequences* for those sentient beings we raise for their meat, milk, eggs, bones, and skin because they are distorted in their evolutionary needs and destroyed in their temporal possibilities [6]. To extract these products, modern farming must forcibly either isolate them, or cram them together; artificially inseminate them and remove their offspring or product against their will; force them to grow unnaturally fast, and finally, take their lives. All farmed animals as sentient beings suffer from their confinement and what is done to them to extract their products [7]. This is the *psychic footprint* of our Anthropocene metabolism.

To the suffering that is being endured inside animal sheds and on the way to the slaughterhouse, we must also add the lived consequences for those in the wild: the nonhuman individuals in the ecosystems in which this extraction takes place [8]. In the sustaining of established farmland or the creation of new monocultural fields, they are either intentionally killed off or must move away into other habitats. Deforestation in the Amazon for new soya fields for feeding farmed animals in China, the US, and Europe is the most obvious example.

What does it mean when humans clear land to make a crop field?

The transformation of a forest or grassland into monocultural cropland is desertification in the eyes of the nonhuman other. Their conditions for life – the rich interwoven web of multiple life forms developed through millennia or even millions of years, with complex time scales intertwining – is in one stroke reduced to the annual activity of sowing and harvesting of only one crop, from multiple temporalities to flat time.

Industrial-agricultural farming is thus a double destruction of the nonhuman animals forced to exist within the confinement of sheds and ending their lives in slaughterhouses and in the destruction of the habitat of wild animals, because they cannot and are not allowed to exist on the fields.

Google maps make this clear: Everywhere in the Western world, more or less all fertile land has been transformed into monocultural farmland. The contrast is starkest in the Amazon because the yellow patches of fields are cut as rectangles into the parts of the rainforest still standing.

To clear a rectangle in the middle of a forest is to define it as *productive land* – the juridical and economic term for land that is designated an extraction zone in which humans can decide what to grow and harvest most efficiently. One could argue that humans have been terraforming over the last 6,000 – 8,000 years by converting biodiverse habitats into monocultural cropland [9], yet the difference that has occurred within The Great Acceleration is the use of pesticides, artificial fertilizers, GM crops, and the application of large, heavy machinery. Modern agriculture today is the result of the total scientific control of all natural processes. It is a form of *techno-nature*: a nature dominated, manipulated, and controlled by technological means and a capitalistic approach to its productive abilities.

This form of techno-nature, together with the other factors creating The Great Acceleration, is behind "the Green Revolution" that began in the 1960s and completely changed the efficiency and yield of farming. Simultaneously with this revolution enabling the increase in crop yields was the rise in global container shipping with cooling capacities allowing for the transnational trade of food across the globe, making a whole new range of products for Western consumers available in the supermarkets that spread across the urban fabric of the West [2].

After considering the Anthropocene metabolism and its consequences, there will be a shift in focus to consider more in-depth how we can think of the body as a metabolizing entity which is intertwined with the *Anthropocene arena* in which the food is made available to us, the consumers, through a global infrastructure of food supply.

Thereafter, it will be considered the possible effects of a global shift towards a plant-based diet as an ethical response to the climate crisis and the need for a global reforestation campaign to capture carbon, thereby mitigating climate change and avoiding the full impact of a sixth mass extinction.

3. The Human Body as a Metabolizing Entity

Even though we are metabolizing within an Anthropocene framework, our body is, from an evolutionary perspective, basically an animal being, a species among other species. During the past two million years, it evolved from a primate into a bipedal upright-standing organism that, like any other animal being, is dependent on water, nutrients, restitution, and protection from hostile climate conditions. The latter leads to the necessity of sheltering architecture, depending on the environment and climate conditions.

That a human body as an organism is dependent on water and nutrients is due to the metabolism inherent in the animal body: to function as an organism it is necessary to constantly generate energy to sustain the life of the body and make sure this energy is transported to the many differentiated activities of the cells.

Approximately 2,350 calories are required per day for an adult's average body to function [10].

This is the body viewed from a purely biochemical perspective, not considering other basic needs such as social relations, sexual activity, touch, attention, or intellectual stimulation, or the body viewed as the site for the inscription of social forces, ranging from the color of skin to social class, cultural background, religious, or political affiliation.

So, what does the body obtain through the digestion of food and water to sustain itself? In other words, what are the basic conditions for a body to exist as a metabolizing entity?

Several characteristics present themselves, and it is important to understand the totality of these elements as aspects of a functional organic unity. A body alive is both "inside" of the body, aware of its condition (it is hungry, sleepy, sad, happy, energetic, etc.) and "outside" of it – engaged in the world and the social relations that define it as an individual but depend on the body that allows it to exist [11]. The following is therefore an attempt to circumscribe the effects of our metabolism. What does metabolism do for us?

First and foremost, we are dependent on the ability of our metabolism to *generate electricity* as the condition for brain activity and the heart muscle. Both the consciousness of the brain and the heartbeat only function through the electrical charging of cells [12]. A human brain alone generates approximately 14 watts of energy (enough to power a small light bulb). The pumping of the heart secures the fluctuation of the blood which allows for the transportation of oxygen that has been captured by the lungs through respiration and the energy that has been digested in the stomach. For the body to generate this electricity from the brain and heart, it needs the vital minerals contained in food, such as calcium, iron, zinc, magnesium, and several vitamins.

As vital organs, the brain and heart would be lethally exposed if it were not for the strong armor provided by the skeleton, and helpless in digesting certain foods without the fierce cutting power of the teeth. So, not only generating electricity but also *the ability to mineralize* is central to the body in the production of bones and the enamel of teeth. The skeleton is the basic structure of the body upon which all the vital organs and muscle tissue are distributed, allowing for its movement and the carrying of its body weight.

Another interesting feature of the animal body relating to its metabolizing ability is that it is *tubular*. This means that to metabolize, the body consists of several vital tubes of different sizes, lengths, forms, and functions that allow the food to enter and waste products to depart. Central to this aspect is also that blood is circulating through veins of various sizes, through which the energy, oxygen, and important minerals are transported.

The central tube of the body is the totality of the digestive tract, which begins with the mouth and ends in the rectum. Inside the intestinal tract (approximately 7–10 meters in length), we find billions of bacteria constituting the flora through which the organic matter is transformed into energy and vital minerals are absorbed. Without this internal decomposition ability, the body would not be able to extract the energy and minerals needed to stay alive. Alongside the processes already mentioned is the question of maintaining the right temperature, allowing for mobility, and sustaining the immune system.

The nutrients that enter this tube are digested and transformed into energy so that the body can produce various kinds of muscles, nerves, and fibers that allow for bodily mobility and protection of the vital organs. Broadly speaking, the human body needs water, proteins, carbohydrates, fiber, fatty acids, and vitamins – and can get these substances from a huge number of food resources by eating a varied diet.

Lastly, it is important to consider the skin as the bodily membrane between the interior of the body (the blood, the brain, the organs, the skeleton, the muscles, etc.) and the exterior (the pressure from external conditions such as temperature, environment, time of day, etc.) that enables the metabolism to function. A clearly defined "interior space" of the body is constantly kept alive by the intake of various substances in either fluid or structured form. Daily this is what we do when we drink water, eat breakfast, have lunch and dinner, not to mention the many small snacks we consume during the day.

In this sense, every human is "running a body" where food is constantly entering the mouth to be digested to keep the level of energy high within the body, to meet the challenges that confront the contemporary highly differentiated life of a structured selfhood [13]. In short: we eat to keep our bodies running as organisms. Everybody we encounter is the result of a life sustained through metabolic processes enabled by eating and drinking.

Following these reflections on what it *means* to be a body from a purely metabolizing perspective, it is pertinent to look at how contemporary Western societies have established a highly complex, differentiated, and globalized infrastructure around the sustaining of these bodily metabolisms that define the current eight billion inhabitants of the planet. From the financial broker speculating on the prices of bulk food living in a high-rise in New York to the farmer tilling rice paddies in India to a Danish health-care worker, we are all subjected to the fundamentals of our bodies: we drink water, eat food, sleep, and expel waste products. We could designate this as the transcendental ground of bodily existence.

Yet, what we consume, how much we consume, and how it is made accessible to us reflect our social, racial, religious, and economic positions within a globalized capitalist economy where food is reared, harvested, and transported all over the world.

Nonetheless, that we humans have designated 38% of the global land surface for agricultural use (approximately 48 million square kilometers) indicates the devastating consequences for a planet that must provide for the bodily metabolism of eight billion inhabitants. Added to this pressure we must not forget the extraction of billions of fish from the oceans to feed the bodies of the world.

4. The *Anthropocene arena*

The Anthropocene and The Great Acceleration cannot be fully grasped without understanding the pivotal role that the massive consumption of fossil fuels has played in this transformation of the planet [14]. Fossil fuel is the primary energy resource that allows for the contemporary globalized infrastructure of food supply (and a whole lot of other activities) in the following aspects:

1) the use of fossil-based machinery to plow, sow, and harvest the crops
2) the use of fossil fuels in the production of pesticides and fertilizers
3) the transportation of goods around the world on container ships, trains, trucks, and airplanes
4) the use of plastic in the wrapping and separation of the various products
5) the use of fossil-based energy to cook, prepare, and store food

Without fossil fuels, most Westernized humans would not be able to exist today in concentrated urban fabrics far away from the natural resources that are extracted and processed on their behalf [15].

This basic infrastructure around the bodily metabolisms and the private households of the middle class from the Global North can be

described as an *Anthropocene arena*. By designating this globalized infrastructure an "arena" – which has its origins in Ancient Rome as a "place of combat" – the elements of violence, display, and entertainment are introduced into conceptualizing how the bodies within the Anthropocene are feeding themselves and existing within private households. It is an arena because it consists of private spaces for the accumulation of objects, services, and experiences, and simultaneously presents itself as a vast field of possibilities to consume products from all over the world. It is an arena because the privileged access to an abundance of food allows us to individualize ourselves – we are encouraged to step forth into the arena and play the game of contemporary individualism, seeking recognition from our social surroundings. The arena is a space where we are free to have interesting work lives, entertain ourselves, be with our children, go on holiday, have a summerhouse, enjoy museums, do sports and leisure activities – in short, become individuals within a fossil-based capitalist society.

This map of the world – "Ecological Footprint" in Figure 1 [16] – shows the land surface resized according to the ecological footprint by its inhabitants. The size of each nation is proportional to the number of the citizens of the nation multiplied by their respective national ecological footprint measured in global hectares consumption per capita. The larger the footprint the more land each citizen uses thus creating the distortion of the national territories. Another way of looking at the map is to see the intensity of the red color as an indication of where the *Anthropocene arena* is most complex, extended, and uses most resources – the Global North.

The material condition for living this individualized life within the Anthropocene from the perspective of the Global North is that food is easily available in supermarkets, cafés, restaurants, and spaces serving fast food. We no longer spend 12 h working in the fields to obtain our basic food as 90% of the human population did 250 years ago.

The supermarket plays an especially integral part in the *Anthropocene arena* as a central distribution point because goods from all over the world are concentrated here, available to individuals to select and purchase. Coffee, chocolate, bananas, rice, sugar, flour, and a huge variety of dairy and meat products, together with a vast number of other goods, independent of seasons and local traditions, are easily accessible due to the global reality of techno-nature and the transportation system. All year round, it is possible to buy fresh fruit and vegetables from every corner of the world.

The supermarket as we know it today is a form of consumerism that emerged and spread out from America after WWII as the new normality [3], thereby replacing the previous small groceries, individualized shops, and a high degree of self-sufficiency regarding growing food for oneself. In Denmark alone, in 2020 there were 2,790 convenience stores – that is, one shop for every 2,100 inhabitants.

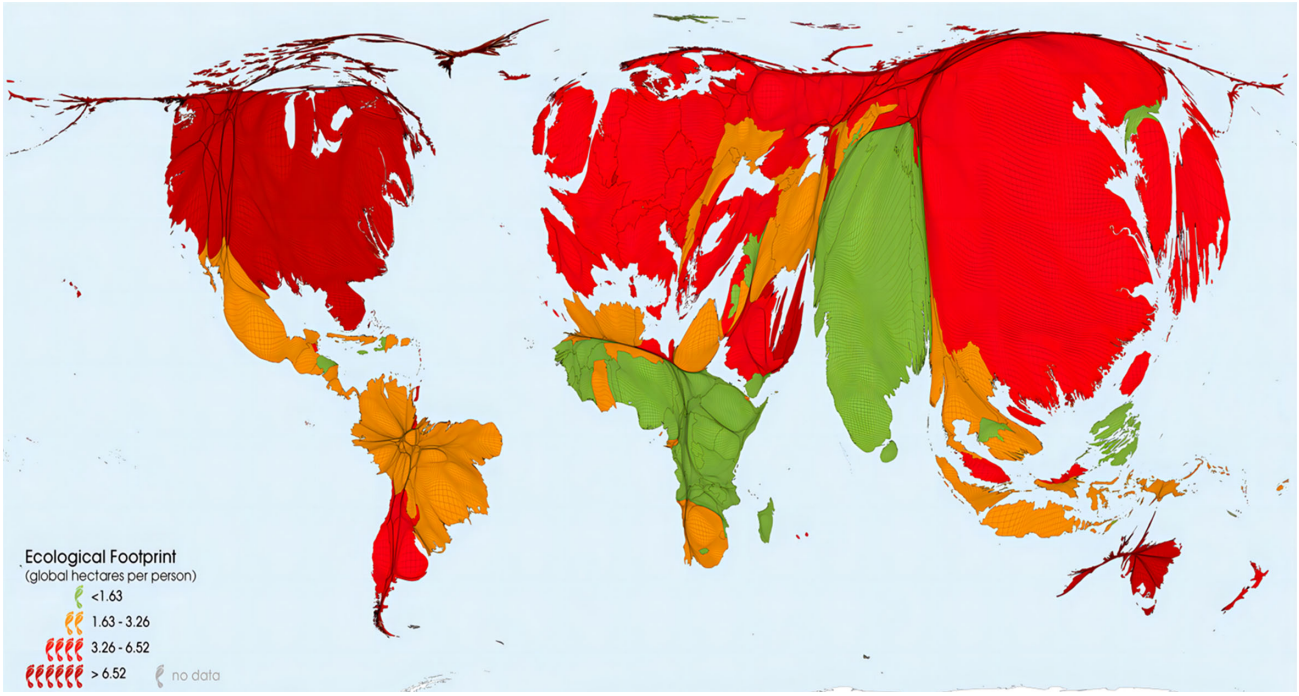
From the supermarket, the food enters the single-family housing unit on its way to the kitchen with its refrigerator and storage cabinets. The kitchen is the architectural center stage for the final act of preparing the food before it enters the mouth of the human, filling up the body with food, and generating energy that allows for the activities of daily life within the *Anthropocene arena*. The "other side" of the kitchen in regard to the primary function of the bodily metabolism is the toilet, in which the body expels waste products from its biochemical processes: urine, and feces, but also carries out hygienic self-care of the intimate zones of the body. Thus, in all Westernized households we find kitchens and toilets that are connected to water and sewage systems that allow for the differentiated use of water, energy, and clearance of waste products. Both spaces play a central role in the maintenance of bodily metabolism.

Let us now look at the natural resources that go into the maintenance of the Anthropocene metabolism in regard to the animal-based products it consumes, and the clearance of the waste products it leaves behind as a residue from its bodily metabolism. The numbers presented here are in many cases averages, since in the *Anthropocene arena* there are huge variations within all sectors due to economic resources, technological circumstances, and availability of natural resources. For example, an Australian toilet will flush 13 liters of water per use if it was manufactured between 1982 and 1992, but if it was made after 2014 only around 4.1 liters of water. These variances are common to all measurements of natural resources consumed to obtain water, meat, clothing, heating, or building materials. But this does not mean we cannot determine which foods and products have a higher environmental footprint than others. Meat production is significantly higher than other food sources. This is demonstrated in an influential study from 2010 by Mekonnen and Hoekstra [17], who estimated the various environmental footprints for each kilogram of meat produced – concentrating on beef, pork, and poultry. In their study, they looked at the whole water cycle of producing 1 kilogram of meat, including water used for growing crops and for the animals to drink, and finally, water related to the handling of waste products from the animals. They found that the water footprint from producing 1 kilogram of beef is 15,400 liters, 1 kilogram of pork is 6,000 liters, and 1 kilogram of chicken is 4,300 liters. The numbers vary within each category, depending on whether the cow was fed in a feedlot or through free ranging. They are approximations, since there are also regional and national differences around the world regarding the amount of water used to produce beef. Not only does beef have a high-water footprint but we must also add the amount of land needed to grow the food for the animals. Here, it is estimated that the necessary amount of land for 1 kilogram of beef is 356 square meters. Additionally, we must add the emission of greenhouse gases with the production of meat since cows are ruminating animals (emitting methane from their digestion). The Danish Ministry of Climate released a report with the carbon dioxide released by the equivalent amount of meat – with 1 kilogram of beef releasing 19.4 kilograms of CO_2, 1 kilogram of pork releasing 3.6 kilograms, and 1 kilogram of chicken releasing 3.1 kilograms. It is estimated that the global production of meat accounts for between 11 to 18% of global emissions of carbon dioxide. Since it is the Global North that consumes the most meat, it is a carbon footprint that has as its main cause the diets of Western populations.

Having a meat-intensive diet therefore comes with a high ecological footprint regarding water use, land area, and greenhouse-gas emissions plus the high *psychic footprint* as the lived consequences for the domesticated animals and those in the wild who lose their habitat to agricultural farming.

From the perspective of producing protein, it is a waste of energy and natural resources rearing animals for food, because of the low conversion rate from natural resources into animal-based protein [18]. As much as three-quarters of the protein eaten by farm animals, most of which comes in the form of human-edible food, is destroyed in their life cycle [10]. The question is how we can obtain the necessary number of proteins and other forms of nutrients needed to sustain healthy bodily metabolisms and at the same time mitigate the climate crisis. Before attempting to answer this question, we first need to clarify the many crises that constitute the climate crisis.

Figure 1
Ecological footprint



5. What Crisis of the Climate Are We Talking About?

The climate of the Holocene to which human civilization has accustomed itself is now being superseded by the climate of the Anthropocene: a climate defined by the highest amount of carbon dioxide (currently 417 ppm) emitted in the last 14 million years. Since molecules of carbon dioxide trap excess heat from the sun within the atmosphere, we are facing an increasingly warming world – with a cascade of extreme weather manifestations ranging from severe droughts, increasing numbers of bushfires, melting of the arctic icecaps, alterations of precipitation patterns, to flooding of low-level areas, rising sea levels, and acidification of the oceans.

All these climatic changes can be seen as partly unintentional side effects of the construction and sustaining of the *Anthropocene arena* in which we live, but only partly, because the world community of both scientists and politicians has known at least since the 1980s that this would happen [19]. This means that "we" as an anthropogenic force (the Global North) are intentionally inflicting these atmospheric changes upon the planet. We know what we are doing as a global humanity. The catastrophe is manmade and deliberate and can be seen as a calculated risk that we as a civilization are taking to maintain the privileges of the *Anthropocene arena*. This does not mean that the global community is not trying to solve the climate with new technology and sustainable energy solutions. Confronted with the effects of an overheated planet (without any indication that global emissions are decreasing), we are also presented with several solutions to mitigate climate change.

Before the presentation of proposals as to how to alter the composition of the atmosphere through an alteration of how we sustain our bodily metabolism, it will be necessary first to "unlock" the climate crisis as a hybrid crisis consisting of at least five intertwined crises.

It is firstly a *chemical crisis*, in the sense, that we have chemically altered the composition of the atmosphere by releasing vast quantities of carbon dioxide into it, thereby trapping heat that leads to an increase in global temperatures. The effects of global warming are well-known and have already been described.

Secondly, it is a *genetic crisis*, in the sense, that the sixth mass extinction represents a genetic loss of the immanent biodiversity of the planet; a biodiversity that has evolved since the mass extinction 65 million years ago. It is a loss of species we know of due to human activities, but potentially also of species we haven't even discovered yet; a loss of "unknown unknowns."

Thirdly, it is a *protein crisis*, in the sense, that we are currently feeding ourselves on the lives and deaths of annually approximately 73 billion farmed animals. Our natural landscapes are defined as monocultural because we are nourishing ourselves on animal-based protein, not to mention the causing of unnecessary pain and suffering upon sentient beings, and the environmental side effects upon wild-life and fresh-water reserves.

Fourthly, it is a *social inequality crisis*, because the worst effects of global warming will strike some more than others, and tragically those who contributed the least to its manifestation are the hardest hit. It is the Global North that has profited from burning fossil fuels, but the Global South will pay the price. This translates into a social inequality crisis – both in the effects and in a justified right to continue consuming burning fuels to build protective infrastructure against climate change.

Fifthly, it is a *generational crisis*, in the sense, that the effects of burning fossil fuels accumulated throughout the past two centuries will be passed on to future generations. This means that children and infants of today, together with the unborn humans of the future, will be forced to live on an increasingly uninhabitable planet, because of emissions happening now and years before they were born. We are inflicting upon our descendants a damaged planet and a life full of extreme weather manifestations.

These five intertwined crises must be seen as a totality of crises that transform the climate crisis into an *ethical crisis.*

Will we continue destroying the conditions for life – not only for ourselves, and those living shortly, but also nonhuman sentient beings and the wonders of nature with which we co-evolved? By which right do we legitimate our current actions that will inflict suffering and catastrophic consequences upon innocent victims? Why is it humans who get to decide the fate of life on planet Earth? These are ethical questions that cut straight to the problem: who do we want to be as humans? What kind of beings do we want to be?

One ethically valid solution is to attempt to step back as geological agents and work for the restoration and regeneration of nature in the widest sense possible. One very simple solution would be if we were able to change the current form and content of Anthropocene metabolism. Could we nourish ourselves in a new way that would substantially reduce our environmental footprint, allow for the re-wilding of our agricultural farmland and a massive carbon capture that could mitigate global warming? Not that changing our diets can stand alone; we also need to re-think how we are living inside our *Anthropocene arena* and how we might reduce the environmental footprint from our lifestyles and consumer habits. But our diet has a huge impact on the planet, and as French philosopher Pelluchon [6] states: "In my manner of consuming and of inhabiting the earth, I reveal who I am and the place I accord to other living beings, human and nonhuman". Through its diet, a body reveals what kind of being it is within the Anthropocene.

6. Mitigating the Climate Crisis Through a New Metabolism

In the article, "The Global Tree Restoration Potential" by Bastin et al. [20], published in *Science* in 2019, they investigated how reforestation on a planetary scale could mitigate climate change by capturing carbon. From a bibliometric perspective, their research reflects a global trend within the scientific community to address adaption, mitigation, and resilience when confronted with the climate crisis [21] that reflects the growing awareness of the crisis' severity for the future of not only humanity but also life on Earth. Not unsurprisingly, the article spurred a heated debate about whether such an undertaking of increasing the global tree cover at such a scale was feasible. Following the debate, the proposed calculation of reforestation on an area of approximately 9 million square kilometers was later corrected to 28.8 million square kilometers. The number of trees to be reforested to capture carbon reveals how much industrial civilization, and especially the Global North, has added to the atmosphere in the process of modernization that has led to the *Anthropocene arena*. Nonetheless, this area accounts for little more than half of global agricultural land use, which is currently 47.8 million square kilometers.

Reforestation of 28.8 million square kilometers would have to happen on a global scale to absorb the excess carbon dioxide that is pushing the global temperatures beyond the 1.5 degrees limit. This is estimated to be the "relatively" safe boundary within which the global climate would remain within the stable climate patterns as we know them. Any rise in temperature beyond this limit carries unpredictable risks of irreversible tipping points in which the climate will begin behaving in ways never seen before.

Data are indicating that we are already moving beyond this threshold, and this is manifesting itself in the constant breaking of previous records in various forms: "The hottest July ever," "The most rainfall in October ever," "The longest drought ever," "The most forest fires ever," "The highest disappearance of glacial cover sheet ever," etc. It is as if the planetary climate is radically changing itself, shrugging off its old habits and tuning itself to a new mode of climatic extremities. Metaphorically speaking, the climate is going from being a cozy Sunday sportsman to a professional heavy-weight boxer that will begin hitting the *Anthropocene arena* with havoc and destruction.

To reforest the planet on a large enough scale to mitigate climate change would entail the repurposing of agricultural farmland where we are currently growing most of our food for our livestock. As shown, from an energy-and-resource perspective, eating animal-based products is a huge waste of energy and resources that are lost in the production of heat, tissue, and animal metabolism. The same protein that is fed to the animals can be used directly to feed humans. There is no dietary need to live on animal-based food products. Whatever is needed in vital minerals and fatty acids to sustain human metabolism can be obtained from supplementary minerals and plant-based omega-3 oils.

Poore and Nemecek [22] in the article "Reducing Food's Environmental Impacts Through Producers and Consumers" estimated that with a plant-based diet, we could reduce the necessary farmland to feed the global population by up to 75% since growing vegetables and corn for human consumption takes up far less land than producing animal-based products. The article also highlights the huge variances in the environmental costs of producing various forms of meat and dairy products, thereby opening a stronger focus on the possibilities of more effectively reducing the environmental costs for each product. A criticism of the article has been its lack of focus on the pastoral raising of livestock, where animals graze on land that is not suitable for agriculture such as areas with mountains. Nonetheless, transforming more than half of the current agricultural farmland into forests, wetlands, and re-wilder land is possible from a speculative perspective, since there will be enough land to feed the global population on a plant-based diet. Of course, there will be huge global differences in which kinds of vegetables and crops will be planted and consumed due to climatic, cultural, and technological means. Nevertheless, a shift towards a plant-based diet could be an imaginary focus in guiding the attempt to transform our Anthropocene metabolism for the sake of future life on planet Earth – both human and nonhuman. If we as a global community succeeded in this transformation, enabling a massive re-wilding of our current agricultural farmland, it would come very close to the ecological vision of biologist Wilson [23] presented in *Half-Earth*, where he proposes to return half of the Earth's land to wild nature.

Whether the estimated amount of carbon sequestration through reforestation will be enough to stop global warming from its current increase in the median temperature since 1850 is highly dependent upon how we manage to reduce our current emissions – now and in the decades to come. Nonetheless, any return of farmed land back to a state closer to what it was before the industrialization of agriculture will always be better for the nonhuman lives and ecosystems with which we co-evolved. Wildlife in all its myriads of manifestations would prefer a piece of land left to its regenerative powers instead of a space defined by monocultural crops. Depending on the amount of land, climate, regional differences, and local vegetation – such a rewilded area would sequester carbon one way or the other, be better for generating cleaner water, and avoid the further erosion of topsoil [24].

If we view the transition into a global plant-based food system in relation to the climate crisis as a hybrid crisis we will potentially be able to solve at least four out of the five crises.

Firstly, we would be able to achieve a mass-scale sequestering of carbon dioxide that would mitigate climate change to some extent. How much it would slow down climate warming, depends on what we do in the other sectors emitting carbon dioxide.

Secondly, we would be able to mitigate or even bring to a halt the unfolding sixth mass extinction, simply because so much land would become a habitat for endangered species.

Thirdly, we would solve the protein crisis by no longer using so much land, and no longer inflicting upon innocent sentient beings the diminished, cruel, and short life within the agricultural-industrial-food complex. Our food would no longer have the current environmental and psychic footprint.

Fourthly, we would be able to regenerate vast areas of fertile landmass into healthy, resilient ecosystems that would be able to generate ecosystem services such as producing oxygen and clean water for future generations. We would be leaving a planet in a much better state for future generations.

The fifth crisis – the social inequality crisis – in regard to environmental justice across a globally divided and socially unequal population in terms of economic wealth, infrastructure, and carbon justice – will only be "solved" in the sense that if the climate were to stabilize due to our mitigating efforts, we – the Global North – would at least not inflict further climatic catastrophes upon the Global South.

From the perspective of fairness and social justice, we as a global community should strive to build up the equivalent standard of wealth that currently defines the *Anthropocene arena* in the Global North in the whole of the Global South. The challenge will be how to achieve this goal within the current climate situation and the available carbon budget together with the natural resources of the planet.

It is important to bear in mind that the *Anthropocene arena*, as defined by a Western standard, is a luxury trap with unintended side effects: it acts as the model for the good life for most people in the Global South. This is not without good reason. It allows humans to individualize themselves and enjoy material privileges. But if we were to extend the current visions and versions of the American Dream to all eight billion inhabitants without radically changing their bodily metabolism and resource footprint, it would be a planetary disaster. This is where the question of ethical responsibility must be raised.

It is the Global North that has profited from this acceleration of trends that has allowed Western populations to live comfortable lives in the past 70 years. Yet, the time has come to acknowledge both the unsustainable effects of this lifestyle and its dark side: the ecological pressure it has put upon the planet. It is time to dial down our demands and begin to give nature back what we have taken from it. It is time for a shift in our dietary habits and a global re-wilding of the planet.

Of course, such a major transformation of our Anthropocene metabolism entails economic considerations. What will it cost? Who will pay? How will it influence regional economies currently dependent on animal-based food production? Who will have to give up their farmland to re-wilding, and who will continue growing food? The difficulty in answering these questions is the totality of economic aspects they open since any calculation has to be held up against the current costs of the American Diet on populations and health-care systems in terms of treatments for obesity, cancer, heart disease, psychiatric illnesses – estimated to be between $700 and $1,000 billion globally [18].

To this economic pressure on national health budgets, we must add the future costs of *not mitigating climate change*, such as costs from the increased spread of infectious diseases due to rising temperatures [25], the pollution of drinking water, the disappearance of ecosystem services (pollination), the impact of climate refugees, and the destruction of the already existing built environment from coastal sea-rise, flooded urban areas, hurricanes, and forest fires.

From an economic perspective, it is interesting to consider a small nation like Denmark, which has intensified its annual slaughter of farmed animals to 119 million, yet as a sector only contributes 3–5% of the GDP and employs approximately 35,000 people. In other words, considering the size of the industrial-agricultural-food complex, which is based on the exploitation and death of sentient beings, and the fact that it plays no major role in the overall economy, it could, from an economic perspective, quite easily be phased out without any major economic repercussions for the population. Compensation schemes for loss of land, conversion or dismantling of farming facilities, and development of new plant-based food products could be orchestrated as a mixture between state subsidy and private venture capital driven by a new ethical demand for plant-based food products.

7. Conclusion: The Anthropocene Metabolism as an Ethical Crisis

Human history is now defining a new geological epoch in the chronology of the planet – the Anthropocene as successor to the Holocene – and through this merging of human history with the history of the planet we have now become aware of what it *means* to be a geological agent [26]. As a terraforming species, we have left traces of nuclear radioactivity in the crust of the earth and altered the composition of the atmosphere with our emissions of carbon dioxide. Our new geological status has had enormous consequences not only for us and our planet but also for its nonhuman inhabitants. Throughout human history, the planet and its climate offered a stable background for our human actions, which we could not influence. This has now changed with the Anthropocene since we are actively pushing the planet towards conditions that are detrimental for human and nonhuman life.

We must come to terms with the fact that our geological agency is both a disturbance and a destruction of other nonhuman life forms – to the extent that the sixth mass extinction of species is happening because of human activities [27]. Human activity in the global *Anthropocene arena* allows for – among other things – an Anthropocene metabolism: eight billion human bodies that are currently running on water and food, and expelling waste products within some kind of shelter.

The Anthropocene has gained so much attention from so many scientific discourses because it is a useful conceptual horizon from which to think about the climate crisis. But, the climate crisis is a hybrid crisis, consisting of at least five intertwined crises that combine to become an ethical crisis. Looking at the Anthropocene from this perspective, we must ask ourselves: what kind of humans do we want to be? Are we responsible for death and destruction, or for life and joyous multiplicity? How do we want to treat the atmosphere, other nonhuman beings, the biodiversity of the planet, future generations, and those millions of people who will suffer from climate change?

The proposition presented here – a global shift towards a plant-based diet – is, therefore, an imaginary focus for the Anthropocene where we as a global collective attempt to regenerate and restore damaged land as much as possible; refrain from any further destruction of natural habitats; dismantle and phase out any economic and social system that distorts and kills nonhuman

individuals (all forms of animal-based exploitation of sentient beings) and finally strive towards social, economic and ecological justice in regards to the unevenness between the Global North and the Global South.

A shift to a plant-based diet is therefore a first step in the attempt to reduce the environmental and psychic footprint of the food we need for our bodily metabolism. What is needed is a new Anthropocene metabolism for the sake of carbon capture and a reduction of our consumption of natural resources.

Ethical Statement

This study does not contain any studies with human or animal subjects performed by the author.

Conflicts of Interest

The author declares that he has no conflicts of interest to this work.

Data Availability Statement

Data are available on request from the corresponding author upon reasonable request.

Author Contribution Statement

Asmund Havsteen-Mikkelsen: Conceptualization, Methodology, Investigation, Writing – original draft, Writing – review & editing.

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