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**Responsible Consumption and Production in the Anthropocene:
Animal Ethics and the Sustainable Development Goals**

**Consum i Producció Responsable a l'Antropocè: Ètica Animal i els
Objectius de Desenvolupament Sostenible**

**Consumo y Producción Responsable en el Antropoceno: Ética
Animal y los Objetivos de Desarrollo Sostenible**

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Abstract

The Sustainable Development Goals (SDGs) are a call for action to governments, organizations and civil society, a call for addressing the environmental and social problems of the 21st century. However, the 2030 Agenda does not focus on animal ethics as one of the keys to addressing these critical issues. The different ethical approaches to the moral status of non-human animals justify the transition to plant-based diets, not only because of the ecological and geological consequences of animal-product consumption but also in accordance with the principles of justice. This work highlights the consequences of animal-product consumption in the Anthropocene. The human being has become a geological force: The Anthropocene is the new geological epoch triggered by human activity that replaces the Holocene. Its effects have a major impact on biodiversity, deforestation, water resources, climate and health. This paper explores the need to develop a normative criterion for technology use to protect the moral status of non-human animals: technological innovation should be focused on the development of animal source foods alternatives.

Keywords: sustainable development goals; anthropocene; technocene; veganism; animal ethics.

Resumen

Los Objetivos de Desarrollo Sostenible (ODS) son un llamado a la acción para los gobiernos, organizaciones y sociedad civil; un llamamiento para abordar los problemas ambientales y sociales del siglo XXI. Sin embargo, la Agenda 2030 no se centra en la ética animal como una de las claves para tratar estos temas tan críticos. Los diferentes enfoques éticos sobre el estatus moral de los animales no-humanos justifican la transición hacia dietas basadas en alimentos vegetales, no solo por las consecuencias ecológicas y geológicas del consumo de productos animales, sino también en concordancia con los principios de justicia. Este trabajo pretende destacar las consecuencias del consumo de productos animales en el Antropoceno. El ser humano se ha convertido en una fuerza geológica: El Antropoceno es la nueva época geológica desencadenada por la actividad humana que reemplaza al Holoceno. Sus efectos tienen un gran impacto sobre la biodiversidad, la deforestación, los recursos hídricos, el clima y la salud. Las siguientes líneas exploran la necesidad de desarrollar un criterio normativo para el uso de la tecnología para proteger el estado moral de los animales no-humanos: la innovación tecnológica debe centrarse en el desarrollo de alternativas para los alimentos de origen animal.

Palabras clave: objetivos de desarrollo sostenible; antropoceno; tecnoceno; veganismo; ética animal.

Resum

Els Objectius de Desenvolupament Sostenible (ODS) són una crida a l'acció per als governs, les organitzacions i la societat civil; una crida per abordar els problemes ambientals i socials del segle XXI. Tot i això, l'Agenda 2030 no se centra en l'ètica animal com una de les claus per tractar aquests temes tan crítics. Els diferents enfocaments ètics sobre l'estatus moral dels animals no humans justifiquen la transició cap a dietes basades en aliments vegetals, no només per les conseqüències ecològiques i geològiques del consum de productes animals, sinó també en concordança amb els principis de justícia. Aquest treball pretén destacar les conseqüències del consum de productes animals a l'Antropocè. L'ésser humà ha esdevingut una força geològica: L'Antropocè és la nova època geològica desencadenada per l'activitat humana que reemplaça l'Holocè. Els seus efectes tenen un gran impacte sobre la biodiversitat, la desforestació, els recursos hídrics, el clima i la salut. Les línies següents exploren la necessitat de desenvolupar un criteri normatiu per a l'ús de la tecnologia per protegir l'estat moral dels animals no humans: la innovació tecnològica s'ha de centrar en el desenvolupament d'alternatives per als aliments d'origen animal.

Paraules clau: objectius de desenvolupament sostenible; antropocè; tecnocè; veganisme; ètica animal.

1. Introduction

The holistic nature of the Sustainable Development Goals (SDGs) leads to a systemic understanding of the United Nations 2030 Agenda. The SDGs cannot be understood independently of each other, but rather should be studied in a relational way “as a system of interacting cogwheels that together move the global system. No SDG will do that individually, and the whole SDGs should not be seen as an additive structure but as a system of synergistic re-enforcement” (Pradhan et al., 2017, p. 1177). The systemic character of the Agenda is similar to the understanding of nature provided by Ecology, a science of relationships which can be defined as “the science of the living beings as members of the whole of nature” (Friederichs, 1958, p. 154). This systemic consideration does not prevent us from analysing each SDG individually, but rather it reminds us the need to connect them together and to not forget the synergies and trade-offs (Obersteiner, 2016). Only in this way it is possible to maintain the integrity of wholeness (Bridgewater et al., 2014), an ecological whole that includes urban (Huang et al., 2015), social (Dempsey et al., 2011) and cultural (Soini & Birkeland, 2014) realities. Sustainability demands fuller acceptance of systemic interconnection (Gladwin et al., 1995).

Human activity has reduced the habitat of wildlife, which is under increasing pressure. Goal 15 states that wild animals are threatened with extinction. The transformation of land for the production of food, fuel and others raw materials is causing that “current extinction rates are higher than those that caused Big Five extinctions in geological time; they could be severe enough to carry extinction magnitudes to the Big Five benchmark in as little as three centuries” (Barnosky et al., 2011, p. 55). These estimates, which show such a fast loss of biodiversity, make it possible to “confidently conclude that modern extinction rates are exceptionally high, that they are increasing, and that they suggest a mass extinction under way—the sixth of its kind in Earth’s 4.5 billion years of history” (Ceballos et al., 2015, p. 3). Moreover, the intensive use and consumption of animals has consequences “to the environment (gaseous emissions, water and soil pollution, and ecosystem damage), issues regarding animal welfare (animal abuse and negative consequences of intensive selection and production), and animal and human health (zoonotic diseases and inappropriate use of antimicrobials and anthelmintic)” (Keeling et al., 2019, p. 2).

Despite highlighting that human activity threatens more species than ever before, non-human animals do not have moral consideration within the Agenda (Visseren-Hamakers, 2020). Consequently, non-human animals “are supposed to be merely instrumental in the sense that the SDGs are understood so as to take animals into indirect consideration —i.e., for humans. Hence, the argument acknowledges the anthropocentric formulation and interpretation of the SDGs” (Torpman & Röcklinsberg, 2021, p. 1).

Ethical approaches to the moral consideration of animals justify the transition to plant-based diets, not only because of the instrumental consequences for the human beings, but also because of principles of justice (Garner, 2013). In this sense, responsible consumption would have favourable systemic effects on the SDGs and especially on Goal 16 (Promote just, peaceful and inclusive societies), if we understand that nonhuman animals should not be subjected to violence, abuse or exploitation, just like human beings:

"The justice approach to animal ethics maintains that unfair treatment is the primary moral wrong being perpetuated on non-human animals. Justice theorists seek to demonstrate that our current attitudes and actions regarding animals are inconsistent with moral principles that we already endorse. A basic constraint on moral judgment is the "principle of equal consideration" which says, roughly, that we should treat morally relevant similar cases in similar ways" (Lekan, 2004, pp. 184-185).

2. Animal-Product Consumption

Among all the problems that limit the achievement of the SDGs, we will focus on the impacts caused by the consumption of animal-based foods. Households influence through their dietary habits and choices, and if meat and dairy products consumption changes "for vegetable-based protein for just one day could achieve the same GHG mitigation benefits as if they had bought all their weekly food from local providers and avoided the energy used for transport" (Food and Agriculture Organization of the United Nations, 2011, p. 24). Consumers are a key element in the transition towards plant-based meat substitutes —"products that take the place of meat in the human diet and have an appearance, texture and taste similar to meat products" (Tziva et al., 2020). There is growing demand for meat-free foods in Western European countries. The sales figures for plant-based foods have clearly increased (Ploll et al., 2020) although they are not yet a mainstream option (Mann & Necula, 2020). Among the fundamental reasons for this change in consumption patterns are the animal-related motives (89.7%), motives related to personal well-being and/or health (69.3%), and environment-related motives (46.8%): therefore, we can affirm that ethics is the primary motivation that leads to a change in consumer habits related to meat consumption (Janssen et al., 2016).

COVID-19 pandemic has added a new perspective. Usually, consumers demand serious controls to avoid any threat of food contamination or the development of foodborne diseases. Over 70% of new infectious diseases are zoonotic in origin (Wang & Crameri, 2014). Although the current pandemic is not associated with livestock, it has drawn attention to alternative food

sources that avoid health risks, both from an ethical and food safety perspective (Rzymiski et al., 2021). The proximity to wildlife —due to environmental degradation such as deforestation— increases the possibility of zoonotic diseases (Austin, 2021). In addition, farm animals can act as bridging hosts, generating sanitary risks. COVID-19 crisis provides us an opportunity to change our animal-based consumption patterns.

In the following lines, we will point out the systemic nature of the impacts of animal product consumption.

2.1 SDGs: “Consequences of Animal Product Consumption”

The SDG 12 (Ensure sustainable consumption and production patterns) is largely linked with most problematic trade-offs (Pradhan et al., 2017). Livestock farming is one of the most negative forces affecting the conservation of ecosystems and biodiversity. The opening of pastures for livestock and the production of soybeans for fodder accentuates the degradation of ecosystems. In fact, livestock production is increasing in tropical countries, where most of the world's biodiversity is found (Machovina et al., 2015). The Amazon is the largest tropical forest on the planet and is a clear example of the loss of biodiversity caused by soy production for livestock (Fearnside, 2005; Kraham, 2017). Most of the deforestation comes from the “consumption of Brazilian soybeans and beef by countries who are already seeking to protect Brazilian forests, increasing the deforestation they are seeking to prevent” (Karstensen et al., 2013). Consequently, the direct consumption of meat —or fodder to feed livestock— has implications for achieving the targets of Goal 15, which seeks to Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss.

Although generalizations are problematic given the heterogeneity of the sector, 10% of global hydrological flows are related to livestock production (Deutsch et al., 2010) and increased meat production is likely to lead to higher environmental impact (Ridoutt et al., 2012). For Mekonnen and Hoekstra (2012, p. 413), governments must adopt environmental policies that discourage massive meat consumption because the water footprint of animal-based product “is larger than the water footprint of crop products with equivalent nutritional value and 29% of the total water footprint of the agricultural sector in the world is related to the production of animal products”. Otherwise, the consumption of animal-based foods would limit reaching some of the targets of Goal 6, as target 6.4, which seeks to substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.

Climate change affects all countries on all continents, negatively impacting their economies and people's lives. As a result, livestock businesses will increase their risks, from lower fodder quality and more droughts to the negative impacts of rising temperatures on animal health and productivity. Livestock's has a direct effect on SDG 13 (Climate Action) and the effects of climate change have consequences for almost all of the goals. For 50 years (1961-2010), Global Greenhouse Gas (GHG) emissions released from beef cattle, pork and chickens increased by 59 %, 89 % and 461 % respectively (Caro et al., 2017). Meat production accounts for between 15% and 24% of current greenhouse gas emissions (Steinfeld et al., 2006). Specifically, according to a study by the FAO (Gerber et al., 2013) the livestock sector plays an important role with the 14,5% of the human-induced GHG emissions, of which the 41 and 20 percent are beef and cattle milk production respectively —the majority of emissions—, and pig meat and poultry meat and eggs contribute 9% and 8% respectively. Some studies have demonstrated the realistic possibility of reducing GHG emissions without completely excluding animal products, “reducing consumption of animal products and switching to meats and dairy products with lower associated emissions (e.g., pork, chicken and milk)” (Green et al., 2015, p. 263). Other studies have shown that a theoretical change to vegan diets “reduced per capita diet-related GHG footprints by an average of 70%” (Kim et al., 2020, p. 10) and the vegan diet “whatever the indicator considered, remained less resource-intensive and environmentally damaging than other diets” (Rabès et al., 2020, p. 144).

For the Food and Agriculture Organization of the United Nations (FAO), health goes beyond human health: animal, plant and environmental health are also part of the One Health approach. The One Health approach can be defined as “a collaborative, international, cross-sectoral, multidisciplinary mechanism to address threats and reduce risks of detrimental infectious diseases at the animal-human-ecosystem interface” and The One Health Initiative considers One Health to be “a worldwide strategy for expanding interdisciplinary collaborations and communications in all aspects of health care for humans, animals, and the environment” (Gibbs, 2014). On one hand, consumption of animal foods is associated with heart disease, and can be prevented by plant-based diets (Campbell et al., 1998; Godfray et al., 2018). On the other hand, healthy animals contribute to human health, which calls for attention to improved hygiene on farms, among many other factors. Hereby, welfarism position, demanded by stakeholders, is becoming a concern for companies that use animals in their production chain. “Cartesian business model” is ceasing to be the only perspective, generating a new corporate sustainability in the food sector (Fernández-Mateo & Franco-Barrera, 2020). Consumers are increasingly concerned about animal welfare (Duncan, 1981; Fraser, 2008; Carenzi & Verga, 2009; Mellor, 2016; Keeling et al.,

2019), demanding “animal-friendly” products that involve good animal housing, good nutrition, good health and natural behaviour (Blokhuis et al., 2003).

Despite the progressive awareness of animal welfare, some authors believe that it may not be enough to reach sustainability levels (Vinnari & Vinnari, 2014). The systemic consequences of the massive and large-scale ingestion of animal products should force us to modify our consumption habits, opting for plant-based diets —with less impact on biodiversity and water resources as the data indicate. Intensive livestock farming, agriculture for fodder production and the extraction of resources and raw materials destroy habitats that used to act as a barrier between humans and wild animals. By bringing humans into contact with unusual animal species, the possibility of the development of zoonotic diseases increases. COVID-19 would be just the beginning. In parallel to the environmental reasons, that seek to prevent the transgression of planetary boundaries —a safe operating space for humanity with respect to the functioning of the Earth System (Rockström et al., 2009)—, there exists ethical reasons.

For Francione (2010, p. 31), the welfares’ position “rests on the notion that there is a qualitative distinction between the minds of humans and that of at least most nonhuman animals”, but that difference would not be relevant because “the only thing that is required is that nonhumans be sentient; that is, that they be perceptually aware”. Although the differences between humans and animals are obvious —nonhuman animals do not have a rational language like humans— “they are completely irrelevant to the morality” (Francione, 2010, p. 34). However, we might still think that this species difference, which divides rational and non-rational animals, justifies discrimination. Rationality justifies morality, and not belonging to the rational species eliminates moral consideration of nonhuman animals. But some human beings —such as infants and people with some kind of disability— would not have a “type” human intelligence and their rights are not denied for that. Thus, the absence of a rational mind is no reason for discrimination: a certain type of mental and linguistic development does not justify moral status. Even some nonhuman animals may have greater cognitive abilities than humans with some kind of disability. Sentient animals have an interest in developing their lives without being harmed, regardless of the specific characteristics of their species of belonging and their level of development:

“Can they suffer? Can they enjoy life? If so, they have interests that we should take into account, and we should give those interests equal weight with the interests of all other beings with similar interests. We should not discount their interests in not suffering because they cannot talk or because they are incapable of reasoning; and we should not discount their interests in enjoying life, in having things that are fulfilling and rewarding for them, either. The principle of equal consideration of interests should apply

to both humans and animals. That's the sense in which I want to elevate animals to the moral status of humans" (Singer, 2009, p. 575).

3. Moral Status of Animals

The Agenda does not seem to explicitly recognize the moral status of non-human animals. However, there is an extensive bibliography that, in the last 60 years, justifies —from utilitarianism, deontology or eudemonism— their recognition as sensitive beings deserving of equal moral consideration, freedoms and direct rights against abuse, violence or cruelty (Harrison, 1964; Singer, 1990; Horta, 2010; Leyton 2010). This extensive bibliography is changing the boundaries of scientific disciplines such as bioethics. Bioethics has traditionally been an anthropocentric discipline: the systematic study of the ethical issues of human life in areas such as biology, nutrition or medicine (Reich, 1978). But more recent studies have highlighted the need to extend this notion of health and well-being to sentient entities, such as non-human animals. It is therefore necessary to move from restricted anthropocentric bioethics to critical bioethics, which challenges why animals are used as commodities to increase profitability. We follow Leyton (2019, p. 185) to state that:

"Bioethics requires a revision that takes into account the interest of all subjects involved in the moral conflicts posed to us by areas such as animal research, or animal used as food. This will necessarily imply a change in the nature of the valuation of animals, from a mere instrumental value to the moral consideration of non-human animals."

On that account, the justified character of equal moral consideration of non-human animals (Faria & Paez, 2019) would lead us to a new comprehensive model of the relationship between humans and animals where "animals should be protected by an 'institutional shield' against these and other invasions in their freedom. Most forms of animal exploitation would, therefore, be forbidden" (Paez, 2021, p. 17). The reduction of systemic impacts and the achievement of SDG targets (see Table 1) would be an unintended consequence of the introduction of a new bioethical criterion and a new institutional shield.

3.1. Utilitarianism, Deontology, Virtue Ethics

Utilitarianism states that the motivation of human behaviour lies in the pursuit of pleasure and the escape from pain. Consequently, happiness consists in minimizing suffering. The historical

example is found in the thought of Jeremy Bentham (1948), who delineated the circle of moral concern in the capacity to feel: the question of suffering is an insurmountable limit. For Peter Singer (2015, p. 100) “if a being suffers, there can be no moral justification for refusing to take that suffering into consideration”. Sentience establishes the circle of moral obligation, erasing the distance that separates human and non-human animals. To set another limit is arbitrary, an unjustified inequality. Thus, utilitarianism considers the interests of human and nonhuman animals equally:

“Pleasure and pain matter to all of us who feel them. As such, it follows that we are obliged to consider, at a minimum, the interests of all those who are capable of feeling pleasure and pain —that is, all those who are sentient. We can then say that sentience is a sufficient condition for having interests and having those interests considered equally” (Matheny, 2006, p. 17).

However, pain can be questioned as a normative criterion. Welfarism speaks of the humane methods of killing animals; if animals are anesthetized, they do not feel and, therefore, do not suffer so there would be no negative moral consideration. For Regan (2004), suffering is not the only harm we can inflict on an animal; premature death implies the loss of a whole series of preferences and possibilities, in short, the deprivation of a life. The rights approach imposes a limit that cannot be exceeded, regardless of the amount of pain and pleasure. While utilitarianism takes into consideration any sentient individual, which is a great advance in terms of species, gender or race, rights cannot be subjected to a simple aggregation calculus of utility.

Kantian deontology, or inherent value theories, is another ethical proposal. In this case the difference that establishes the moral consideration is not sentience or non-sentience, but the difference between instrumental value and intrinsic or inherent value. If utilitarianism calculations can be made that allow suffering for the greater good of the majority, rights prevent that circumstance. Rights establish a framework of justice opposed to aggregation of utility. All subjects of a life have inherent value. Or, in other words, inherent value is being the subject of a life that can be experienced in a better or worse way. For Tom Regan (1986, p. 186) the differences between humans and non-humans are evident, however, there is a clear convergence:

“we are each of us the experiencing subject of a life, a conscious creature having an individual welfare that has importance to us whatever our usefulness to others. We want and prefer things, believe and feel things, recall and expect things. and all these dimensions of our life, including our pleasure and pain, our enjoyment and suffering, our satisfaction and frustration, our continued existence or our untimely death-all make a difference to the quality of our life as lived, as experienced, by us as individuals. as the

same is true of those animals that concern us (the ones that are eaten and trapped, for example), they too must be viewed as the experiencing subjects of a life, with inherent value of their own”.

It is not only human animals that seek self-realization. It is the same with non-human animals who, as subjects of a life, would seek the actualization of their potency and the flourishing of their lives. All animals seek the development of their natures, and “when we fail to meet needs flowing from the telos, we harm the animal” (Rollin, 2011, p. 427). The capabilities approach is not limited to the utilitarian proposal of fleeing from pain and seeking pleasure but seeks the flourishing of individuals. In this sense, Martha Nussbaum defends the right of animals to the realization of the good that is proper to them, that is, they have the right to the flourishing of their existence: “the capabilities approach, which begins from an ethically attuned wonder before each form of animal life, offers a model that does justice to the complexity of animal lives and their strivings for flourishing” (Nussbaum, 2004, p. 319). All sentient beings can flourish if they are not prevented from developing a good life, that is, from developing their own good, their own ends.

Table 1. *SDGs and Animal Ethics.*

	Possible policies and practices from an animal ethics perspective
SDG 1: End poverty in all its forms	Emissions from meat consumption will accelerate climate change and their synergistic effects will increase poverty and its consequences. Soybean, grains or corn used to feed animals could be used to feed the poorest in different ways.
SDG 2: Zero Hunger	A lot of food used to feed the animals could instead be used to feed the world’s hungry people directly; crops grown for livestock production were instead used for human consumption
SDG 3: Health	Adopting an animal may improve physical and psychological health, for both humans and non-human animals. The consumption of plant-based foods avoids the possibility of transmission of zoonotic diseases.
SDG 4: Education	Educating children about animals can improve empathy and reduce interpersonal violence.
SDG 5: Gender Equality and Women’s Empowerment	Animals are often cared for by women and improving the status and welfare of animals enhances their role. Improving the welfare of animals also improves empathy between different groups within their societies and reduces violence among genders
SDG 6: Water and Sanitation	If consumers chose to replace 10-15% of meat with alternative proteins by 2030 the reduction in water use would be of 7-12% of total fresh water (World Economic Forum, 2018).
SDG 7: Energy	We can think that animal waste can be used to generate energy. But, the water used on farms is mixed with fecal matter, hormones, antibiotics, bacteria, heavy metals, ammonia and other harmful substances that can contaminate surface and subterranean water sources.

<p>SDG 8: Economic Growth</p>	<p>Slaughterhouse work is particularly unpleasant and brutal. Workers are exposed to physical, mental and environmental stress, with low wages and ruthless psychological conditions and “protecting worker health proves to be very difficult with the large variability of farm practice, layout, region, and species of animals housed across all CAFOs in the U.S” (Mitloehner & Calvo 2008, p. 179)</p>
<p>SDG 9: Infrastructure, Industrialization</p>	<p>Technology and innovation can change the food sector. In more developed countries, technology and innovation can popularize new forms of plant-based food and new forms of economic development and entrepreneurship (Van Loo <i>et al.</i>, 2020). Technology can also be used to minimize wild animal suffering (Faria, 2016).</p>
<p>SDG 10: Inequality</p>	<p>Inequality in land ownership is a key factor. Large landowners, usually, tend to own cattle, leaving little space for small farmers. Small-holder farmers can drive other forms of land use.</p>
<p>SDG 11: Cities</p>	<p>Cities can be designed to be animal friendly and responsible ownership reduces stray dogs and cats with its associated human health aspects. In an urban area, lifespan of stray cats is much shorter than domestic cats.</p>
<p>SDG 12: Sustainable Consumption and production</p>	<p>Decreasing consumption of animal-based food play an important role. Plant-based food has transformative potential, “reducing food’s land use by 3.1 (2.8 to 3.3) billion ha (a 76% reduction), including a 19% reduction in arable land; food’s GHG emissions by 6.6 (5.5 to 7.4) billion metric tons of CO₂eq (a 49% reduction); acidification by 50% (45 to 54%); eutrophication by 49% (37 to 56%); and scarcity-weighted freshwater withdrawals by 19% (-5 to 32%) for a 2010 reference year” (Poore & Nemecek, 2018).</p>
<p>SDG 13: Climate Action</p>	<p>If consumers chose to replace 10-15% of meat with alternative proteins by 2030 emissions reduction would be 5-8% of total GHG emissions (World Economic Forum, 2018)</p>
<p>SDG 14: Oceans</p>	<p>Plant-based foods lead to a reduction in the need for antibiotics in aquaculture. A change in consumption habits can protect threatened species.</p>
<p>SDG 15: Biodiversity, forest, desertification</p>	<p>Livestock and fodder production have been the predominant use of cleared land following deforestation. If consumers chose to replace 10-15% of meat with alternative proteins by 2030 the total land use would be reduced by 5-10% (World Economic Forum, 2018).</p>
<p>SDG 16: Peace, Justice and Strong Institutions</p>	<p>There is an extensive bibliography that, in the last 60 years, justifies their recognition of animals as sensitive beings deserving of moral consideration, freedoms and direct rights against abuse, violence or cruelty: justice and peace for all subjects of a life.</p>
<p>SDG 17: Partnerships</p>	<p>Promote the diffusion of alternative technologies for the development of new forms of vegan friendly foods through public-private partnerships.</p>

Source: Authors. Prepared for article.

4. Discussion

The SDGs must be enrolled in a scheme that cover a timeline of more than 15 years. In this sense, the concept of Anthropocene allows contextualizing the proposed objectives with a broader historical and scientific perspective. This concept places the SDGs within an ecological framework of human action constitutive of a geological era. However, as we will see, the Anthropocene has been subject of criticism that led to a more precise and specific formulations. This means that global impacts cannot be understood without the intervention of technology, which appears as a key variable. Technology makes it possible to reformulate the problems associated with the use and consumption of animals, offering solutions and alternatives that have consequences for the rest of the SDGs.

Recent global environmental changes suggest that the Earth may have entered a new human-dominated geological epoch, the Anthropocene: Humans are the major global geomorphological driving force (Cooper et al., 2018). The term was coined by Crutzen and Stoermer (2000) as appropriate to emphasize the central role of humanity in ecological and geological transformation. The “Geology of Humanity” (Crutzen, 2016) began with the Industrial Revolution in the late 18th century but “since the 1950s the influence of human activity on the Earth system has increased markedly” (Lewis & Maslin, 2015, p. 176). Several scientific analysis and reports allow the affirmation that the Anthropocene is the new geological era operated by human activity that replaces the Holocene: the human being has become a geological force (Steffen et al., 2011). However, we may not be fully within this new epoch, even though there is sufficient evidence to determine that the stratigraphic change to date is significant (Waters et al., 2014).

The concept of the Anthropocene has been the subject of various reformulations. For Jason Moore (2017, p. 595), the Anthropocene is a comforting story, the world's problems have been created by human beings, “humanity as an undifferentiated whole”. This narrative refers to a geophysical force —humanity or human societies— responsible for the transgression of planetary thresholds. Faced with the Anthropocene, the Capitalocene “names capitalism as a system of power, profit, and re/production in the web of life”. (Moore, 2017, p. 606), situating “the rise of capitalism, historically and geographically, within the web of life” (Moore, 2017, pp. 608-609). Other authors, such as Bonneuil and Fressoz (2016), address different “-cene”, connected to each other, such as the Thermocene —history of the carbon industrial complex—, the Thanatocene —the natural history of destruction through war and ecocide— or the Phagocene —which addresses the era of mass consumption. Finally, for Haraway (2016), the particularity of the new epoch lies in the awareness of the interrelation between human beings and other species (Chthulucene);

therefore, the solution would be in alliances that help us learn to live and die together on a wounded planet.

In any case, Anthropocene describe an epoch of widespread human impact on the planet. Atmospheric concentrations of carbon dioxide and methane exceeding Holocene peaks and mass species extinctions are indications that planetary limits are being reached by industrial, commercial and agricultural activity. Livestock, as we could see above, plays a crucial role in the whole web of actions and consequences carried out by the Anthropocene. Consequently, it is urgent to understand the problem and make the best decisions to mitigate its effects. This is where technology emerges as a tool to achieve the SDGs.

The Anthropocene must be understood from the technological character of human societies. Although the impulse of technical arts began in the Middle Ages (Noble, 2017), the scientific revolution of the 17th century “and the role of measurement and quantification in changing the nature of knowledge” (Henry, 2002, p. 31) was a determining impulse. The world then is reduced to the so-called “primary qualities”, an epistemological change that would transform our world progressively (Fernández-Mateo, 2021).

Several authors have tried to characterize this technological era in different ways. Haff (2014, p. 127), describes the technosphere as “a new stage in the geologic evolution of the Earth. It is a global system whose operation underpins the Anthropocene and therefore merits special attention in our attempts to understand the role of humans in a nascent geologic epoch”. For Cera (2017, p. 244), the Technological Anthropocene is a Technocene “since technology represents here and now the only possible ‘subject of history’ and the same goes for nature. That is to say, the (neo)environment where man has to live” (Cera, 2017, p. 244).

For Hornborg (2015, p. 62) “rather than imply that climate change is the inexorable consequence of the emergence of Homo Sapiens, as suggested by the notion of the Anthropocene, I would thus prefer that the geological epoch inaugurated in the late eighteenth century be named the Technocene”. In the Technocene, technology imposes its way of being on all things, from the climate to the human being himself: “in all areas of his existence, man will be encircled ever more tightly by the forces of technology” (Heidegger, 1966, p. 51). The term technology “does not indicate the sum or addition of single technologies, rather it outlines the worldview and ideology that has made these possible and that manifests itself as a particular historical circumstance” (Cera, 2017, p. 261). The modern technology “determines the relation of humanity to that which exists. It rules the whole earth” (Heidegger, 1966, p. 50).

Faced with Heidegger’s pessimism, we can understand technology as a set instruments, skills and tools at the service of humanity; their legitimacy must be determined by normative

criterion. If we establish that the ends of technology must be subjected to a sentientist Kantian criteria (Korsgaard, 2018; Páez, 2020) and “the basic rights of sentient humans and non-humans are neither conceptually nor ethically distinct, they are part of the same normative enterprise” (Cochrane, 2013, p. 656), the descriptive and prescriptive dimensions of human activity can be oriented towards an end that ensures that non-human animals are protected as ends in themselves, thanks to the development of science and technology. Technology, in the service of a normative end, would make it possible to “to treat all animals, as far as we possibly can, as fellow creatures, whose good matters for its own sake” (Korsgaard, 2004, p. 108).

Sadly, meat consumption remains in the mainstream, and the best way to reduce it is to use technology to generate attractive options for the average meat-eating consumer. While there is an intense bioethical debate about cell-based meat alternatives, in which animals are still used — from virtue ethics, ethical veganism argues “the rejection of animal-based products as food, whether these products come from living animals or a lab” (Alvaro, 2019, p. 138)— the industry is developing synthetic alternatives that can replace their animal source (Lonkila & Kaljonen, 2021). Meat alternatives “have the best chance of successfully replacing meat when they closely resemble highly processed meat products in taste and texture and are offered at competitive prices” (Michel et al., 2021). While a new institutional is being designed and we “can immunise animals against private domination in the sphere of their basic liberties as equal citizens” (Páez, 2021, p. 16), new foods could guarantee —on a provisional basis— the protection of sentient beings.

5. Conclusion

The extension of boundaries of bioethics to sentient biological realities is an example of the broadening of moral obligations. In the near future, new sustainable development goals will be reformulated to include sentient beings in their goals of justice and equality. A first approach to these changes consists in the progressive transformation of consumption patterns, with obvious environmental and health consequences. The Anthropocene makes it possible to place the SDGs in a broader temporal context. But, as has been argued, the Anthropocene is actually a Technocene, since the global ecological and geological transformation cannot be understood without the importance of technology. Given this descriptive reality, it is necessary to formulate normative criterion.

Technology should be a tool to improve the life of an interspecies community. If technology determines the relation of humanity to that which exists, it is necessary that this relationship

follows moral imperatives. The development of technologies that manufacture food without using animals would be in correspondence with these principles of justice. Likewise, we will increasingly see artificial intelligence used to reduce wild animal suffering.

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