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Biomimicry and Soils as a Subject of Law in a Society of Environmental Conflicts: a Fundamental Pillar in the Construction of Ecological Civilization in the 21st Century

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Author's declaration

The author declares that he has participated in the entire scientific process of this research, which includes conceptualization, methodology, writing, and editing. He also declares that he has no potential conflict of interest concerning the authorship and publication of this article.

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Abstract

Food production is multidimensional due to its influence on the international economy and, therefore, its impact on the human economy and the "economy of nature" so that any civilization can endure and progress over time current. By the preceding, humanity and its civilization are at the crossroads of producing quality, accessible and safe food since this is restricted by the destruction of the natural base, expressed by the concentration of land as private property and by the decrease in soil fertility in its organic, mineral, and biological phase (micro and macro fauna), which impacts water and hydrobiological resources, air quality and the dynamics of diverse forests in forest species. The legal framework must be developed so that soils are considered a law subject so that this and future generations can live in harmony with nature.
Keywords: biomimicry; economy and ecological civilization; soils; a law subject; nature.

Biomimesis y los suelos como sujeto de derecho en una sociedad de conflictos ambientales: un pilar fundamental en la construcción de la civilización ecológica en el siglo XXI

Resumen

La producción de alimentos es de carácter multidimensional dada su influencia en la economía internacional y, por ende, en su impacto en la economía humana y en la "economía de la Naturaleza", para que cualquier civilización del mundo perdure y progrese en los tiempos actuales. En virtud de lo anterior, la humanidad y su civilización se encuentran en la encrucijada de producir alimentos de calidad, accesibles e inocuos, pues éstos están restringidos por la destrucción de la base natural, expresada por la concentración del suelo como propiedad privada y por la disminución de la fertilidad de los suelos en su fase órgano mineral y biológica (micro y macro fauna), lo cual impacta los recursos hídricos e hidrobiológicos, la calidad del aire y la dinámica de los bosques diversos en especies forestales. Es importante que se desarrolle el marco jurídico para que los suelos sean considerados sujeto de derecho, de modo que ésta y las futuras generaciones puedan vivir en armonía con la Naturaleza.
Palabras clave: Biomimesis; economía y civilización ecológica; suelos; sujeto de derecho; Naturaleza.

Biomimética e solos como sujeito de direito em uma sociedade de conflitos ambientais: um pilar fundamental na construção da civilização ecológica no século XXI

Resumo

A produção dos alimentos é de natureza multidimensional dada a sua influência na economia internacional e, portanto, o seu impacto na economia humana e na "economia da natureza", de modo que qualquer civilização do mundo pode perdurar e progredir nos tempos modernos. Em virtude do exposto, a humanidade e a sua civilização encontram-se na encruzilhada de produzir alimentos de qualidade, acessíveis e seguros, porque estes estão restringidos pela destruição da base natural, expressa pela concentração da terra na propriedade privada e pela diminuição do solo fertilidade em sua fase orgânica, mineral e biológica (micro e macrofauna), que impactam os recursos hídricos e hidrobiológicos, a qualidade do ar e a dinâmica das diversas florestas em espécies florestais. É importante que o marco legal seja desenvolvido para que os solos sejam considerados sujeitos de direito, para que esta e as futuras gerações possam viver em harmonia com a natureza.
Palavras-chave: biomimética; economia e civilização ecológica; solos; sujeito de direito; natureza.

Introduction

The current phase of the history of humanity, with its system of extraction, production, transformation, transport, and consumption of goods and services for the capitalist and socialist market, must be reconciled with Nature and move towards compatibility between the human economy and the "Nature's economy," so that Nature, as well as future generations of humans and other species with which humans co-evolve, continue to coexist and achieve broken harmony again. Therefore, circularity must be influenced and implemented in terms of efficient use of renewable materials, energy, solar radiation, and information via DNA and from the trophic chain, in which redistribution, solidarity, and mutual support prevail and intragenerational of the human being as a social species.

It is an opportunity offered by the Biomimicry paradigm to humanity, that is, to break with this chain of dynamic and historical processes of unsustainability, which have and continue to generate the environmental crisis of this historical moment. Hence the importance of incurring in the respective structure and productive philosophy linked to agribusiness and conventional industry that is resilient and friendly to the environment so as not to condemn humanity and other species of the biosphere to poor life and even to extinction.

For this reason, soils are essential for constructing an ecological civilization in postmodernity, as it is the basis for food production and, with it, a guarantee of the integral health of people and species in ecosystems. Soils, whether fertile or not, are strategic for security, such as food sovereignty and guarantee of the coevolution of species in the biosphere and, simultaneously, for an ecological civilization to materialize in the 21st century. Of course, this is an indicator for reaching agreements in society that encourage rural and urban land to become subjects of law.

Figure 1. *Types of soil and their importance in agricultural production*

Source: EOS Data Analytics,Inc (2020)

The crises in the present phase of civilization

Humanity and civilization are experiencing difficult, confusing, irrational, irresponsible, and unpredictable times and, therefore, not without risk. It was believed that these problems would be overcome with the development of modernity and postmodernity, but this has not happened, on the contrary, the harmonious relationship between human beings and Nature has deteriorated, producing the sixth extinction of species in the biosphere. The loss of the manifestations of life as we know it is being induced by a series of environmental, economic, political, and cultural problems against the renewability of the natural base. Problems that have become global, critical, and recurring, with intense repercussions of an immeasurable nature that leave their mark on the current history of humanity and future generations.

The promise of indefinite progress materialized in human development has led to an eminently anthropocentric act translated into unlimited economic growth, palpable in the capitalist, socialist, and communist economic models, which suggest that, in their interaction with Nature, they would overcome all limitations as a biological species by submitting Nature to the free will of man, without the inclusion of women. Progress in harmony with Nature has not been achieved. On the contrary, antagonism and predation have been generated, with an intense ecological footprint and a constantly growing social exclusion worldwide, both in industrialized and international societies in developing countries. Then, what is foreseen is the extinction of the species and, with it, the species Homo sapiens sapiens, if the direction or model of the human economy is not changed, which must go towards an economy compatible with the economy of Nature. The progress achieved so far needs to consider the natural renewal of natural resources. There have been advances, but only a few have benefited, at the expense of adverse environmental impacts on the world population, especially in the societies of the southern hemisphere.

This antagonism with the components of Nature, whether biotic or abiotic, and mediated by the human economic economy, influences the loss of cultural diversity in the world, the global cultural homogenization due to the impulse of sumptuous and irresponsible consumption that puts pressure on the scarce, endemic or frugal natural resources in ethnic territories in the world, and to the presence of semi-slavery and slavery practices in the productive chains that were believed to be overcome.

It is noteworthy that, even with the accumulation of knowledge from the different areas of science and technology, humanity is still unable to predict an earthquake, a volcanic eruption, a tsunami, or the cyclicity of a steroid, so that the phenomena of Nature are listened to in-

depth and, consequently, we are very far from fully knowing the intrinsic phenomenology of the factors that dynamize the life and death of the components of the earth and the cosmos. The environmental impacts of the global order have been produced through industrial and agro-industrial practices that are unfriendly to the environment, as well as accelerated urbanization, the impact of which is increased by the constant growth of the world population (Järvensivu, et al., 2019, p. 5). The projection of world growth indicates that humanity will increase by almost 9,800 million people by the year 2050 and 11,200 million by the year 2100 (ONU, 2019; IPCC, 2019, p. 13). This vertiginous growth of the world population is putting pressure on the natural base, preventing its renewal; Right now, "our soils, oceans, forests and our drinking water and biodiversity are suffering a rapid process of degradation, due to processes of overexploitation" (ONU, 2019b).

The FAO report called The State of the World's Biodiversity for Food and Agriculture points out that the genetic resources of both wild and domesticated life are being eroded and lost:

> Many key components of biodiversity for food and agriculture at the genetic, species, and ecosystem levels are declining. Critical ecosystems provide many essential services for food and agriculture, such as freshwater supply, protecting against hazards, and providing habitat for species such as fish and pollinators (FAO, 2019b).

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With such a discouraging panorama, humanity is in crisis with different manifestations, among which we can mention the financial, energy, food, health, and climate crisis due to population growth and decrease, migratory, epidemiological, due to nuclear and biological warfare, personal crisis, values, organizational, and civilization, among others. In these cases, it is necessary to see an opportunity in crises, to have an open mind and creativity, to get out of this civilizing crossroads, and not continue to harm excluded and poor societies in the world. Moreover, this is possible with a new human economy, with bioinspiration, since Nature offers a horizon of infinite alternatives in the circular use of materials, energy, and information. In other words, this is achieved by Biomimicry, both hard Biomimicry and sophisticated weak Biomimicry.

Biomimicry

Biomimicry, as an emerging technical-scientific paradigm, refers to Nature as a measure, model, and mentor (Benyus, 2012). "Nature as a model" is the poetic principle of Biomimesis since it tells us how things should be "brought" (poiēsis). "Nature as a measure" is the ethical principle of Biomimesis since it indicates that Nature puts limits or ethical standards on what we can achieve. "Nature as a mentor" is the epistemological principle of Biomimicry insofar as it affirms that it is the ultimate source of truth, wisdom, and freedom from error (Dick, 2022, p. 101; Blok & Gremmer, 2019, p. 201 and 217). From the biomimetic approach, Nature is considered in an integrating and totalizing way and immersed in a constant dynamic change, meta balance, framed in broad time scales of time (geological and cosmic). It is crucial here to recognize the inherent and undifferentiated instability of Nature, from which precisely differentiated Nature emerges (Block, 2017, p. 138).

Biomimicry aims to reconstruct human systems so that they fit harmoniously into natural systems, without forgetting that they are open systems where matter, energy, and information are exchanged via genetics and the trophic chain. Thus, they are in constant dynamic imbalance and behaving like an entropic system in which humans are part of the total entropy of the system and the environment (Gato, 2019); According to Riechmann, it is essential to remember that "for the physicist and Nobel Prize winner in chemistry Ilya Prigogine, living systems, and the biosphere as a whole, are "systems far from equilibrium" that have efficient "dissipative structures" to remove disorder" (2005, p.10). The same author, quoting Ramón Margalef, considers that "it is as if Nature always reserves the right to introduce things that are unpredictable and capable of disrupting our schemes. You have to accept it that way, and you cannot go around it any" (Riechmann, 2005, p. 11).

What the biomimetic approach intends is to advance a strategy that reverses the processes of unsustainability, and the way to do it is by emulating, copying the laws of the ecosystems of Nature and transferring them to the systems of the human economy. With all this, it is always important to keep in mind that we live in a world where uncertainty, entropy, and the unpredictability and evolutionary game of the components of Nature prevail. However, it is also essential to highlight that the human economy is a subsystem of the natural system and not the other way around. So, the human economy has to be constantly adapting, and the reference and measurement units are the ecosystems with a stationary economy with closed cycles of materials and solar radiation as an energy source.

Nature as a subject of law

In 2009, the United Nations created the Harmony with Nature program (http://www.harmonywithnatureun.org/) to institutionalize a new jurisprudence on land and the rights of Nature in the world. The recognition of the rights of Nature in the constitutions of Ecuador and Bolivia is considered a milestone in the history of humanity and other species. In 2008, it happened in Ecuador, and in 2010, in Bolivia, nations that converted this notion of jurisprudence into their constitutional framework. In 2016, Colombia recognized the Atrato River as a subject of law. In 2018, through Judgment STC4360/18, Colombia also declared the Amazon as a subject of law. Since 2019, it was incorporated in Chile through widespread consultation to generate a new constitution, which includes a new legal framework on the rights of Nature and ecological justice that face the climate crisis and other emerging global agendas.

In September of 2022, in Europe, and specifically in Spain, through Law 19/2022, the legal personality of the Mar Menor lagoon and its basin is declared, recognizing it as a subject of law. According to Pérez (2000), international treaties of a general nature for the conservation of natural resources only contain isolated and generic provisions on soil protection and lack binding legal force. On the contrary, the number of international agreements regulating the protection of soils is deficient, which is why it is necessary to provide them with a subject of law.

International legislation on the protection and conservation of soils

Given the need for soils to play a leading role, that is, to be considered a subject of law and not as an object of private appropriation (anthropocentric perspective), the opportunity arises to incorporate them into the laws of national States, and in treaties international supranational entities. In many international agreements, soils are not yet contemplated as a subject of rights, which hurts their recovery and conservation. The paradigm shift lies, then, in vindicating the soils as living beings that, in turn, sustain the life of other beings that have been or have not been systematized by science and that do not have a voice but still have the possibility of recognizing their specificity as producers of life. This thought contributes to establishing a harmonious relationship between humanity and Nature.

Historically, the importance of soils and the need to protect them have been identified, but only until the 20th century did this paradigm acquire prominence at a global level, thanks to the creation of the International Union of Soil Sciences (IUSS), which was founded in 1924,

and launched together with the World Soil Alliance promoted by the Food and Agriculture Organization of the United Nations (FAO). Some relevant precedents point the way for a new land treatment in the social and legal field. For example, the African convention of 1968 (Algiers, September 15) on the Conservation of Nature and Natural Resources was innovative for its time since it laid the foundations for man to be concerned with the protection of soils. Additionally, on May 30, 1972, the European Soil Charter was presented by the European Council and the United Nations Conference on the Human Environment (UNCHR), in which 109 recommendations were approved in its Action Plan. for the protection of soils and in 1977 the UN held the United Nations Conference on Desertification (UNDC).

The Council of the United Nations Food and Agriculture Organization (FAO) approved 1981 the World Soil Charter. In 1982, the Administrative Council of the United Nations Environment Program (UNEP) approved the World Soil Policy. In 1985 the ASEAN Agreement proposed debates around the conservation of Nature and the natural resources of Kuala Lumpur. In 1992, the Council of Europe resumed its work on this matter, and its committee of ministers endorsed the Recommendation on Soil Protection (Pérez, 2000, p. 199). On June 17, 1994, in Paris, the only international treaty was signed, which was focused on a strategy to combat soil degradation through the United Nations Convention to Combat Desertification, specifically for Africa. The Rio 92 Conference also enshrined a new integrated and innovative approach in Agenda 21 that fights against desertification and drought mitigation based on the efforts of the international community.

Soils as a subject of law

Although there are some 725 million hectares of fertile black soils in the world (FAO, 2022), it is a natural resource with minimal knowledge. Hence humanity needs to build an ecological civilization. Unfortunately, the prevailing perspective on land is that of the object of private appropriation, which is an eminently anthropocentric vision. For this reason, a new territorial planning paradigm is sought where the environmental management of soils becomes a determinant that acts under principles of regenerative, resilient, and biocentric order.

Formulating and endowing soils as a subject of law represents a new horizon of the cognitive order, complex, critical, and purposeful thinking that must be reflected in the categories of law, integrated into the jurisprudence of land and the rights of Nature. By recognizing the soil as an entity subject to law per se, humanity and the other species with which it has co-evolved are being benefited, which will allow us to achieve physical, mental, and spiritual health to the extent that we will have nutritious food and innocuous and spaces for wildlife, contemplation, recreation, and delight.

Regions in the world characterized by agricultural and livestock production have been chosen to recognize soils as a subject of law since they are strategic agroecosystems for humanity and local inhabitants. The selected natural regions on the continents are producers of a great diversity of agricultural products in the complexity of soils that interact with various idiosyncrasies, which represents a collective commitment to the sustainability of the planet from which the functions of soil in production are recognized of food, the conservation of wildlife, demographic growth, urbanization, and the sociocultural manifestations established in the territories.

The conception of soils as a subject of law is transdisciplinary since it generates a dialectical and holistic process by generating analysis frameworks referring to the jurisprudence associated with protecting life on earth. It is an unprecedented, novel proposal and opens new horizons for transdisciplinary knowledge, science, technology, and innovation, as well as for respectful and intelligent dialogue of knowledge in harmony with the components of Nature.

As a preamble to the reflection, the following reference units were considered: 1. The cultivated soils of the vine in the Rioja Alavesa and the soils of mountain pastures, Autonomous Community of the Basque Country (Spain); 2. The soils of the Dehesa, Autonomous Community of Extremadura (Spain); 3. The sweet fruit soils of Lleida in the Autonomous Community of Catalonia (Spain); 4. The soils of Region III of Guanajuato: Laja-Bajío, Mexico; 5. The semi-arid soils of the Caatinga, Cerrado, and Babassual of Matopiba, Brazil, and Peru; 6. The soils of the coffee zone, Caribbean, Amazon, and páramos, Colombia; 7. The Amazonian soils of Napo, Ecuador; 8. The soils of the Moka Valley, Equatorial Guinea; 9. Soils of the Central Plains, Venezuela; 10. The soils of the Baixo Limpopo Region, Mozambique; 11. Perth soils in Western Australia; 12. The soils of the Province of Padova, Veneto, Italy; 13. Soils of Bavaria, Germany; 14. Soils of the Azapa Valley, Region of Arica and Parinacota, Chile; 15. Soils of chestnut groves, department of Pando, Bolivia; 16. The cattle soils of the Pantanal, Paraguay; 17. The soils of the province of Corrientes, Argentina.

The following figure shows these areas in the world that stand out for agricultural production and wildlife.

Figure 2. *Soil areas selected by national States*

Bedoya (2023)

Conclusions

This crossroads in which the current civilization finds itself is due to the implementation of the eminently predatory production system of the natural base that extinguishes life and, with it, that of Homo sapiens sapiens, who is the one who must guarantee the transition towards a civilization ecological democratic and in harmony with Nature. A transition towards a new ecological economy that avoids the sixth extinction and generates a new human economy of the 21st century must be compatible with the so-called economy of Nature.

This new human economy should promote a transition towards the economy and society of bio-inspired knowledge. Biomimicry certainly offers a wise solution to produce, transform and consume intelligently and to continue with the renewal of biotic and abiotic components, incredibly fertile soils conceived as a subject of law since they are a non-renewable resource and one of the fundamental pillars in the transition towards an ecological civilization in the 21st century.

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