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A transnational sustainability perspective and the new global energy matrix[1]

Perspectiva transnacional da sustentabilidade e a nova matriz energética global

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Abstract

With the evolution of humanity and consequently of technological and scientific factors, research aimed at greenhouse gases, climate change, energy security and environmental impacts disseminated by countless agents, such as scientists, non-governmental organizations, researchers, States and climatologists, boosted the development of new energy sources – in addition to fossil fuels. However, these agents have not yet succeeded in building a global energy matrix that is sustainable and that minimizes the risks of a collapse in the means of energy production, given the increase in global consumption. Therefore, it is necessary to rethink the current energy matrix based on sustainability and transnationality. The transnational dissemination of sustainability catalyzes the energy matrix transition, seeking low-carbon alternatives. Sustainability emerges as a paradigm to prevent risks and minimize environmental and social damages. The research is based on the inductive method.

Keywords: sustainability; transnationality; new energy matrix.

Resumo

Com a evolução da humanidade e por conseguinte dos fatores tecnológicos e científicos, pesquisas voltadas aos gases de efeito estufa, mudanças climáticas, segurança energética e impactos ambientais difundidas por inúmeros agentes, como cientistas, organizações não governamentais, pesquisadores, Estados e climatologistas, impulsionaram o desenvolvimento de novas fontes de energia – para além das energias de origem fóssil. No entanto, tais agentes ainda não lograram êxito na construção de uma matriz energética global que seja sustentável e que minimize os riscos de um colapso nos meios de produção de energia, frente

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ao aumento no consumo global, e ao desequilíbrio ambiental. Diante desse cenário, se faz necessário repensar a matriz energética em curso a partir da sustentabilidade e da transnacionalidade. A difusão transnacional da sustentabilidade impulsiona a transição da matriz energética, buscando alternativas de baixo carbono. A sustentabilidade emerge como um paradigma para prevenir riscos e minimizar danos ambientais e sociais. A pesquisa está embasada no método indutivo.

Palavras-chave: *sustentabilidade; transnacionalidade; nova matriz energética.*

1 Introduction

It starts from the understanding of sustainability as a process through which one tries to build a global society capable of staying on the planet as long as possible, even due to depletion or changes in the characteristics of the sun. It is estimated that this can happen in the very long term, but that does not allow us to talk about the perpetuation of human existence on the planet because there will be natural changes in the environment that will make life unsustainable. Through this understanding, sustainability emerges from the fundamental factors to increase the duration of human life on the planet (Carbonell, 2019), through the ideal of sustaining one or more conditions in a complex social scenario, in which human beings are diluted in the global structure, guided by consumerist factors to the detriment of the planet's natural and social systems.

The sovereign states, which emerged through the Treaty of Westphalia[2], began to experience the relativization of their absolute power in the face of the emergence of other agents in the international order, as well as the emancipation of rights, such as individual rights, which began to be aired in the mosaic of sovereignties. Faced with the emergence of a complex and interrelated global community, installed in the scenario of an International Law that did not offer the necessary answers to the demands that were presented to it and that was only concerned with the relations established between States, reflections on transnationality began.

Thinking about the combination of these two categories – transnationality and sustainability – it is possible to address the transnational nature of sustainability[3], which arises,

[2] The Peace of Westphalia of 1648 refers to a set of treaties that ended the Thirty Years' War, which began with the intensification of political rivalry between the Holy Roman Emperor Habsburg and the Lutheran and Calvinist city-states in the northern territory of present-day Germany who opposed its control. (Jesus, 2010, p 221-232)

[3] Se l'idea della sostenibilità delle scelte sistemiche in funzione del benessere delle future generazioni (o, addirittura, in funzione della loro stessa esistenza) assume valenza, dunque, di principio giuridico - o persino, secondo alcune prospettazioni formulate in innervare il complesso grli ordinamenti - l'indagine di tipo etico è promromica alla determinazione della dimensione e del peso complessivo che il principio assume sul versante giuridico. (If the idea of the sustainability of systemic choices in terms of the well-being of future generations [or even in terms of their very existence] therefore assumes the value of a legal principle – or even, according to

especially, from the inability of the Nation-State to act and intervene in problems and challenges on a global scale, which arise in the social, economic, environmental, technological, among others, and refer to the subjects of present and future generations and to all living beings.

Today, in the second decade of the 21st century, there is growing concern about the depletion of energy matrices. Other energy matrices are also being sought that reduce dependence on fossil fuels and promote the use of renewable and clean sources.

Among the complexities experienced by the global community, the necessary change in the energy matrix is evident, which is motivated by the verification of the damage to the environment as a result of the generation and use of energy, the proven finiteness of fossil resources, as well as by the economic, political and imperative factors that result from the dominance of the means for the generation of energy. especially in times of fragmentation of state sovereignty.

One of the vectors of the aforementioned need is the energy crisis that the world is experiencing in the current context. The growth of the world's population has led to a growing demand for energy worldwide, which will result in the scarcity of energy resources, especially if adequate transnational measures are not taken for energy efficiency and diversification of sources. In Europe, for example, recent geopolitical events, such as the Russia-Ukraine war, have a significant impact on Europe's energy security, as is the case with the crisis in natural gas supplies

Having reached these findings, the central problem lies in the relevance of the transnational approach to sustainability as a driver of the transition towards a more sustainable global energy matrix, considering the cooperation between different actors and the integration of environmental, economic and social aspects.

The proposal is to resume the emergence of the transnationality of sustainability as a vector of change in the global energy matrix. Therefore, the general objective is to increase reflections aimed at promoting environmental, economic and social sustainability, as inducers of the new global energy matrix.

The research begins by exploring the phenomenon of transnationality, which arises from the transformation of national capacities and the emergence of different forms of private authority. This process gives rise to the consolidation of new markets and industrial processes, which in turn gives rise to new power relations at the global level. Next, the transnationality of

some perspectives formulated to interact with the complex of legal systems – ethical research promotes the determination of the global dimension and the weight that the principle assumes in the legal aspect.) (Porena, 2017, p. 10)

the classic dimensions of sustainability is addressed, both in the environmental and in the economic and social spheres. Finally, they propose the dissemination of sustainability through transnational structures, which contribute to the transition of the global energy matrix, allowing the creation of spaces for environmental governance and directing transnational actions with global impact, based on broad consensus and shared values.

The research is based on the inductive method (Pasold, 2018, p. 95),[4] as well as on the use of bibliographic and documentary sources.

2 Transnational perspective on sustainability

Sustainability, for some authors, is understood as a new paradigm, with the capacity to redefine axiological guidelines at the local, national, international and, above all, transnational levels (Cruz; Real Ferrer, 2015). In this scenario, reflection on the transnational understanding of sustainability warns about the promotion of sustainable practices and attitudes by States and transnational actors. This behavior can contribute to the development of multisectoral solidarity behaviors against the degradation of natural systems (Bachelet, 1995, p. 19).

2.1 Postulate of transnationality

The emergence of transnationality occurred through the process of transformation of national capacities, as well as the development of different forms of private authority, which resulted in the consolidation of new markets and industrial processes and allowed the emergence of new power relations at the global level[5]. By way of example, the fragmentation of certain state responsibilities and the distribution of operations to specialized agencies, banks, and supranational institutions, such as the IMF and the World Bank, are mentioned (Sassen, 2010, p. 220-21).

[4] For Pasold, it is "[...] investigation and identification of the parts of a phenomenon and collect them to have a general perception or conclusion: this is the so-called Inductive Method". (Pasold, 2018, p. 95)

[5] One of the first researchers to use the terminology "transnationality" was Philip Jessup, through the study called *Transnational Law*, presented in 1965 at the Yale Storrs Lectures, held at Yale Law School. The research carried out by Jessup pointed out that Transnational Law begins with individuals and reaches the society of States, encompassing the law that regulates actions or events that transcend national borders. The studies carried out by Philip C. Jessup (1965, p. 12) also focused on Public International Law and Private International Law. In the words of Paulo Márcio Cruz and Maurizio Oliviero, "Jessup was concerned, at that time, not to polemicize and avoided making statements that could give rise to academic discussions on the use of the term Transnational Law. To avoid lengthy debates, he reduced the notion of this category to being just a more abundant source of norms with which to guide oneself across national borders. (Oliviero; Cruz, 2012, p. 21).

The prefix *trans* does not indicate a world state or a superstate, but the existence of diverse public spaces of governance, regulation and intervention, with control and functioning mechanisms subject to transnational corporations. This phenomenon occurs through the emergence of new multidimensional institutions with more satisfactory responses to contemporary global phenomena (Cruz; Bodnar, 2010, p. 57-58). In this sense, transnationality seeks to question the logic and effectiveness of the established models of global exchange and to propose new mechanisms, beyond the pre-existing ones (Pilau Sobrino; Sirianni; Piffer, 2014, p. 1181).

The main current legal-methodological representations of this phenomenon are the categories Transconstitutionalism and Transjudicialism, which allow transnational dialogues between nation states through the application and interpretation of legal norms analogous to environments that cross several states, but which have common values.

Transnationality is commonly confused with other processes on an international scale, such as internationalization, multinationalization or even globalization, so it is necessary to highlight its distinctive characteristics.

Internationalization is the result of the relations established between countries and is developed bilaterally or multilaterally. This process occurs when more states operate together through an international or, rather, interstate relationship, that is, without application on a global scale (Stelzer; 2009, p. 22). In this scenario, the vector is located in cooperation between States through mutual respect and the understanding of sovereignties located on the same plane.

Multinationalization is perceived as the cradle of globalization and its emergence occurred after the First World War, in a scenario still characterized by the Fordist model and impacted by the *New Deal* and the subsequent Brenton Woods agreement, which replaced gold with the dollar, from which government organizations of global influence and private companies emerged. which began to adopt the model of fractionation and distribution of productive units on a global scale. This process gave rise to the emergence of multinational companies, i.e. multi-state enterprises[6].

[6] Initially, multinationalization did not translate into the adaptation of companies and brands to the places where they would expand, i.e., companies maintained a strong identity with the country of origin and units abroad repeated the internal organizational structures of the parent company. This factor took on new contours in the 1960s and 1970s, when global society began to experience a process of globalization of styles and customs, as well as technological and productive expansion.

Globalization, or also called globalization[7], can be political, technological, cultural, and economic[8]. Influenced by global factors[9], such as the development of communication systems that emerged in the late 1960s (Giddens, 1999, p. 20-21), it began to be recognized only in the 1980s (Arnaud, 1999, p. 1), through studies conducted at American business schools, which came to be recognized as Harvard *business schools*. Columbia, Stanford (Chesnais, 1996, p. 23).

Although globalization cannot be confused with transnationality (Silva; White; Souza, 2021) cannot be totally dissociated, since they constitute interconnected phenomena, through which the former serves as a stage for the paving of the latter (Piffer, 2014). In other words, transnationalization occurs through processes developed in the context of globalization, including the crossing of national borders.

Transnationality is a multifaceted, complex and controversial phenomenon, which is why it can hardly be accepted in the legal, political and social scenario (Stelzer, 2009, p. 25). This picture is intensified by the phenomenological perspective of the transnationalizing paradigm, which results from processes such as the weakening of the sovereign state, the overvaluation of capitalism and deterritorialization.

The process of weakening nation states occurred when they became secondary to the economic forces that govern world relations. This was accentuated by the capitalist hegemonization resulting from the collapse of the Soviet Union, along with the popularization of microprocessors and satellite data transmission. This new configuration of the political system occurred through the monocentric substitution of power by Nation States, which compete with each other for a polycentric distribution of power, in which there are different transnational and national actors that compete and, to a lesser extent, cooperate with each other (Beck, 1999, p. 72). In this scenario, the sovereign State, impacted by supranational

[7] The analysis of the use of the terminologies globalization and globalization reveals that some authors understand globalization as synonymous with globalization. It is evident that the use of the term globalization ends up being a preference of Anglo-Saxon scholars, while the French prefer the term globalization.

[8] Ulrich Beck (2003, p. 59) understands that "globalization is a process of additional collateral effects that takes place in several dimensions and does not designate economic globalization exclusively. It is also a cultural diversification to meet the new need for transnational ways of life. Added to this is the fact that, in the political field, there is a pluralization of agents: states are no longer the only ones that interact and maintain diplomatic relations, a plethora of transnational agents enter the scene, from the World Trade Organization, the WTO, to Amnesty International. In a way, the churches are also included, which are already beginning to raise their voices to participate in the social game of power.

[9] Among the factors that contributed to the emergence of globalization were the reconfiguration of the world economy and the pressure from governments and large international corporations to relax borders for the free movement of goods and capital. Another factor relates to the intensification of cross-interference by transnational actors at the State level. (Beck, 1999, p. 30).

communities, began to be diluted and to submit to the conditions that allow it to act, albeit secondarily, in transnational relations (Bobbio; Matteucci; Pasquino, 1986, p. 1187-1188).

The second phenomenological aspect of transnationality refers to capitalist growth, which developed in the heart of national spaces and became dominant on the global scene (Stelzer, 2009, p. 30). Thirsty for unregulated spaces, the agents that operate capitalist factors seek to transit through the globalized world (Tourraine, 2006, p. 34) so as not to collide with the barriers imposed by the legislation and political, legal and social regulations of the States. It is important to mention trade, which assumes an imperative space in the capitalist-transnationalizing process, since it strongly influences the operations that are carried out between individuals and within deterritorialized movements.

Considered one of the main characteristics of transnationality, deterritorialization, including of power (Teixeira, 2020, p. 13), refers to the process of crossing borders, that is, it evidences the permeable edge of the State, in which the structures of international or global political, economic, social, and cultural power are decentralized (Ianni, 2013, p. 93). This factor can be exemplified by the flow of business production, which no longer complies with the political-legal systems of the States, but favors the economic-commercial benefits offered to it.

2.2 The transnationality of the classic dimensions of sustainability

Sustainability operates as a political and legal principle. In the political sphere, through its multidimensional character (Bosselmann 2008, p. 4) and its historical, conceptual and ethical formulations. In the legal field, through their reflexive and operational deployment, which are necessary for the Law to overcome its conformation as a simplistic technique of social control, that is, of command and control. (Cruz; Bodnar, 2016, p. 244)

Sustainability, through its social, economic and environmental dimensions – as well as from the technological perspective – emerges in a transnational scenario as a response to the rupture of modernizing reason and a condition capable of enabling the construction of a productive rationality, based on new meanings of civilization and with ecological potential on a global scale (Huntington, 2002, p. 31).

2.2.1 Transnationality of environmental sustainability

The transnational dimension of environmental sustainability is based on the understanding that environmental problems are not problems of the environment, but of all human beings, whether at the local, regional, national, international or transnational level, and are independent of ideologies, creeds or any other factors that separate and classify different [10]people.groups. In this sense, the transnationality of environmental sustainability resides in the perception that the web of life goes beyond the mosaic of state sovereignties and the constructions of value that humans have established throughout history.

Among the institutions working in the transnational field of environmental sustainability, we can mention the specialized agencies of the UN, such as the Food and Agriculture Organization of the United Nations (FAO) and the World Meteorological Organization, the World Bank (IBRD), the International Monetary Fund (IMF), the World Trade Organization (WTO), the World Trade Organization (WTO). as well as the Global Environment Facility (GEF). The creation of transnational instruments for the emergence of environmental sustainability is justified by the need to improve and apply norms of multisectoral solidarity for all the inhabitants of the planet (Bachelet, 1995, p. 19), at the risk of the disappearance of populations and ecosystems. Once again, the need to overcome the restricted understanding of ecological problems at the local level is highlighted, in order to develop a *globalist postulate* on the subject (Canotilho, 2007, p. 2). These reflections encourage the development of international and supranational legal-political systems, as a scenario for the paving of an environmental ecological standard at the planetary level (Canotilho, 2007, p. 5-6).

2.2.2 Transnationality of economic sustainability

The transnational scope of the economy is unequivocal, taking as an example the fact that the World Bank, after admitting countries from the Soviet Union, integrated an almost universal

[10] It is recorded that "[...] Society, with all its subsystems, economy, politics, family, culture, precisely in late modernity, is no longer conceivable as "autonomous in relation to nature". Environmental problems are not problems of the environment, but completely - in origin and results - social problems, problems of human beings, of their history, of their living conditions, of their relationship with the world and with reality, of their economic, cultural and political constitution. The "inner nature" of the industrially transformed civilizational universe needs to be clearly conceived as a typical non-environmental environment, as an internal environment, capitulating to all our cultivated possibilities of estrangement and exclusion. At the end of the twentieth century, it is worth saying: nature is society, society is (also) "nature". Whoever today speaks of nature as a negation of society, does so in categories of another century, incapable of encompassing our reality" (Beck, 2011, p. 99).

membership (World Bank Group, 1995, p. 14). Other bodies mentioned include the International Monetary Fund and the World Trade Organization.

Through this perspective, it is possible to perceive the existence of a floating and deterritorialized capital, which is managed through economic practices conducted by transnational corporations[11], which, together with other entities interested in paving supranationalism, influence processes of formation of identities, ideologies, legislation, policies, among other factors, in addition to national loyalties.

Through the transnational dimension of economic sustainability, transnational mechanisms can be developed to reconcile sustainable economic factors with the demands that result from exploitative capitalism. In this sense, the overcoming of post-Fordist capitalism is mentioned, characterized by the opening and integration of global financial markets and the consequent planetary race for profits, as well as the fragmentation of production processes in different areas of the globe[12]. This process can be analyzed by the unsustainability of such practices, which results, among other factors, from the exploitation of labor force and natural resources in fragile states (Ribeiro, 1997, p. 8). The Republicanization of Globalization (Cruz; Bodnar, 2012, p. 19) can help correct this serious problem of the traditional capitalist system.

2.2.3 Transnationality of social sustainability

The transnational dimension of social sustainability is taking place at the heart of a globalised and constantly changing world, in which citizenship is also transformed in order to become more active and efficient for citizens who, driven by the density of global and transnational interconnections, are transformed by the need to move away from the characteristics of the State (territory, sovereignty and nationality). they begin to relate between

[11] Examples of transnational companies and organizations are mentioned such as "the G-7; the Paris Club; regional and multilateral banks (World Bank; Inter-American Development Bank; and others); multilateral agencies and organizations (United Nations; International Monetary Fund; General Agreement on Tariffs and Trade; World Trade Organization; and others); economic and political blocs such as the European Union, the North Atlantic Free Trade Agreement (NAFTA) and Mercosur." (Ribeiro, 1997, p. 8-9).

[12] It is understood that capitalism operates through different configurations, of which the following can be highlighted: a) international capitalism, which operates on the basis of the international division of labor within the scope of the different States, which come to figure as important sovereign agents in the political and economic sphere; (b) multinational capitalism, which results from the pooling of financial resources in the same enterprise, which makes it possible to identify, albeit often partially, the origins of capital and its political responsibility in terms of nationality; c) and transnational capitalism, which is structured on the basis of the volatility and flexibility of financial and industrial capital, and makes it difficult to identify the origins of capital. Through transnational capitalism, large corporations establish relationships between different levels of integration, resulting in the emergence of new global economic structures, operational flows, and configurations of belonging (Ribeiro, 1997, p. 8).

communities, States, international institutions, non-governmental organizations and transnational corporations. These agents can actively participate in the construction of a deterritorialized and cosmopolitan citizen identity, in line with the needs of applying social rights, such as access to housing, food, education, health, among others (Goméz, 2000, p. 532).

It should be noted that, like the other dimensions but in a more transversal way, social sustainability is a fundamental vector for achieving economic and environmental sustainability. Where there is poverty there is no economic development, much less environmental development. (García; Cruz, 2016) The transnational character of social sustainability can be observed in the realization of transnational events that result in the development of feelings of fellowship between individuals from different nations. These events allow us to understand the common anthropological bond and the idea of belonging to the transnational world.

By way of example, we can mention the UN conferences, which are responsible for promoting *internationalism* and *transnationalism* (Ribeiro, 1997, p. 22-25). The conferences focused on the themes of human rights (1993), population (1994), women (1995), environment and development (1992), as well as the Conference of the Parties (2021), are recognized for creating a transnational space in which people from different segments and social positions discuss the problems of the planet, such as the necessary change in the global energy matrix.

3 Contribution of the paradigmatization of sustainability - transnational- to the development of the new global energy matrix

The global energy matrix is predominantly composed of non-renewable sources, resulting in large emissions of carbon dioxide (CO2) and other greenhouse gases (GHG).[13] This scenario was analyzed by the International Energy Agency (IEA)[14] and showed that, in 2018, oil and its

[13] "The gases absorb the heat that is radiated by the Earth, but they only release a part of it into space, resulting in the warming of the atmosphere. The amount of greenhouse gases produced by human activity is colossal: in carbon dioxide alone, the total amounts to more than thirty million tons per year. These gases are released into an extremely fragile atmosphere." (Herson, 2009, p. 7)

[14] The International Energy Agency (IEA) is an agency of the Organization for Economic Co-operation and Development (OECD). It was created after the 1973 oil crisis, with the initial objective of guaranteeing the security of oil supply, through the treaty called "Agreement on an International Energy Program". Over the years, the IEA has expanded its activities into areas such as energy efficiency, climate change, sustainability, research and development, technological collaboration and international energy relations, becoming the leading international energy cooperation body. The IEA has a collective emergency response system aimed at stabilising markets and the world economy, which has been activated on three occasions: in 1991, during the First Gulf

derivatives led energy production with a percentage of 31.5%, followed by coal, which corresponded to 26.9%. It was followed by natural gas, with 22.8%, biomass, with 9.3%, nuclear, with 5%, hydropower, with 2.5%, and other energy sources that corresponded to 2% (IEA). The following year, the IEA identified a 2% increase in fossil fuel consumption, compared to 2018, representing a total of 617 EJ.[15] This increase was mainly driven by natural gas, which grew by 4%, and coal, which registered an increase of 2%. Although it showed no rates of increase in 2019, oil remained the most widely used form of energy. In that year, fossil fuels accounted for more than 82% of global energy production[16].

In 2020, in the face of the global health crisis, which resulted in lockdowns and a decrease in economic activity, fossil fuel consumption decreased by 5%, compared to 2019[17]. In this period, oil consumption fell by 7%.[18] Coal fell 4%, even though China, the world's largest coal consumer, showed an economic recovery and increased its consumption. The fossil energy source that changed the least was natural gas, with a 3% reduction in its consumption.

In 2022, as a result of the war between Russia and Ukraine, Europe faced difficulties in securing gas supplies, aggravating the crisis and energy security on the continent, as well as demonstrating dependence on these resources. The abrupt decline or cessation of gas, oil, and coal sources from Russia has important geopolitical consequences for present and future energy security. (Pepe, 2023, p. 3).

3.1 Main sources of energy used in contemporary times

The main sources of energy that have served humanity in recent centuries have been fossil fuels[19], including oil, natural gas and coal, as well as hydropower, solar energy, wind energy,

War; in 2005, after the occurrence of hurricanes Katrina and Rita, which damaged the oil infrastructure in the Gulf of Mexico; and in 2011, during the crisis in Libya. (IEA)

[15] EJ is the acronym designated by the International System of Units (SI) for the Joule unit of measurement, which refers to the measurement of work, energy, or the amount of heat. A joule corresponds to 1 W × s (watt-second), being approximately equal to 6.2415 ×1018 eV or 2.7778 ×10-4 watt-hours. (Cohen, 2018, p. 97.

[16] To learn more about this scenario, it is suggested to analyze the results of the research carried out by the IEA, which are available on the website https://www.iea.org/reports/world-energy-balances-overview/world. Accessed on: 17/11/2021.

[17] As an example, energy consumption in the United States in 2020 fell by 7.6%. In the European Union, the reduction was 7%, with a strong influence from Italy, France, Spain and Germany. The same rate was seen in Japan and Canada. Russia showed a reduction of 4.8%. With a slight decrease, India, South Korea and Saudi Arabia appear with 3%. Brazil, along with Australia, showed a 2% reduction. Other regions of the world, such as Africa and the Middle East, especially Saudi Arabia, have also reduced their energy consumption. (Enerdata)

[18] The reduction in oil consumption was mainly due to the low demand for transport caused by the effects of the Covid-19 pandemic.

[19] Fossil fuels are the result of a slow process of decomposition of animals and plants, and it is estimated that more than 65 million years have been formed. Societies, which for a long period of time met their energy needs through

nuclear energy, energy from biomass, especially fuelwood, charcoal and sugarcane bagasse, tidal and geothermal energy (Murta, 2011), which will be analysed below.

3.2 Sustainability as a paradigm that induces the new global energy matrix

The development of the new global energy matrix through sustainable standards presupposes the understanding of harmony with the world as a common denominator for the construction of a global community focused on economic, social and environmental factors[20]. This communion of thoughts and attitudes is necessary for the development of technological mechanisms that allow the generation, distribution and use of energy without compromising the environment and human beings.

It is important to mention some instruments that highlight the actions underway to achieve sustainability.

Relevant examples include the Sustainable Development Goals (SDGs) set by the United Nations General Assembly, the Convention on Transboundary Pollution, the Vienna Convention for the Protection of the Ozone Layer, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, among others. These treaties and agreements reflect the global commitment to sustainability and provide guidelines for transnational actions aimed at protecting the environment and the transition to a more sustainable energy matrix.

These instruments seek to promote cooperation between countries, establishing goals and guidelines to address environmental, economic and social issues related to sustainability and the energy matrix.

The Sustainable Development Goals, for example, set out a broad and comprehensive agenda for sustainable development by 2030, which includes actions to ensure access to clean and affordable energy, promote the sustainable use of natural resources, and combat climate change (United Nations, 2015).

physical power, animal traction and biomass, experienced the transformation of energy factors with the advent of the Industrial Revolution, from which the use of energy from fossil materials, such as oil, natural gas and coal, intensified.

[20] Leonardo Boff (2012, p. 14) understands sustainability as the "[...] a set of processes and actions that aim to maintain the vitality and integrity of Mother Earth, the preservation of its ecosystems with all the physical, chemical and ecological elements that allow the existence and reproduction of life, the satisfaction of the needs of present and future generations, and the continuity, expansion and realization of the potentialities of human civilization in its various expressions".

The Convention on Transboundary Pollution aims to prevent and control transboundary pollution, while ensuring the protection of the environment and human health (United Nations Economic Commission For Europe, 1979).

The Vienna Convention for the Protection of the Ozone Layer seeks to phase out ozone-depleting substances, promoting the transition to more sustainable and safer technologies (United Nations Environment Programme, 1985).

The Basel Convention, in turn, establishes standards for the control of transboundary movements of hazardous wastes, with the aim of minimizing the environmental and public health risks associated with this type of transport and improper disposal (Secretariado Da Convention De Basel, 1989).

These instruments demonstrate the importance that countries, through international agreements, attach to the promotion of sustainability and the transition to a more sustainable global energy matrix, providing guidelines and incentives for cooperation between countries and the adoption of sustainable practices.

3.2.1 The environment and the new energy matrix

One of the main pillars of the reflections focused on the new global energy matrix is the environmental dimension of sustainability. Through an ecological conception[21], the ability to reduce the environmental impacts caused by energy generation is studied, as well as the recovery and reproduction of ecosystems in the face of the anthropic aggressions that were conferred on them. Thus, the vector is in the search for the maintenance of the environment, operating through the promotion of strategies for the establishment of conservationist priorities, which are considered necessary to offer qualitative and quantitative responses to environmental systems.

The development of an energy matrix that is sustainable for the environment presupposes a rethinking of the energy sources currently considered as "clean" and "renewable". In this sense, the generation of wind energy is cited as an example, which can cause impacts on wildlife and the habitat of certain species of animals, including the death of birds that collide with the blades of generators. Another factor concerns the management of waste from wind farms, which

[21] It was decided not to adopt the distinction between environmental and ecological in the strict sense, given the greatness of the environmental plan. To support this position, *see* José Joaquim Gomes Canotilho (2010)

are made up of equipment with a useful life of between 20 and 30 years, depending on the climatic conditions of the region in which they have been installed.[22]

Solar power generation, with a strong expansion in recent years, also presents environmental problems due to the arrangement of photovoltaic panels, since the life expectancy of the modules is about 25 to 30 years and their disposal is classified as electronic waste[23], which translates into toxic waste, such as cadmium, lead and selenium, responsible for soil and water pollution.

However, it is very clear that, once the problems mentioned above are solved, clean and renewable sources will be infinitely less impactful than those adopted from the end of the nineteenth century and the first half of the twentieth century, both solar and wind. (Blanchet; Oliveira, 2013)

The new energy matrix must be developed from the reformulation of the legal-state systems aimed at the protection of the environment, in such a way that it is possible to create transnational legal systems capable of guiding the construction of new mechanisms of energy generation, as well as restructuring the existing ones, having as vectors the principles that provide greater protection to the environment.

3.2.2 The economy and the new energy matrix

Sustainability, perceived as an inductive paradigm of the new global energy matrix, is also manifested from the economic perspective. In this scenario, the contribution of the economy to the construction of technological mechanisms aimed at energy generation is reflected, as well as the reduction of the economic impacts that this activity generates in society.

With a transnational scope, the economy became one of the main forms of power, which caused global society to be guided by the principles of the market economy, capitalist accumulation on a global scale, the expanded reproduction of capital, as well as private appropriation. (Ianni, 2013, p. 139)

[22] Companies such as Iberdrola Ingeniería, ScottishPower Renewables and Fundación Tecnalia, the largest research and technological development centre in Spain and a member of the Basque Research and Technology Alliance, are focused on the research and implementation of processes for the recycling of wind turbine blades. With a budget of more than one million euros, provided by the European Union, the objective is to demonstrate the effectiveness of recycling systems and contribute to the preservation of the environment.

[23] According to the provisions of Directive 2012/19 of the European Union. EU - European Union. **Directive 2012/19/EU** of the European Parliament and of the Council of 4 July 2012 on Waste Electrical and Electronic Equipment (WEEE).

Although there is a great influence of the States, the new energy matrix is paved through the existence of floating capital, managed by economic practices that are driven by transnational corporations, which, together with other entities interested in supranationalism[24], also influence identity, ideological, legislative, political, legal processes, among others, in addition to national loyalties.

The relationship between the economy and the new energy matrix is of utmost importance so that: a) sustainability is able to operate costs and benefits, whether direct or indirect, and with the *trade-off* between efficiency and equity in the generation of "clean" energy; b) the economy is able to manage and operate within the scope of technological improvement aimed at reducing waste from the operation and disposal of the energy resources. power generators. energy; c) Market regulation is based on the effectiveness and efficiency of the generation factors, in a context in which asymmetric information, exploitative commercial relations and abuses of power are minimised. (Freitas, 2009)

In addition to the assumptions already mentioned, sustainability, in the context of the new energy matrix, has the capacity to promote the saving of resources and energy, as well as to raise productivity rates, in accordance with the equitable distribution of capital.

3.2.3 The social dimension and the new energy matrix

Reflecting on the new energy matrix from the perspective of the social dimension of sustainability presupposes the understanding of the existence of a new level of integration between social agents[25], who have the capacity to contribute to the transnationalization of the planet under a vision close to cosmopolitanism[26]. In this scenario, extensive and multi-situated networks are developed, composed of individual and collective agents that act in a

[24] Ribeiro cites as an example of international corporations and agencies "the G-7; the Paris Club; regional and multilateral banks (World Bank; Inter-American Development Bank; and others); multilateral agencies and organizations (United Nations; International Monetary Fund; General Agreement on Tariffs and Trade; World Trade Organization; and others); economic and political blocs such as the European Union, the North Atlantic Free Trade Agreement (NAFTA) and Mercosur." (Ribeiro, 1997, p. 8-9).

[25] Juárez Freitas (2009, p. 55) observes that "the social dimension of Sustainability occurs in the sense that an exclusive model cannot be admitted, because it is useless to consider the survival of a few or the relapsed and indifferent oligarchic style, which denies the connection of all beings and the connection of everything, and in this way, the immaterial nature of development itself."

[26] Hannerz (1996, p. 103) defines cosmopolitanism as an "orientation, a desire to commit oneself to the Other. It implies an intellectual and aesthetic openness to divergent cultural experiences, a search for contrasts rather than uniformity. [...] Cosmopolitanism usually has a narcissistic side; The self is constructed in the space where cultures reflect each other." Our translation.

deterritorialized way and that cross different levels of integration, thus paving a kind of digital citizenship of global times. (Ribeiro, 1997, p. 19)

The development of the new energy matrix, under the influence of social sustainability, is relevant in the face of the weakening of most States by dominant groups and their inability to offer the necessary resources for the quality of life of "their" citizens. In the face of this process, social sustainability evokes the contribution of the connected global society to the development of instruments capable of overcoming the labelling and classification of individuals as mere customers, consumers or even passive spectators waiting for energy factors developed by groups that hold power over the mechanisms of production. Despite the utopian charge present in Jéremy Rifkin's proposal (2014), it is important to mention it in his work Sociedade de Custo Marginal Zero. Without a doubt, an indicator of future goals.

As with environmental issues, new technologies should also focus on energy generation practices that are considered clean by global society, but result in serious harm to people in vulnerable conditions. In this context, in addition to the promotion of new technologies for the generation of socially sustainable energy, it is necessary to return to the practices that currently exist, such as hydroelectric plants which, although they are responsible for a large part of the energy generated and classified as renewable energies, result in a high impact on the environment. Whether due to changes in hydrological flows, territorial degradation and loss of biodiversity, riverine communities are strongly impacted[27].

The new energy matrix, from a social perspective, needs to transcend its strictly operational nature and foster feelings of belonging between individuals from different nations, as well as reflections on the common anthropological bond that is established in a world connected and shared by all.

4 Conclusion

It is very likely that the dissemination of sustainability through transnationalized structures will contribute to the transition of the global energy matrix, which must be designed and implemented through necessarily sustainable processes. Thinking about the new energy matrix, through sustainability, will allow the creation of new governance spaces focused on the

[27] Despite the intention to effectively carry out the process of rehousing riverside communities, the projects are often not successful in their practical implementation.

environment and human beings, as well as promoting and guiding transnational actions with global impact, through axiological guidelines of broad consensus.

Greenhouse gas emission reduction targets, known as Nationally Determined Contributions (NDCs) under the Paris Agreement (UN, 2015), for example, play a key role in the transition to a new sustainable global energy matrix. To achieve these goals, it is essential to promote transnational cooperation, invest in renewable energy sources and adopt low-carbon technologies, with the aim of mitigating the effects of climate change and preserving the environment.

In addition, the effective implementation of emission reduction targets requires the creation of clear policies and regulations that encourage the adoption of sustainable practices. And this implies the need for transnational cooperation, in which countries adopt measures as common axiological guidelines. It is necessary to promote research and development of clean technologies, as well as to foster education and awareness about the importance of the transition to a more sustainable energy matrix. The active participation of governments, international organizations, the private sector and civil society is crucial to address the challenges of the energy transition and ensure a more sustainable future for present and future generations

The necessary changes in the production, conservation and use of energy have become evident, with the aim of reducing environmental degradation and increasing global warming. In this sense, it is of utmost importance, as highlighted throughout this text, to rethink the energy matrix, developing alternatives that result in a low carbon content and a lower impact on the environment.

The relevance of the transnational approach to sustainability as a driver of the transition towards a more sustainable global energy matrix lies in the ability to promote cooperation between different actors and integrate environmental, economic and social aspects. This approach seeks to overcome current challenges related to energy production, conservation, and use, with the aim of reducing environmental degradation, while providing more security for future generations.

By rethinking the energy matrix and developing low-carbon alternatives, the proposed perspective emerges as the basis of sustainability as a new paradigm for the sciences involved in the operationalization and application of measures that prevent and manage the risks of energy scarcity, as well as minimize the environmental and social damage caused by its production and use. globally.

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