

Of the Awareness of the Anthropogenic Influence until the Sustainable Development

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Abstract

This text presents a historical retrospective of the early nineteenth century to the early twenty-first century that illustrates the path up to the recent various formulations of the concept of sustainable development. Given the enormous breadth of the subject, the content selection was based on two criteria. Initially, it was decided to contemplate the events and projects abroad, to realize the availability of the references about the subject. The other criterion adopted was to select events and relevant publications with primarily economic and/or environmental focus. The bibliographical survey was conducted from the literature available on the Internet and lists the major conferences and multilateral documents in addition to the most relevant books published on the subject in the Western world. It is noteworthy that the text was structured following the natural chronological order of the events and the publications, to facilitate the identification of the periods with approaches in dealing with socio-environmental problems similar to the current ones. From the results, three main periods were identified regarding the approaches adopted to address the environmental and social problems. In this chapter they were named as “A period of attention turned to the impact of human activities” covering the initial period between 1800 and 1900; “The pre-Stockholm environmentalism period”, 1900-1970; and “The post-Stockholm ecologism period”, 1970 to 2010 (the last year of the survey). It's considered that the historical retrospective is useful because it helps to understand the different definitions of sustainability depending on the historical moment and particular world views, whether from individuals or organizations.

Keywords: Environmental history; Sustainability; Sustainable development; Human-nature relationship

Introduction

The present historical retrospective aims to help the understanding of the different definitions of sustainability (and sustainable development), which result of the historical moment and also of particular world views, whether from individuals or organizations. In the words of Neto [1]: “this notion (of sustainable development) cannot be fully understood dissociated from its historical context”. The difficulty in establishing a widely accepted technical and scientific definition of sustainability lies in the fact that the concept has been defined over a long, continuous and complex historical process, “a critical reappraisal of the relationship between civil society and the natural environment” [2,3]. The same difficulty is encountered regarding sustainability related concepts, such as sustainable development [4,5] and biodiversity [6].

The historical retrospective presented here is based on a bibliographic survey realized on the Scopus Scientific Database in 2011, whereby was possible to confirm that the perceptions of the Nature and Society relationship take different nuances, depending not only on the agents, but especially the current time. Logically, such diverse perceptions guide many different formulations of methods to assessment or measure of the sustainability. The Figure 1 presents the time line of the historical retrospective showing the emergence of the currents of thought. The Table 1, showed as Appendix at the end of the text.

Three main periods were identified are regarding the approaches adopted to address the environmental and social problems. They named in this text as “A period of attention turned to the impact of human activities” covering the initial period between 1800 and 1900; “The pre-Stockholm environmentalism period”, 1900-1970; and “The post-Stockholm ecologism period”, 1970 to 2010, the last year of the bibliographic survey. The last period could be divided into other three periods: “The emergence of the development paradigms”, 1970-1990;

“Implementation of actions for sustainable development”, 1990-2000; and “Follow-up actions for sustainable development”, 2000-2010.

1800-1900: A period of attention turned to the impact of human activities

Padua [7], a Brazilian historian, identifies the eighteenth century as the turning point of the intellectual concept of the N-S relationship in the Western world. The period before was characterized by the thinking of the influence of nature on human history and the period after, by the influence of human activities on nature.

Glacken [8], in his monumental study on the history of intellectual concepts about nature in the Western world, from classical antiquity to the eighteenth century, found that virtually all thinkers were forced to confront the issue, based on three major questions: Is it nature, just as it is present on Earth, endowed with meaning and purpose? Does nature have influence on human life, especially where each society inhabits? Was it the reality of Earth, in its primordial condition, modified by historical actions of man? The results of Glacken [8] research show clearly that the first two questions largely dominated the philosophical

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Year	Events and Resulting Documents
1822	The 1822 Resolution extinguishes the land grant regime in Brazil (in Portuguese: “Regime de Sesmarias”)
1850	Enactment of the Land Law of Brazil (Law 601)
1864	Publication of the Man and nature or physical geography as modified by human action
1892	Creation of the Sierra Club
II – 1900-1970 – The pre-Stockholm environmentalism period	
<i>Year</i>	Events and resulting documents
1909	First International Conference on Nature Conservation , Johannesburg (South Africa)
	International Conference for Nature Protection , Paris (France)
1934	First Brazilian Conference on Nature Protection , Rio de Janeiro
1948	Creation of the International Union for the Protection of Nature (IUPN)
1949	United Nations Scientific Conference on the Conservation and Use of Resources
1950	Publication of The social costs of private enterprises , Karl W. Kapp
1956	United Nations Conference on the Law of the Sea (UNCLOS)
1958	Creation of the Brazilian Foundation for the Conservation of Nature (FBCN)
1960	UNCLOS II
1962	Publication of Silent spring , Rachel Carson and Our synthetic environment , Murray Bookchin
1963	IUPN resolution to protect endangered species
1964	Publication of Ecology and revolutionary thought , Murray Bookchin
1965	Publication of the Crisis in our cities and towards a liberatory technology , Murray Bookchin
1968	Intergovernmental Conference for Rational Use and Conservation of the Biosphere , Paris (France)
	Symposium on Nature Conservation and Restoration of the Natural Environment
	The creation of the Club of Rome
III – 1970-2010 – The post-Stockholm environmentalism period	
III.1 – 1970-1990 – The emergence of the development paradigms	
<i>Year</i>	Events and resulting documents
1970	Publication of Population, resources, environments: Issues in Human Ecology , Paul R. Elrich
1971	Publication of The closing circle , Barry Commoner
	Publication of The Entropy Law and the Economic Process , Nicholas Georgescu-Roegen
	International Conference on Wetlands and Waterfowl
1972	The publication of the manifesto The blueprint to survival , The Ecologist
	United Nations Conference on Human Environment (or Stockholm Conference) , Stockholm (Sweden)
	UN General Conference , Paris (France)
1973	Third United Nations Conference on the Law of the Sea , New York (USA)
1974	Founding of the Institute for Social Ecology
	Publication of The implementation of environmental policies , Karl W. Kapp
	Environment and styles of development , Ignacy Sachs
	United Nations Conference on Trade and Development , Cocoyok (Mexico)
1975	Publication of Strategy for tomorrow , Edward Goldsmith
	Energy and economic myths , Nicholas Georgescu-Roegen
	Dag-Hammarsköld Report , PNUMA
1976	Publication of Development and environment: towards a new approach to socioeconomic and Environmental development , Karl W. Kapp
	United Nations Conference on Human Settlements , Vancouver (Canada)
	Publication of Symbiosis between the Earth and Humankind , René Dubos
1979	First World Climate Conference , Geneva (Switzerland)
1980	Launching of the World conservation strategy: living resources conservation for sustainable development , IUCN
1983	Formation of the World Commission on Environment and Development (or Brundtland Commission) ,
	UNEP
1985	Vienna Conference , Vienna (Austria)
1989	Proposal of the Basel Convention , UNEP

Table 1: Events and leading publications in the period 1800-2010.

and scientific thought until the eighteenth century. The rationale was to understand how nature influenced human history and not vice versa. Some elaborations on the third question seemed to refer to landscape improvements through arts and work. But the issue of the human

capacity to degrade or even destroy the natural world through its actions is essentially modern.

In the period in question, two important environmental currents

of thought appeared: the preservationism and conservationism. The preservationism current aimed to protect nature, mainly by encouraging the establishment of national parks, a trend that was followed worldwide over time. Thus, its enthusiasts intended “to preserve for posterity areas endowed with great natural beauty in their wild state”, moved by the pleasure of aesthetic contemplation of the natural environment and the recognition that the human being is part of nature and, therefore, Nature should be protected [9]. Its most prominent representative was the American naturalist Muir [10] among other important representatives such as Catlin [11], Thoreau [12] and the American diplomat Marsh [13].

Marsh [13] published in 1864 the work called “Man and nature or physical geography as modified by human action”, which focus on the “transformations caused by human action since Antiquity, having as the central axis the denouncement of destruction”. In 1892, Muir led the creation of the Sierra Club, whose initial function was to protect the Yosemite National Park (California, USA) and now constitutes a network of worldwide collaborators that work to protect communities and wild environments. Unlike the preservationism current that defended the use of green areas almost strictly for recreational purposes, the conservationism current advocated the rational use of natural resources. Gifford was one of its most notable exponents [14].

1900-1970: The pre-stockholm environmentalism period

The spread of conservationist ideas led to the first International Conference on Nature Conservation in Johannesburg (South Africa), in 1909, bringing together representatives of the USA, Mexico, and Canada. A second edition of the conference should have been held in 1910, but was suspended by Taft, the US president [14].

The First Brazilian Conference on Nature Protection was held in Rio de Janeiro, from April 8th to 15th, 1934, organized by the Society of Friends of Trees, supported by the National Museum and other major Brazilian institutions. The context at the time of the event was nationalism coupled with the desire for modernization of society and state institutions” where various topics were discussed, to mobilize “significant sectors of society. Event organizers proposed not only new legislation to guarantee the protection of natural resources (the rate of forest devastation at the time was already worrying in Brazil), but also suggested that education campaigns should be conducted among the population to awaken its love for nature. It also suggested the creation of a “Forest School”, similar to those in Italy and the United States [14].

In the words of Silva [14], rapporteur of the Congress and then President of the Friends of the Tree:

The forest issue is at the same time, a social, a sanitary, and an wealth problem of vital and relevant transcendence. Hence, the commitment of the Friends of the Trees Society in asserting the need to teach Forestry in primary and secondary schools in the country [15].

According to Kavinski [15], the post-war years, specially between 1940 and 1970, were marked by resistance to discussions about resource contention and consumption. At Brazil, Silva [14] was one of the exponents in this sense. Rocha and Siman [16] defined it as period marked internationally for what was termed as the “Green Revolution” in response to problems that occurred at the time and threatened the health of the environment and individuals, which were already the subject of environmental debates: conducting nuclear tests, the rapid growth of industry and consumption, the development of large urban areas, among others.

In 1948, the United Nations Educational, Science and Cultural Organization (UNESCO) proposed to create the “International Union for the Protection of Nature” (IUPN). The mission of the bipartite organ, governmental and nongovernmental, was to promote the preservation of wildlife and resource conservation. The organization changed its name to “International Union for the Conservation of Nature” (IUCN) in 1956 and remained so until today. In 1949, the United Nations Scientific Conference on the Conservation and Utilization of Resources, UNSCCUR, brought together several experts in order to address issues related to the conservation of natural resources. This conference goal was “to reaffirm the importance of scientists in the consolidation of the post-war environmental movement” [17].

In 1962, Carson [18] published the book “Silent Spring” seeking to show the effects of DDT on the food chain and how the product accumulated on the fatty tissues of animals. This work was one of the first studies that established a relationship between environmental degradation and human health and called for the emergence of environmental awareness in the 60s and 70s [18].

Also in the early 1960s, Bookchin [19], American anarchist writer, published some papers relating the environmental destruction to the technological-industrial society. His work titled “Our synthetic environment” and published in 1962, established the relationship between pesticides, chemical additives and radiation and human diseases, such as cancer, from the scientific literature [19]. In “Ecology and revolutionary thought”, Bookchin [20] criticizes the capitalist accumulation, and cites it as the cause of environmental degradation. Still in “Crisis in our Cities”, Bookchin [21] explores the specific environmental problems of urban areas. In the same year, the “Towards a liberatory technology”, Bookchin [22] proposes using alternative and renewable energy sources and micro-technologies to form an infrastructure to establish a libertarian society. Bookchin [23] also made a distinction between environmentalism (or “deep ecology”) and what he termed as “social ecology”, indicating that the human being should be seen as a social being and not only as a biological specimen.

In 1968, a group of scientists from various fields of expertise (economists, educators, humanists and businessmen), known as the Club of Rome, met in order to examine the problems that defied humanity (poverty, environmental degradation, urban growth, among others) and discuss their future [24].

Also in 1968, the Intergovernmental Conference for Rational Use and Conservation of Biosphere was held in Paris (France). This meeting established the program Man and Biosphere, MaB, of international scientific cooperation on the interactions between man and the environment which is in force to this day [25].

1970-2010: The post-stockholm ecologism period

The 1970s can be considered a landmark due to the profusion of thoughts on development and environmental problems caused by certain types of human life in Europe, as a response to various environmental disasters with world repercussion, that occurred between the 1960s and 1980s: the pollution of the Minamata Bay with mercury, in Japan; the industrial disaster in an pesticide plant at Bhopal, in India, with the fatal toxic gases emissions; and the disaster of Chernobyl nuclear power plant in the former Soviet Union. The 1980s were marked by increased academic interest in developmental and environmental issues, not only in social or natural sciences already established, but also in fields with cross-cutting sciences, such as Environmental Engineering and Environmental Economics. Some consolidated epistemological

changes in the Nature and Society relationship can be highlighted in the twentieth century, according Padua [7], cited by Souto [26]:

- a) the idea that human action can produce a material impact on the natural world, even to the point of causing its degradation;
- b) the revolution of understanding the world in chronological milestones; and
- c) the vision of Nature as History, a process of construction and reconstruction over time.

The UNEP considers that in the 1980s, the definition of a concept to the sustainable development was being pursued. In the 1990s, there was a profusion of efforts to implement it; and, from 2000, several initiatives have been consolidated to monitor the progress of actions taken in the previous decade [27]. The Figure 2 shows the time line for implementing the international conferences in the period from 1900 to 1990. In this figure, the profusion of international conferences begins roughly from the 1970s. And the following sections detail the characteristics of three distinct periods: i) 1970-1990, marked by the emergency of different paradigms for the development; ii) 1990-2000, characterized by a profusion of initiatives on development of lists and systems of indicators; and iii) 2000-2010, with a profusion of follow-up actions to the sustainable development.

1970-1990: The emergency of the development paradigms

In the 1970s, the emergence of a new ecology contradicted the old ideas regarding protection of nature, giving rise to two currents of thought: the ecocentrism (or biocentrism, deep ecology, the wilderness worship) and the anthropocentrism, according to Manna [28].

According to the ecocentrism, the natural environment is approached in its entirety and human beings are seen as one more of its biological components. On the other hand, the anthropocentrism establishes the human-nature dichotomy, attributing controlling and ownership rights of the natural environment to man, considering that nature would not have value in itself, but would be constituted as a reserve of natural resources available to mankind [28].

The anthropocentric current was originated from two other currents named as “gospel of eco-efficiency” and “environmentalism of the poor”. Eco-efficiency is characterized by a preoccupation with the effects of economic growth [29]. The environmentalism of the poor analyzes the unequal distribution of environmental damage between rich and poor countries and Martínez-Alier [30] is one of its greatest exponents.

In 1970, the “Population, Resources, Environments: Issues in Human Ecology”, by Elrich, et al. [31], was one of the first publications about human ecology, which dates back to the Malthusian principles that correlate the size of the population with the amount of available resources [32].

As opposed to the idea that environmental degradation was caused only by population pressure, Commoner [33], another American biologist, published “The Closing Circle” in 1971, which related the environmental crisis to the capitalist way of production, according to which “new technologies introduced after 1946 (responsible for the production of synthetic pesticides, disposable products, detergents, etc.), produced, according to his calculations, 95% of the total emission of pollutants” [27].

Discussions between Ehrlich [31] and Commoner [33] gave rise to the thesis of “zero growth” in the scientific community in the late 1960s

and early 1970s, according to which economic growth in Third World countries should be limited, in order to stabilize world production levels [34].

In 1972, “The ecologist” magazine published the manifest “The Blueprint to Survival”, signed by English scientists. The principal authorship is attributed to Goldsmith, et al. [35], who were assisted by Goldsmith [35] et al. This manifest was a contribution to the United

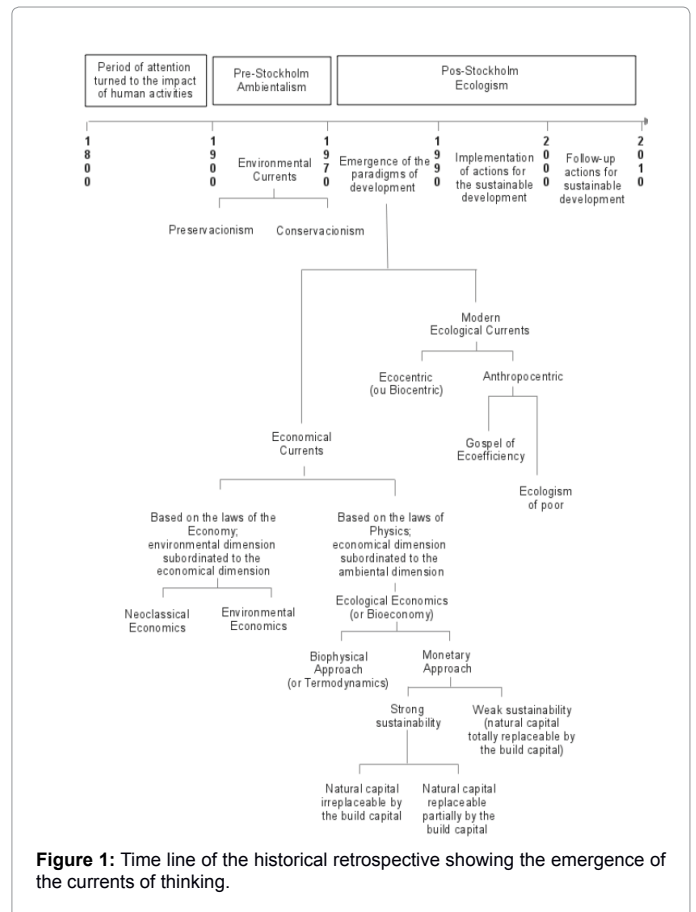


Figure 1: Time line of the historical retrospective showing the emergence of the currents of thinking.

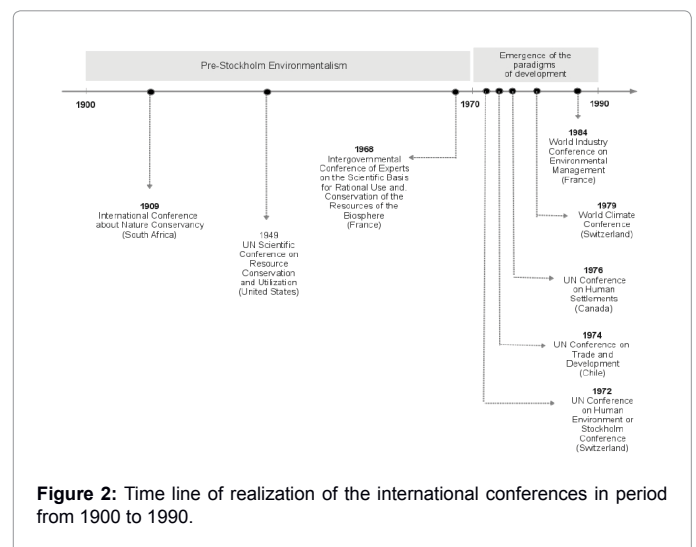


Figure 2: Time line of realization of the international conferences in period from 1900 to 1990.

Nations Conference on the Human Environment, UNCHE, held in Stockholm and in the same year [36].

The “United Nations Declaration on the Human Environment”, dated 1972 [36], better known as the “Stockholm Declaration”, stressed “the need for a new civilizing posture, where the use of natural resources should meet the needs of present generations and ensure the supply of the needs of future generations” [36]. The second principle of the Stockholm Declaration states that “The natural resources of the Earth, including air, water, soil, flora and fauna and especially representative samples of natural ecosystems must be safeguarded for the benefit of present and future generations through careful planning and proper administration” [36].

The Stockholm Conference led to the creation of the UNEP, to coordinate environmental discussions at the international level [37]. In 1973, Strong [38], then the UNEP director, coined the term “eco-development”, “which is considered as the precursor of the term sustainability”, because of his article “One year after Stockholm: An ecological approach to management”.

In rich regions of the world, it is essential to identify and pursue new directions for growth: pursuing alternative patterns of consumption that have less impact on the natural environment, less intensive use of energy, less demand for renewable resources and more appropriate to recycling and reuse, switching from quantitative to qualitative criterion in the national decision making [38].

In this article, Strong [38] reported progress toward the guidelines set forth in the Stockholm Conference and that most of the 85 countries that sent their reports to the Board of Governance for Environmental Affairs was working on an environmental report for the first time. On the other hand, he pointed out that the countries that had this experience had already included the environment in its governance structure and legislation (some even updating its laws), including Brazil.

According to Strong [38], five international conventions have also been established along the preservationist/conservationist line, leading to international multilateral agreements on different topics:

“Convention on Wetlands of International Importance Especially Waterfowl Habitat”, 1971, about the protection of wetlands of international importance;

“Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter”, 1972, about the disposal of toxic substances in the seas and oceans;

“Convention Concerning the Protection of the World Cultural and Natural Heritage”, 1972, about the protection of unique cultural sites and natural areas that are part of the common heritage of mankind;

“Convention on International Trade in Endangered Species of Wild Fauna and Flora”, 1973, about the combat to international trafficking of wild species of fauna and flora; and

“Convention on the Conservation of Migratory Species of Wild Animals”, 1979, about the conservation of migratory species of wild animals.

The text “A Blueprint for survival” [39] was conformed in response to the considerations presented by the Club of Rome in its first report, “The Limits to Growth”, also known as “Meadows Report” [40]. Both of documents published in 1972. However, the “Zero Growth” Thesis, presented in Meadows and others [40] was criticized by some Third World countries, including Brazil, which wanted to experience the

same level of development of the first world countries. “The Limits to Growth” was a response to a growing number of publications dealing with the relationship between society and nature that denounced the destruction of the natural environment, with losses to humanity. The document examines five variables (population, industrial production, food production, exploitation of natural resources and pollution), indicating that even with significant increases in productivity, population growth would lead to chronic food shortages. The report was criticized by Latin American countries that questioned the validity of the variables, arguing that the environmental aspects were emphasized at the expense of the social aspects. According to Odum [41], a reputed ecologist, the report received criticism from many political leaders who did not admit that humanity could not find a way out of the problems raised.

Although the purpose of The Limits to Growth was simply to show what could happen if we did not change our habits, many people, including most political leaders and a large segment of the public, understood the report as if it was predicting the end of civilization. Consequently, there was a storm of criticism. Many stressed that the models did not take into account new technology, the discovery of new resources, the replacement of depleted resources by a new one, etc. Most people seemed to feel that humanity was too smart to get into a cycle of progress and collapse, and that we would either stop or change our lifestyle before we got to that point [41].

The second report of the Club of Rome, named “Mankind at the Turning Point” [42], was published in 1974 in response to the criticism of “The Limits to Growth” and divided the Earth into 10 interdependent geographical areas. The findings of the second report are similar to the first, predicting a global environmental disaster, if the disordered population growth was to continue. It also indicated the two major gaps that were at the heart of the environmental crisis: between humans and nature and between the rich and the poor. As a solution, the report suggests that a condition of “organic growth” should be pursued so that such gaps can be resolved. According to this view, “development should be specific to the region, but globally oriented, rather than based on narrow national interests” [42].

In 1975, Goldsmith [43], published “Strategy for Tomorrow”, which criticized the assumptions of the model adopted in the preparation of the second report of the Club of Rome, because it reflected the industrialization values and had not contemplated the path to (mis) industrialization. The third report of the Club of Rome, “The Rio: Reshaping the International Order”, coordinated by economist Tinbergen [44], focused on the non-developed countries, considering that such nations leaders offered resistance to the organic growth model suggested in the second report.

The fourth report of the Club of Rome, “Goals for Mankind” prepared by Laszlo [45] and published in 1977, was based on an “inventory or atlas of national and regional goals proposed by work groups of various nations and regions” and offered a more optimistic perspective on a way out of the environmental crisis, stating that “the global goals and, ultimately, the global solidarity are attainable and that the work toward these goals has started” [45]. Other reports published by the Club of Rome dealt with specific topics such as waste, energy, organization of society, education, wealth, and well-being.

Goldsmith [46] defended the Thesis of (mis)development to reduce inequalities and achieve a level of stability or, as he claims, survival (of the human species). The search for a strategy for the future should undergo a consultation with the experts and not observation of the

results presented in the second report of the Club of Rome. Such experts should be able to think about the problems objectively in their evolutionary context and not in terms of industrialization values. And also, it suggests that this is a reflection of the myth of modern science, establishing a dichotomy between facts and values that, until then, had not been able to quantify the human values [46].

For the Franco-American humanist Dubos [47], a way to decrease human gaps would be a “domestication” of the Biosphere, where the environmental preservation and human occupation can be reconciled. Along these lines, he published “Symbiosis between the Earth and Humankind” in 1976 and “The Wooing of Earth: New Perspective on Man’s Use of Nature” in 1980 [48]. Simultaneously to the emergence of modern environmentalism, from the 1970s, when more emphasis was placed on man-nature relationship, two schools of thoughts in the economy began to consolidate in an attempt to include the environmental dimension in the economic discussion: the Ecological Economics (or Bio-economy) and the Environmental Economics.

In the neoclassical economics accounting, natural resources are not valued because they are considered as “free goods”. When it became necessary to include the environment in the economic model, “the environment is included as an appendix to the economic activity, which continues to be seen as all dominant, in which case the ecosystem has the essence of a warehouse or pantry, and may even be thought of as a trinket. This is the field of study known as Environmental Economics” [49].

Environmental Economics, which has a more limited view of neoclassical origin, reproduces the dogmatic assumptions of direct association between development and economic growth, restricting itself to the economic valuation and other unique market instruments as action basis. Thus, the difference between environmental and ecological economy is that the first is based on the laws of economy, while the second is based on the laws of physics [49].

Environmental Economics propose to apply tools of neoclassical economics to ecological problems, in which the environment is internalized in the economic calculation and valued in monetary terms. On the other hand, the green economy aims to point out to what extent the use of natural resources can be done in a sustainable way, as commented by Porto and Martínez-Alier [50].

There are two different approaches in Ecological Economics: the thermodynamics (or biophysical) and the monetary valuation of the natural capital (or the capital related to the natural resources). The first approach considers that there should be biophysical constraints as guarantee for the sustainability of development, ensuring the protection and renewal of environmental assets through other mechanisms and not just through market mechanisms. The second approach considers that monetization indexes must be prepared for both natural and built capitals, and one should also investigate whether they are irreplaceable, to a greater or lesser extent, one for the other (the School of Strong Sustainability) or are replaceable (the School of Weak Sustainability) [50].

Two schools of thought make up the thermodynamic approach, one is based on the First Law of Thermodynamics and, the other, on the Second Law of Thermodynamics (or Law of Entropy):

The thermodynamic approach is subdivided into two schools of thought. The first is based on the first law of thermodynamics - the law of conservation of matter and energy - to emphasize the need for balance between the material and energy inputs used in the productive

activity and the corresponding waste. The other is based on the second law of thermodynamics, emphasizing the fact that economic activity uses matter and energy of low entropy and converts them into high-entropy matter and energy. In the very long term, this inevitability of increasing entropy of the economic system implies that sustainable development is not achievable [51].

One of the pioneers of the thermodynamics approach of Ecological Economics was the Romanian economist Georgescu-Roegen [52], who published in 1971 one of his seminal works: “The Entropy Law and the Economic Process”, addressing the metabolic flux of materials and energy in the economy and recovering the concept of “metabolism of society” or “Marx’s metabolism”, of the nineteenth century. Georgescu-Roegen [52] states that the economic subsystem cannot regulate the biological system that encompasses. The author used the second law of thermodynamics to warn about the reduction until disappearance of natural resources and point toward reducing the consumption of raw materials stocks.

In its neoclassical definition, the object of economics concerns the rational management of the finitude of productive resources in a world supposedly marked by an infinity of human needs. Presented as an essentially “natural” phenomenon, this corresponding relative scarcity would be better administered by the market system, since the prices would, then, correctly reflect the said relative scarcity of goods and services in circulation. In other words, the neoclassical economics focuses on the efficient allocation of scarce resources to present and future purposes/use through the market price system [53].

According to Odum [41], as mentioned above, the Law of Entropy might be applied to both artificial and natural systems: The Law of Entropy can be expressed in various ways, including the following: no process involving energy conversion occurs spontaneously, unless there is an energy degradation from the concentrated to the dispersed form. Ecologists are interested particularly in how to transform fuel, nuclear power and other forms of concentrated energy in industrial societies. Therefore, the same basic laws governing non-living systems, such as electric motors and cars, also govern all types of ecosystems. The difference is that living systems use a part of their internally available energy for self -regeneration and to expel the disorder, while machines have to be repaired and replaced using external power. In our enthusiasm for machines, we forget that a lot of energy resources should be reserved always to reduce the entropy created by its operation.

In the Ecological Economics, two paradigms dealing with the relationship between natural capital and built capital (or manufactured capital) emerged. In Strong Sustainability, the natural capital is, to a greater or lesser extent, irreplaceable by built capital, while in Weak Sustainability, it is assumed that the natural capital is replaced by built capital [50]. In economic terms, the Weak Sustainability was explained by Dietz et al. [54], from the reading of the pioneering work along the same line:

The paradigm of (weak sustainability) was actually founded in the 1970s (there was no terminology yet at that time), when the neoclassical theory of economic growth was extended to account for non-renewable natural resources as a factor of production. Such highly aggregate growth models consider the optimal use of inputs (income) generated by the extraction of non-renewable resources and sought to establish rules on consumption at any given time and how much to invest in built capital to increase consumption later [54].

For Strong Sustainability, natural capital fulfills four functions: a) provides a range of materials for production and direct consumption

such as food, wood and fossil fuels; b) assimilates the waste from production and consumption; c) provides amenity services such as visual amenity of the countryside; d) provides basic functions of life support, of which both human life and the other categories depend on. The fourth category is not a direct determinant of human prosperity, is a primary value, which keeps all else together [55].

The requirements for the validation of the Weak Sustainability paradigm would be: a) natural resources are superabundant; b) or the elasticity of substitution between natural and built capital is greater than or equal to one; c) or technological progress may increase productivity of natural capital stock faster than it is being depleted [55].

Four reasons are presented by Barry [55] and by Turner et al. [56] why Strong Sustainability should be followed. First, considerable risks, uncertainties and ignorance about the way the natural capital works still remain. This fact implies that the damage is unknown. Second, the loss of some natural capital may be irreversible. Third, since there is evidence to suggest that we are more averse to losses in utilities than we are eager to gain from it, it is implied that we are highly averse to losses in the functions of the natural capital that provide us with utilities. Life-support systems are obviously included, but there are also amenity functions. Fourth, there is an ethical argument for no replacement, which points towards the fact that the future consumption is not an appropriate substitute for the loss of natural capital.

From the Strong Sustainability derive two schools of thought. One requires that the value of natural capital is preserved. In the case of non-renewable resources, the extraction should be offset by investments in renewable resource substitutes of equivalent value (e.g., wind farms to replace fossil fuels in electricity generation). The other requires that a subset of natural capital is preserved in physical terms, keeping intact their functions. This is named "critical natural capital". As the Strong Sustainability is generic, it is difficult to define the critical natural capital consciously. However, according to its own principles, the critical natural capital should be defined as strictly not replaceable or when the loss is irreversible or it could involve high costs because of its vital role for human well-being, or, finally, when it is unethical [56].

Lima [51], as mentioned above, indicates that the Weak Sustainability requires that the total capital stock is constant over time, while Strong Sustainability requires that the natural capital stock remains constant since it cannot be replaced by the built capital. The critical natural capital corresponds to an intermediate situation, where there may be partial substitution of the natural capital by the built capital. But according to Cavalcanti [49], as mentioned above, although the Ecological Economics is composed of two schools of thought, in general, it is assumed that there is a maximum sustainable scale of the economic system, which must take into account that the consumption of natural capital (named "economy marginal benefits") implies in environmental costs (named "environmental marginal costs"). The positive balance between these two elements generates the "genuine economic growth", otherwise, it generates the "anti-economic growth".

In 1975, Georgescu-Roegen [52], as mentioned above, published the essay "Energy and economic myths", which suggested a minimum bio-economical program of eight points:

- 1) to end production of weapons and completely ban their use;
- 2) assist underdeveloped nations to improve the population's quality of life;
- 3) gradual reduction of the population to levels that can be met only by organic agriculture;

- 4) Regulation of energy waste;
- 5) end of the extravagant lifestyle with excessive purchase of consumer goods;
- 6) increase the durability of durable goods and how long they are used by consumers;
- 7) increase repair capacity of durable goods, favoring spare parts; and,
- 8) use of natural resources more intelligently.

On the one hand, Georgescu-Roegen [52], as mentioned above, was criticized by the positivists and progressists at the time, who agreed with the biological to the economic sphere submission model. On the other hand, Georgescu-Roegen [52] has been criticized by environmentalists who argued that a Political Ecology was required and this could not be discussed in the light of the second law of thermodynamics, according to Marcellesi [53], as mentioned above.

Political Ecology deals with the study of conflicts regarding the access to natural resources and services (and the responsibilities for pollution), which arise because of unequal property rights and inequalities of power and income, both internationally and domestically in each country. In this sense, innovations in the socio-political level are required to make environmental justice a strong global movement for sustainability, according to Martínez-Aler [30], as cited above.

At first, the construction of the environmental issue was based on either "utilitarian" or "cultural" reasons. In the first, the environment is one and consists of material resources without specific and differentiated socio-cultural content, expressed in quantities, where questions arise regarding the means and not the purpose for which the society exploits the natural resources. In the second, on the other hand, questions arise regarding the purpose, including the socio-cultural dimension, where there is no environment without subject, presenting meanings and reasoning according to the standards of different societies and cultures. According to the utilitarian reasoning, the environmental risks are unique, whereas for the cultural reasoning, the environmental risks are differentiated and unevenly distributed, since social groups have unequal chances of escaping.

The two reasons outlined correspond to two models of strategic action. The utilitarian reasoning configured the ecological modernization strategy via market affirmation, technical progress and political consensus. The "ownership society" advocated by neoconservatism is its north: a revolution of efficiency is raised to save the planet, establishing a price for what is priceless. The cultural reasoning, in turn, denounces and seeks to overcome the uneven distribution of benefits and environmental damage. It stems from the consideration that social injustice and environmental degradation have the same root, so that the unequal distribution of power over environmental resources should be changed by removing from the powerful the ability to transfer the environmental costs of development to the most dispossessed [57].

The Environmental Economics is relevant to the Political Ecology, since it studies the metabolism of society and enables the conflicts involved in the use of the environment to be expressed in different valuation languages, according to Barry [55], as cited previously.

The German economist Kapp [58] was one of the inspiring of Political Ecology. In 1950, Kapp [58] published the book "The Social Costs of Private Enterprises", which looked at sources of social harm, induced

by the capitalist economy operation and business action, from the costs associated with water and air pollution to the harm to individuals, such as professional diseases, misfortunes, exploiting female and underage labor. According to Kapp [58], cited above, environmental degradation would be the largest category of social costs, albeit little known and very vaguely defined. The social costs were defined as:

The concept of social costs should include, in addition to so-called economic consequences, those destructive effects and human sacrifices that modern industrial society and modern technology impose upon the physical and psychological health of individuals, on the one hand, and the freedom of determining his choices, his action, his life and his leisure on the other [58].

In 1974, the Polish economist Sachs [59] published "Environment and styles of development", which criticized the development model proposed for the peripheral regions, whereby those nations should be industrially modernized to achieve progress. It also launched six principles for development, like as follow.

- 1) the satisfaction of basic needs;
- 2) the solidarity with future generations;
- 3) the participation of the population involved;
- 4) the preservation of natural resources and the environment in general;
- 5) the development of a social system, ensuring employment, social security and respect for other cultures; and
- 6) Education programs.

This document advanced the concept of eco-development proposed by Strong [38], as cited previously, placing greater emphasis on the social dimension. But, for Sachs [59], as mentioned above, the development process should lead to steady growth with equitable distribution of income thus decreasing social differences and improving the quality of life.

To Bellen [3], cited in initial pages of this paper, the concept of eco-development stemmed from the concern with the development model to be adopted by Third World countries, but gained global importance and usefulness, as it applies to the analysis of relations between the development and the environment.

Also in the 1970s, two reference documents were drafted that followed the proposed development from the productive restructuring, the "Declaration of Cocoyok", by UNEP [60], and the "Dag-Hammarsköld Report", by the Dag-Hammarsköld Foundation [61]. According to Kavinski [14], mentioned previously:

UNEP [60] and Dag-Hammarsköld Foundation [61] criticized strongly the adopted model of society, the industrial technologies employed to maintain this model, the intensive use of non-renewable natural resources, energy matrix based on oil, the lack of equity in the distribution of wealth, the no access to social well-being of some classes and especially the dependence on non-industrialized nations, which prevented the appreciation of the political and social processes at local levels [14].

According UNEP [60] The Declaration of Cocoyok was the result of the United Nations Conference on Trade and Development, UNCTD, held in 1974 in Cocoyok (Mexico), to identify the economic and social factors that led to environmental degradation. In the statement, it was clear that the current development model (focused only on economic

growth) did not take into account basic human needs and, since these needs could not be met, this process could not be named "development", according to Odum [41] and UNEP [27], cited previously. The document suggests that the solution to the crisis would be to design a development process in which basic human needs are met without extrapolating the biophysical limits of the environment, according to UNEP [27].

The Dag-Hammarsköld Report, published by the Dag-Hammarsköld Foundation in partnership with UNEP and other organizations of the UN System, related environmental degradation to the power structure and suggested that a new development model should be conceived, based on "mobilization forces capable of changing the structures of the current systems", according to Bellen [3] mentioned previously. And, still according UNEP [27]:

In 1979, the first World Climate Conference was held in Geneva (Switzerland) in response to a series of studies on warming global temperatures (Arrhenius already in 1896 warned of the greenhouse effect). The main conclusion of the meeting was that the anthropogenic carbon dioxide emissions could have a long term effect on the climate. The World Climate Program was established the following year to provide an international cooperation framework for climate research and a platform for identifying the key issues relevant to global climate change in the 1980s and 1990s including the depletion of the ozone layer and global warming [27].

The 1980s was marked by the initial attempt to formalize a concept for the term "sustainable development" [2,27], but its origin is considered to go back to the works of Malthus, at the end of the XVII century, according to Dalal-Clayton [61,62]. To Romeiro [63], the concept has also emerged in the 1970s under the name of eco-development, from works of Strong [38] and Sachs [59].

In 1980, the IUCN [64] launched the strategy "World Conservation Strategy: living resources conservation for sustainable development", WCS, with support from the World Wide Foundation, WWF and UNEP, where it was acknowledged that resolving environmental problems needed long-term efforts to integrate environmental and developmental objectives. The document presented three goals for conservation of the ecosphere, "the maintenance of essential ecological processes and life support systems, the preservation of genetic diversity and the sustainable use of species and ecosystems".

Bellen [3], mentioned previously, considers this the first time the term "sustainable development" was discussed and defined in the strategy as: type of development that provides real gains in the quality of human life and at the same time conserves the vitality and diversity of the Earth. The goal is development that is sustainable. Today, this concept can be seen as visionary, but it is achievable. For more and more people, this seems to be our only rational option.

In 1983, UNEP has formed the World Commission on Environment and Development - WCED (or "Brundtland Commission"), in order to propose a global agenda for change, to be effective from 2000 [65]. The commission gathered impressions of government leaders and people from all over the world about issues related to development and environment, in public meetings held for this purpose. The commission's final report, entitled "Our common future" (or "Brundtland Report") was published by UNEP [65], in 1987, and defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [59], rescuing the ethical stance of the Stockholm Declaration, published 15 years earlier.

Bellen [3], cited previously, states that the difference between the “World Conservation Strategy” in 1980 and the “Brundtland Report” in 1987 is that in the latter, the focus was shifted from the sustainable development concept to the human element and that, until then, environmental integrity was more emphasized. The “Brundtland Report” was a highly political document, more than scientific, as “its strongest proposal is the legal and institutional changes in the national and international levels”, according to Barbieri and Lage [66].

The 80s was also marked by three major multilateral environmental agreements: the “United Nations Convention on the Law of the Sea” (UNCLOS) of 1982; the “Montreal Protocol on Substances that Deplete the Ozone Layer” (or “Montreal Protocol”) of 1987; and the “Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal”, 1989, according to UNEP [27].

The UNCLOS of 1982 included several determinations to protect the marine environment, including: the extent of the sovereign right of countries on marine resources located within the limits of up to 200 miles, a region referred to as the Exclusive Economic Zone (EEZ); adoption of measures for management and conservation of natural resources; a regional and global cooperation commitment to environmental protection and research; a commitment to minimize marine pollution, including pollution on the coast; and restrictions on dumping carried out by ships at sea [27].

In 1984, the World Industry Conference on Environmental Management was conducted by the International Chamber of Commerce, in face of the industrial disasters of the 70s and 80s. But if on the one hand some governments were implementing codes of conduct for companies (Canada was one of the first) on the other, many companies had migrated their manufacturing plants to countries of the Southern hemisphere to escape the hard laws of their countries. A change in the late 1980s introduced the concept of eco-efficiency “in the industrial environment, as a way to both reduce environmental impact and increase profitability” [27].

The Montreal Protocol of 1987 implemented the decisions of the “Vienna Convention on Substances that deplete the Ozone Layer” (or “Vienna Convention”), held in 1985. The signatory countries must annually provide statistical data on production, import and export of substances that deplete the layer ozone, which are used by the secretariat to prepare national reports [27].

In 1988, the Intergovernmental Panel on Climatic Changes (IPCC) was established by UNEP and the World Meteorological Organization with three Working Groups (WG) to assess climate change, its socioeconomic and environmental impacts, and the strategies to mitigate such impacts. The first group (WGI) assesses the physical aspects of the climate system and climate change; the second (WGII) assesses the vulnerability of socioeconomic and natural systems due to climate change, the positive and negative consequences of such changes and the options for society to adapt to them; the third (WGIII), evaluates the mitigation options of climate change by limiting or preventing Greenhouse Gases (GHG) and the strengthening of activities that remove them from the atmosphere.

The 1989 Basel Convention had three objectives: reduce the movement of hazardous waste across borders of countries; minimize the production of such waste; and prohibit its transportation to countries that do not have the ability dispose of it in an environmentally safe manner, according UNEP [27].

1990-2000: Implementation of actions for the sustainable development

For the UNEP [27], some ideas concerning the institutional level

that permeated the 1980s contributed to the realization of so many international events in the following decade, such as the need for participation of different actors in discussions raised and increasing accounting of the social and environmental aspects. In this regard, several meetings were held at the regional, sub-regional and national levels to address the environmental issue, and the Bergen Conference on Action for a Common Future, the first ministerial conference in Bergen (Norway) in 1990 was a highlight.

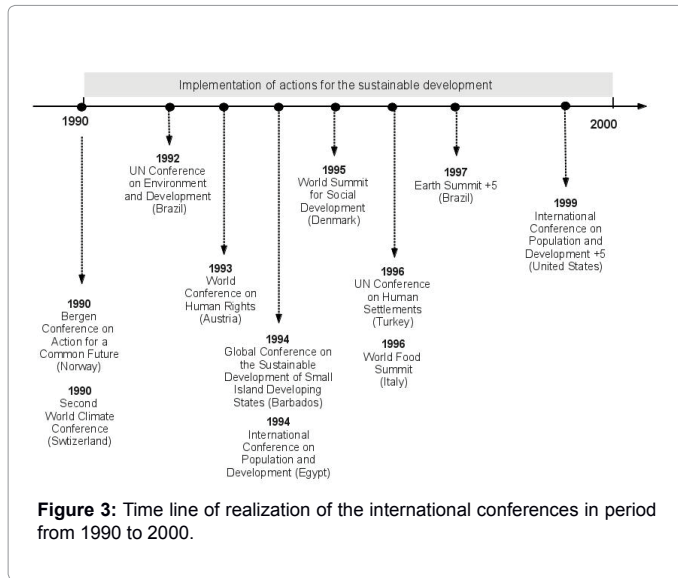
The Figure 3 presents the relevant international conferences to the period between 1990 and 2000. It's important to note that from 1970 to 1990, this research wake -up five international conferences related with the N-S relationship and the related themes. From 1990 to 2000, a half of time of the mentioned period, this number passed to eleven occurrences.

After the reflecting upon a definition for sustainability or sustainable development, in the 1990s, it was sought to implement programs of action for development combined with environmental conservation and social justice, according to UNEP [27]. The same decade was also marked by the profusion of initiatives aimed at quantifying the social and environmental aspects related to sustainable development, and various systems of indicators and synthetic indexes were proposed for this purpose, according to Neto [1].

Although many of the 1990s initiatives to discuss issues related to social and environmental sustainability stemmed from international organizations and governments, the subject also interested the business community, due to either awareness of the fundamental role of business in addressing the problem, or the glimpse of new business opportunities, hence the criticism of Acselrad [57]: from the 1990s, the ‘environment’ is seen as ‘business opportunity’; the environment and sustainability become important categories for interregional and intercity competition; to attract capital, the “ecology” and “sustainability” can become just a symbol, a brand that wants to be attractive.

In 1991, the Second World Industry Conference on Environmental Management, was held in the Netherlands by the International Chamber of Commerce, in which the Business Charter for Sustainable Development, with 15 principles for establishing a business environment management system was proposed and signed [14]. Another important fact was the consolidation of the World Business Council for Sustainable Development, WBCSD, in 1995, associated to the United Nations and based in Geneva, aiming to create opportunities for the participation of enterprises in the international discussions on sustainable industrial development [14] and stimulate the adoption of targets to reduce industrial pollution and emissions of Greenhouse Gases (GHG), according to UNEP [27].

The Global Climate Observing System was created as a result of the Second World Climate Conference held in 1990. In the same year, the first IPCC assessment report was published and warned about the contribution of human activities to global warming by raising the concentration of GHG in the atmosphere. The report presented the results of climate modeling, considering four scenarios for raising the temperature of the planet. The worst scenario assumed maintenance of GHG emission levels, according to which estimated an increase of 0.3°C per decade during the XXI century (with an uncertainty range from 0.2 to 0.5°C per decade). The report also pointed out that even if emissions of anthropogenic carbon dioxide have been shown to be smaller than those that occur naturally on the planet, they have contributed to the change in the global carbon cycle, since they interfere with the natural equilibrium. The report served as a stimulus for carrying out the



Convention on Climate Change in 1992. The second IPCC assessment report was published in 1995.

In 1992, Eco-92 was held in Rio de Janeiro, the United Nations Conference on Environment and Development, UNCED. To Neto [1], this event marked the inclusion of environmental considerations in discussions about the development. The conference was also a highlight among all international meetings due to the record number of participants, from heads of state, delegates, non-governmental organizations and journalists and the high number of resulting documents.

Unlike Stockholm, five documents were prepared in Rio de Janeiro. The Statement on Forest and Earth were understood as a manifestation of the principle of heads of state and governments. The Agenda 21 was a plan of action to reduce environmental degradation to be implemented by 2000, and the Convention on Biological Diversity (CBD) and the Convention on Climate Change (CMC) won fans that held new international meetings that generated more documents, according Odum [41].

Agenda 21 is an action program that was developed from specialized contributions of several governments and international organizations, from which the document “Caring for the earth: a strategy for sustainable living” published in 1991 by IUCN, WWF and UNEP is highlighted.

The United Nations Commission on Sustainable Development, CSD, was set up under the Eco-92, in order to assist the international community in achieving sustainable development. Chapter 40 of Agenda 21 states clearly the importance of formulating indicators as a tool for evaluating and monitoring the progress of the initiatives aimed at sustainable development. The third meeting of the CSD, held in 1995, attended the recommendation of the conference and adopted a work program which specified a compendium of 134 indicators, a structure with methodological sheets for its application and a guide to decision makers, which have been tested by volunteer countries from 1996, according to Turner et al. [56], Acsehrad [57] and UNDESA [67].

The “Declaration of Rio de Janeiro on Environment and Sustainable Development”, one of the documents from the Eco-92, was designed to replace the “Universal Declaration of Environmental Protection

and Sustainable Development”, the document that had been suggested in the Brundtland Report in 1987 and was named later as the “Earth Charter”. The final text of the Earth Charter was approved in 2000 only after efforts of UNEP and the International Green Cross, with the financial support from the Dutch government [14]. The document is the result of international meetings held by the United Nations in the 1990s and underscores the importance of the engagement of all people in the pursuit of human wellbeing.

The Earth Charter encourages all people to recognize the shared responsibility, each according to their situation and capacity, for the welfare of the whole human family, the greater community of life and future generations. Recognizing the interrelationship of environmental between the economic problems and the social and cultural aspects of humanity, the Earth Charter shows an inclusive and integrated framework, according to UNESCO [68].

“The Biodiversity Convention”, of 1992, other result of the Eco-92, was the first global agreement on the conservation and sustainable use of biodiversity, establishing three goals: conservation of biological diversity, sustainable use of its components, and sharing of the benefits of using genetic resources. The Southern Hemisphere countries had some criticisms and claimed for the formulation of a Protocol on Biosafety. The “Cartagena Protocol on Biosafety”, adopted in 2000 and ratified by 182 countries in 2001, deals with potential trade risks and accidents with genetically modified organisms.

The United Nations Framework Convention on Climate Change, UNFCCC, of 1992 was a direct consequence of the Second World Climate Conference, of 1990, whose main objective was to stabilize the GHG emissions and to prevent the interference of anthropogenic activities on global climate. The convention used the principle of equity (“common but differentiated responsibilities”), to guide the adoption of a regulatory framework [59]. This principle reflected the consensus that most GHG emissions came from industrialized countries. The “Kyoto Protocol”, adopted in 1997, ratified by 84 countries until 2001, except the United States, resulted from the considerations of the second global climate IPCC assessment report of 1995, which officially acknowledged the influence of human activities on climate, according to Kavinski [14].

The “United Nations Convention to Combat Desertification”, CCD, of 1994, another result of the Eco-92, has not received as much attention as CBD and UNFCCC since the industrialized countries opposed the idea that “they should bear any financial responsibility in combating desertification”, according to Center for Science and Environment [10], cited by [59]. Despite the small support to the Convention to Combat Desertification, it stands out in relation to the CBD and the UNFCCC in two aspects: endorses and applies the bottom-up approach, emphasizing the importance of the participation of actors and non-governmental organizations in combating desertification; and has annexes that offer detailed regional panoramas about the desertification problem in specific regions such as Africa, the northern Mediterranean, Latin America and the Caribbean [14,67].

In 1997, five years after UNCED, the Rio +5 Summit was held in New York to assess progress in relation to the conference’s goals. The general conclusion of the meeting was that although some progress has been achieved in relation to sustainable development, the Agenda XXI objectives had not been achieved. Specifically, it was pointed out that there was not a full adoption of the principle of equity (common but differentiated responsibilities) and that the economic and global political structures did not progress towards poverty reduction and the fight against predatory use of natural resources [14].

According to Kavinski [14], social movements from around the world gathered in Geneva, in 1998, for the launch of a global coordination against global market, called “Peoples Global Action”. Thousands of organizations gathered in a decentralized manner and without following a hierarchical structure, in meetings that were termed as “Global Days of Action against the Capitalist System”. The movement culminated in a worldwide protest in 1999, when several countries simultaneously had days of global action and protesters prevented the arrival of several delegates of the World Trade Organization for the Ministerial Conference in Seattle. The event alerted the authorities about the strength of social organizations against the capitalist system.

2000-2010: Follow-up actions for the sustainable development

The beginning of the XXI century was marked by international events focused on monitoring the progress made by countries towards the goals for sustainable development proposed in international conferences and conventions held in the previous decade, according to Raustiala [69].

The Figure 4 presents the time line of realization of the international conferences in the period from 2000 to 2010. Comparing the periods of 1990-2000 and of 2000-2010, the number of realized international events grows from 11 to 17. Many of these initiatives were a response to the demonstrations that took place at the end of the twentieth century, when “the conflicts between the north and south and between the civil society and industry intensified”, according to UNEP [27].

In this questioning atmosphere regarding the usefulness of the international agencies belonging to the United Nations system, the then Secretary General, Annan [70], prepared a paper published in 2000 and entitled “We the peoples: the role of the UN in the XXI Century”, in which he justified the UN failures by arguing that “the United Nations can only help to solve these problems if all we are firmly resolved to take into fruition our common mission”, further suggesting that the solution to the problems can be attained by the maintenance of international institutional arrangements, by close cooperation between the countries and the strengthening of national states. Annan [70] also argued that multilateral cooperation between countries had brought about the strengthening of world globalization, but this fact had contributed to the weakening of multilateralism [70].

Also in 2000, the Millennium World Summit was held in New York, and the “Millennium Declaration” was published. This document adopted a world view in which developed and developing countries work together for the

common good, especially the less fortunate. To establish a framework within which progress could be measured, this vision was translated into 8 goals, 18 targets and 48 millennium development indicators that describe what needs to be done to reduce poverty and achieve sustainable development in 25 years, 1990-2015, according to UNEP [27].

The complete list of objectives, goals and millennium development indicators first appeared in September 2001, in the UN document “Roadmap Goals for the Implementation of the Millennium Declaration of the United Nations”. The statement was approved in September 2001 and its objectives, named “Millennium Development Goals”, MDG, were followed by the ideas exposed in the “Development and Poverty Eradication” section of the Millennium Declaration, according to UNEP [27].

The support of the MDGs within the UN System is coordinated

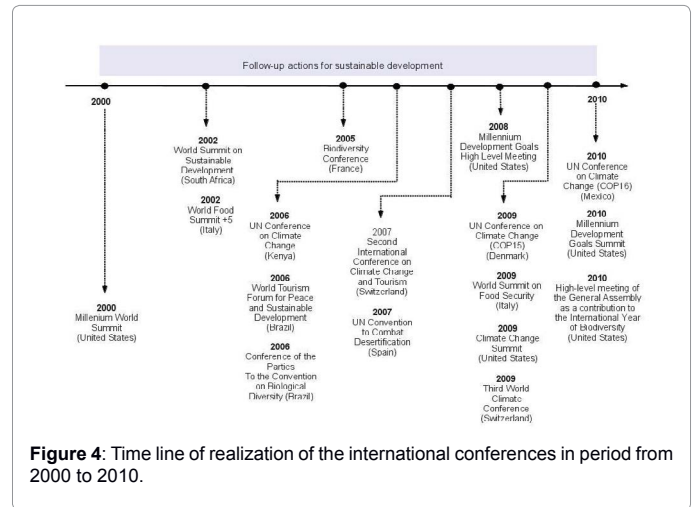


Figure 4: Time line of realization of the international conferences in period from 2000 to 2010.

by the UNEP Administrator, who is also the chairman of the UN Development Group and general campaign leader of the MDGs. According to the UNEP [27], efforts by the MDGs are supported by a set of solid pillars:

- Global and regional regular reports, in addition to MDGs reports of countries that monitor developments;
- “The Millennium Campaign”, which uses the reports, surveys and other sources to build a political and popular movement supporting the MDGs, where the most important is the participation of the poor people, both in developing and developed countries; and
- The United Nations System, working together to provide coordinated and concrete assistance to each country, in order to ensure that national programs and projects are designed to achieve the Goals.

The World Water Forum was held still in the 2000s, and the third IPCC report was published, pointing out that global warming continued to increase. In 2001, the “Stockholm Convention on Persistent Organic Pollutants” was held. In the same year, ministers of 140 countries met in Doha, in the Fourth Ministerial Conference of Trade. The “Doha Declaration”, a document that stemmed from the meeting, introduced a controversial resolution: the granting of a new mandate to the World Trade Organization (WTO) “allowed the Board to arbitrate on the crisis of natural resources, and to determine jurisdiction in international agreements related to conflicts on trade and environment”, according to Kavinski [14].

In 2002, the World Summit on Sustainable Development was held in Johannesburg (South Africa), also known as Rio+10. The summit produced a “plan for instrumental actions to guide national and international policies in pursuit of sustainable development”. However, the Johannesburg Conference reaffirmed the sovereignty of the interests of international organizations over the countries own interests, according to Kavinski [14]:

For many, the Doha agreement could one day be known as a declaration of silent war against the rights of people on the planet and a threat to the sovereignty of the people to defend their own resources. However, at that time, the preparatory report for Johannesburg, presented by the UN, qualified the Doha agreements, from the WTO, as a success [14].

Despite the granting of powers to the WTO to rule on issues

involving the use of natural resources, supported by the UN System, Dasgupta et al. [29], Godoy [71], Hartwick [72], Solow [73] and Togashi [74] states that the Rio 1992, Millennium 2000 and Johannesburg 2002 Declarations had recommendations for reducing global patterns of production and consumption in order to meet the objectives of sustainable development. The eighth principle of the Rio Declaration on Environment and Development states that to achieve sustainable development and a higher quality of life for all, the State should reduce and eliminate unsustainable patterns of production and consumption and promote appropriate demographic policies.

The Chapter I, item 6, of the United Nations Millennium Declaration states the same principle: 'it is necessary to change the current unsustainable patterns of production and consumption in the interest of our future welfare and future generations.' Ten years after the UN Conference on Environment and Development, the Johannesburg Conference on Sustainable Development when dealing with consumption and production patterns, stated that: "if the entire population of the world lived like an average inhabitant of high-income countries, we would need over 2.6 planets to sustain us all", according to Hartwick [72].

In contrast, the "Doha agreement" handed the control over the natural resources from the State to the corporate hands since it bestowed the WTO rights to the follow list, according to Kavinski [14]:

- increase corporate control over natural resources by allowing decisions about their use to be based increasingly on the short term demand of the global financial markets;
- intensify the exploitation of forests, agriculture and fishing for exploration, as well as the burning of fossil fuels, mining and the exploitation of other natural resources;
- eliminate more policies for conservation and community development for considering them unfair barriers to trade;
- determine who appropriates the remains of the world's natural resources in serious degradation process; and
- Subordinate the Multilateral Environmental Agreements (MEA) to the rights to corporations established in the regulations of the WTO.

The 2000s was also marked by the world's attention to climate change. The third and fourth IPCC assessment reports on climate change were published in 2001 and 2007, which showed a great concern regarding the capacity of human activities to change global climate. The Third Conference on Climate Change was held in Geneva in 2009, focusing on climate predictions and information for decision makers. At the meeting, a declaration which provides for the establishment of an assessment structure to be used at the international level in order to improve climate predictions was adopted. The declaration also provides for the creation of a task force for this purpose, which will consult with countries, international organizations and decision makers, partners of the World Meteorological Organization, in order to collect their impressions and publish a report with that assessment structure.

Conclusions

The facts highlighted in this text show that there are different approaches to the subject of environmental sustainability, depending on the views and interests of agents, but mostly, depending on the historical moment in which the debates on the subject are caught. In the two centuries analyzed, the viewpoint regarding the delicate

relationship between society and nature changed, and some distinct periods could be identified:

- by the end of the eighteenth century, when the focus was on the study of the influences of nature in human life;
- the period between the early nineteenth century and the early twentieth century marked by the evaluation of the pressure of human activities on natural resources;
- the period of the mid-twentieth century, with the profusion of reviews of the social and environmental damage that resulted from the postwar development model, motivated by the concern for the increased incidence of industrial disasters of major global repercussions and with the increase in poverty on a global scale; and
- the period from the late twentieth century to the early twenty-first century, characterized by the unprecedented number of international conferences and conventions searching for a new definition to development that takes into account environmental conservation and social justice, formulation and implementation of assessment and control tools and, for that matter, the intensification of clashes between civil society and the industry, among international organizations and movements in defense of human rights and nature conservation.

Given the above scenario, it is difficult to predict whether one day a consensus on what constitutes "sustainable development" can and will be reached. To Bellen [3]:

Sustainable development cannot yet be considered a concept, and may never be constituted as such, with a coherent and articulated theoretical body. The phrase, widely adopted in various contexts, reflects a collective ideal, or even a utopia, in the sense of a future vision on which society, or at least a portion of it, based their projects [3].

Still, it is expected that society finds the "middle way", where it can reconcile the interests, towards a common future fairer to all and to ensure the survival of the human species.

Highlights

- This text provides a retrospective of the recent History (1800-2010) in the thematic of the Nature and Society relationship;
- The research material consists of relevant books and reports published and the international events held in this area;
- The three identified main periods with emergence of different approaches adopted to address the environmental and social problems are entitled as: "A period of attention turned to the impact of human activities", covering the initial period between 1800 and 1900; "The pre-Stockholm environmentalism period", 1900-1970; and "The post-Stockholm ecologism period", from 1970 to 2010;
- The historical moment and the different kind of world view are influencing the construction of the mental models, the research approaches and the experimental designs, which aim to deal with the challenges of implementation of the sustainable development;
- In the course of time, there is an increment in the frequency of realization of the international events related to the thematics of N-S relationship and similar others;

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