SUSTAINABLE DEVELOPMENT: from Awareness to Requirements, a Paradigmatic Vision of Environmental Economic Thought

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ABSTRACT

The objective of this work is to present the fundamentals and concepts related to sustainable development, as well as their evolution. It is sought, specifically, to present an analysis of the main lines of economic thought applied to the environmental context and a reflexive and epistemological discussion about the paths trodden by them within the paradigmatic approach of Burrel and Morgan. It consists of three main chapters: the first deals with the evolution of the concepts of sustainable development; the second seeks to analyze the principle lines of thought about the environmental economy and its central directions; finally, the discussions and reflections of these lines of thought in the paradigmatic context.

Keywords: sustainable development; environmental economy; sociological paradigms.

RESUMO

O trabalho objetiva apresentar os fundamentos e os conceitos relacionados ao desenvolvimento sustentável, bem como a evolução dos mesmos. Busca-se, especificamente, apresentar uma análise das principais linhas de pensamento econômico aplicadas ao contexto ambiental e uma discussão reflexiva e epistemológica sobre os caminhos trilhados pelas mesmas dentro da abordagem paradigmática de Burrel e Morgan. Compõe-se de três capítulos principais: o primeiro trata a evolução dos conceitos sobre desenvolvimento sustentável; o segundo busca analisar as principais linhas de pensamento da economia do meio ambiente e seus direcionamentos centrais; por último, as discussões e reflexões dessas linhas de pensamento no contexto paradigmático.

Palavras-Chave: desenvolvimento sustentável; economia ambiental; paradigmas sociológicos.

Introduction

The starting point, basic and fundamental, for sustainability permeates thought the correct and responsible use of natural resources in order to meet the needs of current generations without hindering the capacity of future generations to meet their own needs. Sustainable development, as conciliation to the economic, social and environmental strands, has become a guide for companies in their processes of production, operation and commercialization of goods and services.

It is known that the productive process is considered one of the principle causes of the depletion of the environmental system, mainly by the use of natural resources as factors of production in a much greater proportion than their capacity for renewal and absorption. Coupled with this is unbridled and irresponsible consumerism. The impacts on nature create environmental and social costs that the conventional market system still does not take into consideration in the process of pricing goods and services. This phenomenon is known as negative externalities, defined by Chen (2007) as consumption or production that has an indirect effect upon the consumption or production of others and is not reflected in market prices.

The first conscious steps with an environmentally sustainable commitment were taken in the 60s and 70s of the past century, with the rise of the work *Silent Spring* by Rachel Carson, with the holding of the Stockholm Conference in 1972 and, concomitantly, with the publication of the report *Limits to Growth*. The phenomenon of environmental awareness then arose, occupying its space next to the concerns of the domains and impositions of power. As a consequence of this, the search for forms and methods for internalizing the inherent costs to the impacts caused in nature, with the goal of making the use of environmental goods possible and rational.

Although hypotheses have already been raised by economic thinkers, it was from the steps mentioned above and, mainly, in the 90s the concern with the limitations of the planet's natural resources to absorb the demand of production and consumption, as well as the search for innovations that promote gains in well-being, that they became present in strategic business discussions (Parry *et al*., 2003), making the necessity of a productive system that respects the obligation of preserving the environment and its ecosystemic services clear and evident.

Technological innovations, legal mechanisms and reflective discussions with the objective of understanding environmental issues may indicate solutions to neglect and unconscious exploitation, contributing to lesser impact and devastation. The possibility of equilibrium exists, however there is the need for responsibility and action.

Accordingly, by proposing to be a small parcel of this contribution, the present work aims to describe the evolution of environmental awareness, through the lines of economic thought directed at environmental concerns, and the paths trodden by these trends in the search for order and sustainable development. Specifically it also seeks to reflect upon and analyze the philosophical and paradigmatic position of these lines, having the propositions of Burrel and Morgan (1979) as its theoretical foundation.

Such a study is justified by the fact of assisting in understanding environmental responsibility and in the epistemological reflection related to awareness and to environmental sustainability.

It uses the comparative method that, according to Gil (1991), conducts the investigation of individuals, classes, thoughts and facts, with a view of highlighting their differences, similarities and evolutions. The chosen technique relies upon the bibliographical study based on books, articles and scientific works on the subject.

Sustainable Development

The Industrial Revolution and the triumph of classical liberalism provided for the rise and expansion of the modern capitalist system. The evolution of this system was significant and unquestionable, ushering humanity into an era of large-scale production and the massive use of raw materials, coming from nature. With the significant increase of production the beneficial consequences increase, new goods and services, ease and convenience, speed and safety, among others. However, serious impacts also arose from this evolution that mainly reached the environment.

According to May *et al*. (2003), the problem of this issue is that the entrepreneurs ignored the fact that the global environmental problems would bring consequences much later on in time, acting upon the remote descendants of every family. This is due to the fact that, many times, the immediacy of productive organizations does not permit the visualization of these future consequences.

The impacts of production and consumption usually generate pressures on the environment, as much by the use of exhaustible natural resources, as by pollution. Such pressures, known as negative externalities, provoke a change in society with respect to the search for maintaining the system without destructive impacts on the environment.

According to Wirth *et al*. (2006) this occurs when the wear and tear of a model implemented in the post-war that provided rapid economic growth, through the investment of goods and capital

and the exploitation of natural resources, is perceived, though without an explicit concern with respect to pollution or environmental imbalances. This model was depleted when the environment did not supply more resources that could be exploited without provoking direct damage to human beings.

With the 1972 publication of the Club of Rome Report, also known as Limits to Growth, the debate about the economic and environmental relationships gained even more importance. It is worth mentioning the United Nations Conference on Environment and Development – ECO92, held in the city of Rio de Janeiro in 1992, as a major milestone in the inclusion of Brazil in discussions of this context.

According to Donaire (1999), the term ecologically sustianed or sustainable development arose from the United Nations World Commission on Environment and Development in 1987, later called “Our Common Future”, involving aspects such as economic growth, social fairness and ecological balance. In this way, the concept of sustainable development goes beyond a simple growth of production and of economic development itself, it covers deeper issues and of complicated measurement that cause sizeable impacts, both in society, and especially in productive organizations. The search for sustainable development has become not just a matter of principles, but of basic necessity for the economy, from the micro- and macroeconomic perspective. Regarding the organizational strategies, it is true that the environmental dimension is already incorporated into the policies and courses of many companies.

According to Lustosa (2010), development is considered sustainable by not running out in jolt of growth, at the cost of depleting the stock of natural resources. Thus, it does not compromise future development and includes the promotion of man in political, social, economic, environment and cultural aspects. The latter is presented with the goal of guaranteeing the upgrading of awareness about material consumption and environmental viability to society, not accepting development at all costs, ultimately from the moment there is damage to the environment, the reflection is certain on the quality of human life.

According to Cavalcanti (2010), environmental sustainability can be defined as a continuous process of upgrading the conditions of life, continually seeking to minimize the impacts of the utilization of natural resources. Yet the author stresses that the economic studies have given their share of the contribution through the incessant search for correct valuation and pricing of environmental goods, having as central motive the internalization of environmental costs in order to obtain prices that reflects the comprehensive marginal social opportunity costs.

In this sense, the section that follows aims to describe the lines of economic thought, directed toward environmental awareness, for later discussions and paradigmatic reflections.

Economic Schools and the Environment

According to Burrel and Morgan (1979), epistemological positivism attempts to explain and predict social events through research. According to the authors, the growth of knowledge is given as an essentially accumulative process, in which new information is included to the set of already existing knowledge, eliminating false hypotheses.

The evolution of economic thought is not different. Specifically in the environmental economy, the most prominent lines of thought that have arisen, and will the focus of this chapter are:

- Malthusian;
- Neoclassical;
- Ecological Economics;
- Economics of Sustainable Development (Evodevelopment).

Each line will be treated with a focus on its specific characteristics, rise, evolution and principal contributions to the understanding of environmental issues in the economic scope.

Malthusian

It has its origin in the theory of the English economist Thomas Robert Malthus whose doctrine related the evolution of the population and the productive capacity of the economy. By making this relation, Malthus said that population would grow in a geometric progression whereas production, principally of food, has its grown in an arithmetic progression. This would lead to a serious problem of low market supply with demand in frank expansion. In short, this theory went beyond this thought by treating principally with important questions, however little considered at that time, such as helping the poor classes, maintaining wages at a subsistence level and controlling birth rates. According to the author, the growth rate of the population should follow the means of subsistence.

A contemporary thinker of Malthus was David Ricardo, who also sought to formulate important questions to the understanding of the limits of economic growth. Hussen (2004) shows that Ricardo, unlike Malthus, said that it would not be population growth that would bring consequences for the expansion of the economy, but it would be the progressive decline in the quality and quantity of natural resources, mainly arable land. This decline, defined as diminishing

marginal productivity, would gravely impact long-term economic growth, mainly due to the agricultural frontier being expanded into less fertile lands.

The constant concern of classical economics was with the so-called “steady state,” cited both by Adam Smith and by Ricardo himself, which indicated a point at which economic growth would become nil, it would have a greater impact if this were to occur before the population had achieved an elevated level of welfare.

These considerations provided the base for the rise of a school of thinkers of the economic issue of the environment that analyzes how the scarcity of natural resources could lead to problems in economic growth. This school of thought became known as Malthusian. According to Hussen (2004), the main focus of these thinkers has been the development of conceptual models that incorporate effects, not just of population and scarcity of resources, but also of technology and human institutions on environmental sustainability.

The same author also states that recent evolutions of this theory show greater attention to population growth, forgetting the importance of the increase of per capita consumption that causes stronger impacts on the environment independent of population growth. This could explain the fact that, even with the level of population growth falling in recent years, the depletion of natural resources continues in frank expansion. This increase in per capita consumption is principally caused by the strong influence of advertising and encouraging consumption and a high rate of waste and disposal of products with ever shorter life cycles.

Technology is also seen by this school as a component provoking environmental damage, mainly due to changes in the variable composition of inputs and outputs. Thus, they believe that the bulk of environmental degradations results from the improper use of modern technologies of extraction, production and consumption in the economy.

The central policies for the environmental issue of this line of thought are summarized in three specific considerations: (i) control of population growth; (ii) moderation or reduction of the per capita use of natural resources; and (iii) promotion and development of technologies not harmful to the environment. The Club of Rome report itself generated by a team of researchers at the Massachusetts Institute of Technology (MIT) is one of the principal works of the Malthusian school on the environment, in which it was shown that the growth of the population and of products was seriously compromised by the economic model present until then.

This first line of thought received several criticisms, mainly in terms of the issue of considering only the negative impacts of technology, not taking into account some contributions that certain innovations would bring to the preservation of environmental resources.

Neoclassical

This school possesses this name for applying the basic considerations of the classical and neoclassical economy theories to environmental issues, mainly those referring to the theory of overall balance. Its main direction is the belief that environmental problems can be solved by the concepts of mainstream economics, giving much emphasis to the applicability of the so-called environmental micro-economy.

The fundamentals of this school, according to Kuwahara (2009), are based on utilitarianism, methodological individualism and equilibrium. According to Romeiro (2003), this school says that natural resources do not present a limit to the expansion of the economy in the long term. This would happen mainly because natural resource factors can be perfectly substituted by other factors, such as capital and labor, in the even of scarcity. This consideration became known as weak sustainability.

The thinkers of this line acknowledge the severity of the issue of environmental degradation and state that it occurs due to the fact that environmental impacts are not internalized in the method of forming market prices. One of the principal motives that such internalization is not realized is that the environment does not possess defined property.

Donaire (1999) states that to resolve this matter it is necessary to determine the property rights of environmental resources and the negotiation of these right in private markets, in order to determine the cost of their utilization. For this to occur, the same author suggests two forms of determining this property: (1) the creation of a market for buying and selling pollution rights (similar to the carbon credits market); and (2) the adoption of compensatory mechanisms for maintaining environmental quality.

With the goal of achieving such objectives, this school relied on the importance of economically valuing the environment, believing this valuation to be the correct attempt at attributing monetary expression to natural resources, mainly because the prices of economic goods do not reflect the true total value of resources used in production. Marques and Comune (1997) show that the neoclassicists attribute this importance to environmental valuation as a manner of interrupting the degradation of natural resources before going beyond the point of no return.

The applicability of neoclassical though stimulated the rise of some economic instruments for environmental management and policy, like for example: Pigouvian taxes, pollution license auctions, subsidies, pollution quotas, fees, regulations and standard of environmental management. According to Corazza (2003) the use of these types of economic instruments is,

today, established with the goal of restoring the efficient functioning of the market and, thus, correcting its insufficiencies and failures.

Another important point of this school is the affirmation that the rise of the median income of families itself may be able to decrease pollution. This last consideration is based on the environmental curve of Kuznets, who, according to Hussen (2004), states that a certain society, when it reaches a high level of per capita income, presents an increase in the demand for better environmental quality. This curve is represented by the form of an inverted U, in which initially there is an increase in pollution due to increased per capita income, however up to a point where the inflection of this curve occurs (thus its form of an inverted U) showing that, even with a continual increase in per capita income, pollution is decreased as a result of a process of the population demanding and being aware of better environmental quality.

This theory of the environmental curve is hotly debated and, often, discredited by many researchers from the environmental side of the economy, mainly because many contrived that reached high levels of per capita income have now managed to decrease their pollution levels, or, often, end up exporting a part of this pollution to other countries. Another point of criticism of this line is the fact that other factors of production are considered perfect substitutes for natural resources, given that many of these resources and ecosystemic functions have complementary behavior in the process of production.

Pigouvian

Line of thought presented by Arthur Pigou, a neoclassical expert, around 1920. According to Donaire (1999), this school states that the matter of environmental pollution has its origin in the failure of the market mechanism that is incapable of reflecting the damage caused by the productive system to the environment and to third parties. Hence it is necessary to create a fee that makes the incorporation of the effects of pollution into production possible, which would determine a shift of the supply curve to the left, because the producers would not spontaneously make this incorporation. It is the principle of polluter pays, that is, the creator of the negative externality must offset the damage caused, in order to equalize the private costs to the social costs of contamination resulting from production.

The question that is raised by this school follows from the finding that there is a divergence between the product's net marginal private value and the product's net marginal social value, exactly by the lack of incorporation of the environmental losses in the productive process, that is,

the producer has a greater return on his investment because of not considering the environmental impact caused by him, but society in general loses with this impact.

According to Alcoforado (2001), the adoption of Pigouvian mechanisms encourages polluters to search for preventive methods under pressure from the costs coming from taxation. In this case, a company subject to taxes over how much it will contaminate the environment tends to compare its imposed costs with the costs of acquiring equipment and controlling contamination, of decreasing its production or of some other intent to reduce the impact.

Due to the fact that the application of taxes on polluters would have the goal of reducing the difference between the marginal private product and the marginal social product.

In short, Pigou's idea is to make a company pay for environmental resources as it pays for other resources such as labor, capital, technology etc.

Ecological Economics

Considered one of the most modern schools of sustainable thought, it arose in the American east coast in the 1980s, in opposition to, at that time, the neoclassical and conventional models.

Romeiro (2003) and Hussen (2004) state that in this line economic and ecological systems are seen as subsystems of a larger and more complex whole, thus imposing restrictions to the expansion of production; known as strong sustainability. In short, it means that the factors of production, including natural resources, are complementary and highly integrated in the productive process.

Despite being recent, it is a very well formed line, possessing the International Society for Ecological Economics (ISEE) and, in Brazil, the Sociedade Brasileira de Economia Ecológica *Brazilian Society of Ecological Economics* (ECOECO). Its focus is aggregating the studies of ecology and economics, with the intention of extrapolating conventional conceptions. It is the relationship of man with nature and the compatibility between economic growth and the availability of resources, seeking to treat environmental issues in a systemic and harmonious way, being, thus, dynamic and evolutionist.

According to Cavalcanti (2010), the image of a ship exemplifies well the different positions of two types of economic thought to identify the scale of the economy compatible with its ecological base,

> a ship, whose cargo – being distributed optimally in its interior (solution to the microeconomic problem) – must comply with the draft line. When water reaches this line, the ship is full; it has reached its safe cargo capacity (optimal scale). Environmental economists, working with markets, do not elaborate the issue of optimal cargo; they are only interested in the proper placement of the cargo in the ship. Ecological economists –

> appealing to the principles of physics and ecology – consider the size of the cargo fundamental. In the conception of a possible macroeconomy of the environment, the cargo capacity, therefore, assumes a key role. It is it that delimits the scope of sustainable development (CAVALCANTI, 2010, p.4).

Therefore, it is a multidisciplinary line, where the search for solutions to environmental issues goes through the utilization of relevant empirical studies and of scientific knowledge that until then were considered separately, like ecology, economics, physics, chemistry, among others.

The fundamental theoretical bases of the economic-ecological approach are found in works like Georgescu-Roegen (1971), which incorporated the notion of entropy of the Second Law of Thermodynamics that states that the quality of energy always degrades from the noblest (higher quality) to the least noble (lesser quality) to economic analysis. That is, productive processes create losses of material and energy that can never be recovered, thus imposing a limit to the productive process according to material-energy availability and the implications of its excessive use. Added to this is fact that to the extent that they are material and energy transformed via the processes of production and consumption, heat and material of entropy are in the end released into the environment, and it, often, does not have the capacity to assimilate such release.

The work of Daly and Farley (2004) is also an important contribution to the though of this school in dealing with the importance of establishing a sustainable scale of the utilization of natural resources and of their ecosystemic service, later defining a just way of distributing these resources and efficiently allocating them in the market, considering intra- and inter-generational fairness.

It is worth pointing out yet another important author for the formation of the ideas of this line of thought, Boulding (1966), who addressed ecological limits and the importance of the nature, extension, complexity and quality of the total capital stock as a way of measuring the success of an economy.

According to Alier (1998), the economy should be seen as an entropic flow of energy and materials that runs through its cycle, that is, differently form the neoclassical line, it sees the economic subsystem (production) immersed inside a broader system, where energy and raw materials enter in the flow of products and factors and later residual energy and waste material leave, which will, within the scope, be reintegrated into the flow.

Figure 1 illustrates this flow of energy and material in a productive process, recalling that part of the residual energy and waste materials are irreversibly lost:

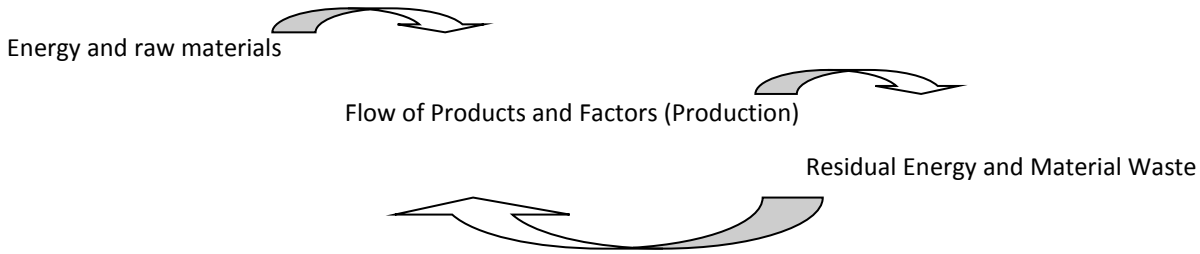

Figure 1. Outline of the cycle of energy and material in production
Source: the authors.

In this way, according to Montibeller-Filho (2001), the use of energy and materials should be minimized, as well as the production of waste and pollution, using for this more energetically efficient materials. This minimization should have its base in its renewal capacity, given that non-renewable resources should be utilized at a rate not higher than that of their substitution for renewable resources, thus conserving biological diversity and creating material waste with the ecosystem's capacity for assimilation and recycling.

Based on that, ecological economics explains that only after verifying the real cargo capacity of the planet in offering energy and raw materials and assimilating and recycling trash and wastes produced by society, can one get a sense of the economic valuation of the environment and internalize the environmental costs comprehensively in the production process. It is clear that the multidisciplinarity is a key point of ecological economics, in involving different sciences and their conceptions, both for explaining environmental issues and their consequences, as well as demonstrating the planet's cargo capacity with respect to human actions.

Ecodevelopment

This school seeks to restructure the relationship between society and nature in a positve sum game, a type of development that requires direct action by social actors, often indicating a change in the style of development of the same, taking into consideration the data of studies and research and cultural and ecological issues. The term ECO, coming from economics and ecology, clarifies a reorientation in terms of integration of planning social, economic and ecological concepts. The idea was to implement many issues addressed principally in the 1972 Environment Conference and in the 1987 Brundland Commission Report, the latter being responsible for the definition of sustainable development itself.

Sachs (1986) establishes the following basic principles of this new development model: (a) fulfillment of basic needs; (b) solidarity with future generations; (c) participation of an involved population; (d) preservations of natural resources and of the environment as a whole; (e)

elaboration of a social system guaranteeing work, social security and respect for other cultures; and, (f) educational programs.

According to Donaire (1999), the scholars of this school state that pollution is the fruit of the style of economic development that became the paradigm of the current capitalist society of consumption, mainly implemented by large multinational corporation, via massive advertising of their products, creating desires and habits often not so necessary. This action sought to, in this way, reproduce in the other countries in the world the same recipe for growth of the more industrialized economies.

This school shows a multiple scope in considering matters like justice, equality and distribution of production and income. Hussen (2004) shows that these considerations have a temporal dimension and generally involve generations and include matters of welfare of all the species of nature. The same author includes two important issues treated by this school: (i) uncertainty, which comes from unpredictable expectations with respect to changes in technology, income and personal preferences; and (ii) irreversibility, which means that the continuation of environmental exploitation at current levels can cause irreversible damange to the ecosystem.

In this sense, Cleveland and Ruth (1997) affirm that the key uncertainty would be determining the minimum amount of natural capital necessary to sustain a given standard of life, as well as verifying the degree to which the capital constructed could substitute depleted resources and a degraded environment. Beyond this, legal mechanisms and ethical criteria are also dealt with by ecodevelopmentalists, principally by the fact that it deals with a current concern with the situation of future generations.

The solutions proposed by ecodevelopmentalists to deal with environmental issues fall in the correction of the current route of development, with the redefinition of its objectives in accordance with the resources available. It should, therefore, take into consideration economic return and the environment at the moment of decision making by the agents of the productive process and of consumption. These points have caused the appearance of new rules of environmental management in companies and in the inter-relation between the economy and the environment.

Figure 2 shows a comparative synthesis of the principle ideas of these school based on certain aspects like the consideration of the existence of limits to economic growth, the nature and origin of these limits and the proposed solutions.

Line of thought	Do limits to economic growth exist?	Nature of these limits	Primary origin of these limits	Proposed solution
Malthusian	Yes	Factors of production, including the environment, are scarce in absolute terms.	Exponential population and consumption growth, and fixed technology.	Control of population growth and the use of environmentally correct technologies.
Neoclassical	Questionable or not relevant	There are no real limits given the possibility of substituting factors.	There are no limits due to the continuous progress of knowledge and technology.	Growth measured by GDP and the allocation of resources through market mechanisms.
Ecological Economics	Yes	The laws of thermodynamics and the fact that the biosphere is a closed system for material needs.	The economy is just a subsystem of the natural ecosystem.	Focus on qualitative growth of the economy with a high priority on the conservation of environmental goods.
Ecodevelopment	Yes	Possible limits to the substitutions of factors.	Human and natural capital are more complementary than substitutes. Concept of irreversibility.	Maintenance of natural capital and human stocks based on ethical principles of equality between generations.

Figure 2. Comparison of the ideas of the principle lines of economy and environment

Source: the authors.

Despite the economy of the environment dealing with a relatively recent conception, it is noted that the theoretical schools have already risen with the intention of alerting and explaining the importance of ecological conservation to society. The evolution of the thought is clear, although the challenges due to the awareness and the regulation as forms of leading business and consumer behavior, is the focus of the following section.

The radical change and search for order

Before reflecting on the evolution of environmental awareness and the lines of economic thought in this context, it is important to discuss, succinctly, the sociological dimensions and paradigms of the work of Burrel and Morgan (1979).

The important contributions of this work are summarized in the affirmation that organizational theories are based on the philosophy of science and on social theory and that all social scientists address their works through explicit or implicit presuppositions about the nature of the social world and the manner in which it can be investigated.

The authors created a model of paradigms according to which organizational analyses are performed. According to them, there are four sociological paradigms in organizational analysis: the functionalist, the interpretative, the radical humanist and the structuralist. The four

paradigms are mutually based on particular views about the social world. Each of them is instituted in its own right and creates its own distinct analysis of social life.

The paradigms are characterized in two dimensions, the first presents the presuppositions about the nature of social science (subjectivism or objectivism) and the second presents the presuppositions about the nature of society (sociology of regulation or sociology of radical change).

The "subjectivist-objectivist" dimension portrays approaches in terms of that which should describe it, identifying four sets of relevant presuppositions for the understanding of the social sciences each characterized by descriptions and lines debated in the literature of social philosophy, namely: in the ontological debate, Nominalism vs. Realism; in the epistemological debate, Anti-positivism vs. Positivism; in the debate on human nature: Volunteerism vs. Determinism and in the methodological debate, Ideograph vs. Nomothetic Theory.

In the dimension of the sociology of regulation or of radical change, the authors cite Dahrendorf (1959) and Lockwood (1956), who distinguish these approaches for sociology concentrated on the one hand on an explanation of the nature of social order and of balance, and on the other hand on the concern about problems of conflict, change and coercion in structural social terms. This distinction received much attention and became known as the "debate of order-conflict." The central ideas characterize a set of concurrent presuppositions that attribute gains to social development, on the one hand, systems with characteristics of cohesion, commitment, solidarity, consensus, reciprocity, cooperation, integration, stability and persistence and, on the other hand, characteristics like coercion, division, hostility, dissension, conflict and change.

The sociology of regulation refers to the theories that are mainly related to the supply of explanations of society in terms that emphasize its unity and cohesion. In counterpart to the sociology of radical change, in its basic concern, it focuses on finding explanations for the radical change, structural conflicts, modes of domination and of structural contradiction that, through their theories, come to characterize modern society.

The paradigms in their dimensions define fundamentally different perspectives for the analysis of social phenomena and address behaviors, contrasting points of view. The Functionalist Paradigm has provided the dominant frame for the driving of academic sociology and of the studies of organizations. It represents a perspective that is rooted in the sociology of regulation and approaches its objective from an objectivist point of view. It is characterized by a concern in supplying explanations about the status quo, social order, consensus, social integration, solidarity,

the need for fulfillment and actuality. This approach tends to be realist, determinist, positivist, and nomothetic.

The Interpretative Paradigm adopts an approach in accordance with the principles that are also described in the sociology of regulation, although its subjectivism in the analysis of the social world makes connections with this sociology implicitly. In its approach to social science it tends to be nominalist, anti-positivist, volunteerist, and ideographic. Given the view of social reality, it is not surprising that the commitment of interpretative sociologists to the sociology of regulation is implicit rather than explicit.

This is a direct product of the German idealist traditions of social thought; their bases established in the work of Kant, these reflect a social philosophy that essentially emphasized the spiritual nature of the social world. It disputes the validity of the ontological presuppositions that subscribe to the functionalist approach and the study of organizations.

The Radical Humanist Paradigm is defined by a concern in developing a sociology of radical change from the subjectivist point of view. It seeks to investigate the possibilities and modes in which man achieves with efficacy the change in the sense of transcending socially alienating limitations. It is oriented by the understanding of society according to a perspective of radical change, that is, according to modes of domination, deprivation and emancipation. Its frame of reference is impaired with a vision of society that emphasized the importance of overthrowing or transcending the limitations of existing social arrangements. In the elements it seeks to contextualize the sociology of radical change, modes of domination, emancipation, deprivation and potentiality.

The Radical Structuralist Paradigm advocates a sociology of radical change from the objectivist point of view. It rests on the vision of society as potentially dominated, however, it assumes that it has its own existence, independent of individual everyday meanings. It is commitment to radical change, to emancipation and potentiality in an analysis that emphasizes structural conflicts, modes of domination, contradiction and deprivation. Its approach tends toward realism, positivism, determinism and nomothetic.

In possession of knowledge about the environmental school of economic thought and the work of Burrel and Morgan, the intention of this onwards is interpreting each of these lines, respecting their characteristics, trying to frame them within paradigmatic quadrants.

The Malthusian incursions related to environmental issues demonstrate subjectivist points of view with postures directed to radical changes, like, for example, the control of population growth and the proposal to reduce the per capita use of natural resources. If on the one hand

Malthus points to the divergences between population and production growth, as these would grow in different progressions, the former geometrically, the latter arithmetically; on the other hand, Ricardo warned of economic retractions due to declines in the quality and quantity of natural resources. The concern about the notations of how the scarcity of natural resources could cause problem to economic growth and development was one determining factor for humans to understand their limitations and search for change in the sense of transcending these limitations, which gave rise to the framing of this line of thought in the radical humanist paradigm.

The Neoclassicists, in the same line of judgment as the Malthusians, began their journey from the same paradigm, however they tended to migrate in the direction of the functionalist quadrant. While recognizing the gravity of the matter of environmental degradation and defending that natural resources do not represent a limit to the expansion of the economy in the long term, the thinkers of this school took an important step in the direction of order by affirming, though subjectively, that one of the principal motives of this issue would be the non-internalization of the environmental impacts on pricing mechanisms. Such internalization came to have a limiting factor that has triggered relevant studies in the search for forms and methods of valuing the damage caused to environmental goods by production and consumption.

Another subjectivist characterization of this school concerns the proposition of Kuznets. In defending that a certain society upon reaching a high level of per capita income would display an increase in the demand for higher environmental quality, due to a process of awareness, ended up being discredited because many countries that have reached high levels of per capita income have not been able to decrease their levels of pollution.

Pigou, an economist from the Neoclassicist school, presents a proposal that tends to the threshold of radical humanist and functionalist paradigms (Figure 3), because such a suggestion institutes the principle of polluter pays, that is, the causer of damage, called by Pigou a generator of negative externality, should compensate or pay for the damage to the environment. Such an idea ended up by instigating, later, lines of regulation on the part of society that decided to exploit the environmental good.

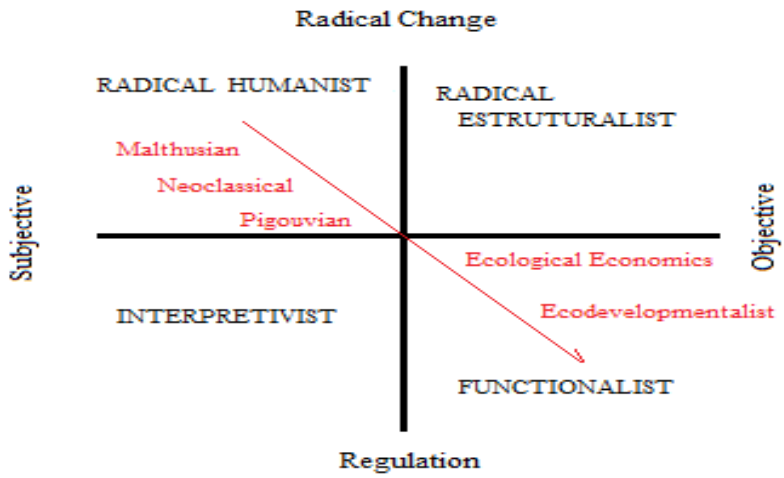

Figure 3. Economic schools in sociological dimensions and paradigms.

Source: Burrel e Morgan (1979), adapted by the authors.

Considered a better articulated school, Ecological Economics summed up the forces from other areas of knowledge with ecology, physics, chemistry, among others; and emphasized research with proven results on environmental issues, accommodating with this the line of thought in the objective dimension. It is adjusted to the functionalist quadrant by relying on empirical studies and is characterized by social order and the consensus on minimizing the production of waste and pollution, aiming at the balance of the ecosystem. In terms of economic valuation and the internalization of costs inherent to the exploitation of the environment, it collaborated with important studies in partnership with other sciences, significantly contributing to regulation in the context of a systemic conception.

With a clear concern for future generations, grounded on concrete data and determined to find a balance between economic development and current and future quality of life, the Ecodevelopmentalists also frame themselves in the functionalist paradigm. Their propositions provoke the rise of rules, laws and forms of management determined by certifications and legal requirements, imposing upon organizations and the business world a more solidary and environmentally sensitive path. Joined to this line, are the fruits of its concerns, represented by recent discussions and research related to the valuation of environmental losses as objectivist fundamentals and contribution to the order and the regulation of business decisions.

Final Considerations

The work, which is just ending, sought to present the concepts of sustainable development and the principle lines of economic thought applied to environmental issues, approaching their main

differences, similarities and fundamentals focused principally on the understanding of the issue of the economy/environment relationship and its possible solutions.

With the initial purpose of being only a small parcel of contribution, the current work has as its focus the description of the evolution of environmental awareness, through the lines of economic thought directed toward environmental concerns, and the paths trodden by them in the search for coherence, for order and for sustainable development.

Far from the belief of indisputable accuracy and with the intention of better comparing and interpreting these lines it was sought, specifically, the reflect upon and analyze the philosophical and paradigmatic position of these economic schools, having as theoretical base the propositions of Burrel and Morgan (1979).

Although it has been the intention of this work to search for a better framing of each school in the paradigmatic quadrants, the complexity of environmental issues demands that its researchers abandon linear and isolated thought in single frames, in favor of a complex and overall thought that aggregates the fundamentals of diverse lines in search of better solutions, as only in this way can the productive process (creator of income and labor) be conciliated with the conscious utilization of natural resources, the leading factor for better conditions of life for current and future generations.

Ultimately, it is important that it be clear that simply reflecting and writing about sustainable development is not enough. The planet asks for help and this presupposes the involvement of those who are embarking on this great “ship.” Studies, people and organizations have fundamental roles in this context, issues that are related to the life cycles of products, productive capacity, consumption, limits of resources, pollution, waste and degradation should guide the decisions of organizations and the behavior of human consumption.

Bibliographical References

ALCOFORADO, I.G., 2001. **A trajetória dos fundamentos das políticas ambientais:** do comando e controle à abordagem neo-institucionalista. In: ENCONTRO DA SOCIEDADE BRASILEIRA DE ECONOMIA ECOLÓGICA, 4. Belém.

ALIER, J. M., 1998. **Da economia ecológica ao ecologismo popular.** LISBOA, Armando de Melo (trad.). Blumenau: FURB.

BOULDING, K.E., 1966. **The economics of the coming spaceship Earth.** In: JARRET, H. Environmental quality in a growing economy. Washington DC: Johns Hopkins University Press.

BURRELL, G.; MORGAN, G., 1979. **Sociological paradigms and organizational analysis.** London: Heinemann.

CAVALCANTI, C., 2010. **Concepções da economia ecológica:** suas relações com a economia dominante e a economia ambiental. São Paulo: Estudos Avançados, 24(68). In: <http://www.scielo.br/scielo.php>. Access: 29 nov. 2011.

CHEN, Chia-Hui, 2007. Chap 16: Why markets fail? In: _____. **Principles of microeconomics.** Massachusetts: MIT. In: <http://ocw.mit.edu>. Access: 22 nov. 2011.

CLEVELAND, C.J.; RUTH, M., 1997. Capital humano, capital natural e limites biofísicos no processo econômico. In: CAVALCANTI, C. **Meio ambiente, desenvolvimento sustentável e políticas públicas.** 4. ed. São Paulo: Cortez.

CORAZZA, R.I., 2003. **Economia, tecnologia e meio ambiente:** comentários sobre aspectos positivos e normativos da economia do meio ambiente. Ensaios FEE, Porto Alegre, 24(2):479-498.

DALY, H. E.; FARLEY, J., 2004. **Ecological economics:** principles and applications. Washington DC: Island Press.

DONAIRE, D., 1999. **Gestão ambiental na empresa.** 2. ed. São Paulo: Atlas.

GEORGESCU-ROEGEN, N., 1971. **The entropy law and economic process.** Cambridge Massachusetts: Harvard University Press.

GIL, A. C., 1991. **Técnicas de pesquisa em economia.** São Paulo: Atlas.

HUSSEN, A., 2004. **Principles of environmental economics.** 2 ed. London and New York: Routledge.

KUWAHARA, M. Y., 2011. **Economia do meio ambiente.** In: <http://meusite.mackenzie.com.br> Access: 30 nov. 2011.

LUSTOSA, F., 2010. **Instituições, cultura e desenvolvimento sustentável na bacia cultural do Araripe.** Rio de Janeiro: Cad. EBAPE.BR, 8(1). In: <http://www.scielo.br/scielo.php>. Access: 25 nov. 2011.

MARQUES, J. F.; COMUNE, A. E., 1997. A teoria neoclássica e a valoração ambiental. In: ROMEIRO, A. R.; REYDON, B. P.; LEONARDI, M. L. A. (org.). **Economia do meio ambiente:** teoria, políticas e a gestão de espaços regionais. Campinas: UNICAMP.

MAY, P. H.; LUSTOSA, M.C.; VINHA, V., 2003. **Economia do meio ambiente.** 3.ed. Rio de Janeiro: Elisevier.

MONTIBELLER-FILHO, G., 2001. **O mito do desenvolvimento sustentável:** meio ambiente e custos sociais no moderno sistema produtor de mercadorias. Florianópolis: UFSC.

PARRY, Ian W.H.; PIZER, W.A., FISCHER, C., 2003. **How large are the welfare gains from technological innovation induced by environmental policies?** Journal of Regulatory Economics, 23: 237-255.

ROMEIRO, A.R., 2003. Economia ou economia política da sustentabilidade. In MAY, Peter Herman;

LUSTOSA, Maria Cecília; VINHA, V. **Economia do meio ambiente.** Rio de Janeiro: Campus.

SACHS, I., 1986. **Ecodesenvolvimento - crescer sem destruir.** São Paulo: Vértice.

WIRTH, L.G. *et al.,* 2011. **Desenvolvimento sustentável:** histórico, conflitos e perspectivas. In: <http://www.cori.unicamp.br>. Access: 21 nov. 2011.