

**ECONOMIC GROWTH AND SUSTAINABLE DEVELOPMENT:
RECONCILING ECONOMY AND ECOLOGY IN THE DEVELOPING
COUNTRIES**

**Croissance économique et développement durable : réconcilier économie et écologie
dans les pays en développement**

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Received: 26/04/2023

Accepted: 25/06/2023

Published: 10/07/2023

Abstract:

There is a general perception that economic theory does not take into account the environmental concern (i.e., the protection of the nature) in its endeavours to understand and foster economic growth. This is to a large extent inaccurate. For long time, the issue of non-renewable natural resources, as well as that of pollution have been subject of contentious debates among economists. If we put aside the so-called “Degrowth theory” (which as yet has had no concrete implementation), the alternative solutions to the mass-production model are based on the concept of “Ecological development” and/or the more often used concept of “Sustainable Development”. After a concise presentation of the different approaches of the environmental issue in the economic theory (first section) and a brief recalling of the international conferences and reports about sustainable development (second section), this paper tackles (in a third section) the famous dilemma economic growth versus nature protection (or in other words, dilemma economy versus ecology) in developing countries, to which it concludes that sustainable development in poor countries is not only an internal challenge for each of them but a crucial stake of North-South international cooperation.

Key words: Economic Growth, Sustainable Development, Environment, Ecology, International Cooperation.

Jel Classification Codes : O19, Q01, Q56, O44, O20.

Résumé :

L'idée reçue est que la théorie économique ne s'intéresse pas à l'environnement (au sens naturel), toute concentrée qu'elle est sur les nécessités de la croissance. En réalité, depuis longtemps, la question des ressources naturelles non renouvelables comme celle des pollutions (de l'air, de l'eau, des sols...) sont l'objet de débats importants parmi les économistes. Les réponses données à ces questions varient naturellement selon les auteurs et les courants de pensée. Si on laisse de côté la notion de « décroissance » qui n'a eu jusqu'ici aucun prolongement concret, les solutions alternatives au productivisme tournent autour des concepts

d « écodéveloppement » et, surtout, de « développement durable ». Après avoir exposé succinctement les positions théoriques en présence, l'article se fixe pour objet d'interroger cette notion de « développement durable » en partant, d'une part, de travaux relevant de la théorie économique et, d'autre part, de documents issus d'organisations internationales (notamment le Rapport Brundtland de 1987). L'une des interrogations majeures concerne le fameux dilemme économie versus écologie (autrement dit, le dilemme croissance économique versus protection de la nature) dans les pays en développement et singulièrement dans les plus pauvres parmi eux. La dernière partie de l'article qui aborde cette interrogation montre que le développement durable dans les pays pauvres est non seulement un défi interne pour chacun d'eux mais un enjeu crucial des relations internationales Nord/Sud.

Mots clés : croissance économique, développement durable, écologie, environnement, coopération internationale.

Jel classification codes : O19, Q01, Q56, O44, O20.

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1. Introduction

Climate change, overexploitation of non-renewable natural resources (taking into consideration the threats of scarcity that may result), the huge increase in polluting sources (air, water and soil), in parallel with very rapid population growth rate (especially in the most disadvantaged regions on earth) are the greatest challenges at the beginning of the third Millennium.

Starting from the first Conference on the Environment held in Stockholm in 1972 under the patronage of the United Nations to the World Agreement on the Climate in Paris (in December 2015), passing by the Rio de Janeiro Earth Summit (in 1992), the Kyoto Climate Change Conference (in 1997), and the Johannesburg Summit on Sustainable Development (2002), the international assemblies on the subject are many, which indicates an effective awareness of the adverse threats facing the planet and the need to collectively tackle them.

The resolutions adopted at the end of these international meetings are undoubtedly useful and interesting: all of them converge towards a limitation of the damages caused to the natural environment by the dominant mass-production paradigm and, therefore, towards a sustainable development in the long term. However, in practice, these resolutions have not in so far led to significant progress in nature protection and biosphere preservation.

Yet, on the conceptual and technological side, alternatives exist and are, to some extent, mastered, particularly in the agricultural sector (with organic or, at least, a reasonable farming), in the energy sector (with the renewable energy), in urban management (e.g. waste treatment and recycling, collective transportation as an antidote to automobile pollution). The obstacles are therefore not mostly technical; they are fundamentally societal and political.

As production, consumption, and investment are part of its field of study and research, economic theory is fully concerned with problems of ecology and environment. How would it apprehend them? More specifically, economists (like other specialists) are more and more aware of the need of preserving the ecosystem. The crucial issue is then as follow: which tools and instruments to

be set in order to strongly encourage economic actors to adopt the appropriate behaviours in the conduct of their business?

Furthermore, as one knows, since the beginning of the 1970s, the ecological concern has been occupying an increasingly important place in the public debate within countries (particularly developed ones), but also at the international level. This growing concern has contributed significantly to the advent (in terms of ideas, but also to some extent in reality) of a new approach to the economic issue, centred on the concepts of “sustainable development”.

The problem, however, is that this concept is not always defined in the same way by everyone. Therefore, it is necessary to investigate closely the content of this new approach, especially in light of the major international meetings that have marked the recent history in this field (Rio de Janeiro, Kyoto and Paris), and the guidelines that have been adopted.

On another level, some analysts suggest that the environmental issue – which can be summarized in three “Ps” (preserving non-renewable resources, preventing climate change and protecting nature in its diversity) – cannot be addressed in the same way, depending on whether the concerned countries are rich or poor. Indeed, one can support the idea that the two groups of countries are not in the same situation relatively to the environmental challenge. Two reasons for that: on the one hand, on the basis of their production and consumption volumes, it is quite clear that industrialized nations are the major contributors to the massive destruction of ecosystem and biodiversity; and, on the other hand, in view of the urgency of the fight against poverty, it seems absurd, or even indecent, to restrict the economic growth in developing countries in the name of the ecological requirement. Facing this point of view, another approach exists, which argues that not only Earth is one and an indivisible planet, but also that poor people are the first victims of the effects of environmental degradation (deforestation, rising of the levels of seas and oceans, floods, droughts, storms and hurricanes...). In this context, the ecological concern should not be considered as an additional privilege for the rich, but as an emergency for the poor. Therefore, everyone must help to overcome the problem.

These two points of view are at the same time as defensible as worthy of criticism. What’s evident, in this matter, is the existence of peculiarities that hinder the sustainable development for the countries of the South and differentiate them from those of the North. Consequently, the issue of sustainable development should be addressed with a particular focus on the context of the countries of the South.

The following analysis is developed through a three-part plan

The first part overviews the various economic approaches to the environment (old currents as well as new ones);

The second part deals with the ecological concerns over the last forty years and their culmination in the concept of sustainable development;

The third part addresses the issue of sustainable development in the countries of the South, and studies its implications at the level of international cooperation.

2. Consideration of the environmental dimension in Economics

There is a general misconception that Economics disregards ecological issues. Moreover, economists are generally considered as limitless-growth centric specialists, with exaggerated concern for the search of material well-being, and very weakly interested by the environmental problems. This idea, although it is widely shared, is far from being founded. In fact, throughout its history, economic theory has integrated the natural constraints in its analyses. Obviously, on this issue as on others, there are deep differences between economic schools: particularly, at the extremes, between on the one hand, the hard-core liberals who, by fully trusting the market mechanisms, eliminate from their models the environmental question; and, on the other hand, those who, on behalf of the protection of nature, advocate zero growth, or even “degrowth”, in contempt of the elementary economic realism. Furthermore, depending on the era, the integration of environmental constraints in the economic analysis was made in different ways and according to very varying doses.

We will briefly spot the light on the process of consideration of the environmental dimension in the economic theory by expounding successively:

- The old currents (Physiocrat and classical);
- The consideration of externalities by the economics of welfare since the 1920s;
- The contemporary debate between radical liberalism and the ecological current in Economics.

2.1. The former currents (Physiocrat and Classical)

With the birth of the political economy two centuries and a half ago (that is to say at the time when economics was just emerging as a distinct knowledge, autonomous from the social and political philosophy) the term “ecology” did not exist: probably because the underlying concern was not then widely shared in the society. Nevertheless, economists of that time did have the ecological concern: especially in France, where they were named (and named themselves) “Physiocrats”. This is a very interesting nomination since the term Physiocracy is defined, according to the French dictionary “Le Robert”, as “a doctrine based on knowledge and respect for the natural laws”. Indeed, François Quesnay (1694-1774), the leader of the physiocrat current, argued in two texts published in 1756 and 1757, that agriculture, only, is source of wealth and that the agricultural sector only, by providing the working population the livelihood, enables the society to engage in other activities and to produce other goods and services (Murray N. Rothbard, 1995, vol. 1).

It is true that at the time chemical fertilizers, pesticides and other environmentally harmful agricultural techniques did not exist. The intensification of agricultural production during the second half of the eighteenth century – described by René Dumont and other contemporary agronomists as “Second agricultural revolution” - was the result of the discovery of the positive effects of animal dejections on the fertility of the soil. These positive effects were significantly greater than those of the traditional method whereby the land is put fallow to reproduce its productive capacity (Yves Citton, 2000).

Would F. Quesnay have been a warm supporter of what is called now “productivism” if modern techniques of agricultural intensification (phytosanitary and other techniques) had existed in his time? This is an interesting question to which no one can answer categorically. What is certain, however, is that at the Physiocrats’ time, there seems to be no contradiction between the (explicit) economic objective to increase production and the (implicit) ecological concern to preserve its main (or even unique) resource, namely the soil. The approach to these problems has grown significantly with the Classical school, although members of this school did not have the same point of view on the ecological issue.

Indeed, for Adam Smith (1723-1790) and some other Classical economists - and also for Karl Marx (1818-1883) who, on this point, was not divergent - natural resources are available in abundant quantities and at low prices. The question is therefore not related to resource availability, but resource utilization for the sake of economic growth, condition for the humanity fate improvement (Murray N. Rothbard, 1995, vol.2). Other Classical economists do not share this belief in a limitless economic growth. John Stuart Mill (1806-1873), for example, disagreed with the idea that the increase of materialistic wealth was a requisite condition for human happiness. Because he did share the ideal of unlimited growth, he did not see, unlike other classics, in the “stationary state” (to which humanity was sooner or later condemned under the classical law of decreasing returns) the dreaded nightmare. For Thomas Robert Malthus (1766-1834), the author of a pessimistic population growth law, populations grow much faster (geometric growth) than resources and livelihoods (arithmetic growth). For this economist, in the long run, famine will hit hard poor people if nothing is done to restrict the birth-rate. However, through these discrepancies, the main issue isn't really about the limits to growth due to the possible depletion of natural resources, but rather about an excessive population growth-related threats (for Malthus), and the nonsense (in the moral meaning) of a human ideal based on unlimited growth (for Mill).

As surprising as it may seem, it is with the Neoclassical current that the integration of the natural environment in the economic analysis took place. To be accurate, let's say that the concept of “External Economies of Scale”, elaborated by Alfred Marshall at the end of the nineteenth century, and the developments of this concept during the 1920-1930s, with the works of his disciples (especially those of Arthur Cecil Pigou) in the framework of what is called “The Economics of Welfare”, are the first steps towards the consideration of the natural environment in economic growth analysis.

2.2. Welfare theorists and consideration of the external effects in the economic analysis

Strictly speaking, one cannot credit the Neoclassic current with the merit of having introduced the ecological dimension in economy. The hallmark of the neoclassical school - that embodies the liberalism in the contemporary economic theory - is to base the economic dynamism on the effective functioning of market laws, which implies free competition and, therefore, free variation of prices (of goods and services as well as of production factors). However, some leading economists, graduates of this school, have taken a step back from this approach. If the case of John Maynard Keynes (1883-1946) is widely studied and taught, that of A. Marshall (1842-1924) is certainly much less known. And yet, with his concept of “External Economies”

(or “Externalities”, as one would call it today), Marshall challenges the assumption that the “social optimum” could be simply achieved by the variations in the price.

Indeed, according to Marshall, any economic action (but this is true in other fields) of an individual has its effects on other individuals, either positively or negatively. For example, trimming the trees in one’s private property is beneficial to neighbours, based on its effects on the quality of the environment, the fight against the erosion of soils and the reduction of carbon emissions. Conversely, a private company that produces chemical fertilizers is harmful to the inhabitants of the neighbourhood, due to the polluting smokes that it spreads in the near environment. The simple consideration of these “negative externalities” (also called “external diseconomies”) in the economic analysis shows that free variations of prices, in a free market, do not automatically lead to the collective satisfaction; such functioning can allow only the satisfaction of a limited number of individual players.

On this basis, the 1920s and 1930s have been decades of an important research development in economics aimed at reconciling the market forces and the social optimum. Based mainly on the works of A. C. Pigou (1877-1959) in Great Britain, and Harold Hotelling (1895-1973) in the United States, this research effort incorporates for the first time, in a meaningful way, the environmental dimension (in a broad sense) in the economic analysis. This new approach, which calls into question the liberal credo of non-intervention of the state in the economy, will result in two management tools of the ecological challenge: firstly, the principle of “Polluter-Pays” and, secondly, the particular arrangements for pricing the non-renewable resources.

2.2.1. A. C. Pigou and the principle of “The Polluter-Pays”

In “The Economics of Welfare”, published in 1920, A. C. Pigou, departing from the idea that prices do not allow to achieve the social optimum, calls for the intervention of the public authorities through a system of taxation and subsidies: taxes to penalize those who damage the environment (i.e. produce negative externalities) and grants to reward those whose activities have good effects on their environment (i.e. generate positive externalities).

It is easy to recognize in these recommendations the origin of the “polluter-pays” principle, applied today in the industrialized countries (through the carbon tax, for instance), which simply compel private agents to take fully into account, in their calculations, the environmental and social impacts of their actions and decisions. This principle, thereby, is aimed at encouraging the private stakeholders to assume the environmental costs of their actions. The goal, in the vision of Pigou, is to reconcile the global or collective interest with individual or private interests.

2.2.2. H. Hotelling and exhaustible natural resources pricing

The interesting path opened by Pigou is, nevertheless, not the only one explored by the economists who are concerned about the collective well-being. In the same vein, the American economist H. Hotelling suggested in a famous paper published in 1931 (The Economics of Exhaustible Resources, Journal of Political Economy), a reflection on the social optimum through the issue of exhaustible (or non-reproducible) natural resources.

The point of view developed by this economist may be briefly summarized as follow. To achieve the collective optimum, there is no need for a system of taxations and subsidies. It is sufficient to

determine the prices of non-renewable resources, not through a free confrontation of supply and demand, but by taking into account the amount of resources that remain as they are utilized. By indicating that the price of a given resource is inversely related to its abundance (and this, regardless of the cost of its exploitation), this method has the advantage of recording the decrease of the quantity of available resources as they are being exploited. This approach undeniably integrates an ecological concern: through a mechanism of prices' rising, its purpose is to reduce the demand for diminishing resources. Hotelling justifies explicitly this way of tackling the resources scarcity by the need to consider, in the economic analysis, the well-being of future generations (producers as well as consumers).

However, as a neoclassical theorist, Hotelling was not in favour of a strong State involvement in the economy: market mechanisms are still preferable even in the ecological matter. Instead of a system of taxations and subsidies, Hotelling's analysis supports the idea that the solution to the problem of overexploitation of non-renewable resources is to be found in the price-setting system for these resources. That is to say that, according to this analysis, the main role of the State is to ensure that levels of natural resources' prices reflect correctly the rate of their depletion. However, in the extreme case of an excessive acceleration of a given resource's exhaustion (and only in this case), the State must intervene through the establishment of a tax in order to raise the price of this resource.

A tricky question inevitably arises, nevertheless, for a liberal economist like Hotelling: that related to the rents enjoyed by producers of non-renewable resources by virtue of this pricing system in which prices are determined not only by the market laws, but also by the rate of depletion of these resources (the prices actually paid by the buyers to the sellers of non renewable resources). The answer of Hotelling to this question is based on justifying these undue incomes by the need to give the producers additional means to enable them, once the resource is completely exhausted, either to invest in exploring other resources, or to completely switch to other types of activities.

In comparison, whereas the Pigou's approach (based on the system of taxation) consists in overcoming the market failures, the Hotelling one (by favouring the pricing system) is simply meant to monitor the functioning of that market (in order to ensure that the levels of prices effectively do take into account the resources' depletion). In both cases (although to a lesser extent in the second), the intervention of the State is essential to deal with the environmental issue. However, it is known that such recourse to State intervention is not consistent with the liberal doctrine which favours market based solutions rather than the State based ones. That is why other liberal economists have developed alternative approaches (and other tools) to address the environmental issue by soliciting the least possible the State or, better yet, by not soliciting it at all. The presentation of the radical propositions of this last current will be an opportunity to show how, at the other extreme of the theoretical spectrum in economy, has been constituted, during the four last decades, a current of "ecological economics", part of which supports not less radical ecologist positions.

2.3. Liberalism versus Ecological Economics

Liberal economists who defended radical theories on the environment are many. Two groups among them illustrate their ideas: the first, known as "Coasian bargaining", refers to the British economist Ronald Coase (Nobel Prize in 1991) and his analysis of the social cost; the second, summed up by the idea that ecosystems are "spontaneous orders", refers to the Austrian economist Friedrich von Hayek (Nobel Prize in 1974). Both groups belong to the so-called Free-Market Environmentalism, a liberal approach of the ecological issue which argues "that property rights and free markets provide the best means of preserving the environment, internalizing pollution costs, and conserving resources".

As a first step, we give an overview of each of these two analyzes; then, we will expound the diametrically opposed analysis of the ecologist thought schools, for which the environmental challenge is an off-market issue.

2.3.1. The Radical Liberalism: How market for emission permits or pure implementation of market laws is the only solution

R. Coase (1910-2013) became a famous economist through two main works. The first one, published in *Economica* in 1937 (under the title "The Nature of the Firm"), is devoted to the concept of transaction costs which holds an important place in today's economic analysis. The second one, published in 1960 in "Journal of Law and Economics" (under the title "The Problem of Social Cost"), develops, on the basis of a rigorous conceptualization of the property rights, a liberal treatment of the environment issue in economics.

For Coase (and other economists who have continued and even deepened his work on the "social cost", like Stigler George and Medema Steven), the ecological problems are rooted not in alleged deficiencies of the market but in real defects of the property rights. A property right is a legal title that gives the right to dispose freely of a resource. If a victim of pollution has a property right on a resource, it has ipso facto the right to no longer be polluted. A well-cited example is that of the owner of a camp site located near a polluting factory: under a property right of the surrounding air (shared with the factory), the owner may require not to be polluted, unless he (or she) prefers to sell this right to the factory. Accordingly, for Coase, the establishment of clear property rights is sufficient to achieve the social optimum. However, as in our example, the rights held by the victim of pollution may be sold to polluters who, consequently, acquire the right to pollute. Tackling the problem of pollution through the market is, from a strict liberal point of view, superior to the State taxing system because, by linking directly involved stakeholders, it allows a more accurate assessment of the pollution price.

Does this approach of property rights dedicate - as some people say - the right to pollute? What is certain is that such approach has given birth (intellectually at least) to a controversial practice known as "emission-permits market", which is, in other words, a market in which rights to discard in nature any particular amount of pollutants (mainly greenhouse gases) are negotiated.

The emission-permits market works specifically - as any market - by confrontation of supply and demand, which means that the quantity demanded of permits is inversely related to the selling

price. More accurately, an increase of emission-permits supply decreases their prices, and consequently the costs borne by the polluters. On the contrary, a decrease of supply for emission-permits increases their prices, which (theoretically) entails a reduction of the pollution.

This liberal approach clearly failed to satisfy supporters of the green-economy, who accuse it of treating nature as a mere commodity. The perverse effects of this “commoditization” are particularly clear, according to them, with the Kyoto Protocol (which favoured the emission-permits as an international method for environment protection): the participating States, who were more concerned about economy than ecology, have negotiated clauses to acquire important amounts of emission-permits so as to cover the pollution costs of their businesses.

Moreover (and more surprisingly), it failed to satisfy the neoliberals (supporters of the free market operating without any interference from the public authorities). Indeed, although based on a great confidence in the market, this emission-permits approach does not fully eliminate the role of the State. This is because, as a representative of the victims of pollution, the State has (theoretically at least) to determine the quantity of permits that should be provided in the market and, consequently, the threshold of tolerable (and/or optimal) emissions. Even this traditional and well-recognized role of the State is unacceptable for the liberals and, much more, for the neoliberals.

This rejection of any public intervention is theoretically based on the notion of “spontaneous order”, a notion long known in the natural science philosophy and developed in economics by Friedrich von Hayek (1899-1992) in many of his works, notably “Individualism and Economic Order” (published in 1948 by the University of Chicago Press).

Although largely present in Adam Smith’s “Wealth of Nations”, the concept of “spontaneous order” is now mostly considered as a legacy of Hayek in the field of economic and social studies. A legacy that has been often used in recent time by neoliberals, in the framework of the environment-centred debates, in order to support the idea that natural ecosystems are spontaneous orders, that need not any public regulation for their equilibrium. In other words, insofar ecosystems are spontaneous orders, not any public interfering is necessary for their natural and effective functioning. On the contrary, such interventionism is likely to disturb the free market laws, generating more environment degradation.

In this view, the emissions permits method, as it has been designed by the Kyoto Protocol, is unacceptable because it gives the State a real power in the climate regulation. Instead, the supporters of the free market based environmentalism advocate a solution entirely relied on the market: which means that it is for the free market, apart from any public interference, to establish the optimal level of the emissions, on the basis of a confrontation, performed by economic players themselves, between costs and gains of the fight against pollution.

In opposition to these liberal theories, during the last forty years is raising an ecologist current in Economics which develops views on the environment issues that meet an increasing success. Some members of this ecologist current profess theories that can also be considered as radical.

2.3.2. The Ecologist Current in Economics.

Initiated in the 1960s by the American economist (of Romanian origin), Nicholas Georgescu-Roegen (1906-1994), the ecologist current in economics is based on two fundamental ideas: on the one hand, the economic process as an integral part of the biological process, of which it is merely an aspect (or extension); and, on the other hand, the human kind, like all living species, is subject to constraints arising from physical laws, the most prominent among which is the law of entropy (or law of energy degradation). This thermodynamics' law, known in France as "the principle of Carnot" (the scientist who established this law in 1824), stipulates that the Earth is a closed system that cannot, sustainably, consume more energy than the quantity it receives from the Sun.

In his famous book "The Entropy Law and the Economic Process" (published in 1971, Harvard University Press), Georgescu-Roegen lays the foundations of a new approach in economics that incorporates the discoveries of Biology (Bio-economics), and Physics (Thermodynamic Economics). On the basis of a rigorous critique of the dominant economic theory, he shows in this book that unlimited growth is impossible due to the law of entropy, i.e. a law of the inexorable degradation of natural resources available to humanity, in particular energy resources.

In its ultimate consequence, this approach leads to the idea that, in the long run, economic degrowth is an inevitable effect of the limits imposed by the laws of nature (in particular the entropy law). For this reason, it has entailed intense debates about the future of humanity, which have proven very exciting intellectually. But unfortunately, at the practical level, the different recommendations that emerge from these debates are often difficult to apply because, either they are unrealistic, or require preconditions that are not easy to fulfil.

Indeed, at the present time, two kinds of answers to the environmental issue claim to stem from Georgescu-Roegen's teaching. That in terms of "degrowth", initiated by the Club of Rome with its famous 1972 Report ("Limits to Growth"), which pleads for a radical stop to growth. The today supporters of this first approach are notably, Paul Ariès (2011), Jean Gadrey (2015) and Serge Latouche (2006, 2014) in France, and Tim Jackson (2009) in United Kingdom: on the basis of pessimistic ecological forecasts, these authors develop socioeconomic theories that can hardly be implemented in the present context characterized by a high level of unemployment in France and in Europe.

The second answer that claims Georgescu-Roegen's legacy is that in terms of "sustainable development". Unlike that of degrowth, the notion of sustainable development is based on the possibility to reconcile economy and ecology (i.e. economic growth and nature protection). In this perspective, it has resulted in interesting theoretical extensions, in the framework of what is named the "current of Ecological Economics", represented by Herman Daly (1996) in the United States, and by René Passet in France (2012). Thanks to a combination of the ecological science teachings and those of a renewed conception of the economic purposes, this new current aims to found a new disciplinary field dedicated to the study of the relations between socio-economic systems and ecological systems (ecosystems).

Nowadays, many economists develop their research programmes in the framework of this environmentally friendly economics. In their works, they tend to show how, on specific issues, it is quite possible, using the tools already available in economics, to implement an intergenerational solidarity (i.e. to utilize efficiently natural resources without depriving future generations) and, therefore, to promote a sustainable development dynamics.

3. The rise of the environmental issue in recent decades: Sustainable Development versus Degrowth

The economic model that prevailed during the 1950s and 1960s (the so-called “mass production model”) has undoubtedly favoured strong growth in the countries which implemented it. But, gradually, it has shown many weaknesses and inadequacies. Therefore, it has logically raised different criticisms which can be classified into three categories:

- criticism from a social point of view, which denounces the exclusions and inequalities systematically generated by this model, within each nation as well as between nations;
- criticism from a cultural point of view, which unveils the misdeeds of this model at the societal level: destruction of traditional sociality, deterioration of community links or, in other words, the social ties which bind every human collectivity and make possible life in society... all these destructions have induced an evolution towards an excessive individualism;
- criticism from an ecological point of view, which highlights the damages caused by this model on the natural environment and the biosphere (overexploitation of exhaustible resources, multiplication of pollutions, climate change...).

Let's leave aside the first two criticisms for a better focus on the third one, which is the core of the reflection proposed here. This criticism from an environmental point of view is a subject to an important debate in the economic analysis, above all since the publication of the works of N. Georgescu-Roegen and those of H. Daly. However, the question that arises is related to the real impact or implication of such criticism. In other words, what are its concrete effects?

Considering the French context, as response to this question, one can say that there are basically two trends today (as noted above): the first one, represented by the periodicals “Silence” (Silence), “L'Ecologiste” (The Ecologist), and more explicitly, “La Décroissance” (The Degrowth), advocates a clear orientation toward a degrowth; the second one, bringing together significant part of the anti globalization nebula (ecologist movements, world and European social forums, far left-wing political parties...), fits more into the perspective of ecological development or sustainable development.

Insofar degrowth remains a purely intellectual theme, without real impact to date, we will not expound here the analysis that underlies it. What can be simply said, is that if the degrowth project has proven, as yet, unable to find an echo in the social and political field, it is probably due to the difficulty (if not impossibility) in applying the theories that it is based on.

Indeed, what concrete follow up can be given to a proposal like the one made by S. Latouche (one of the main degrowth theorists in France) who, using a metaphorical formula, invites not to reduce the pace of growth or even to change the mode of growth, but to break with any growth:

“It is not enough to slow down the locomotive, to brake or even stop it, we have to get off and take another train in the opposite direction” (2006). From our humble point of view, no concrete application can be made of such a proposal.

Let us then focus on the other trend, that one called ecological or sustainable development, which has imposed, on the socio-political level, the environmental concern. To recall the affirmation process of the environmental concern at the international level, two dates must be privileged: 1972, the year of the first International Conference on the Environment held in Stockholm under the auspices of the United Nations; and 1987, the year of publication of the “Brundtland Report” on environment and development, entitled “Our Common Future”.

3.1. 1972: Starting point for the international awareness... but without a real impact so far

First, a semantic precision: in France, the first works that criticize the mass-production model on behalf of the environment date of the seventies. Undertaken by the CIRED (International Centre for Research on Environment and Development), then headed by Ignacy Sachs (1980), these first works privileged the concept of “eco-development” (ecological development). Although relevant, this concept remained confined within small intellectual groups, because of a lack of widespread dissemination within social movements. That is why, in a second time (let us say since 1987 and the publication of the Brundtland Report), the concept of sustainable development has been largely adopted. The advantage of this second concept is that, besides the need to preserve the biosphere, it puts an increased focus on the sake of solidarity of present generations with future ones (in other terms the intergenerational solidarity).

January 1972, as has been said, is the date of publication of a famous report, commissioned to MIT by the Club of Rome (club established in 1968 in Rome by leaders of car manufacturer Fiat, in order “to reflect on the great problems that humanity has to cope with”). Developed under the guidance of a couple of American scientists, Donella H. and Dennis L. Meadows (she a physicist, and he a specialist in social and political sciences), this report - called Meadows Report - is originally entitled “The Limits to Growth”. However, the title of the French version of this report (“Halte à la croissance”, meaning “Stop to Growth”) seems more relevant insofar as, on the basis of an analysis of the limits of the planet's resources, it opens the debate on the necessity of stopping the process of economic expansion (Donella H. Meadows, Dennis L. Meadows, Jorgen Randers J., William. W. Behrens III, 1972).

Is there a cause-and-effect relation? Probably not, but the fact is that six months after the publication of this report, Stockholm hosted the first International Conference devoted to the environment, under the auspices of the United Nations. This conference, although it did not gather so many heads of State and Government, is a first step in the process of an international awareness of environmental problems. The evidence is that seven months later (in December 1972), the United Nations Environment Programme (UNEP) was launched.

However, in spite of the growing awareness it has induced, this official recognition of the ecological challenge has not so far led to the implementation of solutions that prove equal to the task. In addition, it should be noted that the oil price shocks that occurred since the 1970s have contributed much to this growing awareness of the environmental issue. Combined with other adverse evolutions (pollution of all kinds, droughts, floods, water shortages, famine,...), these

shocks have made inevitable, indeed, the questioning of the sustainability of the Western model of mass production and consumption, that had been erected as a universal model during the so-called “Thirty Glorious Years” (i.e. the period between 1946 and 1975) .

All in all, one can say that the world is now aware of the environmental challenge importance. More and more important (at the level of national States as well as at the international organizations level), this awareness leads, to a certain extent, to calling into question the dominant economic model.

Curiously however, while the Bio-economy theorists locate the environmental problem above all within the physical limits of the planet (with the rapid depletion of non-renewable resources), this international ecological awareness is concerned first, and foremost, with the climate change and the biosphere degradation, under the combination of three effects: accumulation of greenhouse gases, emission of chlorofluorocarbons (commonly called CFC) and destruction of the ozone layer. This is why international meetings and summits, devoted to the issue of climate change, have been multiplied over the last decades.

In 1979, the United Nations Organization held the first International Conference in Geneva on “Manhood and Climate”, whose works culminated with the signing, in 1985 in Vienna, of the “Convention for the Protection of the Ozone Layer”. Furthermore, two years later in Montreal, an International Protocol imposed on signatory nations, commitments for limiting their emissions of CFC. Following this first conference, other international meetings on global warming have been organized.

Except the “Summit on Climate” held in Copenhagen in December 2009 (which has been a complete failure), one can list the conference of London in 1989, the conference of Helsinki in 1990, the famous Kyoto summit of 1997 and, above all, the international meeting on “Climate Change” of Paris in December 2015, devoted entirely to greenhouse gas emissions and resilient development model, and which ended with the adoption by all the participating countries of the “Convention on Climate Change”.

Although the United States (who are, with China, the biggest emitters of greenhouse gases) have not ratified the 1997 Protocol of Kyoto, and although President Trump has denounced the more recent Paris Convention on Climate Change, these two international agreements are regarded as decisive for halting the climate change, insofar they include measurable commitments for the signatory countries, which are now required to reduce their greenhouse gas emissions.

More accurately, the international agreement that resulted from the “21st Conference of the Parties to the United Nations Framework Convention on Climate Change” (the official name of the Paris meeting) requires the 179 signatory nations to keep global temperature increase well below 2°C and, if possible, below 1.5°C. The achievement of this goal needs, obviously, a significant reduction in the emissions of greenhouse gases all over the world. However, the group of the most industrialized countries (which includes about thirty-eight members) has a special responsibility in this context, insofar as these countries are, generally, the largest emitters of greenhouse gases.

Although they do not always provide tangible impacts, all these meetings and resolutions on climate are certainly necessary. However, environmental problems are more than climate change. Beyond the climate change, the crucial challenge is how to reconcile economy and ecology, and this challenge raises the issue of green growth and sustainable development. Undisputedly, the Brundtland Report has the merit to formulate the environmental problem in these terms.

3.2. 1987: The “Brundtland Report” and the devotion of the notion of Sustainable Development.

Mrs. Gro Harlem Brundtland is a Norwegian politician (a Minister for several times) known for her commitment to the environment protection. In 1983, at the request of the Secretary-General of the United Nations Organisation (UNO), she founded the World Commission on Environment and Development (WCED), for which she became President. After four years of work, this commission released in April 1987, a report entitled “Our Common Future” – but often named Brundtland Report - which is an impassioned advocacy for sustainable development, making this term an essential notion in the debate on the environment protection (WCED, 1987).

Is it right to consider this report as the document that triggered the second Earth Summit, held in 1992 in Rio de Janeiro (the first being that of 1972 in Stockholm), then the third one, in 2002 in Johannesburg? Anyway, this is the point of view of many commentators and analysts of major international events. It is clear, however, that if the Brundtland Report has left its mark on the history of the environment, it is not due to its tangible effects. It is rather due to the strength of its critics and the sharpness of its analysis. Denouncing the mass-production model, which seriously threatens the ecosystem without ensuring the basic needs’ satisfaction of an important proportion of humanity, Brundtland Report lays the foundation for an alternative approach which takes into account simultaneously the ecological and social dimensions, as well as, the need for solidarity of the present generations with the future ones.

In this context, the report defines, for the first time, the concept of sustainable development by reference to three requirements: reconciling the economy with ecology (environmental requirement); eradicating poverty in the world by prioritizing the satisfaction of the basic needs of disadvantaged populations within each nation as well as at international level (social requirement); and finally, meeting the aspirations of the present generations without sacrificing those of future generations (intergenerational solidarity requirement). “Sustainable development”, according to the authors of the report, “is a development that meets the needs of the present generation without compromising the ability of future generations to meet theirs”.

Important note: mindful of the massive destructions caused to the ecosystem by the mass-production model, the Brundtland Report stresses the physical, atmospheric and other limits, now faced by the pursuit of the economic growth. However, these limits “are not absolute limits but are those imposed by the current state of our techniques and social organization, as well as, the ability of the biosphere to still bear the effects of human activity”. Therefore, as techniques and social organization are perfectible, a new era of economic growth remains possible...but on different foundations.

Here, one can measure the gap that separates the sustainable development's approach and that associated to degrowth theory: in contrast to the latter, sustainable development is not about refusing any growth but to change the operating way of growth, by introducing more democracy (representative and participatory) in the decision-making, at the national as well as the international level. "Meeting essential needs of populations requires not only a new era of economic growth in the nations where the majority are poor, but an assurance that those poor get their fair share of the resources required to sustain that growth. Such equity should be aided by political systems that secure effective citizens' participation in the decision-making and by greater democracy in the international decision-making."

In addition, the Brundtland Report does not omit to firmly emphasize two other important aspects of the sustainable development project: firstly, the solidarity of rich populations (from the North) with the poor ones (from the South); secondly, the need for a better control of population increase. "Sustainable global development requires that the haves (i.e. those who are economically well endowed) adopt life-styles that meet the planet ecological limits - in their use of energy, for example. Further, rapidly growing populations can increase the pressure on resources and slow any rise in living standards; thus sustainable development can only be pursued if increase of population and economic growth are in harmony with the changing productive potential of the ecosystem".

As one can see, on a conceptual level, sustainable development is fairly well-defined in its content and its implications; but still it is a long way from theory to practice. In fact, three decades later, the concrete achievements remain modest and even insufficient. Certainly, in accordance with the guidelines of the Brundtland Report, the Rio de Janeiro Summit (1992) ended with the signing of two international conventions: one on the preservation of biodiversity, the other on the prevention of climate change. Besides, an action plan (called "Agenda 21", in reference to the twenty-first century) has been adopted, in the term of which each signatory State is committed to developing an environment plan detailing the various aspects of its nature protection strategy.

As for the Johannesburg Summit (2002), the organizers – following the recommendations of the Brundtland Report - have set the main objective of the meeting to focus on the social dimension of sustainable development in order to favour real progresses and firm commitments in this field. To achieve this goal, they did invite all the concerned stakeholders to attend this meeting: States of course, but also large companies, NGOs, associations representing civil societies, etc. Unfortunately, despite a high attendance of the Summit, Johannesburg has not resulted in decisions that bind the different actors; therefore, very little progress has been conducted since.

All in all, since 1972 there has been undoubtedly, at a global scale, an important awareness about the environmental issues. However, this rise of the ecological concern has not, as yet, induced a significant progress... except on the climate change issue. Indeed, with regard to this problem, not only the number of signatories of the international agreements on climate has steadily grown, but since the beginning of the 21st century, major countries (except USA) have adopted the clauses included in these agreements: this is notably the case of European Union members, Russia, China... Furthermore, in the particular case of the Paris Convention (which aims to strengthen the global response to the threat of climate change), one can even say that, despite the

USA withdrawal, a real process towards reduction of greenhouse gases emissions has been launched.

4. Sustainable development in the (poor) countries of the South: an internal, but also international issue

The principles of sustainable development are rooted in the criticisms of the mass-production model, developed by academics and environmentalists from industrialized countries. Therefore, the mode of development of these countries was logically called into question. However, with the spectacular growth rates recorded since about four decades by the ANICs (Asian Newly Industrialized Countries) of the first generation and, during the last twenty years, by India and above all China, it is clear that the ecosystem preservation cannot be achieved as long as the so-called “emerging countries” are not fully involved.

A great debate has consequently been established - particularly within the international forums devoted to the environment protection - between, on one side, proponents of the right of poor countries into development and, on the other side, defenders of nature according to whom biodiversity is a common property, which ought to be protected by all. However, as shown by the interventions during the 2009 Copenhagen Summit, the debate on this subject is not as controversial as it first appears, and points of view are no so antagonistic.

Supporters of the right to development do not deny the ecological necessity. Simply, according to them, the environmental clause must not lead to prevent or hinder the development process of poor countries. This would be doubly unfair, since the today's industrialized countries were not, in their time, limited in their process of economic expansion by ecological constraints. In addition, compliance with environmental standards generates high costs that most of the (poor) countries of the South cannot bear alone. Hence, rich countries must help them, financially and technologically, to implement development projects that are less destructive of nature, within the framework of a renewed North-South cooperation.

As far as they are concerned, the most radical advocates of ecology recognize the legitimacy of the claim for the right to economic development of the least-developed countries: they just believe that fight against poverty and the ecosystem protection are not necessarily incompatible. However, the simultaneous pursuit of these two objectives requires an international dialogue framework which allows defining together the appropriate strategies. Such appropriate strategies, once designed, need for their success that the countries of the North allow those of the South to benefit of their experiences, their technologies, as well as their financial support.

On this basis, an international agreement is therefore possible, based on a twofold requirement: on one hand, the need for an appropriate economic growth that enables to eradicate poverty at global scale and, on the other hand, the necessity for North-South ambitious cooperation focused on environmental issues to preserve the ecosystem.

The remaining question then (at the theoretical level as well as at the empirical one) is that of the temporal framework of the analysis of the relation between development and natural environment. In other words, does economic growth inevitably generate, everywhere and always, pollution and destruction of the natural environment or are these ecological damages temporary, i.e. limited to the early stages of the development process? This question arises insofar empirical

studies on atmospheric pollutions (or at least some of them) have shown a tendency to reduction of these pollutions above a certain threshold of economic development and of welfare improvement for the majority of the population.

This phenomenon is approached, in the economic analysis, through what is called the "Environmental Kuznets Curve". If this curve is proven true, optimism is possible, particularly as, according to other empirical studies, energy consumption (per unit of produced wealth) would also have to decrease once a certain level of economic development is reached. Nevertheless, even in this optimistic hypothesis, it is necessary - for a real reconciling of economy and ecology - that environmental protection schemes and programmes, which are objects of hard negotiations at the international level (negotiations focused mainly on the reduction of pollutant discharges and greenhouse gas emissions) are effectively implemented and applied by all.

After a brief presentation of the Environmental Kuznets Curve, we will explain exactly why sustainable development is a crucial international (or global) stake that requires a renovated North-South cooperation focused on the environment issue.

4.1. An Environmental Curve on the Model of the “Inequalities’ Curve of Kuznets”?

In 1955, the Ukrainian-born American economist Simon Kuznets (1901-1985) developed a special relationship between level of income per capita and social inequalities that he schematically represented under the shape of an inverted U-curve. The shape of this curve means that Social inequalities, which generally widen during the phases of economic take-off, tend to reduce later, when the country reaches a certain per capita income threshold. This is what is called in Economics “the Kuznets’ Curve of social inequalities”. Noting that in industrialized countries the demand for an ecological quality has been growing with the raise of living standards, researchers working on the impacts of economic growth in terms of pollutions believed to be able to establish (based on the model of the Kuznets Curve of social inequalities), a curve with bell shape (or inverted U shape) to represent the relationship between income per capita and environmental degradation (for the plot of this curve, see page 17, below).

Called “Environmental Curve of Kuznets”, this curve means that if, in general, the environment deteriorates sharply during the early stages of the economic development (under the triple effect of the accumulation of urban waste, the increase of the pollutants emissions and the acceleration of natural resources exploitation), arrives the moment where the trend reverses. From this moment, called “turning point” - or “inflection point” - studies suggest a trend towards a progressive reduction of pollutions (with the notable exception of those related to urban waste and CO₂ emissions). This turning point (which squares with the moment when GDP per capita of the country is as high as approximately 5000 US dollars of the 1960s in PPP) is also the moment from which starts another positive trend: that of reduction of consumption of energy and of non-renewable raw materials per unit of produced wealth.

Several analytical elements are proposed to explain this reversal. In brief summarize, it is possible, following Gene M. Grossman and Alan B. Krueger (1995), to distinguish three different effects in the relationship between economic growth and natural environment: the “scale effect”, the “composition effect” and the “technological effect”. The scale effect is

environmentally negative since it simply means that the stronger the economic growth is in a country, the more it causes pollution. The composition effect covers the fact that with development, the structure of the GDP changes, the tertiary sector playing a more and more important part in it. This second effect is a positive one, as services pollute less than industry and industrialized agriculture. As for the technological effect, it is also positive because it refers to the capacity (or the ability) that a country acquires, thanks to its higher development level, to implement an effective environmental policy, by allocating more resources to the research activities oriented towards the elaboration of techniques and methods that preserve the environment.

In total, this reasoning amounts to saying that if in the early stages the economic growth is harmful to the environment, starting from the turning point (or inflection point), a reversal of the trend takes place: the composition effect combined with the technological effect exceed the scale effect. Moreover, at the same time as this first argument, other elements are introduced in the explanation that can be summed up in two points.

a) On the consumption side, the demand for a high-quality environment increases with the level of income because the high environmental quality is a superior good, or at least is regarded as such (much like the cultural goods, the leisure goods...). Due to their modest financial resources, poor populations focus in general on basic needs, namely food, clothing, shelter, etc., the ecological concern coming far behind. But, thanks to the income per capita increase, the middle-classes grow, and with them, the demand not only for a higher standard of living, but also for a better living environment (in the ecological sense), which contributes significantly to the environment protection.

b) On the production side, companies are often reluctant to apply ecological standards because they drive additional costs to them. However, it happens that the environment degradation becomes an impediment to production: a good example is that of deforestation that entails a risk of depletion of timber resources, which therefore can result in an unbearable increase of the prices in the world markets. In this case, companies become environmentally responsible and opt to support the implementation of environmental policies.

Figure1. The Environmental Kuznets Curve (1st version)

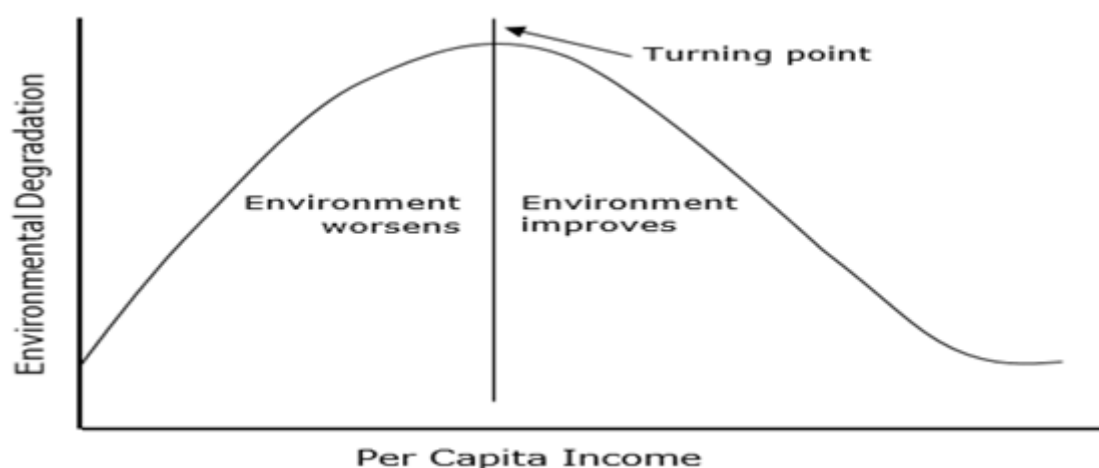
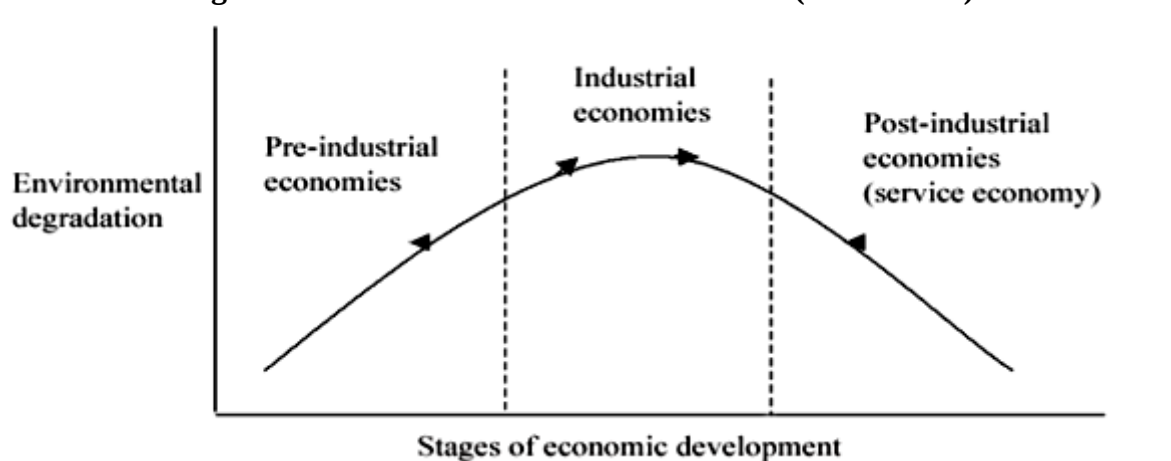


Figure2. The Environmental Kuznets Curve (2nd version)

This analysis of the development/environment relationship, based on the “Environmental Curve of Kuznets”, while being interesting, is widely discussed today. On one hand, not all carefully led statistical studies on the subject verify the relationship postulated between the increase in income and the decrease of pollution. Or, more accurately, if the curve of Kuznets is confirmed for some pollution types (air and especially water), it is not verified for others (urban waste, CO₂ emissions, etc.). On the other hand, further studies, dedicated to the countries of South, show that the crossing of the threshold of 5000 US dollars income per capita does not induce, ipso facto, an improvement of the ecological situation. This is, for instance, the case in Mexico where various environmental indicators (erosion of soils, accumulation of waste, pollution of water and air...) continue to deteriorate strongly while this country had reached theoretically the turning point nearly thirty years ago.

This is to say that the inflection phenomenon of the environmental curve (when a certain level of income per capita is reached) is not at all automatic, but depends substantially on the commitment of the civil society, and on the decisions that are taken at the national Governments level as well as at the level of international organizations of environment regulation.

4.2. Sustainable Development: a North-South relations' stake for the coming decades

In the poor countries as well as in the rich ones, the ecological challenge is henceforth everybody's concern. However, the ecosystem protection requires a strong involvement of the public authorities (at the local and national levels), through audacious policies. That is shown, for example, by the progress made in New Delhi (capital of India) in the fight against urban pollution caused by the intense vehicle traffic. At the end of the 1990s, New Delhi was ranked among the ten most polluted cities in the world. Since 2002, the municipal authorities have set up a proactive policy in the field of urban transport, which imposed the transition to natural gas of all heavy vehicles and also light vehicles that transport goods. This policy showed a real effectiveness insofar it resulted in a significant reduction in Sulphur Dioxide and Carbon Monoxide emissions.

This example, unlike the common misconception, is not unique in the South Countries, as has been proven in the case of China (the world's largest energy market), which has been much criticized in last decades because of the strong ecological footprint of its economic growth. In fact, China has recently shown a real concern about the environment challenge, and has launched

a huge investments programme in renewable power generation which, beside the ecosystem protection and the fight against the climate change, is likely to create million jobs (13 million by 2020, according to credible anticipations). Thus, if local and national policies are quite essential, it is clear, however, that the ecological issue cannot find a fully satisfactory response unless it is treated effectively at the international level, and in particular in the framework of a North-South reinforced cooperation, focused on the environment protection.

For a long time (from the 1950s to the 1980s), influenced by the structuralist theories, debates on North-South relations were centred on the New International Economic Order (NIEO) that must be urgently built. The idea supported by proponents of the development of the then called “Third World” (basically the poor countries of the South, mainly exporters of raw materials) is that this NIEO should ensure better prices for primary goods (agricultural and mining) in order to put an end to the “secular deterioration of trade terms”, which hinders strongly the development of these Third World countries (Raúl Prebisch, 1950; Hans Singer, 1950).

For the past twenty years, under the influence of various developments (Third World burst, emergence of the NICs, loss of influence of the Non-Aligned Countries Organization, collapse of the Soviet Union...), this issue seems abandoned. At the same time, we are witnessing, in meetings and international conferences, a focus on other issues: liberalization of international trade, management of the poor countries’ debt, and fight against terrorism... But, as seen above, the debates have been also focused on the environmental issues: preservation of biodiversity and prevention of climate change by and for a sustainable development.

In the sustainable development perspective, it is clear that the right to development should not be a pretext to exempt the countries of South from the common effort to which each nation has to contribute for a better nature protection. In other words, all countries have to participate to the common effort, although the share of each must be proportional to its size (both economic and demographic). For instance, because of their huge populations and their vigorous and steady economic growth, the shares of China and India in global pollutant gas emissions have been high and increasing over the past decades. Consequently, among the developing countries, the contributions of these two big nations to the reduction programmes of such emissions should be higher than that of small countries.

But beyond the participation of every country to the collective effort, it is clear that the response to the environmental challenge requires also (and perhaps above all) the commitment of developed nations to assist – financially and technologically - less developed ones in their actions for the protection of the environment. However, for a maximum effectiveness, this aid should be replaced in the framework of a renovated and reinforced North-South cooperation, focused on the environment stake. In light of the ongoing negotiations, this cooperation must be articulated around three determinant axes.

4.2.1. Increase in the official development assistance to enable poor countries to "save" their exhaustible resources

At the Rio Earth Summit, the rich countries of the North acknowledged that the preservation of non-renewable resources represents a heavy constraint for the poor countries of the South, and this constraint is all the heavier since natural resources often constitute the only capital owned by

the poor nations. Therefore, so far as this resources preservation is likely to restrain the economic growth of these nations, is it legitimate that it is offset by an increase of the official development assistance provided by rich nations. This issue is one of the major discussion points in the ongoing international negotiations around the environment protection.

In this regard, we note that the GEF (Global Environment Facility), founded in 1991 to financially support sustainable development programs (especially in developing countries), is a good instrument for the protection of nature and the preservation of exhaustible resources. However, the financial means available to this fund are clearly insufficient to cope with the ecological challenge, this insufficiency being worsened by the fact that official development aid to poor countries has been decreasing over this period and especially since the 2007-2008 financial crisis and the deterioration of the overall economic situation that it has entailed.

4.2.2 Conservation of biodiversity and solidarity within and between generations

Desertification, deforestation, degradation of the ecosystem (with extinction of living species and loss of flora and fauna abundance), etc., all these phenomena are now well-known. To cope with these problems, one of the recommended solutions is the creation of preservation, or conservation areas in biodiversity-rich spaces. However, largely, these areas are located in the developing countries, and particularly in the regions inhabited by economically disadvantaged populations. To provide their basic needs, these populations use intensely - and sometimes up to its irreversible destruction - the natural heritage that is accessible to them. To stop these practices that overexploit natural resources (or at least to alter them), ecological public policies at the national level are essential. But, for their full effectiveness, these policies obviously require multifaceted support of the international organizations whose main purpose is to protect biodiversity (GEF, UNDP, WWF...). However, and this is the second sensitive point of the current North-South negotiations on environmental issues, they also require financial and technological support from developed countries. In a way, this means that the intergenerational solidarity, which gives its full sense to the action for biodiversity and sustainable development, should be combined right now with an intra-generational solidarity at the international level between rich and poor nations.

4.2.3 Transfer of Ecology friendly-technologies versus patent protection

One of the key parameters of the protection of the environment in the countries of the South is access to environmentally innovative technologies developed mostly in countries of the North: alternative energies, waste treatment techniques, production processes cleaner and more efficient in energy and natural resources use, etc. However, most of these innovations have been the subject of intellectual property rights protection by private patents. The developing countries, and especially the poorest, simply cannot benefit.

How to deal with the issue of intellectual property protection that restricts the transfer of environmental technologies for the benefit of the South countries? This is the third tense point of the North-South negotiations about the environment preservation. Between the two groups of countries, the disagreement here is particularly important. On the grounds that biodiversity preservation is a global goal, the insistent demand of the developing countries is to have a free access to the environment friendly-technologies. But the developed countries are

pretty reluctant to accept it. Instead, they merely propose various funding formulas in order to promote international flows of information and exchanges of expertise in terms of sustainable development.

Certainly, with the CDM (Clean Development Mechanism) established under the Kyoto Protocol, North-South cooperation in the field of reduction of greenhouse gases is likely to make real progresses: one of the provisions of the CDM is that any company of a North country which contributes (by its technological innovation) to the reduction of emissions of such gas in any South country, can benefit from some kind of compensation in the form of a lessening in the effort that is required of it, in the ecological field, in its home country. But such mechanisms are designed especially for greenhouse gases emissions, but not for other environmental problems. As a result, the disagreement between North and South on technologies' transfer remains intact. Worse: insofar international negotiations on the patents' protection do not progress, the countries of South have come to utilize the argument of the intellectual property, applied to the natural resources: since natural resources located in their soil and subsoil are part of their national ownership, they consider it is their sovereign right to exploit them freely, according to their national interests.

If this defensive position of developing countries is perfectly questionable (as is also that of developed countries), its virtue is to clearly highlight two proposals that are closely related: on the one hand, how, at the international level, the interests at stake are difficult to reconcile; and on the other hand (on the opposite), how a North-South deeply renovated cooperation, allowing the transfer of environmental friendly and eco-development technologies, is henceforth essential.

5. Conclusion

Between ecology and economy, relationships are complex. Contrary to common belief, economic theory has had a long interest in the environmental issue. If the answers to this question have been varying according to the authors and schools of thought, a consensus exists today on the need to take into account the ecological requirement in the economic analysis. On this basis, sustainable development, after a long period that has started with the Stockholm Conference of 1972, is now an essential notion in the public debates, at the international level and also at the national levels (in developing countries as well as in developed ones).

Unfortunately, except some progresses in the area of the fight against global warming, there is a long way from speeches to realities.

With regard to the developing countries - whose share in the degradation of the ecosystem is generally small but growing - it is clear that one should not expect mechanical progresses from the increase in income per capita. In the environment field, certainly more than in others, a favourable evolution of parameters depends essentially on the human will, and especially on the will of those who detain the political and/or economic power. Insofar as financial and technical means are sorely lacking in poor developing countries, the solution to the environmental issue in these countries requires a North-South renovated and enhanced cooperation, which enables them to access to funding schemes and environmentally-clean technologies, controlled mainly by developed countries.

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