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Putting a price on the Living : Social construction of an environment convention[1]

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How economists perceive social construction of environmental issues was considerably modified in the 80s by the emergence of global environmental problems (acid rain, thinning of the ozone layer, risk of climatic change). Ignorance and uncertainty characterized thinking at every level of expertise : possible damage was not clearly evaluated, nor were causes and responsibilities; those concerned were not clearly identified, appearing either as absent (future generations, for example) or as agents only indirectly affected by the problem at stake...The organization of collective action need to be reexaminated, due to information unavailability and to difficulties of identifying implicated interests in global environmental problems. Following Olivier Godard (1993), these problems can be referred to as "controversial universes." As Sylvie Faucheux & Jean-François Noël (1990), Olivier Godard (1992) and Charles Hourcade *et al.* (1992) have shown how social construction of the global environmental problem and the ensuing collective decision-making process result from a complex *interplay* of the actors present : scientists, politicians, industrialists, media, ecologist associations, etc. This atmosphere of controversy and uncertainty concerning fundamental problems makes it impossible, for example, to calculate distribution of probabality for the risk. Under these conditions, collective management of the environment cannot only be based on the agents' rationality and on market forces. Similarly, environmental norms, which make collective action possible, cannot be set merely on the basis of transfer of scientific knowledge in the social and political fields. Traditional approaches in environmental and natural resource economics, with their prescriptions based on what can be called a "stabilized universe"[2], are invalidated by global environmental problems.

To redefine and reduce the importance of market-based trade-off, the "conventionalist approach" emphasizes constitutive principles and outcomes of modes of collective coordination, whether they are market-based or not. Dupuy *et al.* write, "Agreement between individuals, even when it is limited to a contract of market-based trade-off, is not possible without a common framework, without a

[1] This article is based on the text of two communications - Aubertin *et al.* (1996) and Vivian *et al.* (1996) presented at the"Ecology, Society and Economy : what is needed for durable development ?" Colloquy in St.-Quentin-en-Yvelines, May 23-25, 1996.

[2] For Olivier Godard (1993:149), this expression designates "the configuration in which current or potential damages can be repaired and perceived by individuals, only their interests and preferences are directly taken into account, and problems are scientifically stabilized."

constitutive convention ." In a decisional universe dominated by uncertainty, this need for the construction and maintenance of a common convention[3], as outcome of and condition for collective coordination, is greater than ever, as Keynes showed (1936:167) in Chapter XII of *The general theory of emplyment, interest and money*. Theoreticians have studied labor conventions (Salais, 1989), financial conventions (Orléan, 1989) and quality conventions (Eymard-Duvernay, 1989). These studies helped to establish the notion of "environmental conventions" by Olivier Godard (1993), designed to analyze the development of collective cognitive and decisional processes functioning in the framework of global environmental problems. These conventions, agreements on common knowledge and practice, cover diagnoses, technical solutions and goals to be reached as well as institutional mechanisms and tools destined to carry out environmental policy. These elements are "normative frameworks" (Mormont, 1959:19), expressing willingness and commitment to act in a specific framework according to a certain view of the world.

Global environment conventions must be neither rigid nor premature. On one hand, they should preserve a universe of options and choices; on the other hand, they should define clear objectives which enable actors to use their rationality and express their anticipations. For example, the debate to define collective action concerning the ozone layer and climatic change issues was based on two major themes : (1) setting environmental norms through negotiation on a global level (forbidding use of chloride and bromide substances, decided by the Montreal Protocol in 1987 and commitment of the European Union to stabilize carbonic gas emission in 2000 at 1990 levels) on the basis of scientific knowledge and technological choices; (2) evaluation of regulatory instruments which can be used to modify the behavior of the agents involved (see, for example, OECD, 1992). Using the perspective of conventionalist authors such as Luc Boltanski & Laurent Thévenot (1987), it can be shown that the problem of legitimacy conflict is always hidden behind the issues of policy effectiveness and choice of instruments. Thus Olivier Godard (1989:216) points out the extended implications of environmental policy instruments : they involve "a network of affinities with certain social structures, certain representations of nature, certain types of human interests and certain conceptions of organization and coordination of life in society." These instruments should be judged, not only from an efficiency point of view, but above all from that of the legitimacy system in which they are rooted.

Whatever the point of view - institutional, political or scientific -, erosion of biological diversity, already inscribed on the international agenda, is now one of the global environmental problems most urgently in need of solutions. Awareness of the seriousness of this is shown by the signing of the Convention of Biological Diversity during the earth Summit in Rio de Janeiro in 1992, the financing, since 1992, by the Global Environmental Fund (GEF) of projects for the protection of species and ecosystems, and the many bilateral agreements concluded between developing countries and private interests. These latter agreements involve inventories, gathering and studies of the possibilities of patenting and commercializing products derived from indigenous biological resources. These diverse initiatives are a sign that social construction of the problem of biological diversity is under way.

In this text, we will study this evolution, from the conventionalist perspective devised by Olivier Godard (1993). Nevertheless, there is still considerable scientific controversy as to the scope and seriousness of the phenomeneon. The ecologists appear divided or, at the very least, cautious about what is or is not important in the area of biological diversity. This difficulty in elaborating a shared corpus of knowledge, combined with the "urgent" nature of global environmental problems seems to have led to social construction and an environmental convention mainly based on economic issues. In the first part, we will detail how the environmental convention on biological diversity signed at Rio de Janeiro was polarized on the problem of exploiting genetic resources. Biological diversity is first of all perceived as raw material, input in production processes in different industries (pharmaceutics,

[3]Dupuy *et al.* (1989:142) defines convention as "the instrument constituting an agreement of wills, like its product, with a normative obligatory force; the convention should be apprehended both as the result of individual actions and as a framework constraining its subjects."

cosmetics, chemistry, food)...), a "resource", a "natural capital" that should be exploited rationally. In the second part, we will deal with the current abundance of theoretical literature on the economic value of biological diversity. In the absence of universally accepted scientific norms, we feel that the economic norm emerging through theories and procedures aimed at putting value on the living is likely to become the social norm which within the world of the living, will determine what should or should not be protected.

Environmental economics was conceived in the 1960s on the idea that the economist, confronted with a simple problem of allocation of scarce resources, could solve environmental problems alone. The issue of biological diversity could lead to a comebeck to this type of analysis, which was, paradoxically, considered as definitively abandoned since global environment problems have emerged.

I. The process of social construction of the biological diversity problem

The Convention on Biological Diversity signed at the Earth Summit marks a turning point in the awareness of risks inherent in the erosion of biodiversity. In the Convention Preamble (UNEP, 1992), the contracting Parties affirmed their awareness of

"the intrinsic value of biological diversity and the value of diversity and its constitutive elements on a environmental, genetic, social, scientific, cultural, recreational and aesthetic level," and of

"the importance of biological diversity in evolution and preservation of systems which support the biosphere."

However, it should be clearly understood that this Convention is a balance between different concerns and diverse communities of interests. Like all global environment problems, social construction of the biological diversity problem is the result of complex interplay between different actors. This construction manifests major characteristics, noted by Olivier Godard (1992) and Jean-Charles Hourcade *et al.*, particularly in the field of climatic risk.

I.1 Scientific controversy

Direct observation of world-scale environmental damage is rare. Social construction of global environment problems generally originates in the scientific world but does not necessarily correspond to an actual scientifically proven reality. The public, in any case, becomes aware of the issue. Sometimes scientific facts already widely known are analyzed differently or suddenly receive special attention. The extinction of species and human influence on this process are phenomena which have long been studied. Jean-Paul Déléage (1991:66) reminds us how, shortly after the publication of Darwin's *Origin of the Species*, the French naturalist Tribolet anxiously counted up the number of species that man had made extinct since the birth of civilization. Similarly, the shock of the disappearance of the dodo on Mauritius Island and of the American passenger pigeon or the quasi-extinction of the American buffalo has not been forgotten.

However, the degree to which this problem is perceived was modified in the 80s. In semantic terms, this corresponds to the birth of the word "biodiversity" in 1986. The problem is no longer perceived through the cases of more or less charismatic isolated species. It is now seen as a global phenomenon of large-scale destruction of natural habitat. Erosion of biodiversity joins the other global environmental problems (acid rain, ozone layer) which became known a little earlier. This awareness is the result of a combination of anthropogenic phenomena which have taken place on an unprecedent scale, such as homogenization of crops, increased demographic pressure, development of shifting cultivation and the acceleration of deforestation in tropical areas. A large number of estimations of biological erosion flourished in the 1980s, contributing to the confirmation of the phenomenon.

Nevertheless, as Matthieu Glachant & François Lévêque pointed out (1993:74), this data is controversial : neither the exact number of species currently living on Earth[4] nor the rhythm of ecosystem destruction is known. Scientists therefore make hypotheses using this data which serves as the basis for building models of population dynamics. According to the models used, estimations of global biodiversity loss varies from 2 to 10 % of species currently existant per decade. Global erosion figures before a possible stabilization between the year 2000 and 2020 - and here again there is a debate - is estimated at 5 to 25 % of species. According to Edward Wilson - one of the authors who, in writing about the "biological crisis" (Wilson, 1985), has done the most to heighten public awareness of the problem - anthropogenic extinctions are occurring at the rate of a hundred species a day, which is 10,000 times the natural rhythm. At this pace, 25,000 to 75,000 species could disappear by the year 2000. Wilson writes that humanity has thus triggered the sixth species extinction crisis[5] within one generation. Paul Ehrlich (1988) does not hesitate to compare the consequences of this rapid erosion of biological diversity for humanity to those provoked by a nuclear winter. The same atmosphere of urgency characteristic of the controversial universe of global environmental problems is found with the theme of irreversibility. Despite the vigor of the controversy about the scope of the problem, scientific opinions appear corroborative enough to give a stable, socially meaningful representation. Therefore, it is necessary to act, even though scientific uncertainties remain.

I.2 Emergence of economic stakes

"Biodiversity," wrote Edward Wilson, "is one of the planet's greatest wealth, and yet is the least recognized as such." In the second step of the construction of environmental problems, the problem of biodiversity erosion is taken out of the hands of life sciences specialists and gradually becomes a strategic variable for economic agents.The first sector concerned by the reduction of biological diversity is agriculture. The situation is paradoxical, because plant improvement, beneficial for humanity, leads to uniformity of seeds, to gradual erosion of diversity (inter-specific and intra-specific), to the disappearance of the genetic pool of local cultivars and therefore to vulnerability of commercial varieties confronted with diseases and predators. Biological resources are also raw materials for a wide variety of industries (pharmaceutics, cosmetics, food...). More and more studies were made in the 1980s to attempt to evaluate the economic and industrial importance of biological diversity. Developing countries, especially in the Food and Agricultural Organization (FAO), have reinforced their claims for a more equitable sharing of the wealth produced from biological and genetical material collected without charge on their territories.

Out of the 120 pure chemical substances used to make medicine and extracted from several hundred superior plant species, Pistorius and van Wijk (1993) noted that 2/3 come from species located in the temperate zone. Noah Chomsky (1994:53) pointed out that the ethnobotanist Darrell Posey estimates the value on the world market of products derived from medicinal plants discovered by indigenous peoples at $US 43 million. Parallel studies have been made to analyze the impact of the use of genetic agricultural resources on agriculture in the U.S. All specialists remember the discovery in Mexico of genetic material resisting the fungus which had been devastating North American corn crops since the early 1970s with losses estimated at 2 billion dollars (CMED, 1987:185). On the basis of studies of experts, R. and C. Prescott-Allen (1986) concluded that the annual contribution of wild genetic resources to American agriculture can be evaluated at $US 350 million (in 1980 dollars).

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[4] According to M. Glachant and F. Lévêque (1993:71), 1.4 million species (750,000 insects, 250,000 plants and 41,000 vertebrates) have been listed up to now. Estimates of the total number of species living on earth vary from 5 to 40 million.

[5] "The five great mass extinctions," writes E. Wilson (1992:43) occurred in the following order, with the geological periods followed by the dates (in millions of years B.P.) : Ordivician, 440 million years; Devonian, 365 million years; Permian, 245 million years; Triassic, 210 million years; and Cretaceous, 66 million years. A great number of second- and third-order fluctuations also occurred, but these five disasters are located at the extremity of the curve of violent events."

The signature of bilateral agreements between companies and states is another sign of the strategic positioning of economic actors. A lot has been said about the famous agreement concluded in 1991 between the American pharmaceutical firm Merck and the Intituto Nacional de Biodiversidad (INBio), a private not-for-profit organization linked to the Costa Rican Ministry of Natural Resources, Energy and Mines. This agreement specified that, in exchange for 1000 biological samples supplied by INBio, Merck would set a budget of $US 1,135,000 over 2 years for research and sampling. The firm agreed to pay royalties (from 2 to 6% of gross sales) on any commercial product obtained through use of biological material received. On one hand, Merck hopes to discover promising phramaceutical inputs (for 2 years, the firm has exclusive rights to use samples supplied), and, if successful, register patents. On the other hand, INBio plans to use the money to partially finance the complete inventory of biological diversity in Costa Rica, a colossal task which will take 10 years and cost $US 30 million. Furthermore, it is agreed that 50% of the rights earned by INBio will be turned over to The Costa Rica National Park Service to finance conservation activities.

Stocking genetic resources is another area where economic stakes and actors' strategies interact. Matthieu Glachant & François Lévêque noted (1993) that out of the 127 collections of genetic material listed by the International Board for Plant Genetic Resources (IBPGR), 81 are national collections belonging to developed countries, 29 have an international status and 17 are in national collections belonging to developing countries. Thus, according to Henk Hobbelink (1993:73), "At least half of all the preserved third world seeds are already in developed countries' gene banks. The United States holds at least half of the genetic material aimed at maintaining and increasing agricultural productivity. European gene banks have stocked about 35% of the world genetic diversity of food and fodder crops. 86% of microbial collections are in the North, mostly in the U.S. 85% of fetal population is in the North, with once again a majority in the United States.

The revelation of these facts, combined with the small aid granted to developing countries for their efforts to preserve biological diversity, led the FAO to take action. In 1981, FAO prepared an International Convention on Phytogenetic Resources and made plans for the creation of an international gene bank. Since many countries showed reluctance, the FAO had to reduce its ambition to an International Undertaking on Plant Genetic Resources, which defends the notion of a common human heritage and guarantees free access to genetic resources in their ecological niche. For seeds, a Plant Breeder's Right[6] (PBR) guarantees variety protection but assures a principle of free access to genetic resources the variety contains. Because of this free access, the resource has a public good status, which means there can be neither eviction nor destruction of the resource through its use, as is the case for non-renewable resources. In 1987, the FAO defined "farmers' rights" recognizing domestication and improvement of local varieties carried out by successive generations of farmers. Militating for global negotiation for these "farmers' rights," the FAO has proposed to create an International Commission of Phytogenetic Resources (ICPR), a real international forum for the discussion of related geopolitical issues. The FAO also wished to create an international fund designed to support genetic resource conservation programs in Southern countries. It would be financed either by breeders in developed countries, or as an obligatory contribution by member countries calculated as a percentage of a macroeconomic indicator to be defined. Even if recognition of these "farmers rights" appears to be the preliminary step to establishing national soverignity, the balance chosen by the FAO - free access to resources and compensating payments for collective "farmers' rights" drawn from an international fund - has a typical common human heritage status. However, the FAO's proposed system has never functioned.

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[6] "The Plant Breeder's Right," write P.-B. Joly et M. Trommetter (1991:8), is very different from a patent since the monopoly is limited, from two points of view : the farmer's privilege; and any breeder can freely use a rival's plant varieties, although they may be under an exploitation monopoly. This is what is called Free Access to protected plant varieties as source of initial variability. If from an existing varity he creates a new one, he will be able to market freely without the breeder of the variety being able to oppose his own rights. This is an essential difference withthe research exemption of the patent system."

I.3.The biotechnological stakes

Arbitrations on major technological options - a recent example is the catalytic converter in the case of acid rain - are a third fundamental characteristic of social construction in global environmental problems. These technological evolutions, whether they be current or future, modify agents' representations of environmental problems and the solutions which can be found. This can be seen in the case of erosion of biological diversity. The terms of the debate were altered by biotechnological developments.

This boom in biotechnology is one of the reasons for the institutional failure of the FAO system we just evoked. The development of "non-incarnated" technologies (molecular marking, multiplication *in vitro*) modifies know-how by reducing the time necessary to create new vegetal varieties Under these conditions, the PBR is considered, write M Glachant & F. Lévêque (1993:131-132), "by industrial firms to insufficiently protect incarnated biotechnological innovations. This has provoked a debate on patenting vegetable varieties previously excluded from the patent protection system." This evolution reflects both technical progress and the rise of a new breed of actors on the seed market since the early 1980s. This very small number of chemical and agribusiness firms are ahead of traditional plant breeders in biotechnology and are more familiar with the patent system. These figures, who now occupy dominant positions on the agricultural plant seed market, have been identified by Henk Hobbelink (1993:80) as Sandoz, Ciba-Geigy, Shell, ICI and De Khalb/Pfeister. A similar concentration can be noted in the pharmaceutics sector. At the same time, private companies have taken over a domininant role in the field of biotechnological R&D[7].

As Joly & Trommetter have shown (1994:334), biotechnological development leads to deepening divisions in how actors represent the management system most which best responds to the problem of erosion of agricultural diversity. For some, genetic resources - raw materials - are the most important. For example, R. and C. Prescott-Allen (1986) underestimate, in economic terms, the R &D effort required to develop viable agricultural varieties. According to this point of view, one can easily understand why developing countries claim the recognition of national sovereignty over their genetic resources. For others, development of of biotechnologies means that now, biological resources are less important than the industrial techniques used to exploit them. Conservation of biological resources is no longer a "goal in itself", but becomes a "means." According to this point of view, one can see why private companies, which expect to have considerable possibilities of substitution of factors (capital for natural resources), require a strong intellectual property system. Even if the patents only concern a few varieties for the moment -several years are likely to go by before the awaited biotechnological revolution will start having an effect- we are nonetheless heading into an era of appropriation and capitalization of genetic resources. This evolution led to a revision of the PBR in 1991 to limit the effects of patents[8]. Discussions on this topic now take place in the GATT talks, within the framework of the protection of intellectual property.

I.4 A need for institutional stabilization

The Convention on Biological Diversity signed at the Earth Summit is at the intersection of two perspectives. First, that of the exploitation of natural resources (but in emphasizing that natural diversity is linked to cultural diversity). Second, that of a new step in the history of international

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[7] "For vegetable biotechnology," writes Pierre-benoit Joly (1994:52), "75% of research and development efforts are now financed by companies with private capital. Because of this, public research has more and more contractual links with private research and has to submit to the rules of intellectual property prevalent in the private sector."

[8] The new 1991 PBR increases the constraint of inter-variety dependence. For example, a selector who modifies the variety of a competitor by introducing a patented gene, thereby blocking access to the selector's own variety, cannot commercialize it because it is genetically too close to the previous one. For more detail, see Joly, Trommetter (1991).

conventions aimed at protecting wildlife, as Nicolas de Sadeleer points out (1994). After the Stockholm conference (1972)[9], a whole series of international conventions on protection of the environment in the 1970s had a planetary impact : the Convention on Wetlands signed in Ramsar in 1971, the Convention Concerning the Protection of the World Cultural and Natural Heritage signed in Paris in 1972 under the auspices of UNESCO, the Convention on International Trade in Endangered Species signed in Washington in 1975, and the Convention on the Conservation of Migratory species of wild Animals signed at Bonn in 1979. In the 1980s, particularly with the Chart of Nature adopted by the United Nations General Assembly on October 29, 1982, came the realization that the genetic heritage of humanity should be taken into account in these types of protective measures.
The idea launched by the UICN of elaborating a Convention-frame for biodiversity was taken up and developed by the UNEP from 1988 on. UNEP preparations for the Rio conference followed the strategic line advocated by the major organizations for the protection of nature such as the UICN, the WWF and the World Research Institute. These same organizations - especially the UICN (1980) - were among those who launched the theme of sustainable development at the beginning of the 1980s. Although a key concept in reports published by these organizations for the protection of nature (McNeely *et al.*, 1990), the term "conservation" has gradually acquired a wider sense and is now linked with development. However, this perspective was strictly limited to wild species exploited by man and not domestic species.

The Convention signed at Rio is the first international agreement to propose an integrated approach to preservation and sustainable exploitation of biological resources. It covers themes as varied as conservation *in situ* and *ex situ*, wild and domestic species, genetic resources, biotechnologies, biosecurity and genetically modified organisms. However, environmental risk itself seems to have become a secondary problem. The fact that the planned Convention on protection of tropical forests - estimated to harbor more than 50% of world biological diversity - was finally replaced by a simple declaration of principle, not legally binding, is particularly significant. Emphasis was on the problem of sharing profits gained from exploiting genetic resources. At stake here, stated in the text of the Convention on Biological Diversity, was the "just and equitable sharing of advantages drawn from genetic resources, particularly through satisfactory access to genetic resources, and an appropriate transfer of pertinent techniques, taking into account all rights on resources and techniques, by means of adequate financing" (Article 1). Biological diversity thus seems to be limited to genetic resources and ensuing financial advantages. The system finally decided upon at the Rio conference has two main characteristics. First of all, it appears as a means to legitimize the Global Environment Facility, the institution destined to fund development projects metting the requirements of world environmental protection. Secondly, it is a system (1) of intellectual property for genetic sequences in developed countries (a variety can be protected either by an improved PBR or by a patent, if it integrates patentable elements), and (2) of national sovereignty over Southern countries resources. The Convention on Biological Diversity states (Article 3) : "In accordance with the United Nations Charter and the principles of international law, States have the sovereign right to exploit their own resources according to their environmental policy, and they have the duty to act in such a way that their enforcement does not cause any damage to the environment in other States or in regions free of national jurisdiction." The transition from the status of a common heritage to the status of appropriation of biological resources is thus confirmed.

But this does not mean the conflict between different visions of the world has come to an end. Pressure groups (such as the Keystone Dialogue) and official delegations (especially Sweden's) succeeded in excluding international collections of *ex situ* genetic resources from the Convention on Biological Diversity. Consequently, in autumn 1992, the twenty International Agricultural Research

[9] As Nicolas de Sadeleer recalls (1994:35-36), "Humanity has a particular responsibility to safeguard and wisely manage the heritage made up of wild flora and fauna and their habitat, today seriously threatened by a combination of unfavorable circumstances. Natural conservation, and particularly of wild flora and fauna, should therefore occupy an important place in planning of economic development."

Centers (IARCs), which make up one of the largest gene bank networks in the world[10], reaffirmed the principle of free access to their collections. Recalling that they are only guardians of the genetic resource collections, which belong to the international community (it is often impossible to determine the country or countries of origin of stocked material), the IARC decided to place their collections under the jurisdiction of the FAO. Although it is clear that, through the Convention on Biological Diversity, the UNEP now encroaches on the area of genetic resources traditionally occupied by the FAO, the latter has not said its last word on the subject. Its analysis is based on the principle that use and preservation of resources have specific characteristics, varying according to the actors involved. In the pharmaceutical sector, a gene or a specific character is the object of research. In the plant breed field, the potential interest of conservation lies first in the reduction of risks connected with natural or artificial catastrophes (mutation of a pathogen, for example)[11] ; second in the better adaptation to changes in taste and in desired quality and to evolutive international regulations on agricultural policy (Common Agricultural Policy, GATT). For these reasons, the FAO is currently considering a renegotiation of the International Undertaking on Plant Genetic Resources. The FAO's objective is to make it a protocol of the Convention on Biological Diversity. The institutional system proposed by the FAO would be based on open remunerated access to agricultural genetic resources at every level. "Farmers' rights" would be reinforced against private appropriation of genetic resources. Joly & Trommetter (1994:340) proposed to set up a system of PBR or patents with dependent permits making it possible to preserve (remunerated) access to a resource with, at the same time, (remunerated) access in developing countries, either by users'taxes or through an obligatory international fund.

II. Emergence of an economic norm as the main element of the social construction of the biodiversity erosion issue

The conflicts between actors and different world views, characteristic of the social construction of global environment problems, simply continue in the area of economic evaluation and instrumentalization. For an actor to impose his point of view, it vital to be able to refer to an economic argumentation. There are two reasons for this. First, it gives authority to the economic evaluation. The actors becomes more credible. Furthermore, since the others are doing the same, each is obliged to oppose their competitors' evaluations with their own. It is clear that some actors see these evaluations as opportunities to appropriate the system of economic legitimacy for their own ends[12]. Second, it is also said to be a *sine qua non* of the neutrality of the economic evaluation. The language of the economist - or even better, that of the microeconomist (Henry, 1984) - is often presented as a negotiation language - if not *the* language - capable of harmonizing divergent interests. F. Bonnieux (1995:92) writes that economists should be mediators between ecologists and decision-makers. In order to accomplish this, biological diversity has to be priced- and this is the task of economic valuation methods. In this context a price means a monetary indicator of scarcity which is supposed to guide the decisions of economic agents and to assure perfect coordination between them. These two arguments are invoked to justify use of economic valuations and are not fully acceptable. Like all economic policy instruments, the economic evaluation methods and instruments are not neutral. Because they depend on a "market-based convention", they mask reinforce what Olivier Godard (1989) calls "troubles of legitimacy."

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[10] 25% of world collections are concerned, according to P.-B. Joly (1994:54).

[11] The probability of such risks is all the higher in view of the great number of conserved samples.

[12] Daid McDowell (1995), director general if the UICN, stated : "We others, conservation specialists, *must* learn economy." (The italics are his). A little farther on, he says, "If we really want to save the planet, we must begin by grasping the economic dimensions of our mission. This is the reason for the UICN's new initiative, aimed at using economy as an instrument."

II.1. Conflicts of actors around production of an economic evaluation norm

As the institutions set up to protect biological diversity evolved, so did the arguments justifying the choices. In the 1960s advocates of "deep ecology" insisted on humanity's moral duty to preserve the rights of non-humans. A more anthropocentric approach to the issue followed in the 1970s (Tisdell, 1990). The arguments behind this approach went through several phases. It was first based on material justifications such as the ecological risks of disappearances of gene pools. This appreciation of biological risks emphasizes the impossibility of establishing conservation priorities, since it considers all elements of biodiversity of equal importance. With these arguments, the biologist David Ehrenfeld (1988) raised the question of the validity of economic valuation. The next step was made when the UICN, in its *Global Biodiversity Strategy*, ranked preservation priorities by crossing a biological classification with a risk classification . Degrees of potential risk - *scarcity / vulnerability/ disappearance* - were established for genres, families and species. Jim Tobey (1993) notes a new evolution in the 1980s with emphasis on economic and social criteria within this anthropocentric approach. The UICN document was criticized for its failure, in setting up its priorities, to take into account the time devoted to the preservation effort. Also criticized was the *a-priori* link between benefits of preservation and the priority rank established.
This equivalence of preservation choices in biological diversity is thus questioned from two points of view : biological species interdependence (Randall, 1986) and economic priorities should take species' economic value more into account (Tisdell, 1990).

In the early 1980s the Safe Minimum Standard analysis, developed by S.V. Ciriacy-Wantrup (1952) thirty years earlier, was rediscovered. Ciriacy-Wantrup introduced economic criteria in species conservation decision-making on the basis of the uncertainty of profits derived from biodiversity conservation. This approach is based on a cost minimization criteria linked to two options : species extinction or safe minimum standard conservation, i.e. conditions permitting survival of biological diversity. Completed by Richard Bishop's work (1978), this approach corresponds to the logic of what is now known as the precautionary principle.
Clem Tisdell (1990) points out another sign of the increasing importance of economic justification in the 1980s : the role of Resources For the Future in the application of the costs-benefits analysis in biological diversity. This well-known decision-making method arbitrates between preservation and development of human activity by comparing costs (costs of resource conservation and loss of income due to non-exploitation of resources) and advantages from conservation (loss avoided through non-disappearance of biodiversity).
Although these two approaches are both based on economic arguments, they are diametrically opposed on the burden of proof. In the Safe Minimum Standard procedure, the non-conservationists have to prove that the cost of conservation is too great to abandon this option. In costs-benefits analysis, the burden of proof is on the advocates of conservation. They have to show the profits from the conservation option to justify rejection of the "development" option.

These debates and the legitimacy stakes they cover are as relevant as ever. Michael Trommetter (1995) sees the typology of biodiversity values proposed by the FAO in 1994[13], aimed at minimizing non-conservation risks, on the side of the Safe Minimum Standard. On the other side stands the costs-benefits analysis, inevitable in any approach to the issue of economic valuation of biological diversity. The basic hypotheses and the evaluation procedures of the cost-benefits analysis have been widely treated in the literature (for example, Bingham *et al.*, 1995; Pearce & Turner, 1991). First used

[13] The FAO presents a typology of different biological diversity values which require a process of apprenticeship over a period of time :
- portfolio value : to be kept in mind so as to minimize known-risks (notion of risks)
- option value : preserving known plants for unknown use (notion of uncertainty)
- exploration value : preserving unknown plants for unknown uses

on a national level, it rapidly became a benchmark norm on a global level. The argument developed by Warren Oates (1990) in the framework of the negotiations on global environmental issues justifies this transition. If each country preserves its own biological diversity unilaterally (the CBA applied on a national level), the level of preservation of global biodiversity risk being under the standard required, with an economically inefficient effort to reach it. The assymetry of national costs and benefits must be taken into account. The opportunity costs linked to biological diversity protection are higher in industrialized countries than in developing countries. On the other hand, there are less local advantages derived from biodiversity in developing countries. A global-level CBA will show that if the goal is an optimal level of global diversity, it is in the interest of developed countries to help developing countries preserve their biological diversity. Therefore, individual gains obtained from the transfer of preservation effort from developed countries towards developing countries, analyzed by Oates in terms of "commercial gains," correspond to global gain. This idea appears implicitly in the Rio Convention when it recognizes the international benefits of biological diversity and, via the GEF (Global Environment Facility), introduces an international financial transfer system. Market-driven logic is reintroduced by taking biological diversity into account as a global issue.

Many economic studies on biodiversity in general and the economic value of biodiversity in particular have appeared since the end of the 1980s. Noteworthy contributions include Hanemann (1988), Perrrings *et al.*(1992), Pearce & Moran (1994), Barbier *et al.* (1994), Bingham *et al.* (1995), Perrings *et al.* (1995). What is new is that these studies are often carried out for major organizations of protection of nature or for national or international institutions involved in the fight against biological diversity erosion (for example, FAO, UICN or the United Kingdom Forestry Commission). The work of the Global Environment Facility, based on the notion of "incremental cost" produced by the costs-benefits analysis procedure, is aimed at helping the Southern countries preserve biodiversity having a worldwide interest and is another driving force behind the increase in these economic evaluation studies. (Aubertin *et al.*, 1996). CBA is being a benchmark norm in negications between actors, States, International Institutions, NGO and then the debates focuss on valuation methods of costs and benefits.

II.2. Economic valuation : a sight of the world and of society

There are different methods of economic valuation. For a review of the literature, see Pearce & Markyanda (1989) and Cropper & Oates (1992). In our view, the importance given to the interviewer-economist makes the contingent valuation method the most explicit approach to the issues of knowlege and power inherent in environmental problems. We will not dwell on the different biases of approach (instrumental, strategic, hypothetical, dotation effect, etc.) which tend to influence the survey process characteristic of this evaluation procedure. We prefer to insist on implicit underlying hypotheses. Particularly important is the necessity of a "market convention" without which, as Jean-Pierre Dupuy (1989:362) points out, "the paradigm of rationality is incomplete." The interplay of individual rationalities, basis of the market-driven logic of neo-classical economic theory, can only be explained and organized by resorting to a conventionnal framework, to a sight of society and of the world, and to some values common to rational agents.

II.2.1. The social creation of scarcity

The creation of scarcity is the first element of the market convention. "Scarcity," wrote Paul Dumouchel & Jean-Pierre Dupuy (1979:198), "is built on rejection of traditional obligations and solidarity, by the abandon of each individual to his fate." To a certain degree, the evaluator should impose this state.

The first goal of a contingent questionnaire is to draw the universe of scarcity in which the economic agents questioned are to express their preferences. The first step is to construct a limited supply of environmental quality or quantity. The method of contingent valuation first constructs environmental

assets and the qualitative or quantitative changes which are going to affect them, by asking questions and by creating appropriate situations (for example through the use of photomontages and sound tracks). The interviewer defines goods and resources, i.e. elements of biological diversity distinct from one another, which will be proposed to the people questioned. The goal is, on one hand, to construct the biological diversity and, on the other hand, the scarcity affecting it. It will be noted that, as a study by Clive Spash & Nick Hanley (1995) showed, the concept of biological diversity, particularly difficult to grasp overall, is little understood by the public. In view of this, it is no surprise that economic evaluations often concern only one species - the elephant, for example (Brown Jr., Henry, 1989) - which, moreover, has an emblematic quality.

Let us now look at demand. One of the essential conditions for the success of the contingent questionnaire lies in the definition of an adequate method of payment. Once this is set, budgetary constraint is the basis on which the rational consumer will be able to make his choices. But the contingent interviewer does more than design the universe of scarcity and define initial agent dotation; he also implicitly distributes "rights" on resources and the welfare these resources bring. On one hand, as Marc Willinger points out (1996:11), the definition of an agent's willingness to pay (evaluation of a compensating surplus) supposes an implicit right of this agent on his level of initial utility. Symmetrically, the definition of his willingness to accept (evaluation of equivalent surplus) supposes an implicit right of this agent on his level of final utility. On the other hand, refering to the ideas of Ronald Coase (1960), it can be said that the interviewer, through his evaluation procedure, implicitly distributes "rights" on use of resources. If willingness to pay (WTP) is to be found, the interviewer assumes that the right to use the resource belongs to the interviewees. In this case, individuals not only lose amenity induced by environmental change, but also suffer a moral loss due to the attack on what they consider their rights; this what theoreticians call a "dotation effect." According to them, this explains certain variations between WTP and WTA, noted in certain surveys.

II.2.2. Recognition of the instrumental rationale

The second element of the market convention is how agents are coordinated through mutual recognition and agreements.In the case of biological diversity, this means that agents agree on the use of the neo-classical framework to treat problems that go far beyond market-based relationship. As the conventionalists have pointed out (Dupuy *et al.*, 1989:143), there is an underlying hypothesis here of the continuity of the framework of reference of the dominant economic theory which can be questioned. This extension of the market convention is first done by maintaining the hypotheses related to rationality and optimization calculations. In biological diversity as in other areas, rationality, as Serge Latouche reminds us (1994), should enable happiness to be reduced to wealth, wealth to utility, and utility to money. This is the hypothesis that the economist makes, and it is also the hypothesis that the interviewees should make. The interviewer and the interviewees thus suppose that the individuals questioned are independent, sovereign, rational beings whose trade-off are voluntarily made. All participants in the economic valuation also presume that there is no need to resort to other considerations, that there is no need to refer to anything outside this evaluation to obtain agreement of the individuals concerned, i.e. the economic calculation is enough. This is the condition necessary for monetary normalization of individual behavior and decision-making. For instance, once this obtained, American citizens could be asked to express their preferences for the preservation of African animal species.

II.2.3. The market as an institution to combat scarcity

The final element of the market convention, or the agreement between agents, is that the market is the institution that makes it possible to combat scarcity, because it is there that instrumental rationale enters into play. The different methods of economical valuation of the environment are based either on observed expenditures or on "fictive" or "constructed" markets. In the first case, the valuation method deals with observed behavior, known costs. It intervenes after the fact, so to speak and is

called *ex post*. In the second case - that of contingent evaluation - the method concerns potential behavior, on precursory signs of rationality : it is therefore called *ex ante*. It is based on the hypothesis that individuals' intentions correctly predict their intentions. This *ex post/ex ante* distinction is not merely formal. It raises the question of the real role of the evaluator in these procedures of individual preferences : in other words, is the evaluator a simple observer or an active player in this procedure ?

In the first case, the economist simply brings together separate elements : preferences and values which existed prior to his survey. He merely collects them and transmits them to the decision-maker. Although operating in the opposite direction, he can be said to play the role of a walrasian auctioneer. He appears as a neutral, benevolent moderator, acting unselfishly and retiring once the price - presumably an equilibrium price- of the nature has been set. Thanks to the economist's action, a collective decision emerges through the expression of a price, itself the product of individuals' goodwill. Contingent evaluation works because, as in the General Equilibrium Model, the collectivity appears transparent to the individuals. It is nothing more than the sum of free and equal individual wills, of sovereign individuals who rationally establish their society and their relation to the world, to other men and to nature. In this case, monetary expression is considered a veritable voting procedure. (In fact, the most commonly used technique in contingent valuation is that of a "referendum"). The "market" then functions as a full-fledged political system in which the only link between people is that of freely consented market-based trade-off. Still, as we have just seen, all the individuals involved have to accept and have confidence in these market rules.

In the second case - which is, for example, the point of view defended by Marc Willinger (1996) - the economist plays an active role in the very construction of the economic value of biological diversity. Preferences and values expressed by individuals quesioned do not exist outside of the survey. Contingent evaluation only appears for what it is, i.e. a very specific procedure of social construction of the value of the environment. Completely abandoning the realm of theory, the economist becomes a player who institutes politics through economics. In one example, Swallow & Wouyalew (1994) used the contingent evaluation method to reinforce awareness among Ethiopian populations of the need to combat the tsetse fly. This raises the following question : what are the methods guiding this expert in "direct democracy" that the economist considers himself to be? The problem is that in this case contingent valuation is not in the least based on the economic theory which is supposedly its foundation. Originally designed to avoid resorting to the subjectvity of an expert, the Contingent Valuation Method finally appears the means an expert has found to "manage" the preferences and rationality of individuals questioned. There is consequently great danger of manipulation. This, is confirmed in a recent article in *New Scientist*. Fred Pearce (1996) tells of the surprise and annoyance of the population of Pevensey when they learned of the results of the contingent evaluation, after being questioned by University of Newcastle economists. In this case, the argument of "direct democracy" does not seem to have been convincing.

Conclusion

As Nicole Mathieu & Marcel Jollivet (1989:14) noted, the environment is a mirror in which humans see their own reflections. Environmental problems, and particularly global environmental problems, are objects constructed by society according to its beliefs, needs, practices and representations. The issue of Biodiversity erosion is therefore affected by major highligts, characteristic of global environmental problems. We have noted : long-lasting scientific controversy, the need to act in a state of urgency, the use of scientific knowledge and theories as strategic variables, technological changes as a key element in the collective evolution, the need for institutionnal stabilization felt by participants in the Rio conference, etc.

Within the interplay of actors, we have shown that economic considerations, whether practical or theoretical, play an important role in the social construction of the problem of biological diversity and in the environment convention that emerges around it. In the scientific world, economists appear as the community most capable of stabilizing the problem, by supplying the means of establishing an environmental norm. Whether on an institutional or theoretical level, whether in the form of natural resources or as sources of amenities, whether in the form of turnover or willingness to pay, the construction of this environmental norm consists of putting a price on life. This approach has the advantage of making it easy to detect economic interests in play in the environmental issue and, subsequently, to indicate incentive mechanisms which can influence behavior. However, there is a major drawback to this approach : its strong emphasis on the need to "marketize" the world, and to extend the market convention to universes which for the moment are not under its sway : the danger of aggravating legitimacy conflicts which accompany all environmental problems.
René Passet (1979) has shown the conflicts of logics appearing through a confrontation between the economics and the living. For biological diversity issues, there is reason to believe that legitimacy conflicts would be more crucial than for other global environmental issues.

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