



Biodiversity/Biodiversité

2010: A new beginning for biodiversity?

2010 : un nouveau départ pour la biodiversité ?

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ABSTRACT

Proclaimed “International Year of Biodiversity”, will 2010 hold all its promises? Reminder: initiated by the Convention on Biological Diversity ratified after the global summit in Rio de Janeiro, delegations from more than one hundred countries gathered in Johannesburg in 2002 and committed themselves to slowing the erosion of biodiversity by 2010. The European Union was more ambitious (or reckless?) and even spoke about halting this erosion (European Environment Agency, Progress towards the European 2010 biodiversity target, 2009) [1]! Well, that date has come and the overall appraisal that has been made formally in Nagoya in October this year was not so brilliant (see Leadley et al., 2010) [2]—but the same slogan has been launched for 2020! The aim here is not to repeat that appraisal, but, after considering the broad outlines, to evoke some of the issues and challenges that inevitably result from the great question of the protection and management of global biodiversity.

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R É S U M É

Proclamée « année internationale de la biodiversité », 2010 a-t-elle tenu toutes ses promesses initiées d'abord à Rio de Janeiro (1992), puis au Sommet de Johannesburg dix ans plus tard ? Après avoir revisité rapidement le concept de biodiversité sous un double regard, celui de l'écologie et celui du citoyen du monde, qui, à travers les enjeux qu'il met en relief, donne un sens nouveau à la diversité du vivant, on s'intéressera successivement au bilan 2010 (où en est la biodiversité ?), aux défis d'ordre scientifique qu'il conviendrait de relever d'urgence pour freiner l'érosion de la biodiversité et, enfin, aux stratégies d'action qui en découlent. Si la biodiversité apparaît comme poursuivant son déclin, des signes d'espoir se dessinent à travers la large mobilisation qui s'est affirmée et le récent succès du sommet de Nagoya sur la biodiversité.

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1. Biodiversity?

The fact that life is characterized by its diversity (amongst other things) is a notion as old as biology itself—and that is what biologists of all persuasions are working on.

However, now renamed “biodiversity” in the context of the global summit in Rio—a geopolitical rather than a scientific event—the diversity of life has found a new dimension, situated in a social, anthropocentric setting. A perspective in which questions are no longer posed through biology but through all sciences, and even all consciences—that is to say by all members of society.

It appears that this new setting, from the point of view of intentions, even if the actions are yet to follow, today

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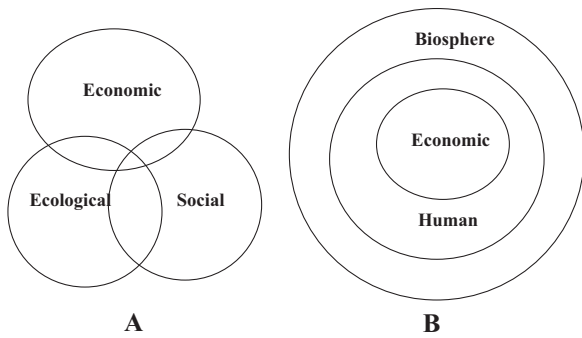


Fig. 1. (A) The standard vision of sustainable development and its three pillars. (B) The ecological vision recognised by René Passet and adopted by the “green economy” as developed by Molly Scott Cato [4]. It is clear that biodiversity goes through the tree circles in figure B linking the economic sphere to the biosphere while including human affairs.

dominates all human affairs: the setting has become “environment and development”—thanks to the Rio summit—with a focus on sustainable development. Let us take a moment to consider what is implied by this general ecological context.

We should all now be familiar with the three pillars of sustainable development: next to the economic pillar, which until recently stood alone to take us to the brink of disaster—by this I mean unsustainable development and the successes we often boast of—we rediscover the social pillar (surprising, isn’t it?), and the environmental pillar. In fact, the real issue is a radical change in perspective and framework—this is what the concept of biodiversity logically leads to if ever we were to think about it in more depth. It is abandoning a vision of the world composed of parallel pipes and almost independent domains and adopting an *ecological* vision of it. It is therefore not sufficient to bring together the three separate circles of economic, social and ecological considerations and to look at where they overlap: we have to accept, as suggested by the economist René Passet [3] that the sphere of economy is just a subset of the sphere of humanity (let us not simply reduce it to “social”) which is itself a subset of the biosphere. And this changes everything. Indeed, as a consequence of this nesting and the interactions that this implies between the three facets of our world, biodiversity reaches across *the whole system* (Fig. 1).

With the concept of ecosystem service that emerged in the 1980 s—but with roots going back a few decades (Box 1) a decisive step was taken.

Actually, the profound underlying changes, and that were only felt later in scientific circles in France, were prepared and nourished, in a strategic vision by the *Ecological Society of America*—the two most remarkable documents were probably the initiative for a sustainable biosphere [9] and the fundamental debate followed by an ambitious strategic plan presented to the ESA in April 2004 [10].

In this context, biodiversity is much more than just a catalogue of species or genes—it is the living tissue of the Earth: a whole system of interacting networks of species—ecosystems, trophic networks—where function and structure are just as important as simple composition (Fig. 2).

Box 1. Where does the notion of “ecological service” come from?

The concept of “ecosystem services” postulates that ecosystems provide services to us. According to Mooney and Ehrlich [5], this notion dates back to the mid-19th century when George Perkins Marsh, a lawyer, politician and scholar, published an inspired book, *Man and Nature* (1864), which describes a wide range of services threatened by our activities. After the war, other authors drove the nail home—in vain I dare say. In 1948, Fairfield Osborn, published *Our Plundered Planet* and William Vogt, *Road to Survival*, and in 1949 was the famous *A Sand County* by Aldo Leopold, famous in the U.S. that is, which developed real ecological thinking.

But it was only in 1983 that Ehrlich and Mooney [6], used the term “ecosystem services” in modern literature—its climax marked in 1997 with *Nature’s Services: Societal Dependence on Natural Ecosystems*, by Gretchen Daily [7].

Finally, the Millennium Ecosystem Assessment [8] popularized the concept and spread it well beyond the community of ecologists.

2. The 2010 deadline: what has happened to biodiversity?

As everyone well expected, the collapse of biodiversity has not been halted [2]—even if this is not simple to demonstrate rigorously—and this is due to three reasons that depend on the very nature of biodiversity.

Firstly because biodiversity is a multiple complex whole, which remains very unequally known and understood; secondly because it has an enormous inertia—while remaining constantly in motion—and it is necessary to look closely to detect any significant changes that can be interpreted over a period of time which is in fact extremely short (the Johannesburg commitment was dated end of 2002 and effective mobilisation was neither immediate nor intense!); and finally because the means available for measurement and monitoring remained insufficient, in spite of real mobilisation about this key question, which has been back on the table in Nagoya this autumn.

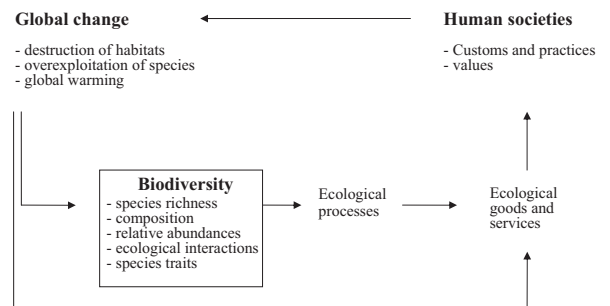


Fig. 2. Biodiversity, destabilised by global change where Humanity plays its role, ensures functions that are today considered as ecological services. Humanity is seen to be an integral part of biodiversity and an actor in its dynamics (adapted from [11]).

2.1. Biodiversity being eroded

Let us return to biodiversity itself, i.e. the state of ecosystems, fauna and flora (I will leave aside the problem, real though it is, of the impoverishment of the crops and livestock heritage): As announced in the recently released *Global Biodiversity Outlook 3* drawn up by the CBD (Convention on Biological Diversity) the target set in 2002 to accomplish a significant reduction in biodiversity losses by 2010—at all levels (regional, national and global)—has not been reached and the decay of biodiversity continues at the excessive rate denounced by, for instance, the MEA [8] and confirmed so far [2]. We can even note that the pressures that it is subjected to—and which are the cause of the erosion—seem to be getting stronger rather than diminishing.

The most widely used direct measurements, i.e. the species indicators, and in particular the IUCN Red List and the WWF Living Planet Index say the same things. We note for instance the high percentage of threatened species for Gymnosperms (32% for 1021 species monitored), Amphibians (29% for 5490 species) while Birds are still at 12% (for 9998 species). The case of amphibians has been well studied and is particularly worrisome [12,13]. As for the “habitat” and “pressure” indicators, which are obviously essential, the assessment published by the Secretariat of the Convention on Biological Diversity [2] is not highly optimistic: natural habitats (particularly coral reefs and wetlands) continue to decline in most areas of the world—although some countries have shown significant progress with the loss of tropical forest and mangroves being slowed down [14]. As for the five main types of pressure leading directly to losses in biodiversity (habitat transformation, overexploitation, pollution, invasive species and climate change), they have at best stabilized but are more usually still increasing.

What is the situation in France? We know that the Muséum and the French committee of the IUCN worked jointly to produce a red list of threatened species in France, with the support of the International IUCN’s species programme. After publications on the state of reptiles and amphibians, breeding birds, mammals and the orchids of mainland France, a recent report concerns French freshwater fish. It shows that, of the 69 species analysed on the mainland, over one in five are threatened. Not excellent. Heading the list of future potential victims are migrating fish like the Atlantic salmon, the European sturgeon and the European eel. We should also note that the less well known Rhone streber, endemic to the Rhone Basin is still in critical danger of becoming extinct. Last but not least, the trends of biodiversity in French overseas territories are particularly worrying, as it is more generally the case for the tropics.

Here, we should say a few words about the Nature-Watch programme (Vigie-Nature) led by the Muséum and especially its emblematic programme “STOC”—the Common Bird Monitoring Programme which has just celebrated its 20th year of existence (see the website: <http://ww2.mnhn.fr/vigie-nature>). One hundred or so species of breeding birds are being monitored by over a thousand ornithologists covering the whole of mainland France. A

sharp decline has been seen in the numbers of birds, especially on farmland where a drop of 20% has been recorded over 20 years. More generally, this decline is affecting specialist species: a 20% drop has also been noted in birds nesting on buildings (swallow, swift with –9% for forest species such as the jay or the great spotted woodpecker). There has also been a northwards shift in populations by about 100 km, following global warming.

For the species classified as “vulnerable to the risk of extinction” on the red list of the IUCN-MNHN published in 2008, we can even talk of population collapse: –65% for the meadow pipit, –76% for the whinchat, 71% for the linnet and –63% for the bullfinch. Some species are increasing in numbers—this is especially true for generalist species such as the common wood pigeon, the starling, the great tit, etc. (+20%).

2.2. But some progress

Let us move on to the progress being made, it is just as real and makes a base on which to construct the future—the after 2010 which is the focus of all attention, especially in this Biodiversity Year and after Nagoya. The image rapidly sketched above might seem disappointing: things are continuing to get worse and it would appear that the conferences, summit meetings, and international commitments have just been empty words. However, that is being short sighted. The world is moving. The proof is, for instance, that the 2010 objective has caused and is causing far-reaching, in-depth mobilisation. In other words, what has happened is, practically speaking, a fundamental investment. The effects are thus not necessarily visible immediately but will be felt in the long term—which is indeed the prime objective. This means that the *social capital* represented by the human networks concerned by biodiversity and its preservation, has been appreciably strengthened over recent years, in France and throughout the world. Such an optimistic assessment has just been confirmed by the decisions adopted at the Nagoya Biodiversity summit: “The outcome of this meeting is the result of hard work, the willingness to compromise, and a concern for the future of our planet. With this strong outcome, we can begin the process of building a relationship of harmony with our world, into the future” said Ryu Matsumoto, the Minister of Environment of Japan, President of the meeting.

3. The challenges

Biodiversity and ecological services remain subjected to the pressure of a human world that is still under the impulsion of the runaway thermo-industrial system that created it. The MEA evaluation report (2005), and the lessons drawn from it, are still valid and should be recalled: we need, we absolutely need, biodiversity and the services it offers sustainably—and this is all dangerously threatened.

The challenges to be met are of three orders: the order of policy, the order of knowledge, and the order of strategies of conservation and landscape planning. Let us leave politics, which is out of the scope of the present analysis, to outline some of the areas where we must make

progress if the objective of “significantly slowing down the erosion of biodiversity by 2020” had to be fulfilled.

3.1. Indicators and long-term monitoring

What was it that Walpole and coworkers stressed in their recent article in *Science* [15]?

That the biodiversity indicators used by the decision makers are underdeveloped and their manpower given insufficient support. In October 2010, the COP (conference of the parties) of the CBD in Nagoya reviewed the progress accomplished in this field and made commitments to a new set of objectives with a revised and improved framework of indicators.

Indeed, the need for long-term monitoring is imperative—to really know what is happening and to be able to anticipate the future; but also to be able to assess the efficiency, or lack of efficiency, of measures taken, and hence evaluate policies.

Yet, the utility of indicators is much broader: any research into biodiversity, any issue concerning sustainability, needs a long-term picture. Of course, no given indicator can be used for all questions, and nor can a given monitoring set-up. It remains that indicators are a major priority and the decision must be taken to finally make the long-awaited investments. However, focussing on indicators cannot replace the real priority; namely the crucial need for systems enabling *long-term* observation, analysis and follow-up. The fact that there is a necessity for international initiatives—and especially their coordination (the GBIF, Lifewatch and the GEON-BON¹ come to mind)—must not be an excuse for being less demanding on a national level, just the opposite in fact! For France, the Vigie-Nature Programme, run by Denis Couvet, Frédéric Jiguet and Romain Julliard (at Paris Muséum), could be the common link uniting a national biodiversity observatory organised as a network or, more precisely, a network of networks.

In this respect, the network of protected areas—even though we must consider the whole of nature, with towns and ordinary spaces as well as parks—is an unavoidable element, especially owing to their high quality of long-term monitoring and simply their very vocation. Another reason for its key role is that it is an ideal context for the emergence of the participative science that is so essential!

3.2. Intersecting research, management and an opening to civil society

The concept of biodiversity as it is presented here (Figs. 1 and 2) calls for this intersection. Whether we are concerned with protecting, managing or repairing, the problems that arise must be shared and debated openly. This implies exchanges between the world of research, the world of nature management and civil society. From the beginning of the 1970s, this was the message spread by the international UNESCO Man and the Biosphere programme

and it is the reason the biosphere reserves exist. This was clearly spelled out again in the “World Conservation Strategy” published back in 1980 by the IUCN, UNEP and WWF.

Moreover, we should be able to rely on the network of protected areas to act as a vast instrument in support of research, training and education on biodiversity and what it means for us. I dare say that not only the Man and Biosphere (MAB) culture, but also its experiences and its failures deserve to be taken into consideration [16].

3.3. Territorial governance, World governance

We have understood: Biodiversity needs space. That means that inserting actions in a territory is a major issue whether those actions concern understanding, protection, education or development. It is in this general context of planning that the problems are posed and that solutions can be found. The concept of National Ecological Network opens the way, today it takes in France the supposedly appealing form of the “Trame Verte et Bleue” (“Green and blue web”) but much remains to be done *outside the protected areas*. It would be useful, in this perspective, to base the work on the existing network of protected area management bodies (in the example of France, the National Parks, the Agency for Protected Marine Areas, the Federation of Natural Regional Parks, Natural Reserves of France, etc.), which all work in cooperation, or should be working in cooperation.

Furthermore, at the other end of the scale, there is the question of the Intergovernmental science-policy Platform on Biodiversity and Ecosystem Services (IPBES) doubtlessly a major issue. Its implementation will be the object of a decision in the coming months. This organisation of experts should help to lay the foundations of acceptable world governance.

3.4. Compulsory interdisciplinarity

Concerning biodiversity, whether we attempt to answer questions of the type “What’s it for?” or “Why protect it?,” “How can it be preserved?,” “How much does it cost and how much will it repay?” or whether we look at all that could change if we became aware that we are also part of biodiversity (a living system that covers the relationships between ecosystem dynamics and human societies) we find ourselves in the centre of a universe where almost all known sciences and modes of understanding play a role (Figs. 1 and 2).

Interdisciplinarity is present everywhere, as if invited by the questions that are being asked. This opens interesting perspectives both in the intersecting disciplines and their interfaces, as defined by the plan of action.

3.5. Challenging climate change

The media buzz over CO₂, with all that global warming can bring about, should not mask the fact that we need biodiversity. In other words, looking at how biodiversity responds to climate change and asking the right questions

¹ Global Biodiversity Information Facility; Global Earth Observatory Network - Biodiversity Observatory Network.

about the conservation strategies that are implied are two issues that require serious consideration.

Let us not forget that the biodiversity that we are talking about here is far from being just a catalogue of species [17]. Thus, dealing with the responses to climate change (the same applies to changes in land use) implies going beyond the analysis of shifts to higher latitudes or altitudes of one species or another. It is the whole living tissue that is degraded and made fragile—it is the whole of the biosphere that is concerned [18,19].

Before moving on to the challenges related to conservation strategies, I would like to stress that, the two points outlined above can alone lead to a profound change in the disciplines concerned, and this is already apparent when we look at the recent scientific literature.

4. The challenges of conservation and restoration

The challenges in this context are the logical continuation of what has just been discussed concerning the state of our knowledge and the priorities that have been laid out—conservation strategies must take their inspiration from this. Increasingly, a double condition should be enforced, and this is a process which has clearly already started as the ideas behind nature conservation have profoundly changed [20]: firstly, associating humans to the objectives proposed and defining those objectives in a spirit of general consultation; secondly, including the conservation strategies in planning policies and in a perspective of landscape ecology. Although it may not at first appear so, this is a true revolution, both for ecological sciences and for the sciences and practices of land planning. But, a notion that is just as important as actual conservation is the development of knowledge and skills for *restoration*.

“Restoration ecology” and “ecological engineering” could be dismissed by critics as “tinkering with nature”, with the argument that reinventing nature is no mean feat, considering the time it has taken and the contribution of so many organisms to become what it is and do what it does. Tinkering, maybe. A certain degree of humility is required, but as we destroy, we must also repair. The idea is not to crow about it, but to do what we can—taking inspiration from nature and learning more about ecosystems. A recent article [21] concerned an investigation of our efficiency in this domain and analysed 89 studies reporting on restoration actions aiming to enhance biodiversity and ecological services in a broad range of ecosystems from across the world. The ecological restoration programmes increased biodiversity and the services provided by 44 and 15%, respectively. The improvements obtained however remained below the levels of the intact ecosystems used as controls. It is clear that rebuilding an ecosystem is not an easy task (see, for instance, [22]).

Moreover, it should be of interest to measure the costs of these restorations [23].

Anyway, ecological engineering is one of the essential components of the strategies of conservation and management of species, environments and landscapes and must be developed if the objectives fixed at Nagoya are to be reached.

5. Conclusion

During this brief overview, Biodiversity has told us that the world is not getting much better; that it has not felt the effects of the wonderful promises made in Johannesburg. And yet, without falling into naive optimism, we can say that progress has been made thanks to an in-depth mobilisation which has affected numerous elements of our societies, well beyond the simple world of research.

This strengthened social capital means that not only the various associations involved, but also the structures and institutions managing the environments and the species, are able to relay the academic research potential. On this basis, a decisive step could be taken at the start of this new decade—a step marked by increased attention accorded to biodiversity and to the services that it provides to human societies [24]. In short, the moment has come for the priority conferred on “biodiversity” to move from the well-meaning *verbal* priority to a *veritable decisive* priority, i.e. one with *funding*.

Whether they concern biodiversity management, restoration ecology, or more generally knowledge we must acquire [25], the issues sketched out here should prove to be profitable.

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