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Saving biodiversity: is innovation the cure?

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Proceedings of the international conference held in Paris on 13 June 2014 by the Fondation d'entreprise Hermès and IDDRI, in collaboration with the National Library of France.

This conference, which was co-organised by IDDRI and the Fondation d'entreprise Hermès, in collaboration with the National Library of France, was held on Friday 13th June 2014 in Paris. Bringing together speakers from diverse geographical and disciplinary backgrounds, this conference aimed firstly to analyse the benefits and risks associated with innovation in mitigating the negative impacts of human activities on biodiversity and, secondly, to propose ways to better manage these innovations so that there is synergy rather than conflict in the maintenance of biological diversity.

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HIGHLIGHTS

- Thinking upstream about the linkages between innovation and biodiversity helps to reduce the negative impacts on the latter. Mainstreaming biodiversity into sectoral policies, including innovation, is a prerequisite for maintaining ecosystems.
- Technological innovations for biodiversity monitoring are part of a very political process. This process requires transparent communication. Communities, civil society and policymakers need to make a concerted effort to seize hold of the growing amount of available tools and data, and organise and implement these tools for a better management of ecosystems. Capacity building is therefore essential.
- The innovations necessary for the conservation of biodiversity are not only technological. They are conditioned by the existence of organisational and socio-economic innovation. It is essential to give consideration to the governance of actors and innovation systems.
- Access to technological innovation is often expensive. In a context of reducing North-South transfers, unequal access to technology thus entails the risk of creating a two-tier system of biodiversity conservation. Shared access to technologies, data and its processing is therefore a major challenge for global solidarity.
- Access to innovations and their circulation is a major issue of social justice, but also a necessary condition for innovation. The agricultural innovation process must be regulated to ensure the equitable distribution of benefits, without restricting those wishing to explore the trajectories of change.
- Environmental regulations should not only serve as limitations to the development of human activities, although such limitations are indeed necessary, but should also be designed to promote and guide biodiversity-friendly innovations. The precautionary principle must be well understood as a fundamental incentive for research and innovation.

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After the welcome speeches of **Bruno Racine**, president of the National Library of France, and **Catherine Tsekenis**, director of the *Fondation d'entreprise Hermès*, **Damien Demailly**, IDDRI's scientific coordinator of the New Prosperity Programme introduced the conference, basing his talk on the key messages of the 2014 edition of the *Planet for Life* book.[1] Firstly, it is essential to take a clear and critical view of the situation. Technological innovations are certainly necessary, but they also have limitations. Secondly, technological change alone, without socio-economic and organisational modifications, will only partially contribute to the preservation of biodiversity. Thirdly, given the plethora of actors and scales involved, the necessary orientation of innovation remains a Herculean task because quick fixes do not exist. How can trajectories of innovation be guided towards the benefit of biodiversity? This conference aimed to address these issues.

TECHNOLOGICAL INNOVATIONS: TOWARDS A BETTER MANAGEMENT OF ECOSYSTEMS?

The development of technology has undoubtedly contributed to the strengthening of the pressure on natural resources. Technological tools used today make possible the more intensive exploitation and the reaching of areas that were previously unexplored—for example the seabed. But can technological tools also contribute to a better management of ecosystems, providing the means for enhanced surveillance of human activities? How can radars, satellites, transponders and new forms of information flow be put at the service of environmental protection? During the first session, chaired by **Julien Rochette**, coordinator of IDDRI's Oceans and Coastal Zones Programme, the role of technological innovations in the management of ecosystems was discussed.

Crystal Davis, from the World Resources Institute (WRI), gave a presentation on the Global Forest Watch 2.0 programme that she manages. Launched in 2014 with the support of around 40 partners, this programme aims to keep track of global forest cover and to create an early warning system that provides the actors involved with the data necessary for better forest management. Through the use of satellite technology and the sharing of data, Global Forest Watch provides rapid, free and regularly updated data on forest cover gains and losses. This information is recorded on an online platform which, by cross-checking with other data (mining and agricultural activities, protected areas, etc.), enables not only the monitoring of changes in forest cover, but also the identification of the possible causes of deforestation (palm oil plantations in Indonesia for example). Through the provision of these data, the Global Forest Watch programme more broadly aims to support a variety of actors in their efforts to conserve forests (companies wanting to limit their environmental impact, governments fighting illegal activities, civil society, etc.).

With a focus on marine ecosystems, **Sandra Brooke**, from the Florida State University, described and analysed the technological tools available today for monitoring and controlling human activities at sea. She firstly emphasized the many challenges related to monitoring human activities, which change by nature, over the vast expanse that is the ocean. Given these challenges, there are today many complementary tools that enable this task to be carried out: Vessel Monitoring Systems (VMS), on-board cameras, Automatic Identification Systems (AIS), radar and satellite imagery, manned aircraft, drones, surveillance vessels, etc. The use of these different tools depends on both specific monitoring needs and the availability of funds, because access to technology, satellites for example, is often very expensive. Sandra Brooke stressed that the effective monitoring of human activities at sea depends largely on the ability to combine the different tools available.

John Tanzer, Global Marine Programme Director at WWF International, then responded to the two former presentations. He particularly stressed the importance of transparency and the accessibility to information for the greatest number of people, and emphasized the underlying issues of communication: given that raw data has little interest for citizens, it appears essential to systematically highlight facts revealed by the data and the implications for the environment. There should also be a major effort to make more systematic use of technology in the marine environment: an environment in which tools can be very useful due to the difficultly of access. Finally, John Tanzer underlined that providing local communities with the necessary technological tools to warn of environmental damage must go hand-in-hand with the development of capacity building programmes.

1. *A Planet for Life 2014, Innovation for sustainable development*. J.-Y. Grosclaude (AFD), L. Tubiana (IDDRI), R.K. Pachauri (TERI) (eds.), TERI Press (2014).

AGRICULTURAL INNOVATION: WHAT IMPACT ON BIODIVERSITY CONSERVATION?

Although dependent on biodiversity and ecosystem services, agriculture is an activity that is involved in their degradation on a global scale. The round table chaired by **Sébastien Treyer**, IDDRI's Director of Programmes, provided food for thought as to the pssible forms of innovation in agriculture that could address the loss of biodiversity in a context of scarce resources and an increase in the food and biomass demand.

One of the solutions proposed to address these challenges is to focus innovation on increasing yields on land already under cultivation to avoid deforestation. However, increasing productivity can be harmful to biodiversity in agricultural areas, but also for agro-biodiversity. **Émile Frison**, Special Representative of Bioversity International, also stressed the importance of linking the issues of agricultural production with biodiversity conservation while placing the debate in the broader framework of sustainability of the entire food system.

In the field of food and agriculture, it therefore seems necessary to consider a variety of innovation trajectories, focused on products or organisms (plants, animals), practices, processes, systems (farms, industries, territories), organisations or public policy. In any case, innovation is never purely technical; it is always accompanied by changes in usages, practices and social systems.

Innovation in these various forms may create risks in terms of genetic diversity and variability while these features could prove vital to the resilience and adaptation to future global change. **Frédéric Thomas**, Research Fellow from the Institut de Recherche pour le Développement (IRD), thus highlighted the fact that plant breeding, although contributing to the reduction of famine, was a factor of genetic erosion as it involves the elimination of agronomic traits of species that are of no value towards economic goals and therefore yields. The *ex situ* conservation of plant and animal genetic resources for agriculture (gene banks, for example) was promoted as a means to overcome the loss of genetic diversity. However, the drawback to this solution is that these resources are fixed, while ecological conditions continue to evolve, especially under the impact of global changes, and must therefore be accompanied by *in situ* conservation to keep populations in the environments in which they developed their distinctive characteristics.

Given the risks of genetic erosion, how can processes of innovation be regulated to ensure equitable sharing and the spreading of benefits without instruments and legal frameworks to restrict those who want to explore other development trajectories? Some intellectual property tools that are intended to promote innovation can lead to rent-seeking situations and the concentration of businesses, particularly in the seed market. **François Meienberg**, from the Berne Declaration Association, cited the case of patents, which despite the payment incentive given to the innovator, limits seed exchanges and access to resources, and thus greatly hampers seed circulation. Moreover, these instruments of intellectual property protection, designed to encourage the creation of new varieties, limit the informal seed exchange among farmers, although these exchanges play a major role in the dynamics of innovation.

In contrast to intellectual property rights, alternative models of organising these innovation systems are now being promoted, such as open source or models that consider farmers to be innovators. **Macy Merriman,** from DuPont Pioneer, underlined the fact that there now seems to be a consensus on the design of the innovation system as a multi-stakeholder system, rather than as a linear process, calling for the development of partnership-based approaches bringing together diverse stakeholders. However, the regulatory framework for these systems remains largely controversial regarding its ability to both finance innovation and provide access to profit sharing. The diversity of models ranging from open source to intellectual property offers contrasting answers that have yet to be analysed.

INNOVATIVE ECOLOGICAL RESTORATION: SCIENCE AND TECHNIQUES AT THE SERVICE OF ECOSYSTEMS

Faced with the realisation that conservation efforts alone will not be enough to reverse the loss of biodiversity, the 2011-2020 Strategic Plan of the Convention on Biological Diversity (CBD) urged countries to restore at least 15% of degraded ecosystems in the world by 2020. However, what scientific and technological advances can help achieve such a goal? Do they enable the recreation of complex and equivalent ecosystems? What are the organizational conditions? In a session chaired by **Renaud Lapeyre**, Research Fellow on Biodiversity and Environmental Services at IDDRI, an update was given on the possibilities and risks of currently available technologies in the field of ecological restoration.

Luc Abaddie, Director of the Institute of Ecology and Environmental Sciences (IEES) in Paris,

introduced this session by defining the terms of the debate. Ecological restoration seeks to restore degraded ecosystems, *i.e.* ecosystems that no longer have the characteristics of a regulated system, as a result of disturbance (such as deforestation for example): the interplay of ecological interactions has been disturbed and feedbacks no longer exist. From there, ecologists seek to restore the qualities of an ecosystem, *i.e.* its ability to maintain itself and to provide ecosystem services. To this end, biodesign involves the use of spontaneous ecosystem dynamics to positively redirect the functioning of these ecosystems. Scientific ecology is thus a source of innovation for the effectiveness of the restoration, due to a large amount of knowledge that is currently underutilized; it also helps to exploit the complexity of ecosystems for environmental purposes (for example, green roofs can both reduce rainfall runoff and insulate homes). It is thus necessary to improve the connection between conceptual innovation by researchers and operational innovation in the field.

Regarding the issue of the orientation of innovation in the field, **Emilie Babut**, Project Officer at the French Ministry of Ecology, Sustainable Development and Energy, gave a presentation on the work undertaken in support of the development of the environmental engineering industry. This sector, which is considered as a priority, can effectively meet the growing demand for ecological restoration. Considering the essential nature of innovation in these companies, and also the difficultly in obtaining funding, several calls for innovative projects were launched in 2011 as part of the French National Biodiversity Strategy. Two projects were described in this talk: the NAPEX project, which involves one company and a scientific laboratory, aims to innovatively transform—in six pilot sites—port areas to provide protected reserves for fish larvae ; and a project aiming to create a quality label that would apply to local plant material production sectors, which could help to reduce the presence of non-adapted species or the spread of invasive species. The latter project is particularly interesting in that it illustrates, from the perspective of a more sustainable ecological restoration, the importance of organisational innovations rather than technological ones.

Finally, **Renald Boulnois**, senior consultant at Biotope, illustrated a number of innovations at the operational level that could help economic sectors and infrastructure projects to meet the "avoid-reduce-offset" hierarchy. First, to avoid the impact on birds from wind turbine installation, the radar technology (AVISCAN®) is able to observe and map bird movements to determine where to position a wind farm. Second, CHIROTECH® is a technology that aims to reduce bat mortality rates caused by wind turbines. This is achieved through the use of a mast that measures climatic parameters and calculates bat activity. The principle involves triggering the starting or shutdown of machine rotation based on the detected bat activity. An analysis has shown that this system has achieved a bat mortality reduction rate of 95% for a loss of only 1% in electricity production. Third, in terms of offsetting, there is now a functional method that assesses the losses that must be offset in terms of units of quality rather than surface. For example, tested in the framework of a high-speed train project, this conceptual innovation has enabled a zero net loss of habitat quality for the little bustard. Based on these three examples, Renald Boulnois called for the promotion of an innovation principle that is complementary to the precautionary principle.

PERSPECTIVES

Lucien Chabason, IDDRI senior advisor, concluded the conference. He underlined that innovations for the protection of nature were in existence prior to the 1992 CBD, particularly in France with impact studies that have been carried out since 1976. However, he stated that the current issues and demands are much more complex. Indeed, the aim today is not to preserve or create a habitat, but to restore the function of degraded ecosystems; neither is it to promote innovations for the management of protected natural sites, but rather to introduce innovations that simultaneously support economic development and ecosystem functioning. It would thus be important in the current context of the debates on the biodiversity bill in France, to rethink environmental law so that it is not seen as a set of obstacles to progress, but as an opportunity to advance knowledge and promote innovation. ▮