

Gradinaru, Giani

## Article

# Limits and shortcomings of market mechanisms to protect biodiversity and ecosystem services

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# **The International Journal of Management Science and Information Technology (IJMSIT)**

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## **Table of Contents**

- 1        **LIMITS AND SHORTCOMINGS OF MARKET MECHANISMS TO PROTECT BIODIVERSITY AND ECOSYSTEM SERVICES**  
         GIANI GRADINARU, Bucharest Academy of Economic Studies, Romania
- 15       **BRAIN CIRCULATION AND SPATIAL MOBILITY OF KNOWLEDGE IN SOUTHEAST EUROPE**  
         MIRJANA STANKOVIC, Ministry of Education and Science, Republic of Macedonia  
         BILJANA ANGELOVA, Institute of Economics, Republic of Macedonia  
         VERICA JANESKA, Institute of Economics, Republic of Macedonia  
         BRATISLAV STANKOVIC, University for Information Science and Technology ,  
         Republic of Macedonia
- 41       **THE PRODUCTIVITY OF INNOVATION IN PORTUGAL**  
         NUNO ARAÚJO, Technological Center for the Metal Working Industry , Portugal  
         LEONARDO COSTA, Catholic University of Portugal at Porto, Portugal
- 53       **TOWARDS E-HEALTH: INFORMATION TECHNOLOGIES FOR INCREASING ENTREPRENEURSHIP**  
         AELITA SKARŽAUSKIENĖ, Mykolas Romeris University, Lithuania  
         RASA JUCIUTE-ROTOMSKIENĖ, Mykolas Romeris University, Lithuania

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## **Limits and shortcomings of market mechanisms to protect biodiversity and ecosystem services**

**Giani Gradinaru,**  
Bucharest Academy of Economic Studies, Romania  
giani\_gradinaru@ase.ro

### **Abstract.**

Biodiversity crisis is one of the many crises that started at the turn of the millennia. The strategy of action outlines a strong economic component, together with the recognition of market mechanisms as the most effective policies to protect biodiversity. In this context, biodiversity and ecosystem services are natural assets that play a key role in economic strategies to promote development and prosperity.

With a view to identifying the main business opportunities that may be associated with the ecosystems services, our scientific approach and analysis has primarily focused in the first stage on the inter-connection between the economic mechanisms and the ecosystems services, thus aiming at substantiating the viability of existing relationship. For that purposes, we have analyzed the implementation methods and techniques of nature conservation policies. The concepts underlying the economic expression of the value of ecosystems services have thus (been) formed and developed.

Developing market mechanisms for nature conservation purposes has become a significant trend growing stronger and faster each and every year. Although controversies and disputes still stir and leading to an obvious split between opponent supporters of conflicting opinions, both international organization and national governments acting either independently or in concert have initiated and implemented such mechanisms. The second part of our paper sets out the main business patterns that can be developed so as to fit into the triple referential requirements for a sustainable development (through the positive effects they create on three distinct dimensions): create profit (economic-wise), contribute to protection of bio-diversity (environment-wise) and helps out the equitable distribution of benefits (social-wise).

Finally, points out that markets fail to quantify the value of most ecosystem services. Existing price signals reflect at best, only a proportion of the total amount corresponding provision of food, water or fuel.

**Key words:** ecosystem services, green innovation, entrepreneurship, business opportunities



## 1. Introduction

The Economic approach to nature has its origins in a number of theories developed since the eighteenth century. By contrast, the notion of ecosystem services is of relatively recent origin, close to the beginning of coherent environmental concerns, namely the 1970s.

A complete and detailed analysis of the evolution of conceptual was made recently by Gomez-Baggethun et al. (2010) proposing the division process in three stages: origin and genesis, consolidation, construction of market instruments.

Currently, although the issue of ecosystem services enjoyed great attention from researchers, the significance of the concept is still subject to different interpretations.

### *Box 1. Ecosystem's services - definition*

1. Ecosystem services are the flows of materials, energy and information from natural capital stocks which combine with manufactured and human capital services to produce human welfare (**Costanza and colab., 1997**).
2. Processes by which the environment produces resources that are considered free of people, such as clean water, timber, habitat, pollination (**American Ecological Society, 2000**).
3. Ecosystem services are benefits that people obtain from ecosystems. (**MEA, 2005; TEEB, 2008**).
4. Are components of natural ecosystems services consumed or used directly to produce human welfare (**Boyd and Banzhaf, 2006**).
5. Conditions and processes through which natural ecosystems and species that are part of them, and necessary for human life. For example, providing clean water, maintaining a constant atmosphere (carbon sequestration), pollination of crops and flora, fulfilling the needs of cultural, spiritual and intellectual people (**FAO, 2008**).

Definitions from Box 1, reveal at least three meanings. Such flows are ecosystem services/ processes, benefits, and components. In the first case, decisions should be directed to the maintenance of such an intensity deemed appropriate, in the second would introduce how they contribute to human welfare (utilitarian approach), while in the third case targets should be expressed in a large stock (natural capital). In the light of quantitative analysis it is important to clarify these issues and the emphasis is on the last option, which may correlate with enough accuracy benefits.

Costanza and colab. (1997) identified 17 ecosystem services. The list of ecosystem services has been finalized taking into account the large classes of natural capital that are essential for human welfare, namely those for which qualitative or quantitative change may impact on welfare. Such changes include small changes in large scale and small scale changes. For example, relatively small changes in atmospheric composition (scale - global) can affect the viability and welfare of the global population, and large changes in species structure of forest ecosystems (small scale - local, regional) can degrade ecosystems having an impact on benefits and costs of human activities.

MEA (2005) identifies 24 ecosystem services that we grouped into four categories. Thus, ecosystem services are:

- Providing services for the life of material resources (food, freshwater, timber, fiber etc.);
- Regulating services (climate, invasions, pollination, natural hazards, erosion etc.);
- Cultural services (spiritual and religious values, education and inspiration, aesthetic and recreational values etc.);
- Support services (primary production, biogeochemical cycles, soil formation etc.).

The determinants are represented by natural and human factors that directly or indirectly cause changes in an ecosystem. Unequivocally they are influences on the ecosystem and are a direct determinant. More diffuse determinants act indirectly by altering one or more as determined directly. The main determinants of an ecosystem change can be Indirect such as: population (demographic), economic, social and political factors, key scientific and technological, and cultural and religious factors. With regard to the direct determinants, climate change, use of fertilizers, land conversion and habitat change resulting from invasive species and pathogens can be considered as a priority.

A change of ecosystem services is almost always caused by multiple determinants, which interact with one another. In addition, changes in ecosystem services can have a feedback effect, in turn influencing the determinants characteristics. Among these we mention the formation of new opportunities and constraints for land use, institutional changes in response to perceived and anticipated resource degradation.

Biodiversity crisis is one of the many crises that started at the turn of the millennia. Concrete form of expression is still disputed. The strategy of action outlines a strong economic component, together with the recognition of market mechanisms as the most effective policies to protect biodiversity. In this context, biodiversity and ecosystem services are natural assets that play a key role in economic strategies to promote development and prosperity. Developing and strengthening policies for transition to an economy based on efficient use of resources is the way forward.

To emphasize the co-viability specific to the connection economy-ecosystem services, scientific approach aimed on one hand how to implement policies for nature conservation and on the other hand, the concepts underlying the economic expression of ecosystem services' value.

Environmental policy can be implemented by using tools such as:

- Legislation: This type of political instruments is a priority option to ensure sustainable use of natural resources, reducing pollution and the frequency of accidents affecting natural resources; to implement urgent measures to form the basis for applying all other implementation tools;
- Market-based instruments: such instruments include taxes, subsidies, tradable permits, fees, etc., using the mechanism of their action to change economic incentives and, consequently, the behavior of private actors when they decide to use resources.
- Communication and information: the mechanism of these instruments including behavioral change through involvement, requiring respect for the well-being of others in a voluntary context, based on awareness of the individual action's consequences on different plans and assuming activities as: understanding common interests, the availability of operational information, transfer of knowledge (for example, extended services) and the existence of attractive interactive information and communication.

Connection economy-ecosystem services is intended to create a system in which contributions of ecosystems to human well-being find an economic expression of value, becoming subject to market negotiations. This expression is justified on several grounds:

- Basis for decisions;
- Relationship between biodiversity and the poor;
- Respecting economic principles;
- Aligning incentives with the distribution of biodiversity benefits and ecosystem services;
- Building a more efficient economy.

## 2. Basis for decisions

Expression of the economic value of ecosystem services helps as basis for decisions by:

- *Comparison of costs*: Deciding factors with access to information on the value of ecosystem services are likely to be more effective and motivate regarding their actions and choice options. Identification and measurement of this value began to feed the policy-making process and turn into market signals. Further, saving opportunities can be identified through planning. For example, evaluation can help to compare services. Thus, water purification can be performed by ecosystems or treatment facilities. Knowing the costs of both options, we can make an economically fundamental choice. The same approach is also applicable for flood control and carbon storage.
- *Comparison of benefits*: evaluation of ecosystem service also allows comparison between the benefits of nature conservation with the benefits of using those areas for other purposes (agriculture, urban development, tourism, mining, etc.), thereby helping to establish priorities in many situations.
- *Development of decision support tools*: Expression of the economic value in the case of ecosystem services contribute to building decision support tools for landowners, investors and other users of natural resources. Instruments may take various forms, such as: payments for ecosystem services, subsidy reform, pollution taxes, fees and charges for access to resources in national parks.
- *Policy impact assessment*: The Framework Directive for Waters and the marine legislation which provides the establishment of Marine Conservation Zones in the UK will be evaluated based on knowledge of ecosystem services value.
- *Establishment of damages* to be compensated in the case of ecosystems' damage.

## 3. Relationship between biodiversity and the poor

The relationship between *biodiversity and the poor* has direct economic implications. Biodiversity is important for all world population, but it is essential for the rural poor who depend directly on natural ecosystems regarding the food supply, building shelters, obtaining income, availability of fuel, medicine and quality of life.

Dependence of the ecosystem services in the case of the rural poor highlights the social impact of biodiversity loss and can be expressed by calculating the "GDP of the poor." In Brazil, the contribution of agriculture, forestry and

fisheries to the GDP increased from 6% to 17% by considering the goods and services that are provided by the forest, but unrecorded in national accounts (Torras, 2000). The poor are more vulnerable because their access to other products and services is impossible or very expensive in relation to their opportunities to get income.

TEEB (2008) has highlighted the link between the persistent poverty and biodiversity and ecosystem services loss, demonstrating that this link compromise the fulfillment of some performance targets, proposed by the MDG (Millennium Development Goals) project, as the eradication of poverty and hunger, women's status in society, infant mortality, maternal health and economic development. This raises issues such as equity, property rights and distribution of the resulting impact from the degradation of nature.

#### **4. Respecting economic principles**

Another important argument to emphasize the co-viability of the connection economy-ecosystem services is that this ensures compliance with a basic economic principle of environmental protection, namely: the "polluter pays" principle (payment made by the polluter is reflecting the value of natural resources in the case of private and public decision making process and aligning incentives with the primary interests of society). Its interpretation, regarding the use of resources, is that "beneficiary-pays", formulated by TEEB (2008) as the "full cost recovery" principle (to transfer the costs of providing goods and services, including environmental costs, to the user or beneficiary; consumers pay the full cost of what they consume).

Ensuring compliance with this principle is achieved through legislative and fiscal measures that transform the economic cost of biodiversity and ecosystem services damages into visible signs for those responsible for their degradation, namely into incentives to change their actions cause. Thus, development of policies to allow users of resources dealing with all costs of such use is a key priority for policy makers.

These principles must be addressed by understanding them within the socio-economic context of each community. Otherwise, problems may occur. For example, higher prices for access to essential services like water for social groups who cannot afford to pay these prices. However, disadvantaged categories can be supported by granting payment or by concessions. This alternative is more effective than the low-cost (incomplete) service delivery for all categories of consumers. In fact, the situation would maintain a "lose-lose" framework, as it creates incentives to over-exploitation of resources without generating sufficient funds to be invested in conservation or reconstruction.

If designed properly, the management of natural capital takes into account the distribution of costs and benefits for all ecosystem services and stimulation of "win-win" situations, in which the welfare of poor is improved in terms of avoiding or reducing loss of biodiversity. Evaluation of the different strategies potential benefits can be used for identifying these opportunities.

#### **5. Aligning incentives with the distribution of biodiversity benefits and ecosystem services**

Biodiversity is unevenly distributed, with a number of areas where it is much higher. To highlight them, two approaches are most frequently used: biodiversity hotspots and ranking countries according to the number of species from different categories.

Myers (1988) proposed the concept of biodiversity hot spots to support decisions regarding the localization of protected areas. Delimitation of biodiversity hot spots is based on two criteria:

- Number of endemic species and
- The level of threat expressed by habitat loss.

By applying these criteria were defined 25 global hot spots, as the representation of figure 1.



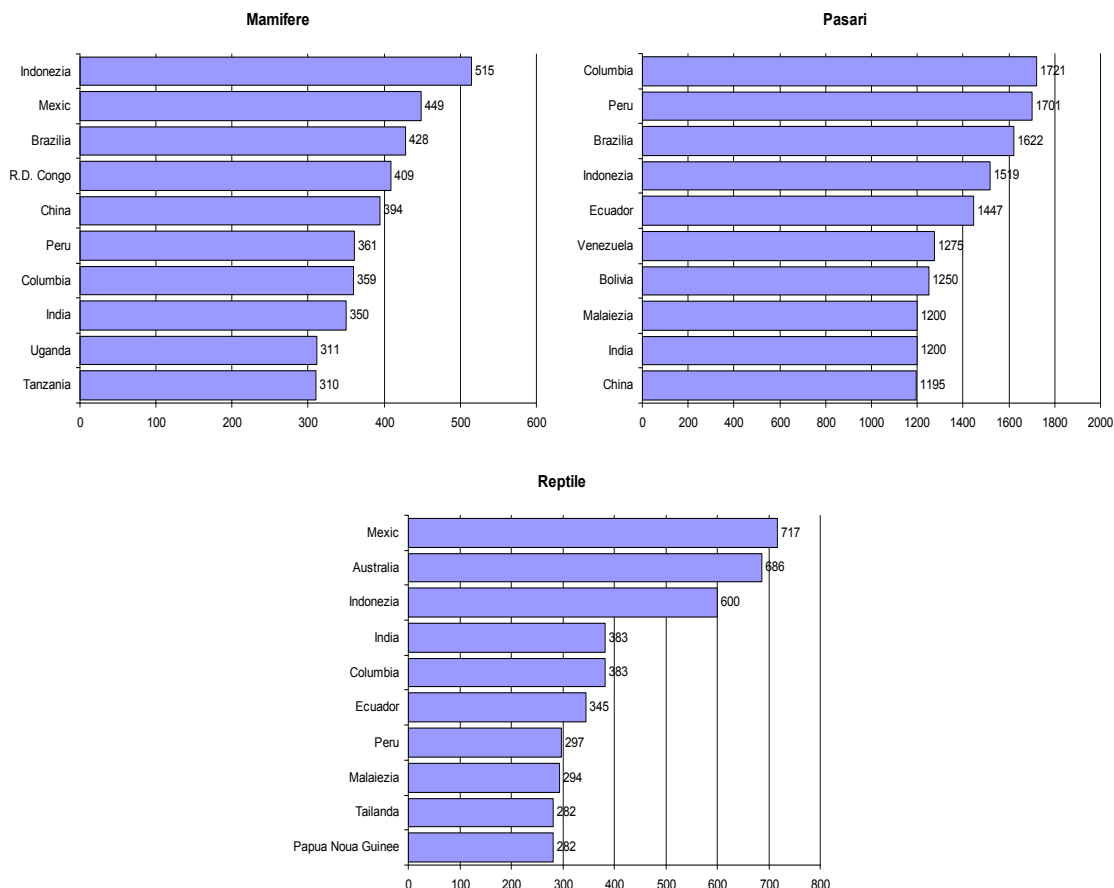
1. Tropical Andes, 2. Central America, 3. Caribbean, 4. Atlantic Forests of Brazil, 5. Ecuador Chico / Western Darien, 6. Brazilian Cerrado, 7. Central Chile, 8. California Floristic District, 9. Madagascar, 10. Eastern Arch and Coastal Forests of Tanzania / Kenya, 11. Western Africa Forrests, 12. Cape Floristic District, 13. Juicy Karoo, 14. Mediteranean Area, 15. Caucasus, 16. Sundland, 17. Wallacea, 18. Filipins, 19. Indo-Burmese, 20. Central and Suthern China, 21. Western Ghats and Sri Lanka, 22. South West Australia, 23. New Caledonia, 24. New Zeeland, 25. Polinezia/Micronezia.

Source: Myers, N. (1988) Threatened biotas: "Hot Spots" in Tropical Forests, *The Environmentalist*, 8, pp.1-20.

**Figure 1:** Biodiversity hot spots

World Conservation Union (IUCN) developed a ranking of countries according to the number of species of three categories: mammals, birds and reptiles. Countries that are on the top ten from the perspective of three categories are presented in figure 2. Countries such as Colombia, Brazil, China, India, Mexico, Malaysia are present in the top ten for several categories.

Diminishing biodiversity dependent ecosystem services are not yet correlated with the distribution of biodiversity, as local ecosystems generates benefits more widely - national and even international (e.g. carbon sequestration, providing medicines, food security). These benefits depend on local knowledge and management and in some cases on economic development opportunities. However, the populations of countries that host high biodiversity ecosystems do not get a receipt for the ecosystem services to which they contribute. Therefore, economically, their exploitation becomes more attractive than their protection.



Source: IUCN

**Figure 2:** Top ten countries regarding the number of mammals, birds and reptiles species

The policy should address this unequal distribution and the global benefits that biodiversity produces. Distribution problem can and must be addressed nationally and internationally. In this regard, there are a number of certain political instruments that may help to solve problems of equity. These include PES, which rewards providers of benefits, until recently considered free. For example, utility companies have to pay for watershed protection.

PES applies to services such as water supply, carbon sequestration, soil protection and biodiversity conservation and can be used for local or international transactions. European Union (EU) spent over 2 billion / year to support PES schemes, represented here by agro-environment schemes and forestry, environment, incentives for low-impact land uses on biodiversity that ensure soil conservation (CE, 2003). The most promising international PES project is REDD+.

PES schemes must be carefully designed to achieve high rates of income and to avoid side effects of improper distribution. Conditions to be fulfilled in this respect are: defining property rights, adequate training for enhancing change, preparing to change, and eliminate power imbalances between local and external users.

## 6. Building a more efficient economy

Faced with the threat of climate change, governments have initiated a series of actions to promote progress towards a "low carbon" economy that minimizes the greenhouse gas emissions. It is necessary that this concept be developed relative to other resources. The more efficient economy is an economy that:

- Provide the right signals to represent the value of nature, from providing food, raw materials, access to clean water, to recreation, inspiration and sense of cultural and spiritual identity;
- Ensure the best use for biodiversity, ecosystems and resources without compromising their sustainability;
- Is supported by the society that respects the value of its natural capital.



In case of any other assets, the loss is not tolerated without asking what we risk to happen with this loss and why. As we ask these questions and identify answers in relation to biodiversity, we realize that the situation is not consistent with our expectations because the nature is lost and the loss rate is very high.

In the case of every buying decision is difficult to go through the whole chain of questions and answers (causes and effects) that transmit the consequences of your decision at a certain population level, but also in terms of lifestyle and values. In these circumstances, it becomes obvious the need for policies to transform the value judgments into market signals, into prices.

The more efficient economy from the perspective of natural resources use is a solution not only for nature conservation. Issues such as poverty and food security, which transcend borders, political regimes and levels of development, will be benefic "side effects".

## **7. Analysis of business opportunities associated with changes in ecosystem services**

Development of market mechanisms for nature conservation is a trend that is increasingly stronger individualized within recent years. Although there are still many controversial issues that have already given rise to an obvious bias, international organizations and national governments have initiated and implemented in cooperation or independently such mechanisms. Consequently, they created the conditions for convergence between private interests and social interests of nature conservation, so there are opportunities for ongoing business development which leads, among other things, the positive effects on biodiversity.

Jonkers and collaborators (2010) consider that such business is a triple referential for sustainable development, through positive effects on three dimensions: creates profit (economics); helps protect biodiversity (environment) and helps fair distribution of benefits (social). Business models that can develop are grouped into the following categories:

- *Carbon*: compensation to maintain the carbon regulation services. This is one of the most popular markets through emission credits trading schemes. The voluntary emission credits markets are emerging too;
- *Water*: Payments for watershed management to conserve water quality and volume. They are motivated by the treatment services (water orifice size) and hydropower potential ("green" energy);
- *Biodiversity*: payments for conservation of natural habitats and ecosystems health. Compensation is the most common form of payment. EU and U.S. law require certain types of ecosystems loss compensation, as a result of economic activities, in order to avoid net loss of biodiversity (biodiversity credits or habitats bank);
- *Certified forest products*: lumber and products;
- *Ecotourism*: access fees in parks and payments for specific services (accommodation, transport, guides etc.);
- *Genetic resources* / bio-prospecting: made by pharmaceutical companies.

Bishop (2009), completes this list with the following market segments, sectors and approaches: organic agriculture, sustainable fishing and aquaculture; sportive hunting and fishing and bio-mimicry (bionic).

Business developed in this area includes a combination of the previous mentioned categories. For example, maintaining forest can generate emission credits, tradable water rights, compensation (credits) for biodiversity and ecotourism revenues (the so-called *package of payments*). Another form, sufficiently developed, refers to products certified as organic food, in which case the conserving ecosystems costs being included in price. Business opportunities associated with changes in ecosystem services occur by considering new paradigms promoted by the concept of ecosystems management.

To create a business based on ecosystem services, their provision must be paid from public funds or by private buyers. Factors on which depend creating business opportunities can be grouped into three categories: corporate management, legislative framework and government mediation.

## **8. Evaluation of market limitations in the case of ecosystem services**

Markets fail to highlight the value of most ecosystem services. Existing price signals reflect at best, only a proportion of the total amount corresponding provision of food, water or fuel. Even in this case, prices may be distorted or to produce benefits without a trading market value. Value of other ecosystem services is not reflected, an exception being services that support tourism.

Ghazoul and collaborators (2009) considers the use of market mechanisms and, in particular, the PES limited by the following problem: inclusivity and poverty, high transaction costs, combining services, social pressure and flexibility of decisions.

*Inclusivity and poverty* - an important constrain for PES is that they are available to land owners that can provide quantifiable services and may exceed the transaction costs of participation in the program. Thus, the program excludes those who have no land or who have small areas. For example, in Ecuador, the PROFAFOR program

operates only with owners holding at least 50 *hectares*. If the same criteria would apply in Kodagu region from India, almost all owners would be excluded. For those without land, the application of the required conservation regime of PES means the loss of *seasonal employment* opportunity.

*Transaction costs* are important for ecosystem services that may be provided independently and can be measured for many landowners. Negotiating with each of the owners increases cost, being the main restriction in the case of RUPES program implementation.

*Combining services* limits PES adoption due to the fact that majority of those entering the program are looking for a single service, or a limited number of services. By promotion, it is possible that other services be ignored or undermined.

*Social pressure* - the success of schemes involving the community depends on institutional structures that allow negotiation and communication between the stakeholders. This becomes very important when there are no clear-cut differences between correct and incorrect solutions and where the stakeholders are different in terms of power and values we respect. Conflicts and community organizations corruption is significant barrier to the use of PES. However, there is ample evidence that such situations can be overcome. For example, Kodagu Model Forest Trust is a partnership of several local organizations aimed at maintaining environmental quality and landscape of the region of Kodagu. The CAMPFIRE program in Zimbabwe, Chimboco community institutions from Bolivia, protected areas institutions established by the Uganda Wildlife Authority are other similar examples.

*Decision flexibility* is problematic given that landowners are bound by contractual obligations to carry out certain activities only because they cannot respond to any changes taking place in the market. The problem can be reduced and avoided by evaluating the delivery of ecosystem in the entire landscape.

The existence of these restrictions finds its explanation into poor correspondence between economic and social assumptions, considered to the proposal and development of market mechanisms for nature conservation. Thus, the reformulation of the "polluter-pays" principle under transformation into a positive externalities provider is not politically neutral. Conceptual change has significant implications, which are rarely discussed in the literature (Van Hecken and Bastiaensen, 2010).

Viewed from a broader perspective, the concept of externality is not without controversy. From the epistemological point of view, it defines both the problem and solution (Vatn, 2005) and does not take account the political influences, "*offering an argument for giving the illusion that biological diversity can be saved without fundamental changes in current distribution of public power.*"

Other controversial issues are how it is defined an externality, the need to address negative externalities or positive externalities and direct and indirect consequences of these decisions.

An externality exists only if a third party is affected, which means a change with economic effect. Thus, the farmer may be polluted or environmentally protective, depending on how you perceive his business effects on ecosystems. Complex relationships between ecosystem functions, their dependence on context and limited knowledge of the interactions makes the externality, and its positive or negative evaluation, a local perception topic. Here is another argument for increasing information and awareness efforts of the local population, to ensure an accurate perception of externalities.

*The choice between positive and negative externalities* is another important dilemma. In the context of land use types, you can define both positive and negative externalities. However, their nature is not subject to *technical evaluation*. For example, a farm is exclusively producing agriculture products, and its owner decides to rebuild fencing with a hedge. Farmers must be rewarded for positive environmental contribution? Or will refer to the social limits of property rights, involving moral and social duty to respect the minimum requirements of environmental protection in farm management. If it is decided that the second case is true, the farmer will pay fees for non-compliance, which offset the negative externalities. When including the first version, i.e. that the investment made to rebuild containment leads to positive externalities, the farmer will benefit from incentives (tax breaks, direct payments). From this perspective, PES can be interpreted as "bribes" given by the company for providing ecosystem services. To increase the efficiency of PES, it is important to prioritize the most degraded areas, which can lead to "polluter pay" situations, contradicting the economic principles of environmental protection. Secondary effect may be that farmers deliberately destroy their land for the benefit of priority to participate in PES programs.

Based on purely economic reasoning, Wittman (1984) shows that *spillovers* are *symmetric*; that may be considered negative or positive, being removed by using instruments specific to each type. The existence of administrative costs (such as trading, negotiation) determines the need for a minimum negative standard, as "administrative costs must be less, to punish an inefficient farmer, which is much less than effective acting." Implicit assumption is that most will comply with minimum standards. The reality in many developing countries, however, contradicts this assumption (Van Hecken and Bastiaensen, 2010).

Another problem is *fairness*. Thus, the question is whether it is justified or to what point it makes sense to ask users of ecosystem services to pay for services that were free and not used in any way contribute to the degradation of those services. In other words, access to water and clean air is a basic human right? Using positive externalities reward can lead to solutions at a different level, than the one the environmental problem determinants are acting. PES is seeking for financial sources to those representing the demand for ecosystem services, starting from those who benefit the most. To meet the requirement of equity, funds should be sought in determining the level of degradation of ecosystem services. Thus, the issue returns to determine the nature externality: positive or negative.

The implementation of market mechanisms for biodiversity protection has important implications for the legitimacy of actions. The key issue is the social limits of ownership. Thus, the appropriate characterization of externalities is not so much an object or a technical task, as a *moral and political problem, based on a value judgment* (Salzman, 2005). Also, differentiation of the evaluation criteria is a subjective process, even if many aspects are accepted as scientific facts, or examples of good sense.

Despite issues that weaken the theoretical background of market mechanisms as feasible tools to protect biodiversity and ecosystem services, such initiatives still have many followers and ambitious plans for their implementation.

Attention paid to market mechanisms for nature conservation has helped to raise political support (Gomez-Baggethun and collaborators, 2010) and the emergence of markets for ecosystem services. However, many uncertainties remain about side effects of this mechanisms generalization, which may manifest as changes in conservation motivation and in generalization of certain visions on human-environment relationship.

Public and private decisions affecting biodiversity rarely manage to take into account the benefits that manifest at regional or global (e.g., protection of water resources). Also, such decisions may omit the local public benefits (for example, in commercial exploitation of timber), even when the local living conditions are affected. Decisions are made taking into account, mainly the short-term gains and not the possibility of providing long-term benefits. This systematic underrating of ecosystem services and the inability to highlight economic value represents the main causes of the contemporary crisis of biodiversity.

Under these circumstances it becomes very important that such decisions ensure the formulation and implementation of public policies for highlighting the main types of benefits and avoiding under-evaluation. Policies must create functional markets for ecosystem services where their value is integrated into price signals. At the same time institutions and rules should be laid down and funds secured.

The transition from the existing situation to the one envisaged through these public policies is looming as a difficult process, in which the main problems are related to the replacement of benefits with costs for those who in the current situation exploit ecosystems, the delay of ecosystems-operating results and change of profile activity and of the way of life.

Overcoming problems depends on many factors, but the change must occur at all levels of decision-making. This requires international cooperation for implementation. The experience of international agreements – provisional Framework Convention on conservation of biological diversity, the IPCC – show that international cooperation efforts can influence the political priorities and favorable social attitudes. Intergovernmental Science-Policy Platform for biodiversity and Ecosystem Services (IPBES) is a project which aims at creating a similar framework to protect biodiversity.

The limits and shortcomings of market mechanisms to protect biodiversity and ecosystem services are used by opponents of these mechanisms. One of these, the NGO Friends of the Earth, at the Conference in Nagoya (2010) considers that "we cannot and should not rely on market mechanisms to carry out the tasks incumbent on governmental power. Commoditization and privatization of nature and biodiversity are false solutions. Biodiversity is not for sale. Existing financial incentives act against biodiversity and not to support it and often violate the rights of local communities" (Rojas, 2010).

Other issues considered problematic are synthesized by Wunder (2005), being represented by the possibility of financing of buyers of ecosystem services and the formation of the social capital, and of the trust in the PES system.

So, as a buyer you must be able to continually fund payments. Then, while demand remains restricted, expanding services on the basis of the offer is unrealistic. From the perspective of the provider, any community may decide at a meeting of the local authority to choose one ecosystem service, instead of providing all the support ecosystem-specific services it manages. With the exception of carbon sequestration services that have global impact, other ecosystem services require the initiative of buyers or intermediaries to provide favorable conditions for the maintenance of ecosystems.

Creating a climate of confidence, setting the rules and rewards can be a difficult process, requiring time and the existence of trusted intermediaries. However, success is not guaranteed. The decades in which rural development has been paternally approached have created expectations that prove difficult to overcome, even though everybody involved would benefit.



Increasing social benefits dependent on ecosystem services imply recognition of property rights over resources. Owning includes the right of use, the rights of hold, lease or sale of land its resources and benefits determining the manner in which they are used. The equitable distribution of these rights is essential.

Where the ecosystem service delivery is regulated, recognition of value is better. In the same time, the rights over such services are modified. The right to use the water, fish and pastures are distributed and administered informally at a community level. When external interventions change such informal rights – with the purpose of creating new markets or to ensure durable exploitation – it is important that the manner in which the life of those who depend on such services is altered.

If the traditional rights are not transposed in legislation, there is a risk that such rights be ignored. The defining process and official recognition of the right to access resources is a basic requirement for conservation and durable exploitation of such resources and the fulfillment degree will influence the social impact of the new tools.

In Paraguay, the implementation of payments for ecosystem services has been achieved in the environment of recognition of such rights and that lead to a raise in financial value for the land that had a low conventional value but were important for subsistence (GFC and colab 2008).

The recognition of the right to resources and the protection of the collective rights. Biodiversity and ecosystems are often public or common goods. Even if they provide services and generate benefits for private persons, they insure collective benefits for the remainder of the society that result from keeping the air clean, the rainfall levels, pollination and so on. All these considered, when the use of lands changes and some ecosystem services are exploited predominantly, based on the profitability of the private sector the public ecosystem services may be disturbed (the erosion control, water resources). A particular case is represented by marine fishing, where over-exploitation lead to the transformation of such fishing zones into a natural resource that is underperforming.

Ostrom (1990) showed that collective owning of the community over resources may favor the evolution and adaptation of a durable exploitation regime. Together with the clear definition of certain rights and the insurance of functional policies for the public goods, the promotion of collective owning of the community of common properties ensures the future provision of ecosystem services.

Forests keep 547 G.t. of carbon dioxide (Trumper and colab., 2009) and may absorb a further of 4,8 G. t. each year (Lewis and White, 2009). On the other side, the carbon emissions resulted from deforestation represents the highest source of greenhouse gas emissions for the majority of developing countries. Such emissions can be avoided at a relatively low cost (Eliasch, 2008) and by such advertence the cost of carbon would drop by 40% (OECD, 2008).

The REDD project has as a main goal the adequate compensation of absorption and keeping of carbon services and the development of other valuable services provided by forests. Having in sight the fact that the quota of emissions which needs to be cut down in order to abide by the climatic policies, the lack of action is no longer an option.

The initial project, REDD, had as main objective avoidance of deforestation and degradation of forests. Whereas there are important areas where this agenda is no longer feasible, such areas being already deforested and in different levels of degradation, the program was rethought as to encapsulate actions of ecological reconstruction be it by reforestation or by other means that contribute to the replenishment of the absorption and keeping of carbon capacity. The result of such reformulation is REDD+.

REDD+ creates a flux of income that has proved attractive for national governments, efficient for industrial pollutants that seek options in order to reach their reduction of emissions targets and ensures benefits for local communities and the poor population from the rural areas. The program could be extended in order to cover other services provided by specific land types and other ecosystems so as to include the main sources incorporated in the category “change of use of lands”.

Preparing for such inevitable climate change implies the creation of possibilities for adaptation. According to Parry and colab. (2009) and to TEEB-CIU (2009) such action will require great investment, more than was initially planned.

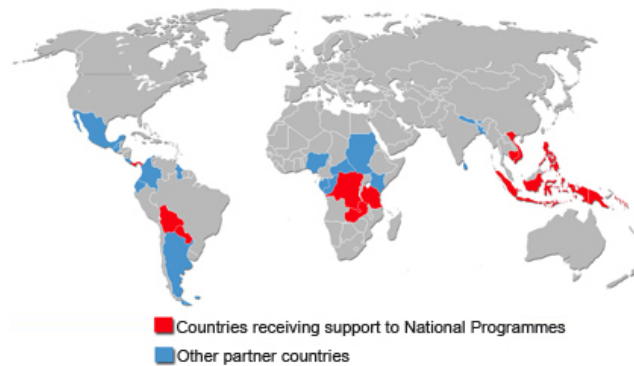
The basic motivation of REDD is linked to biodiversity. The program has been projected in order to reduce carbon dioxide emissions in developing countries and use of fossil fuels is a less important source of emissions than “change of use of land”. The program intends to use funds made available by developed countries in order to avoid deforestation and in order to generate forests in developing countries, to this goal a financial mechanism has been built.

The program has two components:

- assisting developing countries for the preparation and implementation of strategies and REDD mechanisms at a national level;
- support for developing legal frameworks and standardized approaches.

By implementation of such program, REDD shall contribute to the development of institutional capacity from the beneficiary countries in order for such countries to be able to administer their own REDD programs and to facilitate access to financial and technical assistance adapted to the specific needs different countries have.

This partnership included 29 countries that need financial resources support. These countries are differentiated by the manner such support is made available, Thus, there are 12 countries that receive support through national programs and 17 countries that participate as observers in the Political Council of the program. (figure 3).

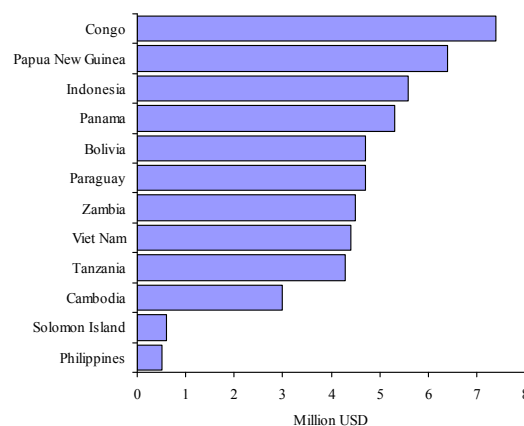


Source: UN-REDD Program.

**Figure 3: REDD Program Partner Countries**

The countries that grant funds are developed countries. Until now the list of such donor countries is very short. The countries are: *Norway, Denmark and Spain*. Norway is the country that contributes the most with almost 150 mil USD, representing 93% of the total amount. Less than half of the common budget (76 mil USD) is allotted to approved budgets. Considering all of this, the amount is not yet entirely transferred, and the made payments have reached only 7 mil USD.

The countries where REDD projects have been approved, according to the budget size are (figure 4) Democratic Republic of Congo, New Guinea, Indonesia, Panama, Paraguay, Bolivia, Zambia, Viet Nam, Tanzania, Cambodia, Solomon Islands and the Philippines. Until so far, expenses were made only in the Democratic Republic of Congo and Viet Nam.



Source: UN-REDD Programme.

**Figure 4: REDD Countries According with the Approved Project Budget**

Implementation of REDD has been carefully monitored by a scientific community that has drawn up several reports regarding its progress, potential benefits, difficulties and results. Kanowski and colab. (2010) have followed such aspects in the specialty literature and have made up an inventory of the benefits and potential disadvantages (box 2).

## Box 2: Benefits and potential disadvantages of REDD

#### **Potential benefits**

- Expression of immediate benefits.
- Higher efficiency compared to other options for reducing greenhouse gas emissions.
- Supporting the conservation of biodiversity and environmental services.
- Contributions to the reduction of poverty and improvement of quality of life in rural areas.

#### **Potential disadvantages**

- The measures of implementation may ignore the rights of the local population over the territories and resources and compromise the progress towards models of decentralized forest governance that was achieved with the involvement of the local population. For example, the representations of the indigenous population in negotiations with REDD + remain a problematic aspect and divergence persists on the eligibility of the forests.
- Concentration for carbon storage and sequestration may result in lessening of attention given to conservation of biodiversity, given that REDD + grants do not make the difference between natural forests and plantations. The risk being that that the measures of protection would apply more to plantations, rather than to natural forests.
- The reduction in emissions that forests provide is more difficult to estimate correctly than the contributions from other sectors.

*Source:* Kanowski, P.J, McDermott, C.L., Cashore, B.W. (2010), Implementing REDD+: lessons from analysis of forest governance, *Environmental Science and Policy*, article in press, 859, pp.2.

The most powerful argument for REDD + is that carbon storage in the forest, alongside the co-benefits in terms of biodiversity conservation and poverty reduction, can "*buy time*" for the preparation of a more comprehensive climate strategy. Negotiations taking place in Copenhagen (2009) and Cancun (2010) were more or less sterile for designing the post-Kyoto actions. Such fact proves that there is a need for decisive steps for the future of climate policy to be ensured.

### **9. Conclusions**

Public and private decisions affecting biodiversity seldom fail to take into account the benefits that manifest at regional or global level (e.g. protection of water resources). Also, they may omit the local public benefits (for example, the commercial exploitation of timber), even when the local living conditions are affected. Decisions are made mainly by taking into account short-term gains and not by taking into account the possibility of providing long term benefits. This systematic undervaluation of ecosystem services and the inability to highlight the economic value are the main causes of contemporary biodiversity crisis.

In these circumstances, it becomes very important to provide opportunity for public policy formulation and implementation, to highlight the main types of benefits and avoid their undervaluation. Policies should create well-functioning markets for ecosystem services, where their value is incorporated into price signals. At the same time, institutions and regulations may be established, together with secured funding.

The transition from the existing situation to desired one, pursued by these public policies may be seen as a difficult process, in which the main problems are related to the replacement cost benefits, for those who exploit ecosystems in the current situation, to the delayed manifestation of policy's results, to both - business profile and way of life - change.

Overcome the problems depend on many factors, but change must occur at all levels of decision. This includes international collaboration for implementation. Experience of international agreements – such as the Framework Convention on Biological Diversity Conservation, IPCC - show that international cooperation efforts can favorably influence the political priorities and social attitudes. Inter-governmental science-politics Platform on Biodiversity and Ecosystem Services (IPBES) is a project which aims to create a similar framework to protect biodiversity.

Limits and shortcomings of market mechanisms to protect biodiversity and ecosystem services are used by the opponents of these mechanisms. One of these, the Friends of the Earth NGO, at a conference in Nagoya (2010) believes that "we cannot and should not rely on market mechanisms to meet the burden of government power. Commoditization and privatization of nature and biodiversity are false solutions. Biodiversity is not for sale. Existing financial incentives work against biodiversity in place to support it and often violate the rights of local communities" (Rojas, 2010).

Other issues considered problematic are synthesized by Wunder (2005), as represented by the possibility of financing to buyers of ecosystem services and capital formation, the confidence in PES system. Thus, as a buyer you should have the possibility to fund ongoing payments. Then, while the demand remains restricted, extension services on offer is unrealistic. From the perspective of the supplier, any community may decide at a meeting of local authority to choose from ecosystem services in place to support to provide all services specific to ecosystems it manages. Except for the carbon sequestration services, that have a global impact, the other ecosystem services requires buyers or intermediaries initiative to ask suppliers to ensure a favorable maintain of ecosystems.

Creating a climate of trust, establish rules and rewards can be a difficult process that requires time and the existence of trusted intermediaries. However, success is not guaranteed. Decades of paternalistic approach to rural development have created expectations that are difficult to overcome, even if all parties are taking benefits.

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