Ecosystem Services and Incentive Mechanisms for Environmental Preservation in Brazil

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Abstract The evidence that environmental imbalances pose a serious and imminent threat to the future of mankind has prompted concrete actions in the environment. However, in Brazil, the challenge is to integrate the various regulations, public policies, new opportunities, and incentive mechanisms for forest protection and restoration. This paper discusses specific forms of action in Brazilian systems of Law, Economics and Politics that can influence environmental issues. It systemically presents economic instruments and analyzes the adoption of programs of Payment for Environmental Services to encourage voluntary practices of environmental protection. We suggest a mandatory strengthening of local power to increase the effectiveness of environmental legislation. The local sphere relates more closely with the more tangible reality and, therefore, is the closest instance of political decision-making that most directly affects people's lives. It is also where the exercise of citizenship is more fruitful and where popular participation is more intense. We assume that sustainable development is unachievable without governance because it promotes common goals through collective action and requires structural changes in the dominant institutions.

Keywords Ecosystem services · Public policy · Payment for environmental services · 2030 agenda for sustainable development

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1 Introduction

Both the economy and human welfare depend on ecosystem services to maintain life and productive activities. Mineral resources and energy sources fuel the economy, but we are also handed other essential elements for our survival: food, water, wood, biomass; regulation services, climate balance, flood control, disease control, air purification; recycling of nutrients, soil formation, oxygen production, as well as other benefits related to our culture, like scenic, recreational, touristic, spiritual and educational elements (Finvers 2008; Bastian et al. 2012).

Although the number of benefits is great, there is no encompassing scientific description both of the multiple relationships between different ecosystem services and of the impact of such approach on political decision-making (Cox and Searle 2009; Haines-Young and Potschin 2010).

Instead, we have been witnessing a growing degradation of ecosystems throughout the world (MEA 2005; Heinberg 2010) and an increase in the risks posed by natural and extreme events (floods, landslides, forest fires, heatwaves), which shows that there has been a decline in the resilience of ecosystems throughout the world (Bastian et al. 2012).

The current mode of production and consumption—created with the premise that the exploration of resources can increase limitlessly—is destroying biodiversity and changing the ability of our ecosystems to produce essential goods and services for life.

The environmental legislation of many countries does not include the idea of "ecosystem services," but, on the other hand, science hasn't also been able to cause a political impact, given the lack of data, standards or evaluation (Cox and Searle 2009).

The restoration of ecosystems, in turn, can be hard or expensive in the case degradation isn't irreversible, causing, nonetheless, extinctions and changes in its defining traces (Keith et al. 2013). Moreover, complex and dynamic systems, such as oceanic and atmosphere circulation, for instance, if systemically disrupted, may reach a tipping point, a point of no return (Medeiros et al. 2017).

Despite the vast increase in ecosystem services (ES) studies in recent years, it has been shown that the outputs of these assessments are not yet suitable for decision making (Martínez-Harms and Balvanera 2012; Schägner et al. 2013). The studies are focusing on key ES and yet information on many other services is scarce but essential for sound decision making. The ecosystem services often span across several administrative structures, i.e., address different policy aspects, which are often covered by different governmental ministerial or departmental units. This requires the integration of different sectors and disciplines once different value dimensions are considered, from biophysical to socio-cultural to economic (Grêt-Regamey et al. 2016).

Such challenges, including limited capacities of relevant policy units or dispersed authorities, complicate the operationalization of the ES concept. There are recommendations for a better implementation of ES into decision making spanning

from the further development of policy instruments and financial mechanisms to a better integration of the regulations, public policies, and incentive mechanisms for forest protection and restoration, and a better representation of methods and results to a more interdisciplinary research (Scarlett and Boyd 2015; Grêt-Regamey et al. 2016).

Given the relevance and the urgency, the conservation of biodiversity and the maintenance of healthy ecosystems have been included in 8 of the 17 Sustainable Development Goals (SDGs), both directly, such as SDG 15 (protect, recover and promote the sustainable use of land ecosystems), and indirectly in its relations with ending poverty (SGD 1); ending hunger, achieving food security and improved nutrition and promoting sustainable agriculture (SGD 2); ensuring healthy lives and promoting well-being for all at all ages (SDG 3); promoting sustained, inclusive and sustainable economic growth (SDG 8); ensuring sustainable consumption and production patterns (SDG 12); taking urgent action to combat climate change and its impacts (SDG 13); conserving and sustainably use the oceans, seas and marine resources (SDG 14).

This paper analyzes specific ways of interfering with the Brazilian Law, Economy and Politics which may influence their treatment of ecosystem services, especially considering not only their potential of being included in regulations, policies and mechanisms dedicated to incentivizing the protection or restoration of forests, as well as the fulfillment of SDGs as from ecosystem services-oriented forms of governance.

2 Environmental Economics and the Conservation of Ecosystems

The economic literature understands ecosystem services as a mechanism that corrects a type of market failure called "negative externality," that is, the costs that circulate externally to that market, do not burden production, but falls over other parties or a population that has no relation with the activity (Nusdeo 2012).

Establishing a monetary value to environmental resources does not mean treating it like a product, but only measuring ecological benefits and damages to be applied in accountable and efficient forms of management, considering that the ecological functions of natural resources have indirect value (Slootweg et al. 2008; Chan et al. 2012).

The economic valuation of ecosystem services must influence the decision-making process regarding the importance of conserving the biodiversity, both identifying and distributing the costs and benefits of different actors, producers and consumers (Paggiola et al. 2004).

Measurement mechanisms depend on the type of environmental good or service is under scrutiny and the dimension of their contribution for (individual or collective) wellbeing. Information on availability, scarcity and willingness of people to work for its conservation must be accounted for (Bateman and Willis 1999).

The conceptualization of the idea of "externality" lies in the intersection between Economics, Ecology and Law, including also the management of public policies. The understanding of reality and its problems (as well as the promotion of solutions) in environmental law and environmental sciences is, usually, interdisciplinary.

For this paper, we considered the relations between individuals, institutions and nature, as well as the premise that, in order to be effective and efficient in terms of sustainability, policies must necessarily focus on equity (Setti et al. 2016).

The destruction of ecosystems and the unsustainable use of the services they provide generate serious environmental problems and intensify social inequalities and poverty throughout the world, affecting especially traditional communities (MEA 2005). Therefore, environmental policies need to be linked to both the economic and social spheres of the development process, altering the cost-benefit analysis of certain economic activities given their negative socioenvironmental impacts.

3 Mechanisms and Instruments to Preserve Ecosystem Services in Brazil

States use mechanisms of command and control (standards, limitations and prohibitions), as well as economic instruments (charging for the use of water, redistributing taxes on goods and services to pay for environmental services; direct payment for environmental services; concessions of forests, etc.) to correct socioenvironmental distortions and injustices produced by the market.

Brazil has been implementing economic instruments related to management and preservation of the environment in the last thirty years due to greater demographic occupation, irregular urban occupation, the expansion of the agricultural frontier and the uncontrolled use of natural resources (Born and Talocchi 2002).

One of the economic instruments that promotes the preservation of ecosystem services is charging for the use of natural resources. This can restrict use and improve quality through taxes or fees on economic activities that degrade the environment and incentives for the sustainable use of natural resources and environmental protection (Nusdeo 2012).

One of the first financial policies dedicated to environmental services in Brazil was the Tax on the Circulation of Ecological Goods and Services ("ICMS Ecológico"), created in the 1990s. The *ICMS Ecológico* is a tax that allows that part of the taxes collected by the state government is handed to municipalities that have conservation units created by the state or federal governments within their boundaries. This has been leading local leaders to understand environmental protection as something positive, given that it stimulates sustainable development, as well as ecotourism and organic food production, expanding employment and income opportunities (Born and Talocchi 2002).

Another initiative is charging for water use, which was established by the National Policy on Water Resources (Law 9.433/1997). Resources must be used to protect drainage basins, including reforestation and forest conservation (DOU 1997). Drainage basins were adopted as regional units for the planning and management of water.

Such reorganization of the system hands power back to decentralized institutions within the basin, stimulating the negotiation between various public agents, users and the organized civil society. Popular participation expands the access of people to basic urban services and infrastructure, developing the civil society and strengthening democratic mechanisms (Jacobi and Barbi 2007).

In the last ten years, not only there was great progress in environmental legislation, but also consultative and advisory councils were strengthened in several areas and in all levels (federal, state and municipal), with the active participation of representatives from social movements and NGOs (Jacobi and Barbi 2007).

A similar system was established by the National System of Conservation Units (NSCU—Law 9.985/2000) as an attempt of providing more resources to Conservation Units (CU), given the ecosystem services they provide to society. NSCU also exempts owners of Private Natural Heritage Reserves (PNHR) of Rural Land Taxes for the protected area (DOU 2000).

The country has increased the extension of its CUs, but did not obtain the necessary budget to maintain the existing CUs, allocating 20% less than what is considered the minimum necessary (Semeia 2014).

For the CUs to get financial resources from direct donations, the distribution of water and the generation of electricity, articles 34, 47 and 48 of the Law that created NSC must still be "regulated." Another source could be the so-called "legal reserve compensation," through the regularization of land ownership at CUs and implementation of the National Policy on Payment of Environmental Services (NPPES), which Bills 792/2007 and 213/2015—already introduced in Congress—address.

The Payment for Environmental Services (PES) is the voluntary payment of those who promote the conservation, recovery, expansion or the management of areas with vegetation considered to provide environmental services (Nusdeo 2013).

Although there are PES tools available, there is no national policy for PES methods currently in force. However, Bill 5.586-A/2009 on certified Reductions of Emissions from Deforestation and Forest Degradation (REDD), the Brazilian Forest Code (Law 12.561/2012) and the National Policy on Water Resources (Law 9.433/97) are all related to ecosystem services. States have more than 20 PES-related laws, decrees and bills (WWF 2014).

The goal is assuring coherence between public and private initiatives regarding the recovery and conservation of biodiversity on the national, state, regional and municipal scales, as well as promoting sectoral government policies that may produce an impact over ecosystem services, especially through policies in the following areas: Environment, Water Resources, Climate Change, Protected Areas, Technical Assistance and Rural Extension for Family Farming and Land Reform and the Forest Code.

4 Governance to Preserve Ecosystem Services

Ecosystem services-oriented forms of governance demands that intersectoral and participatory public management concepts, practices, mechanisms and tools are further deepened, promoting equity and socioenvironmental sustainability in the territory. Traditional communities contribute for that equitable model of development which both defends the environment and natural resources and promotes the solidarity economy and quality of life improvements (Setti and Azeiteiro 2016).

These communities have an ethical behavior regarding the conservation and preservation of life and the environment and, therefore, have a dialectic relationship with society, both denying and affirming its values, continuously recreating survival strategies. Unfortunately, indigenous populations, the "quilombolas" (remnant populations of fugitive slaves) and traditional populations—which are protected by the Federal Constitution of 1988—have been considered hindrances to development.

The lifestyles of traditional communities—including the way they materially and symbolically appropriate nature, their forms of knowledge, their technologies, their cultural practices and actions they take in the territory –, given the need to promote diversity in all its forms, are a counterpoint to the unsustainable lifestyles of urban/industrial societies (Zhouri and Laschefski 2010).

Natural areas and traditional communities are being decimated in the environmental conflicts that emerge due to the unequal distribution of natural resources and the territorial disputes between groups that use the environment differently. Establishing commitments of reaching consensuses are difficult because of the clashing rationalities (modes of being, doing and thinking).

Besides deforestation, other activities such as large hydroelectricity generation projects also represent threats to the provision of environmental services and contribute to climate change (Fearnside 1989; Oyama and Nobre 2003; Betts et al. 2004).

In this scenario of inequality and conflict, traditional communities not only are excluded from development, but also have to take a greater load of the consequences of environmental degradation, fighting for autonomy and resisting the current modes of production and consumption and social organization.

In Brazil, there are 305 indigenous ethnicities and 274 languages (IBGE 2010). The protection of their territories and the traditional use of natural resources – which are fundamental to their culture and lifestyle—are part of their identity (Setti and Azeiteiro 2016). This has been identified in SDG 4, which recommends that the contributions of African descendants and indigenous populations for the development of nations are included in school curricula (UN 2017).

Goals were established to protect and assure the existence of traditional peoples' and communities' ways of creating, doing and living: preserving historical sites; carrying out mappings, inventories and studies on traditional memory, rites and celebrations; preserving linguistic diversity, as well as expressions, artistic expressions and cultural practices of the various ethnicities; promoting a culture of

diversity, solidarity, equality and inclusion in the media; and strengthening peoples and cultures for climate change-related planning (UN 2017).

Environmental sustainability, in the context of traditional communities, has to do with the sustained use of natural resources and a more equitable distribution of wealth, and should be considered in environmental policies and licensing (Zhouri and Laschefski 2010).

Therefore, any public policy dedicated to the preservation of ecosystems must be strategically linked to territorial programs that allow for the inclusion of the idea of sustainable development in the territorial spheres and jurisdictions of government.

5 Integration of Public Policies, Regulations, and Incentive Mechanisms for Protecting Ecosystem Services

The integration of public policies concerning ecosystem services has to do with the hierarchy and territoriality of the relations between national, state and municipal spheres of government and their most varied combinations—given their territorial distribution, which often include more than one municipality, state or region, such as, for instance, the territorial distribution of metropolitan areas, coastal zones, areas with specific land-use conditions (Gallo and Setti 2014; IBAM 2016).

Public policies related to environmental services that includes traditional communities must intersectorally integrate the different themes reflected in government administrative structures from a systemic perspective that recognizes individuals in their contexts.

This demands participatory governance processes capable of ranking priorities based on the needs of the territory (Gallo and Setti 2014), whose institutional format promotes greater social participation in the processes of dialogue, negotiation, representation, planning and evaluation of public policies.

To meet the growing demand for environmental services and, at the same time, benefit traditional communities, the Brazilian government created policies and programs that generate intergovernmental cooperative arrangements that assure complementarity, synergy and the optimization of technical and financial resources.

The National Program for the Sustainable Development of Rural Territories (2003) considered the demands of traditional populations and indigenous peoples, although the processes of planning and implementation did not go beyond the municipal level and were restricted to small groups of beneficiaries (Bonnal 2013).

The Program for the Socioenvironmental Development of Rural Family Production (*Proambiente*) included priority groups (family farmers, artisanal fishermen, traditional populations and indigenous peoples), was based on the balance between environmental conservation and family farming and was implemented through the environmental management of rural areas, the integrated planning of productive units and the rendering of environmental services. *Proambiente* has the

interesting history of having been a project created by the civil society (2000/2002) that went through a phase of transition (2003) to become a program of the federal government (Hall 2008; Neto 2008).

The National Policy for the Sustainable Development of Traditional Peoples and Communities—introduced by Decree 6.040/2007 and implemented by the National Commission for the Sustainable Development of Traditional Peoples and Communities (SDTPC)—emphasizes the recognition, the strengthening and the assurance of the territorial, social, environmental, economic and cultural rights of traditional peoples and communities, respecting and valorizing their identity, their forms of organization and their institutions.

This policy is an advance in the fight against the invisibility and the social exclusion of traditional communities by economic or land-ownership pressures or through discriminatory process in which the recognition of *quilombola* lands and the demarcation of indigenous lands, for instance, clash with the advance of agriculture, logging and mining, as well as the construction of large infrastructural projects, especially in the areas of transportation and energy, to meet the economic demands.

In the context of the creation of the markets for Payments for Environmental Services (PES), the National Water Agency created the Water Production Program (2001) to incentivize the preservation of riparian forests around water springs in private properties, assuring the increase in quantity and in quality of the water offered to the population and including technical and financial support (Wunder et al. 2009).

To assure resources for the projects, studies or any undertaking aiming at the mitigation and adaptation to climate change, the Climate Fund (Law 12.114/2009) was created to support initiatives related to PES policies, providing support to activities that stabilize the concentration of greenhouse gases and that demonstrably contribute to carbon sequestration and the provision of other environmental services, such as the recovery of degraded areas and forest restoration (Santos et al. 2012).

The Green Stipend is an environmental conservation support program created in 2011 (Law 12.512/2011) to support families in extreme poverty living in areas that have been considered priorities for conservation. The program provides a stipend for family farmers, traditional communities and people settled through land reform. The environmental services provided include the maintenance of vegetation in the property where the family resides and the sustainable use of its resources (Santos et al. 2012).

The Brazilian environmental legislation is supported by international declarations and is based on the "polluter pays" principle that charges polluters for the social costs of the productive process, an encompassing mechanism of accountability for ecological damage not exclusively related with immediate reparation (Milaré 2001). The "protector receives" principle is the rationale behind the payment of environmental services and the basis for economic incentives for the protection of areas and the preservation of their resources (Nusdeo 2012).

At the municipal scale, programs for the payment of environmental services are usually dedicated to the preservation of riparian forests and water resources. 7.5% of all municipalities in the country, mostly in the Central-West Region, already pay for environmental services (IBGE 2013).

Ecosystem services have not been discussed exclusively on the public sphere in Brazil. The private sector has also been recognizing the importance of these services for their own businesses. The degradation of ecosystems is relevant for companies that both produce and impact and depend on ecosystems and the services they provide.

The social accountability of companies is a voluntary commitment with a responsible form of management regarding their partners, employees, suppliers, consumers, community and environment that goes beyond the simple fulfillment of their legal obligations. Many organizations have been investing in social projects and taking on the responsibility for the impact their productive processes cause. Companies benefit both because it consolidates their image or brand as a modern and sustainable company and because productivity and competitiveness are linked to the quality of life of the community the institution is a part of (Garcia 2002).

On the other hand, the idea of "social function" is part of the Brazilian constitutional legal order under Art. 170 of the Federal Constitution of 1988, which establishes that entrepreneurs and administrators need to carry out their activities harmoniously, complying with their positive and negative duties and respecting the interests of the society.

The Corporate Partnership for Ecosystem Services (CPES) was created to help companies reduce their negative impacts over ecosystem services; show the value of ecosystems and of the conservation of biodiversity through business strategies that maintain such services; and attain practical results that further expand these business strategies (CEBDS 2013).

To conserve natural resources and use them sustainably, it is fundamental that policies that promote environmental integrity and social inclusion are effective and not a mere mobilization of financial resources and a creation of new markets. The growth of productive chains that cause pollution and the degradation of forests must be limited, and a mode of production and consumption based on solidarity and sustainability must be established.

Therefore, mechanisms for paying for environmental services—in combination with other regulations and tools for social control—must be accompanied by continuous processes of participatory evaluation aiming at suppressing the biodiversity and ecosystem markets, which would subject public and social interests to private, corporate ones.

6 Ecosystem Services and the Fulfilment of Sustainable Development Goals—SDGs

The idea of sustainable development emerged historically with evidence of ecological unbalance and an increase in social inequality, highlighting the unsustainability of the hegemonic mode of production and consumption. This triggered a "social cycle" in the agenda of international organizations, which globally consolidated the agenda of sustainability expressed through the SDGs.

This opens possibilities for the implementation of policies for promoting equity and environmental integrity, expanding the access to citizenry, the preservation of the environment, the solidarity economy and the quality of life (Kumar et al. 2013).

There are serious of issues related to ecosystems and biodiversity that require articulation of socioenvironmental policies between all government spheres. This strengthens shared management strategies focused on the co-accountability for the fulfilment of SDGs.

The eradication of poverty remains a priority. In terms of health, poverty shortens life almost as much as physical inactivity and much more than obesity, hypertension and the excessive consumption of alcohol. Low socioeconomic status is one of the strongest predictors of premature morbidity and mortality all over the world. Poor nutritional status is the cause of 45% of deaths among under-fives. One in every four children in the world is stunted (in developing countries the rate is one in every three); 66 million children in primary school age attend school while hungry (Stringhini et al. 2017).

Damages caused by climate change increase losses caused by the economic crisis, affecting the poorest disproportionally (TEEB 2010), which shows that social inequalities are always ecological inequalities. They determine the modes and levels of access to ecosystem goods and services, which, in turn, also determine both health and disease processes and environmental sustainability.

Other strategic areas for intervention include: (1) the conservation of ecosystems and its services by strengthening protected areas; (2) the implementation of equitable strategies for managing natural resources; (3) the prevention and control of deforestation, as well as the conservation and the sustainable management of forests; (4) the strengthening of inclusive environmental governance mechanisms; (5) the access to genetic resources and the fair distribution of the benefits of their use; (6) the identification and monitoring of exotic invasive species of plants, animals and microorganisms that affect the environment and the health of human beings; (7) the recovery and restoration of degraded ecosystems and the recovery of threatened species; (8) community-based evaluations of ecosystems based on ecosystem services and human wellbeing.

7 Conclusion

The absence of a legal framework for environmental services, the little information on methodologies for measuring and monitoring them, the absence of continued sources of financing and the unfamiliarity with the social and environmental function of traditional communities keep the national policy of environmental services from becoming a strategic action and a positive agenda.

To implement this environmental rationale, environment preservation values need to become an integral part of personal ethics, human rights and the law. The access to and the appropriation of nature cannot continue a privilege of a few, the production of knowledge must be redirected toward transdisciplinarity, and the State must be reformed to promote the participatory management of natural resources.

The actual participation of the society in the economic development process is crucial for the protection of natural resources, in the development of a political-institutional framework for articulated public policies in the fields of health, urban development, the environment, natural resources and education.

Therefore, development ranges from the protection of human rights to a deepening of democracy, to both the effective possibility of everyone participating politically and the expansion of human capacities.

In this sense, the empowerment of traditional communities through education, valorization of traditional culture and knowledge and dissemination of social technologies is achieved through the participation of the people in the management of the territory including the creation of public and multicultural articulation spaces, focused on sustainability and socialenvironmental justice.

Theory seeks to offer decision-makers alternatives that promote the conservation of biodiversity, pointing to the economic tools that make decisions in that direction viable. The challenge is to change the conservation of biodiversity into a technical, political and social issue that is vitally important for sustainable development.

Investments in new and more efficient technologies that reduce the environmental impact of industrial processes have become increasingly less viable. In order to preserve our natural capital, we need sustainable economic reforms based on the assumption that the economic crisis is an opportunity for a paradigm shift regarding our modes of production and consumption.

The use of economic tools in environmental management demands efforts in three areas: macroeconomic coherence, legal compliance and technical capacity. Such areas depend, however, on institutional management and governance capacity for sustainable development.

Given scarcity and the uncertainty involved in the relations between the economic and natural systems, we should be cautious and skeptical given the possibility of irreversible and unreplaceable loss of ecosystem services that are essential for our well-being and survival.

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