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THE VALUE OF FOREST ECOSYSTEM SERVICES IN ROMANIAN PROTECTED AREAS – A COMPARATIVE ANALYSIS OF MANAGEMENT SCENARIOS

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Abstract: *Ecosystem services addressed in this paper include wood production associated with the active management of forests and the value of non-timber forest products and hunting (i.e. direct use values of the protected areas) carried out in and around three of the most important protected areas in Romania. In order to provide information that supports decision making in natural resources management, data and results are presented in a friendly manner for economists, using Sector Scenario Analysis approach – a sector based comparison between business as usual and sustainable ecosystem management scenarios applied on Vanatori Neamț, Retezat and Apuseni Mountains protected areas. Data presented proves that continuing to grant protected areas a low priority in policy development and funding will result in long term economic losses.*

Key words: *forestry, protected areas, ecosystem services valuation.*

1. Introduction

The Romanian forest management system was known for its performance during the communist period, all the forest belonging to the state and being managed following sustainability principles [14]. After 20 years of structural changes triggered by an extended process of restitution, a more stable system is now in place with almost all the forests (6.0 million ha out of 6.3 million ha) being administrated by National Forest Administration Romsilva or by private forest districts [1], [9]. Forest management based inter-alia on biodiversity conservation principles [15] created, in the last 20 years, the opportunity to develop a protected areas (PA) network covering 23% of the total territory of the country and almost 30% of the forests [19].

However, the poor financing of this extended network of PA [10], [11] triggers the need for a better assessment of ecosystem services values and a better way to communicate these findings to decision makers, to support their decisions in terms of forest management and biodiversity conservation funding. The frame for this assessment and communication effort is created by the ecosystem services (ES) valuation initiatives [21]. Millennium

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Assessment [21] recognizes four types of ES: *provisioning* services such as timber, food, non-timber forest products (NTFP), *regulating* services that affect climate, floods, waste and water quality; *cultural* services that provide recreational, aesthetic and spiritual benefits; and *supporting* services such as soil formation and retention, primary production and habitat provision [16], [17].

Wood harvesting, collection and sale of NTFP and hunting are the most important activities within the sector that can be economically counted as direct use values – forest ecosystems provisioning services, since these goods benefit from existing markets. Forest harvesting is a complex activity with potential impacts on biodiversity and the ES provided by PAs such as carbon sequestration, air quality, water and soil erosion regulation, nutrient retention, landscape conservation, and the production of NTFP. Therefore, sustainable forest management is crucial for effective provision of PAs ecosystem services.

In theory forest ecosystems within the PAs are managed, in Romania, according to the forest and parks management plans (MP), but in reality these plans are not always fully enforced due to a range of factors [2]: i) not all PA MPs are approved; ii) there is no compensation for harvesting restrictions within private forests and owners therefore have no incentive to limit harvesting; iii) in some of the PAs there may be the need to extend the area of protected forests, but in the absence of a comprehensive biodiversity inventory and monitoring system, and with resistance from forest administrators and owners, these forests continue to be harvested for wood, which may entail a number of negative effects on the provision of important ES; iv) while there is a good legal framework in place, enforcement of the law is weak and in many cases over cutting and illegal logging is evident.

NTFP are potentially important for the local economy [2]. However, even in areas where the collection and processing of NTFP is economically significant [4], those products are not managed and harvested in a way that captures their full potential. Forest administrators often concentrate on wood harvesting and processing and pay little attention to the economic potential of NTFPs [2].

In terms of revenue generation, hunting is less important compared with wood production. Nevertheless, recreational hunting is an important service offered by forests. In spite of a legal framework that controls hunting, due to enforcement problems, the extent of illegal hunting is still high [2].

The primary goal of PAs is biodiversity conservation but the ecosystems under special protection regime usually have other benefits for human wellbeing, including economic returns from direct use of the products. Still, there is the need for a clear distinction between ecological and biodiversity capital and the stream of economic benefits produced by this capital [21].

The present paper is an argument for a sustainable management of PAs including large forest areas showing that, by assigning a price for biodiversity and ecosystem services, the forestry sector can gain also important long term economic benefits.

2. Material and method

The valuation study [2] on which this paper is based focuses on pilot PAs: Apuseni Natural Park (ANP), Retezat National Park (ReNP), and Vanatori-Neamt Natural Park (VNNP). The study involved analysis of provisioning forest ecosystem service values for each of the 3 Pas and envisages economic links between ecosystem services of protected areas on

the one hand and the practices and results of the forestry sector on the other hand At the same time, the study looked at how economic costs and benefits are distributed within and between socioeconomic groups identifying winners and losers from alternative PA/ecosystem management approaches and scenarios.

The Sector Scenario Analysis (SSA) was applied in a major study by United Nations Development Programme (UNDP) in the Latin American and the Caribbean in 2010 [3]. A guidebook for its broader application is currently under development. A core part of the SSA approach is the comparison between two scenarios, Business as Usual (BAU) and Sustainable Ecosystem Management (SEM), to illustrate the contribution of ecosystem services to key productive sectors of the economy.

Under BAU, planning and management functions are typically supported by limited human, financial, institutional, and informational resources [12]. Too often, PA conservation goals and objectives are poorly linked to conservation programs and costs, and existing budgets are not linked to programmatic priorities [2].

Under SEM, funding and capacity are available to meet basic to optimal protection needs. In SEM, protected area's conservation goals and objectives are linked to ecosystems conservation programs and are realistically linked to funding. As a result, ecosystems status improves and their benefits, in terms of increased productivity and equity, expand [2].

BAU and SEM scenarios description Table 1

Scenario	T1 and T2 areas – strictly protected areas	T3, T4 and T5 areas	All areas	NTFP and recreational hunting
BAU	No compensatory payments T1 and T2 areas remain constant	Legal logging at national 2010 average (i.e. 59% of annual increment)	Illegal logging at 5% of annual allowable quota	NTFP harvested at present levels and declining over time. Decreasing potential for recreational hunting
SEM	Compensatory payments in place. Increase in T1 and T2 areas	Legal logging at national 2010 average (i.e. 59% of annual increment) decreasing 7% per year between 2016 and 2030. Constant after 2030. Decrease in T3 and T4 areas.	No illegal logging after 5 years	Increase in NTFP harvest levels over time up to sustainable limit. Decreasing potential for recreational hunting

In the table above T1 represents areas with no cuttings allowed except in very special circumstances, T2 – conservation cuttings allowed, no production purpose, T3, cuttings allowed with low intensity, multiage stands, T4, regeneration cuttings allowed, regeneration under forest – one age stands, T5, clear-cuttings followed by artificial or vegetative regeneration.

The analysed scenarios are based on assumptions developed by the authors and refined through meetings with relevant

stakeholders: in SEM scenario: the strictly protected forest areas (T1 and T2) will increase due to better knowledge regarding biodiversity in the forest ecosystems, there are financial compensations for private restricted forests, no illegal logging after five years and NTFP harvested at a sustainable level. In BAU scenario, management continues in the present conditions (Table 1).

The paper relies on collection and interpretation of existing data from PAs management plans [20], [23], [24], forest management plans, different reports made by forestry authorities at central and local level [22], [18], as well as from different literature sources [4], [5], [6], [17]. In undertaking a social cost benefit analysis of the BAU SEM management scenarios, two valuation approaches were adopted to estimate the market and non-marketed ecosystem services: the *market price approach* - considers *use values* associated with ecosystem goods and services that are bought and sold in the existing markets [7] and *productivity approach* - focuses on the relationship between an ecosystem service and the production of a marketable good (e.g. wood) [8]. All values have been adjusted to the 2012 Romanian price levels, applying a consumer price index deflator to account for domestic inflation. For comparison reasons, the present values (PV) for the streams of revenues in both scenarios were calculated.

3. Results and discussion

The valuations presented in this paper are not comprehensive, as long as they rely only on available data without involving any fieldwork and they depend on many assumptions. The study also relies to a certain extent on extrapolating the few data available on the sustainable levels of NTFP and, of necessity, involves using techniques known collectively as" transfer of benefits`` . It is to be hoped that, when ""new data becomes available, the results presented in this paper can and will be updated and improved.

The pilot PAs have a total forest area of 94,137 ha with a total standing volume of 27,600 m^3 (2010), consisting of fir, spruce, birch, oak, and other hard and softwood species.

The value of forests in terms of wood harvested in the pilot PAs (both private and state owned forests) was €3.0 million in 2010.

Income to public forest administrators	3,236,600
Income to private forest administrators*	1,032,572
Income from illegal logging	145,585
Income to NEF	87,351
Total Value	4,095,162
Public sector revenues	3,252,005
Private sector revenues	843,157

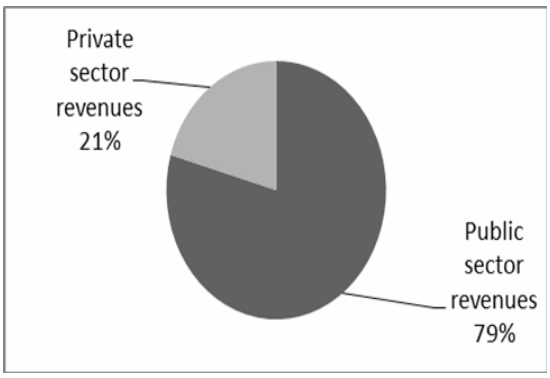

Fig. 1. *2010 baseline value and beneficiaries distribution (EUR); * - value containing compensations*

The percentage of publicly owned forest within the pilot PAs varies from 58% in VNP to 97% in ANP. This influences public expenditure on compensatory payments under SEM across the PAs, i.e. where private forests are significant (e.g. VNNP), compensatory payments should be higher. Public revenue from harvested wood – state owned forests - in 2010 for the three PAs was around € 2.4 million (1.6 in ANP, 0.6 in ReNP and 0.2 in VNNP), including the revenues coming from the state owned forests.

Both private and public forest administrators contribute 3% of the value of standing wood sales to the National Environmental Fund (NEF). This added an additional € 0.1 million to public revenues from forestry in 2010. Illegal logging is estimated at around €145,585 accruing to the private sector in 2010. Recent studies [4] estimate the value of non-timber forest products harvested (NTFP) under sustainable conditions and sold at €1.0 million (€0.6 million in ANP, € 0.1 million in ReNP and € 0.3 million in VNNP).

Hunting values in 2010 were estimated based on data reported by the hunting areas administrators and studies done in other PAs [4] but transfer benefit techniques were used in a conservative way, considering that 75% of the value corresponds to a sustainable hunting level. In 2010 prices this is equivalent to €27.636 (13,278 for ANP, €6,910 for ReNP and €7448 for VNNP). The total baseline value of the PAs can be seen in Figure 1 (including the distribution of this value among the main beneficiaries).

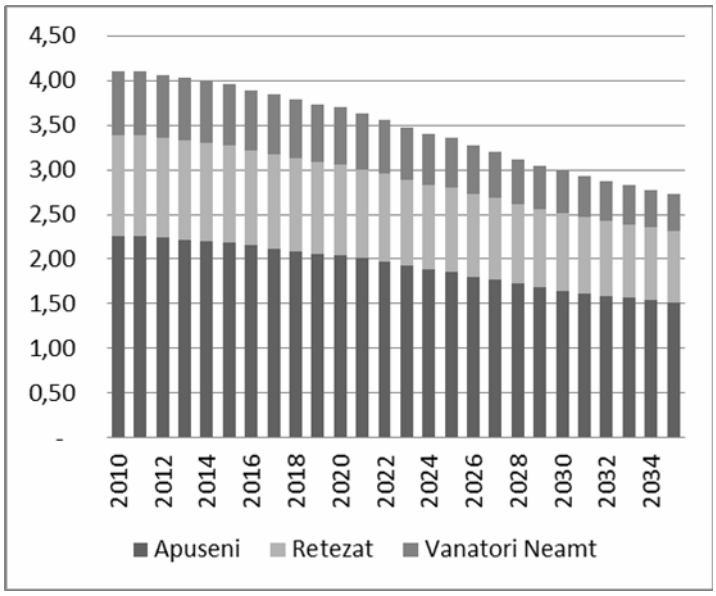

Fig.2. *Forestry sector values BAU - € mill. (PV=€34.43 mill)*

A continuation of BAU in the three PAs results initially in a more or less constant value for the forestry sector. The quantity of harvested wood falls over time due to the change in age class structure but this is also taken into consideration in the SEM scenario. The limited use of NTFP is the main factor determining a decrease in forest sector value under BAU relative to SEM. The present estimated value of ecosystems in the 3 PAs for the BAU scenario is €34.43 million (Figure 2).

SEM will result initially in a decrease in forest sector values, as wood harvesting declines due to a reduction in T3 and T4 areas and in the percent of the annual increment being harvested, and as compensation increases in line with the increase in T1 and T2 areas. Overtime, the PAs forest related value steadily increases, recovering the value lost through the reduction in wood harvesting, due to the increased value of NTFP. The productivity of NTFP is underpinned by a healthy ecosystem and biodiversity. The rate of growth eventually slows as sustainable NFTP harvesting rates are reached, and is constant in the long run. The PV (10% rate over 25 years) for the 3 pilot PAs is estimated at €33.7 million (Figure 3).

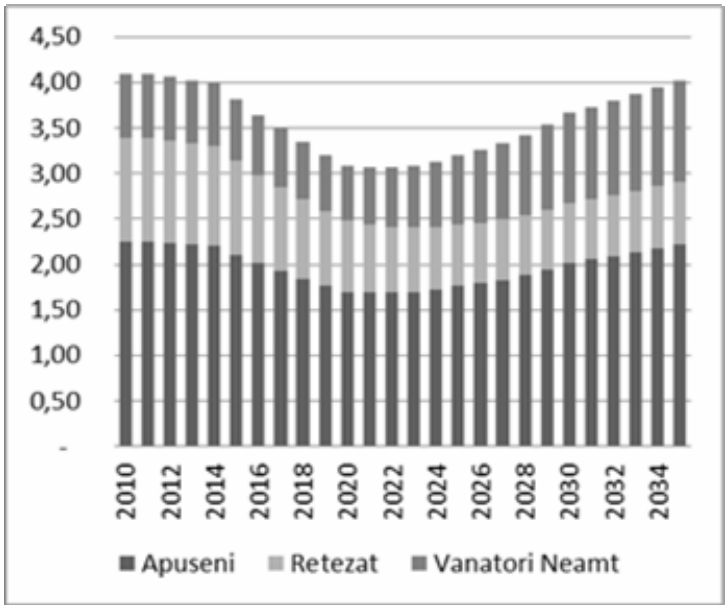

Fig.3. *Forestry sector values SEM - € mill. (PV=€33.7 mill)*

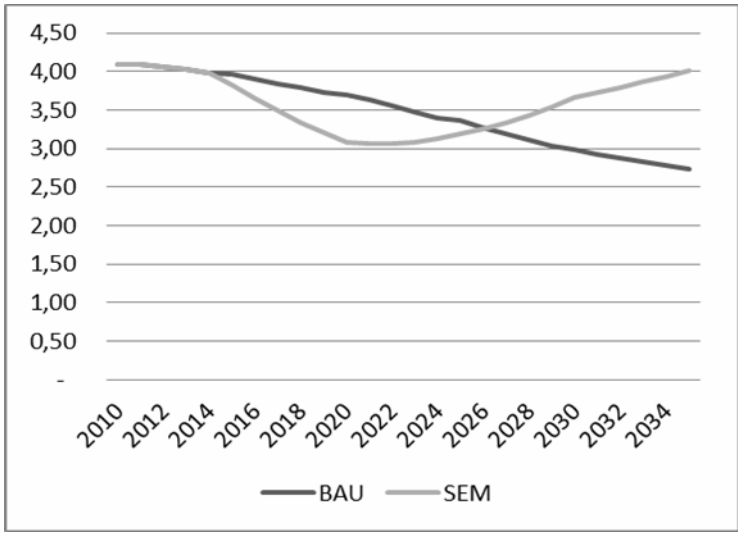

Fig.4. *Scenarios comparison - BAU vs. SEM*

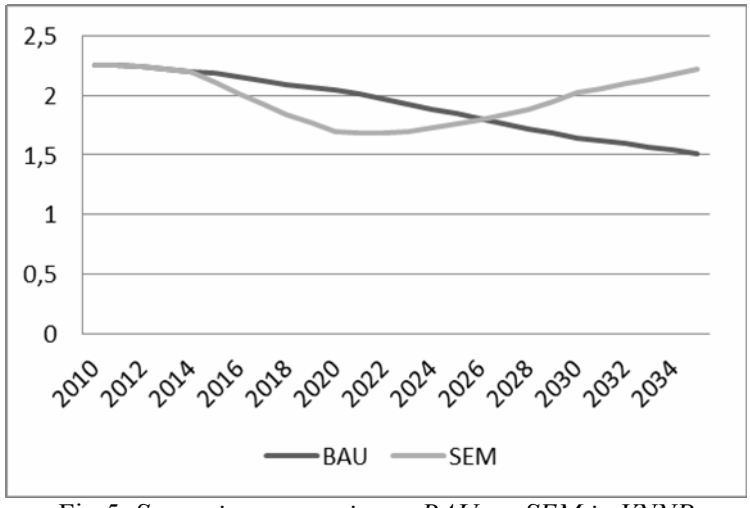

Fig.5. *Scenarios comparison - BAU vs. SEM in VNNP*

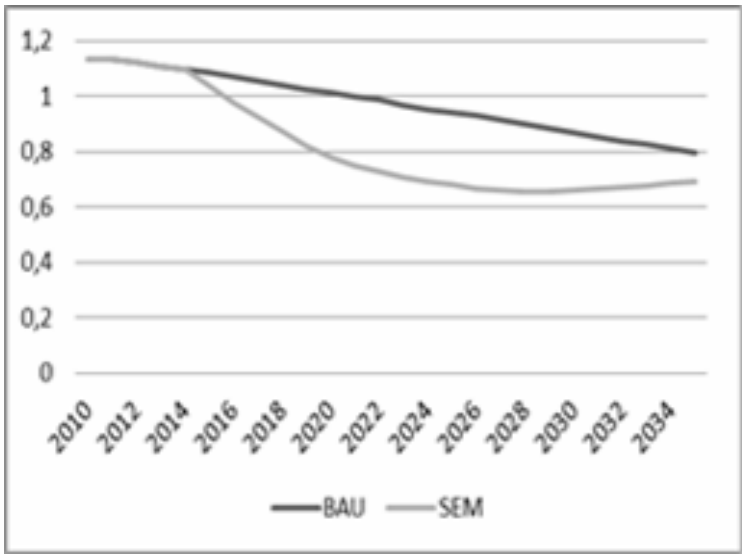

Fig.6. *Scenarios comparison - BAU vs. SEM in ReNP*

As illustrated in Figure 4, while BAU is equivalent or superior to SEM in the short term, in the medium to long term SEM is more profitable.

Furthermore in the long term under BAU values continue to decline, while under the SEM the (high) value becomes constant through time reflecting the sustainable management of the areas.

The profiles for the BAU and SEM scenario are not the same for all PAs. It is worth noting the situation for ReNP and VNNP. In VNNP, SEM is equivalent or superior to BAU over the 25 year assessment period and also shows significant medium to long term gains (Figure 5). This is due to the influence of NFTP. In VNNP the natural conditions (lower altitude, water availability, forested and non-forested areas, a suitable habitat for traditional fruits and an existing tradition in NTFP collection) support

greater weight of NTFP values compared to standing wood. In ReNP the situation is the opposite – higher altitude, mountain plateaus supports lower provision of NTFP. As a result the BAU scenario remains superior over the long term (Figure 6).

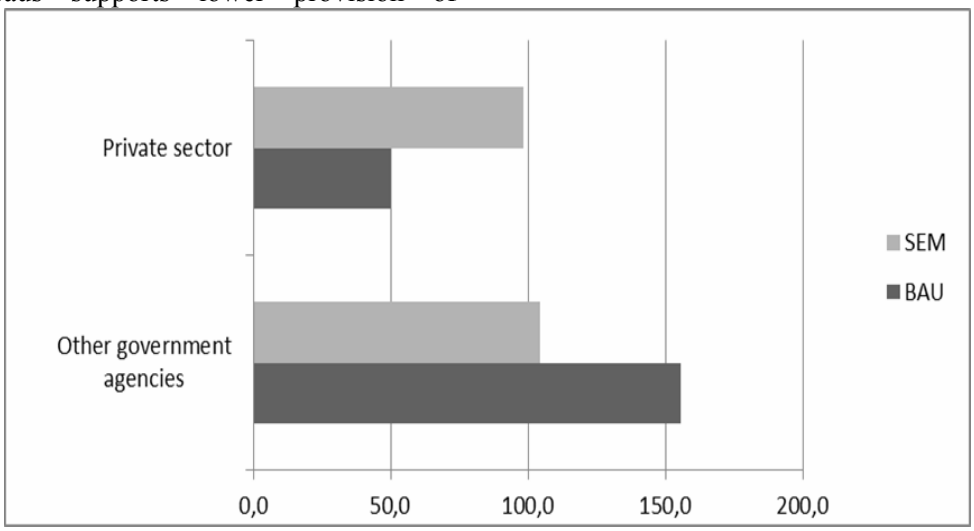

Fig.7. *Beneficiaries of ES in BAU and SEM scenarios*

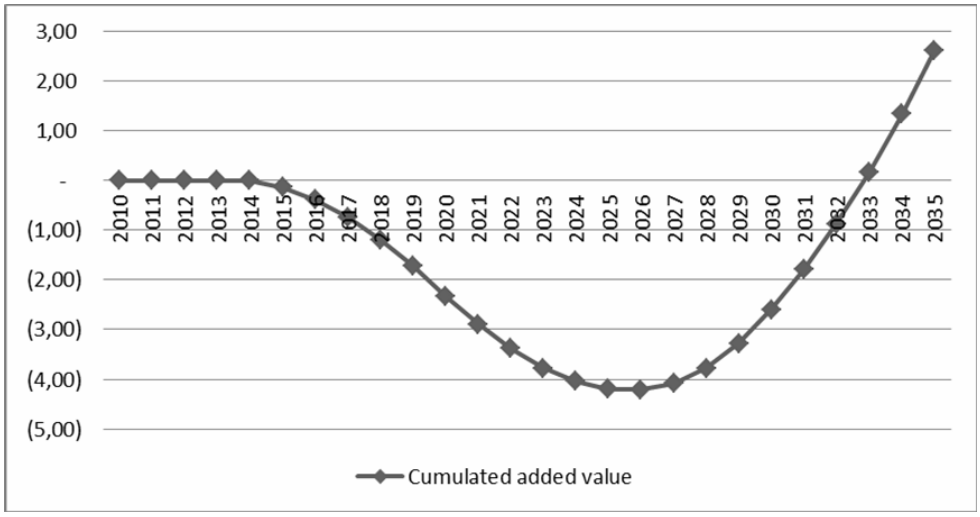

Fig.8. *Cumulated added value SEM over BAU*

It is to be mentioned that SEM scenario implies costs that accrue to the state budget – due to the necessity of compensatory payments (Figure 7). Therefore, when compared with the BAU scenario, SEM means lower total values in the first years. After a certain period (16 years for VNNP, more than 25 years for ReNP), SEM values recover the difference and SEM pays for the initial costs. In the long run, the value of PAs under the SEM scenario will recover, and is projected to generate higher values beyond a 25 year horizon. In addition other ES generated / maintained

by sustainable forestry (e.g. carbon sequestration, water and soil erosion regulation, landscape) are ensured.

SEM is superior to BAU over the 25 year time horizon, generating an additional €2.6 million (Figure 8). However, given the gains to other sectors supported by sustainable forestry (e.g. tourism revenues are partly contingent on undisturbed forests which contribute to landscape values and a range of regulating services such as water and soil retention support agriculture and industry and carbon sequestration), this gain can still be considered underestimated.

All the figures show that the private sector is the main beneficiary, pointing out again the potential to develop payments for ecosystem services arrangements with the private sector.

PA authorities are not represented among the beneficiary groups as neither BAU nor SEM include revenues to PAs authorities.

Under SEM forest administrators lose revenue due to the decline in timber production and increase in compensatory payments but gain from NTFP production. Sustainable ecosystem management implies a decrease in PA values on short term and a fall in public income due to compensatory payments.

4. Conclusion

The results of the study open gates to discussion regarding the design and implementation of Payments for Ecosystem Services (PES) mechanisms as means of operationalizing the concept "internalization of forest externalities". The private sector is the main beneficiary in SEM, being represented by private forest administrators as well as companies dealing with NTFP commerce.

Medium and long term policy implications can be envisaged for both forestry and biodiversity sectors. In depth studies regarding the biodiversity in conjunction with evaluations of the economic implications of the sustainable management of forest ecosystems will be able to develop a strong base for decision making in sectors with apparent opposite interests as forestry and biodiversity conservation, in order to gain mutual benefits.

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