An Assessment of the Contribution of Ecosystems in Protected Areas to Sector Growth and Human Well Being in Romania

Improving the Financial Sustainability of the Carpathian System of Protected Areas (PAs)

Final Report, October 2012

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Contents

Acronyms and abbreviations 4
List of figures 5
List of tables 7
Acknowledgments 8
EXECUTIVE SUMMARY 9
1 Introduction 18
1.1 Study context 18
1.2 Objective of study 19
1.3 Overview of Approach 19
1.4 Limitations and challenges 20
1.5 The Carpathian Network of Protected Areas 20
1.6 Layout of report 22
2 Conceptual Framework and Methodology 23
2.1 Protected Areas and Ecosystem Services 23
2.2 Sector Scenario Analysis 26
2.2.1 Overview 26
2.2.2 Sector Focus 27
2.2.3 Ecosystem management scenarios – BAU and SEM 29
2.2.4 Indicators 31
2.2.5 The Importance of Time 33
2.2.6 Valuing Ecosystem services 34
2.2.7 Overview of methodology 36
3 The CNPAs and the targeted PAs in Romania 38
3.1 Targeted PAs in Romania 38
3.2 Qualitative assessment of ES provided by pilot PAs 38
4 The Contribution of Ecosystems in PAs to sector growth & welfare 41
4.1 The Value of PA ESs to Tourism 42
4.1.1 Introduction 42
4.1.2 Ecotourism management in the Carpathian PAs under BAU 43
4.1.3 Characterization of BAU and SEM scenarios 45
4.1.4 Analysis 47
4.1.5 Contribution of ecosystems of PAs to economic activity and employment 52
4.2 The value of PA ecosystems services to Forestry and Hunting 54
4.2.1 Introduction 54
4.2.2 Characterization of BAU and SEM scenarios (provisioning services) 56
4.2.3 Carbon sequestration 63

4.3 The value of ecosystem services of PAs to Agriculture 66
4.3.1 Introduction 66
4.3.2 Characterization Modeling BAU and SEM scenarios 67
4.4 The Value of ecosystems in the targeted PAs to Water Supply Sector 73
4.4.1 Background 73
4.4.2 Characterization of BAU and SEM scenarios 74
4.5 Natural Disaster mitigation and risk reduction 83
4.5.1 Background 83
4.5.2 Characterization of BAU and SEM scenarios 84
5 The estimated values of ecosystems of PAs at the national level 90
5.1 High level assessment of PA ecosystems at system-level to the economy 90
5.2 The costs of SEM 92
6 Conclusions and Recommendations 94
6.1 Conclusions 94
6.2 Recommendations 96
6.2.1 Tourism 96
6.2.2 Forestry and Hunting 96
6.2.3 Agriculture 97
6.2.4 Water resources 97
6.2.5 Natural Disaster Management 97
6.2.6 General further research needs 97
6.2.7 Policy and finance 98
6.2.8 Institutional aspects 98
Annex 1: Characterization of pilot PAs 104
Annex 2: Logical scheme for soil erosion calculation 111
Annex 3: Romania's Carpathian PAs 112
Annex 4: Summary of values for the 5 Pilot Pas, valuation approaches and beneficiaries 116
Annex 5: Glossary of Terms 119

Acronyms and abbreviations

ANP	Apuseni Natural Park
ANAR	National Agency “Romanian Waters”
ANRM	National Agency for Mineral Resources
BAU	Business as Usual
BEF	Biomass Extension Factor
CNPA	Carpathians Network of Protected Areas
CBA	Cost Benefit Analysis
CS	Consumer Surplus
ESA	Ecosystem Services Approach
ES	Ecosystem Service
FMP	Forest Management Plan
GEF	Global Environment Facility
GDP	Gross Domestic Product
GIS	Geographical Informational System
IUCN	International Nation for Conservation of Nature
IPCC	International Panel on Climate Change
INCDT	National Institute for Tourism Development Research
LAC	Latin America and the Caribbean
LSU	Livestock Unit
MNP	Maramures Mountains Natural Park
MA	Millennium Assessment
MP	Management Plan
NFA	National Forest Administration – Romsilva
NTFP	Non Timber Forest Products
NPV	Net Present Value
NBT	Nature Based Tourism
NEF	National Environmental Fund
PA	Protected Area
PCNP	Piatra Craiului National Park
PAME	Protected Areas Management Effectiveness
PPP	Purchasing Power Parity
PV	Present Value
PES	Payments for Ecosystem Services
ReNP	Retezat National Park
REA	Romanian Ecotourism Association
SFS	Sustainable Financing Strategy
SSA	Sector Scenario Approach
SOP	Sectorial Operational Programme
SNAM	National Society of Mineral Waters S.A.
SEM	Sustainable Ecosystem Management
TEV	Total Economic Value
UNDP	United Nations Development Project
VAT	Value Added Tax
VNNP	Vanatori Neamt Natural Park
WWF	World Fund For Nature
WTP	Willingness to Pay
WTTC	World Travel and Tourism Council

List of figures

Figure 1-1: Distribution of the Romanian Carpathian PAs 21
Figure 2-1: Overview of SSA Approach 26
Figure 2-2: Shifting patterns of BAU /SEM 34
Figure 2-3: Key methodological steps 37
Figure 4-1: Baseline value for the 5 PAs – Tourism (Euros / year) 49
Figure 4-2: Tourism sector values BAU CS included (PV10%=€787.2mill) 49
Figure 4-3: Tourism sector values BAU CS excluded (PV10%=€439.3mill) 50
Figure 4-4: Tourism sector values SEM CS included (PV10%=€1,289.9 mill) 50
Figure 4-5: Tourism sector values SEM CS excluded (PV10%=€802.4mill) 50
Figure 4-6: Tourism value under BAU and SEM over 25 years 51
Figure 4-7: Cumulative value of SEM over BAU 52
Figure 4-8: Baseline value for the 5 PAs – Forestry and Hunting 59
Figure 4-9: Forestry sector values BAU (PV10%=€77.3million) 59
Figure 4-10: Forestry sector values SEM (PV10%=€74.5 million) 60
Figure 4-11: The pilot PA ecosystems' value to Forestry and Hunting under BAU and SEM 61
Figure 4-12: Trends of BAU and SEM scenario for ReNP 61
Figure 4-13: Trends of BAU and SEM scenario for VNNP 61
Figure 4-14: Gains to beneficiary groups – SEM 62
Figure 4-15: Cumulative added value of SEM over BAU 63
Figure 4-16: Results of CO2 modelling: example MNP 64
Figure 4-17: Indirect use values - BAU – carbon sequestration for the 5 pilot PAs (PV@10%=14.4 million EUR) 65
Figure 4-18: Indirect use values - SEM – carbon sequestration for the 5 pilot PAs (PV@10%=20.2 million EUR) 66
Figure 4-19: Baseline value for the ecosystems in the 5 PAs – Agriculture 69
.Figure 4-20: Food production value – BAU (PV@10% discount rate, 25 years=€174 mill) 70
Figure 4-21: Food production value – SEM (PV@10% discount rate over 25 years=€190 mill) 70
Figure 4-22: BAU and SEM scenario values for ANP - best case 71
Figure 4-23: BAU and SEM scenario values for PCNP – worst case 71
Figure 4-24: The pilot PA BAU and SEM values 71
Figure 4-25: Potential beneficiaries of SEM over BAU 72
Figure 4-26: Cumulative value of SEM over BAU 72
Figure 4-27:Links between land management and the value of regulating services 74
Figure 4-28: Example of watersheds identification and mapping - MNP 75
Figure 4-29: Year 2010 PA Maramures, soil erosion areas in BAU (first map) and SEM (second map) scenarios *(Source: Transilvania University 2012*) 77
Figure 4-30: Estimated values of the fresh water ecosystems of 5 PAs –urban water supply – BAU (PV@10% discount rate, 25 years =€20.7mill) 80
Figure 4-31: Estimated values of the fresh water ecosystems 5 PAs – urban water supply – SEM (PV@10% discount rate, 25 years =€21.5mill) 81
Figure 4-32: Estimated values of the FW ecosystems of 5 PAs –urban and bottled water supply – BAU (PV@10% discount rate, 25 years =€176.3mill) 81
Figure 4-33: Estimated values of the Fresh Water ecosystems of 5 PAs – urban and bottled water supply – SEM (PV@10% discount rate, 25 years =€177.2mill) 82
Figure 4-34: Distribution of ecosystems values in MNP - BAU vs. SEM (Public and private) (2011 82
Figure 4-35: Disaster risk map in MNP (source Transilvania University 2011) 85
Figure 4-36: Estimated value of ecosystems in Pilot PAs in terms of flood prevention services 87
Figure 4-37: Potential benefits of the ecosystems in 5 PAs in damage costs reduction – using forest surface approach (Ceroni 2007). 87
Figure 4-38: Costs saved by ecosystem services of Pilot PAs - BAU (PV@10%=10.8 million EUR) 88
Figure 4-39: Costs saved by Ecosystem services of Pilot PAs - SEM (PV@10%=14.5 million EUR) 88

Figure 4-40: Costs saved by ecosystem services of the Pilot PAs (preventive costs included) - BAU (PV@10%=67.1 million EUR) 88
Figure 4-41: Costs saved by Ecosystem services of.Pilot PAs (preventive costs included- SEM (PV@10%=119.3 million EUR) 89
Figure 5-1: FTE Gap Analysis by program area 93

List of tables

Table 0-1 Summary of ecosystems values for the 5 pilot sites 13
Table 2-1: Potential PA ecosystem services and links to productive sectors (Source: Bann & Popa). 25
Table 2-2: Overview of how sectors benefit from ES provided by PAs in Romania and management challenges 28
Table 2-3: Differences in Management Approaches of BAU and SEM 31
Table 2-4: Comparing BAU and SEM - Potential Indicators 33
Table 2-5: Scope of Economic Valuation Methods 35
Table 3-1: Key features of the pilot sites 38
Table 3-2: Qualitative assessment of PA services and benefits at Pilot Sites 39
Table 4-1: Key features of BAU and SEM scenarios for tourism sector in the 5 pilot PAs 46
Table 4-2: Travel and tourism in pilot PA impact in 2010 (mill EUR) 53
Table 4-3:Summary of BAU and SEM scenario for the forestry sector for the pilot PAs 57
Table 4-4: Information on forests in pilot PAs 58
Table 4-5: CO_2 sequestered quantities in 2010 and in a 25 years period in BAU and SEM scenarios 65
Table 4-6: Characterization of BAU and SEM for food production related to PA grazing lands 68
Table 4-7: Carrying capacity of natural pastures within the pilot PAs 68
Table 4-8: Average quantity of eroded soil under the BAU and SEM scenarios 76
Table 4-9: Baseline value for water supply for the 5 pilot PAs (Euros per year) 79
Table 4-10: Risk level as % of forest coverage under BAU and SEM in targeted PAs. 85
Table 4-11: Characterization of BAU and SEM values for floods incidence 86
Table 5-1: Summary of ecosystems values for the 5 pilot sites 91
Table 5-2: Financial gap analysis by program area, per year 92
Table 5-3:. Overview of Cost Categorizes 92
Table 0-1: Romanian CNPAs) 113
Table 0-2: Qualitative Assessment of Romania Carpathian Protected Areas 114

Acknowledgments

The authors would like to thank the following people for their valuable contributions and support throughout the project - Monica Moldovan (UNDP), Doru Irimie (UNDP), Dragos Mihai (NFA – Romsilva), Robert Pache (NFA – Romsilva), Mircea Verghelet (Director of PCNP), Sebastian Catanoiu (Director, VNNP), Ioan Vasile Abrudan (Transilvania University), Ioan Dutca (Transilvania University), Mihai Nita (Transilvania University), Mihai Zota (Consultant), Marlon Flores (Consultant) and Lucy Emerton (Consultant).

EXECUTIVE SUMMARY

Background

The Carpathian Mountains, which extend over an area of 210,000 km^2 in Central and Eastern Europe, are included in the WWF Global 200 Ecoregion list and host Europe's most extensive tracts of montane forest, the largest remaining natural mountain beech and beech/fir forest ecosystems, and the largest area of virgin forest left in Europe. Romania holds 54% of the Carpathian mountain range.

The Carpathian Network of Protected Areas (CNPA) is comprised of 285 protected areas that cover 31,978 km^2. However this network of Protected Areas (PAs) is considered to be insufficient in terms of scale, connectivity and management to prevent the irreversible loss of biodiversity in the Carpathian ecoregion. PAs of the Carpathian mountains face a range of pressures including the overexploitation of forest resources through logging and poaching and habitat degradation and fragmentation caused by the construction of roads, houses and tourism infrastructure that is not properly planned and developed (Project Document, 2009). Futhermore, the Carpathian PAs are underfunded. For example, the 5 Romanian PAs selected for study by this project received around €950,000 in funding in 2010, while €1,600,000 is considered to be necessary to meet basic needs and around €2,550.000 to optimally manage the sites (UNDP 2011).

This study sets out the economic and social aruguments for the Romanian CNPAs. More specifically the study aims to generate evidence of how a sustainably managed CNPAs supports productivity in key sectors such as tourism, forestry and industry, using key indicators such as employment, tax revenue, foreign exchange earnings and equity aspects. The study also seeks to demonstrate the costs associated with unsustainable management. This evidence will be used to convince public and private decision-makers of the importance of PAs to growth and productivity in key sectors of the Romania economy and to the welfare of the population in general. Such evidence will provide part of the rationale for better PA financing. The study also demonstrates the application of the **Sector Scenario Analysis (SSA)** approach to PA ecosystems, as an approach that can be replicated at other sites across the network.

Approach

Following the Sector Scenario Analysis (SSA), the analysis is at the sector level, but it starts with an understanding and quantification of Ecosystem Services. A core part of the SSA approach is the comparison of two scenarios, Business as Usual (BAU) and Sustainable Ecosystem Management (SEM), to illustrate the contribution of ecosystem services under two broad management scenarios to key productive sectors of the economy. The approach aims to go beyond a traditional social cost benefit analysis (CBA) of policy options, by providing information on a range of indicators, in addition to the Net

Present Value (NPV), that are important to decision makers – such as the contribution of an ecosystem service to employment creation and poverty alleviation.

The pilot sites selected for study are Apuseni Natural Park (ANP), Retezat National Park (ReNP), Piatra Craiului National Park (PCNP), Vanatori-Neamt Natural Park (VNP) and Maramures Mountains Natural Park (MNP). The sectors studied are: tourism and recreation; forestry and hunting; agriculture; water resources; and, disaster risk management.

It is important to note that the valuation estimates presented in this report are not comprehensive, and are based on a number of assumptions. The study relies on the limited data that are available for the Romanian system of PAs, and value transfer estimates. The resulting analysis should therefore be seen as an initial (and incomplete) assessment of the economic contribution of pilot PAs. It is to be hoped that when new data become available, or as more detailed studies are undertaken, the figures presented in this report can be supplemented, improved and updated.

Key Findings

The analysis covers an assessment of how ecosystem services provided by the pilot PAs contribute to tourism and recreation benefits, primary wood production associated with the active management of forests, NTFP values and hunting carried out in and around PAs, carbon sequestration, food provision (milk) related to PA pastures, and water provision to the bottled water industry and for urban supply in the case of the water resources sector. The analysis of disaster mitigation is focused on the damage costs avoided as a result of the erosion and water flow regulation services provided by the PAs. The key findings for each sector covered by the study are provided below.

Tourism. The value of tourism and recreational activities for the five pilot PAs is estimated at just over €109.5 million in 2010. Furthermore tourism has a substantial multiplier effect across the economy. Based on a study by the World Travel and Tourism Council in 2011 tourism within the pilot PAs generates €365 million (or 0.3% of the GDP). In addition it creates around 37,100 full-time job equivalents. Importantly, according to the Romanian Ecotourism Association (REA), around 80-90% of eco-tourism expenditure remains in the areas where the tourism program is operating, benefitting many rural areas. A continuation of BAU in the 5 pilot PAs may cost Romania's economy more than €2.6 billion over the next 25 years in lost tourism revenue alone.

There are many untapped tourism and recreational opportunities that could be developed in order to increase revenues from PAs. T**o**urists and recreational visitors in the 5 pilot PAs are estimated to be willing to pay almost €42 million a year more than they are currently being charged. However, increased funding and policy action is required to capture these potential revenue streams. Some sites have more capacity for tourism development than others. For example, ANP and PCNP are clearly 'honey pots' are eco-tourism development should initially focus on these areas.

The main beneficiaries from PA tourism are private tourist operators. Payment for Ecosystem Services (PES) mechanisms may offer opportunities for PAs administrations to derive finding for i) tourism

infrastructure development; ii) management of visitors; iii) biodiversity conservation studies; and, iv) operating costs.

Forestry. The value of forest provisioning services (timber, Non-timber forest products (NTFP) and hunting) for the pilot PAs is estimated at around €9.1 million per year (2010). Under BAU forestry activities may add some €2.8 million over the next 25 years to Romania's economy. However, this revenue will disappear after 30 years as the capacity of PAs to generate economically valuable wood and NTFP is eroded. This is without taking into consideration the considerable losses in other forest ecosystem services such as carbon sequestration, water and soil erosion regulation and landscape provision and tourism. SEM implies a decrease in forest wood, NTFP and hunting values in the short term and a fall in public income due to compensatory payments for areas taken out of production. Nevertheless, in the long run, the value of PAs under the SEM scenario will recover, and is projected to generate a higher Net Present Value (NPV) beyond a 25 year horizon. In addition other ecosystem services generated and/or maintained by sustainable forestry (e.g. carbon sequestration, water and soil erosion regulation, landscape) are ensured.

Currently the full potential of NTFP is not being captured. The SEM scenario assumes a significant increase in NTFP production with Retezat and VNNP PAs showing particular potential in this respect. Carbon sequestration functions of the forest under SEM could generate an additional €33 million (cumulative value over 25 years). However, it will not be possible for Romania to access the voluntary carbon markets, and thereby capture the value of sequestered carbon in protected areas, until central authorities adopt a clear legal framework and institutional arrangements permitting this (e.g. to monitor and guarantee the sequestered quantities).

Agriculture. The value of the provisioning service food for the ecosystems of the 5 pilot PAs is estimated at around €20.0 million in 2010. For the ecosystems where the carrying capacity is exceeded SEM implies a fall in the value of food provided by pastures in the short and long term. However, the annual values after 10-15 years are significantly higher than the BAU values. In addition BAU also sometimes results in irreversible damage to ecosystems. A continuation of BAU in terms of pasture management in the 5 PAs could cost Romania's economy some €84 million over the next 25 years. The success of SEM however requires motivating local communities to maintain traditional breeding practices.

Water resources. The ecosystems of the pilot PAs provide a number of key regulating services including soil loss prevention and the regulation of water flow and quality. Water quality and quantity is very important to the many brands of mineral water sourced from the Carpathian mountains. The estimated total cumulative value to the economy of SEM relative to BAU of clean water provision, based on water treatment cost avoided, is estimated at 35.4 million (over 25 years). The NPV of SEM is €0.9 million. Private water bottling companies are the main beneficiary and are identified as potential partners in Payment for Ecosystem Services (PES) schemes.

Around 70% of the watershed areas in the PAs are forested and soil erosion is currently well regulated, as a result there is not a significant monetary difference between the BAU and SEM scenario. However, it

is important to note that the benefits provided by the ecosystem services could be lost through increases pressures on the sites.

Natural disasters. Romania has a long history of natural disasters (floods and landslides). The *potential* economic loss associated with these events is estimated at 6% of the GDP accounting for approximately $2,300 million a year, with an annual probability of occurrence of 0.5 % (World Bank 2008). The quality and quantity of ecosystems significantly impacts the frequency and severity of natural disasters and the growing emphasis on PAs could play a central role in risk reduction under sustainable forest ecosystem management. If the upstream protection functions of the ecosystems of 3 pilot PAs serve to minimize the impact of floods by just 25% below what it would have been in the absence of the protective functions, then the ecosystems' value of flood control in terms of avoided **damage costs** (projected on a *pro rata* basis) equates to an average of €0.4 million a year – 9 million a year based on a damage cost avoided and preventative expenditure approach respectively. When applying the damage cost avoided and preventative expenditure values as upper and lower value limits for the ecosystems of the 5 pilot PAs over the next 25 years, the water retention regulating services within the PAs in terms of mitigating natural disasters (flood control), is valued at between € 27 million and €182 million (under BAU) and €44 million and €482 million under SEM.

The results are summarized in the Table below. The NPV of SEM (based on the PV of SEM minus the PV of BAU) for the 5 sites is estimated at €518 million. The cumulative benefit of SEM for all five PAs is €2,794 million (i.e. the total benefit of SEM relative to BAU over 25 years). This can be viewed as the benefit of SEM or the cost to the economy of continuing with BAU.

High level assessment of PA ecosystems at system-level to the economy

There are 21 major protected areas (12 national parks and 10 nature parks) included in the Romanian CNPA. Based on the analysis of the ecosystems of the 5 pilot protected areas it is possible to derive very high level estimates of the value of SEM for the Romanian CNPA system as a whole. Scaling up the values for the 5 pilot areas to the whole network, based on the number of hectares and assuming that the 5 pilot sites are representative of the whole area, provides SEM with a NPV of €1,685 million (and cumulative value of around €9,000 million over BAU). These should be viewed as very high level, initial indicative values.

Table 0-1 Summary of ecosystems values for the 5 pilot sites

ES Type	Service	BAU Value (PV @10%, 2011-2035, mill EUR)	SEM value (PV@10%, 2011-2035, mill EUR)	NPV (PV SEM – PV BAU) @10%, 2011-2035, mill EUR	Total cumulative benefit under SEM (25 years, mill EUR)
Provisioning Services	Food / agriculture products	174.00	190.00	16	83.90
	Wood & NTFPs	77.30	74.50	-2.8	-2.80
	Water supply (reduced treatment costs associated with regulating services of soil erosion and water flow regulation)	176.3	177.2	0.9	35.4
	Source of energy (fuel etc)	0.00	0.00	.-	0.00
Regulating	Regulation of GHGs	14.40	20.20	5.80	33.30
	Micro-climate stabilization	0.00	0.00	-	0.00
	Soil erosion and water regulation (storage and retention) related to disaster mitigation	10.80	14.40	3.60	17.50
	Nutrient retention	0.00	0.00	-	0.00
Cultural Services	Spiritual, religious, cultural heritage	0.00	0.00	-	0.00
	Educational	0.00	0.00	-	0.00
	Recreation and ecotourism	787.20	1,282.90	494.8	2,626.80
	Landscape and amenity	0.00	0.00	-	0.00
	Biodiversity non-use	0.00	0.00	-	0.00
	TOTAL	**1,440.7**	**2,000.6**	**556.4**	**2,794**

Conclusions

This study demonstrates that Romania's PAs are an important and productive asset providing a significant flow of economically valuable goods and services. The results show that there are significant benefits associated with moving from the BAU management of the areas to SEM. The NPV of SEM (based on the PV of SEM minus the PV of BAU) for the 5 sites is estimated at €518 million. The additional cumulative value of ecosystems under SEM in the five PAs is estimated at around €2,800 million (over 25 years). However, it is important to recognize that many ecosystem services are being provided/operating at close to the SEM level (e.g. the watershed protection function of the parks which contributes to soil

stabilisation and water flow regulation and purification and grazing lands in some parks). Therefore, the significant benefits already provided (under the BAU scenario) are at risk if the parks at not sustainably managed. Note therefore needs to be taken of the values that could be lost as a result of damage or loss of the ecosystem service. In such cases the significant values under BAU need to be protected and enhanced where possible.

The results can be taken as an underestimate of the value of the ecosystems in the five pilot sites given that a number of ecosystem services are not accounted for. These include fisheries, hydropower, micro-climate stabilisation, nutrient retention, spiritual, religious and cultural heritage, education, landscape and amenity and biodiversity non-use.

Inevitably movement towards SEM will incur **costs** – for example SEM for the tourism sector requires investment in visitor centres, infrastructure and staff to monitoring and manage tourism flows, while SEM for the forestry and agriculture sector will require compensation payments for restriction imposed on existing activities. By and large these costs are not included in the analysis and the benefits of SEM may therefore be overestimated. However based on a high level comparison of the cost of optimally managing the PAs, the benefits are shown to outweigh the costs many times.

There are a number of uncertainties surrounding the estimates that could be reduced through further studies. There is uncertainty is related to the valuation approaches used (e.g. benefit transfer has been used in a number of instances and site specific studies are required for more reliability) and the physical data (e.g. there are limited surveys of visitor numbers, WTP, CS and tourist profiles). However, of note is the fact that this study has been able to contribute to the availability of scientific data through the site specific modelling that has been undertake to determine soil erosion and associated changes in water flow and quality.

The analysis highlights the difficulties in estimating the regulating services and specifying how regulating services interact to provide ultimate benefits. For example soil erosion underpins the water quantity and quality estimates used to estimate water treatment costs. The analysis also highlights the interdependencies between sectors. For example, ecotourism depends on SEM within agriculture, forest and the water resources sector.

The key sector benefiting from PAs is shown to be the **tourism sector** which if sustainably managed has the potential to generate an additional €2,626 million over the next 25 years (94% of the total additional value of SEM). It is important to note that this value depends on the continued provision of healthy PAs ecosystems that contribute to the tourism experience and for which tourists are prepared to pay. While costs were not included in the BAU-SEM analysis for tourism, based on analysis by NFA-Romsilva (and assuming costs are constant over 25 years) cumulative cost over 25 years for tourism is estimated at 2.8 million, indicating that that SEM can more than cover its administration and management costs. This finding should help the Romania CNPAs in its current preparation of a PA entry passes and fees policy.

The significant consumer surplus estimated for tourism and recreational experiences within PAs in Romania suggests that mechanisms, such as **entrance fees**, would be successful. Entrance fees can

also be used to control demand and minimize impacts on the site. Currently entrance fees are very low or non-existent, so there is therefore the scope to introduce and increase entrance fees, particularly at sites where the tourism potential is high. However, realizing the full tourism potential (benefits) is dependent on the prior investment in tourism and recreational facilities.

SEM is seen to enhance employment, especially in the tourism sector, and has the ability to promote equitable growth through providing opportunities in rural communities surrounding PAs. The distribution of the benefits and values among potential beneficiaries is also important, particularly in terms of ensuring an equitable distribution of benefits and costs and in designing potential PES. There are four main groups economically impacted by PAs: PAs authorities, other government agencies, the private sector, and households. They cover most sectors and population groups in the country and include beneficiaries at local, regional and national levels.

Recommendations

Recommendations have been identified for the sectors studied to facilitate the design of sector specific policies to sustainably manage important ecosystems services. Separate recommendations for additional future research, and relating to policy and institutional strengthening have also been identified.

Tourism

- Studies to determine appropriate entrance fees at the sites, and how entrance fees should be introduced and managed.
- Improved data collection on visitor numbers. Data should be collected by NIS or by statistical surveys conducted by professionals on behalf of PA administrations.
- Further studies to determine the potential for introducing tourism related PES mechanisms.

Forestry and Hunting

- Develop NTFPs management and harvesting as part of a sustainable management strategy for the forest areas within the protected areas. This will require undertaking more detailed studies of their capacity and market potential
- To realize SEM more areas need to be taken under protection and adequate compensation for any lost production due to forest land use restrictions needs to be provided.
- In terms of PES, opportunities to set up payments from private companies benefiting from NTFP production should be explored.

Agriculture

- Encouraged breeding where the carrying capacity of pastures has not yet been reached. This is likely to require incentives for farmers. Further consultation with farmers and studies are required to design an effective incentive mechanism.
- Compensate households where breeding / grazing needs to be reduced.

Water resources

- Explore potential PES schemes. For example, for Bottle water companies to pay a percent of their revenues to the NEF, which would be used to finance projects submitted by PAs focused on the sustainable management of mineral water springs.
- Further study of the bottle water industry is required to generate data on the efficiency of the bottling companies (costs for processing and bottling); costs associated with the temporary stoppage in the delivery of an ES (for example, during heavy rains spring may have too many nitrates due to infiltration from pastures and need to be closed); and value added along the production chain.

Natural Disaster Management

- Further studies are required to generate data on the cost of damage to public infrastructure, household damage costs and the frequency of natural disaster events.

General further research needs

- Development of PA ecosystem-based PA management plans.
- More detailed study of the links between BAU and SEM to employment, tax revenues and other key indicators in addition to NPV. In most cases the data was not available to report on these indicators within this study.
- Detailed analysis of the costs of SEM
- Site specific studies to refine ecosystem valuation estimates. This study has relied largely on value transfer estimates, there are also very few primary economic valuation studies available in Romania. To refine the estimates sites specific studies of the sites could be undertaken, especially for their tourism values which is a key driver for the 5 pilot sites studies.
- Refinement of aggregate / system wide assessment.
- Establishment of a permanent review group to support research and findings composed of politicians and academics is recommended.

Policy and Finance

Based on the conclusion and arguments of SEM it is clear that sectors need to introduce policies to protect PA ecosystems services. Cross sector co-operation is also vital given that a number of sectors both benefit from and have the ability to degrade ecosystems through their activities. The results of this study can be used to inform the development of sector policies that ensure the sustainable management of PA ecosystems and to design sustainable financing mechanisms.

The development of PES and other sustainable financing opportunities is ongoing as part of the broader UNDP-GEF study. The mechanisms being explored related to tourism, water management and ecosystem compensation.

Institutional aspects

Several institutional reforms are recommended to support the transition to SEM and an ecosystems based management approach. These include:

- Increased capacity for NEF administration to deal with biodiversity conservation applications and project monitoring;
- Establishment of an Association of PA administrations to support administration of funds;
- Increased capacity at the NEPA (National Environment Protection Agency) to formally verify and approve the MP of the PA;
- Enhanced Co-ordination between the Ministry of Environment and Forests and the Rural Development Programme Management Authority to determine a compensation payments system for forests;
- Development of a carbon registry mechanism at the Ministry of Environment and Forests to initiate movement towards carbon trading;

1 Introduction

1.1 Study context

This study is a component of the United Nations Development Programme – Global Environment Facility (UNDP-GEF) project "Improving the Financial Sustainability of the Carpathian System of Protected Areas (PAs).' The overall objective of the UNDP-GEF project is to secure the financial sustainability of Romania's Carpathian network of PAs, as a model for replication across the entire Carpathian Network of Protected Areas (CNPA). This is to be achieved through the development of a supportive legislative framework and sustainable PA financing strategy and the building of institutional and individual capacities of management authorities and other local stakeholders. The project consist of two main components as summarized below.

Component 1 of the project - Supportive legislative framework and Sustainable PA Financing Strategy, consists of the following outputs - (i) development of a set of by-laws and adoption of amendments to existing laws; (ii) development of a Sustainable Financing Strategy (SFS) for 22 large PAs in the Romanian portion of the Carpathians; (iii) acheivement of the Government's commitment to gradually increase funding (e.g. 20% yearly increases from 2007 level) for the targeted PAs; (iv) development of model business plans to demonstrate specific market-based revenue mechanisms for 5 clusters of PAs in the Romanian Carpathians; (v) Validation of a set of PA diversified income-generation mechanisms (market and non-market options) in at least 3 PAs; and, (vi) Documentation and transfer of lessons and knowledge to key actors representing PAs from other Carpathian countries.

Component 2 of the project - Institutional and individual capacities of management authorities and other local stakeholders to realize sustainable financing of PAs developed includes the following outputs**:** (i) Training of a critical number of PA finance professionals; (ii) establishment of a Carpathian National Association of Protected Area managers: (iii) Improved information management linking PA management plans (programs and activities) with financial management/accounting system; and, (iv) A strengthen public PA management committee with a mandate to monitor revenue and expenditure of PAs.

Based on the results of Outputs I and II of component I the project will develop a **communications strategy** aimed at decision-makers, private sector executives and civil society. This study will inform the communications strategy by setting out the economic and social aruguments for the Romanian CNPAs. More specifically the study aims to generate evidence of how a sustainably managed CNPAs supports productivity in key sectors such as tourism, forestry and industry, using key indicators such as employment, job creation, tax revenue, foreign exchange earnings and equity aspects. The study also seeks to demonstrate the costs associated with unsustainable management. This evidence will be used to convince public / private decision-makers of the importance of PAs to growth and productivity in key sectors of the Romania economy and to the welfare of the population in general. Such evidence will provide part of the rationale for better PA financing.

1.2 Objective of study

At present there is little policy-relevant information on the economic value of PAs in Romania, and PAs are accorded a low budgetary and economic policy priority. Public and corporate decision makers, facing increasing pressure on funding, tend to allocate less financial resources to PAs relative to other sectors, which are perceived to be more productive in development terms. Over the past 10 years the Carpathian PAs in Romania has been underfunded; the 5 pilot PAs selected for study by this project received around €950,000 in funding in 2010, while €1,600,000 is considered to be necessary to meet basic needs and around €2,550.000 to optimally manage the sites (UNDP 2011) Therefore, PAs managers face a challenge in communicating the linkages between PA biodiversity conservation and the wider welfare benefits to communities and the economy in general.

This study seeks to address this challenge by demonstrating that PAs are an important and productive asset providing a significant flow of economically valuable goods and services. Economic studies drawing out the significance of these services in monetary terms and their contribution to local, regional and national economies can be a powerful way of demonstrating the significance of PAs to decision makers.

The key objectives of this study are to:

- Demonstrate the importance of ecosystem services provided in and around protected areas to the Romanian economy
- Demonstrate the application of the Sector Scenario Analysis (SSA) approach to PA ecosystems, as an approach that can be replicated to other sites across the network.

1.3 Overview of Approach

This study was undertaken over 12 months. Key parties involved in the study were the National Forest Administration (NFA) – Romsilva, as the project implementing agency, UNDP as coordinator, PAs administrations as collaborators, different agencies and organizations in each study sector as data providers and scenarios analysis participants and national and international consultants. The Transilvania University in Brasov assisted in data collection and compilation for all components of this study.

This study has attempted to apply the Sector Scenario Approach (SSA) to 5 pilot PAs in Romania's Carpathian Mountains. The pilot sites are Apuseni Natural Park (ANP), Retezat National Park (ReNP), Piatra Craiului National Park (PCNP), Vanatori-Neamt Natural Park (VNP) and Maramures Mountains Natural Park (MNP). Evidence has been gathered to demonstrate how ecosystem services provided in and around these PAs support productivity and growth in key sectors of the economy under two scenarios - Business as Usual (BAU) and Sustainable Ecosystem Management (SEM). The sectors studied are: tourism and recreation; forestry and hunting; agriculture; water resources; and, disaster risk management.

1.4 Limitations and challenges

The valuation estimates presented in this report are not comprehensive, and are based on a number of assumptions. The study also relies on the limited data that are available for the Romanian system of PAs, and value transfer estimates. There are many limitations to the value transfer approach which are mainly to do with the credibility of applying data about a particular site or ecosystem to another context which might have very different biological, ecological and socio-economic characteristics. Where transfer values have been used, a conservative approach has been taken.

The resulting analysis should therefore be seen as an initial (and incomplete) assessment of the economic contribution of pilot PAs. It is to be hoped that when new data become available, or as more detailed studies are undertaken, the figures presented in this report can be supplemented, improved and updated.

1.5 The Carpathian Network of Protected Areas

The Carpathian Mountains extend over an area of 210,000 km^2 in Central and Eastern Europe covering seven countries: The Czech Republic, Hungary, Poland, Romania, Serbia, Slovakia and Ukraine. The Mountains are included in the WWF "Global 200" Ecoregion list and host Europe's most extensive tracts of montane forest, the largest remaining natural mountain beech and beech/fir forest ecosystems, and the largest area of virgin forest left in Europe. In addition to forests, which cover about 90,000 $km^{2,1}$, the area hosts semi-natural habitats such as montane pastures and hay meadows, which are the result of centuries of traditional management of the land. One-third (3,988 plant species) of all European vascular plant taxa are found in this region, 481 of which are endemic. The Carpathians form a 'bridge' between Europe's northern forests and those in the south and west and thereby provide a vital corridor for the dispersal of plants and animals throughout Europe. It is also the last region in Europe to support viable populations of large carnivores supporting an estimated 8,000 brown bears, 4,000 wolves, and 3,000 lynx (Project Document, 2009).

Romania holds 54% of the Carpathian mountain range of medium elevation (1,136m on average) with just a few peaks exceeding 2,500 meters in altitude.

Under the Carpathian Convention established at The Conference of Kiev in May 2003[2] all seven range states have taken measures to protect this ecoregion. The Carpathian Network of Protected Areas (CNPA) is comprised of 285 protected areas that cover 31,978 km^2. However this network of PAs is

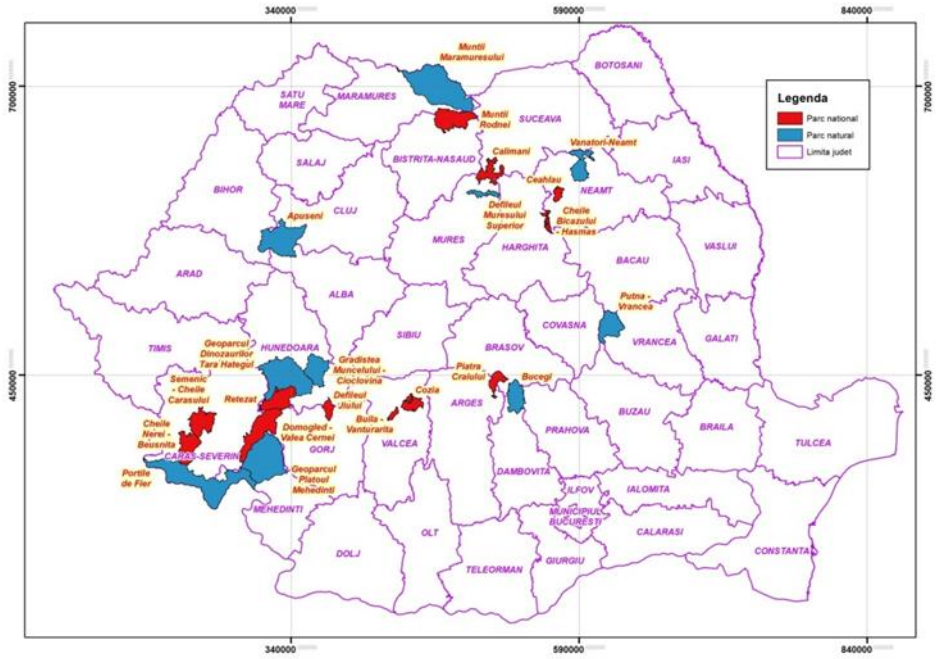
[1] Romanian Carpathian forest: 55,000 km^2, Slovakia Carpathian forests: 17,500 km^2; Ukrainian Carpathians: 15,000 km^2, Poland Carpathian forests: 4,800 km^2.

[2] The Carpathain Convention states that: "The parties shall cooperate in developing an ecological network in the Carpathians, as a continuant part of the Pan-European Ecological Network, in establishing and supporting a Carpathian Network of Protected Areas, as well as enhancing conservation and sustainable management in the areas outside of protected areas".

considered to be insufficient in terms of scale, connectivity and management to prevent the irreversible loss of biodiversity in the Carpathian ecoregion. Only 17% of the ecoregion is protected, which is very low when compared with the Alpine Bioregion of Europe that has 35% coverage by the network of Natura 2000 sites. In general, the northwest of the Carpathians is more effectively covered and managed than the southeast portion (Project Document, 2009). **Figure 1-1** illustrates the distribution of Romania's Carpathian PAs.

PAs of the Carpathian mountains face a range of pressures including the overexploitation of forest resources through logging and poaching which have intensified as a result of land restitution and privatization; and, habitat degradation and fragmentation caused by the construction of roads, houses and tourism infrastructure that is not properly planned and developed (Project Document, 2009).

Figure 1-1: Distribution of the Romanian Carpathian PAs



The long term goal for the CNPA is to establish a scientifically-based and representative regional network of well-managed protected areas that are sustainably financed, provide social and economic benefits, and ensure the participation of local communities. To achieve this goal, the range states need to improve the biogeographical representation of protected areas, strengthen management of the sites and secure a sustainable stream of financing for the PAs. Current finance streams are inadeqaute. For example, **i**n Romaina the CNPAs currently receive no funding from the national budget and their current annual income is estimated at US$5 million - half of what is required to implement basic conservation (pay salaries, utilities, fuel and basic equipment). The UNDP Financial Sustainability Scorecard assessment estimated that the US$9 million per year is required to achieve a basic level of conservation and US$15 Million a year for an optimal level of conservation (i.e. full implementation of all PA management plans).

1.6 Layout of report

The rest of this report is organized as follows:

Chapter 2 presents the conceptual framework for the SSA and details how the SSA framework has been applied in this study.

Chapter 3 provides a summary of the 5 pilot PAs and a qualitative overview of the ecosystem services that they provide. A more detailed overview of the pilot PAs is provided in Annex 1.

Chapter 4 is the main analytic section of the report. Chapter 4 presents the findings on the contribution of ecosystems in the pilot PAs to sector growth and welfare for five key sectors - tourism, forestry (including hunting), agriculture, water resources and disaster management.

Chapter 5 provides a high level estimate of the economic contribution of the Carpathian Arc Ecosystem as a whole, based on the findings for the 5 pilot PAs, and discusses the requirements for completing a more robust estimate of the economic importance of the network as a whole. It also provides high level estimates of the cost of optimally managing the five pilot sites.

Chapter 6 concludes and presents recommendations.

2 Conceptual Framework and Methodology

This Chapter sets out the conceptual framework that underpins the methodology adopted in this study, and an overview of how this conceptual framework was applied.

2.1 Protected Areas and Ecosystem Services

The conceptual framework is grounded in the Ecosystem Services Approach (ESA). An ecosystem (e.g. forest, wetland, marine area) is a natural unit of living things (animals, plants and micro-organisms) and their physical environment, e.g. forest, river. Ecosystems services (ES) relate to a flow of resources or service from the natural environment that directly or indirectly benefit people**.** The Millennium Ecosystem Assessment (MA 2005) presents a framework to assist in the identification of ES, classifying them into the following four categories:

- ***Provisioning services*** relate to the tangible products, such as timber, non timber forest products (NTFPs), fish and pharmaceuticals products provided by ecosystems;
- ***Regulating services*** refer to an ecosystems natural processes such as carbon sequestration and water regulation that contribute to social wellbeing;
- ***Cultural services*** relate to the non-material benefits obtained from ecosystems, for example, through tourism and educational use; and,
- ***Supporting services*** are necessary for the production of all other ecosystem services (e.g. soil formation or nutrient cycling). They differ from the other services in that their impacts on people are either indirect (via provisioning, regulating or cultural services) or occur over a very long time.

The Ecosystem Services Approach (ESA) explicitly recognizes that ecosystems (e.g. forests, wetlands) and the biological diversity contained within them contribute to individual and social wellbeing. Importantly it recognizes that this contribution extends beyond the provision of goods such as timber and fish to the natural regulating functions such as carbon sequestration. The ESA therefore provides a framework for considering whole ecosystems in decision making and for valuing the services they provide.

It is important to note that economic valuation is focussed on the ‘final benefits’ or ‘outcomes’ realised by society from the services an ecosystems provide, not the services and functions that contribute to those outcomes. This is to avoid double counting. The benefits generated by supporting services, while fundamental to the provision of final benefits, are not valued independently as they are intermediate benefits which contribute to the provision of a range of final benefits. Their value is captured in the valuation of the final outcomes associated with the services they support. Supporting services include soil formation and retention, primary production and habitat provision.

Health is also not explicitly listed as an ecosystem service as health benefits are considered to be provided by a range of services such as fish, flood protection benefits and a clean environment for recreation. The health cost associated with a decline in these services may be used to measure the benefits provided by an ecosystem. **Biodiversity** is also considered to be cross cutting, the final benefits of which could be associated with a range of services. An exception is biodiversity non-use which is listed as a separate service.

The Millennium Ecosystem Assessment (MA, 2005) emphasizes that **Protected Areas** (PAs) provide critical ES that support human prosperity and survival, like clean water, flood and storm mitigation, fish stock replenishment, and carbon sequestration. Conceptually, healthy and bio-diverse ecosystems generate greater amounts, higher quality, and more stable flows of ES over time. It is therefore critical that countries establish PA systems to protect viable populations of diverse species and representative ecosystem samples. The system level approach aims to broaden PAs from a set of scattered sites that protect few species to a system that provides viable support to biodiversity and ecosystems at the national or regional level (Flores in Bovarnick *et al*, 2010), thus further enhancing the provision of vital ES. A system level approach is being promoted in the Carpathian Mountains.

Table 2-1 provides a typology of ecosystems services that may be associated with a PA. The Table indicates the likely provision of these services against IUCN's PA management categories. **Table 2-1** also notes which sectors of the economy may benefit from the provision of PA ecosystem services.

Table 2-1: Potential PA ecosystem services and links to productive sectors (Source: Bann & Popa).

ES Type	Service	Benefit / outcome	IUCN PA Management Categories[3]						Sectors supported by ecosystem service
			I	II	III	IV	V	VI	
Provisioning Services	Food	Wild meats, fruits, freshwater fish and seafood harvested for commercial and subsistence purposes.	•	•		•	•	•	Households Fishery, Tourism, Agriculture
	Wood	Timber, fuel wood and fibre		•					Households, Industry
	Water	Public water supply, water for industrial and agricultural usage	•	•		•	•	•	Agriculture, Industry, Tourism
	Natural medicines	Natural medicines	•	•		•	•	•	Household
	Biochemicals	Biochemicals and genetics	•	•		•	•	•	Agriculture
	Ornamental resources	Ornamental resources	•	•		•	•	•	Industry
	Source of energy (fuel etc)	Energy provision e.g., hydropower	•	•		•	•	•	Energy
Regulating Services	Regulation of GHGs	Carbon sequestration	•	•	•	•	•	•	Potentially all
	Micro-climate stabilization	Air quality	•	•	•	•	•	•	Potentially all
	Water regulation (storage and retention)	Flood and storm protection	•	•	•	•	•	•	Tourism, Industry, Households, agriculture
	Waste processing	Detoxification of water and sediment / waste	•	•	•	•	•	•	Tourism, Industry, Households, agriculture
	Nutrient retention	Improved water quality	•	•	•	•	•	•	Fisheries, Agriculture
Cultural Services	Spiritual, religious, cultural heritage	Use of environment in books, film, painting, folklore, national symbols, architecture, advertising	•	•	•	•	•	•	Tourism, Households
	Educational	A 'natural field laboratory' for understanding biological processes		•	•	•	•	•	Households
	Recreation and ecotourism	Bird watching, hiking, canoeing,	•	•	•	•	•	•	Tourism
	Landscape and amenity	Property price premiums due to views		•	•	•	•	•	Tourism, Households
	Biodiversity non-use	Enhanced wellbeing associated for example with bequest or altruistic motivations	•	•	•	•	•	•	Potentially all

[3] Ia Strict Nature Reserve; Ib Wilderness Area; II National Park; III Natural Monument or Feature; IV Habitat/Species Management Area; V Protected Landscape/ Seascape; VI Protected area with sustainable use of natural resources.

2.2 Sector Scenario Analysis

2.2.1 Overview

The Sector Scenario Analysis (SSA) was applied in a major study by UNDP in the Latin American and the Caribbean (LAC) in 2010 (Bovarnick *et al* 2010). A guidebook for its broader application is currently under development. The analysis is at the sector level, but it starts with an understanding and quantification of ES. A core part of the SSA approach is the comparison of two scenarios, Business as Usual (BAU) and Sustainable Ecosystem Management (SEM), to illustrate the contribution of ecosystem services under two broad management scenarios to key productive sectors of the economy. The approach aims to go beyond a traditional social cost benefit analysis (CBA) of policy options, by providing information on a range of indicators, in addition to the Net Present Value (NPV), that are important to decision makers – such as the contribution of an ecosystem service to employment creation and poverty alleviation.

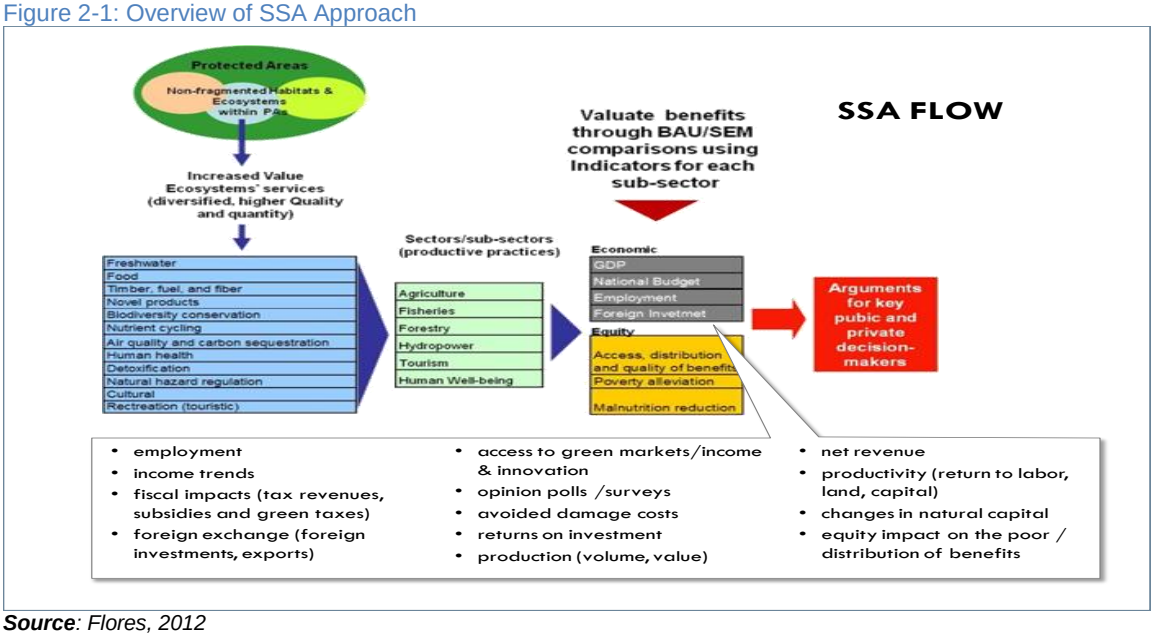
The analysis lends itself to the generation of politician-friendly data. An ecosystem-centric approach cuts across sectors and ministerial mandates, whereas a sectoral approach aligns with the organization of Ministries. It can therefore be used to facilitate the incorporation of ES values and their management into economic planning, policy and investment at the sectoral level.

Key questions that the approach seeks to answer include:

- To what extent do key sectors depend economically on the natural inputs of PAs?
- What opportunities do these sectors have to benefit from maintaining ES?

An overview of the approach is provided in **Figure 2-1**. Key features of the approach are discussed in more detail below.

Figure 2-1: Overview of SSA Approach



***Source**: Flores, 2012*

2.2.2 Sector Focus

The approach considers the ES provided by PAs as inputs into a country's economic sectors and presents data on the economic value of ES to each sector.

Ecosystems within Romania's PAs provide ecosystem services (ES) such as water provision and regulation, soil fertility, pollination, pest control, growth and reproduction of food species, storm mitigation, climate regulation and waste assimilation, which directly and indirectly provide inputs into the production of key sectors in Romania's economy. Key sectors benefiting from the ES provided by PAs include - agriculture, fisheries, forestry, nature-based tourism, human settlements and hydropower. The contribution of ES to sector productivity and growth can be degraded and lost under BAU scenarios and enhanced under SEM.

The logic to drawing out the contribution of ES under different management regimes to key sectors is that it can provide a comprehensive and tailored argument to present to sector Ministries. This can facilitate the integration of ecosystem management and protection into key sector plans and strategies, and aid negotiations with other Ministries were the management of an ES by one sector clearly impacts its provision to another (for example, the tourism sector may be adversely impacted by unsustainable agricultural or forestry practices).**Table 2-2** highlights how ES can contribute to different sectors.

Table 2-2: Overview of how sectors benefit from ES provided by PAs in Romania and management challenges

Sector	Key ES	Management challenges / Issues
Agriculture	A sustainable, high-quality water supply depends on well-maintained ecosystems that are often preserved within PAs. Water is critical for irrigation and other uses. More than 80% of Romania's water supply (excluding the Danube) and 40% of Ukraine's water supply comes from the Carpathians (Project Document, 2009). Therefore water provision services are important. Forest PAs provide natural habitats for genetically-important crop wild relatives, and many species that pollinate crops and control pests.	These services are frequently under-valued and provided for free encouraging overuse. Further research is needed to assess the links between reduced water quality, lower flows, and PA ecosystem management. PAs can be of use in developing solutions to degradation in freshwater ecosystems.
Forestry	The Carpathians host Europe's most extensive tracts of montane forest, the largest remaining natural mountain beech and beech/fir forest ecosystems, and the largest area of virgin forest left in Europe. The Carpathian forests cover about 90,000 $km^{2.}$ Carpathian PAs therefore provide an important carbon storage service. Payments for carbon storage in Carpathian PAs could mean a significant revenue (i.e., foreign exchange transfers and funding to pay for the transition to SEM). The argument for that is valid if PAs are under direct threat of deforestation.	Under BAU, direct threats to (Romania's) Carpathian forests include illegal logging and infrastructure development. Furthermore, current Income from taxes, timber, and forest products is low sending incorrect signals to the market and negatively impacting government expenditure for forest management. Taxes and fees on timber and other forest products need to be set at appropriate levels, so that the Government has a vested interest in sound forest management, sustainable commercial logging, and prevention of illegal activity, to ensure future revenue flows. This is relevant to PAs that allow sustainable use of forest resources.
Nature Tourism	PAs contribute to nature-based tourism (NBT) / ecotourism. This depends on the natural attractions provided by PAs, such as the habitats with wild plants and animals, exotic foods, fresh water and air, viewscapes, and cultural services essential to NBT. Tourists find NBT experiences, trekking, wild life viewing (including bird-watching), hunting, whitewater rafting, kayaking, and canoeing, more valuable when they take place in healthy ecosystems, such as those found in PAs (Flores, in Bovarnick *et al* 2010).	Under BAU PA-based NBT is undermined by insufficient investment in the conditions required to manage NBT and the supporting PA well resulting in negative external costs. It is assumed that if PAs shift to SEM practices, NBT will generate greater economic value.
Human Settlements	Human settlements benefit from PAs through the provision of a variety of critical services such as the provision of fresh water, regulation of natural hazards, and natural mitigation of climate change. Forest and wetland PAs provide cheap, clean drinking water to countless rural and urban populations, including a third of the world's most populated cities (Dudley *et al*. 2010). Well-managed natural forests almost always provide higher quality water, with less sediment and fewer pollutants than water from other catchments (Aylward, 2000). Research has shown that about a third (33 out of 105) of the world's largest cities obtain a significant portion of their drinking water directly from PAs (Dudley *et al*. 2010).	Watershed conservation can greatly improve water quality and quantity, reducing water treatment costs.
Hydropower	PA can provide water for hydropower production	Poor PA management results in sedimentation of waterways and reduced water for hydropower. Under SEM sedimentation is reduced supporting hydropower production and also benefiting irrigated agriculture and potable water supplies.

2.2.3 Ecosystem management scenarios – BAU and SEM

The approach aims to provide evidence of the economic benefits, both direct and indirect, of PA ecosystems. The analysis looks at these benefits in terms of the potential decline in productivity due to ecosystem degradation that would result from no action or change (BAU) and compares it to productivity and under SEM. The Business as Usual (BAU) and Sustainable Ecosystem Management (SEM) are generic scenarios used as the basis for assessing the economic values of ecosystem services (ES).

These two management scenarios are described below, based on Flores in Bovarnick *et al*, 2010.

2.2.3.1 Business as Usual

Under BAU PAs are underfunded, lack management capacity and face severe threats. They are unlikely to provide basic protection to biodiversity and ecosystems functions. This is the case in Romania where the funding gap to provide a basic level of conservation is estimated at US$5 million a year and US$9 million a year to provide an optimal level of conservation.

Under BAU, planning and management functions are typically supported by limited human, financial, institutional, and informational resources (Lockwood *et al.* 2006). Too often, PA conservation goals and objectives are poorly linked to conservation programs and costs, and existing budgets are not linked to programmatic priorities. Altogether, this makes it difficult to measure effectiveness, estimate realistic needs, and determine financial gaps. Further, at national levels in the BAU scenario, domestic funding for PAs is often stagnant as a result of constrained national budgets, obsolete legal and regulatory frameworks, lack of transparency, poor accountability, as well as a lack of political will to support "greening" of national development plans. Protected area budgets may simply be based on previous-year expenses, while transfers to PA system agencies are often late and less than what was actually approved; and due to limited implementation capacity, protected area agencies often fail to execute their allocated resources.

BAU is characterized by a focus on short-term gains (e.g. < 10 years), externalization of impacts and their costs, and little or no recognition of the economic value of ES.

2.2.3.2 Sustainable Ecosystem management (SEM)

Under SEM, funding and capacity are available to meet basic to optimal protection needs. SEM is understood as an advanced management approach in which protected area management functions are more aligned with human, financial, institutional, and informational resources. In SEM, protected area's conservation goals and objectives are linked to ecosystems conservation programs and are realistically linked to funding. As a result, ecosystem health improves and their benefits, in terms of increased productivity and equity, expand. By and large, the benefits of SEM outweigh its costs.

Under a SEM scenario, the focus is on long-term gains (10-20 years), while the costs of impacts are internalized. Degradation of ES is avoided, thereby generating potential for a long-term flow of ecosystem

goods and services. SEM practices tend to support ecosystem sustainability, not for ideological reasons, but, rather, as a practical, cost-effective way to realize long-run profits.

SEM complements the commonly used 'protected area management effectiveness' (PAME) approach. PAME is used to assess how well a PA is managed, that is the extent to which it is protecting values, and achieving goals and objectives (Hockings *et al*. 2006). SEM brings an additional dimension of ecosystems management, namely a better understanding of the economic costs of ES loss in PAs. A key feature of SEM is adequate funding, and the SSA approach aims to build economic arguments to promote increased funding to protect biodiversity and ecosystems in PAs.

The Costs of SEM. The provision of PA benefits, however, is not free; there are significant costs associated with PA management, both in terms of direct expenditures, and in terms of indirect costs or impacts, and opportunity costs (alternative uses foregone). Governments must either set aside funding for PAs every year or establish self-financing mechanisms. The tendency of direct expense to grow with improved PA coverage or quality provides an easy argument for those that choose to favour BAU with its short-term gains, which can be quite attractive, even if resource-depleting.

In many cases, PA management programs include both characteristics of BAU and SEM. The shift from BAU **Table 2-3** summarises the key differences between the two management approaches.

Table 2-3: Differences in Management Approaches of BAU and SEM

BAU (business as usual)	SEM (sustainable ecosystems management)
• PA management plans are not based on threats assessment and abatement needs. • PA tourism infrastructure does not meet the demands of tourism visitation. • PA's investment in tourism infrastructure is below basic needs. • Critical ecosystems that support tourism are under threat. • Unregulated tourism visitation. • Tourism industry is not supporting PA tourism infrastructure development and PA tourism programs. • Industrial waste discharges from food processing industry and tourism development causes eutrophication. • No water treatment facilities. • Carbon objectives are not incorporated into forest management and timber production-based models.	• PA management plans address specific threats assessment and abatement needs. • PA tourism infrastructure meets demand of tourism. • PA's investment in tourism infrastructure meets needs. • Tourism government agencies support PA tourism and ecosystem protection programs. • Tourism industry supports PA tourism infrastructure and ecosystem protection programs. • Critical programs to conserve ecosystems are fully funded, and threats are minimal. • Pollution fees are high. • Water treatment facilities installed and fees charges. • Environmental externalities are included in water tariffs and tourism's service charges • Carbon sequestration objectives are incorporated into forest management planning models.

Source: Flores in Bovarnick *et al* 2010.

2.2.4 Indicators[4]

The SSA approach aims to present data on a set of economic indicators in order to compare the costs and benefits of BAU and SEM. Possible indicators include the Net Present Value (NPV), income, employment, production output, food security, tax revenues, and the impacts on low income and marginalized populations. The approach therefore seeks to provide evidence across a range of indicators in addition to the NPV of the BAU /SEM Cost Benefit Analysis (although this remains a core indicator).

There is growing evidence that the economic benefits of well-managed PAs include - increased production (GDP) in selected sectors, more jobs in rural areas (mainly by providing small-scale business opportunities to local populations and employment in service sector jobs (though mostly low-skilled), higher tax revenues, and higher foreign exchange earnings, especially though international tourism. Additional sectors can benefit as a result of economic multiplier effects. For example, tourists visiting PAs spend money on, in addition to entry fees and Nature Based Tourism (NBT) experiences, travel and local transport, accommodation, food, merchandise, and souvenirs inside and outside of the PA. As for other sector, tourism creates a chain of economic activity that affects not only those delivering services directly to tourists, but also their suppliers, and the suppliers to the suppliers in other sectors. This long chain multiplies the initial amount spent by tourists. NBT is particularly beneficial to small business including those in the informal service sector.

Perhaps the most important economic impact of PAs to local and national governments comes in the form of **fees and taxes,** including income taxes from people working in the NBT sector, property tax,

[4] This section is based on Flores in Bovarnick *et al*, 2010.

VAT, export tax, entry fees, and royalties from concessions. In the US, for example, the travel and tourism industry generates about US$105 billion in tax revenues annually. These revenues can be severely undermined by BAU practices: poor investment in tourism in PAs and the conditions of absent or non-functional tax collection systems. Tourism is the main **foreign exchange earner** for many developing countries.

PAs can also have an important influence on equity and poverty alleviation, benefiting communities within or near to PAs and society at large. Engagement of nearby communities and other stakeholders is a key feature of SEM. This will help ensure that externalities are taken into account and that all affected parties are integrated into the planning and implementation process resulting in sustainable and equitable outcomes conducive to poverty alleviation. Assessing the effects of PAs on poverty is however complex, requiring consideration of a range of factors related to rural populations such as income, livelihood security, access to infrastructure and markets, education, empowerment, gender, health, and access to natural resources.

Indicators that can be used to compare SEM and BAU across key sectors are summarized in **Table 2-4**.

Table 2-4: Comparing BAU and SEM - Potential Indicators

Indicators	Productive sectors						Well-being			Comparison	
	Forestry	Agriculture	Fisheries	Hydropower	Industry	Tourism	Natural disaster mitigation	Water supply coverage	Rural livelihoods	BAU	SEM
Net Present Value	●	●	●	●	●	●		●	●	?	?
Employment (direct, indirect, induced)	●	●	●	●	●	●				?	?
Income trends	●	●	●	●	●	●			●	?	?
Fiscal impacts (tax revenues, subsidies and green taxes)	●	●	●	●	●	●				?	?
Foreign exchange (foreign investments, exports)	●	●	●	●	●	●				?	?
Access to green markets / income and innovation potential)	●	●	●	●	●	●			●	?	?
Avoided damage costs							●			?	?
Returns on investment	●	●	●	●	●	●	●	●	●	?	?
Production (volume, value)	●	●	●	●	●	●	●	●	●	?	?
Changes in natural capital	●	●	●	●	●	●				?	?
Equity impacts on the poor / distribution of benefits								●	●	?	?
Opinion polls/surveys	●	●	●	●	●	●	●	●	●	?	?

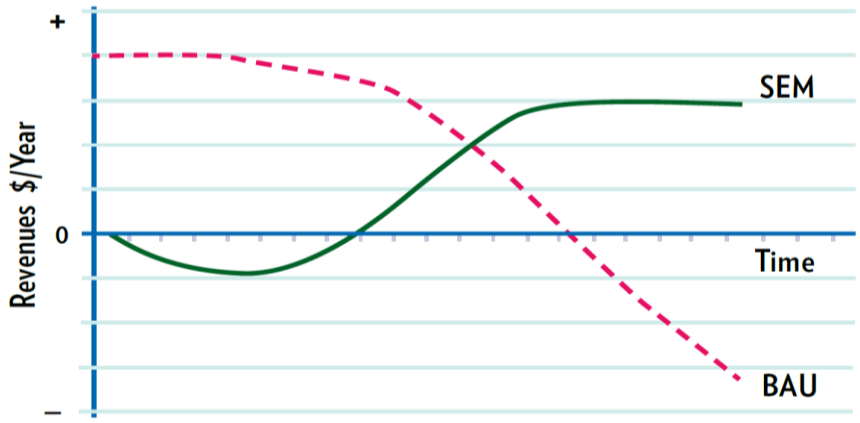
Source: Flores, 2012

2.2.5 The Importance of Time

The methodology recognizes that for policy makers, static (time bound) point data is of limited value. In a situation when choices need to be made between different types of land-use and development practices, the current total value of an ecosystem reveals nothing about how that value might change over time, the current quality of the resources and if current management practices are sustainable or not. The current value of a resource may be high but be based on unsustainable rates of resource depletion and in the extreme may result in ecosystem collapse. It is therefore important to evaluate how ecosystem services might be reduced through damaging management practices or enhanced through sustainable management over a suitable time horizon.

Figure 2-2 illustrates one possible scenario. In this case, BAU profits exceed those of SEM in the short run, but ecosystem degradation gradually decreases them. SEM net revenues are negative in the first years, as sunk investment costs take a toll. In such situations Government policies can either target the up-front costs (e.g. technical assistance) or promote a longer planning horizon (e.g. cheap access to credit) (Bovarnick *et al*, 2010). Therefore to make well-informed decisions, decision makers need a cost benefit analysis that includes a sensible time dimension that tracks resource depletion over time under different management practices.

Figure 2-2: Shifting patterns of BAU /SEM



Source: Bovarnick et al, 2010

2.2.6 Valuing Ecosystem services

In undertaking a social cost benefit analysis of the BAU SEM management scenarios a range of valuation approaches may be adopted to estimate the market and non-marketed ecosystem services provided. These approaches are well documented in the environmental economics literature. This section provides an overview of available valuation approaches along with references to other sources where more detail on key valuation approaches may be found. The main categories of valuation approaches are as follows:

- ***Market price approaches***: Consider *use values* associated with ecosystem goods and services that are bought and sold in actual markets.
- ***Productivity approaches***: Focus on the relationship between an ecosystem service (e.g. the provision of clean water) and the production of a market good (e.g. agricultural crops). The *use value* of ecosystem service is inferred by changes in production that result from changes in the ecosystem as an input to production (e.g. quantity or quality).
- ***Revealed preference methods***: Estimate the *use value* of ecosystem non-market goods and services by observing behaviour related to market goods and services that can be linked to the ecosystem service in some way. For example the travel cost method may be used to value tourism in PAs where there are no entrance fees through the cost (both money and time) incurred in undertaking the tourism activities.
- ***Stated preference methods***: These survey based approaches create hypothetical markets to determine the value of non-market goods and services. Individuals are typically asked what they would be willing to pay or accept for a specified change in the provision of an ecosystem service. Stated preference techniques are the only approaches that can estimate all the various components of Total Economic Value (TEV) - direct and indirect use value and non-use value.

Broadly speaking market price and productivity approaches are ordinarily applied to value *market goods and services*, while revealed preference and stated preference approaches are applied to value *non-market goods and services*. However, there can be overlaps between methods and often

combinations of methods are required for informed decision-making for specific management issues. **Table 2-5** summarises the scope of the different valuation methods[5].

Table 2-5: Scope of Economic Valuation Methods

Valuation Method	Component of TEV	Scope – types of goods and services
Market pricing methods	Use value (direct and indirect)	*Market goods and services and market substitutes (for non-market goods and services)* Direct use value: limited to commodities (e.g. fish, timber) or the contribution of ecosystem services such as water provision to marketed products (e.g. agriculture, forestry, fisheries, manufacturing, power generation) Indirect use value: estimating avoided damage (e.g. from flooding) or marketed substitutes (e.g. cost of water treatment) or tangible impacts (e.g. cost of illness)
Production input methods (e.g. production function approach)	Use value (direct and indirect)	*Market goods and services* Use value: Limited to the role of ES as an input to production processes (e.g. the effect of water quality on agriculture).
Revealed preference methods		
Hedonic pricing (e.g. hedonic property pricing)	Use value (direct and indirect)	*Non-market goods and services* Use value: The contribution of ES to environmental amenity that can be observed from markets (e.g. property market).
Travel cost method	Use value (direct and indirect)	*Non-market goods and services* Use value: The contribution of ES to recreation and tourism activities that is revealed by the travel costs incurred by users.
Multi-site recreation demand models	Use value (direct and indirect)	*Non-market goods and services* Use value: The contribution of ecosystems to recreation activities that is revealed by the choice decisions (i.e. whether to visit a specific site or not) and travel costs incurred by recreation users.
Stated preference methods		
Contingent valuation	TEV (use and non-use value)	*Non-market goods and services* TEV: The contribution of ecosystems to most non-market goods and services can be captured by contingent valuation.
Choice modeling (e.g. choice experiment)	TEV (use and non-use value)	*Non-market goods and services* TEV: The contribution of ecosystems to most non-market goods and services can be captured by choice modeling approaches.
Benefits transfer		
Unit value transfer / function transfer	*TEV (use and non-use value), depending on evidence used*	*All of the above depending on the type of study from which evidence is sourced.*

***Source**: Adapted from Worley Parsons Canada Ltd and eftec (2009)*

[5] For more information on the **hedonic pricing approach** see Taylor, L. 2003. 'The hedonic method', in Champ, P., Boyle, K., and Brown, T (eds) (2003) A primer in Non-market valuation. Dordrecht: Klwuer; Maler K-G (1974) Environmental Economics, John Hopkins University Press for Resources for the Future, Baltimore. For more information on the **TCM** see: Bockstael, N.E and McConnell, K.E. (2006) Environmental and Resource Valuation with Revealed Preferences: A Theoretical Guide to Empirical Models, Springer; Ward, F.A. and Beal, D.J. (2000) Valuing nature with travel costs models: a manual, Edward Elgar Publishing; Kanninen, B. (2006) Valuing Environmental Amenities Using Stated Choice Studies: A Common Sense Approach to Theory and Practice, Springer. For more information on **stated preference methods** see: Arrow, K.R. Solow, P.R. Portney, E.E. Leamer, R. Radner, and H. Schuman 'Report of the NOAA Panel on Contingent Valuation'. Federal Register 58 (1993): 4601-14. Bateman, I., Carson, R.T. Day, B. Hanemann, M. Hanley, N. Hett, T. Jones-Lee, M.Loomes, G. Mourato, S. Ozdemiroglu, E. Pearce, D.W. Sudgen, R. and Swanson, J. (2002). Economic Valuation with Stated Preference Techniques: A Manual, Edward Elgar, Cheltenham, UK.

2.2.7 Overview of methodology

The conceptual framework presented in Sections 2.1 and 2.2 serves as a guide for the application of the SSA approach. However, in reality, the research effort has to be tailored to match priority areas of research and available resources. This section details the approach used in this study. An overview of the methodological steps is provided in **Figure 2-3**.

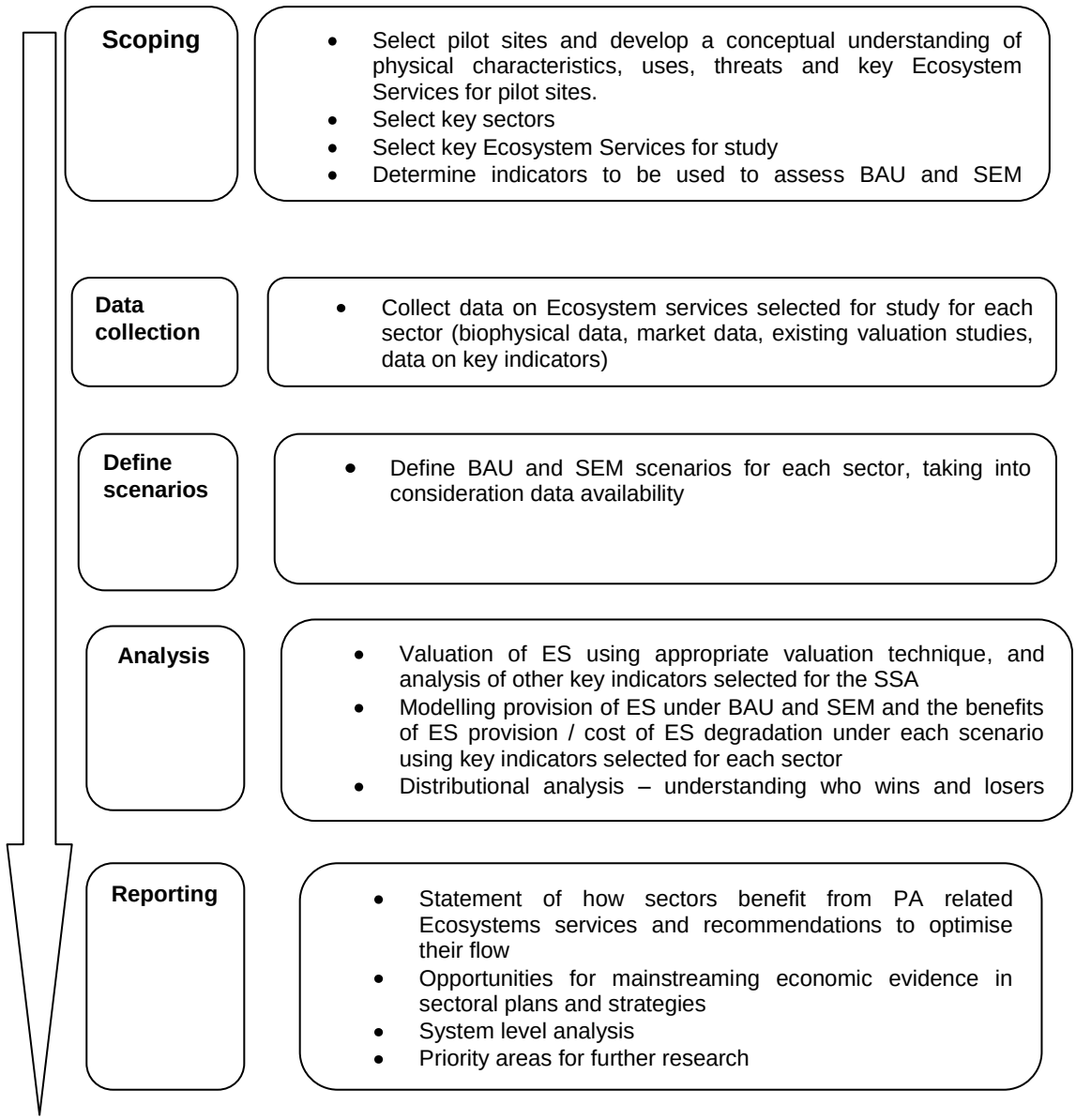
This valuation study is focuses on 5 pilot PAs: Apuseni Natural Park (ANP), Retezat National Park (RNP), Piatra Craiului National Park (PCNP), Vanatori-Neamt Natural Park (VNP) and Maramures Mountains Natural Park (MNP). The study involved analysis of key ecosystem service values for each of the 5 pilot PAs and looked at the economic linkages between PA ecosystem services, production practices and outputs in the following productive - agriculture, tourism, forestry, water supply and disaster prevention/mitigation. At the same time, the study looks at how economic costs and benefits are distributed: within and between sectors and socioeconomic groups identifying winners and losers from alternative PA/ecosystem management approaches and scenarios.

Two scenarios are analyzed – BAU and SEM. The Business As Usual Scenario illustrates what would happen if current practices and activities continue at their current level of (chronic) under-financing. Under this scenario on-going ecosystem degradation and loss is anticipated. The SEM scenario reflects an effective, well-managed and adequately-funded PAs management. The study examines the state of ecosystems under each scenario, the goods and services provided, and the impact on local and national economic output and wellbeing where possible.

The study extrapolates the few data that are available for Romanian system of PAs, and of necessity employs value transfers. The primary source of data is valuation studies that have been carried out in Central, South and Eastern European countries with similar economic, institutional and ecological conditions to Romania. All values have been adjusted to bring them to 2012 Romania price levels, applying a consumer price index (CPI) deflator to account for domestic inflation, and using appropriate Gross Domestic Product Purchasing Power Parity (GDP PPP) conversion rates to equalise differences between Romania and other countries.

The aim of the SSA of the pilot PAs is to provide local decision makers with arguments for investing in PAs conservation, and to generate information that could be directly incorporated into pilot PAs business plans. Key messages for Romania's CNPA have also been drawn from these representative sites.

Figure 2-3: Key methodological steps



3 The CNPAs and the targeted PAs in Romania

3.1 Targeted PAs in Romania

The main features of the five Carpathian pilot PAs are summarized in **Table 3-1**. More detail on each PA is provided in Annex 1.

Table 3-1: Key features of the pilot sites

PA	Area (ha)	Location	Key characteristics
Apuseni Natural Park (ANP)	148,850	Western Romania, Central-North Western side of Apuseni Mountains, covering parts of Cluj, Bihor and Alba Counties	Biodiversity, karst landscape, local tradition in wood processing, cultural heritage
Maramures Mountains Natural Park (MNP)	148,850	North Romania, covering almost all the area of Maramures Mountains, northern – eastern part of Maramures County	Biodiversity, mountain landscape, local tradition in architecture and natural products, cultural and historic heritage
Piatra Craiului National Park (PCNP)	14,773	Meridional Carpathians, Central Romania, stretching over the counties of Brasov and Arges,	Longest lime edge in the country, local traditions and architecture, biodiversity
Retezat National Park (ReNP)	38,138	Western part of Romania, part of the Retezat – Godeanu masiff, stretching over the counties of Hunedoara, Caras – Severin and Gorj.	Glaciar lakes, mountain landscape, biodiversity, local traditions
Vanatori Neamt Natural Park (VNNP)	30,818	North-western part of Romania, eastern slope of the Oriental Carpathians (Neamt Mountains) and under mountains hills of Neamt, stretching over the county of Neamt	Vegetation low mountains landscape, local ethnic and spiritual traditions, historic and cultural heritage of the communities, biodiversity, *Bison bonasus* repopulation

Source: Management plans for the 5 PAs.

3.2 Qualitative assessment of ES provided by pilot PAs

Natural and National Parks in Romania's Carpathians provide a wide range of ES, which support the productivity of many sectors and benefit individuals. The differences between parks in terms of the ecosystem services they provide are not significant, but it is possible to identify ES of particular importance for each PA. The variation between parks in terms of ecosystem services provision is a result of the differences in their natural features, protection and conservation goals, maturity based on when the park and park administration were established, and, management efforts and processes in place. A qualitative assessment of the ES provided by the pilot PAs can be seen in **Table 3-2**. It is evident from **Table 3-2** that the majority of ES are provided across the sites, with micro-climate stabilization, water regulation and recreation and tourism considered to be important at all sites. **Table 3-12** also identifies the sectors that benefit from the provision of a given ES and in turn the sectors that may impact the provision of ES through their activities. For example, industry, households and the tourism sector benefit from water provision, however the quality and quantity of water will be impacted by, for example, agricultural practices (such as the use of agrochemicals) and forestry (extraction practices).

Table 3-2: Qualitative assessment of PA services and benefits at Pilot Sites

ES Type	Service	Benefit / outcome	Significance					Sectors supported by ecosystem service	Sectors impacting / influencing the provision of ecosystem service
			ANP	MNP	PCNP	ReNP	VNNP		
Provisioning Services	Food	Commercial and subsistence crops; breeding products	**	*	**	**	**	Households Fishery, Tourism, Agriculture	Households, Fishery, Agriculture, Industry
	Wood	Timber, traditional wood products, commercial processed wood products	**	**	**	*	**	Households, Forestry, Wood processing industry	Forest administration, households, wood processing industry, Forestry
	Water	Public water supply, mineral waters for commercial use, water for industrial and agricultural usage	**	**	*	*	*	Industry, households, tourism	Agriculture, Industry, Forestry
	NTFPs	Natural medicines, forest fruits, forest fruits based products	**	**	*	*	**	Forest administrators, households, industry	Forest administration, Households, Industry, Forestry
	Source of energy (fuel etc)	Energy provision e.g., hydropower	**	–	–	**	–	Energy	Forestry, Breeding
Regulating Services	Regulation of GHGs	Carbon sequestration	*	**	*	*	*	Potentially all	Potentially all
	Micro-climate stabilization	Air quality	**	**	**	**	**	Potentially all	Industry, Forestry
	Water regulation (storage and retention)	Flood and landslide prevention	**	**	**	**	**	Tourism, Industry, Households/ Urban Settlement, agriculture	Forestry, Agriculture, Breeding
	Soil erosion regulation	Improved water quality ,	*	**	*	*	–	Households, Urban settls, hydropower	Forestry, Agriculture, Breeding
	Nutrient retention	Improved water quality	*	*	*	*	*	Fisheries, Agriculture, water supply	Forestry, Agriculture, Breeding
Cultural Services	Spiritual, religious, cultural heritage	Local traditions, Churches and monasteries, Archaeological ruins (historical not recreational value). Use of environment in books, painting, folklore, national symbols, architecture, advertising	**	**	**	*	**	Tourism, Households	Potentially all

	Educational	A 'natural field laboratory' for understanding biological processes	?	?	*	*	*	Households	Potentially all
	Recreation and ecotourism	Recreational fishing and hunting, birdwatching, hiking, Holiday destination (aesthetic views), archaeological ruins (historical not recreational value)	**	**	**	**	**	Tourism	Potentially all
	Landscape and amenity	Property price premiums due to views	?	?	*	*	_	Tourism	Potentially all
	Biodiversity non-use	Enhanced wellbeing associated for example with bequest or altruistic motivations	?	?	*	*	*	Potentially all	Potentially all

***Code**: ** service important, * service provided, - service not relevant,? uncertain of provision*

Source: Based on interviews with the Administrative Directors of the PAs and the PA Management Plans.

4 The Contribution of Ecosystems in PAs to sector growth & welfare

This Chapter examines the economic contribution of the 5 pilot PAs to the tourism, forestry and agricultural and water resources sector, and to disaster mitigation in Romania. It covers an assessment of tourism and recreation benefits in the case of the tourism sector, primary wood production associated with the active management of forests, the value of NTFP and hunting carried out in and around PAs and carbon sequestration values in the case of the forest sector, food provision (milk) related to PA pastures in the case of the agriculture sector and water provision to the bottled water industry and for urban supply in the case of the water resources sector. The analysis of disaster mitigation is focused on the damage costs avoided as a result of the erosion and water flow regulation services provided by the PAs.

For each sector the following format has been followed: (i) a box summarizing the key findings for each sector; (ii) an introduction to the sector specifying the ecosystem services of interest; (iii) an overview of the current situation in Romania; (iv) a description of the two scenarios modeled (BAU and SEM); and, (v) the valuation methodology, analysis and results.

In many cases the valuation is based on the direct production benefits to key sectors (tourism, agriculture, forestry and water resources) associated with the active use and management of ecosystems in and around PAs. However, these sectors also benefit indirectly through a range of regulating services[6].

[6] For tourism, it is assumed that the benefits associated with regulating services are captured through the valuation estimates, as services such as clean water and air are considered to be part of the eco-tourism experience

4.1 The Value of PA ESs to Tourism

Box 4-1: The key findings for the tourism sector

- **Tourism within PAs is of considerable economic value.** The value of tourism and recreational activities for the five pilot PAs is estimated at just over €109.5 million in 2010

- **Tourism has a substantial multiplier effect across the economy**. Based on a study by the World Travel and Tourism Council in 2011 tourism within the pilot PAs generates €365 million (or 0.3% of the GDP), including gross visitor spending of more than €280 million, capital investment in excess of €194 million. In addition it creates around 37,100 full-time job equivalents. Importantly, according to the Romanian Ecotourism Association (REA), around 80-90% of eco-tourism expenditure remains in the areas where the tourism program is operating, benefitting many rural areas.
- **Continuing to accord PAs a low policy and funding priority will incur long term economic losses.** A continuation of BAU in the 5 pilot PAs may cost Romania's economy more than €2.6 billion over the next 25 years in lost tourism revenue alone;
- **There are many untapped tourism and recreational opportunities that could be developed in order to increase revenues from PAs. To**urists and recreational visitors in the 5 pilot PAs are estimated to be willing to pay almost €42 million a year more than they are currently being charged in entry fees, tours, etc. However, increased funding and policy action is required to capture these potential revenue streams.
- Some sites have more capacity for tourism development than others. For example, ANP and PCNP are clearly 'honey pots' are eco-tourism development should initially focus on these areas.

4.1.1 Introduction

This chapter is focused on eco-tourism or Nature Based Tourism (NBT), rather than sustainable tourism. Ecotourism refers to a sub-section of the tourism sector, while the principles of sustainable tourism apply to all types of tourism activities, operations, establishments and projects[7].

A definition of ecotourism taken from Romanian legislation closely aligns with international definitions (Quebec declaration, UNEP/WTO, 2003), "*a tourism kind in which the main objective is observing and acknowledging the value of nature and local traditions, that should fulfill the following conditions: i) to contribute at nature protection and conservation, ii) to utilize local human resources, iii) have an*

[7] The concept of sustainable tourism was defined by the IUCN, WWF and PNABE in the early 90s. It is "*envisaged as leading to management of all resources in such a way that economic, social and aesthetic needs can be fulfilled while maintaining cultural integrity, essential ecological processes, biological diversity and life support systems*" (INCDT 2009). It is generally accepted by academicians, international organizations and tourism operators that caring for the environment is an ethical duty and that *sustainable* tourism makes sound economic sense (IUCN 2010).

educational character, respect for nature – tourists and local communities awareness, iv) to have an insignificant negative impact over the natural and socio-cultural environment".

In Romania communities have historically cohabited with nature such that human presence and natural landscape are closely linked. As a consequence ecotourism and rural tourism are strongly connected, making it hard to separate the two.

Ecotourism is supported by the protection and development of protected areas, which maintains the quality and quantity of the many ecosystem services that underpin ecotourism activities. Romania in general and the Carpathian PAs in particular have a remarkable natural potential providing ***unspoiled natural landscapes, clean water and air, and biologically diverse habitats, fauna and flora.*** In addition to this natural capital, the Romanian Carpathian PAs benefit from a rich ***ethnographic potential with remarkable authenticity and originality***. This cultural and spiritual heritage is represented by traditional architectural values, manufacturing techniques and facilities, customs and ancestral traditions (such as traditional community specific celebrations and holidays). Furthermore, historic monuments, archeological sites, museums and old orthodox vestiges increase the eco-tourism potential. All these natural and cultural features contribute to the range of important ecosystem services provided by PAs (section 2.1).

Global ecotourism is increasing by 20-34% annually; a trend that is also evident in Romania. According to the Romanian Ecotourism Association (REA), the economic impact of ecotourism programs within the REA has increased significantly from 0.95 million € in 2004 to 1.6 million € in 2008. Tourists visiting Romania are increasingly appreciating places where natural resources are protected, but this is not yet the central interest to the majority of tourists. Ecotourism is a small segment of the tourist market and is confronted with many problems including: weak cooperation at the local level, minimal and inappropriate promotion at the national and international level, a limited and undiversified eco-tourism offering, weak infrastructure and the lack of a specialized work force.

4.1.2 Ecotourism management in the Carpathian PAs under BAU

Accommodation facilities exist within, or in the immediate vicinity of, almost all the Carpathian areas - a fact favorable to the development of eco-tourism in the area (INCDT 2009) [8]. Based on the data provided by INCDT and NFA – Romsilva the following facilities are available at the pilot site: ANP - 150 facilities within the park and more than 600 in the vicinity of the park borders; MNP - 40 facilities within the park and more than 30 outside of the park; PCNP - 10 facilities within the park and more than 50 outside; ReNP - 5 facilities in the park and more than 10 outside; and, VNNP - 2 facilities in the Park and more than 50 outside (excluding accommodation facilities provided by monasteries) (INCDTa 2009).

There is evidence that spending on hotels in areas with attractive natural landscapes tend to be greater than in other places. Work carried out in Croatia by the Institute of Tourism has for example found that there is a premium of as much as 24-32% attached to the price that visitors are willing to pay for hotels located in forest areas, and that landscape is a decisive factor in visitors' choice of hotels (Pagiola, 1996).

[8] There are some exceptions e.g. Natural Park Gradistea Muncelului – Cioclovina,

Unfortunately a number of constraints related to eco-tourism infrastructure and PA management can also be noted:

a) **Camping sites and refuges**[9]. Only a few parks have these facilities and they are generally not in good condition or properly managed; in many cases they are privately managed by entities who do not cooperate with park administrations;
b) **Hunting cabins.** There are more than 200 hunting cabins, managed by NFA-Romsilva, in Romania. Around 120 of these are located in the Carpathians, but only 5 or so are located in the parks. They are currently under-utilized, but could be important for tourism if promoted and managed.
c) **Visitor centers**. Only 4 Carpathian parks have visitor centers - Retezat, Lunca Muresului, Piatra Craiului and Vanatori Neamt. Not all of these visitor centers are operational. They face maintenance difficulties and offer limited attractions;
d) **Access infrastructure**. Some of the PAs administrations have developed tourist access routes, but in general they are in bad condition and insufficient;
e) **Special tours** organized by PAs administrations are lacking and suffer from poor promotion and a lack of diversification;
f) **Promotion of ecotourism is poor.** Promotion materials are lacking on the internet, through tour operators and through the main communication channels (newspapers, television and radio). Even where tourist profiles exist, direct marketing of services are not undertaken.
g) **Public relations** in many parks are not properly managed leading to conflicts with community members over the lack of compensation measures and inappropriate restrictions.
h) B**iodiversity, a potential attraction for tourists from an educational point of view, is not very well studied**. Maps of habitats and species, pointing out special biodiversity features and restrictions are being designed and published but this process has just started and is seriously underfunded. There are very few wildlife viewing sites / observational facilities within the parks. Proper biodiversity mapping is also urgently required to understand the carrying capacity of the PAs and manage the flow of visitors in a way that does not damage the valuable ecosystems.
i) Even where PAs have **developed management plans (MP**), with tourism development measures included, they are not fully enforced due to the complicated and bureaucratic legal framework and the lack of a centralized vision and strategy[10].

Under these conditions, the development of the ecotourism is restricted, making it impossible to fully realize the social and economic benefits that a well-managed ecotourism sector can provide. These benefits include: i) local jobs; ii) stimulation of the local economy due to infrastructure and services development; iii) stimulation of the rural economy through encouraging the development of local traditional products; iv) improvement of intercultural relationships; and, v) the design and implementation of self-financing mechanisms as instruments for protection and conservation.

It is important to note that poorly managed eco-tourism activities can lead to costs related to natural resource degradation. Management based on short term economic gains and overexploitation of

[9] Refuges are common in mountain areas and offer basic overnight accommodation for hikers
[10] All the parks have submitted MPs to the Ministry of Environment and Forests, or at least a simplified plan of actions and conservation measures. Unfortunately, only 4 have been officially approved by the Government due to the limited capacity available to assess the MPs or other central government agencies being against some of the measures, which causes delays.

natural and cultural resources puts pressure on sensitive areas and can trigger many problems such as: noise, pollution, over use and development of landscape resources, replacement of local traditions with methods that are temporarily perceived as efficient. All of these aspects place ecosystem services at risk and compromise the sustainable tourism potential of an area.

4.1.3 Characterization of BAU and SEM scenarios

For the purpose of this study, BAU and SEM scenarios were developed building on the current (baseline) situation described in section 4.1.2.

Business As Usual is defined as a continuation of PAs underfunding and a disconnection between the increasing interest in eco-tourism and the quality of the ecotourism experience being offered at sites. In spite of the PAs remarkable natural and cultural resources, the lack of biodiversity studies makes it impossible to known and manage sensitive areas and describe new features and species; damage to biodiversity through tourism may therefore occur and/or tourists may lose interest on account of the lack of biodiversity information. The absence of facilities for visitors also restricts the proper management and accounting of tourist flows. Poor access, visitor facilities, tour guides and management and low diversification will discourage / shorten the duration of visits and willingness to pay. Poor marketing further works against tourists choosing Romania's PAs as an eco-tourism destination.

In the BAU scenario, the absence of clear compensation measures for land owners may also be an incentive for them to continue using some natural resources (e.g. wood or hay) in an unsustainable way. This may lead to ecosystem degradation, which will negatively affect tourism demand. This situation is likely to be made worse by the absence of properly enforced MPs and PA regulations. Poor water management will impact water quality, and industry may affect the air quality, while uncontrolled infrastructure development may result in a loss of traditional architectural styles typically favored by tourists[11]. As a consequence of BAU, ecotourism does not develop and visitor numbers and willingness to pay decline.

Sustainable Ecosystem Management reflects a situation in which the increasing interest for ecotourism in PAs is matched with measures that encourage and optimize its potential. With proper funding, PA administrators are able to develop and enforce MPs. The MPs provide for the ongoing evaluation of biodiversity, development and diversification of access and visitor facilities, implementation of special conservation measures, use of compensatory payments, proper control of industrial development and natural resources use, pro-nature education and development of the tourism strategy and management. Under these conditions it is reasonable to count on an increase in tourist numbers, longer visiting periods and increased expenditures and WTP.

Enforcement of MPs, with proper compensation payments, creates the bases for strong relationships with community members, who will benefit from the increased eco-tourism both economically and socially. SEM also means better promotion of the PAs.

[11] In Maramures, accommodation facilities based on the local architectural styles are more profitable and attract tourists compatible with an eco-tourist profile**.**

Better enforcement of building regulations will increase the attractiveness of areas, and, in time demonstrate that newly adopted architectural styles are likely to lead to reduced earnings relative to the conservation of tradition style accommodation and traditions, which will attract tourists. Overtime tourism related damages will decline, based on a strong collaboration between tour operators, communities and PAs administration in terms of tourism management. The key features of the BAU and SEM scenarios adopted for the 5 pilot PAs are summarized In **Table 4-1**.

Table 4-1: Key features of BAU and SEM scenarios for tourism sector in the 5 pilot PAs

Site	Indicators	BAU	SEM
General	Description	No active management of tourism; no visitor facilities and poor access facilities; continuing illegal logging and improper use of pastures leading to the landscape degradation; ongoing transition from traditional local architecture to modern style buildings.	Active tourism management; development of access and visitor facilities; sustainable natural resource usage; increased emphasis on local traditions; introduction of entrance fees when the expectations of tourists and the tourism offer are balanced.
	Total visitor arrivals	Increase 4.8% per year till 2026 (MRDT 2007),stagnant after that	
	Total overnight stays	Increase 6.8% per year till 2026 (MRDT 2007), 2.5% per year after that	
	Average expenditures per visitor per visit (food & hotel)	No change over short-term, but decrease over longer term as PAs stagnate / decline	No change over short-term, but increase over longer term as PAs improve
	% PA tourists spending on food & hotels	No change over short-term, but decrease over longer term as PAs stagnate / decline	No change over short-term, but increase over longer term as PAs improve
	Total PA tourist consumer surplus per visitor	No change until 2016, after which decreases	No change till 2016 then increases by 1% till 2020 and then 1.5% until 2025. Stagnant after that
ANP	Recorded number visitors to PA	Years 1- 5 1% increase; Years 5-10 – 0.8% increase; Years 10-15 – 0.7%, stagnant after that.	Increasing: Years 1-5 – 2%, Years 5-10 – 3%, Years 10-15 – 5%, Years 15-20 2%, Year 10-25 – 1%.
	PA entry fees values	Change in line with recorded number of visitors, starting from baseline 2010 value (10% of visitors paying 1EUR/visit)	Entry fee at present level (1EUR/visit) Revenues increase up to a point where 50% of the visitors are paying.
MNP	Recorded number of visitors to PA	Years 1- 5 1% increase; Years 5-10 – 0.8% increase; Years 10-15 – 0.7% increase, stagnant after that.	Increasing: Year 1-5 – 1%, year 5-10 – 2%, year 10-15 – 2%, stagnant after that
	PA entry fees	No change – no entry fee value	Introducing entry fee in 2015 at 1EUR/visit level. Revenues increase up to a point where 50% of the visitors are paying.
PCNP	Recorded number visitors to PA	Increasing Years 1- 5, 1%; Years 5-10, 0.8%; Years 10-15, 0.7% (as a result of capturing proportion of overall visitor increase to Romania), stagnant after that.	Increasing: Year 1-5 – 2%, year 5-10 – 3%, year 10-15 – 5%, year 15-20 2%, year 10-25 – 1%.
	PA entry fees	No change – no entry fee value	Entry fee introduced in 2015 at 1EUR/visit. Revenues increase related to an increase in number of visitors paying from 10% to 50% in 2035
ReNP	Recorded number visitors to PA	Increase - Year 1- 5, 1%; Year 5-10, 0.8%; Year 10-15, 0.7%. Stagnant after that.	Increasing: Year 1-5, 1%; year 5-10, 2%; year 10-15 2%; stagnant after that
	PA entry fees	Change in line with recorded number of visitors, starting from baseline 2010 value (70% of visitors paying 1EUR/visit)	
VNNP	Recorded number visitors to PA	Increasing -Year 1- 5 1%; Year 5-10 – 0.8%; Year 10-15 – 0.7%. Stagnant after that.	Increasing: Year 1-5 – 2%, year 5-10 – 2%, year 10-15 – 3%, year 15-20 2%, year 10-25 – 1%.
	PA entry fees	No change – no entry fee collected	Introducing entry fee in 2015 at 1EUR/visit level. Total revenue increasing from 5% of the visitors paying up to a value corresponding to 25% of the visitors

			paying in 2035

The SEM and BAU scenario are not identical for the 5 pilot PAs, especially in terms of the evolution of visitor numbers and the collection of entry fees. At present 2 pilot PAs generate revenues from entry fees, set at 5 RON/visitor (around 1EUR), that is ReNP (where fees are collected from about 70% of visitors) and ANP (where fees are collected from about 10% of visitors[12]). SEM for ReNP implies continuing to collect entry fees from 70% of visitors while SEM for ANP implies increasing the level of visitors paying entry fees to 50%. For MNP and PCNP we assume that entry fees will be introduced after 5 years and that collection of this fee will increase to up to 50% of visitors in 2035. Due to the number of entry points into the park and the main tourist activity (i.e. visiting monasteries and churches rather than eco- tourism) for VNNP the SEM scenario implies the introduction of entry fees in 2015, with the collection rate increasing to 25% of visitors paying in 2035.

4.1.4 Analysis

In terms of the number of visitors, the pilot PAs were ranked based on their accessibility and attraction. ANP and PCNP are clearly 'honey pots' and visitor numbers are anticipated to increase more at these sites under SEM, VNNP takes a middle position, while ReNP (due to its geography (mountain edges) and the tradition of the park) and MNP (due to travel time, access and visiting facilities) experience a lower increase in visitor numbers under SEM (**Table 4-1**).

Visitor numbers. Data on the number of visitors entering the PAs per year are available for all the pilot PAs, however concerns over the reliability of the data has promoted a conservative approach in the use of this data in the analysis. The INCDT study (2009) provides estimates[13] of the number of visitors for all the Parks in 2009: 300,000 in ANP; 100,000 in PCNP; 10,000 in ReNP, 10,000 in MNP and 400,000 in VNNP (INCDTa 2009). Statistics on the number of visitors in Romania have been derived from the National Institute of Statistics (NIS, 2011), and extrapolated to derive 2010 baseline data for all the parks based on the INCDT study for 2009. This baseline data was used in the scenario analysis for BAU and SEM as detailed in **Table 4-1**.

In MNP, Ceroni (2007) estimate 10,000 visitors based on the numbers reported by the railway operator in Vaser Valley. However, based on interviews with park administration employees, it seems likely that the number of people visiting Maramures Area (including MNP) is far higher than this, as the available data are only based on those sites for which visitor records are kept. To account for this, the study makes a conservative estimate that half as many tourists are visiting areas in the MNP as recorded. As a result the figure used for MNP is 13,050 visitors in 2010[14].

Visitor expenditure. Visitor expenditure on entrance fees, travel, accommodation and souvenirs etc.

[12] This low collection rate is due to a number of factors including – the difficulty of supervising the many entry points into the park; organization issues including a lack of collaboration with the local tourist operators, and limited facilities and services.

[13] Data on visitor numbers are usually provided by PA administrations based on data collected from local operators; in the future, the precision of these estimates needs to be improved. Data should be collected by NIS or by statistical surveys conducted by professionals on behalf of PA administrations.

[14] There were 10,000 visitors in 2007. This translates to 8,700 visitors in 2010 (based on decrease in number of visitors from 2007 to 2010 (NIS, 2011)). The data relates only to the valley of Vaser, which covers only 10% of the Park. It is assumed that half as many tourists visit the other parts of the park, resulting in a total of 8,700+4,350 = 13050 visitors in 2010, for the whole park.

can make an important economic impact at the local to national scale. In 2010, ANP generated direct revenues of 34,000 € mainly from visitor fees (ANP has 4 small visiting centers and 4 information points). ReNP also generated some income from visitor fees (ReNP has 2 visiting centers and one information point). MNP, PCNP and VNNP didn't generate any direct revenues from entry fees and other charges, but visitors to these pilot areas spent money on hotels and restaurants.

The study in MNP (Ceroni, 2007) has been used across the pilot sites, as this is the only available study on PA tourism expenditure. Ceroni calculates average visitor expenditure per visit on food and accommodation[15] at RON 483.5 in 2007, equivalent to €135.5 per visitor per visit (2010 prices). The average duration of a visit was 5 days, suggesting a total daily expenditure per visitor of €27.1 (Ceroni, 2007). This estimate appears conservative compared to similar studies in the region. For example a study of Durmitor National Park in Montenegro revealed a gross turnover of €1.6 million for hotels and restaurants, translating into an average accommodation fee of €12.6, plus typical spending on food, drinks and other services of €46.0 per visitor day (UNDP 2011). In Tatra National Park in Poland visitors spend around €45 per day, and in Slovakia's Slovensky Raj National Park total visitor expenditure averages €54 per person day (Getzner 2009).

In order to derive total expenditure estimates for the PAs, the likely proportion of visitors camping and staying in hotels was taken into consideration. In ReMP and PCNP the majority of tourists use tents while trekking around the high altitude areas; conversely, in MNP and VNNP the majority of tourists use hotels. Based on the data provided by INCDT (INCDT 2009a) it is assumed that 70% of tourists in ANP, 75% tourists in MNP, 40% of tourists in PCNP, 20% of tourists in ReNP and 60% of tourists in VNNP stay in hotels. Thus, direct spending on hotels may account for annual revenues of €20,4 million in ANP, €1.3 million in MNP, €5.5 million in PCNP, €0.28 million in ReNP and €32.7 million in VNNP[16]. This is considered to be a conservative estimate as it is based on a low estimate of visitor expenditure relative to other studies and a likely under-reporting of tourist numbers.

Consumer surplus of visitors. The total economic value of PA tourism is greater than the amount of money people actually spend. This is because some tourists would be willing to pay more than they do on entry fees, hotels and restaurants, travel costs etc. to enjoy the tourism experience of a PA. This "consumer surplus" is measured by a visitor's maximum willingness to pay for the PA tourism experience less their actual expenditure.

In 2005 a study was carried out in five parks in Romania (Bucegi, Cozia, Domogled, Piatra Craiului, Portile de Fier) to determine the economic value of recreation. The Travel Cost Method used information about respondent's actual travel costs to determine Consumer Surplus based on the demand curve. The results showed an average consumer surplus per visitor of €42 (Dumitras 2008, Dumitras *et al* 2011) in 2007. In 2010 prices (using PPP conversions), this is equivalent to an average consumer surplus per visitor of €50.7. This is an average estimate from 5 Parks, and of the pilot sites only PCNP is included among them. For PCNP consumer surplus is €44.3[17].

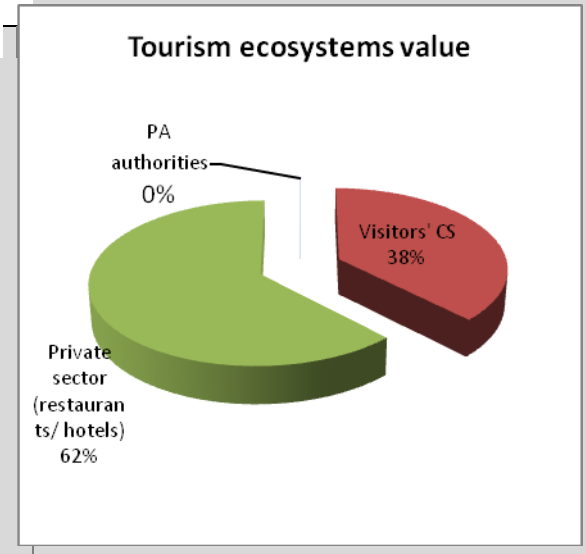
[15] Entrance fees did not exist at this time.
[16] This is based on the number of visitors multiplied by the percentage of tourists with longer stays multiplied by with the total expenditure per visit (135.5 €)

[17] Another less detailed study in MNP in 2007 found that just under 60% of visitors were willing to contribute between €18 (for the conservation of traditional landscapes) and €21 (for wildlife conservation programmes) to PA funding (Ceroni 2007).

Based on an average consumer surplus per visitor of €50.7 (derived from Dumitras 2008, Dumitras *et al* 2011) for all sites except PCNP, for which the site specific consumer surplus estimate of €44.3 was adopted and visitor numbers total consumer surplus for each site is estimated at: €15,3 million a year in ANP, € 0.7 million a year in MNP, €4.4 million in PCNP, €0.5 million in ReNP and €20.3 million in VNNP. The baseline value for the 5 pilot sites, together with the distribution of the baseline value among main beneficiaries, is presented in **Figure 4-1**.

Figure 4-1: Baseline value for the 5 PAs – Tourism (Euros / year)

Direct revenues (visitor expenditure on hotels and restaurants plus revenues to PAs)	68,366,536.3
Visitor consumer surplus (based on Dumitras *et al* 2011)	41,219,620.0
Total PA ecosystem value to tourism	109,586,156.3
Including	
Revenues to PAs (based on entrance fees etc)	41,000.0
Revenues to hotels and restaurants (based on Ceroni, 2007)	68,325,536.3
Consumer surplus (based on Dumitras et al 2011)	41,219,620.0



Applying the BAU and SEM scenario and calculating the present value (PV) for a 25 years period (2010 – 2035) provides the results shown in **Figures 4-2** to **4-5**. The results are reported with and without the consumer surplus values for both the BAU (**Figure 4-2** and **4-3**) and the SEM scenario (**Figures 4-4** and **4-5**).

Figure 4-2: Tourism sector values BAU CS included (PV10%=€787.2mill)

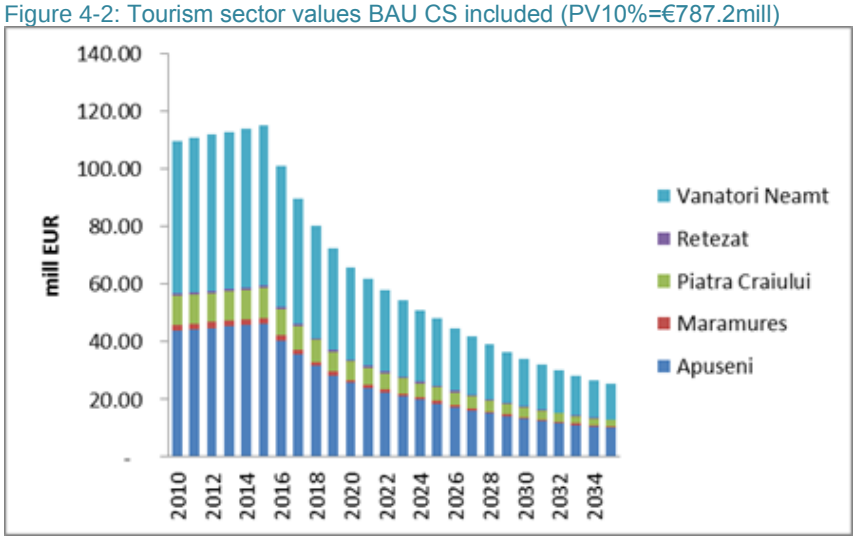


Figure 4-3: Tourism sector values BAU CS excluded (PV10%=€439.3mill)

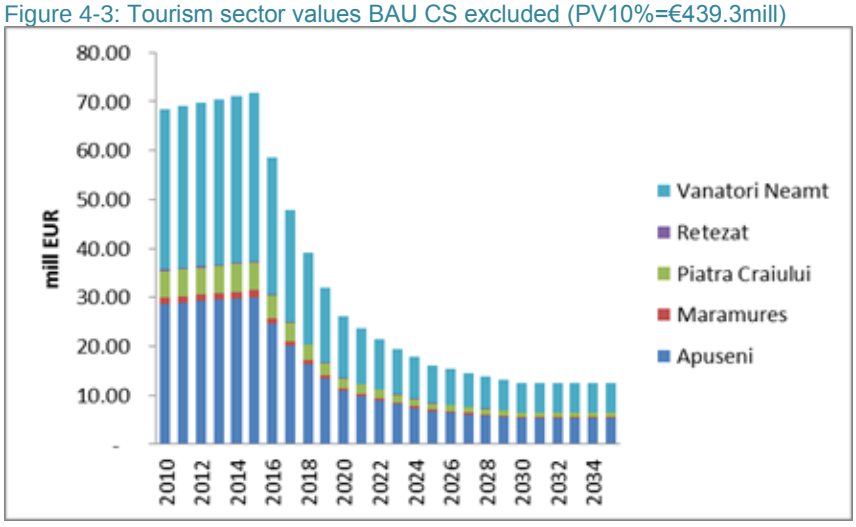


Figure 4-4: Tourism sector values SEM CS included (PV10%=€1,289.9 mill)

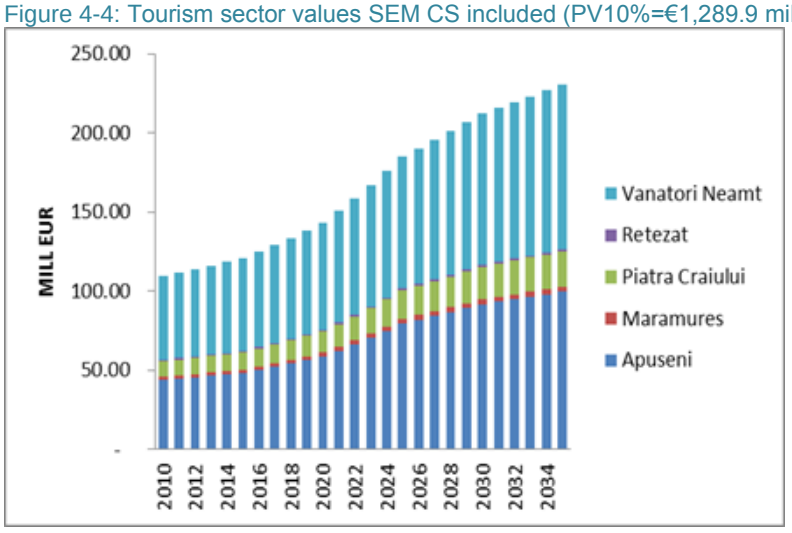
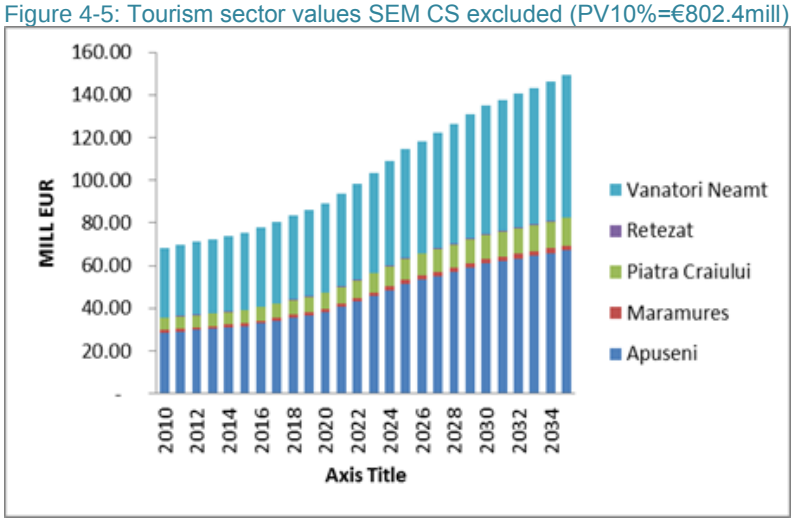


Figure 4-5: Tourism sector values SEM CS excluded (PV10%=€802.4mill)

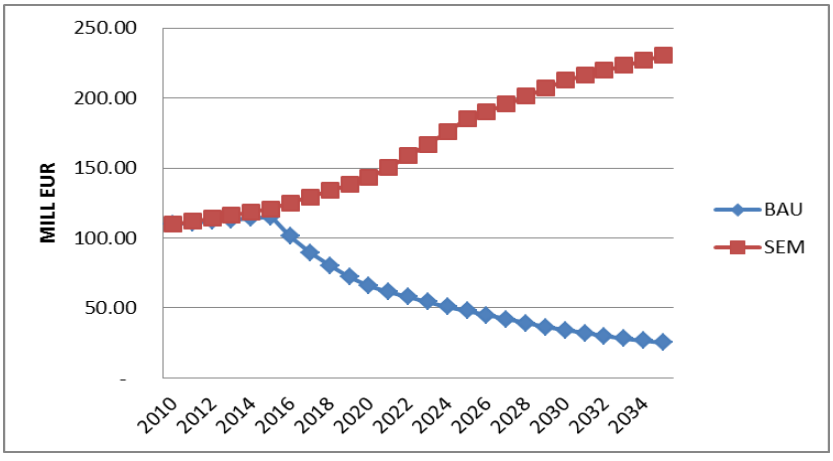


The continuation of BAU in the pilot PAs results in an increase in tourism values over the short term, followed by a progressive decline related to the degradation and loss of biodiversity and ecosystem services overtime and the consequence fall in visitor numbers. The present value under BAU for the 5 pilot PAs is €787.2 million (including consumer surplus) and €439.3 million based on expenditure values only Apuseni Natural Park and Vanatori Neamt Natural Park make up 89% of this value[18]. The values of the ecosystems from the parks range from €6.2 mill (ReNP) to €381.8 mill (VNP).

Sustainable Ecosystem Management (SEM) results in a progressive increase in tourism values at the pilot sites, as both the quality of biodiversity and ecosystems and the tourism services offered improve. The increased number of visitors is the main determinant for the increase in PAs revenues. While not considered in the SEM scenario, tourism revenues could be further increased by raising prices / entrance fees overtime. Although an increase in the value of tourism is sustained over the 25 years, the rate of growth slows as the ecosystem and biodiversity status is restored and as the PAs carrying capacity is reached. Sustainable eco-tourism discourages an increase in tourists beyond the sites carrying capacity, visitor numbers therefore plateau in the long run. The PV (10% rate over 25 years) for the 5 pilot PAs is calculated at €1,289.9 million level (including consumer surplus) and €802.4 million based only on expenditure. The Apuseni Natural Park and Vanatori Neamt Natural Park make up 92% of this value. The values for the parks range from €8.5 mill (ReNP) and €604.8 mill (VNP). **Figure 4-6** illustrates the different trajectory for tourism value under BAU and SEM for the 5 pilot sites.

The NPV of SEM is €502.7 million including consumer surplus and €363 excluding consumer surplus.

Figure 4-6: Tourism value under BAU and SEM over 25 years



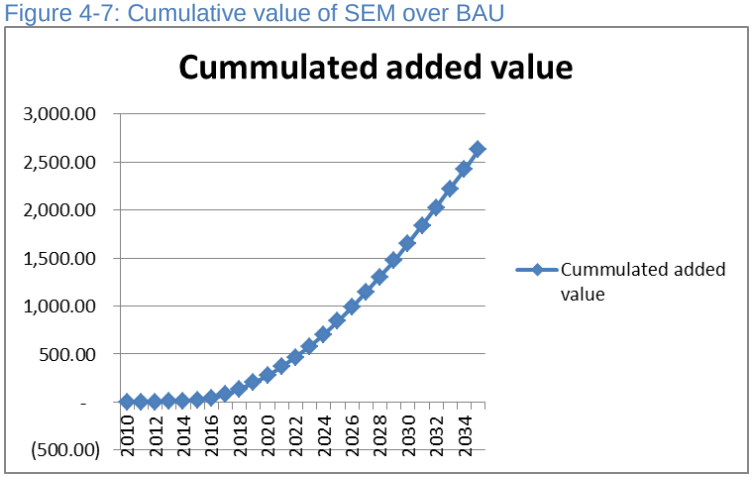
PA authorities derive a small amount of revenue from entry fees. The private sector (represented by tour operators, hotels, pensions, restaurants, transportation companies and souvenir manufacturers) is the main beneficiary across the 5 PAs. The private sector is therefore the key stakeholder to engage with in the development of any potential payments for ecosystem services mechanisms. It is

[18] While VNNP is not considered to be a honey pot site, there are many visitors to the monasteries in the area.

worth noting that an increase in private sector revenues may also indirectly increase local and national budgets, based on the profitability of the sector[19].

The value added by SEM across the pilot PAs to the tourism sector is a clear indication of the potential gains association with SEM, and the costs of BAU. SEM implies sustained and increasing tourism value supported by a well managed PA while a continuation of BAU results in the steady loss of tourism value as the capacity of PAs to generate economically valuable goods and services is eroded. These long-term losses outweigh the short-term gains. The added value of the ecosystems of the 5 PAs steadily increases over the years in line with an increase in the quality of ecosystem management (**Figure 4-7**). **The total cumulative (additional) value (over 25) to the tourism sector as a result of moving to SEM from BAU in the 5 pilot sites is around €2.6 billion.**

Figure 4-7: Cumulative value of SEM over BAU



4.1.5 Contribution of ecosystems of PAs to economic activity and employment

As is the case with other sectors and PA goods and services, the total economic impact of PA tourism is far greater than the direct spending on entry fees, hotels and restaurants. The tourism sector also benefits from visitor expenditures on secondary and support services, resulting in significant indirect and induced impacts. These include capital inflows and investments on infrastructure and equipment, government spending for example on tourism marketing and promotion, aviation, administration, security services, resort area security services and sanitation, and domestic purchases of goods and services by the sectors dealing directly with tourists (for example, food and cleaning services by hotels, fuel and catering services by airlines, and IT services by travel agents). The induced contribution of tourism also includes the income and jobs supported by the spending of those who are directly or indirectly employed by the travel and tourism industry.

The World Travel and Tourism Council (WTTC, 2011) presents its economic impact research for Romania's tourism sector, based on a methodology consistent with that approved by the UN Statistics Division. This shows that around 94% of visitor spending is on leisure travel. Assuming that these figures can be assigned on a *pro rata* basis to the estimated 534,300 visitors to the pilot PAs, then it is estimated that tourism within the pilot PAs makes a total direct, indirect and induced contribution to

[19] There is no available data on the eco-tourism's sectors profitability but further calculations could be made based on the profitability tax (set at 16% in Romania) and the average number of employees (wages are taxed at up to 45% for budget funds such as health and unemployment.

GDP of some €365 million in 2010 (**Table 4-2**). This includes gross visitor spending of more than €280 million, public expenditures of almost €25 million and capital investment in excess of €194 million, as well as some 37,100 full-time job equivalents.

Table 4-2: Travel and tourism in pilot PA impact in 2010 (mill EUR)

	All domestic and international tourism [1]	**All Leisure travel [2]**	**PA tourism [3]**
a. Visitor exports	1,356.3	1,274.9	112.2
b. Domestic expenditure	2,069.0	1,944.8	171.1
c. Government individual spending	46.0	43.2	3.8
d. Purchases by tourism providers	-1,816.1	-1,707.1	-150.2
Direct contribution to GDP (€ million)	**1,655.2**	**1,555.9**	**136.9**
Other impacts (indirect & induced)			
Domestic supply chain	1,724.1	1,620.7	142.6
Capital investment	2,344.8	2,204.1	193.9
Government collective spending	252.9	237.7	20.9
Imported goods from indirect spending	-2,436.8	-2,290.6	-201.5
Induced	873.6	821.1	72.2
Indirect and induced contribution to GDP (€ million)	**2,758.6**	**2,593.1**	**228.1**
TOTAL CONTRIBUTION TO GDP (€ million)	**4,413.8**	**4,149.0**	**365.0**
Employment ('000 jobs)			
Direct employment	234.3	220.2	19.4
Indirect employment	214.3	201.4	17.7
Total employment ('000 jobs)	448.6	421.7	37.1

Source: [1] WTTC 2011, [2] imputed from WTTC figures for 2009 and 2010, [3] imputed on a pro rata base on NIS and INCDT records of visitors

Note: See Annex 5 for definition of key terms used in Table

Of note is the fact that the impact of ecotourism at the local level is significantly higher than that of 'classical' tourism. According REA members, approximately 80-90% of eco-tourism expenditure remains in the areas where the tourism program is operating, which are mainly in rural areas. This data only relates to the 16 tour operators that are members of RAE and is concentrated in Brasov and neighbor counties, while the potential for developing ecotourism more broadly across Romania is considered to be extensive.

4.2 The value of PA ecosystems services to Forestry and Hunting

Box 4-2: The key findings for the forestry and hunting sector

- **The Pilot PAs are of considerable value to the Forestry sector.** The value of forest provisioning services (timber, Non-timber forest products (NTFP) and hunting) for the pilot PAs is estimated at around €9.1 million per year (2010);
- **Continuing to accord PAs a low priority in terms of policy and funding will result in economic losses in the long term.** Under BAU forestry activities may add some €2.8 million over the next 25 years to Romania's economy. However, this revenue will disappear after 30 years as the capacity of PAs to generate economically valuable wood and NTFP is eroded. This is without taking into consideration the considerable losses in other forest ES such as carbon sequestration, water and soil erosion regulation and landscape provision and tourism.
- SEM implies a decrease in forest wood, NTFP and hunting values in short term and a fall in public income due to compensatory payments for area taken out of production. Nevertheless, in the long run, the value of PAs under the SEM scenario will recover, and are projected to generate a higher NPV 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.
- Currently the full potential of NTFP is not being captured. The SEM scenario assumes a significant increase in NTFP production with Retezat and VNNP showing particular potential in this respect.
- Carbon sequestration functions of the forest under SEM could generate an additional €33 million (cumulative value over 25 years).

- It will not be possible for Romania to access the voluntary carbon markets, and thereby capture the value of sequestered carbon in protected areas, until central authorities adopt a clear legal framework and institutional arrangements permitting this (e.g. to monitor and guarantee the sequestered quantities).

4.2.1 Introduction

This section includes primary wood production associated with the active management of forests and the value of NTFP and hunting carried out in and around PAs (i.e. direct use values of the PAs). A key forest regulating service, carbon sequestration, is also estimated. It is important to note that a number of other forest regulating and supporting services are captured via their contribution to other sectors[20].

During the communist period Romania had one of the best performing forest management systems in Europe, with all State forest managed following sustainability principles. However, the process of forest restitution, where areas were returned to former owners, triggered important legal and institutional changes as well as illegal logging and unsustainable forest harvesting in some areas. A

[20] Forest landscape values are considered to be captured by tourism values, while the value of forest regulatory services in terms of water provision and regulation and soil erosion are covered in the water resources sector (section 4.4). .

stable system is now in place with almost all the forest (6.0 million ha out of 6.3 million ha) being administrated by NFA Romsilva or by private forest districts.

NFA Romsilva follows Forest Management Plans, which are reviewed every 10 years, and are based on sustainable principles such as biological diversity conservation. The forest is divided into functional categories[21]. In T1 and T2 categories there are important restrictions regarding forest harvesting. Based on functional zoning of the PAs, the protected forests are usually categorized as T1 and T2 forests, both for state and private forests. The state has prepared a legal framework for compensating T1 and T2 private forests owners, but payments have not yet taken place.

Wood harvesting, collection and sale of NTFP and hunting are the most important activities within the sector. Wood is a valuable product used in construction, furniture, pulp and paper, heating, and energy production. The Carpathian forest ecosystems provide important quantities of economically attractive wood species such as beech, spruce and oak. Based on official statistics, 59% of the annual increment is harvested. 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, and the production of NTFP. Therefore, sustainable forest management is crucial for effective provision of PAs ecosystem services.

No statistics are available on the extent of illegal logging, but while this is occurring in almost all areas it is not considered to be significant. However, illegal clear cutting in some parts of the Carpathians has created problems in the past, and remains a potential threat. For example, the floods and landslide in Maramures in 2006 -2010 can be linked to clear cutting that occurred in Borsa and Viseu forests in 2001-2005 (Giurgiu, 2010). Furthermore, clear cutting in private forests in Arges County and around PCNP have had significant negative effects on the quality and effectiveness of ecosystems and its landscape (http://www.realitatea.net/defrisari-in-piatra-craiului_308741.html).

In theory forest ecosystems within the PAs are managed according to the forest and parks management plans, but in reality these plans are not always fully enforced due a range of factors, typical of the BAU scenario, including:

- Not all PA MPs are approved and therefore they are not enforced in all cases;
- There is no compensation for harvesting restrictions within private forests and owners therefore have no incentive to restrict harvesting;
- 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 be having a number of negative effects on the provision of important ES;
- 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 local economies. However, even in areas, such as Maramures, where the collection and processing of NTFP is economically significant, those products are not managed and harvested in a way that captures their full potential. Forest administrators often

[21] T1 – 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.

concentrate on wood harvesting and processing and pay little attention to the economic potential of NTFPs.

In terms of revenue hunting is not very important compared with wood production. Nevertheless, recreational hunting is an important service offered by forests. The legal framework controls and restricts hunting, but is facing significant problems in terms of enforcement. Hunting quotas are approved by the central authority, and generally speaking are not reached, but it is hard to quantify the extent of illegal hunting, which is evident

4.2.2 Characterization of BAU and SEM scenarios (provisioning services)

Under **Business as Usual (BAU**) timber harvesting will continue to support a number of wood related industries. Due to the limited extent of protected forests within the PAs (T1 and T2 areas), biodiversity losses may occur in some areas. At the same time, negative impacts on water, nutrient and soil erosion regulation, landscape and air quality will continue. Ineffective enforcement of the legal framework will result in ongoing illegal logging and hunting. The absence of an equitable system of compensatory payments will encourage local forest owners to overcut. BAU does not encourage optimal management of NTFP, and the potential of those products will decrease due to ecosystem degradation.

With the present limited levels of protected forest areas (T1 and T2), the potential threat to biodiversity (which is not yet properly assessed due to ongoing lack of funding for proper identification and monitoring of flora and fauna) will lead to continuous degradation of potentially valuable ecosystems, hindering the development of recreation, tourism and educational activities.

The **Sustainable Ecosystem Management (SEM)** scenario would involve less emphasis on wood production supported by: (i) an expansion of T1 and T2 areas where justified on account of their biodiversity significance; (ii) Compensatory payments for private forest owners; and, (iii) optimal harvesting of NTFPs. The reduction of forest harvesting will create opportunities for increasing the potential of NTFP (guided by studies on sustainable use) and recreational hunting. Enforced PA MPs, together with a better enforcement of forestry specific regulations will lead to a reduction in illegal logging and hunting.

The analysis has used GIS data bases of the forest management plans of forest areas within the PAs. The forest areas within the parks are divided into 2 categories – strictly protected area (categories T1 and T2) where no cuttings are allowed, and areas where sustainable cutting is permitted (T3 and T4). Standing volumes were calculated based on stand composition, age and productivity class using standard equations for volume calculation. Extracted volumes were provided by the PA forest administrations or calculated based on national averages provided by the Ministry of Environment and Forests – Status of Romanian Forests 2010. An estimation of illegal logging is based on Government reports and expert opinion. In order to determine appropriate compensation values for T1 and T2 forests, a formula was adopted which included all the technical norms adopted by the Government for this purpose[22].

Table 4-3 summarizes the BAU and SEM forest sector scenarios for the pilot PAs.

[22] The formula takes into account: forest area, average standing wood price, annual increment per ha, and correction factors depending on species and functional category (Ministerial order 625/04.09.2006)

Table 4-3:Summary of BAU and SEM scenario for the forestry sector for the pilot PAs

Description of indicators	BAU	SEM
Wood harvesting		
T1 and T2 areas – strictly protected areas	No compensatory payments T1 and T2 areas remain constant	Compensatory payments in place. Increase in T1 and T2 areas
T2 and T3 areas	Thinning	
	Legal logging at national 2010 average (i.e. 59% of annual increment)	Legal logging at national 2010 average (i.e. 59% of annual increment) 7% per year between 2016 and 2030. Constant after 2030. Decrease in T3 and T4 areas.
All areas	Illegal logging at 5% of legal logging level	No illegal logging after 5 Years
NTFP and hunting		
NTFP potential	Harvested at present levels and declining over time	Increase in harvest levels over time up to sustainable limit
Recreational hunting	Decreasing potential	Increasing potential

The pilot PAs have a total forest area of 190,064 ha with a total standing volume of 59,191 m^3 (2010), consisting of fir, spruce, birch, oak, and other hard and softwood species. Data relating to the Pilot PAs forests is presented in **Table 4-4** (Transilvania University 2012, MMP 2010).

The value of forests in terms of wood harvested in the pilot PAs was €6.7 million in 2010. The percentage of public owned forest within the pilot PAs varies from 40% in PCNP 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. PCNP), compensatory payments are higher. Public revenue from harvested wood in 2010 for the pilot PAs was around € 5.2 million (1.6 in ANP, 2.7 in MNP, 0.1 in PCNP, 0.6 in ReNP and 0.2 in VNNP).

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 € 0.2 million to public revenues from forestry in 2010. Illegal logging is estimated at around €331,816 accruing to the private sector in 2010.

Table 4-4: Information on forests in pilot PAs

Species	Area (ha)	Standing volume (,000 m^3)	Volumes extracted 2010 (m^3)	Average prices(standing wood, RON/m^3)
ANP				
Resinous	37,607	10,352	65,554.0	84.73
Birch	10,980	3,023	19,140.1	69.04
Oaks	16	4	27.8	114.8
Other hardwood species	143	39	249.0	75.08
Other softwood species	0	0	0.0	58.63
TOTAL	48,746	13,418	84,970.8	
MNP				
Resinous	55,958	17,201	11,9549.7	84.73
Birch	28,717	8,827	61,352.4	69.04
Oaks	1,450	446	3,098.8	114.8
Other hardwood species	235	72	502.6	75.08
Other softwood species	14	4	29.2	58.63
TOTAL	86,375	26,550	184,532.7	
PCNP				
Resinous	5,535	2,907	9,272.8	84.73
Birch	4,026	2,114	6,745.0	69.04
Oaks	0	0	0.0	114.8
Other hardwood species	0	0	0.0	75.08
Other softwood species	40	21	67.6	58.63
TOTAL	9,602	5,042	16,085.3	
ReNP				
Resinous	17,216	8,294	43,965.6	84.73
Birch	2,024	975	5,168.5	69.04
Oaks	36	18	92.9	114.8
Other hardwood species	0	0	0.0	75.08
Other softwood species	1	0.3	0.2	58.63
TOTAL	19,277	9,287.3	49,227.2	
VNNP				
Resinous	22,719	4,259	15,997.8	84.73
Birch	3,102	581	2,184.2	69.04
Oaks	292	54	205.8	114.8
Other hardwood species	0	0	0.0	75.08
Other softwood species	1	0.1	0.0	58.63
TOTAL	26,114	4,894.1	18,387.9	
TOTALS TOR ALL PILOT PAs				

Source: Transilvania University 2011

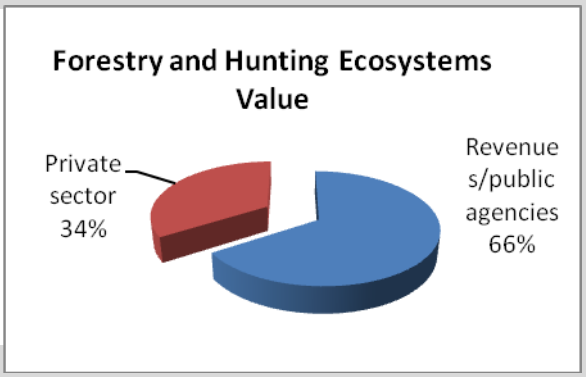
Recent studies (Ceroni 2007, Transilvania University 2011) estimate the value of non-timber forest products harvested (NTFP) under sustainable conditions and sold at €2.1 million (€0.6 million in ANP,

€1.0 million in MNP, €0.1 million in PCNP, €0,1 million in ReNP and € 0.3 million in VNNP). Key NTFP are mushrooms, wild berries, medicinal plants, ornamental plants and Christmas trees (Ceroni 2007, Transilvania University 2011).

Ceroni (2007) estimates hunting in MNP at RON 0.1 million, but expresses some doubts regarding the sustainability of this activity. Data from a study by the Transilvania University (2012) provides similar values. Taking a conservative approach, 75% of this value has been adopted as corresponding to a sustainable hunting level. In 2010 prices this is equivalent to €58,278 (€13,278 for ANP, €27,906 for MNP, €3,069 for PCNP, €6,910 for ReNP and €7448 for VNNP). The total baseline value of the 5 pilot PAs can be seen in the **Figure 4-8** (including the distribution of this value among the main beneficiaries).

Figure 4-8: Baseline value for the 5 PAs – Forestry and Hunting

Public revenues	6,008,403.9
Market earnings	3,109,247.5
User consumer surplus	
Total value of PA water supplies	9,117,651.4
Including *(note: values not additive)*	
Revenues to PA authorities	-
Revenue to other public agencies	6,008,403.9
Non commercial users/beneficiaries	
Private sector	3,109,247.5



The results under the BAU and SEM scenario are provided in **Figure 4-9** and **Figure 4-10**.

Figure 4-9: Forestry sector values BAU (PV10%=€77.3million)

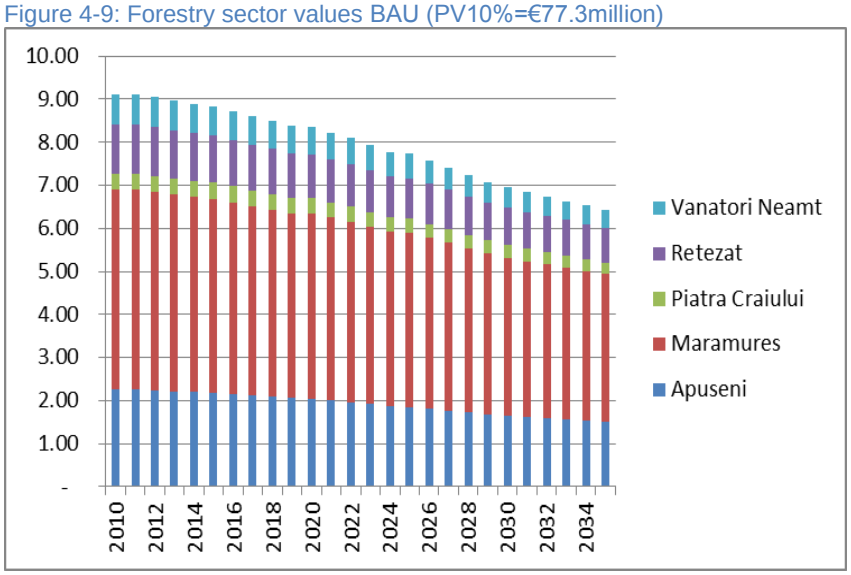
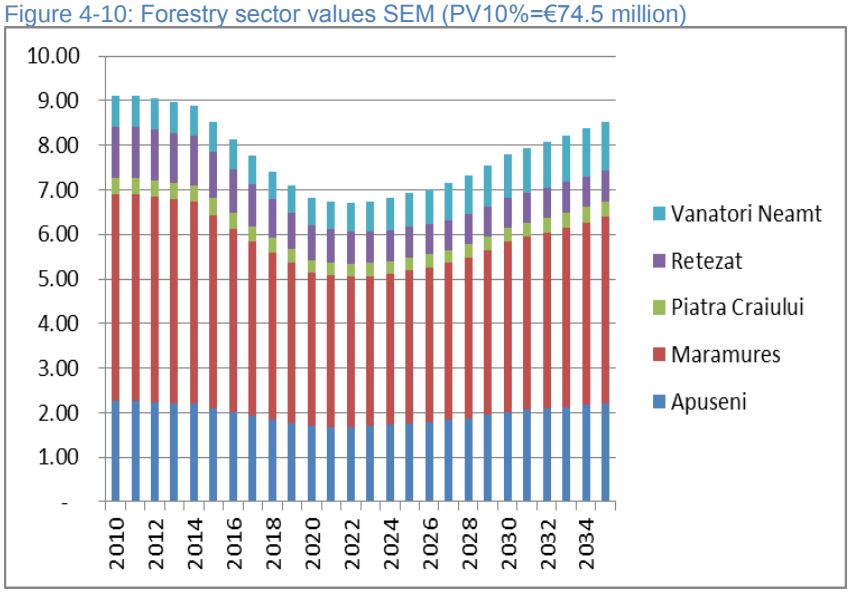


Figure 4-10: Forestry sector values SEM (PV10%=€74.5 million)



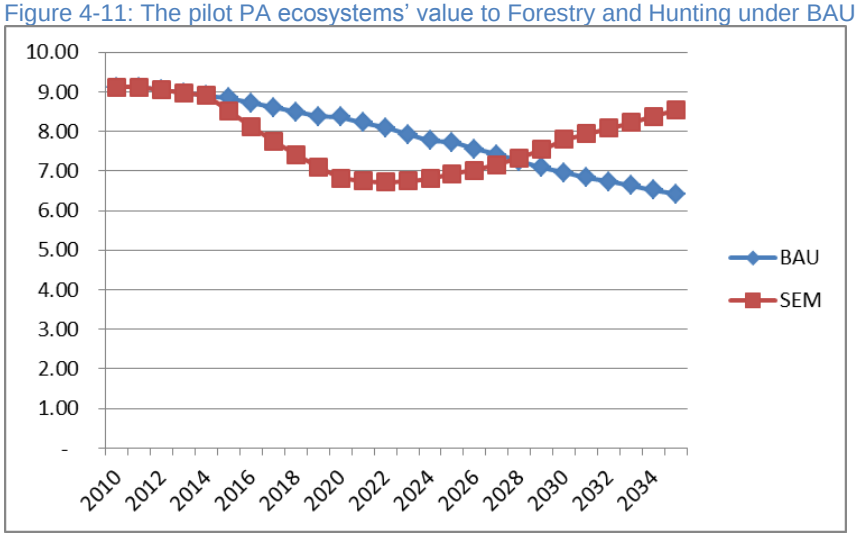
A continuation of BAU in the pilot PAs results initially in a more or less constant value for the forestry sector. The quantity wood harvested falls over time due to the normal stand evolution, but this is also taken into consideration in the SEM scenario. The limited use of NFTP is the main factor determining a decrease in forest sector value under BAU relative to SEM. However, this decrease is not severe, assuming that other forest regulating services continue to be provided. The present estimated value of ecosystems in the 5 PAs for the BAU scenario is €77.3 million (**Figure 4-9**)

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 value of 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 ecosystems and biodiversity. The rate of growth eventually slows as optimal NFTP harvesting rates are reached, and is constant in the long run. The PV (10% rate over 25 years) for the 5 pilot PAs is estimated at €74.5 million (**Figure 4-10**).

There are significant differences between the pilot PAs in terms of forest sector benefits/value (**Figure 4-9**, **Figure 4-10**). Under BAU, PV values range from €3.3 mill EUR (PCNP) to €39.7 mill (MNP). Under SEM, PV values range from €3.2 mill (PCNP) to €37.5 mill EUR (MNP).

As illustrated in Figure 4-11, while BAU is equivalent or superior to SEM in the short term, in the medium – 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.

Figure 4-11: The pilot PA ecosystems' value to Forestry and Hunting under BAU and SEM



The profile for the BAU and SEM scenario are similar for ANP, MNP and PCNP. However, it is worth noting the situation for ReNP and VNNP (**Figure 4-12**, **Figure 4-13**). In VNNP, SEM is equivalent or superior to BAU over the 25 year assessment period and also shows significant gains in the medium to long term. This is due to the influence of NFTP. n 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 being placed on NTFP values compared with wood at the site. In ReNP the situation is the opposite – higher altitude, mountain plateaus supports a lower weight being placed on NTFP. As a result the BAU scenario remains superior over the long term.

Figure 4-12: Trends of BAU and SEM scenario for ReNP

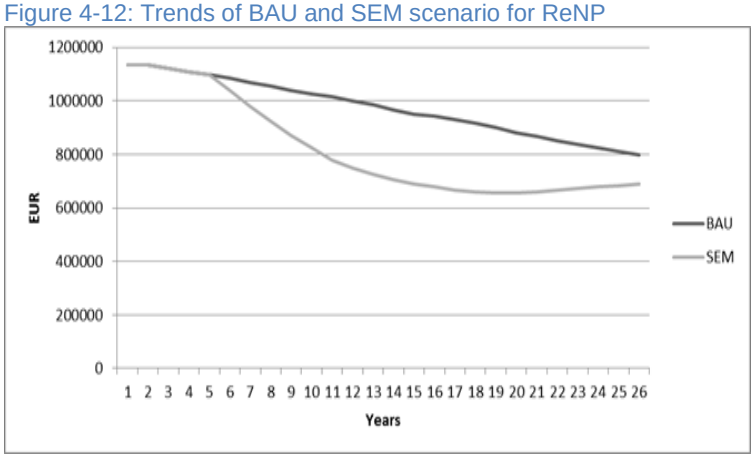
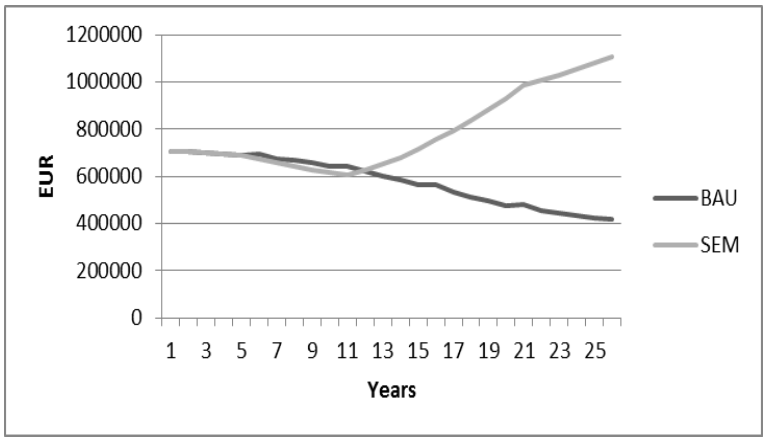
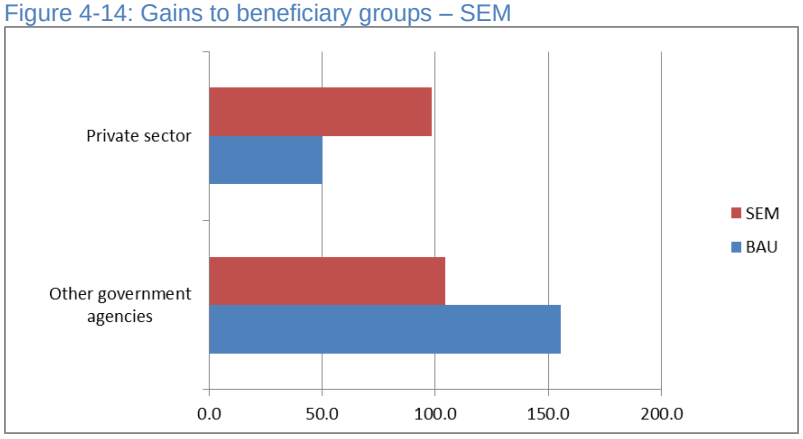


Figure 4-13: Trends of BAU and SEM scenario for VNNP



PA authorities are not represented among the beneficiary groups as neither BAU nor SEM includes revenues to PAs authorities. The private sector is the main beneficiary, indicating again the potential to develop PES type arrangements with the private sector. Under SEM forest administrators lose revenue due to the decline in timber production and increase in compensatory payments but gain from NTFP production (**Figure 4-14**).

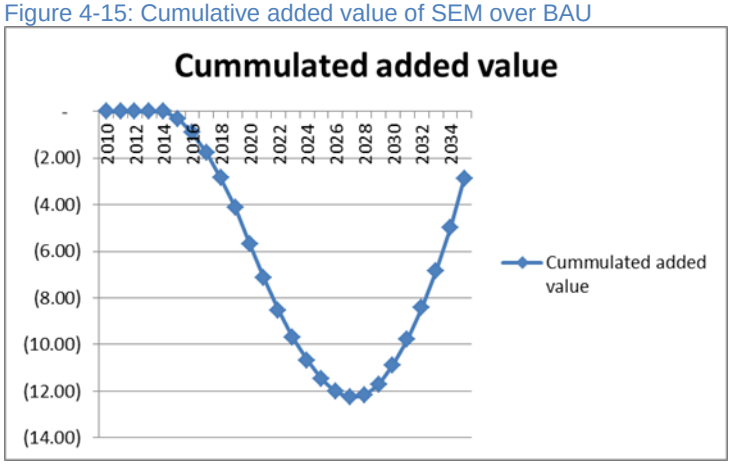
Figure 4-14: Gains to beneficiary groups – SEM



Sustainable ecosystem management implies a decrease in PA values in short term and a fall in public income due to compensatory payments. Nevertheless, in the long run, the value of PAs under the SEM scenario will recover, and are projected to generate higher values beyond a 25 year horizon based on trend analysis. In addition other ES generated / maintained by sustainable forestry (e.g. carbon sequestration, water and soil erosion regulation, landscape) are ensured (**Figure 4-15**).

BAU is superior to SEM over the 25 year time horizon, generating **an additional €2.8 million**. 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 loss is very small. After 32 years SEM is superior to BAU.

Figure 4-15: Cumulative added value of SEM over BAU



4.2.3 Carbon sequestration

4.2.3.1 Introduction

Ecosystems, such as forests and pasture land, provide an important carbon sequestration service. The value of this service is not currently captured in Romania, although a growing international market in carbon presents potential opportunities for doing so.

Emissions quotas were calculated for Romania in the 90s, after signing the Kyoto Protocol, which took into consideration heavily polluting old communist style industries, which were in decline. This consequently left Romania with 'reserves' in terms of carbon emissions and little incentive until recently to increase carbon sequestration. As a result, Romania has an important carbon reserve that could be traded on international carbon market. Furthermore, carbon potential is high since forests in and around protected areas has been well regulated, and afforestation of degraded and agricultural land has been undertaken. However, institutional and legal arrangements for participating in carbon markets are not in place. It will not be possible for Romania to access the voluntary carbon markets, and thereby capture the value of sequestered carbon in protected areas, until central authorities adopt a clear legal framework and institutional arrangements permitting this (e.g. to monitor and guarantee the sequestered quantities).

4.2.3.2 Carbon sequestration – Characterization of BAU and SEM scenarios

In order to value carbon sequestration within the pilot PAs, the same assumptions have been adopted as for the forestry sector in terms of wood harvested quantities (see section 4.2). Carbon sequestered by other ecosystems has not been estimated.

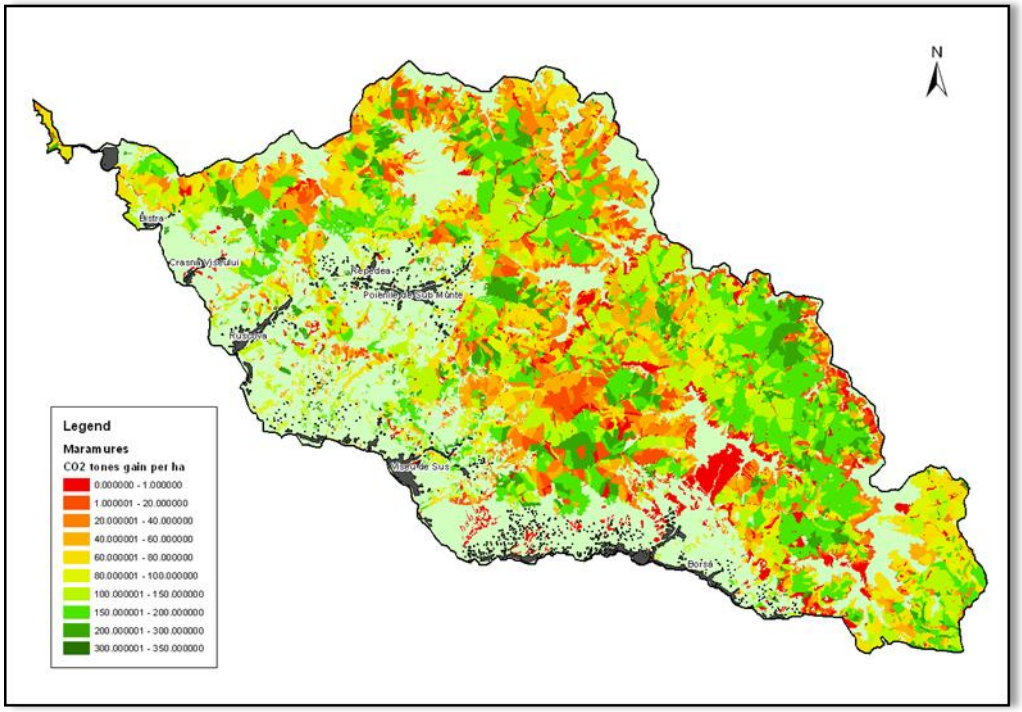
BAU assumes a continuation of wood harvesting at present levels (as a percent of annual increment of forest stands), keeping the present area of strictly protected forests and some illegal logging. Under the SEM scenario, illegal logging is eliminated, T1 and T2 forest areas are expanded and the fall in harvested wood quantities in production forest eventually leads to an increase in sequestered carbon.

The CO_2 accumulated stock was modeled using GIS based on forest stands description from PAs administrations (data from Forest Management Plans). For every species and production class a regression equation was defined to determine the standing volume/ha. Based on the stand area and the consistency of the stands, the total standing volume was determined for each stand. The Biomass Extension Factor (BEF) used was 1.2, this value being the minimum value proposed by the Intergovernmental Panel on Climate Change (IPCC) Guide (IGES 2006). The average wood density values used are also conservative and based on IPCC guidelines. Corresponding coefficients for carbon concentrations within wood biomass were used by species, and based on IPCC guidelines, CO_2 quantities were estimated for every forest stand.

4.2.3.3 Analysis

The BAU and SEM scenario characterization for CO_2 consisted of applying the above described methodology for stand volumes based on the harvested volumes as calculated for the forestry sector. For CO_2 only additional stands from year to year were considered. Interesting data were obtained through this method (**Figure 4-16**). It can be seen that a greater additional quantity of CO_2 is accumulated in the protected forests as well as in the youngest stands.

Figure 4-16: Results of CO2 modelling: example MNP



Source: Transilvania University, 2011

The total amount of additional CO_2e in the 5 pilot PAs from 2009 to 2010 is estimated at 490.1 tones (see data for every pilot PA in the Table 4-5). Based on the reported average price for CO_2e, estimated by New Energy Finance and Ecosystem Marketplace (Ecosystem Marketplace 2011) for Clear Development Mechanism under Kyoto protocol, active in Romania[23] ($4.5/t$CO_2e$ in 2010, decreasing from $4.7/t$CO_2e$ in 2009), the baseline value of CO_2 sequestered in the pilot PAs is around €1.6 million.

[23] Afforestation of degraded agricultural land project in Romania, based on Emission Reduction Purchase Agreement (ERPA) between PCF (World Bank) and National Forest Administration – ROMSILVA, signed in May 2004 (price $3.6/t$CO_2e$)

Table 4-5: CO_2 sequestered quantities in 2010 and in a 25 years period in BAU and SEM scenarios

PA	Additional CO2, 2009-2010 (t)	Baseline indirect use value 2010 (EUR)	Additional CO2 in 25 years – BAU (t)	Additional CO2 in 25 years – SEM t)
ANP	101,92	351,979	2,321,934	4,352,347
MNP	266,88	921,670	6,361,569	11,515,098
PCNP	36,36	125,569	851,223	1,599,768
ReNP	62,566	216,070	1,414,380	2,655,160
VNNP	22,336	77,137	499,355	976,642

A continuation of business as usual will result in a slow decline in PA carbon sequestration values due to a decline in harvested volumes (based on age class distribution detailed in FMP), and hence less CO_2 sequestered. Under the BAU scenario, the present value (PV) of the carbon sequestration service of the 5 pilot PAs over the next 25 years is around €14.4 million (**Figure 4-17**).

Proper PA management and law enforcement under SEM will initially result in a decline in PA carbon sequestration value as the harvested volumes are not significantly smaller than in BAU scenario in the first years. After this, due to a fall in the volume harvested (the same reduction scheme used for forestry sector valuation) carbon accumulation increases. By the end of the appraisal period, increased increments, together with relatively constant harvested volumes, result in a stable value. Under the SEM scenario the PV of carbon sequestration over the next 25 years is just over €20.2 million for the 5 pilot PAs (**Figure 4-18**). With the proper legislation in place, it should be possible to realize this benefit in the future assuming the ongoing supply of carbon funding. The total cumulative value of SEM relatives to BAU is estimated at €33.3 million.

Figure 4-17: Indirect use values - BAU – carbon sequestration for the 5 pilot PAs (PV@10%=14.4 million EUR)

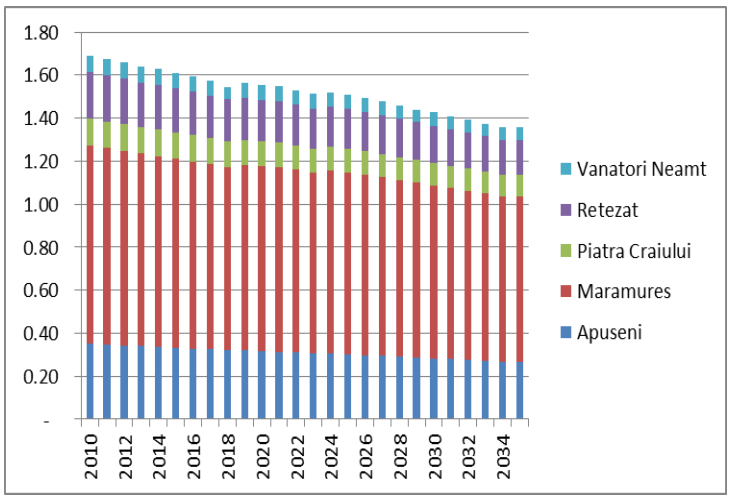
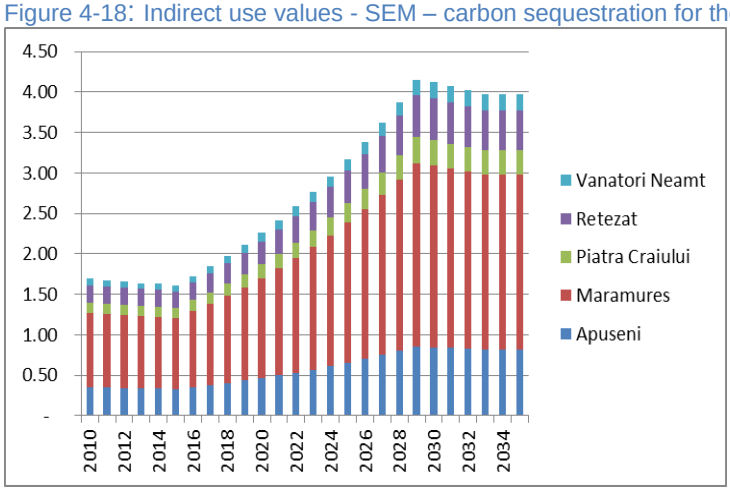


Figure 4-18: Indirect use values - SEM – carbon sequestration for the 5 pilot PAs (PV@10%=20.2 million EUR)[24]



4.3 The value of ecosystem services of PAs to Agriculture

Box 4-3: The key findings for the agriculture sector

- The value of the provisioning service food for the ecosystems of the 5 pilot PAs is estimated at around €20.0 million in 2010;
- For the ecosystems where the carrying capacity is exceeded SEM implies a fall in the value of food provided by pastures in the short and long term. However, the annual values after 10-15 years are significantly higher than the BAU values. In addition BAU also sometimes results in irreversible damage to ecosystems
- A continuation of BAU in terms of pasture management in the 5 PAs could cost Romania's economy some €84 million over the next 25 years (this is based on the cumulative value of SEM relative to BAU).
- SEM requires motivating local communities to maintain traditional breeding practices.

4.3.1 Introduction

Grazing is the main agricultural activity carried out within the Carpathian PAs[25]. Animals typically feed on household plots using hay harvested from privately owned lands or in the open access natural pastures. Cows and sheep are a very important revenue source for households surrounding the PAs, and also sustain the production of traditional eco-food products.

Domestic animal husbandry is an example of a traditional and sustainable relationship between local communities and nature, which has contributed to the rural landscape within the PAs. Ancient animal husbandry traditions continued to be practiced throughout the communist period in the mountain areas, where collectivization was partly avoided.

[24] The declining slope in the last years of SEM is due to particularities of the stands: increasing age and decreasing accumulation.

[25] There is some agricultural land within the Carpathian PAs, but their area and productivity is very low. They are mainly used to produce fruit that is then consumed domestically.

Unmanaged pastures can in the long run damage biodiversity and ecosystem services. For example, over grazing and over harvesting of hay can damage ecosystems through a decline in vegetation density, the loss of key species and soil erosion. Conversely, without active management the species composition in under grazed areas is likely to change reducing the area of pasture and/or its carrying capacity. There is therefore a strong argument for the active management of pastures located within the PAs based on an understanding of their carrying capacity, which is yet to be determined.

Pasture areas within the Carpathian PAs are both under and over-grazed. Under-grazing is due to decreasing animal populations in remote mountain areas partly explained by low economic returns from animal husbandry which discourages animal breeding in small rural communities. Conversely overgrazing is due to limited land resources in or around bigger communities resulting in the number of animals exceeding the carrying capacity of the pastures. In some PAs both over and under grazing is evident; areas that are easier to access are overgrazed while pastures far away from settlements in the mountains are under grazed. In such cases, even if the carrying capacity for the PA as a whole is not exceeded, overgrazing may be causing ecosystem damage at specific locations. Carrying capacity studies are therefore needed not only at the PA level but for each pasture area within a PA.

This Section analyses the value of food (milk), a provisioning service, provided by pastures located in the pilot PAs[26]. The other ES provided by agricultural pastures are considered to be captured indirectly through other sectors (e.g. tourism).

4.3.2 Characterization Modeling BAU and SEM scenarios

In PCNP and ReNP the carrying capacity is surpassed by the number of animals and overgrazing is evident. For these two PAs the BAU scenario assumes that overgrazing will continue in the pastures, leading to pasture degradation and ultimately a dramatic reduction in pasture productivity. The SEM scenario assumes that in the short run grazing reaches its carrying capacity and is maintained at this level into the long term. However, realizing SEM in these two pilot PAs may not be very easy; reducing the number of animals is likely to require compensatory payments for members of the community and / or the demonstration of viable income generating alternatives.

According to the Management Plans for the PAs and the expert opinion of the Transilvania University in MNP, ANP and VNNP the pasture carrying capacity is *not* exceeded. For these PAs the BAU scenario assumes that the number of animals will increase, or decrease, in line with the population forecasts and that the pasture carrying capacity will decrease due to the absence of any active management. The SEM scenario assumes that in the first 5-10 years, as a result of encouraging local communities to actively manage their pastures, the carrying capacity will be reached and then remain constant over the long term. This situation depends on the success of breeding initiatives, the encouragement of which may require investment and animal husbandry remaining profitable.

Table 4-6 summaries the BAU and SEM scenarios for the food production supported by pasture within PAs.

[26] Meat production has not been considered.

Table 4-6: Characterization of BAU and SEM for food production related to PA grazing lands

Site	BAU	SEM
MNP, ANP, VNNP	At the PA level pasture carrying capacity is not exceeded. No active management of pastures. Number of animals follows the present trends (decrease in line with population). As a result of the absence of active management the carrying capacity declines over time.	By encouraging traditional breeding, the number of animals reaches the carrying capacity. Pastures are actively managed by maintaining breeding at the area's carrying capacity The carrying capacity decreases initially then increases until it reaches an optimum level as a consequence of active management.
ANP, PCNP	At the PA level pasture carrying capacity is exceeded. The carrying capacity dramatically declines after a few years without significant change in number of animals. The number of animals is maintained for the first 5 years at high levels but decreases after that due to reduced carrying capacity.	The number of animals decreases from year 1 to avoid degradation of pastures. In 5-10 years the carrying capacity is reached. Due to active management, an optimal long term equilibrium is sustained

The following data has been used in the analysis - area of pasture, average over grazing or actual overgrazing data (where available), milk prices/earnings (assuming that earnings are unitary based on LSU (Livestock Unit)[27] indicator for pastures and hay production areas).

Studies of pasture capacity are available for Piatra Craiului, Vanatori Neamt and Retezat Parks. They provide an equivalent production using LSU for assessing all areas.

In PCNP for a total pasture area of 379 ha the carrying capacity was estimated at 260 LSU in 2000 (i.e. 1.4 LSU / ha), while there were 566 LSU using the pastures, suggesting overgrazing of 218% (Transilvania University 2012). In ReNP in 2004 (Cernelea 2004) for a total area of 14,937 ha there were 6,395 LSU, slightly more than the carrying capacity of 6,300 LSU (i.e. 0.41 LSU/ha). The average carrying capacity is 0.68 LSU / ha for Piatra Craiului, 0.42 LSU/ha for Retezat and 0.8 LSU / ha for Vanatori Neamt. Taking a conservative approach, an average of 0.45 LSU/ha was used in the calculations for the pilot PAs for which carrying capacity studies were not available.

For MNP the data collected in 2007 (Ceroni 2007) translates into a total of 20,347 LSU on a total area of 50,341 ha of pastures within MNP. The same data were collected from different sources (PAs management plans, Transilvania University 2011, Cernelea, 2004) for the pilot PAs (**Table 4-7**).

Table 4-7: Carrying capacity of natural pastures within the pilot PAs

PAs	Surface of pastures (ha)	Total support capacity (LSU)		LSU	
		Total	Per ha	Total	Per ha
ANP	21,619	9,730	0.45	9,650	0.44
MNP	50,341	22,653	0.45	17,840	0.35
PCNP	2,147	1,450	0.68	3,380	1.57
ReNP	14,937	6,422	0.42	7,810	0.52
VNNP	3,057	2,446	0.8	1,523	0.50

Assuming that a LSU produces 15 liters of milk per day (MARD 2011), an average producer price of RON 0.7 per liter in 2008 (CC 2009), and that the number of animals is more or less constant between 2007 - 2011 the following values are derived:

[27] LSU is the feed requirement used as the basis of comparison of different classes and species of stock.

- ANP – around €4.8 million. The carrying capacity is virtually reached. An additional value of 18,000 EUR could be considered given that the pastures are not entirely used up to their carrying capacity. The challenge for ANP is maintaining the active management of the pasture by keeping local communities interested in the present level of breeding. ANP reflects the best situation within the pilot PAs in that the number of animals more or less corresponds to the sites carrying capacity.
- Figure 4-22**Figure 4-22**).
- MNP - around €8.8 million. An additional €0.8 million could be considered due to the fact that the pastures are not used at their carrying capacity. This value is consistent with the value determined in 2007 (Ceroni 2007) of €9.4 million, using another valuation method.
- PCNP – around €1.6 million. This value is not sustainable, and the consequences of a continuation of BAU could be significant. Under SEM the pasture related benefits of PCNP could stabilize around €0.6 million per year; PCNP is an extreme case reflecting the costs of extensive over-grazing. A comparison of milk values under BAU and SEM is provided in Figure 4-23.
- ReNP – around €3.8 million, but this is also not based on sustainable pasture use. The situation is not as extreme as in PCNP but nonetheless solutions for reducing the pressure on the pastures need to be found. The sustainable value under SEM is €3.2 million.
- VNNP – around €1.0 million. An additional €0.2 million could be considered due to the fact that the pastures are not used to their carrying capacity

Figure 4-19 presents the baseline for the pilot PAs. The production surplus relates to the additional (potential) value that could be realized by the currently under-grazed areas. All the values accrue to private beneficiaries. It was not possible to find data on the economic impact of the agriculture sector (multiplier effects, income, and employment).

Figure 4-19: Baseline value for the ecosystems in the 5 PAs – Agriculture

Direct revenues from milk sales	19,755,356.2
Production surplus	1,082,589.2
Total agriculture value	20,837,945.4
Including (note: values not additive)	
Revenues to PA authorities	-
Revenue to other public agencies	-
Production surplus	1,082,589.2
Private sector revenues	19,755,356.2

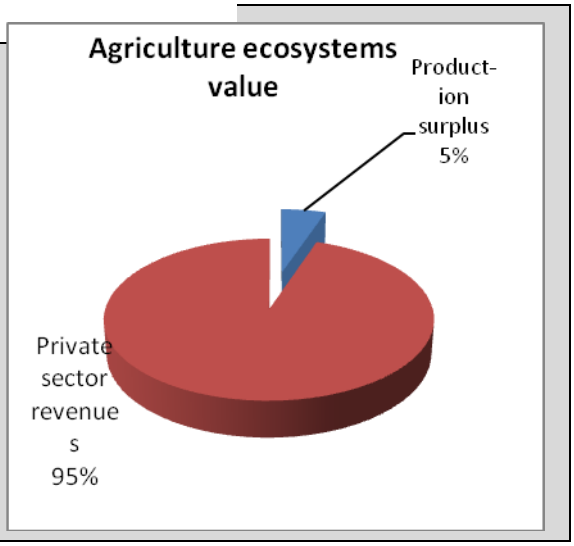


Figure 4-20 and **Figure 4-21** show the PV of food production under BAU and SEM for the five pilot sites. SEM is shown to be superior to BAU by **€**16million (10% discount rate, over 25 years) Due to the fact that some sites are close to SEM management already, the difference between BAU and

SEM in this instance is not so big. MNP's pastures do not have a very high carrying capacity, but MNP has the highest values among the parks due to the large area of pastures.

.Figure 4-20: Food production value – BAU (PV@10% discount rate, 25 years=€174 mill)

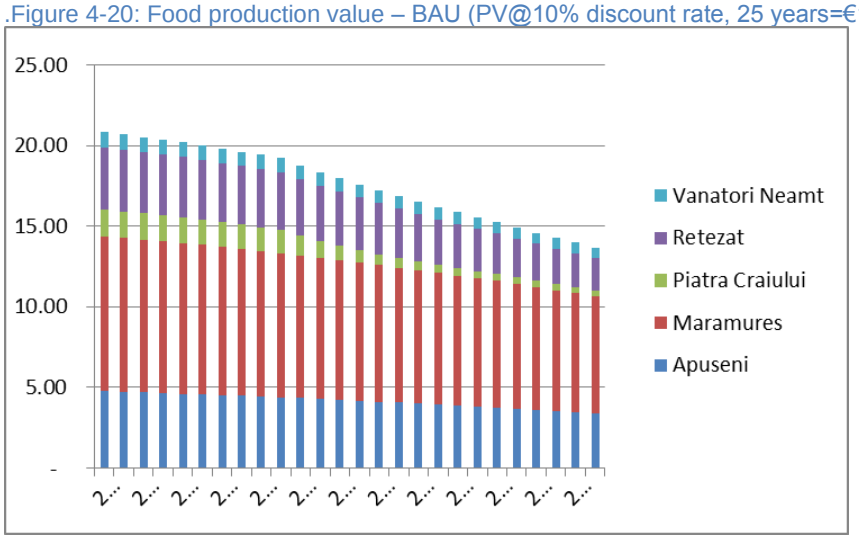
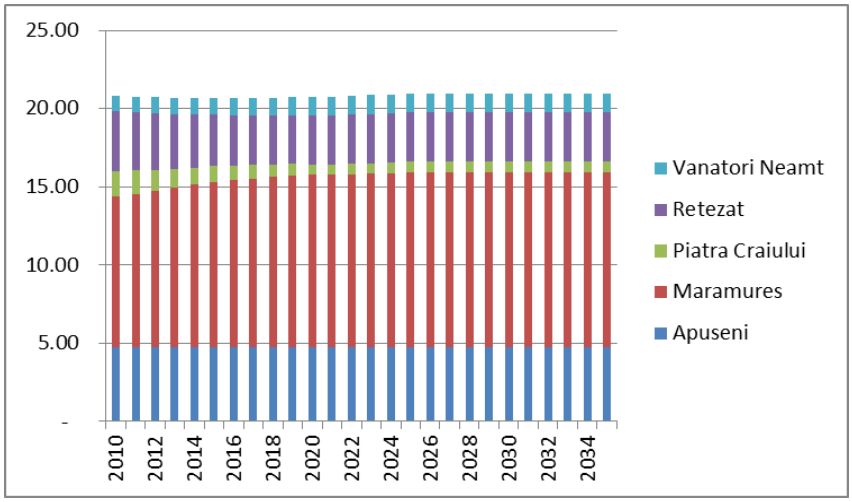


Figure 4-21: Food production value – SEM (PV@10% discount rate over 25 years=€190 mill)



The continuation of BAU in the pilot PAs initially results in stable values. However, values fall after 5 years for two main reasons: (i) for PAs where the carrying capacity is not exceeded, the value of milk declines due a lack of active pasture management; (ii) for PAs where the carrying capacity is exceeded pastures experience rapid degradation as a result of overgrazing.

SEM shows stable values if the aggregate data for the 5 pilot PAs is considered (**Figure 4-21**). However, For PAs where the support capacity is *not* exceeded (i.e. ANP (which is almost in a SEM situation), MNP and VNNP) do not record a significant increase in value under the SEM scenario (**Figure 4-22**). For PAs where the carrying capacity is exceeded (PCNP and ReNP) SEM results in a significant decrease in value compared to the present unsustainable situation in the short run, but achieves a long term equilibrium (**Figure 4-23**).

Figure 4-22: BAU and SEM scenario values for ANP - best case

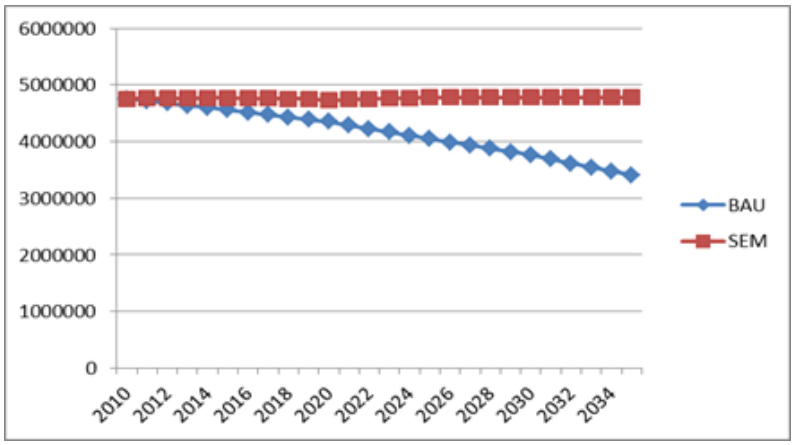


Figure 4-23: BAU and SEM scenario values for PCNP – worst case

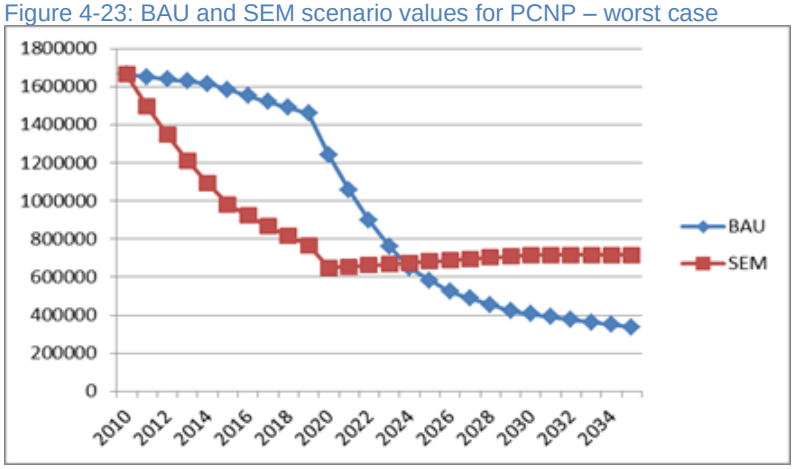
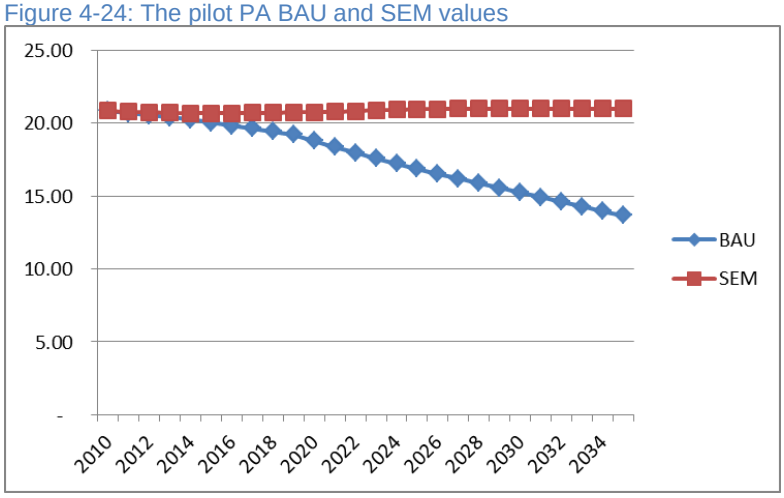
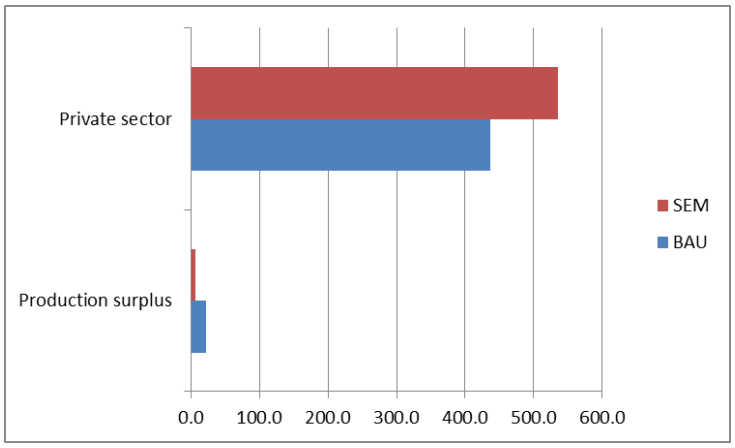


Figure 4-24: The pilot PA BAU and SEM values



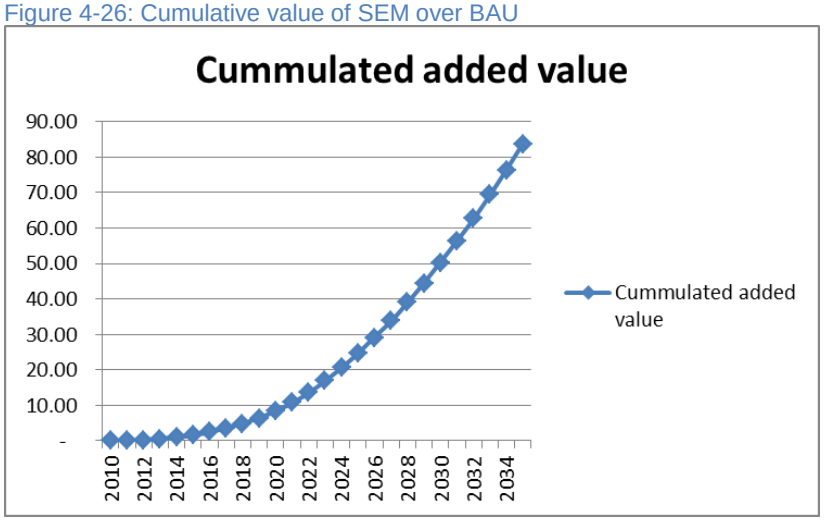
PA authorities are not represented among the beneficiary groups as revenues to PAs authority was not considered under either scenario. The private sector is the main beneficiary and therefore the focus for any potential PES type arrangements. The production surplus relates to the potential added value accuring to animal owners as a result of using the currently untapped carrying capacity (**Figure 4-25**).

Figure 4-25: Potential beneficiaries of SEM over BAU



For the PAs where the carrying capacity is exceeded SEM implies a fall in the value of food provided by pastures in the short and long term. However, the annual values after 10-15 years are significantly bigger than the BAU values, and in addition BAU also sometimes results in irreversible damages to ecosystems (for instance under grazing in the high altitude pastures results in pastures being populated with *Pinus mugo*, thus changing the ecosystem, (Cernelea 2004)). SEM requires motivating local communities to maintain traditional breeding practices. If this is successful, the value added by SEM is significant. **The total cost of continuing business as usual over 25 years, for the agricultural sector for the ecosystems of the 5 PAs is estimated at €84 million (Figure 4-26).** This is considered to be a conservative estimate as the value added through the processing chain is not considered. Furthermore, markets for eco traditional products are growing adding more potential value for the PAs. Quantitative data on these aspects are not available.

Figure 4-26: Cumulative value of SEM over BAU



4.4 The Value of ecosystems in the targeted PAs to Water Supply Sector

4.4.1 Background

Box 4-4: The key findings for the water supply sector

- The ecosystems of targeted PAs provide a number of key regulating services including soil loss prevention and the regulation of water flow and quality.
- Water quality and quantity is very important to the many brands of mineral water sourced from the Carpathian mountains.
- The estimated total cumulative value to the economy of SEM relative to BAU of clean water provision, based on water treatment cost avoided is estimated, at 35.4 million (over 25 years). The NPV of SEM is €0.9 million.
- Private water bottling companies are the main beneficiary and potential partners in PES schemes, which are yet to be explored for the PAs
- Currently, soil erosion is quite well regulated in the ecosystems in PAs, and as a result there is not a significant monetary difference between the BAU and SEM scenario. However, it is important to realize that the benefits provided by the ES could be lost through increased pressures on the ecosystems

Well-maintained mountain ecosystems play a role in water retention and the regulation of surface water flows, which influences soil erosion and sediment transportation, and water filtering which helps maintain water quality. The Romanian Carpathians are the main source of water for a large part of Romania. Furthermore, water quality and quantity is very important to the many brands of mineral water sourced and bottled in the mountains in the west and center of the county as well as to many other industries and households[28].

This section attempts a quantification and monetary estimation of the contribution of PA regulating services - **water regulation and soil erosion prevention** to water users in urban areas and bottled water companies and breweries/soft drinks manufacturers. Its main focus is the costs avoided by SEM and the benefits of clean water.

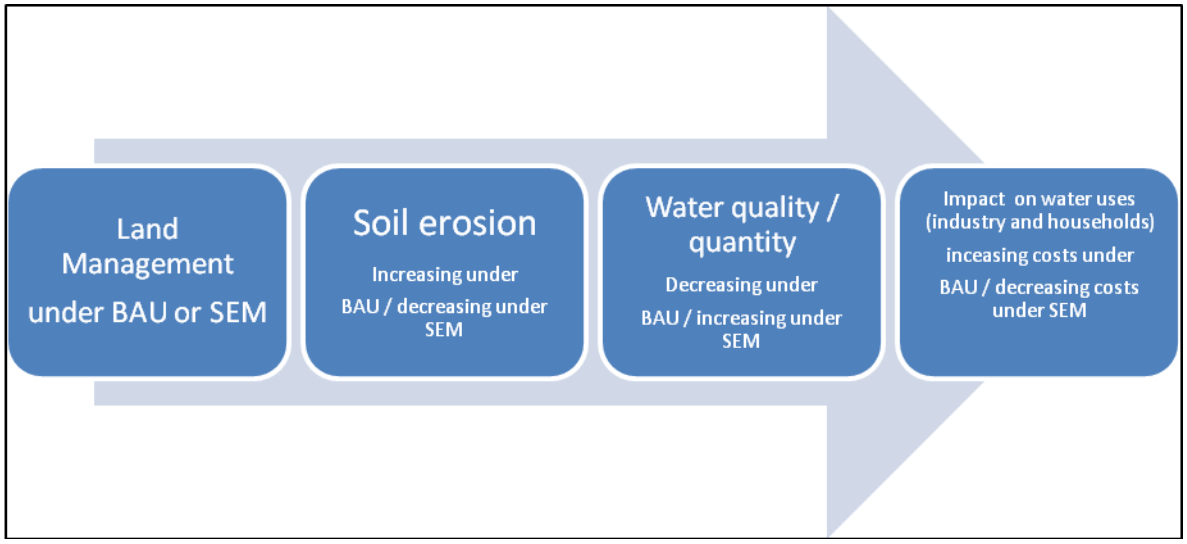
Watershed protection and the development of infrastructure to improve water utilization have a long history in Romania. Infrastructure designed to prevent flooding can be found on many mountain rivers, but the sustainable management of the watershed ecosystems is the key to the whole effort. The legal framework regarding watershed protection includes restrictions regarding the management of forest and pastures in the mountain areas. Unfortunately, in many cases these provisions are not properly enforced, compromising the provision of the regulating services. Reductions in forest cover and even clear cutting in some cases, together with an over utilization of the mountain pastures has resulted in a decrease in the ability of ecosystem to retain water and protect against soil erosion. The optimal provision of regulating services requires SEM, which will maintain forest and pasture ecosystems in the Carpathians PAs.

[28] The area surrounding the pilot PAs is not very important for land cultivation. Irrigation water for agriculture is sourced downstream at some distance from the PAs and has not been considered.

4.4.2 Characterization of BAU and SEM scenarios

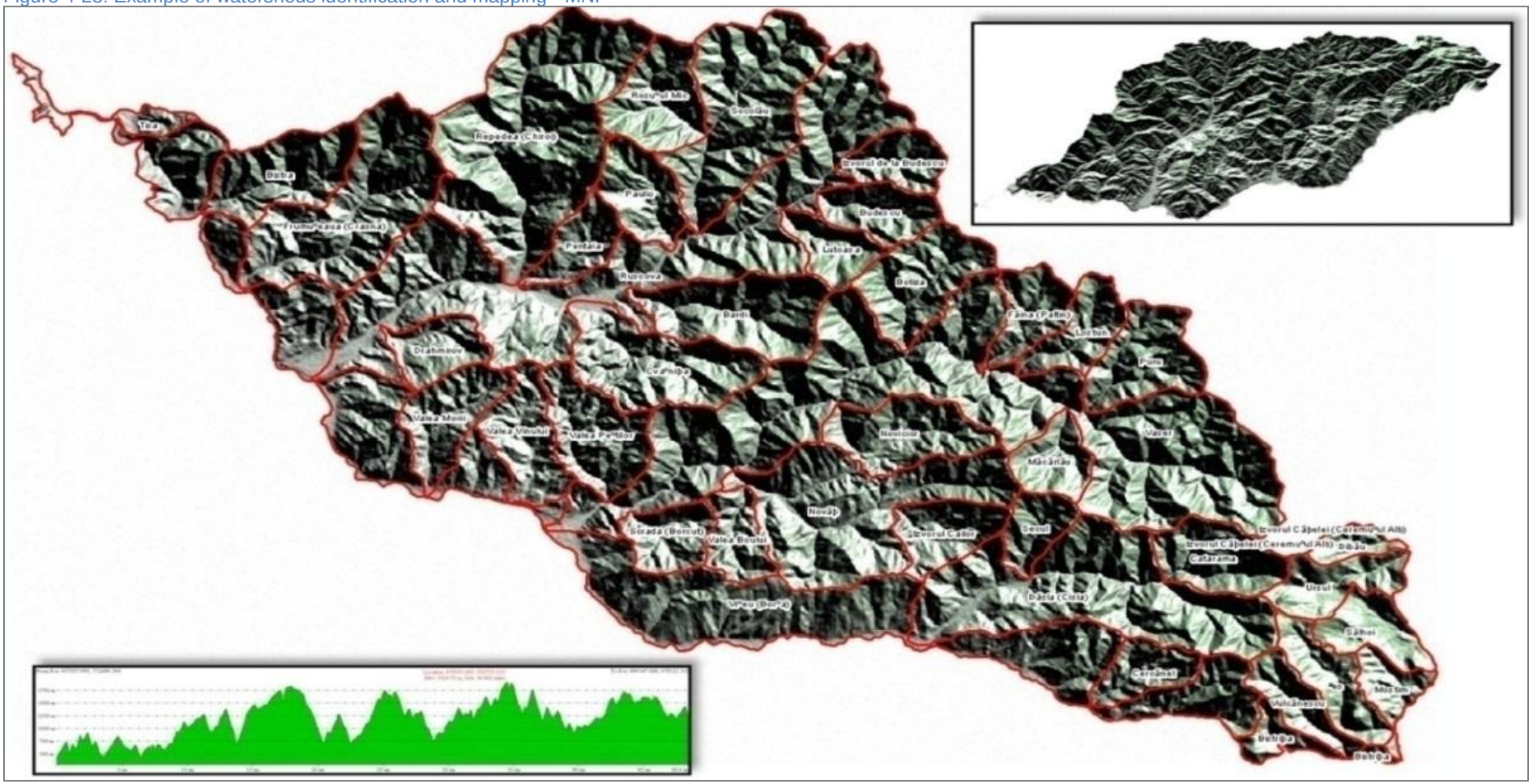
Detailed data were collected and interpreted on the biophysical linkages between ecosystem status, land use and land cover, and impacts on downstream water flow and quality - especially the impact of land use/land cover change on soil loss and the relationship between soil loss and downstream silt/sediment transport. The links between the changes in the quality and quantity of ecosystem regulating services and the monetary value of this change are summarized in **Figure 4-27**.

Figure 4-27:Links between land management and the value of regulating services



Watershed identification and mapping is based on a digital elevation model for each pilot PA. **Figure 4-28** provides an example of watershed identification and mapping in MNP, Transilvania University, 2011). Surface area and the maximum and average slope were calculated for each watershed. To determine the baseline vegetation coverage information was taken from forest management plans submitted by NFA-Romsilva. Based on this information a 25 year model was developed for the BAU and SEM scenarios.

Figure 4-28: Example of watersheds identification and mapping - MNP



Soil erosion was quantified, in order to understand the implications of soil erosion on water quality, turbidity and downstream silt/sediment transportation, using the universal soil loss equation (USLE). It was assumed that under the BAU and SEM scenarios the morphological, soil and pluvial characteristics of the watersheds were the same. The variable used for the BAU and SEM scenario is C – vegetation cover. Under BAU (i.e. a situation where current trends in PA funding, management and use continue, resulting in insufficient spending and an inability to manage threats to the conservation status of ecosystems) the density of the forest stands is considered constant (a conservative approach). Under SEM it is assumed that the density of the forest stand increases and that there is an improvement of pasture habitats (in terms of land coverage) due to their sustainable management.

The model was run over a 25 year period for both the SEM and BAU scenario, deriving annual quantities of eroded soil for all the watersheds in the PAs. Annex 2 provides more details of the model.

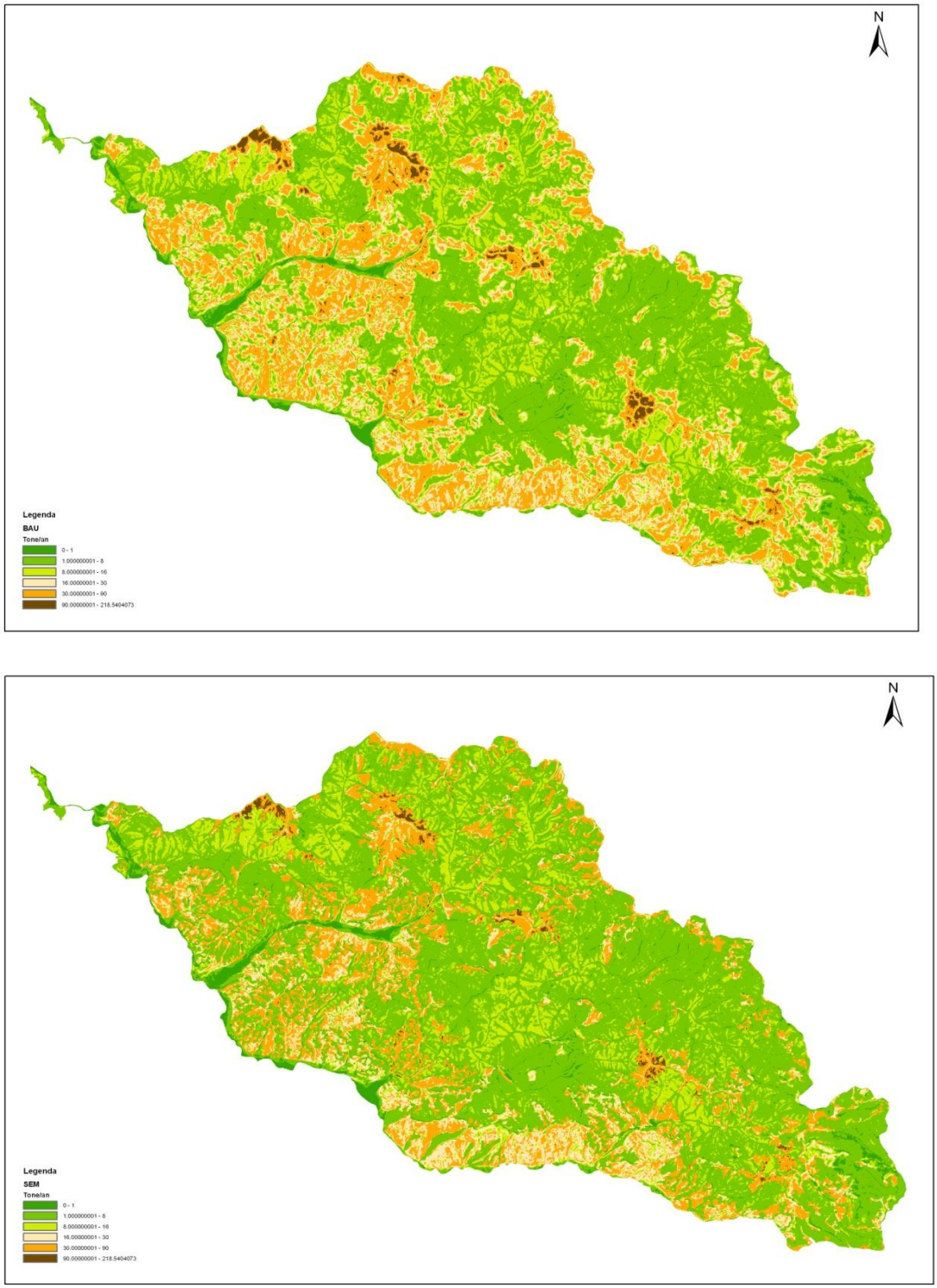
The average quantity of soil eroded under the BAU and SEM scenario for the 5 pilot sites is presented in **Table 4-8**. The difference in the level of soil loss under BAU and SEM are seen not to be significant. This is because management of the PAs is currently not too far off the SEM ideal in terms of the soil erosion protection function provided.

Table 4-8: Average quantity of eroded soil under the BAU and SEM scenarios (*Source: Transilvania University 2012*)

PA	***Average value for erosion rate (t/year and ha)***	
	BAU	*SEM*
Maramures	*17*	*14.5*
Vanatori Neamt	*2.5*	*1.9*
Piatra Craiului	*8.1*	*6.1*
Retezat	*12.3*	*11.3*
Apuseni	*3.6*	*3.11*

Figure 4-29 presents an example of the results of the modeling; it compares the BAU and SEM scenarios for Maramures NP in 2035. The darker the shading the higher the rate of soil erosion rate (i.e. brown reflects higher rates of soil erosion of between 90 and 218.5 t/year and pale green lower rates of soil erosion of between 0 and 8 t/year).

Figure 4-29: Year 2010 PA Maramures, soil erosion areas in BAU (first map) and SEM (second map) scenarios *(Source: Transilvania University 2012)*



Foster (1987) studied the relationship between communities' water treatment costs and soil erosion on Ohio's corn belt, The results indicated that that a 10% reduction in annual gross soil erosion results in a 4% reduction in annual water treatment costs. While this study is quite old and undertaken in the USA, it provides an indicative measure of the relationship between soil erosion and water treatment costs. Available public data (SOP Environment 2008) shows that 15% of the water operator costs account for water treatment.

Bottled water industry

Ecosystems of the Maramures Natural Park support many mineral water springs, but only one (Borsa – Valea Vinului) is used by a commercial water bottling company. SNAM S.A. Bucharest (Societatea Nationala Ape Minerale a sub concession of a private company – DELMAR Ltd) utilizes about 30,000 m^3 of water a year and generates almost €120,000 a year in concession fees for ANRM (source: SNAM 2011, interview). However, the bottling capacity of DELMAR Ltd. is 50,000 m^3 / year. Therefore an additional 20,000 m^3 a year could be utilized, representing the potential to generate additional revenues from concession fees[29] of €80,000 a year.

There are no commercially used mineral water springs in **Apuseni National Park**, but nearby in the Ladului watershed, in the immediate vicinity of the Crisul Cald and Aleu watersheds, there is one of the most important facilities for bottled mineral water in Romania - Stana de Vale. The concession belongs to SNAM SA Bucharest, but is leased by one of the biggest companies in South Europe – European Drinks, who use the springs in Stana de Vale to bottle around 340 million liters of mineral water or derivate beverages. The concession paid to the state budget is around €1,360,000 (SNAM 2011). It is certain that the Stana de Vale spring is influenced by ANP's ecosystem services; it is estimated that 40%-50% of water provision (filtration) depends on ecosystems of ANP (based on the expert opinion of Romania Water's employees), given that two of the nearby watersheds (all the mountain area around Stana de Vale) originate within ANP.

In ReNP, PCNP and VNNP there are no springs used for mineral water either in the PAs or in the vicinity of the parks.

Assuming a conservative production ratio of raw to bottled water of 50% and an average retail price of €0.2/liter, ecosystems in the pilot PAs are key to sustaining the current gross value of companies, which is estimated at €17 million, while potential earnings (based on the estimated water surplus[30] in MMNP and ANP) may add another €10 million.

Urban water supply

Based on the data from the Somes Tisa Basin Management Plan (Rowaters 2010), water from the ecosystems of Maramures Natural Park accounts for approximately 6% of water consumption in the area and serves a population of 113,400. Given that over 90% of rural settlements only use groundwater and do not pay for the consumption, only the urban population using water provided by urban water operators are included in the calculations, that is 63,500 inhabitants (Rowaters 2010)[31]. Consumers pay VITAL S.A Baia Mare, the local water operator, a tariff of €0.4 per m^3 (RON1.75 per m^3).

According to the Somes Tisa Basin Management Plan (Rowaters 2010), water from the Fantanele reservoir covers almost all the consumption in Cluj County. Data from the local water operator SC Compania de Apa Somes shows that 98% of the water used in Cluj Napoca city and the small localities around comes from Tarnita, Somesul Cald and Gilau lakes - Fantanele lake, inside ANP is the source of water for all these lakes. This means it serves a population of around 350,000

[29] The concession fee is the amount of money paid by the concessioner to the state, measured in RON/m^3.
[30] The surplus relates to the available water which is not currently bottled.
[31] 56% of the population is urban

inhabitants. Consumers pay SC Compania de Apa Somes SA, the local water operator, a tariff of €0.35 per m^3 (RON 1.6 per m^3).

According to the Management Plan for Siret Basin (Rowater 2010) urban areas around VNNP (Tg. Neamt mainly) only groundwater.

Urban water for 17,900 inhabitants in Zarnesti town comes entirely from PCNP, from Gura Raului area (interview with CL Zarnesti, 2011). Consumers pay SC Morani Impex SRL, the local water operator, a tariff of €0.08 per m^3 (RON 0.33 per m^3).

Urban water supply for approximately 2,456 households in Hateg and 582 households in Santamaria Orlea is provided by Raul Mare River coming from Gura Apei reservoir, inside the ReNP. This is equal to around 9,100 inhabitants for the two towns. Consumers pay SC Apa Prod SRL Deva, the local water operator, a tariff of €0.3 per m^3 (RON 1.33 per m^3).

Average urban consumption in Romania is 110 liters per person / day (Rowaters 2010). The user fee charged by municipal water operators is €0.01 per m^3 - 43.84 RON per 1,000m^3 (Rowaters 2010). Municipal water operators are public owned companies, and the tariff is cost based, with a minimum profit going to public sector. Based on discussions with Rowaters, it is assumed that these charges include fees paid to Rowaters plus the treatment and distribution costs and a gross profit of 10%. These tariff rates are considered to be low, and therefore consumer surplus is expected to be significant but has not been accounted for.

Table 4-9 summarises the baseline values for water supply provided by the ecosystems of PAs for domestic water supply and to the bottle water industry.

Table 4-9: Baseline value for water supply for the 5 pilot PAs (Euros per year)

Domestic water supply	
a. Water operators – gross revenues from consumers. (i.e. Number of users × water consumption × price).	6,684,147.15
b. Water operators - gross profit. (i.e. gross revenues minus costs for treatment and distribution minus tariffs paid to Rowaters)	2,215,317.67
c. Revenues to ANAR[1] (i.e. revenues of Rowaters from water operators)	177,137.29
d. SUB TOTAL – fresh water ES – urban water (b + c)	2,392,454.96
Bottled water industry	
e. ANRM [2] revenues from existing bottled water concessions	680,000
f. ANRM revenues from potential bottled water concessions	[400,000]
g. Actual income to bottle companies	17,000,000
h. Potential income to bottle companies	[10,000,000]
i. SUB-TOTAL - ES value for bottled water based on (g)	17,000,000
Distribution of revenues from bottle water	
j.PA authorities	0
k.Other government (revenue for ANAR - Rowaters and ANRM + profit of water operators, b + c + e)	3,072,454.96
l. Private sector (g - e)	16,320,000

Notes: 1/Water companies pay Rowaters for using water. They are responsible for treatment and distribution and charge the final user. They are State owned companies, except for the company in Zarnesti-PNP. 2/ ANRM are The National Agency for Mineral Resources. They issue concessions to bottling companies.

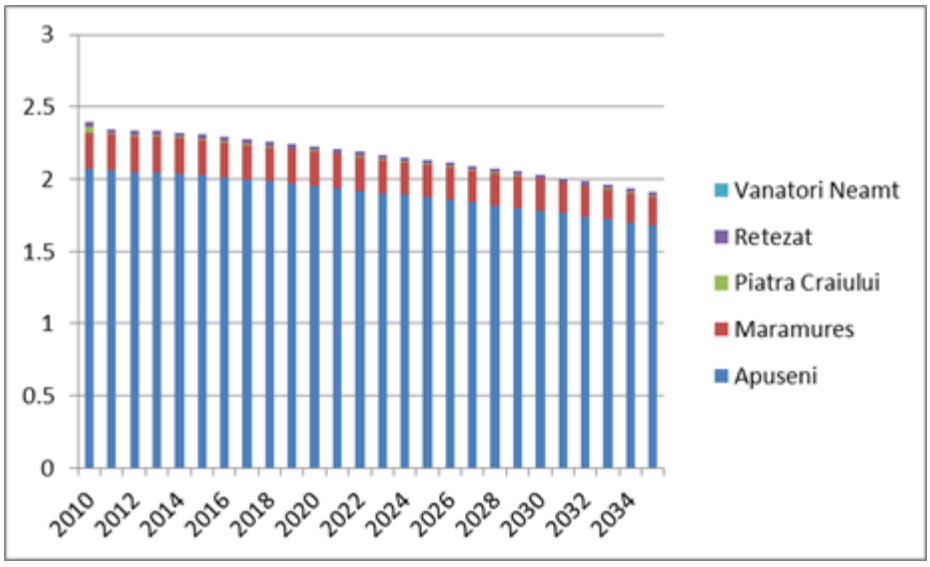
In comparing the BAU and SEM scenarios it is assumed that water treatment and distribution costs will be higher under BAU on account of the higher level of soil erosion(as modeled by the Transilvania University.

A continuation of BAU will result in ongoing soil erosion resulting in higher water treatment costs for urban supply. Under the BAU scenario, the net present value (NPV) of the economic contribution of the ecosystems in the 5 pilot PAs over the next 25 years is just under €20.7 million (**Figure 4-30** [32]). Treatment and distribution costs have been considered.

Proper PA management and law enforcement will result in a progressive increase in the quality of water supplied for urban use related to a decline in soil erosion. Under the SEM scenario the PV of gross economic contribution of the ecosystems of the 5 PAs over the next 25 years is just under €21.5 million (**Figure 4-31**).

For bottled water no significant differences in the benefits are evident between the BAU and SEM scenarios as illustrated in **Figure 4-32** and **Figure 4-33**. This is because the current management of the sites is quite close to the sustainable ecosystem management level, hence while soil erosion quantities decrease under the SEM scenario, their influence over the monetary values captured downstream is not that big. Over a 25 year time horizon, the SEM generates additional benefits of €0.9 million (NPV, 10% discount rate over 25 years).

Figure 4-30: Estimated values of the fresh water ecosystems of 5 PAs –urban water supply – BAU (PV@10% discount rate, 25 years =€20.7mill)



[32] In the calculations for the graph in Figure 4-30 and Figure 4-32 the bottle water industry was not considered.

Figure 4-31: Estimated values of the fresh water ecosystems 5 PAs – urban water supply – SEM (PV@10% discount rate, 25 years =€21.5mill)

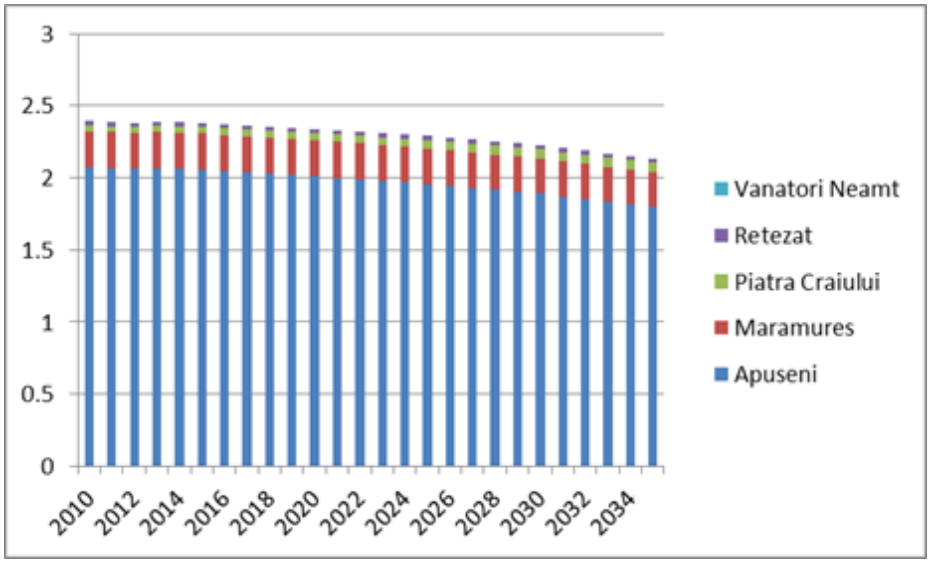


Figure 4-32: Estimated values of the FW ecosystems of 5 PAs –urban and bottled water supply – BAU (PV@10% discount rate, 25 years =€176.3mill)

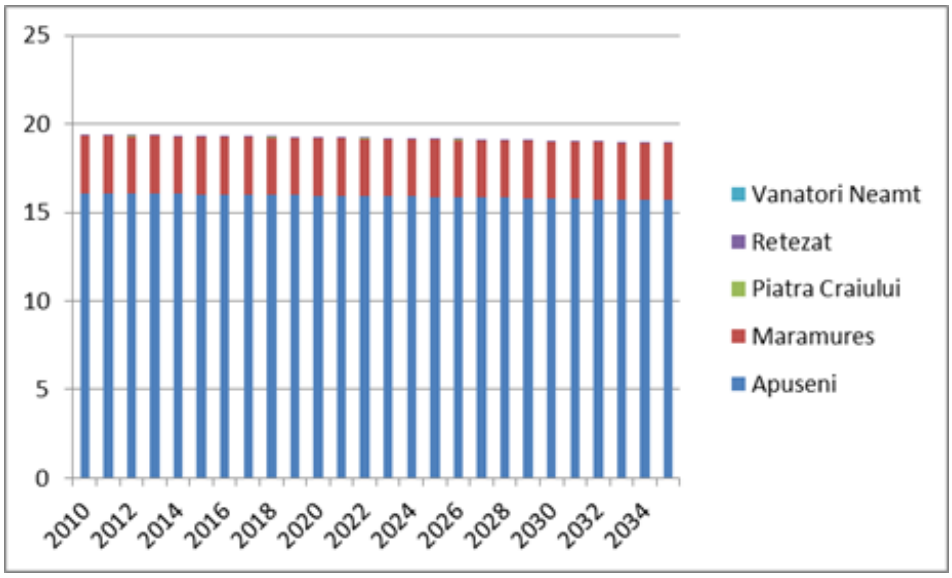
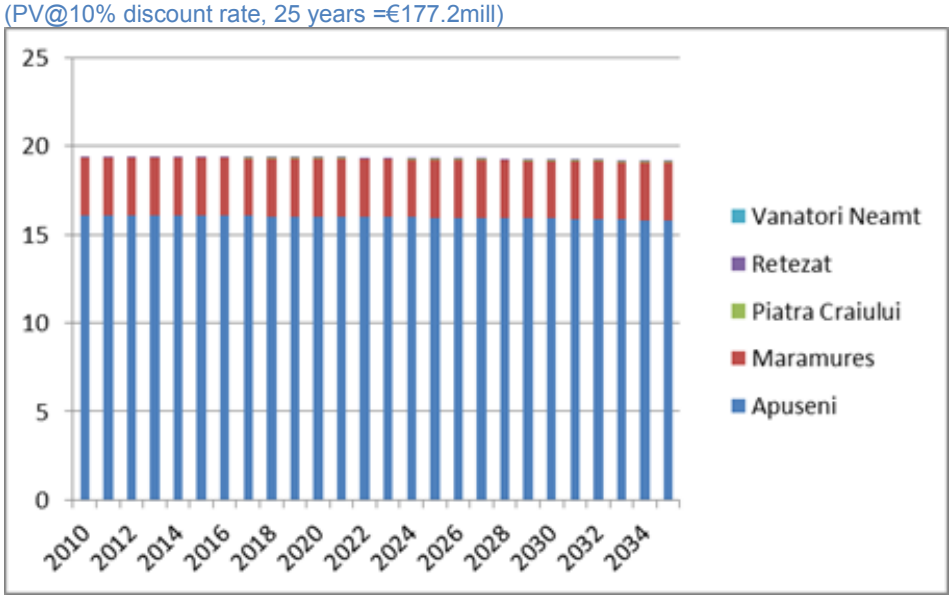


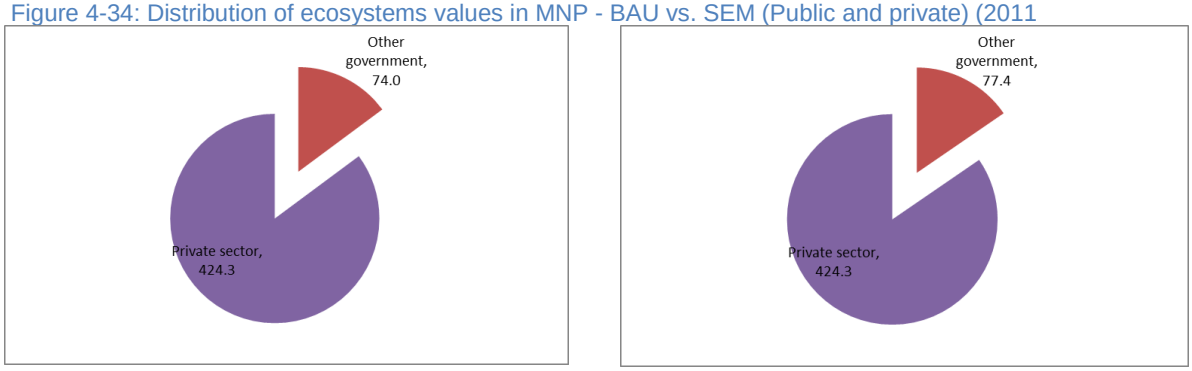
Figure 4-33: Estimated values of the Fresh Water ecosystems of 5 PAs – urban and bottled water supply – SEM (PV@10% discount rate, 25 years =€177.2mill)



The private sector is the main beneficiary, indicating that for the pilot PAs the private sector is the main stakeholders with whom to explore potential payments for ecosystem services schemes (**Figure 4-34**). The State water operators gain some value under the SEM scenario due to an increased profitability as result of the reduced treatment costs. PA authorities are not represented among the beneficiary groups under the BAU or SEM scenarios, as revenues to PAs authority have not been considered. However, the future PES mechanism may be able to address this. Improvements in private sector revenue may also lead to increased revenues for local and national budgets, through taxes due on profit.

It should also be noted that capturing the willingness to pay for clean water is an important issue for the future. Setting up the mechanisms to do this will cost money and it will take time to build awareness among the population about the importance of a resource that is currently cheap and in good supply.

Figure 4-34: Distribution of ecosystems values in MNP - BAU vs. SEM (Public and private) (2011



The ecosystems in the 5 pilot PAs provide valuable water regulation and soil erosion regulation services, which contribute to the provision of clean water. The total cumulative value to the economy of SEM relative to BAU, based on water treatment cost avoided is estimated at €35.4 million (over 25

years). Private water bottling companies are the main beneficiary and potential partners in PES systems.

Around 70% of the watershed areas in the PAs are forested and soil erosion is currently well regulated, as a result there is not a significant monetary difference between the BAU and SEM scenario. However, it is important to note that the benefits provided by the ES could be lost through increases pressures on the sites.

4.5 Natural Disaster mitigation and risk reduction

Box 4-5: Key findings for natural disaster and risk reduction sector

- Romania has a long history of natural disasters (floods and landslides). The *potential* economic loss associated with these events is estimated at 6% of the GDP accounting for approximately $2,300 million a year, with an annual probability of occurrence of 0.5 % (World Bank 2008).
- The quality and quantity of ecosystems significantly impacts the frequency and severity of natural disasters and the growing emphasis on PAs could play a significant role in risk reduction under sustainable forest ecosystem management.
- If the upstream protection functions of the ecosystems of 3 pilot PAs serve to minimize the impact of floods by 25% below what it would have been in the absence of the protective functions, then the ecosystems' value of flood control in terms of avoided **damage costs** (projected on a *pro rata* basis) equates to an average of €0.4 million a year – 9 million a year based on a damage cost avoided and preventative expenditure approach respectively.
- When applying the damage cost avoided and preventative expenditure values as upper and lower value limits **for the ecosystems of the 5 pilot PAs over the next 25 years, the water retention regulating services within the PAs in terms of mitigating natural disasters (flood control),** is valued at between € 27 million and €182 million (under BAU) and €44 million and €482 million under SEM.

4.5.1 Background

Floods and landslides rank among the major natural hazards facing mountain areas in Romania. Annual average incidence of major flood related events in Romania is 1.03 events / year with an exposed population of 1,174,894 people. The potential economic loss associated with these events is estimated at 6% of GDP accounting for approximately US$2,300 million a year, with an annual probability of occurrence of 0.5 % (World Bank 2008). Statistics show that farmland, housing, traffic and communication lines are endangered by flooding. Over recent years there have been marked increases in losses from property damage and lost revenue due to business interruption caused by extreme weather events. Major flooding events were recorded in July 2004, July and September 2005 and March 2006 affecting 14,128, 14,669, 30,800 and 17,071 people respectively (WHO 2011). Flooding is particularly intense in mountainous areas and low-lying floodplains (MEF 2005). It is likely that the frequency and severity of these events will increase in the future, both due to on-going ecosystem degradation and because of climate change.

Romania has had to live with natural disasters for a long time, and has adopted specific regulations aimed at minimizing their risk. These regulations were effective before the fall of the communist

regime, when the state was the major land owner. For example, the forest categorization system (e.g. T1 and T2 – protection forests) was driven by the recognition of the protection role of the forest, not only for biodiversity conservation, but in particular for water and soil erosion regulation.

Due to changes in property ownership, regulations being less strictly enforced during the transition period, forest overharvesting (sometimes clear cutting) and increasing pressure on pastures and agricultural land the protective role of ecosystems has diminished, and the incidence of floods and landslides has increased in the last 10-15 years. Infrastructure developed to reduce the impact of natural disasters such as dams, slope regulating systems, torrent regulating infrastructure, etc. has been virtually abandoned or insufficiently maintained in some areas. This has also contributed to an increase in the incidence of disaster events, although it is hard to isolate the influence of the damaged ecosystems from the poor maintenance or lack of protective infrastructure.

The quality and quantity of ecosystems significantly impacts the frequency and severity of natural disasters and the growing emphasis on PAs could play a significant role in risk reduction under a sustainable ecosystem management scenario.

4.5.2 Characterization of BAU and SEM scenarios

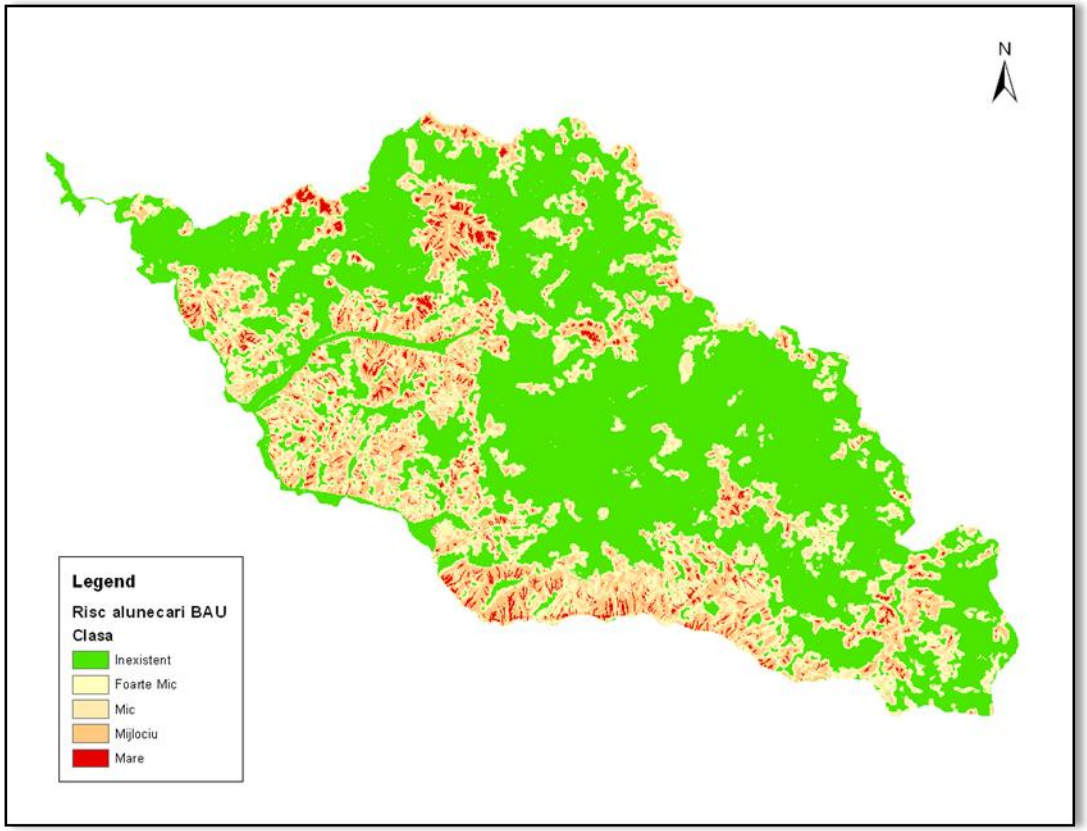
In order to value role of the ecosystems of PAs in mitigating floods and landslides, the assumptions used to estimate soil erosion were adopted (see section 4.4.2). Under the BAU scenario the density of the forest stands is conservatively considered to be constant. Under the SEM scenario it is assumed that the density of the forest stands increases and that there is an improvement in natural pasture habitats (in terms of land coverage) due their sustainable management.

The assumptions are based on the fact that under the BAU scenario, the unsustainable management of the forests and the inactive management of pastures (or overgrazing in some case) will decrease the water retention functions of the ecosystems. This translates into a higher incidence of flash floods. Conversely under the SEM scenario, the water retention function is stronger resulting in a decreased incident of flash floods.

The methodology adopted required accessing a large volume of information across many sectors and was prompted by the finding that there is a strong correlation between eroded soil quantity and disaster risk (Pradhan 2011)[33]. The results show a direct proportionality between soil erosion and the risk of landslide and floods events. Forested areas (in green) have no disaster risk while deforested areas have the highest risk (in red).The intermediary levels are: very small risk, small risk, medium risk. Risk for floods and landslide event were calculated based on eroded soil quantity using different scientific formula and indicators (**Figure 4-35**)[34].

[33] Several case studies published in 2010 and 2011 demonstrate a direct link between soil erosion and the risk of landslide.
[34] Formulas are based on a digital model of the terrain (expressed by indicators) and soil erosion quantities that are measured. The results are based on extrapolating the measured results and finding average empirical coefficients.

Figure 4-35: Disaster risk map in MNP (source Transilvania University 2011)



Risk maps and the percentage of area at risk have been derived for each pilot site. **Table 4-10** summarizes the results of the BAU and SEM modeling for the ecosystems in the pilot PAs. For VNNP the results show no difference between BAU and SEM, this largely due to the lower altitude and gentler slopes found in the park.

Table 4-10: Risk level as % of forest coverage under BAU and SEM in targeted PAs.

PA	Risk level	% of surface - BAU	% of surface - SEM
Apuseni	Low and very low	96	99
	Moderate	3	1
	High and very high	1	0
Muntii Maramuresului	Low and very low	75	90
	Moderate	21	9
	High and very high	4	1
Piatra Craiului	Low and very low	97	99
	Moderate	3	1
	High and very high	0	0
Retezat	Low and very low	99	100
	Moderate	1	0
	High and very high	0	0
Vanatori Neamt	Low and very low	99	99
	Moderate	1	1
	High and very high	0	0

The results indicate that the differences between BAU and SEM are significant only for MNP, PCNP and ANP. For ReNP and VNNP the differences are very small. These findings correlate with data

recorded for disaster events; there are major floods recorded for the last years in MNP, some events took place in ANP and PCNP while almost no major events were recorded in ReNP and VNNP. The data were translated into a general decreasing annual incidence of major flood events, used when calculating the costs avoided by SEM. The decreasing incidence of floods for the pilot parks under SEM are shown in **Table 4-11**, along with the BAU scenario indicators.

Table 4-11: Characterization of BAU and SEM values for floods incidence

Site	indicator	BAU	SEM
General	Number of people affected by flash floods	Change in line with population plus a factor of 1.2 to account for increasing density of settlement & development	
	% of potentially affected population avoiding damages	Decreasing 1% years 1-5, 1% years 5-10, 2% years 10-15, 3% years 15-20, 4% years 20-25	Increasing 5% years 1-15, 4% years 15-25
	Forest capacity to prevent flood events	Decreasing 1% years 1-5, 2 % years 5-10, 3% years 15-25	Increasing 5% years 1-10, 3% years 10-25
	Costs / expenditures avoided / ha	Change in line with population plus a factor of 1.2 to account for increasing density of settlement & development	
	Forest surfaces considered	Double the T1 and T2 area	
ANP	Frequency of flash floods/year	Increasing 0.1% years 1-15, 0.3% years 15-25	Decreasing 2% years 1-5;, 1% years 5-25
MNP		Increasing 0.2% years 1-15, 0.5% years 15-25	Decreasing 3% years 1-5, 2% years 5-25
PCNP		Increasing 0.05% years 1-15, 0.15% years 15-25	Decreasing 1% years 1-5; 0.5% years 5-25

Given the results of the risk assessment, which covered a 25 year period, and the availability of data (some records are only for ANP, MNP and PCNP) the valuation was based on the average number of people affected by floods and expenditures to repair infrastructure (CJAlba 2010, CJCluj 2010, CJ Bihor 2010, CJ Brasov 2010, CJ Arges 2010) for ANP and PCNP. For the two PAs the total population affected is around 1,500 and damage to public infrastructure is estimated at €1,543,300. No comprehensive MNP-level data are available on either the damage costs associated with floods and landslides, or of the expenditures that are made to prevent or mitigate them. Detailed data can be found about the area of Borsa, Viseu de sus and Poienile de sub Munte related to flood and landslide events in July 2008 (CJM 2008). Damage due to floods was reported by 677 households in Viseu de sus, Borsa and Poienile de sub Munte municipalities, all inside the park: affecting 2,600 people. The total compensation directly paid to the population was €84,000, or €124 per household. In addition, damage to public and commercial infrastructure (roads and bridges) was estimated to total €3.0 million. The number of households affected by flooding around Vaser Valley in 2008 accounts for just 19% of the total population affected by internationally reported floods in 2004 and 2006 (WHO 2011). It is clear that the Carpathian PAs may play an appreciable role in providing flood mitigation in Romania which is regularly affected by flooding. Extrapolating the historical data on the frequency and impact of flooding events, we can assume that a flash flood (affecting 2,500 people) occurs every 1.03 years.

If the upstream protection functions of the 3 pilot PAs serve to minimize the impact of floods by just 25% below what it would have been in the absence of the protective functions, then the value of flood control in terms of **damage costs avoided** (projected on a *pro rata* basis) equates to an average of €1.3 million a year.

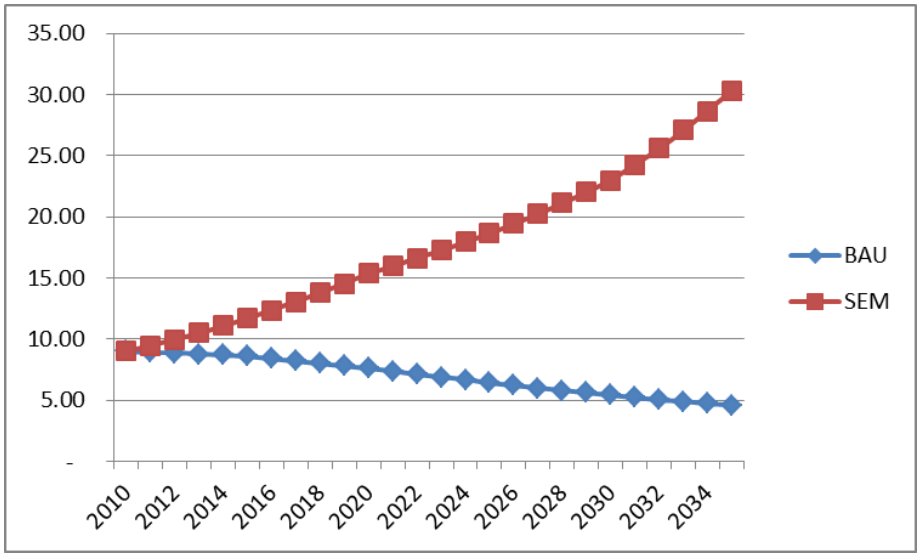
It is also possible to look at the **preventive expenditures**. Work carried out in 2007 in MNP estimates the value of water regulation and flood control services provided by forested ecosystems

from public expenditures at €150/hectare – equivalent to €181 in 2010 prices (Ceroni 2007)[35]. If these values are applied to a surface equal to twice the area T1 and T2 forests in all 5 PAs[36], and assuming that the forest's flood mitigation capacity is 60%[37], this translates into annual benefits of some €9 million a year (**Figure 4-36**). Applying the BAU and SEM scenario over the data processed using Ceroni's model results in much higher values compared to the damage cost avoided approach, but the data is scarce and unreliable.

Figure 4-36: Estimated value of ecosystems in Pilot PAs in terms of flood prevention services

	EUR
Damage costs avoided	1,364,641
Preventive expenditures avoided	8,992,138
Total PA flood protection value	1.3 – 9.0 million

Figure 4-37: Potential benefits of the ecosystems in 5 PAs in damage costs reduction – using forest surface approach (Ceroni 2007).



A continuation of business as usual will result initially in a slow decrease followed from 2020 with a dramatic decrease in damage cost avoided due to the increased incidents of floods coupled with the reduced ecosystem protection capacity. Under the SEM scenario there is a slow increase in the damage costs avoided. Under the BAU scenario, the present value (PV) of the damage costs avoided by ecosystem services in the pilot PAs over the next 25 years is just over €10.8 million. The PV for SEM scenario is estimated at €14.5 million (**Figure 4-38** and **Figure 4-39**). Under the preventative cost approach the cost under BAU is 67.061 million and under SEM – 119.301 million.

[35] In this study values were derived from Croitoru et al. (2007) who estimated watershed protection values based on direct public spending to protect forest with a hydrological value. Croitoru reports values between 45 and 150 euro per hectare per year for different Mediterranean countries including Slovenia and Croatia. The upper value of 150 euro (502.05 RON) per hectare from Croitoru was chosen for application in MNP, given that the area is particularly prone to floods. This value is most likely an underestimate of the public spending necessary to fully protect the water regulation functions in MNP"

[36] This is taken to be a conservative approach, as it does not consider the whole forest area

[37] Conservative estimate - based on expert opinion.

Figure 4-38: Costs saved by ecosystem services of Pilot PAs - BAU (PV@10%=10.8 million EUR)

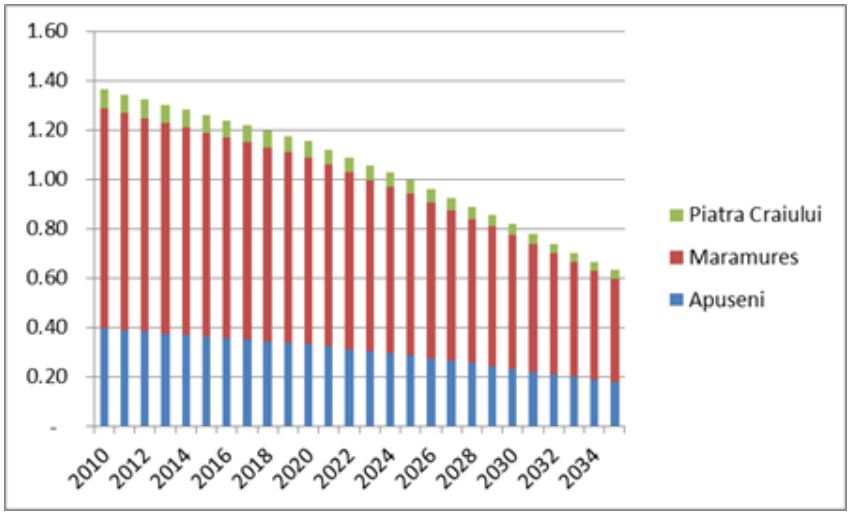


Figure 4-39: Costs saved by Ecosystem services of Pilot PAs - SEM (PV@10%=14.5 million EUR)

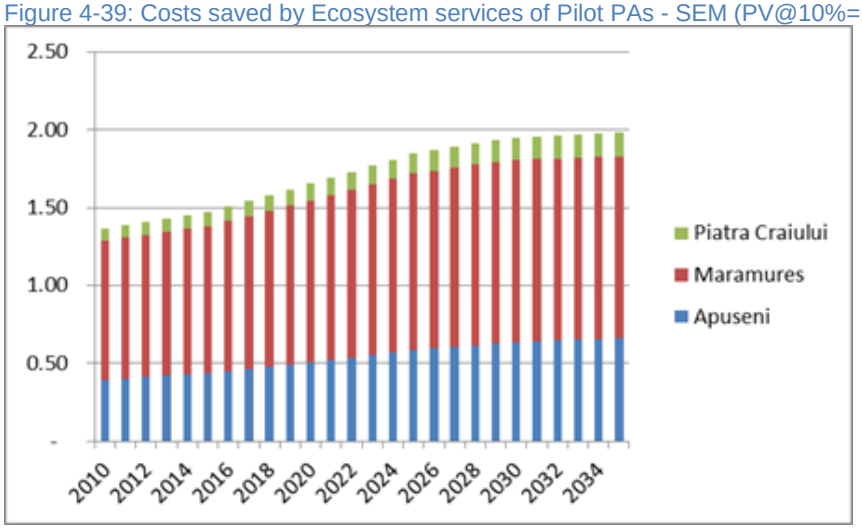


Figure 4-40: Costs saved by ecosystem services of the Pilot PAs (preventive costs included) - BAU (PV@10%=67.1 million EUR)

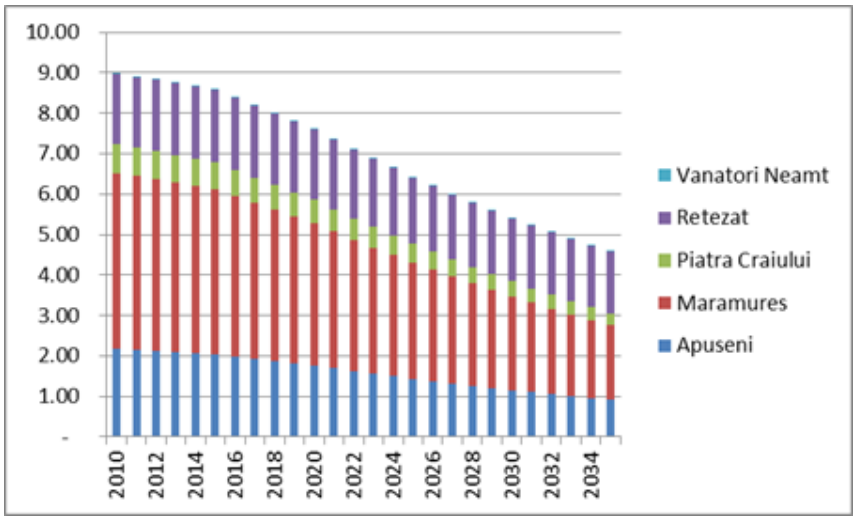
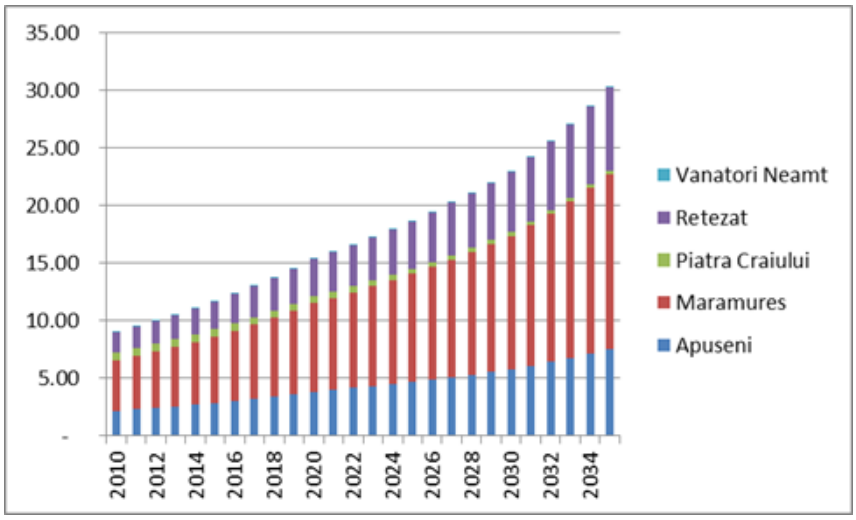


Figure 4-41: Costs saved by Ecosystem services of.Pilot PAs (preventive costs included- SEM (PV@10%=119.3 million EUR)



While the risk/surface estimation data are quite reliable, the lack of data regarding flashfloods in the PA areas, as well as difficulties in processing the data (averages, estimates, etc) lead to uncertainties in the final estimates. The following should be taken into consideration:

- Damage cost avoided approach: For ANP and PCNP only public expenditures to repair public infrastructure were considered. Damages and costs for private households were not considered. For MNP only data estimated for a certain valley within the park were considered, and the costs for households were estimated based on official reports on compensation for household loses, while the real costs are assumed to be higher. As a consequence, the values presented using this approach are quite conservative;
- Preventative expenditure approach: In terms of the study in MNP (Ceroni 2007) there are numerous uncertainties and assumptions that raise question marks about the reliability of the results. As a consequence, this approach is considered to be less conservative.

Taking the two values derived from the damage cost avoided approach and the preventative expenditure approach to represent upper and lower limits, the water retention (flood mitigation) service provided by ecosystems of the 5 pilot PAs, the cumulative value of SEM relative to BAU is estimated at €17 - €300 million over the 25 year appraisal horizon. This is the cost that can be avoided through SEM.

5 The estimated values of ecosystems of PAs at the national level

While it is useful to have an estimate of the contribution individual parks, and the 5 pilot parks overall, make to the Romanian economy and welfare, there are conservation benefits in managing the PAs as a network. Therefore an understanding of the economic importance of the overall network of PAs is important. This Chapter attempts a high level estimation of the contribution of the Carpathian System as a whole to Romania's economy based on the evidence generated on the five pilot PAs. It also set outs the steps to developing and refining this assessment.

There are currently 106 PAs in Romania covering a total area of 1,057.487 hectares. The Ministry of Environment and Sustainable Development are legally responsible for these PAs. There are 21 major protected areas (12 national parks and 10 nature parks) included in the Romanian CNPA. Annex 3 presents an overview of the Carpathian PAs noting their total surface areas and forest cover. It also provides a qualitative assessment of the Romanian Carpathian Protected Areas, including the 5 pilot sites, based on the expert opinion of the park managers and the study team. On the basis of the qualitative assessment across the sites, the pilot studies can be taken to be broadly representative of the network as a whole in terms of the range of Ecosystem Services they provide and the relative significance of these services.

5.1 High level assessment of PA ecosystems at system-level to the economy

Annex 5 provides an overall summary table of the valuation approach, findings and uncertainties for each of the PA ecosystem service assessed in this study. **Table 5-1** based on Annex 5 estimates the NPV of SEM (based on the PV of SEM minus the PV of BAU) for the 5 sites at €518 million. The cumulative value of all five PAs is €2,794 million. A very high level estimate of the value of the entire Carpathian network of PAs can be based on the value of the ecosystem services of the 5 pilot PAs, which represents just over 30% of the total area of the entire network (**Table 5-1**). This is estimated at a NPV for SEM of €1,685 million and a cumulative value of €9,084 million.

Table 5-1: Summary of ecosystems values for the 5 pilot sites

ES Type	Service	BAU Value (PV @10%, 2011-2035, mill EUR)	SEM value (PV@10%, 2011-2035, mill EUR)	NPV (PV SEM – PV BAU) @10%, 2011-2035, mill EUR	Total cumulative benefit under SEM (25 years, mill EUR)
Provisioning Services	Food / agriculture products	174.00	190.00	16	83.90
	Wood & NTFPs	77.30	74.50	-2.8	-2.80
	Water supply (reduced treatment costs associated with regulating services of soil erosion and water flow regulation)	176.3	177.2	0.9	35.4
	Source of energy (fuel etc)	0.00	0.00	.-	0.00
Regulating Services	Regulation of GHGs	14.40	20.20	5.80	33.30
	Micro-climate stabilization	0.00	0.00	-	0.00
	Soil erosion and water regulation (storage and retention) related to disaster mitigation	10.80	14.40	3.60	17.50
	Nutrient retention	0.00	0.00	-	0.00
Cultural Services	Spiritual, religious, cultural heritage	0.00	0.00	-	0.00
	Educational	0.00	0.00	-	0.00
	Recreation and ecotourism	787.20	1,282.90	494.8	2,626.80
	Landscape and amenity	0.00	0.00	-	0.00
	Biodiversity non-use	0.00	0.00	-	0.00
	TOTAL	1,440.7	2,000.6	556.4	2,794

These aggregated results should be taken as a very high level indicative estimate. They are based on the estimates for five pilot sites which themselves include a number of assumptions and uncertainties. To refine the estimates sites specific studies of the sites could be undertaken, especially for their tourism values which is a key driver for the 5 pilot sites studies. The aggregated value may be an underestimate in that many ecosystem services have not been valued, but the estimated services may also be overestimated due to the fact that many of costs of SEM have not be taken into consideration.

Importantly the dependency of the values to scale also needs to be taken into consideration. For some services, for example recreation and tourism there is a steep relationship between area (scale) and value. That is the provision of the first few sites bring high benefits, but adding more and more sites can add relatively little to total value. Therefore independently valuing sites and adding them up can lead to a misleading assessment. The overall assessment of the area needs to account for changing marginal values as total quantities change over a region (i.e. taking into account substitute sites in the case of tourism values).

5.2 The costs of SEM

The financial (management) costs of BAU and SEM have not been considered in detail as part of this study, which has focussed on illuminating the cost of BAU in terms of ecosystem service degradation and hence the ability of PA ecosystem services to support productive sectors. This section provides an overview of the financial costs associated with the optimal management of the Carpathian PAs, for the 5 pilot PAs, based on a recent assessment by NFA-Romsilva (2010 figures).

Table 5-2 presents the financial gap analysis by program area for the five pilot sites. The total gap is estimated to be €666,658 / year. More detail on cost categories in provided in **Table 5-3**. **Figure 5-1** presents the FTE gap analysis by program area.

It should be noted that the PAs have not yet developed yet an ecosystems-based PA management plan, so the cost indicated here may be underestimates. This will needed. Nad further discuss in the conclusions and recommendations.

If we assume that costs are constant over 25 years, the total cost over 25 years to optimally manage tourism is €2.8 million (compared to €2,626 million in estimated benefits). This suggests that the investment in SEM (optimal management), for which total cumulative cost would be €16.7 million, is cost beneficial.

Table 5-2: Financial gap analysis by program area, per year

Cost category	Available	Basic (gap)	Optimal (gap)	Total
Biodiversity management	70,212	99,121	263,098	432,431
Tourism	24,856	50,040	39,480	114,376
Awareness, heritage, local development	9,128	7,940	11,048	28,116
management & admin	37,819	28,392	28,524	94,735
TOTAL	142,015	185,493	342,150	669,658

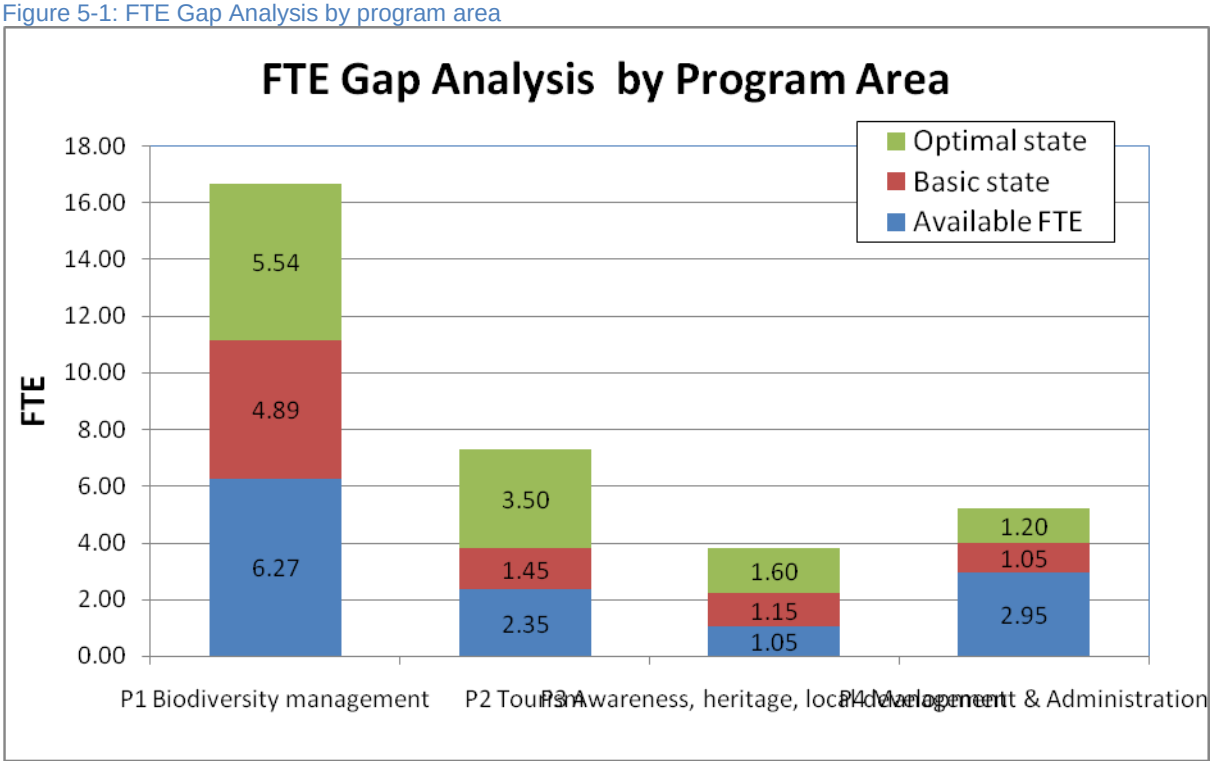
Source: NFA-Romsilva

Table 5-3:. Overview of Cost Categorizes

P1 Biodiversity management	1.1. Inventory and mapping 1.2. . Monitoring the conservation state 1.3. Patrol, implement regulations, special measures of protection 1.4. Data management 1.5. Reintroduction of extinct species 1.6. Ecological reconstruction
P2 Tourism	2.1. Recreational infrastructure 2.2. Tourism opportunities and services, information, marketing and promotion 2.3. Visitor management
P3 Awareness, heritage, local development	3.1. Traditions and communities 3.2. Public awareness and communication 3.3. Ecological education
P4 Management & Administration	4.1. Equipment and infrastructure 4.2. Management staff 4.3. Strategic documents and planning 4.4. Staff Training

Source: NFA-Romsilva

Figure 5-1: FTE Gap Analysis by program area



6 Conclusions and Recommendations

6.1 Conclusions

This study has attempted an initial assessment of the economic contribution of the ecosystems of the Carpathian Network of PAs. It has adopted an ecosystem-based Sector Scenario Approach, the objective of which is to provide evidence of the contribution of PA ecosystem services to productivity and growth for key sectors of the economy and to identify appropriate policies that enhance the provision of these ecosystem services over the long term.

The results show that there are significant benefits associated with moving from the BAU management of the areas to SEM. The NPV of SEM (based on the PV of SEM minus the PV of BAU) for the 5 sites is estimated at €518 million. The additional cumulative value of ecosystems under SEM in the five PAs is estimated at around €2,800 million (over 25 years). However, it is important to recognise that many ecosystem services are being provided/operating at close to the SEM level (e.g. the watershed protection function of the parks which contributes to soil stabilisation and water flow regulation and purification and grazing lands in some parks). Therefore, the significant benefits already provided (under the BAU scenario) are at risk if the parks at not sustainably managed. Note therefore needs to be taken of the values that could be lost as a result of damage or loss of the ecosystem service. In such cases the significant values under BAU need to be protected and enhanced where possible.

The results can be taken as an underestimate of the value of the ecosystems in the five pilot sites given that a number of ecosystem services are not accounted for. These include fisheries, hydropower, micro-climate stabilisation, nutrient retention, spiritual, religious and cultural heritage, education, landscape and amenity and biodiversity non-use.

Fisheries and hydropower are dependent on water quality and quantity. The monetary significance of these sectors under BAU and SEM is yet to be properly assessed. However, significant economic cost could be imposed through a deterioration in ecosystem heath (for example loss of watershed protection forest and increase soil erosion could result in siltation of downstream dams adversely affecting electricity production cost and profitability).

Inevitably movement towards SEM will incur **costs** – for example SEM for the tourism sector requires investment in visitor centres, infrastructure and staff to monitoring and manage tourism flows, while SEM for the forestry and agriculture sector will require compensation payments for restriction imposed on existing activities. By and large these costs are not included in the analysis and the benefits of SEM may therefore be overestimated. However based on a high level comparison of the cost of optimally managing the PAs, the benefits are shown to outweigh the costs many times.

There are a number of uncertainties surrounding the estimates that could be reduced through further studies. There is uncertainty related to the valuation approaches used (e.g. benefit transfer has been used in a number of instances and site specific studies are required for more reliability) and the

physical data (e.g. there are limited surveys of visitor numbers, WTP, CS and tourist profiles). However, of note is the fact that this study has been able to contribute to the availability of scientific data through the site specific modelling that has been undertake to determine soil erosion and associated changes in water flow and quality.

The analysis highlights the difficulties in estimating the regulating services and specifying how regulating services interact to provide ultimate benefits. For example soil erosion underpins the water quantity and quality estimates used to estimate water treatment costs. The analysis also highlights the interdependencies between sectors. For example, ecotourism depends on SEM within agriculture, forest and the water resources sector.

The key sector benefiting from PAs is shown to be the tourism sector which if sustainably managed has the potential to generate an additional €2,626 million over the next 25 years (94% of the total additional value of SEM). It is important to note that this value depends on the continued provision of healthy PAs ecosystems that contribute to the tourism experience and for which tourists are prepared to pay. While costs were not included in the BAU-SEM analysis for tourism, based on analysis by NFA-Romsilva (and assuming costs are constant over 25 years) cumulative cost over 25 years for tourism is estimated at 2.8 million. This conservative approach adopted in the analysis (i.e. a conservative estimate of visitor numbers, expenditure and level of entry fee has been used) adds confidence to the finding that SEM can more than cover its administration and management costs. This finding should help the Romania CNPAs in its current preparation of a PA entry passes and fees policy.

The significant consumer surplus estimated for tourism and recreational experiences within PAs in Romania suggests that mechanisms, such as **entrance fees**, would be successful. Entrance fees can also be used to control demand and minimize impacts on the site. Currently entrance fees are very low or non-existent, so there is therefore the scope to introduce and increase entrance fees, particularly at sites where the tourism potential is high. However, realizing the full tourism potential (benefits) is dependent on the prior investment in tourism and recreational facilities.

In addition SEM is seen to enhance employment, especially in the tourism sector, and has the ability to promote equitable growth through providing opportunities in rural communities surrounding PAs. The distribution of the benefits and values among potential beneficiaries is also important, particularly in terms of ensuring an equitable distribution of benefits and costs and in designing potential PES. There are four main groups economically impacted by PAs: PAs authorities, other government agencies, the private sector, and households. They cover most sectors and population groups in the country and include beneficiaries at local, regional and national levels.

Based on analysis of the ecosystems of the 5 pilot protected areas it is possible to derive very high level estimates of the value of SEM for the system as a whole. Scaling up to values for the 5 pilot areas for the whole network, based on the number of hectares and assuming that the 5 pilot sites are representative of the whole area provides SEM with a NPV of €1,685 million (and cumulative value of around €9,000 million over BAU). This provides an argument for investing in conserving the Romanian CNPA as a whole. These very initial and rough estimates do however need to be refined through more detailed studies at the pilot sites and site specific studies at other sites in the network.

6.2 Recommendations

Recommendations have been identified for the sectors studied to facilitate the design of sector specific policies to sustainably manage important ecosystems services. Separate recommendations for additional future research, and relating to policy and institutional strengthening have also been identified.

6.2.1 Tourism

The following approaches to managing entrance fees could be further explored, and are being reviewed in the proposed PA entry passes and fess policy:

- Entrance fees could be applied at the honey pot sites and the funds redistribute across the network using the Association of PAs Administrators;
- An entrance fee of 2 EUR/per visit could be introduced at the honey pot sites.
- A diverse set of payment options could be explored (e.g. internet, cash machines, accommodation operators, transport operators) and/or incentives (e.g. stickers) to encourage payment;
- Awareness campaigns are recommended to introduce news of any proposed higher entrance fees.
- A realistic target should be set, e.g. that 50% of visitors pay within the next 10 years.

A further study could be conducted to determine the appropriate entrance fee for key sites. The priority should be to develop tourism at 'honey pot sites' based on a detailed understanding of the carrying capacity of the area and actions needed to fully develop and manage ecotourism at these sites (e.g. the development of visitor centres infrastructure, trails, signage etc).

Data on visitor numbers are key to the proper management of the protected areas. These are usually provided by PA administrations based on data collected from local operators; in the future, the precision of these estimates needs to be improved. Data should be collected by NIS or by statistical surveys conducted by professionals on behalf of PA administrations.

Further study is required to determine the potential for introducing tourism related **PES mechanisms**. Private tours operators are the main beneficiary from tourism within the PAs. A possible mechanism to explore is tourism operators paying PAs for collaboration in terms of touring, hotels and cable cabin operators. Tourism operators (restaurants, hotels, tour operators, etc.) could for example pay 0.5-1.5% of their revenues to the National Environmental Fund (NEF). This payment would visible to tourist on receipts etc. The NEF would then spend this money on the PAs.

6.2.2 Forestry and Hunting

As part of a sustainable management strategy for the forest areas within the protected areas, NTFPs management and harvesting should be developed. This will require undertaking more detailed studies of their capacity and market potential.

SEM requires taking more areas under protection and providing adequate compensation for any lost production due to forest land use restrictions. One possibility is to use European funding available for

Natura 2000, as a lot of parks overlap with the Natura 2000 network. However, this is only an option once Management plans, defining the conservation measures are in place,

In terms of PES, there may be opportunities in the future to set up payments from private companies benefiting from NTFP production.

6.2.3 Agriculture

To derive the benefits of SEM breeding needs to be encouraged where the carrying capacity has not yet been reached. This is likely to require the provision of incentives to farmers, and further consultation with farmers. Studies are required to design an effective incentive mechanism. Conversely, farmers will require compensation where breeding / grazing needs to be reduced.

6.2.4 Water resources

A potential PES schemes in the water resources sector is for Bottle water companies to pay a percent of their revenues to the NEF, which would be used to finance projects submitted by PAs focused on the sustainable management of mineral water springs.

Further study of the bottle water industry is required to generate data on the efficiency of the bottling companies (costs for processing and bottling); costs associated with the temporary stoppage in the delivery of an ES (for example, during heavy rains springs may have too many nitrates due to infiltration from pastures and not be usable); and value added along the production chain.

6.2.5 Natural Disaster Management

Further studies are required to generate data on the cost of damage to public infrastructure, household damage costs and the frequency of natural disaster events.

6.2.6 General further research needs

There are a number of research needs generic to all the sectors, these include:

- The PAs have not yet developed yet an ecosystems-based PA management plan, and this is a priority need looking forward;
- More detailed study of the links between BAU and SEM to employment, tax revenues and other key indicators in addition to NPV. In most cases the data was not available to report on these indicators within this study;
- Detailed analysis of the costs of SEM;
- Site specific studies to refine ecosystem valuation estimates. This study has relied largely on value transfer estimates, there are also very few primary economic valuation studies available in Romania. To refine the estimates sites specific studies of the sites could be undertaken, especially for their tourism values which is a key driver for the 5 pilot sites studies.
- Refinement of aggregate / system wide assessment
- The establishment of a permanent review group to support research and findings composed of politicians and academics is recommended.

6.2.7 Policy and finance

Based on the conclusion and arguments of SEM it is clear that sectors need to introduce policies to protect PA ecosystems services. Cross sector co-operation is also vital given that a number of sectors both benefit from and have the ability to degrade ecosystems through their activities. The results of this study can be used to inform the development of sector policies that ensure the sustainable management of PA ecosystems and to design sustainable financing mechanisms.

The development of PES and other sustainable financing opportunities is ongoing as part of the broader UNDP-GEF study. The following financing mechanisms are currently being explored:

- Tourism
  - The introduction / increase in entrance fees to capture willingness to pay building on the findings of this study and focussed on the "honey pots" sites;
  - Contributions from tourism operators – for example PA tourism operators paying a certain percentage of their profit to the NEF (National Environmental Fund), with PA administration projects then being financed by the fund;
- Water
  - Similar to tourism, bottling water operators contributing a certain percentage of their profit to the NEF (National Environmental Fund)
  - For urban water supply, Rowaters paying for clean water (as part of an integrated PES mechanism).
- Ecosystem compensation – investors paying for any residual impact of their activities to the NEF.

Reform of the legal framework of the National Environmental Fund would be required based on the design of these innovative financing mechanisms.

6.2.8 Institutional aspects

Several institutional reforms are recommended to support the transition to SEM and an ecosystems based management approach (these are linked with the envisaged financing mechanisms described above):

- Increased capacity for NEF administration to deal with biodiversity conservation applications and project monitoring;
- Establishment of an Association of PA administrations to support administration of funds;
- Increased capacity at the NEPA (National Environment Protection Agency) to formally verify and approve the MP of the PA;
- Enhanced Co-ordination between the Ministry of Environment and Forests and the Rural Development Programme Management Authority to determine a compensation payments system for forests;
- Development of a carbon registry mechanism at the Ministry of Environment and Forests to initiate movement towards carbon trading;

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Annex 1: Characterization of pilot PAs

(ANP 2008, MNP 2008, PCNP 2008, ReNP 2009, VNNP 2010)

Apuseni Natural Park (ANP)
Area: 75,784 ha
Location: Western Romania, Central-North Western side of Apuseni Mountains, covering parts of Cluj, Bihor and Alba Counties
Flora: The vegetation is structured by altitude as follows: mountain meadows, spruce forests (*Picea abies*) and deciduous forests, where one can encounter species such as: beech (*Fagus silvatica*), hornbeam (*Carpinus betulus*), Sycamore maple (*Acer pseudoplatanus*), Wych elm (*Ulmus montana*), ash (*Fraxinus excelsior*), wild cherry (*Cerasus avium*), field maple (*Acer campestre*), White birch (*Betula verrucosa*), rowan (*Sorbus aucuparia*), goat willow (*Salix caprea*), black walnut (*Juglans regia*) etc.
Fauna: Many invertebrate species have been identified in the park, some being new to science, and some others being endemic to the Apuseni Mountains. The underground fauna is very well represented on ANP territory: many species are endemic and many are only found in one or two caves. Best represented is the group of *Cholevinae* coleopterans (*Leiodidae*) and *Trechinae* (*Carabidae*). The cave-dwelling genera *Drimeotus* and *Pholeuon* are endemic to the Apuseni mountains. The other genus *Pholeuon* also has an endemic sub-genus in the Bihor mountains, *Pholeuon* (s.str.), which is represented in ANP by 22 taxa. Among the *Trechinae*, the genus *Duvalius* is not endemic for Romania, however, 18 species of Bihor are endemic to this mountain range. In the aquatic ecosystems of ANP over 15 species of fish are found: brown trout (*Salmo trutta fario*), rainbow trout (*Salmo irideus),* brook trout (*Salvelinus fontinalis*), grayling (*Thymallus thymallus*), bullhead (*Cottus gobio*), minnow (*Phoxinus phoxinus),* Danubian barbel *(Barbus meridionalis petenyi),* barbel (*Barbus barbus*), nase (*Chondrostoma nasus*), stone loach (*Noemacheilus barbatulus*), spined loach (*Cobitis taenia taenia*), chub (*Leuciscus cephalus)* and roach (*Rutilus rutilus carpathorossicus)*. Among amphibians 10 species were identified, of which worth mentioning are the fire salamander (*Salamandra salamandra*), the yellow-bellied toad (*Bombina variegata*), newts (*Triturus alpestris*, *T. cristatus, Triturus vulgaris ampelensis*). Among reptiles, 8 species can be listed: the common adder (*Vipera berus*), wall lizard (*Podarcis muralis*), viviparous lizard (*Zootoca vivipara*), sand lizard (*Lacerta agilis*), slow worm (*Anguis fragilis colchicus*), smooth snake (*Coronella austriaca*), Aesculapian snake (*Elaphe longissima*) and the grass snake (*Natrix natrix*). All common mountain bird species live in the area. In coniferous forests the following prevail: ring ouzel (*Turdus torquatus*), crossbill (*Loxia curvirostra*), nutcracker (*Nucifraga caryocatactes*), willow tit (*Parus montanus*), goldcrest (*Regulus regulus*), three-toed woodpecker (*Picoides trydactilus*), hazel grouse (*Tetrastes bonasia*), crested tit (*Parus cristatus*). In the deciduous forests, openings and meadows are encountered: woodpigeon (*Columba palumbus*), raven (*Corvus corax*), black wood-pecker (*Dryocopus martius*), mistle thrush (*Turdus viscivorus*), bullfinch (*Pyrrhula pyrrhula),* chaffinch (*Fringilla coelebs*), etc. Near the watercourse are encountered: dipper (*Cinclus cinclus*), grey wagtail (*Motacilla cinerea*) and the common sandpiper (*Actitis hypoleucos*). The following raptors are found in the park: Lesser Spooted Eagle (*Aquila pomarina*), Golden Eagle (*A. chrysaetos*), Common Bussard (*Buteo buteo*), Kestrel (*Falco tinnunculus*) and Red-footed Falcon (*F. verspertinus*), Sparrow Hawk (*Accipiuter nisus*) and Goshawk (*A. gentilis*). The mammal fauna includes species common to beech and spruce mountain forests, and also chamois (*Rupicapra rupicapra*) that has been reintroduced into the upper basin of Crisul Pietros – Boga valleys. The large mammal fauna is well represented by wolf (*Canis lupus*), lynx *(Lynx lynx*), bear (*Ursus arctos*), roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*), wild boar (*Sus scrofa*). Among the carnivores we find the wild cat (*Felis silvestris*), the polecat (*Mustela putorius),* and the otter *(Lutra lutra).* The small rodents are represented by 10 species, some of them having a special importance, as they have been listed in the EU Habitats Directive 92/94/EEC: bank vole (*Clethrionomys glareolus*)*,* common vole (*Microtus arvalis*), field vole (*M. agrestis*), house mouse (*Mus muculus*), yellow-necked mouse (*Apodemus flavicollis*), striped field mouse (*A. agrarius*), wood mouse (*A. sylvaticus*), common dormouse (*Muscardinus avellanarius*), fat dormouse (*Myoxus glis*) and red squirrel (*Sciurus vulgaris*). The small insectivores are also well represented in ANP with 8

identified species (excluding bats): common shrew (*Sorex araneus*), pygmy shrew (S. *minutus*), alpine shrew (*S. alpinus*), water shrew (*Neomys fodiens*), Miller's water shrew (*N*. *anomalus)*, white-toothed shrew (*Crocidura leucodon*), mole (*Talpa europaea*) and hedgehog (*Erinaceus concolor*). A few caves have special importance also due to the bat colonies they shelter (Lup Nicoara, 2005: Borda, 1998/199, 2002, Database of the Romanian Bat Protection Association): greater horseshoe bat (*Rhinolophus ferrumequinum*), lesser horseshoe (*Rh. hipposideros)*, *Rh. euryale*, *Myotis myotis, M. blythii, M. nattereri, M. brandtii, M. mystacinus, M. bechsteinii, M. emarginatus, M. daubentonii, M. dasycneme*, noctule bat (*Nyctalus noctula*), *Pipistrellus pipistrellus, Plecotus auritus, P. austriacus, Barbastella barbastellus, Miniopterus schreibersii*, out of which the species *Rhinolophus ferrumequinum*, *Myotis myotis* and *Miniopterus schreibersii* has a great scientific importance.

Landscape: The Apuseni Mountains are characterized by a remarkable karst landscape, both for its extension and for its richness and variety of forms. The cliffs, mountains meadows and surface karst phenomena are landscape units of major interest. These are represented by dolines, short blind valleys (where the water infiltrates the limestone rocks through sink holes or swallow holes), karst plateaus, dry valleys, karren, polje (closed and flat hydrographic depressions with underground drainage), gorges, defilés etc. A particularity of Bihor Mountains is the presence of the forested karst, one of the few regions of this kind in Romania. The forest influences the development of underground caves but, at the same time, it sustains a remarkable biodiversity on the surface. The existence of this kind of landscape is one of the premises for the existence of ice caves.

Rationale for PA selection - socio-economic context: Specific karst environment biodiversity conservation is among the main reasons for selecting the area for protection. The area is among the last areas of those dimensions benefitting from the forested karts landscape. At the same time, the human communities within the area of the park represent an eloquent example of the “motii” population, only found in Romania at this site. The high aesthetic quality of the landscape is a result of the use of specific unique traditional methods for managing the land and organizing the local communities. There are 55 villages in the area of the park with a total estimated population of around 35,000 inhabitants. The local economy covers small scale agriculture and breading, forestry and wood processing, commerce and tourism. Mining activities have been very important in the past, and may become important again in the future. The area of the park is an important source of clean water to be used by downstream population.

Maramures Mountains Natural Park (MNP)

Area: 75,784 ha

Location: North Romania, Almost all the area of Maramures Mountains, covering northern – eastern part of Maramures County

Flora: The vegetation types identified in the park are: i) Beech (Fagus sylvatica) and oak (*Quercus petraea*) vegetation layer, with a lot of other forest species such as *Tilia cordata, Prunus avium, Acer pseudoplatanus, Carpinus betulus* ii) Mixed mountain – pre-mountain forests (between 700 – 1,200 m altitude) with *Fagus sylvatica, Fraxinus excelsior, Ulmus glabra, Larix decidua, Betula pendula*, etc.; iii) Mixed mountain forests (between 1,000 – 1,400 m altitude) with *Fagus sylvatica, Abies alba, Picea abies, Acer pseudoplatanus, Fraxinus excelsior*; iv) Spruce mountain forests (over 1,300 m altitude); v) mountain meadows. A special zonal position is held by aquatic ecosystems, of great importance being the high altitude peat bogs within the spruce forests. A total number of 1,521 taxa were identified in the park, 27 of them being endemic taxa of the Romanian Carpathians: *Achillea schurii, Aconitum moldavicum, Armeria pocutia, Campanula carpatica, Campanula serrata, Cardaminopsis neglecta, Centaurea carpatica, Centaurea melanocalathia, Chrysosplenium alpinum, Cochlearia officinalis subsp. pyrenaica, Dentaria glandulosa, Dianthus tenuifolius, Doronicum carpaticum, Festuca carpatica, Festuca porcii, Heracleum carpaticum, Hieracium kotschyanum, Melamphyrum saxosum, Phyteuma tetramerum, Phyteuma vagneri, Poa granitica ssp.disparilis, Ranunculus carpaticus, Scabiosa lucida, Silene nutans ssp. dubia, Symphytum cordatum, Trisetum fuscum.*

Fauna: No less than 7 invertebrate taxa (out of a total of 74) were identified for the first time in Romania within the area of MNPN: *Rhaphium ensicome, Rhaphium rivale, Argyra spoliata, Diaphorus halteralis, Hilara albitarsis, Empis (s.str.) nuntia, Empis (s.str.) planetica*. An impressive number of Lepidoptera were also identified: 136. There are also important fish populations, increasing in biodiversity with the decrease in altitude: *Salmo trutta fario, Thymallus thymallus, Hucho hucho, PhoxiriLis phoxinus, Cottus gobio, Barbus peloponnensius petenyi, Chondrostoma nasus, Leuciscus souffia agassizi* (endemic for Maramures area). Amphibians are also well represented: *Salamandra salamandra, Triturus alpestris, Triturus montandoni* (endemic for Oriental Carpathians), *Bombina variegate, Bufo bufo, Rana dalmatina, Rana temporaria.* All Carpathians specific birds can be seen in the MNP, of note are *Lyrurus tetrix, Tetrao urogallus, Tetrastes bonasia* (rare species), *Aquila crysaetos, Aquila pomarina*, etc. Mammals populations is also complete: wolf (*Canis lupus*), lynx *(Lynx lynx*), bear (*Ursus arctos*), roe deer (*Capreolus capreolus*), red deer (*Cervus elaphus*), wild boar (*Sus scrofa*), the polecat (*Mustela putorius),* and the otter *(Lutra lutra).*

Landscape: Besides the valuable natural landscapes, Maramures Mountains are characterized by a very specific rural landscape with special local traditional architecture evident in houses and churches.

Rationale for PA selection - socio-economic context: MNP has been a natural park since 2005, in order to conserve landscape and local traditions, protect the natural, spiritual and cultural heritage of the area, practice sustainable forest management and encourage tourism based on these values. The area represents many natural, ethnic, cultural and historic values but also faces numerous problems related mainly with mining activities undertaken in the past, which left a physical mark in degraded sites but also a mark on the social environment by turning a once prosperous zone into a poor one. As a consequence of these specific local aspects, the objectives of the PA administration are diverse. There are 10 communes and towns in the area of the park with a total estimated population of around 115,000 inhabitants. The local economy covers small scale agriculture and breading, forestry and wood processing, small manufacture (traditional products including local trational food industry) commerce and tourism. Wood processing showcased in the architecture of local houses is a special feature of the area and an important touristic attraction. The area was a traditional mining area, while the industry is not very well represented today is has left an important historic impact on the landscape. The area of the park is an important source of clean water to be used by downstream population.

Piatra Craiului National Park (PCNP)

Area: 14,773 ha

Location: The entire Piatra Craiului National Park is located in the Meridional Carpathians, Central Romania, and it also includes parts of the neighboring mountain passes Rucar-Bran and Rucar-Zarnesti. The Piatra Craiului National Park stretches over the counties of Brasov and Arges, including areas belonging to the towns of Zarnesti, Moeciu (Magura and Pestera villages), Bran, Rucar and Dambovicioara.

Flora: The richness of the species inside the Piatra Craiului National Park is the result of the extremely diverse conditions the territory provides for the development of the vegetation. The altitude exceeding 2,200 m provides the appropriate development conditions for almost all of the Carpathian Chain alpine and mountain species. Fungi, moss, lichens and flower plants species thrive in the area.. A total number of 1170 plant species and subspecies have been identified throughout the national park's territory. 181 species have been included into the "*Red List of superior plants in Romania*" as endemic, rare or vulnerable species, proving the importance of the Piatra Craiului National Park from the point of view of flora species conservation. Improtant species include garofita pietrei craiului (*Dianthus callizonus*) the symbol of the Piatra Craiului massif, this mountain being the only place in the world to house this species, *Taxus baccata, Angelica arhangelica, Nigritella nigra* and *N. rubra, Papaver alpinum ssp. corona-sancti-stefani; Linaria alpine, Leontopodium alpinum, Trolius europaeus, Rhododendron mytifolium, Gladiolus imbricatus, Gentiana lutea, Daphne blagayana, Daphne cneorum*, etc. These species benefit from a strict conservation regime and attract nature lovers to Piatra Craiului during the summer..: The Piatra Craiului National Park houses an impressive number of mountain orchids, 48 species out of the 53 species found in Romania. Due to the high declivity of the mountain slopes, the vegetation layers formed according to the altitude are best noticeable here, the massif being surrounded, from the bottom towards the ridge, by hay fields, forests, bare rocks and alpine meadows.

Fauna: Invertebrate are particularly rich numbering 35 endemic species (e.g *Nesticus constantinescui* (Arahnida) and *Rhagidia carpatica* (Arahnida, Acari)) and 91 species identified as new to science.. There is also a large number of butterfly species, to date 216 species have been identified as either rare or endemic: *Psodos coracinus dioszeghy*,sub; *Apamea zeta sandorokovacsi*; *Erebia pronoe* found in the Carpathians only in Piatra Craiului and Bucegi; *Pieris bryoniae* mentioned in the red list of European day butterflies, etc. The fish, amphibians and reptiles fauna is slightly poorer, if compared to the other vertebrates group. The Piatra Craiului National Park also holds a rich bird fauna, including the 111 species identified so far, on the territory, rendering the area an ideal destination for bird watching. The climate and geology conditions, the geomorphology, the structure of the flora and vegetation, have created the proper conditions for the development of a particularly diverse mammal group. Over 40% of the 100 mammal species found in Romania live here. To date 21 species of bats have been identified in caves or old tree hollows throughout the national park. Many of these species are included in the strictly protected species category, according to the Bern Convetion, 6 of them are listed in the European Council Directive 92/43 EEC (*Rhinolophus ferrumequinum, R. euriale, Myotis bechsteinii, M. blythii, M. myotys, Barbastella barbastellus*) and one species - *Vespertilio murinus* - is included in the Bonn Convention. The Piatra Craiului National Park also holds a large population of large carnivores: bears - *Ursus arctos*; wolves - *Canis lupus*; lynx - *Lynx lynx*.

Landscape: The main landscape feature is the 25km long limestone ridge, oriented from NE to SW – the longest and tallest limestone ridge in the country. Piatra Craiului National Park shelters several habitats types and species of European interest. For example: bushes with *Pinus mugo* and *Rhododendron myrtifolium,* alpine and subalpine calcareous grasslands, calcareous and calchist screes of the mountain to alpine levels, mountain hay meadows, Luzulo-Fagetum beech forests, acidophilous *Picea* forests of the mountain to alpine levels etc. Beside the impressive natural landscape of Piatra Craiului, the local communities and villages create a very attractive landscape with households scattered on the top of the hills, where the locals have preserved centuries old traditions, in harmony with nature

Rationale for PA selection - socio-economic context: The main reasons for establishing Piatra Craiului as a National Park were: to maintain the biodiversity, landscape and species conservation, to

promote and encourage tourist activities and public awareness and education of nature conservation values. There is one town and 8 villages in the area of the park with a total estimated population of around 37,000 inhabitants. Zarnesti town was the most important industrial area in the past (Celohart – pulp and paper, UM Tohan – mechanic factory, forest harvesting enterprises, wood processing enterprises). Nowadays, industry is in a precarious situation due to the market economy transition and recession. Bran, Moeciu, Dambovicioara and Rucar villages have a strong history in traditional breeding, forest harvesting and wood processing. Land cultivation is a low intensity activity. In the last decade there was a significant development of agro-tourism in the east and south parts of the park. Tourism is spectacular in Bran and Moeciu (attraction: Dracula Castle) and moderate in Fundata, Dambovicioara and Rucar. There is considered to be a very high untapped touristic potential.

Retezat National Park (ReNP)

Area: 38,138 ha

Location: ReNP is a Biosphere Reserve and is located in the west part of the country, as a part of the Retezat – Godeanu massif. ReNP stretches over the counties of Hunedoara, Caras – Severin and Gorj.

Flora: There are 60 vegetation association described for Retezat, with a big variation, from *Pino-Quercetum moehringietosum pendulae* in lower areas to *Oreochloo-Juncetum trifidi* represented on small areas around the mountain peaks. Worth mentioning is the limestone area of Small Retezat with rare/endemic species like *Barbarea lepuznica, Pedicularis baumgarteni* generally vulnerable to overgrazing. Retezat shelters 1,190 superior species out of 3,450 known in Romania. There are 90 endemic taxa, identified since 1858. The *Red list of superior species in Romania* contains 130 species that can be found in Retezat. Retezat is the genetic center for Hieracicum genum, sheltering 257 taxa, some of them endemic: *Hieracium borzae, Hieracium nigrilacus.* It is also the genetic center for Poa genum – 31 taxa. A series of species have their classical area in ReNP: *Barbarea lepuznica, Centaurea pseudophrygia ratezatensis, Oxytropis jacquinii retezatensis, Hypochoeris maculata* var. carpatica, *Festuca rupicola* var. retezatensis. Mountain meadows represent a very important area, sheltering almost all the species that are specific for alpine flora. Another area of interest is the zone between stone peaks area and the mountains meadows, with specific representatives: *Rhododendron kotschii*, *Pinus mugo* or *Pinus cembra.*

Fauna: The invertebrates are represented by hundreds of species, the biggest number of endemic species in Retezat: 9 subspecies of butterflies, 6 species of plecopters, and 4 tricopters. The *erbia* group of species (order Lepidoptera) is a glacier relict. There are 10 species of amphibians, 8 of them considered rare and vulnerable at the national level. One of the trout species in the park (out of 11 fish species) is not indigenous (*Salmo trutta lacustris).*The reptiles are represented by 9 species, one of them considered rare and all of them considered vulnerable. Out of the 185 species of birds identified in the park, 122 are residents. Worth mentioning are: *Aquila chrysaetos* (represented on the Park logo), *Aquila pomarina, Circaetus gallicus*, *Falco peregrinus*, *Tetrao urogallus*, *Bubo bubo*, *Glaucidium paserrinum*, *Ciconia nigra*. 55 species of mammals have been determined in RNP, over 23% of the terrestrial mammals in Europe. The Park area offers conditions for the most important big European carnivores: the wolf, the bear and the lynx. Big herbivores are also located in the park: chamois (*Rubicapra rubicapra*) red dear (*Cervus elaphus*), roe dear (*Capreolus capreolus*). Small carnivores such as *Felis silvestris* and the mustelides can also be found in diverse habitats of the park. The caves from Retezat shelter the bear population but also 13 bat: species including *Rhinolophus ferrumequinum*, *Vespertilio murinus* and *Pipistrellus pygmaeus*.

Landscape: ReNP is the park of the "blue eyes"**:** there are 80 glacier lakes in Retezat, the biggest of them (Bucura) covers 8.8 ha. There are also over 20 peaks higher than 2000 m. These landscape features, together with the araa's biological diversity have lead to a high interest in the area dating back to the middle of the 19 century. Traditional grazing activities are still practiced by local people, adding cultural value to the impressive mountain landscape. The vegetation associations mentioned above, located in the alpine area also contribute to a very attractive landscape.

Rationale for PA selection - socio-economic context: ReNP is the oldest Park in Romania, created in 1935. At that time, the designation of the park was motivated by many scientists:" the

superior region of Retezat must be transformed into a grandiose park: an important scientific reserve" (A. Borza, 1935). Based on present legislation, the main scope of RNP is the protection and conservation of representative samples for bio-geographic national space, containing vary valuable natural elements of physic-geographic, floral, fauna, hydrological, geological, paleontological, caves and soil related etc. aspects, offering the possibility of visiting for scientific purposes, education and tourism. The park area si not very populated, only villages from 2 communes (Rau de Mori and Salas), and a town (Uricani) influence the park. The main economic activities in the area are: breading, forest harvesting, wood processing, small scale agriculture, part of the community members basing their existence on those activities. Another part of the community's members have jobs outside the area, and outside the community. The unemployment rate is rather high, finding jobs being difficult. The difficult economic conditions affecting the communities are determined basically by: week infrastructure, lack of capital for implementing development projects, aging of the population, lack of information access, lack of strategic approach of authorities regarding industrial development, decline of traditions and reduction of traditional product's importance and demand.

Vanatori Neamt Natural Park (VNNP)

Area: 30,818 ha

Location: North-western part of Romania, eastern slope of the Oriental Carpathians (Neamt Mountains) and under mountains hills of Neamt, stretching over the county of Neamt.

Flora: The vegetation is structured by altitude: i) holm oak forests, lower altitude, with *Quercus dalechampii* mixed with *Quercus pedunculiflora, Fagus sylvatica, Tilia cordata* – Moldavian holm forests; ii) beech and mixed beech forests with *Fagus sylvatica, Picea abies and Abies alba* (noticeable two rare species - Romania *Fagus taurica* and *Fagus orientalis);* iii) zonal meadow vegetation along riversides with *Alnus sp*.; iv) secular meadows: *Festuco-Agrostetum capilaris, Trifolio – Lolietum perennis, Rorippo – Agrostetum stolonifere.* The diversity of the flora of the territory is remarkable: more than 1,831 species and subspecies. There are a number of remarkable endemic species: *Centaurea carpatica* ssp*. rarăurensis* (creşte numai în Moldova), *Cirsium decussatum, C. furiens, C. grecescui, Dentaria glandulosa, Hepatica transsilvanica, Leucanthemum waldstenii, Phyteuma wagneri, Ranunculus carpaticus, Symphytum cordatum* and also a number of 50 floral rarities: *Allium schoenoprasum* ssp. *sibiricum, Anacamptis pyramidalis, Carex disticha, Cephalanthera rubra, Caelogossum viride, Corallorhiza trifida, Crepis mollis, Dactylorhiza cordigera* ssp. *cordigera, D. incarnata, D. maculata* ssp*. maculata, D. sambucina, Dianthus campestris* ssp*. campestris, D. collinus* ssp*. glabriusculus, Dianthus collinus* ssp*. moldavicus Epipactis atrorubens, E. helleborine, E. palustris, E. purpurata, Epypogyum aphyllum, Erigeron alpinus, Galium pumilum* ssp*. pumilum, Gentrianella germanica, Gymnadenia conopsea, G.odoratissima, Herminium monorchis, Hypochoeris glabra, Lathyrus pannonicus* ssp*. collinus, Leguosia speculum-veneris, Liparis loeselii, Listera cordata, Luzula forsteri, L. luzulina, Mercurialis ovata, Microstylis monophyllos, Monotropa hypopytis* ssp*. hypopytis, Neotia nidus-avis, Orchis coriophora* ssp*. coriophora, O. elegans, O. mascula* ssp*. signifera, O. morio, O. ustulata, Pedicularis sceptrum-carolinum, Petasites paradoxus, Platanthera bifolia, Polemonium coeruleum, Potentilla neumanniana, Ranunculus circinatus, Salix aurita, Scandix pecten-veneris* ssp*. pecten-veneris, Scorzonera humilis, Streptopus amplexifolius, Traunsteinera globosa, Trollius europaeus, Typha schuttleworthii, Valeriana simplicifolia, Angelica archangelica, Cypripedium calceolus, Taxus baccata* etc*.*

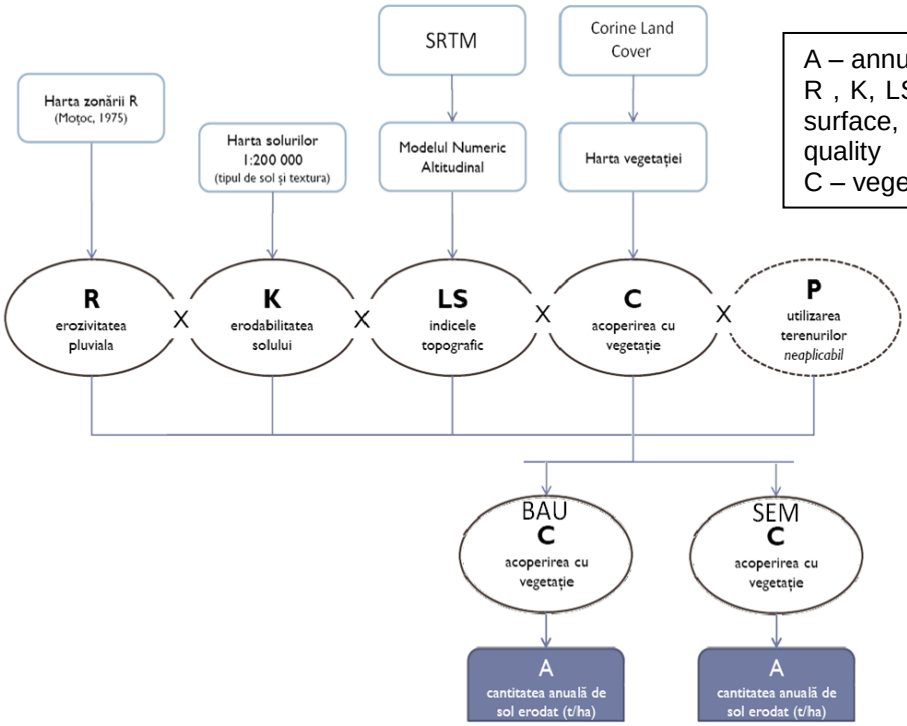
Fauna: The fauna is characteristic of the Carpathians: numerous invertebrates including a significant number of Lepidoptera – 138, fish – 7 rare species (including *Salmo trutta*), reptiles – 3 species (including *Vipera berus*), amphiibians – 11 species (including Carpathian endemism *Triturus montandoni*), birds – 101 species (including *Accipiter gentilis, Accipiter nisus, Aquila pomarina, Buteo buteo, Buteo lagopus, Strx aluco, Strix uralensis, Crex crex, Ciconia nigra, Ciconia ciconia, Tetrao urogalus, Alcedo athis)*, mammals – 35 species, among them *Ursus arctos, Canis lupus, Vulpes vulpes, Lynx lynx, Felix sylvestris, Martes martes, Mustela erminea, Mustela nivalis, Mustela putorius, Sciurus vulgaris, Meles meles, Erinaceus europaeus, Cervus elaphus, Capreolus capreolus, Sus scrofa, Lepus europaeus, Glis glis*.

VNNP is closely associated with *Bison bonasus*, once very common in Romania and then absent for a long period, the Bison has been successfully repopulated within the park in a long and ambitious project.

Landscape: VNNP is the park of the natural forests, churches and monasteries and *Bison bonasus*.

Complex forests, the majority of them being very close to their natural condition in a hilly area creates an unforgettable landscape (famous places include Silver Forest – with birch and Copper Forest). The landscape is completed by numerous churches and monasteries ituated on large valleys surrounded by forests and meadows, close to very picturesque villages featuring traditional architecture. Lakes and traditionally managed meadows (with trees and hay deposits) are important elements of the VNNP landscape. The recent repopulation of bisons as well as the development of infrastructure to facilitate sightseeing over the *Bison bonasus* breeding area is also a spectacular and attractive landscapes.
Rationale for PA selection - socio-economic context: VNNP was estabished in 1999, aimed at the protection of the natural, spiritual and cultural heritage of the area, sustainable forest management, landscape and local traditions conservation, bison repopulation, and the encouragement of ecotourism. The most important objective of the park administration is the conservation of the landscapes where natural and human interaction over time has created a distinct area, with significant landscape, cultural and biological values. There are 5 important settlement (The town Targu Neamt among them) in the park area, with a total population of around 48,000 inhabitants. There are also a large number of monks populating the 14 monasteries in the area. The main economic activities are: small scale agriculture, breeding, commerce, traditional products manufacturing, and increasingly – tourism. Orthodox monarchal tourism is a very important part of this sector that is considered to have great potential. There are a lot of famous cultural and historic sites within the park.

Annex 2: Logical scheme for soil erosion calculation



A – annual quantity of eroded soil:
R , K, LS, P – factors depending on surface, slope. Length of slope, soil quality
C – vegetation covering

The formula used for calculating the annual quantity of eroded soil is based on indicators established through experiments and measurement. The formula is the following:

$$A = R \times K \times LS \times C \times P$$

R – Pluvial erodibility

K- Soil erodibility

LS – Topography indicator

P – Usage of land (not applicable in this study as applies only to surfaces within villages and towns, therefore set to 1)

C – Vegetation covering

In the BAU and SEM scenario analysis the variable indicator is C – the vegetation covering.

Source: Terente, 2008, Transilvania University, 2011

Annex 3: Romania's Carpathian PAs

There are currently 106 PAs in Romania covering a total area of 1,057.487 hectares. The Ministry of Environment and Sustainable Development are legally responsible for these PAs. There are 21 major protected areas (12 national parks and 10 nature parks) included in the Romanian CNPA. **Table 01** presents an overview of the Carpathian PAs noting their total surface areas and forest cover. The pilot sites are highlighted.

Table 0-2 provides a qualitative assessment of the Romanian Carpathian Protected Areas, including the 5 pilot sites, based on the expert opinion of the park managers and the study team. On the basis of the qualitative assessment across the sites, the pilot studies can be taken to be broadly representative of the network as a whole in terms of the range of Ecosystem Services they provide and the relative significance of these services.

Table 0-1: Romanian CNPAs)

PARKS		Admin. institution	Total surface ha	Forest type		
				Forest cover		Strictly protected forest
				- ha -	%	- ha -
NATIONAL PARKS						
1	Călimani	Romsilva	24,041.0	16,118.5	67.05	8,464.3
2	Cheile Bicazului – Hăşmaş	Romsilva	6,575.0	6,345.5	96.51	4,823.7
3	Cheile Nerei – Beuşnița	Romsilva	36,758.0	29,165.0	79.34	7,588.0
4	Cozia	Romsilva	17,100.0	16,055.6	93.89	7,839.9
5	Domogled - Valea Cernei	Romsilva	61,211.0	45,641.8	74.56	19,755.3
6	Piatra Craiului	Romsilva	14,773.0	10,170.8	68.85	3,753.68
7	Retezat	Romsilva	38,138.0	19,254.0	50.49	884.9
8	Muntii Rodnei	Romsilva	46,399.0	27,670.3	59.64	13,323.6
9	Semenic - Cheile Caraşului	Romsilva	36,160.7	30,743.1	85.02	9,405.2
10	Buila – Vânturarița	Romsilva	4,186.0	3,850.7	91.99	1,496.9
11	Ceahlău	C Council	8,396.0	7,321.9	87.21	3,243.6
12	Defileul Jiului	Romsilva	11,127.0	9,422.0	84.68	9,012.0
Nature parks						
13	Apuseni	Romsilva	75,784.0	48,795.5	64.39	11,647.0
14	Bucegi	Romsilva	32,663.0	21,357.7	65.39	5,805.0
15	Grădiştea Muncelului - Cioclovina	Romsilva	38,184.0	26,229.7	68.69	4,357.1
16	Porțile de Fier	Romsilva	115,655.0	63,919.5	55.27	9,610.4
17	Vânători Neamț	Romsilva	30,818.0	26,322.6	85.41	11,417.0
18	Munții Maramureşului	Romsilva	148,850.0	72,000.0	48.37	8,850.0
19	Putna – Vrancea	Romsilva	38,204.0	30,563.5	80.00	6,423.2
20	Geoparcul Dinozaurilor Tara h.	U. Bucharest	102,392.0	45,256.0	44.20	0.0
21	Geoparcul Platoul Mehedinți	C Council	106,000.0	6,000.0	5.66	0.0
22	Defileul Mureşului Superior	no admin.	9,156.0	7,500.0	81.91	1,000.0
TOTAL			**1,002,570.7**	**569,703.7**	56.82	**148,700.8**
National Parks			**304,864.7**	**221,759.2**		**89,591.1**
Nature Parks			**697,706.0**	**347,944.5**		**59,109.7**
CNPA Romania			**1,002,570.7**	**569,703.7**		**148,700.8**

Source: PA Management Plans

Table 0-2: Qualitative Assessment of Romania Carpathian Protected Areas

ES Type	Service	Benefit / outcome	Platoul Mehedinti	Cioclovina	Defileul Jiului	Bucegi	Ceahlau	Calimani	Defileu Muresului	Rodnei	Cheile Nerei	Cheile Bicazului	Semenic	Domogled	Putna Vrancea	Buila Vanturarita	Portile de Fier	Tara Hategului	*ANPM*	MMP	Piatra Craiului NP	RNP	Vanatori Neamt NP
Provisioning Services	Wood	Timber, traditional wood products, commercial processed wood products	*	*	**	**	**	**	*	**	*	**	*	*	**	**	**	**	**	**	**	*	**
	Water	Public water supply, mineral waters for commercial use, water for industrial and agricultural usage	*	*	*	**	**	**	**	**	?	**	–	–	*	*	*	**	**	**	*	*	*
	NTFPs	Natural medicines, forest fruits, forest fruits based products	*	*	–	*	**	**	*	**	**	*	–	*	–	–	?	**	**	**	*	*	**
	Source of energy (fuel etc)	Energy provision e.g., hydropower	–	–	**	*	–	*	*	*	**	–	*	*	*	*	*	**	**	–	–	**	–
Regulating Services	Regulation of GHGs	Carbon sequestration	**	**	**	**	**	**	**	**	**	**	**	**	*	*	?	**	*	**	*	*	*
	Micro-climate stabilization	Air quality	**	**	**	**	**	**	**	**	**	**	*	**	**	*	–	**	**	**	**	**	**
	Water regulation (storage and retention)	Flood and landslide prevention	*	*	*	**	**	**	**	**	*	**	–	*	*	**	–	*	**	**	**	**	**
	Soil erosion regulation	Improved water quality ,	*	*	**	**	**	**	*	*	**	**	–	–	*	*	?	*	*	**	*	*	–
	Nutrient retention	Improved water quality	?	**	?	*	*	**	*	*	**	*	–	*	*	*	*	*	*	*	*	*	*

ES Type	Service	Benefit / outcome	Platoul Mehedinti	Cioclovina	Defileul Jiului	Bucegi	Ceahlau	Calimani	Defileu Muresului	Rodnei	Cheile Nerei	Cheile Bicazului	Semenic	Domogled	Putna Vrancea	Buila Vanturarita	Portile de Fier	Tara Hategului	*ANPM*	MMP	Piatra Craiului NP	RNP	Vanatori Neamt NP
Cultural Services	Spiritual, religious, cultural heritage	Local traditions, Churches and monasteries, Archaeological ruins (historical not recreational value). Use of environment in books, painting, folklore, national symbols, architecture, advertising	–	**	*	**	**	*	–		**	–	*	*	**	**	*	**	**	**	**	*	**
	Educational	A 'natural field laboratory' for understanding biological processes	–	*	*	**	**	*	*	*	*	*	–	**	*	*	–	**	?	?	*	*	*
	Recreation and ecotourism	Recreational fishing and hunting, birdwatching, hiking, Holiday destination (aesthetic views), archaeological ruins (historical not recreational value)	*	*	**	**	**	*	*	**	*	**	**	**	**	*	**	**	**	*	*	*	**
	Landscape and amenity	Property price premiums due to views	*	*	*	**	**	*	–	–	*	**	*	*	?	–	*	**	?	?	*	*	–
	Biodiversity non-use	Enhanced wellbeing associated for example with bequest or altruistic motivations	?	*	–	**	**	?	?	*	*	?	–	?	?	?	?	**	?	?	*	*	*
Code: ** service important, * service provided, - service not relevant, ? uncertain of provision																							

Source: Park Managers and expert opinion of study team

Annex 4: Summary of values for the 5 Pilot Pas, valuation approaches and beneficiaries

ES Type	Service	Valuation approach	Annual value million € (2010)	NPV (PV SEM – PV BAU) @10%, 2011-2035, million €	Total cumulative benefit under SEM (25 years, €million)	Comment	Beneficiary / sector
Provisioning Services	Food / agriculture products	Market prices for milk. Based on number carrying capacity	20	16	83.90	No costs considered so benefits overestimated. However, this is considered to be a conservative estimate as the value added through the processing chain is not considered. Furthermore, markets for eco traditional products are growing adding more potential value for the PAs. Quantitative data on these aspects are not available.	Animal breeders, households, food processing industry
	Wood and NTFPs	Market prices	9.1	-2.8	-2.80	Compensation costs for private owners of T1 & T2 category forest. Hard to estimate wood prices and NTFP capacity and value	Forest administrators, forest owners
	Water	Reduced treatment costs for the mineral water industry and urban water supply	2.2	0.9	35.4	Based on site specific models of soil loss, but an old study of relationship between treatment cost and soil erosion Good data from ROWATERS management plans. A conservative approach use to assess treatment costs; The value does not include the consumer value of water for domestic users, which is considered to be significant given the low tariff rates	Water operators, mineral water bottling companies
	Source of energy (fuel, hydro power)	Not estimated	-	.-	-	The Carpathian PAs do support hydropower production. However, it was not possible to estimate this service	Hydropower producers
Regulating	Regulation of GHGs	Market prices for CO_2		5.80	33.30	Sequestration quantities based on IPPC default values. Site specific studies could be undertaken to increase confidence in estimates The costs (e.g. determining and monitoring carbon	Forest owners, local and central public authorities

ES Type	Service	Valuation approach	Annual value million € (2010)	NPV (PV SEM – PV BAU) @10%, 2011-2035, million €	Total cumulative benefit under SEM (25 years, €million)	Comment	Beneficiary / sector
						emissions) have not be considered	
	Micro-climate stabilization	Not estimated		-	0.00		Tour operators, hotels, restaurants, PA administration (in terms of park fees)
	Soil erosion regulation and Water regulation (storage and retention)	Damage avoided & preventative expenditure approach of disasters such as floods	1.3 - 9	3.7 – 32.24	17.50-300	Cost based approaches used, which may not be an accurate reflection of the benefit provided by the services. Two approaches may be taken as indicative of the potential range of this benefit Limited data on cost of damage and frequency of events	Local communities, households
	Nutrient retention	Not estimated	-	-	-		Water operators, mineral water bottling companies
Cultural Services	Spiritual, religious, cultural heritage	Not estimated	-	-	-	Partly captured under tourism	Tour operators, hotels, restaurants, PA administration (in terms of park fees)
	Educational	Not estimated	-	-	-	Partly captured under tourism	Tour operators, hotels, restaurants, PA administration (in terms of park fees)
	Recreation and ecotourism	Benefit transfer. Expenditure by tourists and consumer surplus	109.5	502.7	2,626.80	No costs considered in BAU-SEM scenario analysis, but NFA-Romsilva estimate the annual costs of optimally managing tourism at the 5 pilot sites at114,3 million A conservative estimate of visitor expenditure used, relative to studies in other countries and visitor numbers are also considered to be conservative. In the SEM	Tour operators, hotels, restaurants, PA administration (in terms of park fees)

ES Type	Service	Valuation approach	Annual value million € (2010)	NPV (PV SEM – PV BAU) @10%, 2011-2035, million €	Total cumulative benefit under SEM (25 years, €million)	Comment	Beneficiary / sector
						scenario the entry fee is kept constant at 1 EUR/visit/visitor, with a maximum of 50% of visitors paying. 27% of value is a potential value (consumer surplus) dependent on the introduction of successful mechanism to capture this value.	
	Landscape and amenity	Not estimated	-	-	-	Partly captured under tourism	Local land owners
	Biodiversity non-use	Not estimated	-	-	-	Could be significant for the network as a whole	Potentially all

Annex 5: Glossary of Terms

Appraisal	The process of defining objectives, examining options and weighing up the cost benefits, risks and uncertainties of proposed policies, programme or projects before a decision is made
Bequest value	Non-use benefit associated with the knowledge that natural resources will be passed on to future generations.
Carrying capacity	The maximum population that the environment / ecosystems can sustain indefinitely
Consumer Surplus	The difference between the price paid and the maximum amount an individual is willing to pay to obtain a good; this reflects the additional benefits that is gained by consumers in consumption of a good or service.
Contingent valuation	A stated preference approach to valuing non-market goods and services where individuals are asked what they are willing to pay (or accept) for a change in the provision of non-market good and service
Cost Benefit Analysis	A decision making tool that compares costs and benefits of a proposed policy or project in monetary terms
Cultural services	A category of ecosystem services that relates to the non-material benefits obtained from ecosystems, for example through recreation.
Damage cost avoided approach	Estimates the value of ecosystem services based on the costs of avoiding damages due to lost services. The damage cost avoided method uses either the value of property protected, or the cost of actions taken to avoid damages, as a measure of the benefits provided by an ecosystem. For example, if a wetland protects adjacent property from flooding, the flood protection benefits may be estimated by the damages avoided if the flooding does not occur
Direct use value	Economic value associated with use of a resource in either a consumptive manner or non-consumptive manner.
Discounting	The process of expressing future values in present value terms. This allows for the comparison of flows of cost and benefit over time regardless of when they occur.
Economic value	The monetary measure of the wellbeing associated with the change in the provision of some good. For market goods this is ordinarily measured by market price; for non-market goods this ordinarily measured by willingness to pay (WTP) or willingness to accept (WTA).
Economic valuation evidence	Economic values, value functions and other empirical
(monetary valuation evidence)	evidence available from existing (primary) studies that provides the source of evidence for value

	transfer. Previous value transfer analyses may also provide evidence for current applications.
Ecosystem services approach.	A term that is used to describe a framework for analyzing how human populations are dependent upon the condition of the natural environment. The approach explicitly recognizes that ecosystems and the biological diversity contained within them contribute to individual and social wellbeing
Existence value	Non-use value derived from knowing that a resource continues to exist, regardless of use made of it by oneself or others now or in the future.
Hedonic pricing method	A revealed preference valuation method that estimates the use value of a non-market good or service by examining the relationship between the non-market good and the demand for some market-priced complementary good (e.g. property or land prices).
Indirect use value	Economic value associated with the services supported by a resource as opposed to the actual use of the resource itself; e.g. key ecosystem services such as nutrient cycling, habitat provision and climate regulation.
Marginal change	An incremental change (ordinarily a 'unit change') in the provision of a market or non-market good or service.
Market goods	Goods and services traded in formal markets.
Market price	The value of the provision of goods and services that may be directly observed from markets.
Monetisation	The assignment of a monetary value to a change in the provision of a non-market good or service.
Net present value (NPV)	The difference between the present value of costs and the present value of benefits.
Non-use value (passive use value)	Economic value not associated with any use of a resource, but derived altruistic, bequest and existence values.
Meta-analysis	An empirical study that collates data from multiple valuation studies on a particular good, with the purpose of identifying the key factors that influence estimated economic values.
Non-market goods and services	Goods and services that are not traded in markets and are consequently 'un-priced' (e.g. environmental goods and services).
Present value	A future value (cost or benefit) expressed in present terms by means of discounting.
The preventative expenditure approach	A market pricing approach that examines upfront payments to prevent degradation. Also referred to as the 'defensive expenditure approach' 'mitigation approach' or 'avertive behaviour approach'. There are two different approaches to this type of analysis and only one of them is truly a cost-based valuation technique. If estimates of what people are willing to pay to prevent damage to the environment or

	themselves are elicited through the use of constructed markets, or by the examination of past events in similar circumstances through the use of revealed preferences exhibited through actual or surrogate markets, first based estimates of value will be derived.
Producer surplus	The difference between the minimum amount a seller is willing to accept for a good and the actual price received; this reflects the additional benefit in exchange gained by the producer (e.g. 'profit').
Regulating services	A category of ecosystem services which refers to the regulation of ecosystem processes such as climate regulation, air quality regulation, water regulation (e.g. flood control), water quality regulation (purification/detoxification) and erosion control.
Revealed preference methods	Economic valuation methods that estimate the use value of non-market goods and services by observing behaviuor related to market goods and services (e.g. travel cost method and hedonic pricing method).
Stated preference methods	Economic valuation methods that use questionnaire surveys to elicit individuals' preferences (i.e. willingness to pay and/or willingness to accept) for changes in the provision on non-market goods or services.
Supporting services	A category of ecosystem services which are necessary for the production of all other ecosystem services, such as soil formation and retention, nutrient cycling, water cycling and the provision of habitat.
Total economic value (TEV)	The economic value of a resource comprised of its use and non-use values.
Travel cost method	A revealed preference and survey based valuation method that uses the cost incurred by individuals traveling and gaining access to a recreation site as a proxy for the recreational use value of that site.
Unit value transfer	Transfer of a mean average (or median) value estimate for a study good to estimate the value of policy good.
Use value	The economic value that is derived from using or having potential to use a resource. It is the net sum of direct use values, indirect use values and option values.
Value transfer (benefits transfer)	Process by which readily available economic valuation evidence is applied in a new context for which valuation is required.
Welfare (wellbeing)	A measure of satisfaction or 'utility' gained from a good or service.

Willingness to accept compensation (WTA)	The monetary measure of the value of forgoing a gain in the provision of a good or service or allowing a loss
Willingness to pay (WTP)	The monetary measure of the value of obtaining a gain in the provision of good or service or avoiding a loss

Source: Adapted from eftec (2009)

World Travel and Tourism Council Definitions used in Table 4-2

Visitor exports (WTTC, 2011)	Spending within the country by international tourist for both business and leisure trips, including spending on transport
Domestic expenditure	Spending within a country by that country's residents for both business and leisure trips. Multi-use durables are not included since they are not purchased solely for tourism purposes
Government individual spending	Government spending on individual non-market services for which beneficiaries can be separately identified. These social transfers are directly comparable to consumer spending and, in certain cases, may represent public provision of consumer services. For example it includes provision of services in national parks and museums.
Direct contributions to GDP	GDP generated by industries that deal directly with tourist, including hotels, travel agents, airlines and other passenger transport services, as well as the activities of restaurant and leisure industries that deal directly with tourists.
Indirect contributions	The contribution to GDP and jobs of capital investments, Government collective spending and supply-chain effects
Capital investments	Includes capital investments spending in all sectors directly involved in the Travel and Tourism industry. This also constitutes the investment spending by other industries on specific tourism assets such as new visitor accommodation and passenger transport equipment, as well as restaurants and leisure facilities for specific tourism use.
Government collective spending	General government spending in support of general tourism activity. This can include national as well as regional and local government spending. For example it includes tourism promotion, visitor information services, administrative services and other public services.
Supply chain effects	Purchases of domestic goods and services directly by different sectors of the Travel and Tourism Industry as inputs to their final tourism output. .
Induced contributions	The broader contributions to GDP and employment of spending by those who are directly or indirectly employed in tourism.