# Financial and socio-economic impacts of nature conservation on forestry in Slovakia

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**ABSTRACT**: The article deals with financial and socio-economic impacts of nature conservation in forest and wood industries of Slovakia. The paper presents costs and losses of state budget, forest enterprises and wood-processing companies caused by restrictions related to Act No. 543/2002 on Nature and Landscape Protection. Total financial impacts were calculated at 26.98 mil. EUR and total socio-economic impacts based on revenues of the wood-processing industry at 167.81 mil. EUR, which means a loss of 2,268 jobs. These financial and socio-economic impacts were partially compensated, the sum of compensations reached 2.79 mil. EUR.

**Keywords**: nature conservation; financial and socio-economic impacts; NATURA 2000

There has been a characteristic trend in European forestry during the last decades: the increasing importance of non-timber values including nature protection (Sirgmets et al. 2011). Forest management is becoming multifunctional. It supplies various materials and products while providing other ecological and social services. Multifunctional forest management plays an important role in economic development, employment and state's prosperity, especially in rural areas (Moravčík et al. 2010a). Forests provide services with different purposes, from the production of wood through environmental protection to the recreational use such as leisure time activities, sports, healing, etc. (Kovalčík, Tutka 2008). According to Act No. 543/2002 on Nature and Landscape Protection, protected areas in Slovakia include sites of habitats or habitats of species of European or national interest, and habitats of birds, including migrating birds. Protected areas are usually located in the areas less affected by human activities, which are, in Slovakia, usually dominated by forests. Protected areas of both national and European (NATURA 2000) networks currently cover 57% of the Slovak forested area (Table 1). Human activities in protected areas are restricted by the Law on Nature and Landscape Protection through the provisions of five different levels of nature protection, from the 1st protection level, which means unprotected landscape, to the 5th protection level, which equals the IUCN category Ia (IUCN 1994; Dudley 2008). Each level is defined by the list of activities which are restricted in it as they can have a negative impact on the object of protection. The first level of protection with the least restrictions (the provisions of general nature and landscape protection are applied) applies to so-called "open landscape", outside protected areas. The range of restrictions increases with the protection level number.

Any forestry activity is prohibited in the highest 5th level of protection (in particular, nature reserves and monuments). Management of land in the 2nd, 3rd and 4th levels of protection is restricted, in particular, in terms of pesticide and fertilizer use, building of forest roads (this restriction can eliminate any management, prohibited or not) and other constructions, berry-picking, intensive forest management and hunting activities. These levels of protection apply to the protected landscape areas under 2nd level of protection, national parks under 3rd level of protection, small-scale protected areas under 2nd, 3rd, 4th or 5thlevel of protection and their

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buffer zones. State Nature Conservancy of the SR registers 9 national parks, 14 protected landscape areas and more than 700 small-scale protected areas, prevalently under 5th level of protection, which include national nature reserves, nature reserves, natural monuments, and protected elements. Small-scale protected areas can be nested in landscape protected areas or national parks.

In addition to this "national network", "European network of protected areas" NATURA 2000 was established in Slovakia after 2000, consisting of Sites of Community Importance (SCI) and Special Protection Areas (SPA). It provides a concept of nature protection ordered to EU member states by the European Commission in two directives: Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds and Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora. Both directives were implemented into Act No. 543/2002 on Nature and Landscape Protection. 86% of the SCI's area overlaps with an existing national network of protected areas. The remaining 14% is under interim protection with the 2nd level of protection. Overall, the protection of NATURA 2000 is often more severe than it appears from the declared level of protection, because it requires careful assessment of planned activities regardless of the protection level. This requirement applies also to activities that should be considered as standard habitat and species treatment, which might not be assessed if agreed by conservationists. The lack of approved SCI's and SPA's management plans also remains the issue (Moravčík et al. 2011).

For the period until approximately 2000 so-called active protection of protected areas prevailed comparable to IUCN categories IV to VI (IUCN 1994, Dudley 2008). Priority for foresters and conservationists was to salvage all wind-damaged trees and thus to prevent pest outbreaks and subsequent loss of the object of protection in these areas. Authorities of nature conservation gradually began to promote "passive protection", especially after Act No. 543/2002 on Nature and Landscape Protection came into force. Degradation of forests in protected areas (which many times means the loss of the object of protection in these areas) was proclaimed to be a part of natural processes. Protection of natural processes [*sensu* Grumbine 1994, or "even aspects of theory on ecological and evolutionary processes" (Margules, Pressey 2000)] should become a new objective of Slovak nature conservation; some are even considering the concept of rewilding (Soulé, Noss 1998). Slovak conservationists have started to apply these theories, originally developed for relatively natural ecosystems, in an extremely simplified manner. Their only interest is to assign all protected areas under the 5th degree of protection to spontaneous development, regardless of the impacts of such non-management on ecosystems.

There is also a demand to leave intact even some parts of windblown areas in forests under lower levels of protection, which reflects the pressure to expand so-called strictly protected zones of national parks. This process includes the interim protection of 'candidates' proposed to be incorporated to such zones. Such a growing amount of unprocessed windblown wood creates optimal conditions for bark beetle outbreaks and subsequent degradation of both directly affected and neighbouring stands. The current management of forest ecosystems in Slovak protected areas is affected by a mutual conflict of environmental, social and economic interests. Environmental objectives are many times enforced much more aggressively than social and economic ones, despite the fact that it was the traditional past forestry which maintained close-to-nature ecosystems in such a condition that

Table 1. Protected areas by the particular protection levels and categories

| Protected areas | Level of protection (ha) | | | | | Total |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Protected landscape areas (PLA) | – | 354,450 | – | – | – | 354,450 |
| National parks (NP) | – | – | 225,286 | – | – | 225,286 |
| PLA and NP buffer zones | – | 146,552 | 15,826 | 3,921 | 1,107 | 167,406 |
| Small-scale protected areas (SSPA) | – | – | 395 | 8,711 | 67,376 | 76,482 |
| Sites of community importance (SCI) outside the national network of PA (protected area) | – | 67,576 | – | – | – | 67,576 |
| Special protection areas (SPA) outside SCI and the national network of PA (Protected area) | 212,044 | – | – | – | – | 212,044 |
| Total | 212,044 | 568,578 | 241,507 | 12,632 | 68,483 | 1,103,244 |

Source: Moravčík et al. 2011

extensive forest areas could be designated as protected areas of the national or European (NATURA 2000) network. The contradiction between nature conservation and multifunctional forest management can be identified even at the level of generally binding legal regulations. There are several cases in which the legislation on nature conservation requires such measures that are prohibited by forestry legislation or vice versa. A similar contradiction is emerging even at the level of international processes and initiatives. For example, forest health is one of the Pan-European Criteria for Sustainable Forest Management (MCPFE 2002). Conservation initiatives, however, tend to ignore the degradation of forests if caused (in their opinion) by natural factors. This development has resulted in the fact that the health of Slovak forests is currently the poorest in the whole Central-East Europe region according to an independent monitoring of ISPRA (Forest Europe, UNECE, FAO 2011).

Forest management required by conservationists often conflicts with the management recommendations for NATURA 2000 sites (European Commission 2000a, b; 2003), in particular with an objective to preserve the existence of habitats for which the site has been designated, even at the expense of human interventions into natural processes. IUCN (e.g. Dudley, Phillips 2006) also recommends a significantly more flexible approach to the categorization of protected areas than do Slovak conservationists.

If the production, i.e. market, forest use is restricted, it has a dual socio-economic impact on the society (whether society-wide or private ownership). From the viewpoint of forest owners and managers, the economic efficiency of their business and their property values may decrease. These subjects should be compensated if we want to maintain their competitiveness in the marketplace (Šišák 2007).

The aim of this paper is to complexly calculate the costs and losses to the state, forest managers and entrepreneurs in the wood-processing industry associated with the application of restrictions set by Act No. 543/2002 on Nature and Landscape Protection as amended on forest land. Its purpose is not to question the importance of nature conservation, but rather to make a more objective view on this issue and to assess the effectiveness of all investments in nature conservation.

## MATERIAL AND METHODS

The volume of property damage in various protection levels of protected areas can be calculated based on the Compendium of Slovak Forestry Statistics from the Slovak Forest Information System administered by the National Forest Centre. Therefore, the calculation is based on real data with possible errors due to average values of model forest stands established for different protection levels (2–5). Financial and economic data are from databases of Statistical Office of the SR (www.statistics.sk), Green Reports (Moravčík et al. 2006, 2009, 2010b) and Economic Accounts for Forestry (Kovalčík et al. 2010, 2011). Information about financial compensations was requested directly from the competent organizations – Ministry of Environment, State Nature Conservancy, Nature Protection and Agricultural Paying Agency.

Financial and economic impacts are quantified by restricting the common management (decreased revenues from wood, increased costs), reducing the overall value of forests, increased costs due to the implementation of protective measures in the protection zones in the 5$^{th}$ level of protection, economic and social impacts of the nature protection restrictions. On the other hand, the amount of paid financial contributions was also quantified as compensations for nature conservation restrictions.

### Restrictions of common management

The method and procedure of calculating compensations for the restrictions of common management on forest land in protected areas were carried out according to the methodology set down by Government Decree No. 438/2005 on details about the contents of the application for reimbursement for restricting the common land management and on the manner of calculating the compensation, based on research of Tutka et al. (1996, 2001) and Linderová et al. (1997). Compensation amounts were determined for the following cases of loss:

– loss or decrease of revenues from wood in areas with permanent ban on economic activities and harvesting:

$$U_1 = \text{VŠH}_{\text{LPMJ}} \times \left(\frac{Ta}{Za} - \frac{Tob}{Za}\right) \times \text{P}$$

– reduction in revenues from wood in forest stands with the regulation of regeneration felling, with prolonged rotation period, except for the permanent ban on felling in the 5$^{th}$ level of protection:

$$U_2 = \text{VŠH}_{\text{LPMJa}} \left(\frac{Ta}{Za} - \frac{Tob}{Za}\right) \times \text{P} \times 1{,}0\rho^{r} - 1$$

– loss from increased costs of restricted management in relation to the costs of normal forest management:

$U_{3,1} = (Nob_1 - Nb_1) \times Ta_z$

– in the case when increased costs are calculated from the realized timber volume

$U_{3,2} = (Nob_2 - Nb_2) \times P_z$

– in the case when increased costs are calculated from the area of intervention

where:

$VŠH_{LPMJ}$ – general unit value of forest stand in €/ha at a real age of forest stand calculated according to a special regulation,
*Ta* – volume of planned intermediate or regeneration felling in terms of common management,
*Tob* – volume of limited intermediate and regeneration felling,
*Za* – forest growing stocks,
ρ – 3% interest rate,
r – duration of forest management plan (years) or length of restrictions in FMP (years),
P – forest area (ha),
$Nob_1$ – total unit costs of the required (restricted) method of management ($EUR·m^{-3}$),
$Nob_2$ – total unit costs of the required (restricted) method of management ($EUR·ha^{-1}$),
$Nb_1$ – total unit costs of the common method of management ($EUR·m^{-3}$),
$Nb_2$ – total unit costs of the common method of management ($EUR·ha^{-1}$),
$Ta_z$ – volume of felling with increased costs in ($m^3$),
$P_z$ – area of restriction with increased costs (ha).

### Reduction of the general value of forests

Very negative consequences of the application of the law on nature and landscape protection with its latest amendments and promotion of the concept of non-intervention protection and natural processes in protected areas lie in damage to certain habitats, the loss of which can be expressed through the quantification of their social value (Chapter 6) and also reduction of the general value of forests.

We determined the general value of forests according to provisions of Regulation No. 492/2004 of the Ministry of Justice of the SR. We adjusted the basic value of forests in protected areas in $EUR·ha^{-1}$ in 2010 in terms of damage in accordance with the assimilation organs (in %) in 2000 and 2010. We calculated the general value of forests in protected areas in 2010 by this method and besides also the possible general value of these forests if their health condition has not worsened so dramatically in comparison with 2000, but if it remained at the level of 2000.

### Increased forestry expenses due to the increased need of pest-control measures in the buffer zones of strict reserves

Protection measures well beyond the normal management (common forest tending) must been taken in the buffer zone areas (these buffers were not originally intended to protect the "outside" from the "inside", however, it is their main function now). These measures include frequent patrols of "bark-beetle observers", intensive use of trap trees and pheromone traps, salvage cuts and so on (Skuhravý 2002; Nikolov et al. 2011). These protective measures result in higher costs compared to the normal forest management. The amount of increased costs is quantified by comparing the current costs of forest protection and the costs of forest protection in protection and buffer zones of strictly protected areas. An area of 100 m for protection zone and 500 m for buffer zone was established for areas with strict protection and dominant representation of spruce. The real area of the protection zones of protected areas has been reduced to zones with the representation of spruce, which accounts for 29% of protection zones and similarly for 28% in buffer zones.

### Economic and social impacts of bans and restrictions on nature conservation

Socio-economic impacts can be quantified on the basis of income costs, employee and employer contributions, paid income tax and VAT. These indicators were evaluated in the period of 2006 to 2010 and were calculated per 1 $m^3$ of production based on data from the database of Statistical Office of the SR and sectoral forestry statistics. Employer's contributions were calculated at the level of 35.2% of labour costs. Employee's contributions and personal income tax were determined according to the net income calculator (www.openiazoch.sk) based on the average income in forestry. The conversion rate was 30.126 SKK/EUR. All values are discounted to the price level in 2010, while using these deflators: 2006 = 1.1034, 2007 = 1.0734, 2008= 1.0262, 2009 = 1.01.

## RESULTS

### Property loss arising from the bans and restrictions of the law on nature and landscape protection

Using the above-mentioned procedure, we calculated the annual loss of 22.427 mil. EUR. The loss in state-managed forests (including non-state forests in the vocational management) is 12.602 mil. EUR and in non-state managed forests 9.825 mil. EUR. Despite the fact that under the law on nature and landscape protection entities managing state-owned forests are not entitled to get any compensation for the property loss, we did determine the amount of loss because it is really generated and transferred to the state and its citizens. The following Table 2 shows the amount of property loss by levels of protection, and particularly in the Sites of Community Importance and Special Protection Areas that do not overlap with the national network of protected areas.

### Increased costs in forest due to the implementation of protection measures in protection zones in the 5th level of protection

Act No. 543/2002 on Nature and Landscape Protection establishes buffer zones of protected areas. The 4$^{th}$ level of protection is applied to buffer zones of small-scale protected areas with the 5$^{th}$ level of protection and is declared by the competent authority of nature conservation. For all strictly protected areas (e.g. nature reserves) in which the conservation authority has not declared a buffer zone, according to §17, section 7, the rule is applied on a strip 100 m outward from the protected area, unless the regulation states that such a protection zone does not apply. Protection zones, according to the original idea, should protect protected areas under the 5$^{th}$ level of protection against influences from outside. However, the current situation is quite different and surrounding forests have to be protected from the spread of bark beetles from non-intervention areas under the 5$^{th}$ level of protection. However, 100-m buffer zone is insufficient for this purpose. Practical experience and available literature (Wichmann, Ravn 2001; Wermelinger 2004; Kunca et al. 2011) show that endangered areas are at a distance of 500 m from the small-scale strictly protected area. In these buffer zones, it is necessary to implement measures to prevent the spread of pests from strictly protected areas into the surrounding forest stand according to §28, sec. 3 of Act No. 326/2005 on Forests. According to the increased average annual costs of forest protection in buffer zones of protected areas amounting to 58.52 EUR·ha$^{-1}$ in the area of 37,185 ha, the overall increased costs of forest protection were set to 2.176 mil. EUR·year$^{-1}$.

### Reduction of the general value of forests

Very negative consequences of the application of the law on nature and landscape protection with its latest amendments and promotion of the concept of non-intervention protection and natural processes in protected areas have reduced the general value of forests. Due to the rapid deterioration of forest health condition in protected areas, the general value of forest with health condition decreased by 23.79 mil. EUR in 2010 compared to value with health condition in 2000. The average annual value in forests of protected areas decreased by 2.38 mil. EUR.

Table 2. Annual amount of individual property losses in thousand EUR·year$^{-1}$

| Level of protection | Area (ha) | Loss of revenues from wood | Decreased revenues from wood | Increased costs of management | Total |
|---|---|---|---|---|---|
| 5 | 68,483 | 1,648.3 | – | – | 1, 648.3 |
| 4 | 12,632 | – | 0.4 | 77.1 | 77.5 |
| 3 | 241,507 | – | 10.7 | 3,724.5 | 3,735.2 |
| 2 | 501,002 | – | 18.7 | 12,259.3 | 12,278.0 |
| Σ 2–5 | 823,624 | 1,648.3 | 29.8 | 16,060.9 | 17,739.0 |
| SCI outside the NN of PA | 67,576 | – | – | 1,709.8 | 1,709.8 |
| SPA outside the NN of PA | 212,044 | – | – | 2,978.7 | 2,978.7 |
| Total | 1,103,244 | | | total | 22,427.5 |

NN – national network, PA – protected area, SCI – Sites of community importance, SPA – Special protection areas

## Economic and social impacts of bans and restrictions on nature conservation

The current range of economic restrictions in an inadequately extensive system of protected areas has a negative impact on the balanced fulfilment of economic, ecological and social forest functions, and also on regional development, quality of life, employment and incomes of the population especially in rural mountainous areas. Conflicts between the sectors of forestry and nature conservation regarding management of protected areas are persisting. Nature conservation advocates mostly a non-intervention regime and no processing of wood from salvage felling. The average annual volume of salvage felling wood located in protected areas which has not been processed in accordance with the relevant provisions of the Act on Nature and Landscape Protection is approx. 362,000 m$^3$.

The overall socio-economic impacts of non-processed wood from salvage felling in protected areas can be expressed through the loss of sales of the wood-processing industry, which is 167.81 mil. EUR using the 2010 prices (Table 3). The impacts also include the loss of sales in forestry and all supplying sectors. A significant socio-economic impact is the loss incurred due to the substitution of fuel wood with natural gas, thus creating a negative trade balance of 1.46 mil. EUR. All these effects lead to a loss of 2,268 jobs, mostly in rural less-favoured areas, resulting in higher government spending on unemployment compensations for these workers, including the payment of health insurance. We need to promote jobs in other sectors of the economy. Currently, the costs of creating one job are around 30,000 EUR, representing the total government spending on the above number of jobs of approx. 68 million. EUR.

The use of wood raw material for energy purposes gains an increasing importance. The main reasons are reduction of $CO_2$ emissions and a decrease in the dependence on energy imports. The use of 1 m$^3$ of fuel wood for energy purposes represents an equivalent of 307 m$^3$ of natural gas calculated by the average heating capacity (10.5 GJ·m$^{-3}$) (Trenčianský et al. 2007). At current prices of natural gas 0.251 EUR·m$^{-3}$, it creates a negative trade balance of 77 EUR·m$^{-3}$ of fuel wood. As the average share of fuel wood is 5.24% of total production (Table 3), it amounts to 1,460,600 EUR annually.

## The amount of paid financial contributions as a compensation for nature conservation restrictions

### *Financial contributions from the state budget according to §60 of Act No. 543/2002 on Nature and Landscape Protection*

Financial contributions from the state budget according to §60 of Act No. 543/2002 are intended to maintain or achieve favourable conditions of a part of the country which cannot be achieved by con-

Table 3. Summary of financial and socio-economic impacts of unprocessed wood from salvage felling in protected areas

| Category of socio-economic impacts | EUR·m$^{-3}$ | EUR·year$^{-1}$ |
|---|---|---|
| Loss of revenues in wood-processing industry | 463.55 | 167,806,499 |
| Contributions to employees and employer | 14.29 | 5,172,980 |
| Income tax | 6.23 | 2,255,260 |
| VAT | 20.68 | 7,486,160 |
| Net wages of employees | 24.27 | 8,785,740 |
| Economic outcome | 22,89 | 8,286,180 |
| Other costs | 330.21 | 119,536,020 |
| Cost of wood = Loss of revenues in forestry | 44.98 | 16,282,760 |
| Contributions | 6.07 | 2,197,240 |
| Income tax | 2.06 | 745,720 |
| VAT | 3.92 | 1,419,040 |
| Net wages (including the supply sector) | 19.93 | 7,214,660 |
| Economic outcome | 3.25 | 1,176,500 |
| Other costs | 9.75 | 3,529,500 |
| Negative trade balance due to substitution of fuel wood with natural gas | 77.00 | 1,460,600 |
| Loss of opportunity to create or maintain jobs (number) | | 2,268 |
| In forestry | | 923 |
| In wood-processing industry | | 1,345 |

Source: Moravčík et al. (2006, 2009, 2010b) ventional land management and to maintain buildings or underground capacities created by human activities if these buildings or capacities are necessary to ensure the protection of protected species which are connected with them. The following Table 4 shows the payment of these contributions for the period 2005 to 2010.

***Compensation for common management according to §61 of Act No. 543/2002 on Nature and Landscape Protection***

The compensation for the restriction of common management under §61 shall be understood a fact when resulting from restrictions and measures of ban and other conditions of nature and landscape protection laid down by Act No. 543/2002 or based on this Act, the land owner is entitled to a financial contribution corresponding to the restriction of common management, with the exception of owners of private protected areas and their buffer zones. While the Ministry of Environment does not have any data on compensations paid by the type of land, it provided us only with summary data for forest and non-forest land (Table 4).

***Financial contribution for any damage caused by protected animals under §97 of Act No. 543/2002 on Nature and Landscape Protection***

Ministry of Environment provided the amount of financial contribution and the number of subjects only in sum for §97 but did not differentiate by the type of financial contribution in accordance with letters a)–h) of the Act on Nature and Landscape Protection (Table 4).

***Financial contribution used for measures to prevent the spread of harmful agents from areas with the 5th level of protection***

State Nature Conservancy (SNC) provides the following information on financial contributions used in the period of 2006 to 2011 to ensure measures to prevent the spread of harmful agents from protected areas with the 5$^{th}$ level of protection where state administration authorities did not allow an exception to implement protective measures (removal of infected trees). Table 4 shows data for the period of 2006–2010.

***Payments within the Rural Development Programme 2007–2013 for measures in relation to the objectives of nature protection – NATURA 2000 – forest land***

Measure 224 aims to help private forest owners and their associations to address specific disadvantages resulting from the implementation of guidelines for NATURA 2000 (5$^{th}$ level of protection). The support set down in Article 36, letter b) sec. iv) shall be granted annually and per hectare of forest with the aim to offset the costs and loss of income resulting from restrictions on the use of forests and other forest land in connection with the implementation of Directives 79/409/EEC and 92/43/EEC in the concerned area. The support is provided between the minimum and maximum amounts set down by Council Regulation No. 1698/2005, in the range of 40–200 EUR·ha$^{-1}$. In Slovakia, the annual payment for SCI was set to 47.14 EUR·ha$^{-1}$. Table 4 shows the support according to measure 224.

***Payments within the Rural Development Programme 2007–2013 for measures in relation to the objectives of nature protection – forest-environmental payments***

Forest-environmental payments set down in Article 36 letter b) sec. v) represent a compensation for particular forest management aimed to maintain and increase biodiversity, conservation of natural forests, climate change mitigation and water resource conservation. The proposed activities which are necessary to achieve the set goals go beyond the relevant compulsory requirements for forest management. The support should provide private forest owners and their associations with the compensation for the loss of income and

Table 4. Financial contributions from the state budget in the period of 2005–2010

| Paid financial contributions | Number of subjects | Financial contributions (EUR) | Average per year (EUR) |
|---|---|---|---|
| §60 of Act No. 543/2002 | 41 | 130,523 | 21,754 |
| §61 of Act No. 543/2002 | 103 | 8,590,947 | 1,431,825 |
| § 97 of Act No. 543/2002 | 983 | 1,411,804 | 235,301 |
| Measures to prevent the spread of harmful agents | 51 | 1,919,022 | 393,804 |
| Measure 224 of RDP 2007–2013 | 197 | 1,871,610 | 623,870 |
| Measure 225 of RDP 2007–2013 | 141 | 236,852 | 78,951 |
| Total | | | 2,785,505 |

Source: Agricultural Paying Agency (2011) additional costs resulting from voluntary commitments. The support is provided between the minimum and maximum amount set down in the Annex to Council Regulation No. 1698/2005, in the range of 40–200 EUR·ha$^{-1}$. For the measure in RDP 2007–2013 the amount was set to 54.47 EUR·ha$^{-1}$ or 57.92 EUR·ha$^{-1}$ for SPA.

## DISCUSSION

Currently, we can state that the health condition and other parameters of forest ecosystems are unfavourable. Forests in protected areas which were not adequately adapted to the introduction of non-intervention approach often suffer from the gradual deterioration of health due to pest gradation, and insufficient forest tending or regeneration. Their development shows slow degradation to less valuable ecosystems with lower biodiversity. In Slovak protected areas, since 2005 approximately 6,790 ha of spruce habitats have temporarily declined to non-forest habitats (of which more than a half consists of habitats of European interest, the rest is represented by habitats of national interest). The same process threatens to affect other 3,357 ha, after which the majority of Slovak protected mature natural spruce woods will temporarily vanish (Moravčík et al. 2011). Restrictions resulting from the Act on Nature and Landscape Protection do not often enable to implement the necessary measures to reverse this process. Granting of exceptions tends to be rejected on the ground of an assumption that natural processes will gradually solve this problem. However, it is very probable that this approach will lead to the loss of natural biodiversity. Because of the global warming and non-existent connection between particular isolated sites of these habitats, future restoration of these habitats back to high-diversity spruce woods is not guaranteed. Currently, a significant proportion of forest reserves are in such a condition that without corresponding revitalization measures there is a risk of losing their original object of protection.

The current problem is a failure to establish and solve the management of buffer zones (protection zones) between protected areas and other forest stands. Initially it was assumed that buffer zones would serve to protect the protected areas from unfavourable effects of the environment. Today the situation is reversed and buffer zones should protect the surrounding vegetation from adverse effects of non-intervention areas (especially insect outbreaks). In many cases, however, buffer zones and their management were not intended for such a function. Under the management one often understands only constant search and rehabilitation of infested trees, which in turn may lead to extensive clear cuts, while buffer zones will become the most affected part of forests. Such management is difficult from financial, technical and personnel aspects and it is not clear who will provide it, using what methods.

The direct financial effects quantified by the restriction of common management (loss and reduction of revenues from wood, increased costs), reduction of the overall value of forests, increased costs due to the implementation of protective measures in protection zones of forests in the 5$^{th}$ level of protection represent annually 26.98 mil. EUR. Forestry as the primary production sector provides an important raw material base for the wood-processing industry. The wood-processing industry gains an average revenue of 463.55 EUR·m$^{-3}$ from the processing of 1m$^3$ of round wood (average for wood-processing, pulp and paper and furniture industry), which represents 3.92 of jobs per 1,000 m$^3$ of round wood and the resulting contributions and taxes for the state. The processing of 343,000 m$^3$ (round wood except fuel wood), which is not permitted to process by conservation authorities, would create or maintain in sum 1,345 jobs a year in the wood-processing industry and would generate profits of 167.81 mil. EUR a year in the wood-processing industry. A very important aspect is the government spending on unemployment. Unprocessed timber reduces the number of jobs in forestry and wood-processing industry, and this subsequently generates government spending on unemployment compensation for these workers, including the payment of health insurance, or it implies a need to promote jobs in other sectors of the economy.

These approaches are in the environment of the lack of financial compensation for forest owners and managers, local population and other groups concerned. The total financial compensation paid on average for the restriction of common management per year (2.08 mil. EUR), as well as compensations on forest land within NATURA 2000 – forest land and forest-environmental payments of 0.70 mil. EUR per year do not cover a half of the average annual financial loss caused to forest managers by bans and restrictive conditions of Act No. 543/2002, estimated at 26.98 mil. EUR. In Slovakia, no comprehensive system of financial compensation for property loss and increased costs compared to common management has been created yet. However, in some cases partial solutions have been provided, but their application lacks sufficient funding. Nature and landscape protection does not create any financial resources. It requires to subsidy the effect of their approaches from public funds (state budget, Rural Development Programme and so on). Therefore, this model of protection should be reconsidered in terms of state funding opportunities and the ambitions of nature and landscape protection should be adapted to real economic possibilities in Slovakia.

In addition to the above-mentioned effect, nature conservation restrictions cause much more negative socio-economic and financial impacts affecting also the forest sector to a various extent. We did not quantify them because of their complexity. These are mainly:

– increased costs of fire protection of protected areas,
– restrictive intensification of forest management – lack of use of the existing natural potential to enhance the economic viability of the forestry sector,
– increased bureaucracy – more and prolonged legislative proceedings,
– investment restrictions and overcharge – problems with the construction of highways, lack of approval of the construction of industrial parks, recreational centres and others,
– effects of the lack of infrastructure for regional development, safety and health of the population, the opportunity to travel in the region, including difficulty in commuting,
– increased costs of the health and safety of visitors to nature.

## CONCLUSIONS

Total financial effects have been calculated at 26.98 mil. EUR and total socio-economic impacts based on profit from the wood-processing industry at 167.81 mil. EUR. A negative socio-economic impact is observable also in the negative balance of trade due to the substitution of fuel wood with natural gas in an amount of 1.46 mil. EUR. These financial and economic impacts causing property loss are partly compensated by financial contributions, in the majority of cases according to §60, §61, §95, payments for measures to prevent the spread of harmful agents from the territory with the 5th level of protection and payments under the Rural Development Programme 2007–2013, which represent an average of 2.79 mil. EUR·year$^{-1}$, which covers only 10% of the financial costs. To compensate the loss, State Nature Conservancy receives funds from public sources (state budget, EU funds).

Total socio-economic impacts calculated from the ban on the processing of wood from salvage felling in protected areas cause, besides the above-mentioned financial loss, also the loss of 2,268 jobs, mostly in rural areas. This situation generates larger government expenses on unemployment compensation, health insurance payments, or there is a need to promote jobs in other sectors of the economy. Another loss of jobs is incurred in the supply and other related sectors, which was not taken into account in the calculations, and it represents about 4,000 jobs mainly in supply sectors of forestry sector (400) and wood-processing industry (2,200) and other related sectors to the wood-processing industry, for example, printing industry (1,400 jobs).


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