# Socio-economic conditions in selected biosphere reserves

**Drahomíra Kušová[1,*], Jan Těšitel[1], Karel Matějka[2] & Michael Bartoš[1]**

[1]*Institute of Systems Biology and Ecology, Academy of Sciences of the Czech Republic, Department of Landscape Ecology, Na Sádkách 7, CZ-37005 České Budějovice, Czech Republic*
[2]*IDS, Na Komořsku 2175/2A, CZ-14300 Praha 4, Czech Republic*
*\*draku@usbe.cas.cz*

**Abstract**
Established under UNESCO's Man and the Biosphere (MAB) Programme, biosphere reserves represent a series of protected areas linked trough a global network, intended to demonstrate the relationship between conservation of biodiversity and sustainable development. The focal point of this article is to discuss whether or not biodiversity protection can be considered as factor differentiating level of regional socio-economic conditions. Three Czech protected landscape areas, also recognized internationally as biosphere reserves, were used to test the hypothesis that territories under special regime of management due to nature protection suffer from economic underdevelopment. Based on the analysis of objective data and subjective reflection of the situation by local population we can conclude that protected areas should not be seen as territories a priori handicapped. This fact can be seen as a good precondition for biosphere reserves to achieve their mission aimed at promoting sustainable development.

*Key words:* nature protection, socio-economic conditions, biosphere reserves, sustainable development

## INTRODUCTION

Nature conservation has a tradition lasting more than hundred years. The concept have evolved over time, gradually stressing special themes – the progress can be seen as one starting with protection of particular species over protection of ecosystems until today, when an appropriate management of large scale landscape areas has become a focal point. The focus on landscape scale has brought about also a shift in the role local communities are expected to play in this type of nature protection – satisfaction of their socio-economic aspirations has begun to be perceived as an inevitable part of management of protected areas. Such a tendency is evident also in Central Europe, where areas having a status of being protected cannot be considered pristine landscapes. On the contrary, they are permanently populated cultural landscapes having passed century long cultivation by human activities. As a result modern nature protection measures should count with needs of local population in order not to make areas under protection a priori disadvantaged from socio-economic viewpoint. The strategic shift has also been reflected by the concept of biosphere reserves as it was accepted at the Man and Biosphere Conference in Sevilla in 1995. The concept presumes that biosphere reserves, besides being instruments for conservation of biological diversity, as model areas for research and educational activities, should promote sustainable development (see e.g. UNESCO 1996, Jeník 1996). There is still an open question, however, if such a balance can be ever achieved in reality.

## Methods used and model areas

### Model areas

Within the project titled "Participative management of protected areas – a key to minimize conflict between biodiversity protection and socio-economic development of local communities", financially supported by the Czech Ministry of Environment, relevant data was collected in three model areas – Protected landscape areas (PLA) – Šumava, Třeboňsko, and Křivoklátsko (see Fig. 1). For the purpose of some analyses, the model areas were extended to include also municipalities that form what we called "surroundings" of the model areas. It was made of 20-km zone around the studied protected areas. Municipalities of interest formed then three groups – lying completely within the protected areas (group A); being in between, i.e. intersected by borders of protected areas (group B); and those having their cadastral areas completely outside the protected areas (group C).

The protected landscape areas of our interest were, thanks to their uniqueness, also recognized internationally as biosphere reserves. They differ each other as to their natural parameters and historical socio-economic conditions, forming thus a broad scope of aspects to be taken into account when assessing mutual relationship between nature protection and local and regional socio-economic development (e. g. Bičík et al. 2002).
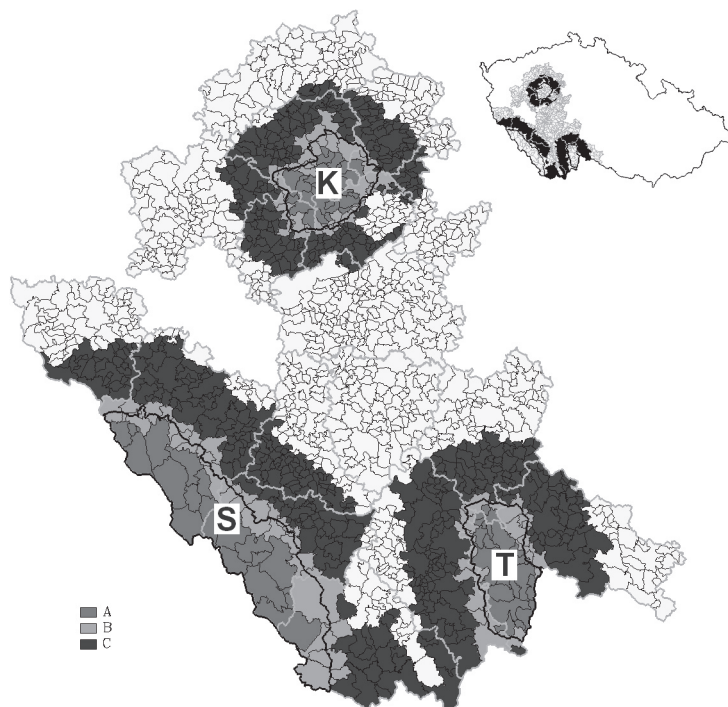


**Fig. 1.** Model areas: K – Protected landscape area Křivoklátsko, S – National park and Protected landscape area Šumava, T – Protected landscape area Třeboňsko; protected areas are marked by black lines. Municipalities were divided into three groups according to border of the protected area (A – completely within the area, B – on the border, C – surrounding of the area).

**Methodology**

Double optics can be in principle applied when discussing social unevenness in general – the objective and subjective ones. The distinction between the two perspectives is evident. The former reflects social consensus or political will, while the latter is based on evaluation of personal experience and aspirations of individual people. All that can be extended to include a spatial dimension, as there are not only individual people, but whole regions that can be considered rich or poor (Mareš 1999). In order to identify the development of the relationship between nature protection and socio-economic milieu in protected areas properly, a triangulation approach was applied. Triangulation is defined as mixing of methods and dates in order to get several viewpoints upon a topic to be studied (Olsen 2004). It combines analyses of objective data provided by official statistics as well as subjective data gained by field surveys, giving a picture on how local people themselves perceive their situations (Těšitel et al. 2005). Identification of "media image" of the selected protected landscape areas became also one of the conducted tasks, mainly the medially presented cases of successful cooperation or, on the other hand, of possible conflicts between the administration of the protected landscape area and the communities (Kušová et al. 2005).

We tested a question asking if areas being under a special regime of management due to nature protection do differ significantly from the surrounding areas, as to socio-economic milieu concerns. Two sets of objective data describing our three landscape protected areas as well as their surroundings were used, which was provided by the Czech Statistical Institute. The first set consisted of ten variables describing type of land use, expressed in terms of share of particular land-use categories within a basic statistical unit. The other set characterized socio-economic milieu in the territory by use of basic demographic data, data describing material well being of inhabitants as well as data on availability of infrastructure and services. All the data was related to municipality level as the basic statistical unit. Twenty two relative socio-economic characteristics were derived in order to enable comparison among units of different extent. Individual municipalities were twice processed by use of principal component analysis (PCA) – according to the data on land use and according to the relative socio-economic parameters. Based on results of both ordinations a new parameter, "normalized socio-economic status" of municipalities, was derived. It was used to test differences between landscape protected areas and their surroundings. All results were visualized by use of GIS technology.

In order to get information on how people subjectively reflect their current socio-economic situation as well as on what is their relation to nature protection, interviewing of key informants and extensive questionnaire survey were undertaken in all the three model areas parallelly in 2004. Together twenty key informants were addressed by use of semi-standardized interview, being both representatives of nature protection and mayors of local municipalities as well as experts in nature protection and regional development. The questionnaire survey technique was used to map opinions of local population as to everyday life. Adult people, older than fifteen, permanently living in the model areas formed the basic set. The sample was derived from it by use of combination of quota and random sampling, the quota being based on the size of municipality. Altogether, 1150 respondents were addressed. The share of the sample in the basic set was 1.86%, which made the sample representative enough for our purposes. Data was processed by use of SPSS 12.01 for Windows and graphical outputs were produced by Excel 2000 for Windows.

## RESULTS

### Objective perspective

Analysis of land-use was processed by use of PCA ordination (Fig. 2). The first two ordination axes ($PCA_1$ and $PCA_2$) were used to classify municipalities. These axes account for 41% of variability of the data set. The first classification (classes according the variable URBA=$PCA_1$+$PCA_2$ which we called "degree of urbanization") followed the gradient made by level of urbanization (rural to urbanized areas), while the other (orthogonal variable AGRI=$PCA_1$–$PCA_2$ which we called "share of agriculture") goes along the gradient characterizing share of agriculture in land use (prevailing forested areas to prevailing agricultural land).

Analogically socio-economic data was processed (Fig. 3). It emerged that almost one third of data variability was described by the first ordination axes ($PCA_1$), while the second one ($PCA_2$) accounted for the next eleven per cent. Further decline is smooth and continuous. Two factors proved to become evidently responsible for the position of a municipality in ordination space formed by two first axes – level of education and age structure. It yielded four basic arbitrary classes. The first class can be characterized as "normal" municipalities with population living in relatively well equipped local urban centers. The second one represents municipalities with an aging population, in some case "dying out spots". In municipalities of the third class live relatively young people. They are, however, not educated and suffer from unemployment. The fourth class is made up of municipalities with young educated and growing population.

As land use practices differ in individual model areas and in their surroundings, it proved to be incorrect to compare socio-economic conditions in and out of the model territories directly, but only when they were adjusted to landscape and local environmental features. Comparison without such an adjustment would lead to revealing of differences in natural conditions and type of settlements instead of those in socio-economic milieu.

The relationship between land-use and socio-economic parameters was searched for by use of correlations among several first axes for both mentioned PCA ordinations. Thanks to the fact that statistically significant dependence proved to be evident between the first ordination axis of the socio-economic parameters (PCA1) and degree of urbanization (URBA), it was possible to use, instead of the score of the first ordination axis, the difference between its value and the value expected, which was calculated by use of the following linear regression model (for $i^{th}$ municipality):

$$PCA1_i = (a + b \, URBA_i) + e_i$$

where a and b are regression parameters and e is an error. Differences between real and expected values were then calculated as values of variable

$$DIF\_PCA1 = PCA1 - (a + b \, URBA)$$

that we called "normalized socio-economic status" of a municipality. The higher its value, the better living conditions occur in a municipality.

It is fair to state, however, that the normalized socio-economic status could be calculated only when two principal presumptions had been taken into account. We presumed, that land-use types were related to the nature conditions of a particular locality and the character of a municipality (formed by prevailing economic activity in both contemporary and historical perspectives), and that socio-economic conditions were influenced by land-use practices.

Values of the variable DIF_PCA1 were calculated for all the municipalities forming our broader model areas (lying either inside of a protected area or in its surrounding). The difference between values assigned to municipalities inside the protected areas and those lying
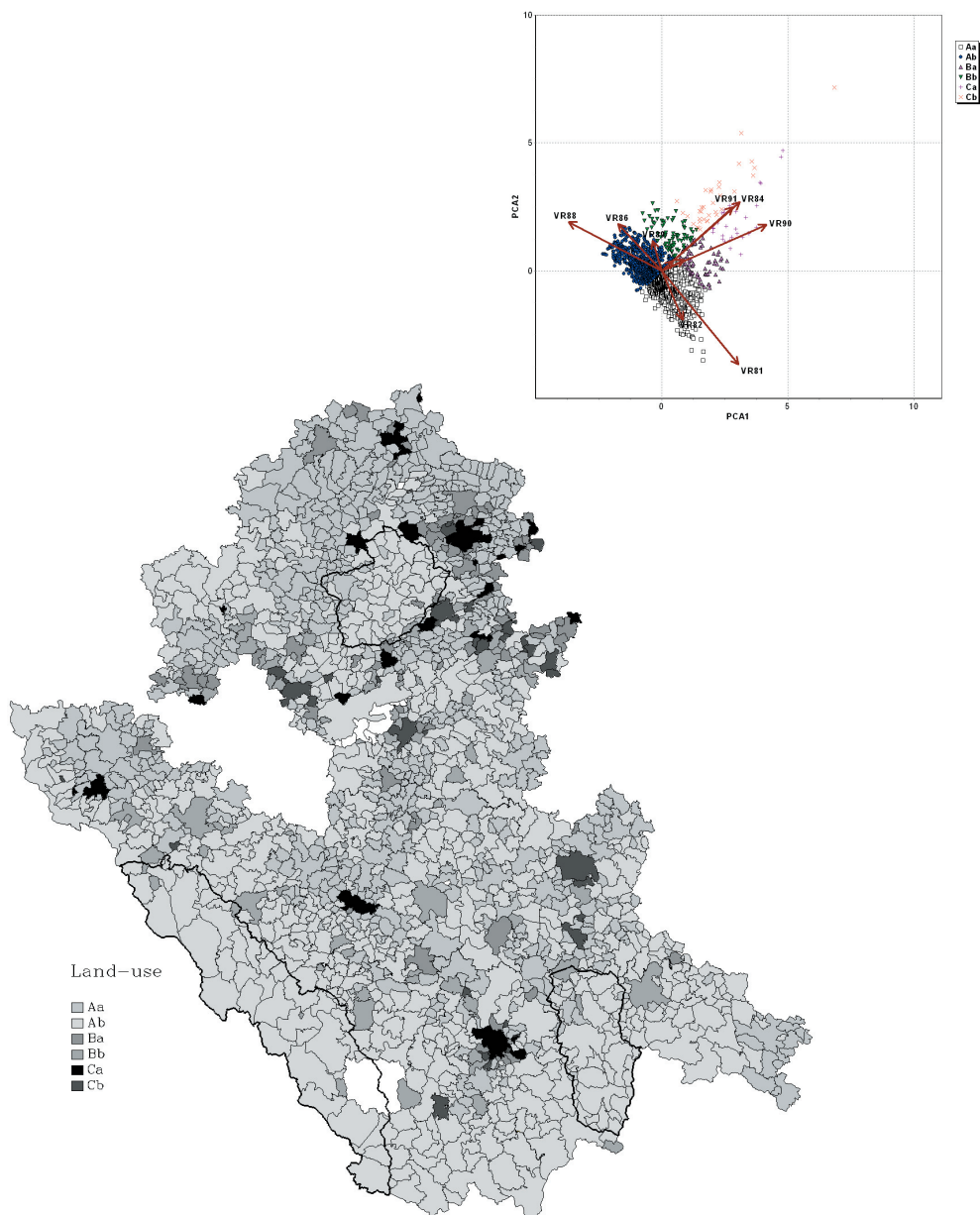
**Fig. 2.** Classification of municipalities on the basis of principal component analysis (PCA) of land-use data. Explanations: Combined classes consist of first uppercase character for municipalities within rural landscape (A), intermediate landscape (B) and urbanized landscape (C) – classes are derived from degree of urbanization. Lowercase character represents agricultural land type (a) or forest land type (b). Accompanying figure shows ordination biplot of first two PCA axes based on data (Czech Statistical Institute, municipality statistic database, 2002): share of arable land (vr81), hop gardens (vr82), vineyard (vr83), gardens (vr84), orchards (vr85), grasslands (vr86), forests (vr88), waters (vr89), build-up areas (vr90), other plots (vr91). Not filled units – white color: Data not available (military training area).
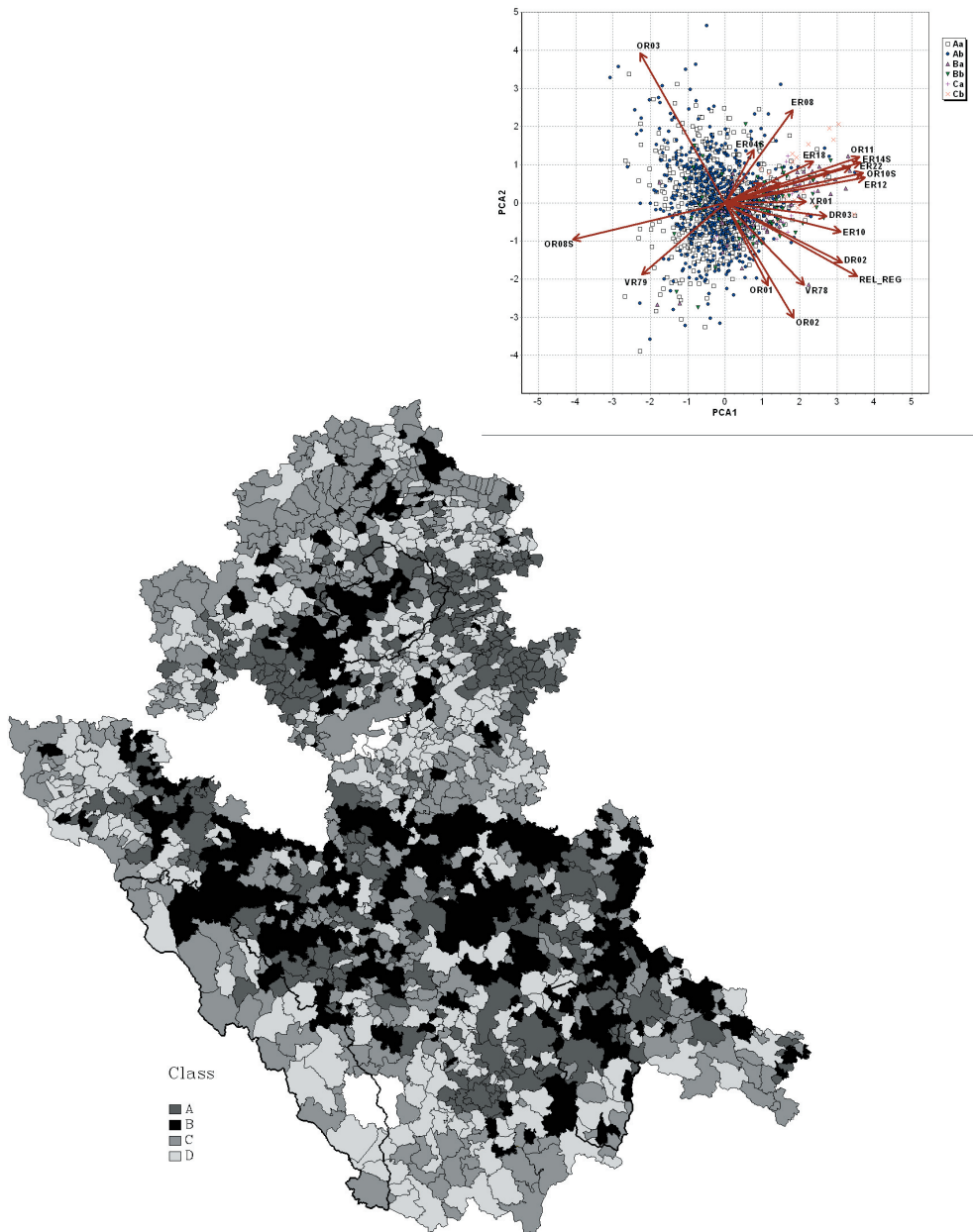
**Fig. 3.** Classification of municipalities on the basis of principal component analysis (PCA) of socio-economic data. Explanations: see next page.
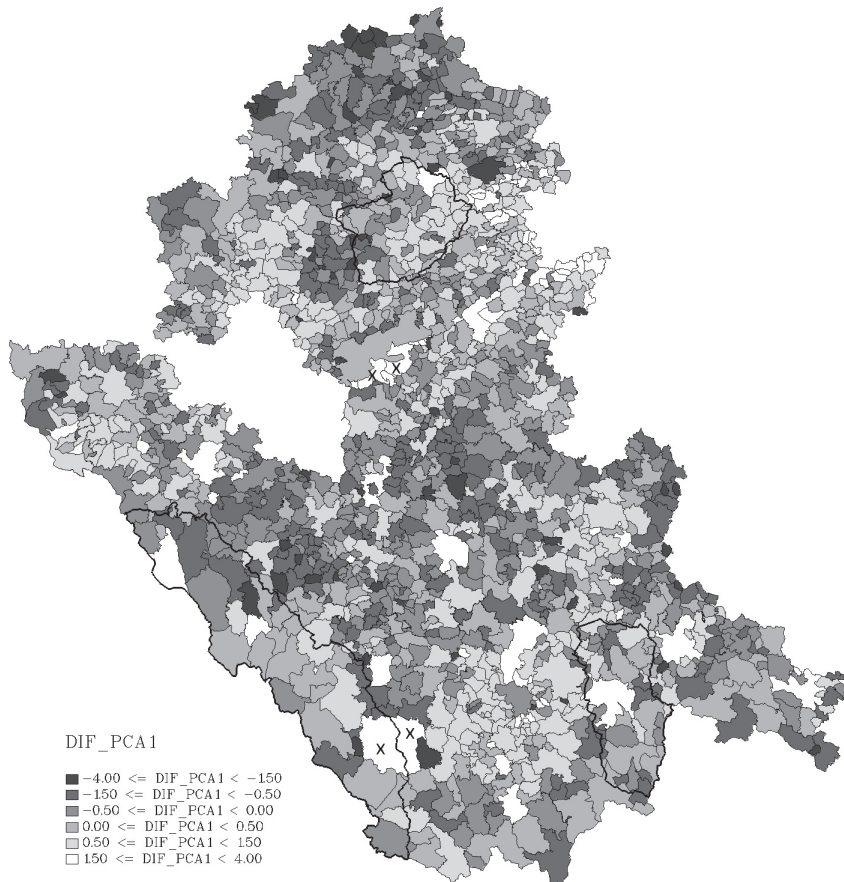
**Fig. 4.** Classification of municipalities according to normalized socio-economic status. The higher value of DIF_PCA1, the better living conditions in a municipality. Not filled units – white color with "x": Data not available (military training area).

**Fig. 3.** Explanations: Municipalities are divided into classes A – with standard human population (PCA1 ≥0, PCA2 ≥0), B – with aging population (PCA1 <0, PCA2 ≥0), C – with young low-qualified population (PCA1 <0, PCA2 <0), D – with growing "perspective" population (PCA1 ≥0, PCA2 <0). Accompanying figure shows ordination biplot of first two PCA axes based on relative data (original data – Czech Statistical Institute, Census 2001): Calculated out of total number of houses: permanently inhabited houses (dr02), houses owned by physical person (dr03). Calculated out of total population size: number of persons having a car in the family (er04s), having a phone line in a family (er08), having a mobile phone in the family (er10), having phone or mobile in the family (er12), having a personal computer in the family (er14s), with recreational house ownership in the family (er18), with possibility to use some recreational building (er20s), "well appointed" persons (er22), youngs of 0–14 years old (or01), adults (or02), seniors above 64 years old (or03), peoples without secondary level education (or08s), peoples reached second level education (or10s), university graduates (or11), students commuting for a school (xr02). Relative change in inhabitants number per year within period 1960–2000 (REL_REG). Calculated out of adult population size: economically active peoples (vr78), unemployed peoples searching for job (vr79), peoples commuting for a job (xr01), commuting at a long distance – out of the district (xr07s). Not filled units – white color: Data not available (military training area).

outside, was tested by use of F-test in analysis of variance with a three-level factor: munici-palities within the protected area (group A), on the border of this area (group B) and lying completely outside the protected area (group C). The difference proved not to be statistical-ly significant. Based on this we can conclude that protected areas do not differ from the "normal" surrounding areas as to socio-economic conditions, at least those described by the first ordination axes (Fig. 4).

## Subjective perception

The depiction of the present socio-economic situation, as viewed by locals, does not differ from the picture drawn by use of the official statistical data. People who live in our model areas can be characterized as members of a stabilized population. They seem to be deeply rooted in the territory, most of them have been living there for a long time, or they were even born there. Besides their affinity to nature, it is primarily social relations that make them feel tied to the locality – family, friends, job opportunities, flat and ownership of real estates. After all, the majority of them need not commute for a job or school out of the model area. They do not want to move out of the territory at all (see Fig. 5 and Fig. 6).

When evaluating quality of facilities in their municipalities, most of them have been con-vinced that available services as well as infrastructure are appropriate in the sense that they reflect the size of a particular municipality and its history. As to their own current economic situation concerns, majority of inhabitants seems to be content with it (see Fig. 7 and Fig. 8).

Their everyday life does not seem to be much influenced by the fact that they live in a protected area. In fact, only a minority of inhabitants has encountered representatives of the protected landscape area administration in person; they are as a rule those who have had to deal with some legal or bureaucratic procedures in which the administration of PLA partici-pates. On the other hand, most people living in the area use some facilities run by the admi-nistration, and participate in voluntary activities related to nature protection. They also high-ly appreciate the fact that the "label" of being recognised a protected area increases tourist attractiveness of the whole territory (Fig. 9 and Fig. 10).
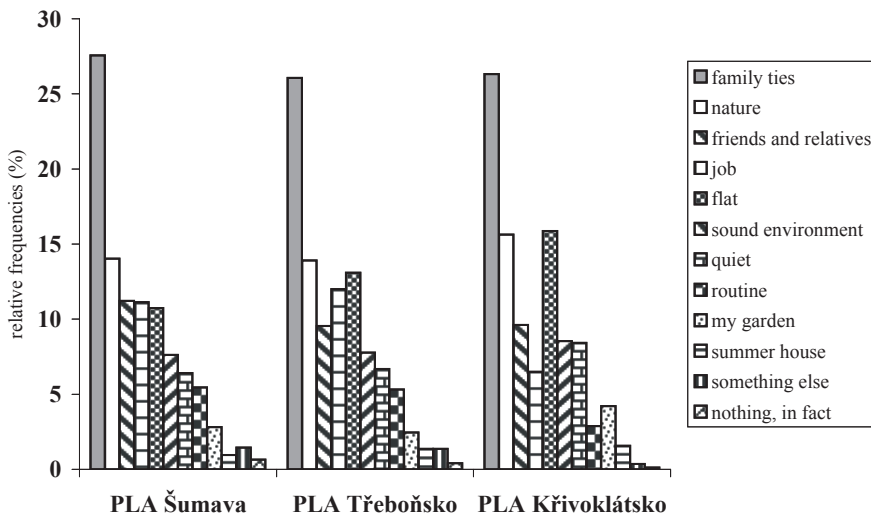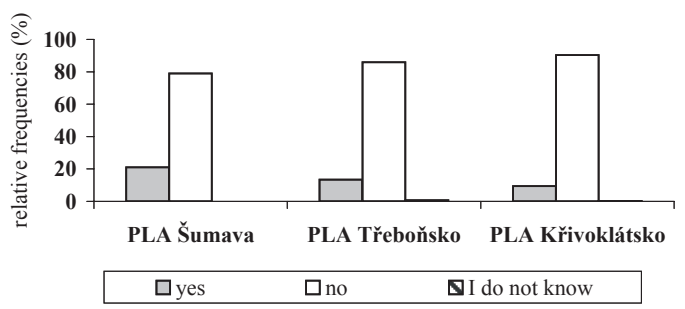


**Fig. 5.** Ties to the territory.

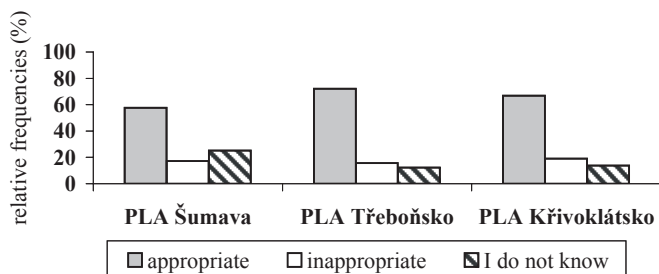**Fig. 6.** Intention to leave the territory.



**Fig. 7.** Quality of services and infrastructure related to scale of municipality.
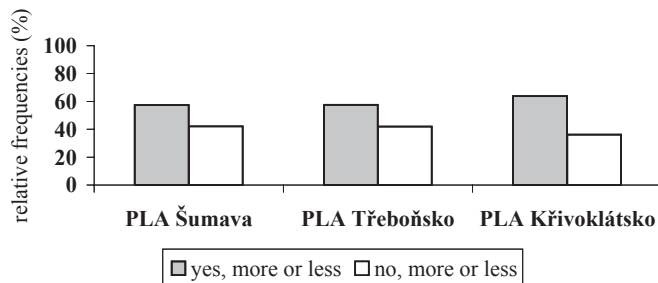


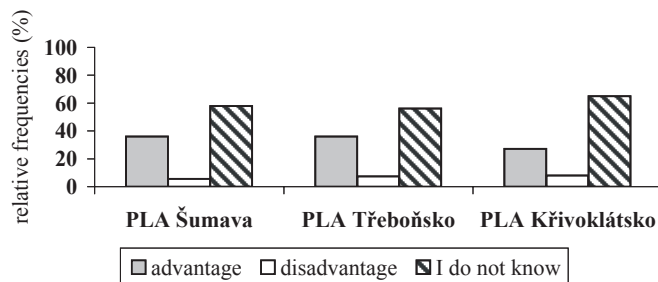**Fig. 8.** Contentment with personal economic situation.



**Fig. 9.** Role of PLA in regional development as it is perceived by local people.
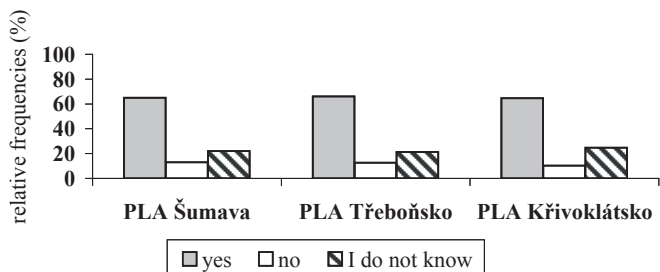
**Fig. 10.** Does PLA increase tourist attractiveness of the region?
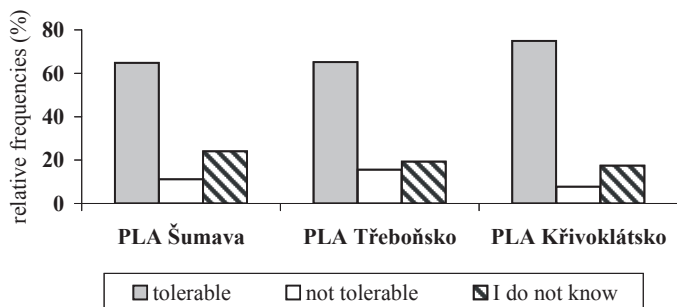


**Fig. 11.** Number of tourists in the region as it is perceived by local people.

To sum up briefly, it is possible to state that people living in the three protected areas do not feel to be handicapped in a socio-economic sense. As to their relation to nature protection, they perceive it in a "peaceful way"; in some cases they even have been able to find a way, how to make some kind of profit from it. The peaceful coexistence is primarily based on the fact that representatives of the municipalities as well as the administration of protected areas have already overcome the initial contradiction and have come to the point of building a joint vision of future coexistence. Sustainable tourism, as an activity acceptable by both sides, seems to have become the key point of the above mentioned common vision.

## DISCUSSION AND CONCLUSION

According to the generally accepted scheme, two conditions should be met in order that certain level of development to be achieved in a particular region. It is natural, social and cultural capital representing the principal role of internal potential of a particular region. Such a potential, however, can be converted to developmental impetus only when it meets an appropriate external context that represents the other presumption necessary (e.g. KUŠOVÁ et al. 1999; TĚŠITEL et al. 1999).

Based on the analysis of objective data and subjective reflection of the situation by the local population, we can generally conclude that protected areas should not be seen as territories handicapped a priori (e. g. ZEMEK & HEŘMAN 1998, BARTOŠ et al. 2005, ZEMEK et al. 2005). The status of being protected can be seen simultaneously in two ways, both as limitation and comparative advantage. On one hand, nature protection really poses limits on some economic activities as to their type, intensity or localization concerns. On the other hand, thanks to the state policy of nature protection and regional development policy, such regions are eligible for special funds, which cannot be applied for by other regions. To use

the terminology of regional development theories, we would say that the status of being protected may represent internal potential of the area. The level of its commodification depends on many factors, including local personalities and their activities (Bartoš et al. 1998).

We can also speak about economic externalities in this context. In our three protected areas we found concrete positive externalities such as "sound environment" and "well-preserved nature", which were highly appreciated by locals. These externalities proved to contribute to a large extent to the stability of local population as they represent one of the dominating attachments binding inhabitants to the territory (see Fig 5).

In all the model areas there is a commonly shared positive opinion among people as to the role of PLA in tourism development (Fig. 10). The "touristic" potential is perceived as not fully exploited yet (see Fig. 11). Once we agree with local key personalities and assume that sustainable tourism can be considered the base of the local economy in protected areas, we can go even further in our defense of nature protection. As sustainable tourism can be characterised as small-scale, decentralised, friendly to the natural as well as the cultural environment, and based on active participation of locals, it is, as an economic activity, based on commodification of natural as well as cultural capital of the particular locality or region (Jenkins 2001, Kušová et al. 2002, Ira 2005, Nolte 2005). Based on this premise we can formulate a theoretical statement, to some extent paradoxical, that nature protection can play a role of a guardian of long-term economic development as it keeps comparative advantage of an area alive. It can be seen as a good message for biosphere reserves in the effort to achieve one of their missions, the one aimed at promoting sustainable development.

At the very end it is fair to point out that, despite the "internal" differentiation of individual protected areas, all of them are embedded in a very similar regional context. The nation wide analysis of the current socio-economic situation proved that all our protected areas lie within regions where serious social conflicts are not present. This is mainly thanks to the
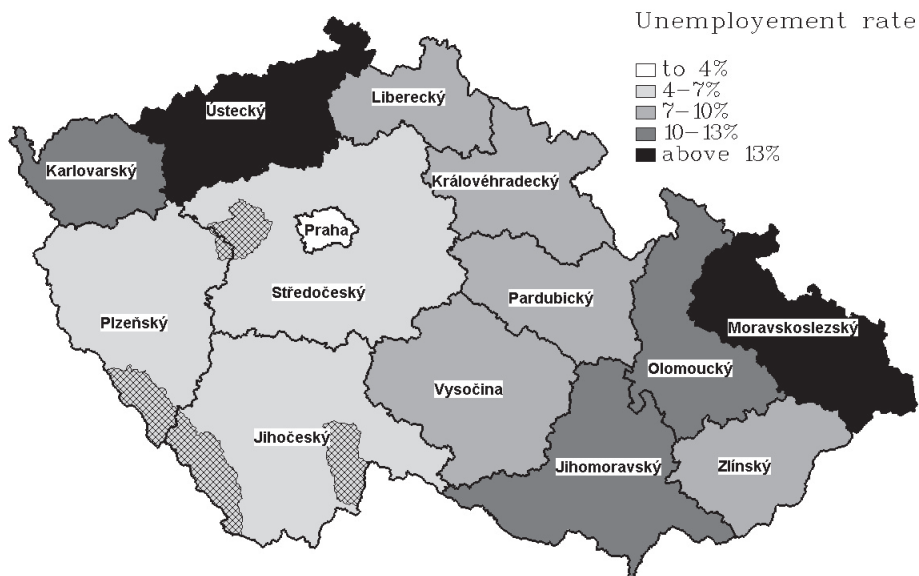


**Fig. 12**. Regional distribution of unemployment – Czech Republic, 31 Dec 2004 (source: Ministry of Labour and Social Affairs of the Czech Republic).

relatively low unemployment rate occurring there (see statistics on web-side of the Ministry of Labour and Social Affairs of the Czech Republic, http://portal.mpsv.cz/sz/stat). Therefore, we should be cautious when trying to generalize project results to apply to all Czech protected areas. In order to get more general outputs it would be necessary in future research to include protected areas situated in economically problematic regions, at least those lying in the regions of Ústecký kraj and Moravskoslezský kraj (Fig. 12).

## Souhrn

Podle Sevillské strategie (Cíl III. Úkol III. 2.5.) se doporučuje užívat biosférické rezervace jako experimentální oblasti pro rozvoj a testování metod, které vyhodnocují a monitorují nejen biodiversitu, ale i udržitelnost a kvalitu života místních obyvatel. Pro vybrané biosférické rezervace reprezentované CHKO Křivoklátsko, CHKO Třeboňsko, CHKO a NP Šumava byla proto provedena komparativní empirická studie s cílem otestovat hypotézu, zda jsou tato území díky zvýšené formě ochrany přírody výrazně socio-ekonomicky znevýhodněna vůči svému okolí. Hodnocení socio-ekonomických podmínek bylo založeno na analýze dat z databází Českého statistického úřadu, která popisovala základní socio-demografické charakteristiky obyvatel, vybrané parametry kvality života a využití území. Dále pak bylo toto hodnocení doplněno analýzou spokojenosti místní populace s vlastním každodenním životem a socio-ekonomickou situací v chráněných územích včetně jejích názorů a postojů k ochraně přírody. Tato data byla získána dotazníkovým sociologickým šetřením. Na základě provedených analýz lze konstatovat, že na zkoumaná chráněná území nelze pohlížet jako na území apriorně handicapována, neboť výrazné rozdíly v socio-ekonomickém rozvoji chráněných území a jejich okolí nebyly prokázány. Tento fakt je významný pro jeden z hlavních úkolů biosférických rezervací, kterým je kromě ochrany biodiversity i podpora udržitelného rozvoje.

## References

Bartoš M., Kušová D. & Těšitel J., 1998: Integrated endogenous regional development concept and the role of Šumava National Park administration. *Silva Gabreta*, 2: 385–394.

Bartoš M., Kušová D. & Těšitel J., 2005: Život v územích se zvláštním režimem [Life in large scale areas with specific regime]. *Životné Prostredie*, 39: 76–79 (in Czech).

Bičík I., Jeleček L., Chromý P., Kupková L. & Šefrna L., 2002: Comparison of land use changes in and outside biosphere reserves in Czechia. In: *Land-use changes in comparative perspective*. New Delhi: Oxford IBH Publishing, pp. 249–258.

Ira V., 2005: Sustainable development, quality of life and tourism. In: *Tourism, regional development and education*, Hesková M., Šittler E. & Dvořák V. (eds.) Reviewed proceedings of the 10th International conference "Tourism, regional development and education", Tábor, 12–13th May 2005. Katedra cestovního ruchu Tábor, Jihočeská univerzita České Budějovice, pp. 51–56.

Jeník J. (ed.), 1996: *Biosférické rezervace České republiky. Příroda a lidé pod záštitou UNESCO* [*Biosphere Reserves of the Czech Republic. Nature and people under patronage of UNESCO*]. Empora, Praha, 160 pp. (in Czech).

Jenkins T. (ed.), 2001: Integrated tourism: a conceptual framework, Deliverable 1. Ms., Supporting and Promoting

Integrated Tourism in Europe's Lagging Regions, 64 pp, online reference http://sprite.econ.upatras.gr.

Kušová D., Bartoš M. & Těšitel J., 1999: Potential development of the right shore of Lipno Lake area – comparison of landscape and urban planning documentation with ideas of local inhabitants. *Silva Gabreta*, 3: 217–227.

Kušová D., Bartoš M. & Těšitel J., 2002: Role of traditions in tourism development in the Czech part of the Bohemian Forest. *Silva Gabreta*, 8: 265–274.

Kušová D., Těšitel J. & Bartoš M., 2005: The media image of the relationship between nature protection and socio-economic development in selected protected landscape areas. *Silva Gabreta*, 11: 123–133.

Mareš P., 1999: *Sociologie nerovnosti a chudoby* [*Sociology of unevenness and poverty*]. SLON, Praha, 248 pp. (in Czech).

Nolte B., 2005: *Tourism in Biosphärenreservaten Ostmitteleuropas. Hoffnungen, Hindernisse und Handlungsspielräume bei der Umsetzung von Nachhaltigkeit*. Mensch&Buch Verlag, Berlin, 242 pp.

Olsen W., 2004: Triangulation in social research: Qualitative and quantitative methods can really be mixed. Developments in Sociology. In: *Developments in Sociology*, Holborn M. (ed.) Causeway Press, Ormskirk, 30 pp.

Těšitel J., Kušová D. & Bartoš M., 1999: Non marginal parameters of marginal areas. *Ekológia*, 18: 39–46.

Těšitel J., Kušová D., Matějka K. & Bartoš M., 2005: *Lidé v biosférických rezervacích* [*People in biosphere reserves*]. Institute of System Biology and Ecology, Academy of Sciences of the Czech republic, České Budějovice, 54 pp. (in Czech).

UNESCO, 1996: *Biosphere Reserves: The Seville Strategy and the Statutory Framework of the World Network*. UNESCO, Paris, 18 pp.

Zemek F. & Heřman, M., 1998: Socio-economic potential of landscape integrated in GIS frame. *Ekológia*, 17, Supplement 1: 232–240.

Zemek F., Heřman M., Mašková Z. & Květ, J., 2005: Multifunctional land use – a chance or resettling abandoned landscapes? (A case study of the Zhůří territory, the Czech Republic). *Ekológia*, 24, Supplement 1: 96–108.