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## **SUSTAINABILITY AT THE REGIONAL LEVEL: THEORY AND APPLICATION**

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The article is aimed at the possibilities of application of the sustainability concept on the regional level, with special regard to possibilities of spatial differentiation based on the analysis of sustainability, which can be projected into sustainable management of regions. After introducing some basic remarks on the sustainability concept the article discusses potential of geographical science for the research of sustainability and highlights contribution of geography to renewal of the paradigm of sustainability that seems to stagnate mostly at the global level. Theoretical suggestions are then briefly applied to the region of the Giant Mts. (Krkonoše), Czech Republic, which, as a Biosphere Reserve, are predestined to be such a research issue. The main contributions of geography to the sustainability concepts are seen in the ability of synthetic approach to the research issues and ability of spatial differentiation, which enables us to examine lower hierarchical levels.

**Key words:** sustainability concept, geography, regions, Krkonoše Mts.

### INTRODUCTION

Sustainability or sustainable development is a much discussed concept in professional and recently also in political circles, but not quite clear to the public, though often referred to in various contexts. One of the reasons for the present status of sustainability or sustainable development is that it comprises such

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a wide range of topics, scales and disciplines. This article presents a geographer's view of sustainability and attempts to highlight the contribution of geography to the sustainability concept.

Sustainable development or sustainability is one of the modern approaches attempting to handle the poor conditions of the Earth's environment and to tackle the quality of life of the Earth's population. However, until recently its theory and applications have been to a large extent concerned with global problems, regional studies having rather a normative politically defined character. In this respect mainly the *sustainable development* concept may appear to be somewhat stagnant and in need of new impulses. One of them can be to shift the attention to the *sustainability* approach (differences between these two terms are discussed in the following part) and to apply it at lower hierarchical level than the global. A regional level seems to be appropriate in this quest for greater concreteness.

The objective of this article is to outline a possible approach to regional sustainability from the geographical point of view, especially to possibilities for spatial differentiation based on the analysis of sustainability, which can be projected into sustainable management of regions. Theoretical suggestions and remarks will be demonstrated on the case of the Krkonoše Mts., which, as the national park and biosphere reserve located in densely populated and human-affected landscape of Central Europe, are more than a suitable area for research into application of the regional sustainability concept.

#### SOME THEORETICAL REMARKS

In the environmental sciences, including geography, sustainability is mostly understood either as a concept of land use, which is not destructive to landscape ecosystems, or, less specifically, as a way of human behaviour, which does not compromise the level of natural resources in the landscape or ecosystem and at the same time takes into account the quality of human life. The origins and philosophical foundations of the concept are discussed in detail for example, by Rao (2000), Huba (2002) and Klinec (2002). Sustainability seeks an optimal relationship between the productivity and carrying capacity of ecosystems, between conservation and development, and it is concerned with homeostasis and resilience of landscape, which are crucial for achievement of sustainability of landscape ecosystems (IUCN, UNEP, WWF 1980, Izakovičová et al. 1997, Hanašín et al. 2000).

Some authors (e.g. Sneddon 2000, Williams and Millington 2004) distinguish strictly between the terms "sustainable development" and "sustainability". The former seems to be conceptually exhausted and it is concerned mainly with environmental problems on the global level. It is often used in social sciences, particularly political science and economics. The latter term is understood as a new paradigm in the relationship between humans and nature, not as a way or tool for securing equal prosperity for future generations. Sustainability appears to be a more complex and thus more difficult to handle concept that is connected with adaptive management, biodiversity, ecological integrity and resilience rather than with policy, elitism or an accent on economy. Sustainability is a term expressing more precisely the approach of disciplines originally embed-

ded in natural sciences (e.g. geography or ecology). In similar way it is approached to in this contribution.

Though sustainability is an interdisciplinary term, geography as a complex science has exceptional potential for enriching and integrating methodological approaches to the sustainability concept (Wilbanks 1994). The basic general contribution of geography to sustainability is spatial (or more precisely spatio-temporal, since the time element should not be omitted) expression of the following issues: what is or what should be sustainable, in what scale, by whom and for whom, by what institutional mechanisms. At the regional level, these issues are spatially concerned with geographical organization of landscape segments or regions, where attention is centred to the study of interactions between humans and their physical, economic and socio-cultural environment taking advantage of the holistic and synthetic approach (Huba and Ira 1996, Hanušin et al. 2000, Johnston et al. 2000, Sneddon 2000, Purvis and Grainger, eds. 2004).

Although some authors (Bartelmus 1999) understand sustainability as a solution of dichotomy in the relationship between nature and the economy, it is generally acknowledged that sustainability leans on three pillars: environmental, economic and social (UNCED 1992, Izakovičová et al. 1997, Rao 2000, UN 2002). Other authors add cultural, political, institutional or technological dimensions, or refer to the socio-cultural aspect, quality of life etc. (e.g. Hynek 1999, Haughton and Counsell 2004). Although the pillars of sustainability should theoretically be in balance, actually the economic component is being accentuated in understanding of the sustainability concept.

Presently there are two basic approaches to the sustainability concept regardless the terminology used by different authors (Huba and Ira 1996, Holland 1997, Hunter 1997, Bartelmus 1999, Rao 2000, Huba 2002, Williams and Millington 2004). The first one is embedded in the philosophy of anthropocentrism, rationalism or technocratism. It claims that the needs of society have to be fulfilled regardless of possible disturbances to natural environment. Such sustainability is referred to as a weak, shallow, normative or economic. It attempts to measure the level of sustainability with the help of indicators, which assess the development of certain phenomena. Weak sustainability does not seek a solution to environmental problems in limiting economic development. It calls for better use of resources, mainly renewable, better inter-generational and geographical distribution of costs and benefits, it is optimistic in the view that technological to environmental problems will be achieved.

The second approach is based on the philosophy of eco-centrism, post-rationalism, and derives from deep ecology. Human activities are assessed according to impacts on components of the natural environment. It is called strong, deep, value-oriented or ecological sustainability. It attempts to identify values compatible with the sustainability concept, to change the order of values of society that should result in a change of behavioural patterns. It urges the shift in importance from wealth over welfare to well-being. Strong sustainability claims that it is necessary to revise the demands of society on resource use, which should be adjusted to the potential of the planet. It criticizes contemporary concept of economic development and urges sustainability of the natural environment.

However, the above-mentioned approaches should not be understood as dualism, but rather as a spectrum with various shades. Some authors (Rao 2000, Williams and Millington 2004) propose the concept of sensible or moderate sustainability combining characteristics of both approaches. It claims that limits for every component of the natural environment should be defined, thus bringing the term carrying capacity to the fore. Sensible sustainability stresses the importance of the ecosystem approach, accepts preservation of the functional integrity of ecosystems as a primary value (Hunter 1997) seeing use of resources by society as a secondary value. Thus the interests of the whole are put above the interests of the individual. Our opinion is that the present state of the environment and the general values appreciated by the society justify slight discrimination against weak sustainability and in favour of the principles related to strong sustainability. Moreover, the concept of “sustainability” itself is associated with eco-centrism lacking the reference to the somewhat economic nature of the term “development”, while the concept of “sustainable development” is associated rather with anthropocentrism.

#### ON THE METHOD

Presently there are three basic approaches to the solution of general research questions in geography (Johnston et al. 2000, Purvis and Grainger, eds. 2004):

1. territorial differentiation and study of typical and distinct features of a location or region and their relations,
2. spatial analysis and study of the organization of points, lines and surfaces,
3. study of the landscape and impacts of human activity on the natural environment.

All three approaches can significantly contribute to the development of the sustainability concept, particularly at lower hierarchical levels than the global, which is given by the fact that the spatial dimension or spatial context of sustainability has been neglected so far (Niu et al. 1993). The role of geography lies in introduction of more sophisticated concept, following three above-mentioned approaches, into the sustainability paradigm. The study of spatial relations and the geographical distribution of phenomena in space can provide information about non-sustainable segments of geographical space and about causes of this non-sustainability. The “level” of sustainability varies according to the hierarchical organization of space (vertical diversity) on the one hand, and within an individual hierarchical level (horizontal diversity) on the other. Although this contribution mainly deals with “horizontal” sustainability, the “vertical” has to be taken into account as well.

We have identified four categories that should receive attention when thinking of sustainability at the regional level:

1. geographical framework,
2. geographical identity,
3. aspects of sustainability,
4. factors of sustainability.

The first two categories can be seen as spatial, while the latter two categories take on the form of certain qualities or geographical content of spatial elements in our scheme. Let us now take a closer look at the individual categories in general sense before we examine them more concretely in the case study.

### GEOGRAPHICAL FRAMEWORK

By geographical framework we mean the location or position of a particular geographical segment. If we are concerned with a regional level of sustainability this geographical segment or region, as it will be called below, is generally put somewhere below the global hierarchical level and above the local hierarchical level. However thus we oscillate in a considerably wide hierarchical range. In fact and to be quite clear, in our opinion, a regional level roughly understood as a sub-national is level the most promising for the research into sustainability.

Speaking of the geographical framework we are interested in the wider spatial context of a region (both physical geographical and human geographical), since it is not possible to assess sufficiently the “state of sustainability” in the region without profound knowledge of its geographical position with regard to the characteristics of neighbouring areas and their geographical context. We also have to introduce a time element into our scheme, since the historical development and context of a particular region forms an inseparable part of its spatial context. Thus, briefly summed up, the geographical framework of a region is given by spatio-temporal context in which this region is anchored.

### GEOGRAPHICAL IDENTITY

The concept of identity in geography is related to different phenomena (Johnston et al. 2000). It is frequently used for instance in behavioural geography as a concept expressing the link between an individual (or population) and place seen from the point of view of the individual. The main object of research into identity is society and its members, who actively participate in the research. Such identity is formulated on a subjective basis.

On the other hand, geographical identity can be understood as a product of environmental and social (societal) action in a particular region. In this “passive” approach identity is seen as given by objective (or more precisely quasi-objective) circumstances and conditions. Such identity is not as invariable, as it may seem. It can evolve through the course of time as environmental and social conditions responsible for its character change or development.

In this contribution, geographical identity is understood as a given, dynamic and independent reality evolving in space and in time. The geographical identity is seen as something unique, special and typical for a particular region at a given hierarchical level that distinguishes it from other regions. Identification of such features in a region is of great importance when researching the state of sustainability in the region. This is closely connected with one of the crucial geographical themes highlighted above, that is with a study of spatial arrangements and spatial inequalities. We assume that the “qualities” of identity cannot be homogenous in the whole region. In order to assess more precisely arrange-

ments and inequalities we suggest that a researched region should be differentiated into regions of lower hierarchical level (sub-regions). Such differentiation has great value in defining crucial features from the point of geographical identity and distinguishing them from unimportant ones.

### ASPECTS OF SUSTAINABILITY

Aspects of sustainability are similar to pillars of sustainable development (see the second section of the contribution). In this sense they form either a general framework for assessment of sustainability in a particular region or a prism through which we can look at the state of sustainability in the region. Though authors do not agree on the number and character of aspects of sustainability (cf. UNCED 1992, Izakovičová et al. 1997, Rao 2000, UN 2002, Haughton and Counsell 2004) we can undoubtedly conclude that there exist two main groups: one being connected with nature and the environment, and the other, with society. Hynek (1999) brings forward five aspects: environmental, economic, social, political and cultural. These five aspects satisfy rather well the whole spectrum of geographical views of the sustainability and importance of individual aspects is relatively balanced.

### FACTORS OF SUSTAINABILITY

Factors of sustainability are generally concerned with human presence and activities, either positive or negative, in a region. "Factor" is an utilitarian term, which was used before by Klapka (2006) and which should probably be better understood as a "cornerstone" of sustainability, that is a phenomenon that actively affects the state of sustainability in a region (unlike the aspects of sustainability, which are understood as passive phenomena or classification criteria). These active phenomena, as factors of sustainability, essentially enter and determine the character of a two-way interaction between society and the environment.

Factors of sustainability can considerably differ in character and number according to the geographical framework and geographical identity of the researched region and according to the hierarchical affiliation of this region. It means that the factors have to be specified individually for each region under study on the one hand and according to the research objectives on the other. Human presence and human activities in a region as factors of sustainability are reflected and expressed in two basic categories: 1) land use and 2) the character of society and quality of life of its members.

The former category is a result of interaction between the natural or environmental "background" and social "foreground" of a region or could be seen as a product of political, economic and social structures (Geist, ed. 2006). It is physical factors ("cornerstones") representing secondary landscape structure (see e.g. Miklós and Izakovičová 1997) that are placed in this group. The latter category comprises, on the other hand, immaterial factors ("cornerstones") that are understood by Miklós and Izakovičová (1997) as tertiary landscape structure. These factors often express various parameters related with population and its activity. It is necessary that the defined factors of sustainability in a region be

further quantitatively and qualitatively analysed, since their character is rather general.

#### CASE STUDY: SUSTAINABILITY IN THE KRKONOŠE MTS.

As a region for application of the presented theoretical suggestions the Krkonoše Mts., in the Czech Republic have been chosen for detailed testing of the above-mentioned hypotheses by Klapka (2006). The results are briefly discussed in the following section according to the structure of the preceding section.

##### Geographical framework

Geographical framework of the Krkonoše Mts. can be defined both according to the physical geographical and human geographical points of view. The former is according to Jeník (1998) determined particularly by the marginal position of the mountains at the boundary of basic geological, geomorphological and climatic structures in Central Europe, namely the Hercynian and Alpine systems and oceanic and continental climate. In this position the Krkonoše Mts. are the highest elevation between the Alps and the Scandinavian mountains in the north-south direction and between the Atlantic Ocean and Southern Ural in the west-east direction.

The human geographical framework of the Krkonoše Mts. is determined by their position in the core part of Central Europe—namely in the territory of frequent political, social, economic and cultural disturbances (particularly ethnic changes after World War II and political and economic changes after 1948 and 1989). This territory represents a relatively wide border belt functioning both as a barrier and as an area of mediation between the Western cultural-economic innovation centres and Eastern areas of the continent. The marginal position of the Krkonoše Mts. can be expressed more specifically as the region on the border between different political territories with different cultural and economic levels (from the 14<sup>th</sup> century to the middle of the 18<sup>th</sup> century within one state since then between sovereign states). The Krkonoše Mts. are also situated in a position neighbouring one of the first industrialized parts of Europe and areas producing the heaviest pollution of the natural environment in the whole Europe.

##### Geographical identity

Geographical identity is closely related to the geographical framework of the Krkonoše Mts. Geoecological or environmental identity is dealt with in detail by Jeník (1998 and 2000). It is determined by:

- maximal height among all the Hercynian mountain ranges in Central Europe,
- contrast of steep northern slope and more gentle southern slopes caused by the tectonic situation along the main crest line,
- contrast of remnants of Tertiary etchplain with landforms modelled by Pleistocene glaciation and periglacial climate,

- sub-oceanic and windy climate with high portion of solid precipitation and action of avalanches in winter,
- permanent existence of forestless areas on exposed ridges and in glacial corries in the Holocene,
- high diversity of plant and animal populations,
- organizational similarity and genetic affinity of ecosystems to corresponding biomes in European high mountains and Scandinavia.

The natural environment and uniqueness of the Krkonoše Mts. are significantly conditioned by complex physical geographical processes (so called anemo-orographic systems – see more in Jeník 1961) that are responsible for the formation of the most important geographical structure in the Krkonoše Mts., namely the Arctic-Alpine tundra (see more in Soukupová et al. 1995).

The socio-cultural identity of the Krkonoše Mts. (Klapka 2006) is a result of complex socio-economic and cultural-political development lasting in the foothills almost 750 years and in mountain part for about 150-300 years less. It does not show such distinct and unique features as the environmental identity, and it is particularly determined by:

- long-term continual settlement of relatively high population density exerting permanent anthropic pressure on the landscape,
- status of a traditional and in many respects pioneering tourism and recreation area lasting since the second half of the 19<sup>th</sup> century,
- several disturbances of continuous socio-economic, political and cultural development,
- extremely intensive recreational use at present.

Socio-cultural identity determines the development of typical land use and landscape structure and its manifestation is both positive (formation of typical landscape character) and negative (emergence of environmental problems).

Interactions between components forming both the environmental and socio-cultural identity of the Krkonoše Mts. resulted in the emergence of a number of problems seen from the point of view of the sustainability. We regard the unacceptable use and consumption of the landscape of the Krkonoše Mts. or its parts for tourism, recreation and related activities as the main problem.

### Aspects and factors of sustainability

As mentioned earlier aspects of sustainability should possess “universal” validity, thus the factors of sustainability in the Krkonoše Mts. can be discussed immediately. We have identified three factors (“cornerstones”) of sustainability:

1. nature and landscape conservation,
2. tourism and related activities,
3. local population.

While nature and landscape conservation and tourism come under the category of land use, local population represents the category of society. These three factors and their mutual relationships are crucial for sustainability in the region of the Krkonoše Mts.

The importance of factors and their relationships is not equal. The greatest attention should be paid to nature and landscape conservation, followed by tourism and local population. Interaction between the factors of tourism and nature and landscape conservation is crucial for sustainability in the Krkonoše Mts.

#### Spatial differentiation of the Krkonoše Mts.

As suggested earlier, the sustainability assessment in our scheme requires detailed spatial division of a region. Spatial differentiation of a studied region reflects to a large extent its geographical identity, particularly the environmental aspect. It is also advantageous to use the factors of sustainability for the criteria of differentiation as much as possible. The result of differentiation in our case is a set of landscape ecological units of micro-choric level. Such concept reflects both geographical identity of the Krkonoše Mts. and the character of factors. Four differentiating attributes possessing a synthetic character were used:

1. landforms (including exposition and some other related climatic features),
2. land cover,
3. land use,
4. landscape care.

The first two attributes are related to environmental structural landscape characteristics and the latter two attributes are related to anthropogenic functional landscape characteristics. The attributes of landforms, land cover and land use are closely connected with the geographical identity of the Krkonoše Mts., attributes of land use and landscape care relate closely to two of the factors of sustainability: nature and landscape conservation and tourism, and more loosely to the factor of local population.

Application of deductive hierarchical approach to differentiation of the Krkonoše Mts. region resulted in delimitation of 51 spatial units reflecting the development and dynamic state of landscape processes, which formed a kind of a spatial framework for assessment of sustainability (Fig. 1). For the sake of clarity Figure 1 includes only names of the most important and distinct spatial units.

Mere delimitation of spatial units without specifying their sustainability-related content is, however, only a half result that does not provide the necessary foundations for the following steps. Therefore the resulting spatial units were grouped into 13 landscape types (Fig. 2). The same four attributes used for differentiation of the region of the Krkonoše Mts. formed the basis for typology. This typology brought into the research on the one hand necessary simplification in terms of the following steps regarding assessment of sustainability and future propositions, and, on the other generalization important from the methodological point of view. For detailed discussion of these steps we are compelled to refer to the work of Klapka (2006), since it is outside the scope of the presented contribution. Figure 2 presents landscape types of the Krkonoše Mts. as a dimensionless category and only provides a basic outline of the spatial distribution of individual landscape types (marked as A – M).

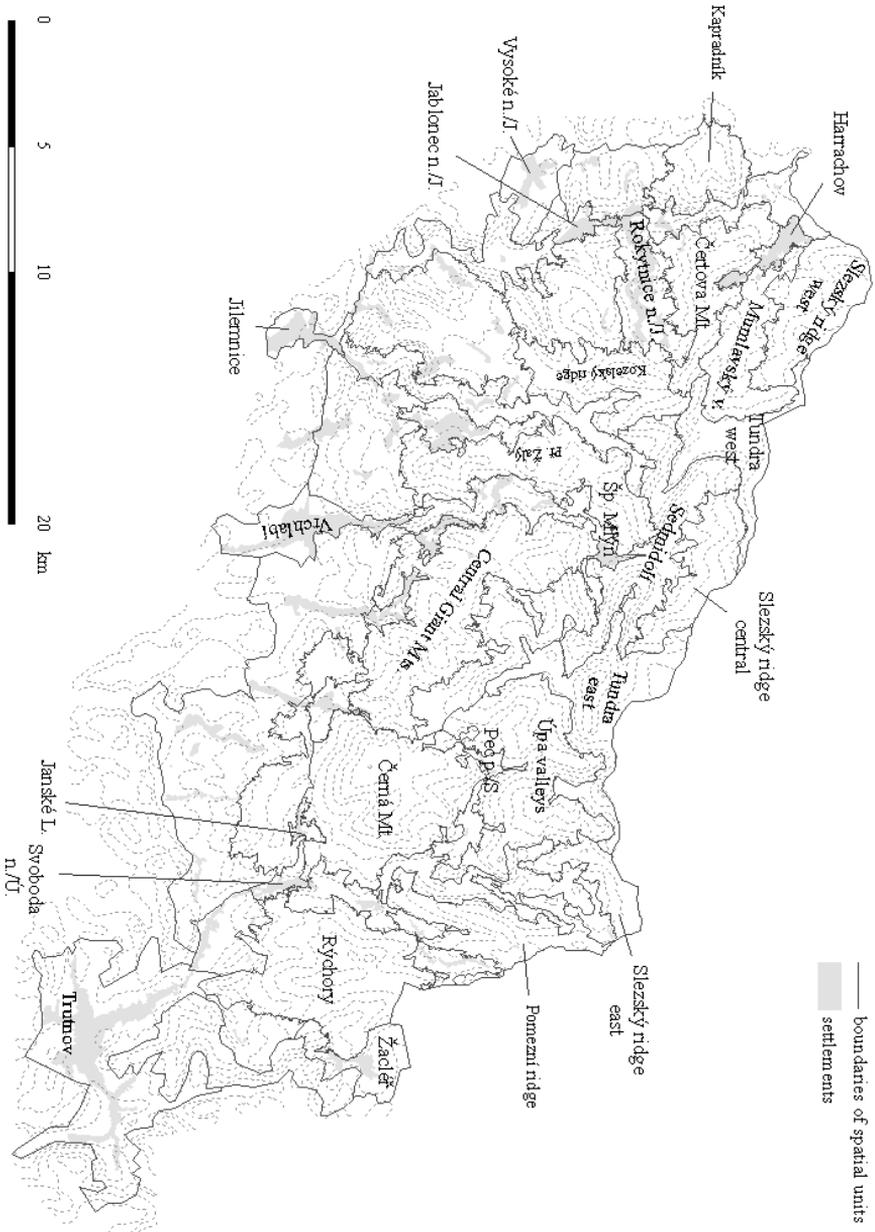


Fig. 1. Spatial units of the Krkonoše Mts. region

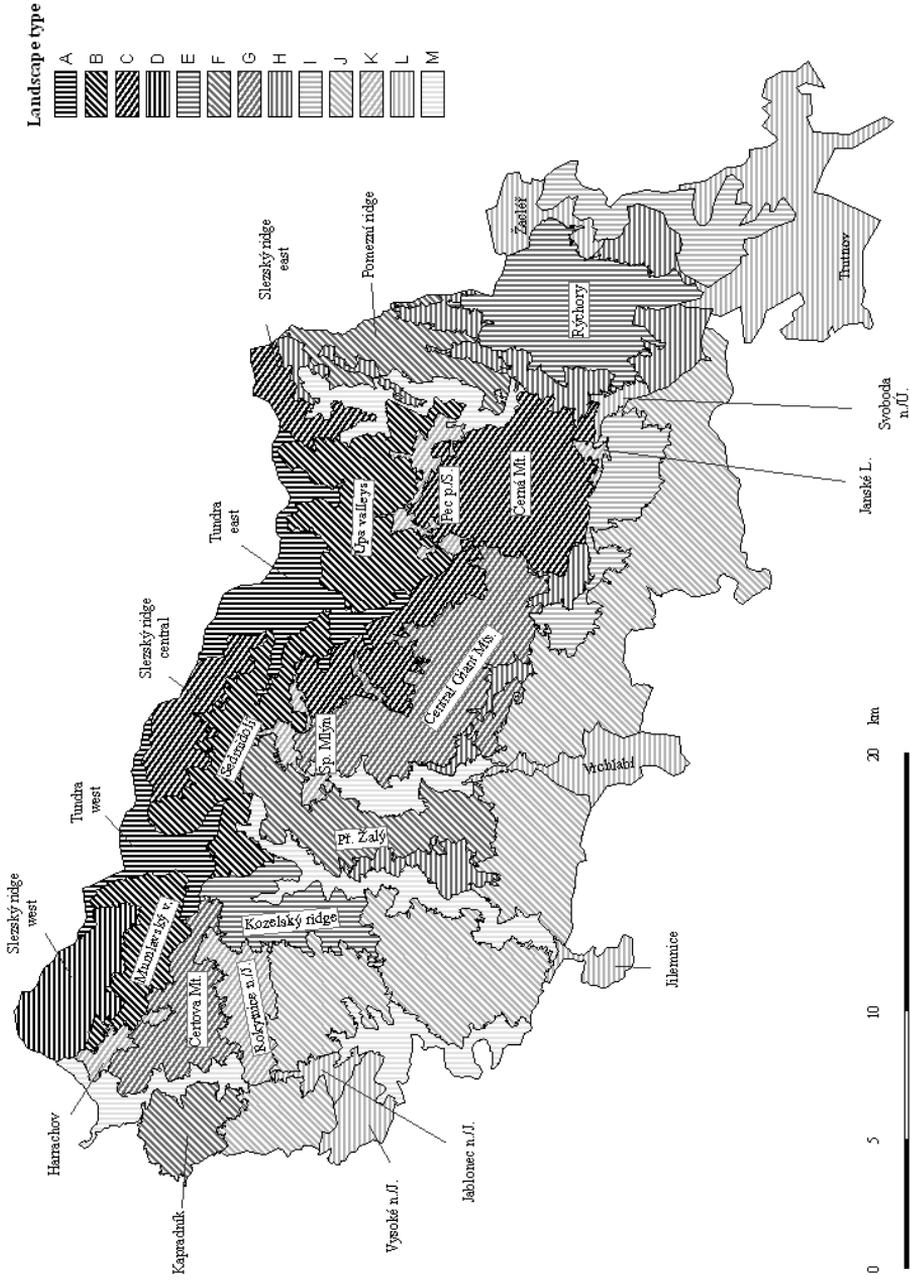


Fig. 2: Landscape types of the Krkonoše Mts.

## CONCLUSION

It is rather obvious that the research into sustainability involves contemporary topical geographical themes, as will be commented on further. On the contrary, the two main contributions of geographical science to the sustainability concept are:

- the ability of geography to take into account and assess synthetically most of the pillars, aspects and factors (a concrete term depends on a concrete author) of sustainability,

- the ability of spatial differentiation that does not limit geography to assessment of sustainability only at the global level, but also at lower hierarchical levels, the regional level probably being the most suitable for sustainability assessment.

The former contribution is based on the nature of geography as a complex science that is able to connect knowledge of natural and social sciences that both attempt to contribute to the sustainability concept. In the presented scheme, part of its components is rather seen as eco-centric (geographical framework, geographical identity), some rather as anthropocentric (aspects of sustainability, factors of sustainability). Or the nature of these components could be viewed as dichotomy, when all involve in some way the issue of human impacts on the landscape and the influence of the landscape on various socio-economic phenomena.

The latter contribution is related to the one of the above-mentioned stagnations of the sustainability concept, namely the relative incapability to leave to a certain extent the global level of sustainability and its applications. The regional and hierarchical approach to sustainability is related to the geographical concept of territorial differentiation. In our scheme a region is understood, on the one hand, as a spatial unit positioned in higher hierarchical regional system. This is the geographical framework of a region affecting its sustainability. On the other hand, a region consists of spatial units of a lower hierarchical regional system, which create the geographical identity of a region.

Spatially differentiated geographical identity and its expression in the form of spatial units should bear a great importance for assessing sustainability in a region and factors affecting this sustainability. Spatial analysis and study of organization of various geographical phenomena, particularly those related to the factors of sustainability, in spatial units can provide healthy and important foundations and framework for other, and ideally interdisciplinary, research within the sustainability concept.

The differentiation of a region into spatial units and typology of these units can be used in the management of a region in terms of its sustainability, for instance as the basis for a sustainability strategy. This approach possesses several advantages. On one hand spatial differentiation provides an increased level of tangibility of proposed measures, on the other the typology secures a moderate level of necessary generalization. Furthermore, the proposed approach is able to relate “horizontal” (i.e. spatial) and “vertical” (i.e. componential or indicator) features of sustainability.

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## UDRŽATELNOSŤ NA REGIONÁLNEJ ÚROVNI: TEÓRIA A APLIKÁCIA

Udržateľnosť je pojem, o ktorom sa v súčasnosti často diskutuje. Skúmajú ho rôzne odbory na rôznych úrovniach a z rôznych uhlov pohľadu. Momentálne pojem udržateľnosti trochu stagnuje predovšetkým kvôli tomu, že sa zväčša aplikuje na globálnej úrovni. Cieľom príspevku je naznačiť možné geografické prístupy k problematike udržateľnosti na regionálnej úrovni. Teoretické závery a poznámky sa aplikujú na región Krkonoš, ktorý, ako biosferická rezervácia, je vhodný pre štúdium udržateľnosti.

Udržateľnosť sa v geografii chápe ako pojem, ktorý znamená také využívanie prírodných zdrojov, ktoré nepoškodzuje krajinné ekosystémy. Udržateľnosť hľadá optimálny vzťah medzi produktivitou a udržateľnou kapacitou týchto ekosystémov medzi ochranou prírodných zdrojov a ekonomickým rozvojom. Udržateľnosť sa zároveň líši od termínu udržateľný rozvoj predovšetkým tým, že viac akcentuje filozofiu ekocentrizmu a je spojený s biodiverzitou, ekologickou integritou a resilienciou.

Priestorový aspekt udržateľnosti sa doteraz zanedbával aj keď štúdium priestorových vzťahov a geografickej distribúcie javov môže poskytnúť dôležité informácie o neudržateľných častiach geografického priestoru a o príčinách tohto nepriaznivého stavu.

Ak hovoríme o udržateľnosti na regionálnej úrovni, podľa nášho názoru je vhodné venovať pozornosť nasledujúcim kategóriám:

1. geografický rámec,
2. geografická identita,
3. aspekty udržateľnosti,
4. faktory udržateľnosti.

Geografický rámec umožňuje začleniť skúmaný región do širších súvislostí, geografická identita a jej priestorová diferenciácia zjemňuje pohľad na región a vytvára vo forme priestorových jednotiek nižšej hierarchickej úrovne dôležitý základ pre náš výskum udržateľnosti v skúmanom regióne.

Aspekty udržateľnosti tvoria rámec pohľadu na problematiku udržateľnosti. V našom prípade sme volili kultúrny, ekonomický, sociálny, environmentálny a politický aspekt. V regióne Krkonoše sme za faktory udržateľnosti považovali ochranu prírody a krajiny, cestovný ruch a miestnu populáciu.