

SOCIAL-SCIENTIFIC RELEVANCE OF LANDSCAPE ECOLOGY AS THE REFLECTION OF ITS THEORETICAL-APPLIED AND EDUCATIONAL DEVELOPMENT

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Abstract

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The social-scientific relevance of landscape ecology is one of the most important meta-scientific research themes dealing with landscape ecology as a scientific discipline. In this context it is possible to understand the social-scientific relevance of landscape ecology as the reflection of its theoretical-applied and educational development. The social relevance of landscape ecology is dependent on its trans-disciplinary and educational nature while its scientific relevance is dependent on its intra-disciplinary, interdisciplinary and managerial nature. The strengthening of social and scientific relevance of landscape ecology creates the required internal preconditions for its sustainable development and efficiency in theory and practice.

Key words: social-scientific relevance, sustainable development and scientific efficiency of landscape ecology

Introduction

Global socio-economic, ecological-environmental problems arouse increasing interest in disciplines other than ecological scientific ones, and urge solutions for the landscape. Consequently, this increases competition in sciences involved with research into the relationship between humans and landscapes and requires, beside other factors, perfection in the theoretical-applied and educational efficiency of landscape ecology through its continuous development, with the aim of achieving its socio-scientific relevance.

The social and scientific relevance of landscape ecology represents one of the important research subjects of meta-landscape ecology involved with multiple aspects of landscape

ecology as a scientific discipline. In this context, the social and scientific relevance of landscape ecology can be interpreted as the reflection of its theoretical-applied and educational maturity or development. Meanwhile, the more broadly interpreted social relevance of landscape ecology (obligatory-applied-educational relevance) in its essence is similar to that of geography in the sense of Matlovič and Matlovičová (2010).

The social relevance of landscape ecology is its exterior aspect resting on motivation of landscape ecologists to apply results of landscape-ecological research to the practice and educational process as Ořaheř (1999) pointed out. In this way, it helps to strengthen landscape-ecological awareness in society.

On the other hand, the scientific relevance of landscape ecology (heuristic-meritorious-managerial relevance) in the sense of the social relevance of geography (Matlovič, Matlovičová, 2010) represents its inherent aspect, which dwells on the awareness of the substance and core of landscape ecology. Scientific relevance can also be interpreted in the narrower meaning of the word regarding its position amongst other scientific disciplines. The main goal of the scientific relevance of landscape ecology is strengthening its position among the other sciences dealing with ecological-environmental and social questions in the landscape.

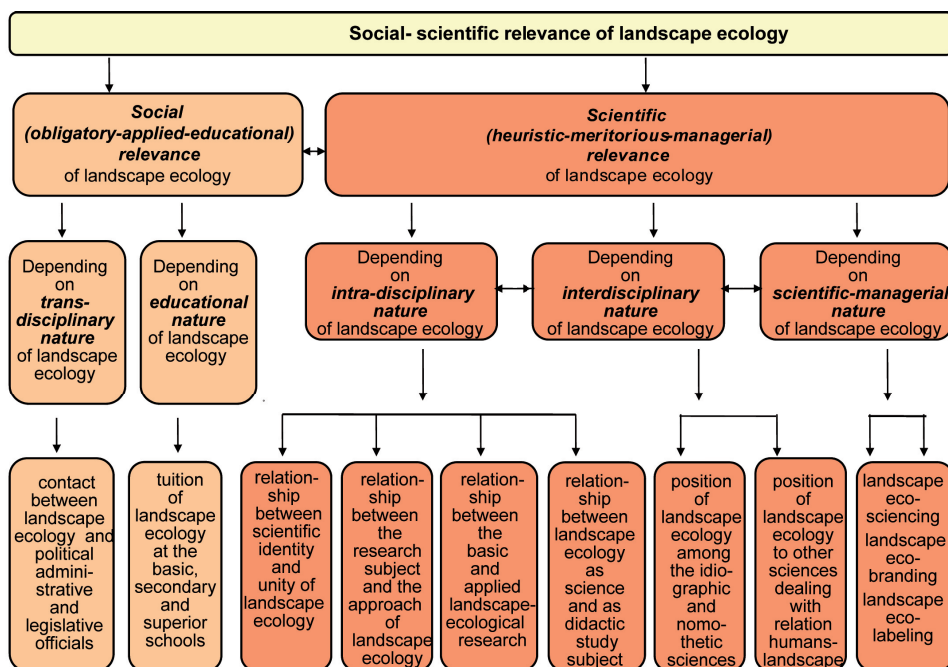


Fig. 1. Scheme of the socio-scientific relevance of landscape ecology depending on its trans-, intra- and interdisciplinary as well as educational nature.

What follows from this reflection in addition to other factors, is that the social and scientific relevance of landscape ecology are not placed against each other in isolation, but, to the contrary, they are inherently united and mutually complementary. The social relevance of landscape ecology creates a certain external framework for its scientific relevance, which determines the potential of increasing its scientific significance and of creating landscape-ecological awareness in society. Scientific relevance enriches the social weight of any science, and simultaneously landscape-ecological awareness, here by its scientific landscape-ecological dimension.

The roles of the social-scientific relevance of landscape ecology can be interpreted in two ways, either as a generally educative one where the basic landscape-ecological knowledge constitutes part of universal education, or alternatively, in the scientific-applied-educational position focused on the holistic-synthesising and ecological-relational explanation of the spatial-temporal context for the relationship between humans and their landscape.

Some remarks on the social relevance of landscape ecology

One of the principal manifestations of the social relevance and import of landscape ecology is the public's recognition and estimation of it as a necessary and useful scientific discipline. It creates the essence of the landscape-ecological awareness of society and realization of the spatial-temporal and ecological-relational natural and social contexts of landscape. This means that increasing landscape-ecological awareness is accompanied by the increased social relevance of landscape ecology. Landscape-ecological awareness is to great extent a reflection on the development and maturity of the theoretical/meta-scientific basis of empirical knowledge, methodical instruments and applied-educational level within and without landscape ecology. The societal level of landscape-ecological awareness depends on the general, and particularly on the ecological, education of the population, and on the applied efficiency of results attained by basic research.

Societal recognition of landscape ecology's significance is a dynamic phenomenon depending not only on the external political, economic, historic and cultural situation but partly also on the trans-disciplinary and educational nature of landscape ecology and the social position of science in general.

The social position of science influences the importance of landscape ecology for society. The present development of scientific disciplines fostered by several processes, including that of ecology, makes the filtration of ecological paradigms into other sciences possible. It lends them ecological relational-functional elements. On the other hand, processes such as those in geography and humanization enrich ecology by the spatial-holistic and social elements which eventually strengthen its social relevance (more in Žigrai, 2001).

The social importance of landscape ecology is influenced, amongst other things, by the globalization of science in general. It manifests itself in the selection, commercialization, convergence and cooperation of different sciences. This selection is characterized by the preference of technically and technologically oriented scientific disciplines, and a distinct trace of commercialisation appears in the emphasis on economic aspects connected with

the expectancy of rapid returns for the investments into research (more in Žigrai 2006). This convergence of sciences most likely stems in efforts to approximate methodical instruments, empirically-applied and educational experience of the individual sciences to solve the key ecological, environmental and socio-economic problems, which have global effects (more in Žigrai et al., 2010).

Meanwhile, scientific cooperation requires drawing on various sciences involved with economic, technical, socio-cultural, political, ecological/environmental and geographical research to satisfy the needs of educated society under the on-going globalization process, and the study of its properties and laws. Each of these sciences can contribute and enrich human society by the specific knowledge that enhances its competitiveness within the globalized world.

For instance, economic knowledge makes it possible to comprehend the economic framework and rules of globalization. Technical disciplines contribute by discoveries to the building of technical infrastructure indispensable for keeping in step with globalization. Results achieved by political science help the understanding of the global political context. Fresh knowledge of ecological-environmental disciplines sets the limits of sustainable development of the society and ecological-environmental quality in the context of the entire planet. Knowledge gathered by research of socio-cultural sciences makes it possible to outline the social carrying capacity of the globalization process. Geographical sciences with their holistic spatial view recognize the necessity of strengthening regionalization as a certain compensating process in the face of globalization (more in Žigrai, 2006).

a) *The trans-disciplinary character of landscape ecology* reveals the extent landscape ecology is able to communicate and cooperate with socio-political decision-making actors and civic initiatives in the transformation of basic and applied research for its needs. The key factor is obviously the capability and necessity of transferring landscape ecological, relational-ecological and spatial-holistic scientific thinking and language to those appropriate within the sectors of political, administrative and legislative officials.

b) *The educational character of landscape ecology* is characterized by the extent to which it can strengthen the landscape-ecological awareness and its social weight through a differentiated approach to tuition and lecturing in biological subjects and geography in basic, secondary and tertiary education. Tuition in ecology, biology, geography and environmental science, which are closest to landscape ecology in secondary schools, is central because there are sufficient students who possess the basic biological-geographical knowledge to become future carriers of landscape-ecological principles. These also have the capacity to comprehend empirical and biological-geographical knowledge in temporal-spatial, ecological-relational and natural-social contexts. This can also contribute to progression from the general-cognitive level to that of explanation, contextual, holistic and application abilities.

Education of landscape ecologists in universities and tertiary schools must achieve the main objective of formation of its scientific-applied and educational professional profile, which in turn can lay the basis for the competitive application in scientific-applied and educational activities. In addition to curricula, choice of subject, scope of basic knowledge, sequence and continuity of subjects, the development of mental predispositions must ensure

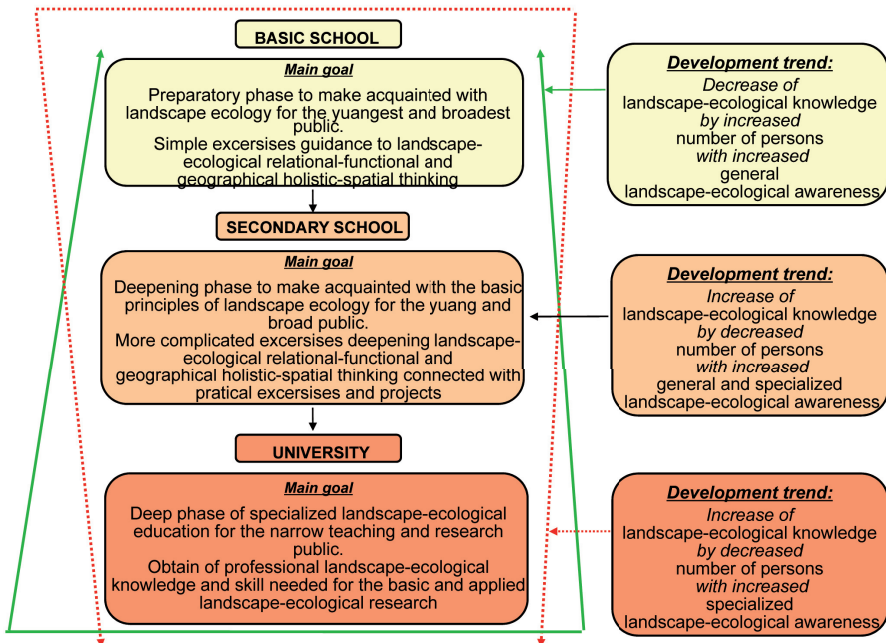


Fig. 2. Scheme of development trends and relationships among the landscape-ecological knowledge, number of persons with landscape-ecological awareness at the basic and secondary schools and at the universities.

that future landscape ecologists acquire the capability to combine, create temporal-spatial and ecological-relational syntheses and think within temporal-spatial and natural-societal contexts. This will simultaneously create prerequisites for implementation of landscape ecology lectured as a study-subject in landscape ecological science, and in cooperation with other subjects. It is also very important that there exist subsequent potential employment options for graduates in the social practice of landscape ecology.

Several remarks on the scientific relevance of landscape ecology

The scientific relevance of landscape ecology can be interpreted in the narrower sense of the term which combines both the internal and external factors in the context of the intra- and interdisciplinary and scientific-managerial-marketing nature of landscape ecology. Thus, for instance, the level of scientific relevance of this science in the framework of its interdisciplinary nature depends on the following: (1) the preservation of its scientific identity in the relationship between the research subject and the approach of landscape ecology (2) in the relationship between the basic and applied landscape-ecological research and (3) on the relationship between landscape ecology as a science and landscape ecology as the allocated educational and didactic study subject.

The scientific weight of landscape ecology in the framework of its interdisciplinary nature greatly depends on the position of landscape ecology among the idiographic and nomothetic sciences, and on the relationship between landscape ecology and other sciences involving relationships between man and his landscape. As far as the scientific-managerial-marketing nature of landscape ecology is concerned, the scientific weight of this science depends on the capacity to manage the following factors: (1) organization and interconnection of the individual types of landscape ecological activities (2) events and publications and (3) building and marketing the landscape ecology “brand”.

Respect for these relationships is an indispensable condition for permanent strengthening of the socio-scientific relevance of landscape ecology. Scientific relevance of landscape ecology depends on several theoretical and meta-scientific relationships and circumstances both within and without landscape ecology. The most important of these are:

a) *Preservation of landscape ecology’s scientific identity and ecological-geographical integrity*, with the prerequisite of strengthening its scientific relevance, *within the framework of its interdisciplinary nature*. Ignorance of the scientific identity of landscape ecology situated at the intersection of its subject, aim and research methods plus suppression of its internal inseparability of ecological and geographical entities causes problems in its internal unity. This can result in problems in the definition of its scientific profile. Anchoring its identity, integrity and scientific profile increases its scientific relevance.

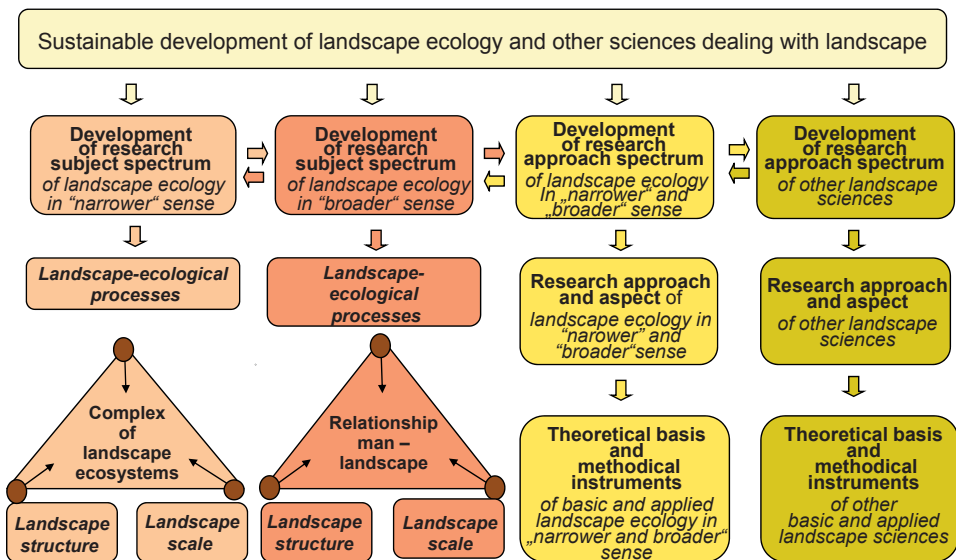


Fig. 3. Sustainable development of landscape ecology and other sciences dealing with landscape depend on relationship between development of its research subject and research approach.

The scientific profile of landscape ecology, and indirectly its scientific relevance, depends to a certain extent on the *relationship between the research subject and the research approach*, and this is the condition for the sustainable development of landscape ecology as a scientific discipline. The expansion of this research subject involving research into ecosystem-sets on the landscape level and the relationship between man and his landscape do not threaten the scientific identity of this science, provided that the nature of landscape ecological research and its themes remain unchanged.

Widening of this research subject involves the great challenge for this science to provide solutions to serious social and ecological-environmental problems. This will contribute to its increased socio-scientific relevance. This therefore requires continual elaboration of the landscape ecological research approach, involving its theoretical basis, methodical instruments, empirical knowledge and applied-educational experience. More intensive cooperation with other sciences involved with the solution of common problems in landscape is also desirable. Ensuring sustainable development of landscape ecology by widening the spectre of its research subject and approach, together with preservation of its nature will contribute to strengthening its position among all landscape-study sciences. Hence, its scientific relevance will also deepen.

The scientific relevance of landscape ecology is to a significant degree determined by *the relationship between basic and applied landscape ecological research*, by the relationship between the possibilities of the scientific supply of basic and applied research, on one hand, and the quantitative-qualitative social demand satisfying the varied needs of society and individuals, on the other. For the relationship between the scientific “supply” and social demand to function, it is also necessary to accept the following conditions: (1) the internal condition for adequate functioning of this relationship involves the upper limit of the scientific carrying capacity of the application of the results of basic landscape ecological research for the needs of applied landscape ecological research, and (2) the external condition involves the observance of the upper limit of the social-financial carrying capacity.

The higher level of basic landscape ecological research increases the force of argument of the applied research in practice, which improves the quality of the decision making process at the political level. This also increases the social weight, – that is, the acceptance of applied research which leads to the greater financial support to basic research from that portion of society creating social demand (more in Žigrai, 1996).

The relationship between landscape ecology as a scientific discipline and landscape ecology as the educational-didactic subject also helps strengthening its social weight, and indirectly, its scientific relevance. Landscape ecology as a scientific discipline creates and determines the scientific background to landscape ecology and identifies obligatory and optional subjects at schools, thus helping to preserve the didactic unity of landscape ecology as the taught subject and strengthening its position, preventing it from merging with other subjects. And vice versa, there is feedback when landscape ecology as a study subject enriches the theoretical-meta-scientific and empirically-applied part of landscape ecology by the didactic knowledge and skills of compulsory and optional ecological and geographically oriented subjects. This

also helps subsequent guidance of the development of basic landscape-ecological research for university didactic requirements (more in Žigrai, 2008).

b) *Within the framework of the interdisciplinary nature of landscape ecology, the above-mentioned unique intersecting ecological-geographical property of landscape ecology causes difficulty in defining its position among nomothetic and idiographic scientific disciplines.*

Landscape ecology represents a certain platform for the co-existence of nomothetic and idiographic scientific-research approaches, and the balance between them. It also simultaneously plays the important role of mediator between these scientific disciplines, and this contributes to its increasing scientific significance. In addition, such interpretation of landscape ecology can contribute to the palliation of the increasing discrepancy of economical and financial interests between universal, meaning prevalently nomothetic, sciences and the regionally specific ones. It also means enhancing the scientific and social prestige of landscape ecology. Consequently, the efforts of landscape should concentrate on strengthening the nomothetic nature of this science (more in Žigrai et al., 2007).

Obviously, from the meta-landscape-ecological viewpoint, the co-operation and participation of nomothetic and idiographic sciences and their approaches supporting landscape ecological research is very important, as it can contribute to strengthening the inseparability of ecological and geographical entities within landscape ecology and its identification.

Determination of the significance and position of landscape ecology among nomothetic and idiographic sciences represents one of the key, and simultaneously topical, research areas of meta-landscape ecology which can also efficiently contribute to solutions of the proper landscape-ecological, theoretical-methodological, empirical, applied and didactic problems indirectly contributing to the increased scientific weight of this science.

The scientific relevance of landscape ecology also greatly depends on its position and relationship to other sciences involved with the now modern and attractive research into the relationship between man and landscape.

This is why efforts to draw sciences and philosophical currents closer to each other, and to create a kind of general “landscape science”, are observable in literature. This universal science may be able to integrate several sciences involved with landscape research to solve global ecological-environmental and socio-economic problems (Antrop, 2000; Brown et al., 2006; Pedroli et al., 2006 and others).

Hence, the stance of landscape ecology and its limiting discipline, geography, should be univocal. The theoretical basis, consisting of a scale of tools and abundant empirically-applied experience in landscape research and the landscape-human relationship have already been incorporated in “landscape-teachings” (*Landschaftslehre, landšaftovedenie*) as one of the geographical disciplines, in the sense of Drdoš, 1981, Mičian, 1993 and Mičian, Zatkálík, 1984. This means that geography has achieved a considerable theoretical, methodical, empirical and applied advantage over the newly emerging multidisciplinary general „landscape science” as a more widely conceived science concerning landscape situated at the intersection of geographical, ecological and other sciences dealing with landscape research.

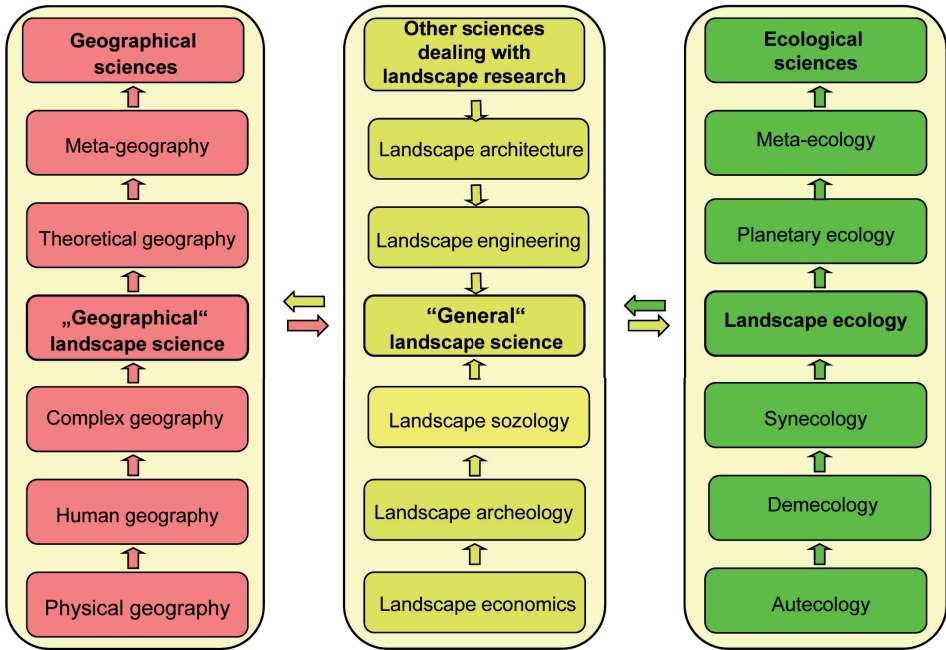


Fig. 4. Scheme of information flow among geographical, ecological and other sciences dealing with landscape research.

The position of landscape ecology within “landscape science” is not so sharply defined as that of geography because this is a relatively young ecological discipline with dual interpretation. In the narrower sense of the word, the “ecological” landscape ecology deals with research into sets of ecosystems at the discerning level of landscape. This means that its position in “landscape science” is more distant than the more widely interpreted “geographical” landscape ecology, which also covers human activities and important ecological factors affecting them (more in Žigrai, 2010).

In connection with certain efforts to achieve the leading scientific position in landscape research, it should be noted that no scientific discipline, including landscape ecology and geography, could possess exclusivity in this sense, because landscape as a research subject is very complex. This is due to the landscape entity representing a hybrid, open and natural-anthropogenic system with the corresponding dimensions and features of spatial-temporal human impact results.

Despite this, precise landscape ecology and “landscape teachings” with their holistic-spatial-synthesising and ecological-relational approach display certain properties which predestine them to an integrating and bridging role for themselves and other sciences investigating landscape from their special aspects as well as the landscape-ecological and geographical.

Landscape ecology integrates the ecological sciences at the choric level of landscape, and it simultaneously lends an ecological-relational nature by the research of ecosystems at the landscape level to disciplines investigating landscapes, besides the ecological ones.

The “landscape teachings” integrate geographical sciences into one comprehensive science and integrate both the choric and topic levels of sciences involved in landscape research; this entails the landscape science itself. In addition, landscape ecology and the teachings about landscape bridge and reduce the theoretical and methodological distance between them and other sciences involved in landscape research.

Therefore, it is precisely landscape ecology and geography which should establish “landscape science” in the sense of interdisciplinary sciences concerned with landscape (Žigrai, 2010). These should therefore play a central and leading role in co-operation with other scientific disciplines involved in landscape research. This would also increase the socio-scientific relevance of both landscape ecology and geography.

c) Matlovič and Matlovičová (2010) advise that *the important part of geography’s scientific relevance is its scientific-managerial-marketing nature*. These authors report that this manifests itself in three forms:

1. As “sciencing”, in the case of landscape ecology “*landscape eco-sciencing*”. This includes the following; establishment and networking of landscape ecological institutions, organization of landscape-ecological events, preparation of landscape ecological projects, provision for financial sources, publishing of landscape-ecological periodicals and presentation of landscape-ecological studies.
2. As “branding”, in the case of landscape ecology “*landscape eco-branding*”. This includes the following; building a marketing image of landscape ecology which preserves its identity and authenticity; building its trade mark by patenting its principles and laws suitable in commercialization, and an increase in the scientific value of landscape ecology.
3. As “labelling” in the case of landscape ecology “*landscape eco-labelling*”. This includes the following; involvement the interpretation of the research object and approach to landscape ecology under the heading or label of other scientific disciplines, resulting in the loss of identity and authenticity of the image and brand of landscape ecology, and also its position among other disciplines.

Scientific-managerial-marketing facets of landscape ecology have not enjoyed much attention in landscape-ecological literature. This reflects the population’s current landscape-ecological awareness and the extent to which landscape ecology is accepted by the population in general.

Conclusion

The above-outlined meta-scientific remarks on the socio-scientific relevance of landscape ecology as the reflection of its theoretical-applied and educational development insinuate that it is a very complex issue requiring the choice of adequate strategies and philosophy

for the formulation of measures targeted at increasing the proper socio-scientific weight of landscape ecology.

One possible approach to strengthening its position is to increase the theoretical-applied efficiency of landscape ecology itself. This efficiency depends of the qualitative and quantitative relationship between the objective nature of this science in preserving the balance between the theoretical and applied core of landscape ecology and its subjective nature. This entails preserving the balance between the theoretical-empirical landscape ecological knowledge of landscape ecologists and their capacity to transform and implement this knowledge into practice.

Respect for the above-mentioned relationships should create the necessary internal pre-conditions for the sustainable development of landscape ecology and its scientific efficiency. This sustainable development must include the following relationships: (1) the relationship between the scientific identity and unity of landscape ecology, (2) its research subject and approach, (3) basic and applied landscape research, (4) the position of landscape ecology among idiographic and nomothetic disciplines (5) the position of landscape ecology among sciences involved with landscape relations and (6) the relationship between landscape ecology

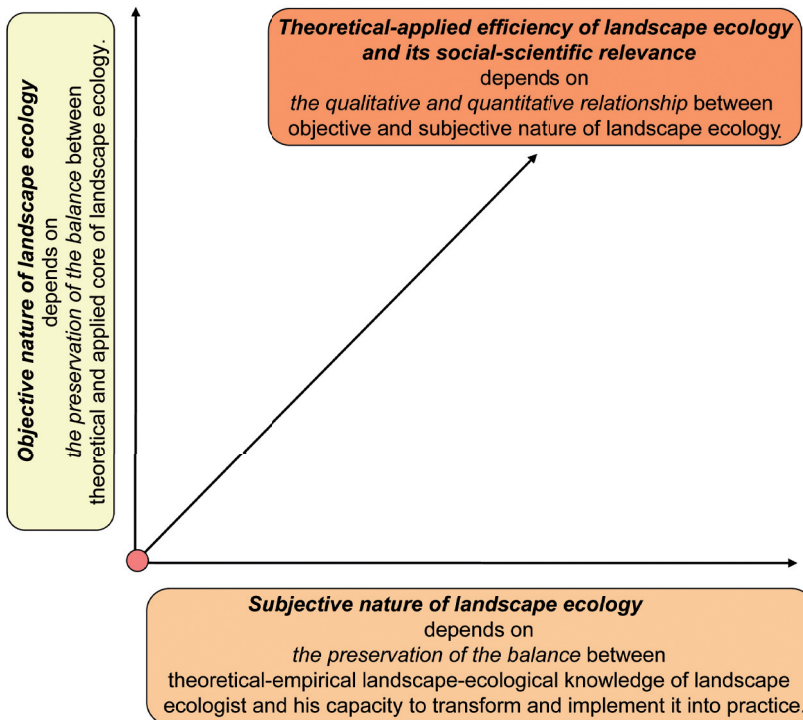


Fig. 5. Scheme of theoretical-applied efficiency of landscape ecology depends on the balance between its objective and subjective nature.

as a science and landscape ecology as an educational-didactic study subject. These applied relationships will ensure the conditions necessary to increase its scientific and social weight through observing the appropriate ratio between the sustainable development of the theory and the practice of basic and applied landscape ecology.

Sustainable development of the theory of the basic and applied landscape ecology accelerates the empirical landscape-ecological research oriented to practice by means of analogy and extrapolation of theoretical regularities and principles of landscape ecology.

And *vice versa*, sustainable development of the practice of the basic and applied landscape ecology creates new impulses for the empirical landscape-ecological research oriented to the practice necessary for the institution of new theoretical regularities, laws and principles of landscape ecology.

In this way, sustainable development of landscape ecology's scientific efficiency along with securing the relationship between the qualitative-quantitative balance and mutual information flow between theory and practice of landscape ecology becomes one of the compulsory internal prerequisites for securing its overall sustainable development.

Therefore, increased socio-scientific relevance of landscape ecology depending on its trans-, intra- and interdisciplinary educational and science-managerial-marketing nature, together with the corresponding relationships, requires intensification and deepening of the contact and cooperation between researchers and pedagogues in the field of landscape ecology and political-administrative stakeholders and civic institutions.

Additionally, it is also necessary to shift tuition of biology, ecology and geography at basic and secondary schools from the generally cognitive to the explanatory position. The university level requires formulation of a clear professional profile for landscape ecology graduates, enabling them to assume an efficient position and application in science, education and practice.

In this way is possible to strengthen the concurrent ability of landscape ecologists with other specialists dealing with research into the human-landscape relationship. This will also increase the graduate's landscape-ecological awareness.

One of the compulsory measures also involves the necessity of establishing the unambiguous scientific identity of landscape ecology, for determination of both the subject and approach to its research and its position among other disciplines.

Other important measures include widening the subject of landscape ecological research accompanied by the deepened nature of landscape-ecological subject and the preservation of the balance between basic and applied landscape ecological research.

It is also desirable to intensify cooperation between landscape ecology as a scientific discipline and landscape ecology as a university study-subject, together with the strengthening of the nomothetic nature of this science.

The compulsory measures also include intensified cooperation of landscape ecology with other sciences involved in research into the relationship of humans and nature and the building of landscape ecology's brand.

It should be noted that these brief measures constitute part of the meta-landscape-ecological research, and they should proceed permanently complementing each other in parallel, and this will assure their high efficiency facilitating the increase of the socio-scientific relevance of landscape ecology.

This socio-scientific relevance is one of the most important meta-scientific research themes dealing with landscape ecology as a scientific discipline. In this context, it is possible to understand the social-scientific relevance of landscape ecology as the reflection of its theoretical-applied and educational development. The increase in social-scientific relevance of landscape ecology depends on the following: (1) the contact and collaboration between landscape ecologists and the political decision-makers and stakeholders, (2) on the transition from the teaching of general landscape ecological knowledge level in primary schools to the explanatory position in secondary schools and (3) teaching the relationship between basic and applied landscape ecological research.

The professional profile of the landscape ecology graduate should be oriented towards effective application in scientific research, education and practice. The scientific relevance of landscape ecology depends on the trans-disciplinary, educational, intra-disciplinary, interdisciplinary and scientific management and marketing character of landscape ecology. These measures must be sustained permanently and in a complementary manner.

The preconditions for forming sustainable development in landscape ecological effectiveness, and thus increasing the scientific relevance of landscape ecology, include a well-balanced relationship between the scientific identity of landscape ecology and its natural-social unity, between the landscape ecological research object and subject, between theory and practice of landscape ecology, between landscape ecology as science and landscape ecology as an educational subject, and also the clearly defined position of landscape ecology between the idiographic and nomothetic sciences and its position among other sciences dealing with landscape research.

In future, it will be necessary to intensify the information flow between the theory and practice of landscape ecology which, inter alia, will contribute to the expansion of the theoretical methodological spectre of basic and applied landscape ecological research to increase the significance of landscape ecology and its position among the nomothetic and idiographic scientific disciplines, and will increase the efficiency of implementation of results reached in basic landscape ecological research into applied landscape ecology. In the framework of applied landscape ecological research, it is important to outline a more effective mechanism of transformation, implementation and argumentation of obtained results by landscape ecological research concerning the changing propensities in the relationship between humans and their landscape, for appropriate landscape transformation, landscape planning and management, and also to satisfy the requirements of decision makers and stakeholders.

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References

- Antrop, M., 2000: Geography and landscape science. *Belgeo* 1-2-3-4, special issue: 29th International Geographical Congress, 1: 9–36.
- Brown, D.G., Aspinall, R., Benett, D.A., 2006: Landscape models and explanation in landscape ecology – space for generative landscape science? *The Professional Geographer*, 58, 4: 369–382. <http://dx.doi.org/10.1111/j.1467-9272.2006.00575.x>

- Drdoš, J., 1981: Development of the landscape science and its position in the scientific system (in Slovak). In *Krajina, jej racionálne využívanie a ochrana. Skriptum pre PGŠ, I. časť*, PF UK Bratislava.
- Matlovič, R., Matlovičová, K., 2010: Social relevance and establishment of geographical “branding” (in Slovak). *Manuskript*, 17 pp.
- Mičian, L., 1993: Word about geography (in Slovak). *Geografia*, 1: 22–24.
- Mičian, L., Zatkálik, F., 1984: Landscape science and environmental care (in Slovak). *Vysokoškolské skriptá*. PF UK, Bratislava, 137 pp.
- Oťaheľ, J., 1999: Societal dimension of the landscape ecology (in Slovak). In Hrnčiarová, T., Izakovičová, Z. (eds), *Krajinnookologické plánovanie na prahu 3. tisícročia*. ÚKE SAV, Bratislava, p. 54–59.
- Pedroli, B., Pinto-Correia, Cornish, P., 2006: Landscape – what’s in it? Trends in European landscape science and priority themes for concerted research. *Landsc. Ecol.*, 21, 3: 421–430. <http://dx.doi.org/10.1007/s10980-005-5204-5>
- Žigrai, F., 1996: The relationship between basic and applied landscape-ecological research in Slovakia. *Ekológia (Bratislava)*, 15, 4: 387–401.
- Žigrai, F., 2001: Position, meaning and tasks of meta-landscape ecology (Some theoretical and methodological remarks). *Ekológia (Bratislava)*, 20, Suppl. 3: 11–22.
- Žigrai, F., 2006: Relevance of regional geography in the process “globalization” of science vs “regionalization” of science (in Slovak). *Acta Geographica Universitatis Comenianae*, 47: 47–55.
- Žigrai, F., Drdoš, J., Oťaheľ, J., 2007: Contribution of geography to development of the landscape ecology in Slovakia. *Acta Facultatis Studiorum Humanitatis et Naturae Universitatis Prešovensis, Folia Geographica*, 11: 128 pp.
- Žigrai, F., 2008: Metascientific background of the landscape ecology tuition as ecological subdiscipline on the universities (in Slovak). *Manuskript*, 10 pp.
- Žigrai, F., 2010: Landscape ecology in theory and practice (Selected theoretical and meta-scientific aspects). *Ekológia (Bratislava)*, 29, 3: 229–246.
- Žigrai, F., 2010: Landscape as an interdisciplinary research object on the example of the relationship between land use and landscape protection from the landscape-ecological point of view (in Slovak). *Acta Fac. Stud. Human. et Natur. Univ. Prešovensis, Folia Geographica*, 16: 53–71.
- Žigrai, F., Finka, M., Petříková, D., 2010: Convergence of ecological, economic and social aspects facing the problems of landscape and climate change – meta-scientific approach. Book of abstracts, International Conference in Landscape Ecology „Landscape structures, functions and management: response to global ecological changes“. 3.-6. September, Brno/Praha, p. 27.