

PRESERVATION OF AUTHENTICITY AND DETERMINATION OF IDENTITY OF LANDSCAPE ECOLOGY AS ONE PREREQUISITE OF ITS FUTURE DEVELOPMENT (SELECTED THEORETICAL AND META-SCIENTIFIC ASPECTS)

FLORIN ŽIGRAI

Department of Geography and Applied Geoinformatics of the University of Prešov, Slovak Republic, e-mail: florin.zigrai@al.net

Abstract

Žigrai F.: Preservation of authenticity and determination of identity of landscape ecology as one prerequisite of its future development (selected theoretical and meta-scientific aspects). *Ekológia* (Bratislava), Vol. 34, No. 2, p. 186–206, 2015.

Authenticity and identity of landscape ecology is the core and synthesis of inherent conditions determining its development. Bringing into line the development of the theory, methodology and application it is possible to strengthen the social and scientific relevance of landscape ecology as the reflection of its theoretical-applied and educational maturity or development. Preservation of authenticity and determination of identity of landscape ecology depend first of all on the relationship between landscape-ecological research object (what is researched), landscape-ecological research approach (how it is researched) and landscape-ecological research subject (who researches). These three parts of landscape-ecological research are subject to a permanent development and change. The delineated meta-scientific, e.g. universal remarks seem to be applicable in an effort to ensure the preservation of the authenticity and identity as the condition of further development for the science solving the ecological-environmental and socio-economical problems in the landscape.

Key words: authenticity, identity, landscape ecology, future development.

Introduction

Science and its individual disciplines including landscape ecology represent a comprehensible and dynamic entity, development of which is subject to numerous external and internal factors and conditions. One of them is preservation of authenticity and determination of identity of landscape ecology as one of the key theoretical and meta-scientific issues and tasks. The issue of preservation of authenticity and determination of identity for landscape ecology as one of the most important prerequisites of its development was not given much importance so far. For instance, identity of landscape ecology is marginally mentioned in studies of Moss (1999) or Wiens (1999). Authenticity and identity of landscape ecology has

been indirectly expressed via six key issues and ten research topics landscape ecology should treat in future (Wu, Hobbs, 2002). It is also indirectly possible to deduce by generalisation and synthesis of landscape-ecological knowledge from the 2011 world IALE Congress in Beijing, what should the focus of future development landscape ecology be: exacting, globalisation, inter-multi and trans-disciplinarity, economisation, comprehensiveness and application of landscape-ecological research. One of the key condition of so focused future landscape-ecological research is precisely preservation of authenticity and determination of identity for landscape ecology.

Mission of this paper is to convey several theoretical and meta-scientific remarks concerning to criteria, significance and identity of authenticity of landscape ecology as the prerequisite of its further development, to the relationship between the research object and research approach of landscape ecology, as well as the measures leading to preservation of authenticity and determination of identity of landscape ecology as the prerequisite of its further development.

In the connection with preservation of authenticity and determination of identity of landscape ecology as the prerequisite of its further development is necessary to take into consideration the most important external factors and conditions for landscape ecology at the moment for its further development, that is:

- Time-spatial contextuality, complexity and integrity of the increasing spectre of ecological, environmental and socio-economic problems in the relationship between man and landscape (for more see Žigrai, 2002, 2012a), as well as
- Social, ecological and environmental paradigms, e.g. sustainable development, ecological footprint, ecological ethics, ecological risk, ecological economy, environmental justice paradigm, limits to growth and other.

As landscape ecology is relatively young science, there was no time for creation of some several paradigms like they exist, e.g. in older sciences such as geography or ecology (for more see Mičian, 1995, 1996; Paulov, 2012; Eliáš, 2001; Rychnovská, 2001; Žigrai, 2001).

The newly emerging social and ecological-environmental paradigms nowadays represent an important research trend in addressing comprehensive ecological-environmental and socio-economic problems by means of intra-, inter -(multi) and trans-disciplinary approaches.

The social, ecological and environmental paradigms influence external theoretical and meta-landscape-ecological principles. These principles are simultaneously the result of the internal development of landscape ecology.

In this way, they were generated in the framework of theoretical landscape ecology in accordance to Forman and Godron (1986) some *theoretical landscape-ecological principles*, such as the ones of biotic diversity, energy flow, species and redistribution of nutrients within the biocentric, it means in a narrower sense interpreted landscape ecology, and the principle of landscape structure, functions, changes and stability in the framework of anthropocentric, it means in a broader sense interpreted landscape ecology.

In the framework of meta-landscape ecology is the creation of the *meta-landscape-ecological principles* which acquire a mixed geographical-ecological nature more difficult. It is given by the circumstance that landscape ecology is situated on intersection of these scientific

disciplines as the result of mutual 'geographization' and 'ecologization'. The meta-landscape-ecological principles are only in the initial stage. In spite of that, it is possible to define some meta-landscape-ecological principles such as:

- integrating principle, i.e. inseparability of geographical and ecological entities,
- principle of landscape-ecological trinity (it means presence of all tree entities, e.g. geo-bio-ecological landscape processes, structures and scale),
- principle of mutual complementarity between narrowly interpreted (bio-eco-centric) landscape ecology as well broadly interpreted (anthropocentric) landscape ecology (more in Žigrai, 2009).

The above-mentioned social-ecological and environmental paradigms and theoretical and meta-scientific principles of landscape ecology then represent, beside other, an outer framework and background of future trend in order to preserve its authenticity and determine its identity (more in Žigrai 2002, 2010a, 2012a).

Among the *internal* factors and conditions of the development of landscape ecology:

- Character of authentic and objectively identical landscape ecological entities, processes and structures;
- Relationship between sustainable development of theory and practice both of the basic and applied landscape ecological research;
- Relationship between object, approach and subject of landscape ecological research;
- Position of landscape ecology among other sciences involved with the man-landscape relationship, and
- Position of landscape ecology among idiographic and nomothetic sciences must be first of all mentioned.

These internal factors directly contribute to the sustainable development of landscape ecology and its scientific efficiency, status and an increased scientific and social weight (for more see Žigrai, 2010a, 2012b).

The synthesising element of above-mentioned internal factors inducing development of landscape ecology is authenticity and identity, which also represent its most important theoretical-meta-scientific characteristics.

Some remarks to criteria of authenticity of landscape ecology

Authenticity (genuineness, originality, credibility) of landscape ecology is its internal property, which must be verified by established objective criteria, such as landscape-ecological entities, processes, structure, scale and object, approach and aim of landscape ecological research. These objective criteria are reflected in the definition of authentic landscape ecology as presented in the fourth part of the article.

The principal objective criteria for the preservation of authenticity of landscape ecology as the prerequisite of its further development include:

- Preservation of *inseparability* of geographical entities, approaches and principles from ecological entities, approaches and principles;
- Preservation of *landscape-ecological trinity*, it means:
 - geo-, bio- and human ecological process, landscape structure and spatial arrange-

ment of its components (pattern), and of the definition level of landscape (scale) while researching into ecosystems on the level of landscape and their relationship to the society, as well as

- Preservation of the *balanced relationship* between the object and approach of landscape-ecological research while:
 - by contemporary broadening of the object of landscape-ecological research,
 - deepening the approach of landscape-ecological research, as well as intensifying of interdisciplinary cooperation of landscape-ecological research for practical life.

These objective criteria for preservation of authenticity of landscape ecology as the prerequisite of its further development also represent the cores of its meta-scientific principles (for more see Žigrai, 2009 and Fig. 1).

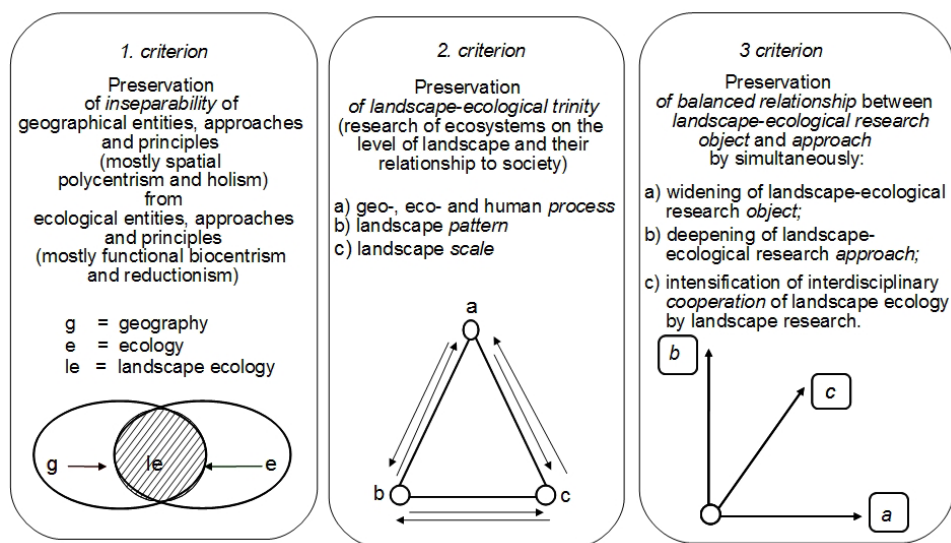


Fig. 1. Criteria of preservation of authenticity of landscape ecology as the prerequisite of its development.

1) The first criterion for preservation of authenticity of landscape ecology is inseparability of geographical entities, approaches and principles from ecological entities, approaches and principles. By their separation, landscape ecology as scientific discipline is bound to lose its integrating and interpenetration character and simultaneously its authenticity.

Preservation of inseparability of geographical entities, approaches and principles from those of ecology, meanwhile represent the most important meta-scientific landscape-ecological principle. This principle is the reflection of mutual influence of geographical, ecological sciences and humanities (Žigrai, 2001 and Fig. 2).

On the border line of the geography and ecology in the process of geographization and ecologization generated landscape ecology and in the focal point of the triangle created the generation-innovation core of geographical-ecological sciences and humanities.

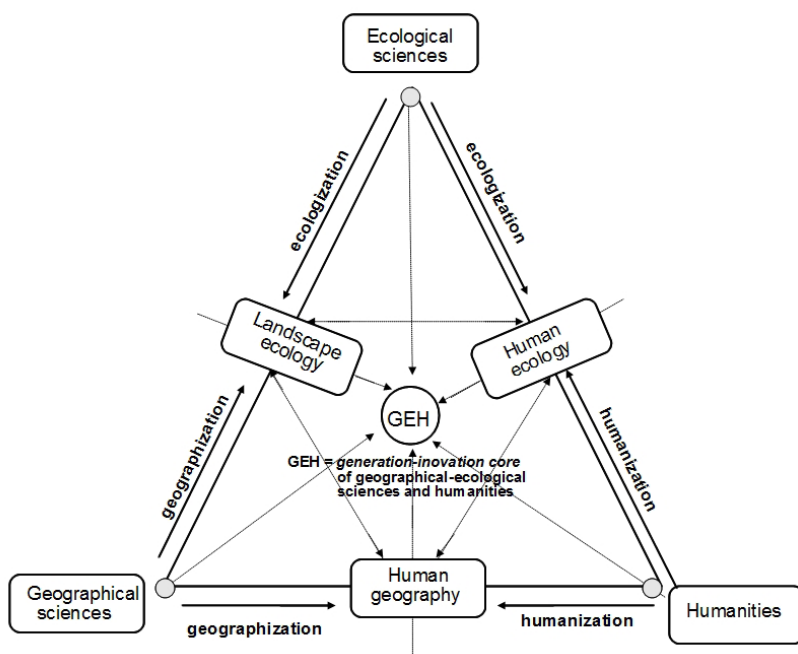


Fig. 2. Scheme of mutual influence of selected sciences and generation of landscape ecology on their penetration.

The more detailed approximation of landscape ecology in the interpenetration field of geography and ecology is presented in Fig. 3.

From this scheme follows, that the spatial aspect of geography together with its theories and methods help to solve the ecological research topic and vice versa the interactive aspect of ecology with its theories and methods help to solve the geographical research topic. They help simultaneously together by the research of geographical-ecological system of landscape and ecosystems ecology as the main common research topic of geography and ecology by the spatial-geographical and interactive-ecological research approach.

This mixed geographical-ecological system together with its research approaches creates the interior entity of the authenticity of landscape ecology.

The principal characteristics of geographical and ecological entities, research approaches and theoretical principles, which form the internal content of individual main criterion follow:

The principal characteristics of geographical entities, research approaches and theoretical principles as the geographical part of landscape-ecological authenticity:

- *The principal characteristics of geographical entities:* spatial contextuality, wholeness, synthesis, spatial order, differentiation, interaction, integrity and coincidence;
- *The principal characteristics of geographical research approaches:* spatial, structural, polycentric, geosystemic ones, which explore prevalingly the horizontal-vertical, abiotic, biotic and human-geographical relationships in landscape, as well as
- *The principal characteristics of the geographical theoretical principles:* principle of land-

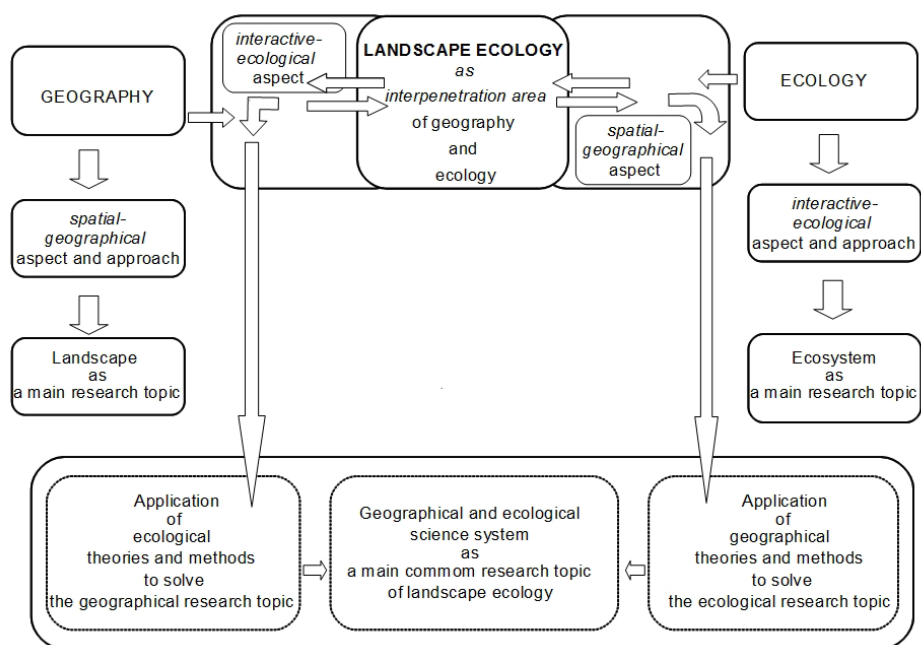


Fig. 3. Scheme of the information flow among geography, ecology and landscape ecology.

scape structure and function, principle of landscape changes and principle of landscape stability.

- The principal characteristics of ecological entities, research approaches and theoretical principles as the ecological part of landscape-ecological authenticity:
- *The principal characteristics of ecological entities*: biotic-environmental contextuality, ecological capacity of interaction, ecological integrity, trophic-energetic balance, biological productivity;
- *The principal characteristics of ecological research approaches*: prevalingly functional, process-biocentric, and reduction-ecosystemic which research prevalingly the vertical-horizonal, abiotic, biotic and human-ecological mutual relationships in landscape, as well as
- *The principal characteristics of ecological theoretical principles*: principle of mobility of species, principle of redistribution of nutrients, principle of energetic flow and principle of biotic diversity.

2) The second criterion for preservation of authenticity of landscape ecology is that landscape ecology is bound to simultaneously research into the geo-bio and human-ecological processes of landscape structure on the choric scale of landscape. This criterion also represents one of the key meta-scientific landscape ecological principles for preservation of the landscape-ecological trinity (process-structure-scale) in research of ecosystems on the choric scale of landscape and their relationship to society.

3) The third criterion for preservation of authenticity of landscape ecology as the pre-requisite of its further development is maintenance of a balanced relationship between the landscape-ecological research object and approach by:

- simultaneously widening of landscape-ecological research object,
- deepening of landscape-ecological research approach and
- ntensification of interdisciplinary cooperation of landscape research for practice.

In the light of the above-quoted characteristics and criteria of authenticity of landscape ecology situated in intersection of geographical and ecological entities, research approaches and theoretical principles, it is then possible to distinguish three types of landscape ecology (Fig. 4):

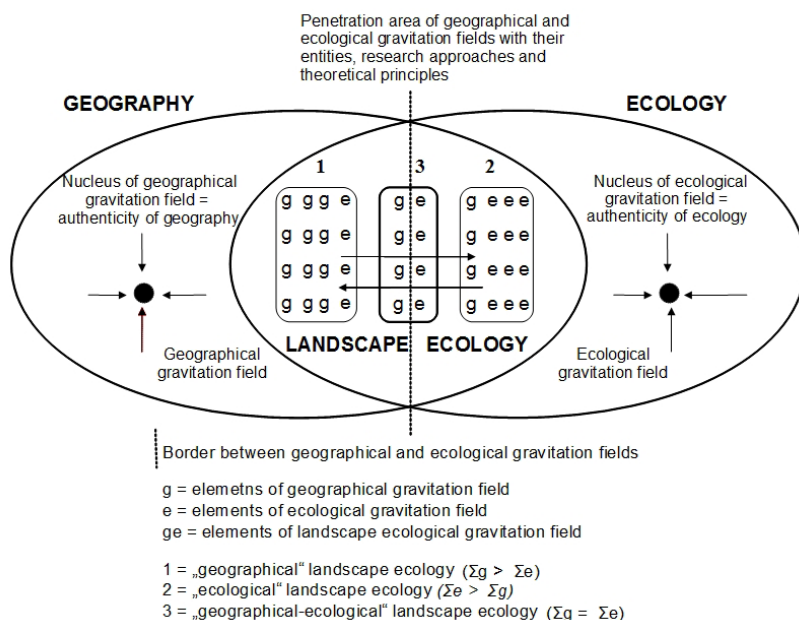


Fig. 4. Authenticity of geographical, ecological and geographical-ecological landscape ecology depends on quantitative share of geographical and ecological entities research approaches and theoretical principles of landscape ecology.

- The 'ecological' in narrower sense interpreted landscape ecology with the distinct prevalence of entities, research approaches and theoretical principle of ecological gravitation field ($\Sigma e > \Sigma g$);
- The 'geographical' which is in a broader sense interpreted landscape ecology with the distinct prevalence of entities, approaches and theoretical principles pertaining to the geographical gravitation field ($\Sigma g > \Sigma e$), and eventually
- The 'ecological/geographical' landscape ecology with the mixed interpretation of landscape ecology with approximately quantitatively balanced representation of entities, approaches and theoretical principles of ecological and geographical gravitation field ($\Sigma e = \Sigma g$).

In case landscape ecology does not possess any ecological entity, approach or principle,

but only geographical entity, approach and principle, it becomes pure geography and vice versa if landscape ecology does not possess any geographical entity, approach or principle, but only the ecological one it becomes pure ecology. This is how landscape ecology in the two cases loses its authenticity and objective identity (Žigrai, 2010b, c).

The difference between the narrowly and broadly interpreted landscape ecology becomes obvious when their research objects and approaches are compared and from their overall meta-scientific characteristics and function presented on the Fig. 5:

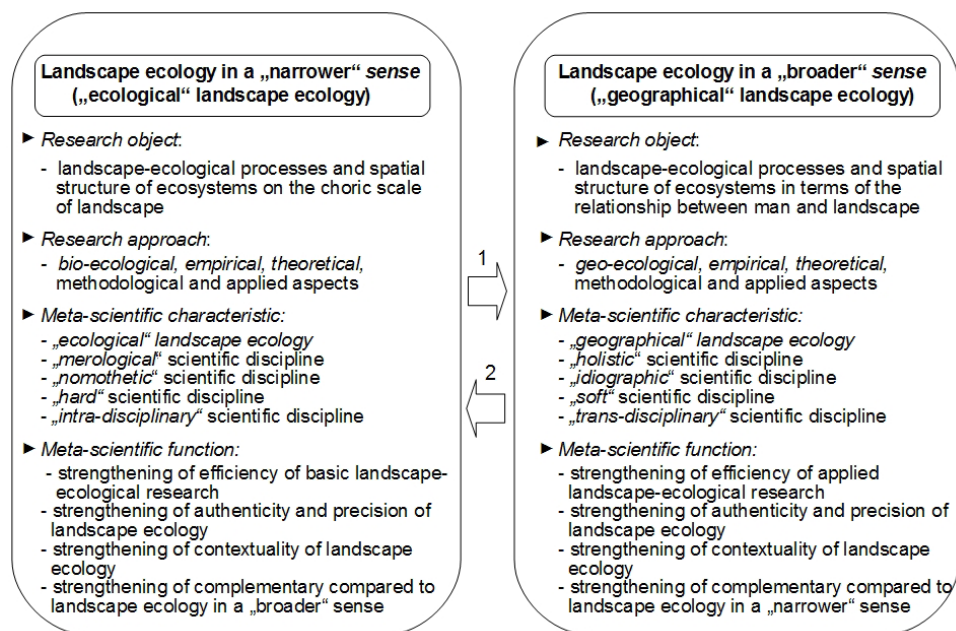


Fig. 5. Research object and approach, meta-characteristic and function of „narrower“ and „broader“ landscape ecology and their mutual relationship.

→ From the meta-scientific point of view it is possible to refer to 'ecological' landscape ecology as the 'hard' merological-nomothetic and intra-disciplinary scientific discipline.

Meanwhile, this type of landscape ecology fulfils several meta-scientific functions, such as the strengthening of efficiency of basic landscape ecological research, authenticity of landscape ecology, precision of landscape ecology and complementarity compared to 'geographical' landscape ecology that is in the broader sense.

On the basis of these properties it is possible to formulate the following definition of 'ecological' landscape ecology:

“Ecological” landscape ecology represents an integrating merological-nomothetic and intra-disciplinary ecological discipline on the choric scale of landscape in penetration of ecological and geographical entities, investigating relationships between ecological processes and spatial

structure of a set of ecosystems, by bio-ecological empirical, methodological, theoretical and applied research approaches”.

To achieve the research aims of ‘ecological’ landscape ecology, it means that, acquisition of new empirical data, preparation of new methodological approaches, theoretical regularities and general laws on landscape ecology, is very important its deep and narrow cooperation first of all with other ecological and environmental sciences.

→Research object of ‘geographical’, it means in a broader sense interpreted landscape ecology, is research object focused mainly on the study of landscape-ecological processes and spatial structure of ecosystems on the choric scale of landscape in terms of the relationship between man and landscape. The research approach is geo-ecological, empirical, methodological, theoretical and applied aspects.

From the meta-scientific point of view, ‘geographical’ landscape ecology may be as well referred to as ‘soft’ holistic-idiographic and trans-disciplinary scientific discipline. This type of landscape ecology fulfils several meta-scientific functions, such as strengthening of efficiency of applied landscape ecological research, natural and social contextuality and participation of landscape ecology, as well as strengthening of complementarity compared to the ‘ecological’ landscape ecology, that is in the narrower sense of the term.

On the basis of these properties, it is possible to formulate the following definition of ‘geographical’ landscape ecology:

“Geographical” landscape ecology represents an integrating holistic-idiographic and trans-disciplinary ecological discipline on the choric scale of landscape in penetration of ecological and geographical entities, investigating relationships between ecological processes and spatial structure of a set of ecosystems as well as their relationships to the society, by geo-, bio-, and human-ecological empirical, methodological, theoretical and applied research approaches”.

To achieve the research aims of ‘geographical’ landscape ecology, it means that, acquisition of new empirical data, preparation of new methodological approaches, theoretical regularities and general laws on ‘geographical’ landscape ecology, is very important its deep and narrow cooperation first of all with socio-cultural and economic sciences.

The two above-described and defined types of landscape ecology with their empirical knowledge, methodological tools and theoretical base are important for preservation of its authenticity. The key circumstance of their cooperation is their mutual enrichment and complementarity on different levels. The circumstance that the ‘ecological’ landscape ecology with its intra-disciplinary nature helps maintaining and strengthening of the ecological nature, authenticity and nomotheticity of the geographical part of landscape ecology as a whole, is considered most important from the meta-scientific point of view.

On the other side, ‘geographical’ landscape ecology lends to the ‘ecological’ landscape ecology a holistic overview necessary to obtain socio-economic and time-spatial contextuality, complexity and integrity as the prerequisite for solution of topical ecological, environmental and socio-economic problems in the context of landscape.

Meanwhile, landscape ecology is not a stiff but dynamic scientific discipline. Sometimes in its development, the geographical type or ecological type of landscape ecology prevails or another time they are in a dynamic balance. These transformations of type of landscape ecology depend on changing quantitative ratio of geographical and ecological entities, ap-

proaches and principles of landscape ecology depending on external event, such as appearance of a new paradigm of the landscape ecology development, processes of geographisation, ecologization, humanization and commercialization of sciences.

Hence, it is important for landscape ecology to be able to return from extreme positions to the centre in order to maintain its stability (Žigrai, 2009).

It means that the nature of landscape ecology pursuing the quantitative representation of geographical and ecological entities, processes and structures, research objects and approaches oscillates between the geographically accented on the one side and ecologically accented landscape ecology on the other.

This oscillation of nature and core of landscape ecology depends on its various internal conditions and attributes, as well as on external socio-economic and historical-cultural conditions. These conditions are reflected apart from others, in the general and specific paradigms which influence the development of landscape ecology (Žigrai, 2002, 2012a).

The core of authenticity and objective identity of landscape ecology is in centrally situated 'geographical-ecological' landscape ecology.

Preservation of authenticity for landscape ecology depends, beside other, on its future scale-conceptual, content-conceptual and scientific and structural development. This development will also depend on increasing significance and research of the socio-complexity in the framework of content-conceptual development of landscape ecology and increasing significance of planetary or global ecology and its cooperation with landscape ecology in the framework of its scale-conceptual development. These circumstances inevitably provoke increasing significance of meta-landscape ecology in the framework of scientific-structural development of landscape ecology and indirectly also preservation of its authenticity and determination of its identity (Žigrai, 2010 c).

Some remarks to the importance of preserving the authenticity and determination of identity of landscape ecology

Preservation of authenticity and determination of identity of landscape ecology as the prerequisite of its future development conduct and support the development of theory, methodology and application of landscape ecology. They also contribute to fixing of the social and scientific acceptance and relevance of this science.

They eventually lead to preservation of authenticity and determination of identity of landscape ecology as the prerequisite of its further development.

Although the object, approach and aim of landscape ecological research continuously develop there is always something left that binds landscape ecology and preserves its character expressed by its authenticity or objective identity. It prevents spilling of the content of landscape ecology, of losing its profile and face, which might also mean losing its claim to be called landscape ecology. It also means that the name of a science must correspond to its content and vice versa.

Meanwhile, the point is not only to find solution to an academic problem but the practical aspect connected with the position, competition and competence of landscape ecology amidst other scientific disciplines is also very important for solving the serious ecological

and environmental, socio-economic problems existing in the relationship between man and landscape. It is the reason why the most important theoretical and meta-scientific tasks of landscape ecology include preservation of its authenticity and determination of its objective identity as one of the prerequisites of further development of this science. This is the issue for the now emerging meta-landscape ecology representing the meta-scientific superstructure of landscape ecology. The principal research object of meta-landscape ecology is landscape ecology as a scientific discipline (for more see Žigrai, 2001, 2003).

The general meaning of preservation of authenticity and determination of identity for landscape ecology (Fig. 6) consists of:

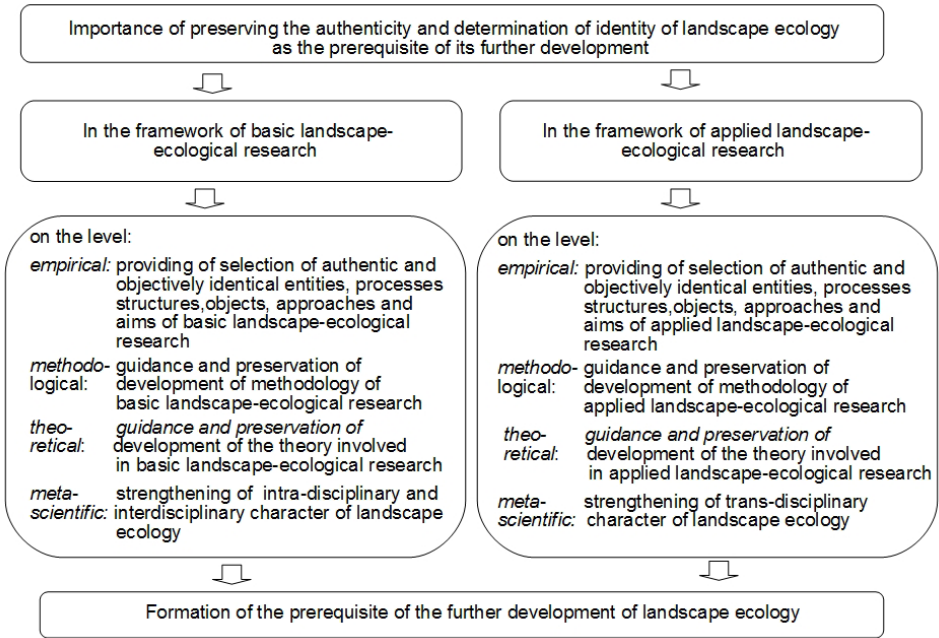


Fig. 6. Scheme of the preserving of the authenticity and determination of identity of landscape ecology as the prerequisite of its further development.

- a) *empirical-methodical-theoretical* significance inhering in:
 - Selection of authentic and objectively identical entities, processes and structures, objects, approaches and aims of basic and applied landscape-ecological research;
 - Guidance and preservation along with development of methodology for basic and applied landscape-ecological research and
 - Guidance and preservation of development of the theory involved in basic and applied landscape-ecological research;
- b) *meta-scientific* significance inhering in:
 - Development of intra-disciplinary balance of landscape ecology between its empirical,

- methodological, theoretical, applied and didactical parts;
- Preservation of balanced intra-disciplinary relationship between the object and approach of landscape-ecological research of landscape ecology both in 'sensus stricto' and in 'sensus lato';
 - Preservation of balanced multidisciplinary relationship between the development of the object and approach of landscape-ecological research and research of other disciplines involved with the man-landscape relationship;
 - Provision for further intra-disciplinary development and interdisciplinary cooperation of landscape ecology and within it preservation of a balanced development between strictly and broadly interpreted landscape ecology, and
 - Preservation of the incompatible position and competence of landscape ecology in the framework of multidisciplinary cooperation with other disciplines and trans-disciplinary cooperation with political and administrative stakeholders in search for solutions of common ecological, environmental and socio-economic problems.
- c) *Scientific-managerial* significance inhering in:
- Preservation of the 'trademark' of landscape ecology protecting it against appropriation of its results of basic and applied research by other disciplines;
 - Good management when applying for research projects and grants and opening of the new landscape-ecological centres/laboratories and accreditation of the existing ones (justified existence and competence of projects, institutes and university chairs) as well as
 - Organisation of landscape-ecological events motivated by an effort to maintain their landscape-ecological nature.
- d) *Didactic* significance inhering in:
- Preservation of authentic and objectively identical character of landscape ecology as science and landscape ecology as study/curriculum subject;
 - Preservation of scientific and didactic profiles of university teachers of landscape ecology in habilitation and inauguration proceedings as well as in compilation of study plans and programmes for students of landscape ecology in order to secure their future professional profile.

Several remarks to determination of identity of landscape ecology

Determination of objective and subjective identity of landscape ecology is one of the most important but also most difficult parts of its theoretical and meta-scientific research. An attempt will be made here to explain at least some criteria, which determine and influence identity of landscape ecology and the definition of landscape ecology itself. Taking into account the objective, i.e. authentic and subjective criteria for determination of identity of landscape ecology, it is possible to interpret it in the position of objective and subjective identity.

→ *Objective identity of landscape ecology* refers to the agreement and identity of its content with above-mentioned criteria of authentic landscape ecology, i.e. its geographical-ecological entities, approaches and principles. It means that the objective identity of landscape ecology

represents its identifying relationship to authentic landscape ecology.

Meanwhile, this is a relationship between two scientific properties of the same scientific disciplines, in our case landscape ecology with objective identity and landscape ecology with authentic nature. It means that the objective identity of landscape ecology is determined by authenticity of landscape ecology.

→ On the other side, subjective identity of landscape ecology is interpreted as the relationship between landscape ecology and landscape ecologist as a subject of landscape-ecological research. Subjective identity of landscape ecology divulges to what extent landscape ecologist identify themselves with the nature of landscape ecology and its research object, approach and aim. For this reason such identity of landscape ecology can be referred to as subjective. Subjective identity of landscape ecology then represents its external property determined by its agreement with interpretation of landscape ecology by the subject of landscape-ecological research. Aspiration and aim of landscape ecologist should be to incessantly draw closer their subjective views of landscape ecology to the objective identity and authenticity of landscape ecology.

Apart from other, it also means that *subjective identity* of landscape ecology perceived by landscape ecologist is not a steady and constant property. It changes in the course of landscape ecologist's scientific or pedagogical career under the effect of the following selected criteria and circumstances:

- Character of landscape-ecological knowledge, ability and skills of landscape ecologist,
- Their bonds with the scientific work team,
- Their bonds to scientific speech,
- Their bonds to *Alma Mater* where they acquired the profile of future landscape ecologist,
- Their bonds to science in general,
- Their influence by paradigms of landscape-ecological school,
- Time span of their research-scientific and educational activities, and
- Their bonds to nature of landscape-ecological research projects.

These subjective criteria are the ones that guide landscape ecologists in interpretation and identification of landscape ecology as an object, approach and aim of research. The some landscape ecologists besides identify landscape ecology with certain principle, research activity, approach, strategy or with empirical, applied and integrated science.

Criteria of subjective identity of landscape ecology if associated with different opinion on landscape ecology also influence the character of subjective defining of landscape ecology, which is the synthesising extract of landscape ecologist's thinking process.

All this leads to a vast diversity of the definition of landscape ecology and it is the reason why it should be the theoretical and meta-scientific efforts of landscape ecologists who are carriers of differing subjective identities of landscape ecology to draw closer to a single or united objective identity of landscape ecology with an authentic character. It will also make it possible to define single landscape ecology regarding its authentic-objective nature. In this sense it is, for example, the effort in development of an authentic definition of landscape ecology according to (Mičian, 1999), more in (Žigrai, 2012c).

Defining of landscape ecology in this sense, however, depends on choice of objective-nomothetic criteria independent on subjective decision-making process of the landscape ecologist. Otherwise, several subjective viewpoints of landscape ecologists concerning landscape ecology

will lead to several partial and often contradictory definitions of this science. The result is confusion even misinterpretation of the notion and the meta-scientific character of landscape ecology, object, approach and aim of research and the position of landscape ecology among other sciences.

One of the conditions for preservation of authenticity of landscape ecology and determination of its identity is also provision for transfer and implementation of authentic or objectively identical empirical landscape-ecological knowledge of basic research to the educational process and practice (more in Žigrai, 2013).

The research and didactic level of landscape ecologist as the subject of landscape-ecological research manifests not only in its research-scientific empirical, methodological, theoretical and applied capacities and knowledge but also in the competent to implement specialised and didactic knowledge, skills, and techniques in landscape-ecological educational process. The landscape ecologist imparting tuition will thus help develop personal characteristics and abilities of students necessary for their professional activities (see more in Žigrai, 2012d).

The most important properties and characteristics of future landscape ecologists include:

- capability of understanding of landscape-ecological problematic in the time spatial and natural-social contextuality, complexity and integrity;
- capability of generalization and holistic thinking necessary for the assessment of generally valid landscape-ecological interrelations and general laws;
- capability of spatial differentiation and combination necessary for preparation of landscape-ecological analyses and syntheses;
- capacity to interpret and evaluate analytical landscape-ecological data necessary for the problem-orientated landscape-ecological plans;
- capacity to coordinate and cooperate, which is necessary for successful management of scientific team, involved with basic and applied landscape-ecological research ;
- capability of argumentation and discussion necessary for efficient implementation of landscape-ecological studies and plans into political decision making and
- capacity of original, discovering, innovative, intuitive and creative thinking in landscape-ecological research on its empirical, methodical, theoretical, meta-scientific, applied and didactic levels.

Meanwhile, the relationship between landscape ecologist as a subject of landscape-ecological research and the object of such research is also interesting. This relationship is often interpreted in one way, it means in the sense of contribution of a particular researcher to the development of a particular scientific branch on empirical, methodical, theoretical or didactic and applied levels.

However, this relationship can be also perceived in an opposite direction with informational feedback, it means in terms of contribution of landscape ecology as a science to the development of landscape ecologist personality involved with this discipline. This contribution means not only broadening of its intellectual horizon but also more comprehensive interpretation of the given issue in time-spatial and natural/social contextuality, complexity and integrity. Besides, contribution of landscape ecology also inheres in strengthening of moral and volition properties of the landscape ecologist necessary for the demanding scientific activity.

Some remarks to the relationship between researched object and the research approach of landscape ecology as one of the key conditions of preserving authenticity and determination of identity of landscape ecology .

Preservation of authenticity and determination of identity for landscape ecology as the condition of its further development depends first of all on the relationship between the researched object (what is researched?), research approach (how is researched?) and subject of research (who researches?) landscape-ecological themes within the interior structure of landscape ecological research. Simultaneously these three parts of landscape-ecological research are subject to in continuous change and development (see Fig. 7).

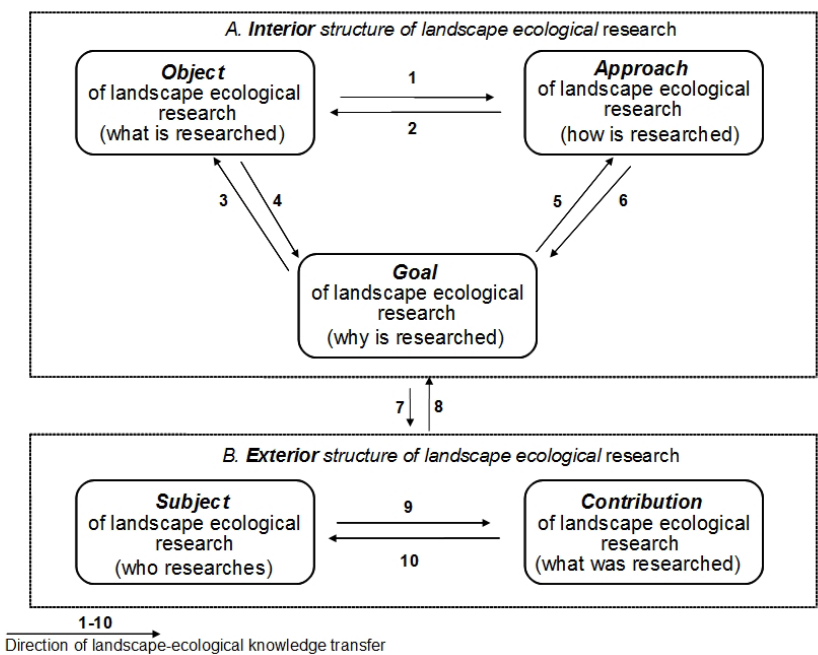


Fig. 7. Preservation of authenticity of landscape ecology depending on relationship between object, approach, goal, subject and contribution of landscape ecological research.

Preservation of authenticity and determination of identity of landscape ecology as prerequisites of its further development also depend on:

→ *Increase of time-spatial contextuality, comprehensiveness and integrity of landscape ecological research object:*

The increasing time-spatial and landscape-ecological contextuality , comprehensiveness and integrity of research object of landscape ecology also requires adequate broadening of the spectre of approaches of landscape ecological research, as well as intensification of cooperation with other sciences involved with the research of ecological-environmental and socio-economic issues.

This will, beside other, prevent the increasing imbalance between research approaches of landscape ecology and other sciences in the broadening spectre of the common research object.

- *Multidisciplinary relationship between the quantitative/qualitative broadening of the landscape-ecological research object and approach in the time/spatial context:*

Origins of this relationship are in the circumstance that broadening of the research spectre of ecological-environmental and socio-economic problems in terms of man-landscape relationship simultaneously represents the increasing social demand of landscape ecology and simultaneously a challenge for this science and other sciences supposed to find solutions to these problems.

In this connection is necessary to define the authenticity of landscape ecology with its position and task in the framework of other sciences.

- *Broadening of the spectre of object of landscape-ecological research, it means the research field of landscape ecology:*

Broadening of the spectre of landscape-ecological research object does not mean a threat to its authenticity and objective identity. It is rather a positive phenomenon as an impulse for the solution of new landscape-ecological problems in applied sphere and thus also for further development of landscape ecology presuming that the information feedback of new applied results and knowledge enriching its theoretical-methodological basis permanently operates. This reflection also concerns the broadening of the spectre of research objects of other sciences involved with the relationship between humans and landscape and with preservation of their authenticity and determination of identity.

- *Parallel broadening of the approach spectre of landscape-ecological research, i.e. broadening and deepening of theoretical, methodological and applied research approaches and aspects of landscape ecology:*

This process of broadening the spectre of research approaches in landscape ecology representing its offer and simultaneously answer to social demand does not essentially mean a threat to its authenticity and objective identity if the above-mentioned criteria and aspects are observed.

In other words, while broadening the scientific-research and didactic field of landscape ecology evoked by ecological, environmental and socio-economic problems and needs of the practical sphere it is necessary to approach them bearing in mind the character of landscape ecological aspects determined by criteria ruling preservation of authenticity and determination of identity of landscape ecology

- *Parallel broadening of the spectre of research approach of other scientific disciplines involved with research into man-landscape relationship, it means broadening, deepening of theoretical, methodological and applied research approaches and aspects of these disciplines:*

It means that other than these landscape-ecological disciplines completes the research approach of landscape ecology with missing necessary information and simultaneously contribute to enlightening of the socio-economic background and its modifications and impact on landscape-ecological phenomena, processes and structures in the man-landscape relationship.

And vice versa, results of landscape ecological research enrich the theoretical, methodological and applied knowledge of other than landscape ecological disciplines making possible an information feedback what beside other, contributes to preservation of authenticity and determination of identity of landscape ecology and its future development.

This will also justify the name and mark of landscape ecology and its independence as a science.

On the contrary, the more identical is landscape ecology with other sciences involved with landscape research, the greater the loss of authenticity and identity and justification of its name together with its delimitation as independent science.

→ *Preservation of stability of landscape ecology:*

Taking into account the generally applicable meta-scientific relationship, obviously the younger a science the more integrative, cross-sectional and idiographic it is. It is also case landscape ecology. It becomes unsure and prone to loss of stability, authenticity and objective identity.

This statement leans on the experience that younger integrative and idiographic sciences do not possess a settled and elaborated theoretical bases, methodological tools and terminology and on the other side they are heavily influenced by alien entities and approaches used by other disciplines and this is how they are attracted to their theoretical and methodological gravitation fields.

→ *Internal development of authenticity of landscape ecology and other disciplines and their interpenetration:*

The key moment here is preservation of the dynamic balance in the development of authenticity of landscape ecology, which depends on two circumstances:

- *Internal* situation in the framework of theoretical and methodological development of landscape ecology, i.e. on preservation of balance between autochthonous, i.e. original and new criteria of authenticity and on
- *External* situation manifested by the rate of penetration of allochthonous, i.e. alien criteria of authenticity from other sciences involved with research of the man-landscape relationship into the authentic environment of landscape ecology.

It means that the more identical landscape ecology with other sciences involved with landscape research the greater the loss of its authenticity and objective identity and justification for its name and independence.

Based on the above quoted remarks concerning preservation of authenticity and determination of identity of landscape ecology as well as the meta-scientific nature of landscape ecology (1), object of landscape ecological research (2), approach of landscape ecological research (3), the aim of landscape ecological research (4), the possible definition of authentic mixed 'ecological'/'geographical' landscape ecology is:

- (1) "*Landscape ecology represents an integrating nomothetic/ idiographic, intra-disciplinary and trans-disciplinary ecological discipline on the choric scale of landscape in penetration of ecological and geographical entities,*
- (2) *investigating relationships between ecological processes and spatial structure of a set of ecosystems as well as their relationships to the society,*
- (3) *by landscape-ecological, i.e. geo-, bio, and human-ecological empirical, methodological, theoretical and applied research approaches.*
- (4) *The research aims of landscape ecology are acquisition of new empirical data, preparation of new methodological approaches, theoretical regularities and general laws on landscape ecology as well as solution to ecological, environmental and socio-economic problems in landscape."*

This definition of landscape ecology also makes it possible to derive a definition of a landscape ecologist and what are they involved with. Landscape ecologist is then the scientist, researcher and educator who comprehends landscape ecology in the spirit of above-defined landscape ecology, and is involved with its research using its research methods and pursuing their research aim.

Some remarks to measures aimed at preservation of authenticity and determination of identity of landscape ecology

Preparation of proposal of measures aimed at preservation of authenticity and determination of identity of landscape ecology as a prerequisite of its future development should be based on its philosophy, strategy and aim of the development. These are given by the circumstance that the study of landscape ecological development represents one of the most important and permanent theoretical and meta-scientific issues and tasks.

- *Philosophy* inherent to preservation of authenticity and determination of identity of landscape ecology as the prerequisite of its development is in:
 - guidance and preservation of the development of theory, methodology and application of landscape ecology,
 - simultaneously strengthening of the socio-scientific acceptance and relevance of landscape ecology, as well as
 - contribution to the preservation of authenticity and determination of identity of landscape ecology (Fig. 8).

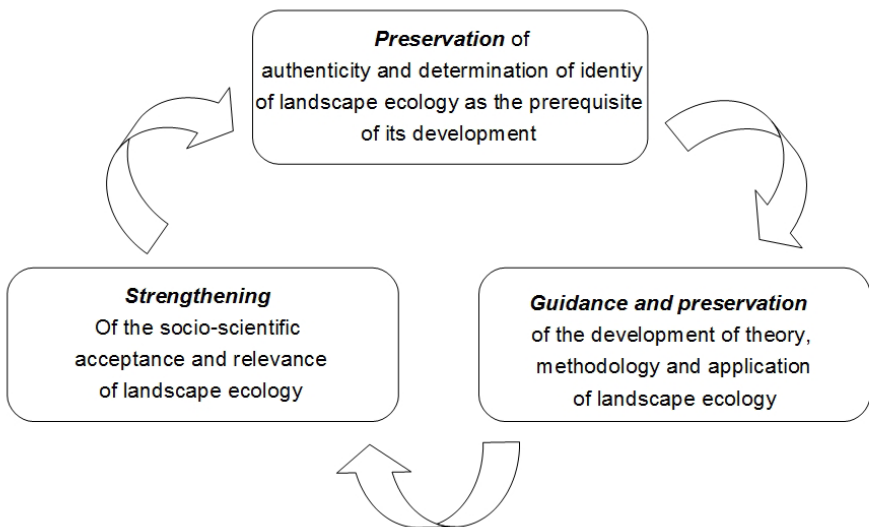


Fig. 8. Scheme of philosophy and strategy of preservation of authenticity and determination of identity of landscape ecology as the prerequisite of its development.

- *Strategy and aim* of such measures first of all depend on:
 - Preservation of integrity, it means inseparability of geographical and ecological entities, approaches and principles;
 - Preservation of landscape-ecological trinity (processes, structure, and landscape scale) in research of ecosystems on the level of landscape and their relationship to society;
 - Preservation of the balanced relationship between the object and approach of landscape-ecological research;
 - Progressive approximation of subjective identity of landscape ecology to objective identity of landscape ecology, which coincides with its authenticity.

Based on so determined strategy and aims set, it is possible to propose the following selected measures on different levels necessary for preservation of authenticity and determination of identity of landscape ecology as the prerequisite of its further development:

a) Measures aimed at *preservation of authenticity* of landscape ecology:

- *On empirical level*: provision for selection and elaboration of authentic and objectively identical entities, processes, structures, objects, approaches and aims of the basic and applied landscape ecological research;
- *On the level of methodology*: to guide and preserve development of methodology applicable in authentic basic and applied landscape ecological research;
- *On the theoretical level*: to guide and preserve the development of the theory for basic and applied landscape ecological research and
- *On the meta-scientific level*: to strengthen the intra-, inter- and trans-disciplinary nature of authentic landscape ecology;
- To preserve the balanced intra-disciplinary development between the object and approach to landscape-ecological authenticity research both in its narrow and broad interpretation;
- To preserve the balance between the broadened spectre of research object and approach to authenticity of landscape ecology and other sciences
- To intensify collaboration of authentic landscape ecology with other scientific disciplines in the framework of broadening of the landscape ecological research object and approach;
- To preserve the balance between the broadened spectre of research approaches to authenticity of landscape ecology and the broadened spectre of research approaches to authenticity of other sciences and
- To preserve the balance between the broadened spectre of ecological-environmental and socio-economic problems and the theoretical and empirical offer of the authentic landscape ecology strengthening their mutual information linkages.

b) Measures for *determination of identity* of landscape ecology:

- Elaboration and completion of criteria for objective and subjective identity of landscape ecology;
- Progressive objectification of subjectivity of criteria used for determination of identity of landscape ecology;
- Working out of the theoretical and meta-scientific ways of approximation of subjective identity of landscape ecology to the objective identity of this science;
- Emphasis on importance of time-spatial and natural-social contextuality, complexity and integrity of the research object of landscape ecology;

- Strengthening of knowledge, capabilities and skills of landscape ecologist which will contribute to objectification of subjective view of landscape ecologist on landscape ecology
- Promotion of research into circumstances and causes of subjective identity of landscape ecology, as well as
- Increased attention to defining of landscape ecology with its objective identity.

Conclusion

Above quoted brief meta-scientifically focused remarks to preservation of authenticity and determination of identity of landscape ecology as the prerequisite of its further development represent an effort to partially enlighten one of important theoretical, meta-scientific and applied problems of landscape ecology which was given little attention so far. This fact is, for instance, also reflected in poor elaboration of objective criteria for establishment of authenticity and determination of identity of landscape ecology.

Meanwhile, authenticity and identity of landscape ecology are its key meta-scientific characteristics preservation and determination of which are important prerequisites of its further development. First of all preservation of inseparability of geographical entities, approaches and principles from ecological ones, preservation of landscape-ecological trinity in research of ecosystems on the level of landscape and their relationship to society and preservation of the relationship between the object and approach of landscape-ecological research are the main conditions for preservation of authenticity and determination of identity of landscape ecology, hence for its future development.

It must be also noted that broadening of the spectre of landscape-ecological object research means the research field of landscape ecology does not mean a threat to its authenticity and identity. It rather acts as a positive incentive for the solution of new landscape-ecological problems and further development of landscape ecology if the information feedback of new applied results and knowledge enriching its theoretical and meta-scientific basis works well.

Identification of the essence of authenticity and identity of landscape ecology depends first of all on the establishment of objective criteria for its evaluation. This paper brings three criteria now considered crucial based on acquired theoretical and meta-scientific knowledge. The difficulty inherent to identification or enlightenment of authenticity of landscape ecology and determination of its identity is in the fact that objective criteria selected by the subject, it means landscape ecologists, does not have to be perfectly complete or relevant. It means that these criteria imply certain level of subjectivity.

Based on the above-quoted criteria of preservation of authenticity and determination of identity of landscape ecology it was possible to venture into an objective definition of authentic landscape ecology presented in this paper. Meanwhile, it should be noted that it is the first attempt of the author to enlighten the issue of preservation of authenticity and determination of identity of landscape ecology as the prerequisite of its future development.

Beside other, it also means that this is only a first step towards the essence of authenticity and identity of landscape ecology in the course of basic and applied landscape-ecological research through acquisition of fresh empirical, methodical, theoretical, meta-scientific and applied knowledge. This acknowledgement is, apart from other, influenced not only by the comprehen-

sive time-spatial contextuality of research object of landscape ecology but also by its mixed idio-graphic-nomothetic nature.

The above quoted theoretical and meta-scientific notes can be used, for their generally applicable nature, in the solution of the question of preservation of authenticity and determination of identity of other sciences involved with the ecological-environmental and socio-economic aspects of the man-landscape relationship.

References

- Eliáš, P. (2001). Ecology at the end of 20th century (in Slovak). *Ekologické Štúdie*, 3, 45–53.
- Forman, R.T.T. & Godron M. (1986). *Landscape ecology (in Czech)*. Praha: Academia.
- Mičian, L. (1995). Problems of meta-geography and meta-cartography in the east- and middle European literature (in Slovak). *Geografický Časopis*, 47(2), 63–73.
- Mičian, L. (1996). About to ways to landscape synthesis (in Slovak). In T. Hrnčiarová (Ed.), *Celostnosť-syntéza-ochrana životného prostredia* (pp. 35–39). Bratislava: Ústav krajiny ekológie SAV.
- Mičian, L. (1999). Geography, physical geography, landscape ecology, geoeology: their interpretations and functions (in Slovak). *Geografický Časopis*, 51(4), 331–345.
- Moss, M.R. (1999). Fostering academic and institutional activities in landscape ecology. In J.A. Wiens & M.R. Moss (Eds.), *Issues in landscape ecology* (pp. 138–144). 5th IALE-World Congress. Snowmass, CO.
- Paulov, J. (2012). Basic paradigms in the evolution of geography as a science: an attempt at a brief identification (in Slovak). *Geografický Časopis*, 64(2), 91–109.
- Rychnovská, M. (2001). What has done the 20th century to ecology and what do next? (in Czech). *Ekologické Štúdie*, 3, 42–44.
- The 8th World Congress of the International Association for Landscape Ecology (2011). Beijing, China.
- Wiens, J.A. (1999). Toward a unified landscape ecology. In J.A. Wiens & M.R. Moss (Eds.), *Issues in landscape ecology* (pp. 148–151). 5th IALE-World Congress. Snowmass, CO.
- Wu, J. & Hobbs R. (2002). Key issues and research priorities in landscape ecology: an idiosyncratic synthesis. *Landsc. Ecol.*, 17, 355–365. DOI: 10.1023/A:1020561630963.
- Žigrai, F. (2001). Position, meaning and tasks of meta-landscape ecology (Some theoretical and methodological notes). *Ekológia (Bratislava)*, 20(Suppl. 3), 11–22.
- Žigrai, F. (2002). Paradigm as scientifically relevant notion for the prognosis of the development of landscape ecology (in Slovak). *Acta Environmentalica UC (Bratislava)*, 11, 73–85.
- Žigrai, F. (2009). Some remarks to theoretical and meta-scientific principles of landscape ecology (in Slovak) In V. Herber (Ed.), *Fyzickogeografický sborník 7* (pp. 9–15). Fyzická geografie a trvalá udržiteľnosť. Brno: PF Masarykova univerzita.
- Žigrai, F. (2010a). Landscape ecology in theory and practice (selected theoretical and meta- scientific aspects). *Ekológia (Bratislava)*, 29(3), 229–246. DOI: 10.4149/ekol_2010_03_229.
- Žigrai, F. (2010b). Typology of landscape ecology (in Slovak). In V. Herber(Ed.), *Fyzickogeografický sborník 8* (pp. 22–29). Fyzická geografie a kulturní krajina. Brno: PF Masarykova univerzita.
- Žigrai, F. (2010c). Position and cooperation of landscape ecology in the framework of ecological sciences (in Slovak). *Ekologické Štúdie*, 1(1–2), 190–199.
- Žigrai, F. (2012a). The paradigm of sustainable development as a preconditions of development of landscape ecology (in Slovak). *Ekologické Štúdie*, 3(1), 89–101.
- Žigrai, F. (2012b). Social- scientific relevance of landscape ecology as the reflection of its theoretical-applied and educational development. *Ekológia (Bratislava)*, 31(2), 168–181. DOI: 10.4149/ekol_2012_02_168.
- Žigrai, F. (2012c). Metascientific contribution of Doc. RNDr. Ľudovít Mičian, DrSc. To the development of geography and landscape ecology (in Slovak). In V. Herber (Ed.), *Fyzicko-geografický sborník 10* (pp. 14–22). Fyzická geografie a krajinná ekológia: teória a aplikácie. Brno: PF Masarykova univerzita.
- Žigrai, F. (2012d). Meta-scientific background of the education of landscape ecology at the universities (in Slovak). *Ekologické Štúdie*, 3(2), 4–19.
- Žigrai, F. (2013). Transfer of landscape-ecological knowledge from theory to practice as a multistage process. *Ekológia (Bratislava)*, 32(3), 305–319. DOI: 10.2478/eko-2013-0027.