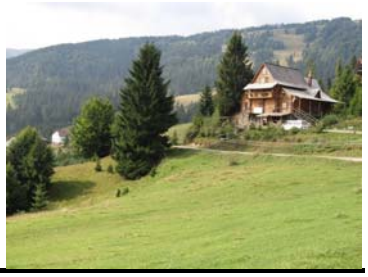

TEORETYCZNE PODSTAWY I METODY BADAŃ WIZUALNEJ JAKOŚCI KRAJOBRAZU W KONTEKŚCIE PRZESTRZENNEJ ORGANIZACJI KOMPLEKSÓW NARCIARSKICH

THEORETICAL BASES AND RESEARCH METHODS IN VISUAL QUALITY OF THE LANDSCAPE WITHIN THE CONTEXT OF LANDSCAPE AND SPATIAL ORGANIZATION OF SKI RESORTS

Yaryna Onufriv
mgr inż. arch.

Politechnika Lwowska
Wydział Planowania Miast
Instytut Architektury

STRESZCZENIE

Artykuł analizuje stan teoretycznego opracowania problemu określenia i oceny jakości wizualnej krajobrazu w kontekście badania wpływu przestrzennej organizacji kompleksów narciarskich na wizualny obraz górskiego krajobrazu. Artykuł systematyzuje i analizuje znaczną ilość teoretycznych badań krajobrazu wizualnego, jego osobliwości i estetyczne zależności postrzegania, metodykę analizy i planowania dużych obiektów krajobrazowych oraz współczesne technologie analizy jakości wizualnej środowiska. Głównym wnioskiem artykułu jest integracja światowych doświadczeń naukowych w zakresie badań wizualnej jakości środowiska w kontekście projektowania kompleksów narciarskich.

Słowa kluczowe: jakość górskie krajobrazy, kompleks narciarski, wizualna, zasady estetyczne.

ABSTRACT

The article explores the state of theoretical development of visual landscape research within the context of visual impact of ski resorts investigation. In the article the great amount of existing theoretical investigations of visual landscape, the specifics of landscape perception and its aesthetic basics, the methodology of landscape analysis and design and current technologies of visual quality analysis are systematized and analyzed. The main contribution of the paper is the integration of the world scientific theoretical frames in the field of landscape visual quality into the context of ski resorts designing.

Key words: aesthetic principles, mountain landscapes, ski resort, visual quality.

1. INTRODUCTION

Recently the problem of visual perception of landscape is very topical. European landscape Convention (ELC) defines landscape as *an area, as perceived by people, which character is the result of the action and interaction of natural and/or human factors* [5, p. 3]. From this definition one can see the importance of the factor of visual quality of the landscape and investigation the particularities of human perception of the landscape. Numerous scientific studies of the problem of visual quality of the landscape date back to the last century. The problem was discussed in the context of different scientific fields, as psychology, philosophy, aesthetics, physiology, phenomenology, architecture, geography and so on. In this article the problem is viewed through the context of mountain landscapes development and in particular ski resorts planning.

Mountain environments are highly appreciated by tourists [17]. Nowadays, tourism becomes one of the main sources of income for the local communities in mountain regions in Europe [18] and in Ukraine. As the recreational quality of a mountain landscape is to a great extent linked to its scenic beauty [4], the question of visual quality of the landscape is very important for the society. The development of ski resorts in natural mountains environment, as any other proposal that results in a change to the landscape, affects both the landscape as an environment resource in its own right and people's views and visual amenity [11, p. 4].

The analysis of the state of theoretical development of the problem of visual quality of mountain landscapes, presented in this article, shows the main aspects of the problem, basic methods of architectural investigation, techniques and technologies that are currently used in the field. This literature review can be the basis of further theoretical development of the problem of influence of ski resorts construction on visual perception of Carpathian Mountains.

2. BASIC TERMS AND IDEAS DEFINITION

By looking through the scientific literature we can identify most frequently cited terms and notions concerning the idea of visual quality of the landscape: *aesthetics of landscape, visual landscape, visual element, visible form, spatial composition*.

The term '*aesthetics*' comes originally from the Greek '*aesthenesthai*', to perceive, and '*aistheta*', things perceived. The philosophical notion of *aesthetics of landscape* is broadly enlightened by Simon Bell [2, p. 64]. According to Bell, aesthetics is an all-embracing, multi-sensory engagement with our environment within which we are a natural component. Therefore perception is central to our sense of beauty and the pleasure we may obtain from our environment. Bell carries out a wide analysis of different approaches to the definition of landscape aesthetics and summarizes this analysis by defining visual/aesthetic principles e.g. unity, diversity, coherence, spirit of place, mystery, multiple scales and strength. A detailed analysis of the term "landscape aesthetics" we can find in the article "Landscape and the philosophy of aesthetics: is landscape quality inherent in the landscape or in the eye of the beholder?" by Andrew Lothian. Lothian also gives a detailed historical analysis of philosophical interpretation of beauty and aesthetics [12].

In the literature highlighting the idea of visual quality of the landscape one can meet the term *visual landscape* or physiognomic landscape, which means the visible properties of all the landscape phenomena and their structure [15, p.16]. Visual landscape consists of visual elements. According to Bell [1, p. 81], basic visual elements from which all landscapes are composed are defined as point, line, plane, solid volume, open volume (Fig.1).

Each of these elements may be varied in a number of ways (variables: number, position, direction, orientation, size, shape (form), interval, texture, density, colour, time, light, visual force, visual inertia). They may also be organized into different patterns. It is the com-

bination of these three components, the element, its variation and organization, which describes the patterns to be found in the existing landscape or produces new visual designs or new patterns (organization: objectives – diversity, unity, genius loci; spatial cues – nearness, enclosure, interlock, continuity, similarity, figure and ground; structural elements – balance, tension, rhythm, proportion, scale; ordering – axis, symmetry, hierarchy, datum, transformation).

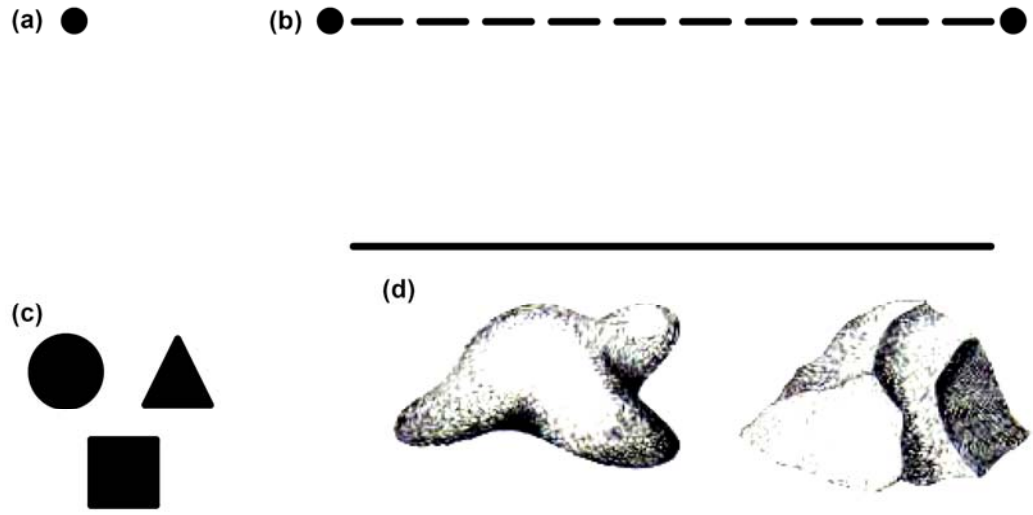

Fig. 1. Basic elements of the visual landscape: a) point; b) line; c) plane; d) volume. Source: [3]

In some literature sources one can find the term *visible form*, which is the synonym to the 'visual element', but underlines the spatial context of the term. This term explains the visual manifestation of three-dimensional forms and their relationship in outdoor space, expressed by its structural organization and ordering principles [1]. Visible form is crucial because it affords movement by its openings, offers a sense of direction by its spatial orientation and offers arousal/attraction by its visual composition. The visible form of the landscape architectonic composition derives from the act of visual perception, which is linked with the sequential unfolding of visual information by movement through space [14, p. 110].

Spatial composition or landscape architectonic composition consists of a given spatial relationship between surfaces, screens and objects in space considering the diurnal and seasonal variations in natural light and vegetation. The basic notions which are used in the scientific literature for explaining the spatial composition are: perspective (wide perspective, atmospheric perspective, colored perspective, linear perspective), panoramic view, viewpoint, dominant, accent, axis. The main categories of composition are defined as contrast, nuance, tone, color and tectonics.

3. THE PROBLEM OF LANDSCAPE PERCEPTION AND VISUAL QUALITY OF THE LANDSCAPE

Human *perception of landscape* is a comprehensive notion. It can be characterized as conscious, cognitive, constructive and estimative. Despite the fact that perception is formed from the sequence of sensations and many senses, not just vision, in the paper the emphasis is made on the visual aspect of human perception, as the central theme of this article is "visual quality of the landscape".

The term visual, derived from the Latin „visualis" and „visus" – sight, from „videre" – to see, is used as adjective relating to perception by seing or sight: *visual perception* [16]. According to Bell, human perception of landscape can be in two dimensions: 1. percep-

tion of landscape from a far distance as a picture (only visual perception); 2. perception of landscape in a mode of participation and complicity with a landscape – while perceiving the landscape closely (apart the visual apparatus also are involved auditory, olfactory, tactile, gustatory senses) [3]. But despite the distance to the perceivable object our brain is always involved in the process of perception. So we can distinguish two aspects of landscape perception: physiological (the 'senses') and psychological (the 'brain'). All aspects of physiological perception can be measured in an objective way [15, p. 22][1]. The psychological process is individual and thus essentially subjective and determines the experience of the landscape and finally affects our behavior and actions [15, p. 24][2]. According to Nijhuis, Van Lammeren, Antrop, existing approaches to landscape perception research can be divided in four paradigms and two types of models [15, pp. 24–25]:

I – expert model (1. expert-approach: evaluation of the *visual landscape* by experts and trained observers, characterized by heuristic methods and the use of systematic descriptive inventories, visual management systems, etc. Most of the Dutch studies on the visual landscape can be labelled as expert-approaches, and also such scientists as Boogert and Schalk (1995), Wassink (1999), Hendriks and Stobbelaar (2003), Lynch [13], Cullen (1961), Appleyard et al. (1964), Ashihara (1983), Smardon et al. (1986), Higuchi (1988), Bell (1996) [2, 3], Thiel (1997), Dee (2001) and The Landscape Institute (2003) [15, p. 24]. In Ukrainian scientific community and in general on post-soviet terrain visual landscape studies aren't enlightened in sufficient way and are characterized by using only expert approach [7,19,20];

II – public *landscape preference* models (1. psychophysical-approach: testing general public or selected populations' of landscape aesthetics/properties by, for example, environmental psychologists, landscape architects, characterized by the use of photo questionnaires. In these studies the behavioural approach is the dominant methodology. Scientists that used this approach are: Van de Wardt and Staats (1988) and Staats and Van de Wardt (1990), Appleton (1975), Daniel [6]; 2. psychological-approach: search for human meaning associated with landscape or landscape properties by environmental psychologists, characterized by mapping landscape experience. As in the psychophysical-approach, the behavioral approach is dominant. The famous scientists that used this approach are: Korthals Altes and Steffen (1988), Coeterier (1987), Kaplan and Kaplan [10], Bell et al. (2001) and Nasar (2008); 3. phenomenological-approach: research on subjective experience of the landscape (e.g. phenomenologists, psychologists, humanistic geographers), characterized by the interpretation of paintings, poetry, etc. These studies show a humanistic approach. Examples of this approach are: Lemaire (1970), Tuan (1974), Boyer (1994) and Olwig (2002).

There are also other classifications in studying of human perception of the landscape and its visual, aesthetic qualities. For example, Andrew Lothian [12] divides landscape studies into two paradigms: the objectivist or physical paradigm – a conventional view that the quality of the landscape is an intrinsic attribute of the physical landscape (famous scientists that work in this approach are Zube, Sell & Taylor, Daniel & Vining); the subjectivist or psychological paradigm considers landscape quality as solely a human construct, based on the interpretation of what is perceived through the memories, associations, imagination and any symbolism it evokes. A. Lothian considers that the promising approach in exploring the visual landscape is subjectivist's approach. Terry C. Daniel makes a suggestion about the transition from the objectivist and subjectivist approach to the ecological approach. Namely he predicts in the article *Whither scenic beauty? Visual landscape quality assessment in the 21st century* [6] the dominance of ecological oriented approach in landscape visual quality assessment in the future.

[1] According to Sevenant (2010); Jacobs (2006); Bell (1999) as cited in [15, pp.15–39].
[2] According to Jacobs (2006); Bell (1999); Coeterier (1987); Sevenant and Antrop (2010) as cited in [15, pp.15–39].

Another important aspect of the problem of visual quality of the landscape is visual quality indicators identification. In order to answer this question one should look through the environmental preference studies. S. Kaplan identifies four structural components in aesthetic preference: coherence, complexity, legibility/distinctiveness and mystery [10]. Based on this theory and deepen analysis of the thematic field, Bell proposes 6 qualities of beautiful landscape: diversity/complexity, coherence, spirit of place, mystery, multiple scales and strength [2, pp. 104–105]. In the article *the ecology of visual landscapes: exploring the conceptual common ground of visual and ecological landscape indicators* [8, pp. 933-947] we can find the attempt to explore the common ground between two aspects of landscape – visual and ecological character, and how indicators could be used for communicating both aspects. The scope is limited to aspects related to landscape structure. The authors use 9 key concepts [8, p. 935][3] describing visual landscapes: stewardship, coherence, disturbance, historicity, visual scale, imageability, complexity, naturalness, ephemera. Some of these "key concepts" or in other words visual quality indicators of the landscape can be used to describe urban space. For example, the term "imageability" we meet also in Kevin Lynch's "image of the city" [13]. Lynch develops the concept of "cognitive urban image" and categorizes inhabitant's image of the city into five physical elements: paths (streets, walkways, canals or railways), edges (shores, edges of developments, walls), districts, nodes (junctions, squares or street corners), landmarks (buildings, signs, mountains). These urban elements heighten imageability, legibility and clarity of urban space. Legibility, imageability and clarity mean the visual quality of the urban space, but also can be used to identify any kind of space, including rural and natural environment. According to Lynch, a legible space gives emotional trust, increases potential density in experience and decreases chaos, anger and unconscious crowd in space. Another interesting concept of visual quality of the space is the concept of jack I. Nasar –"evaluative image of the city", which focuses on the likability of the cityscape and identifies the likability levels as most liked, liked/disliked, disliked and most disliked areas [21]. This approach can be used in visual quality assessment both for the cityscape and landscape.

4. METHODS OF VISUAL ASSESSMENT OF THE LANDSCAPE AND GOOD DESIGN PRACTICES

In the context of the problem of visual perception of mountain landscapes a special attention deserves the monography of S. Bell and D. Apostol called *Designing sustainable forest landscapes* [3]. In this monography authors present the methodology of expert approach of visual and aesthetic assessment of forest landscapes and propose practical techniques of clear cuts planning, which match the aesthetic and ecological laws and have been tested in a forestry of Great Britain. The scientists describe the Visual Management System, according to which the methodology of defining *scenic attractiveness* and degrees of *scenic integrity* are presented. The method of calculating relative scenic value is to describe the landscape elements that make up each character zone in terms of line, form, colour, texture and composition. Scenic integrity indicates the degree of visual disruption of landscape character. The authors indicate 3 classes of scenic attractiveness (distinctive, typical and indistinctive) and 6 classes of scenic integrity (from very high to unacceptably low). The scenic attractiveness classes and landscape visibility data are combined to create Scenic Classes, ranging from 1 to 7, which indicate the relative importance or value of discrete landscape areas. These scenic classes are used during forest planning. The methodology of forest landscape planning according to Visual Management System consists of five steps:

1. Landscape inventory with the identification of the extent of the landscape visible from established viewpoints such as roads, settlements and recreation areas; the

[3] According to Tveit et al. (2006) as cited in [8, pp. 933–947].

suite of landscape features present, both natural and man-made; landscape sensitivity, calculated from the physical factors and viewer-related factors such as numbers of viewers, viewing distance, duration and perception.

2. Landscape analysis, consisting of detailed mapping, the recommendation of the Visual Quality Objectives and the final establishment of Visual Quality Objectives by the forest manager that have to be balanced against the aesthetics (Fig. 2).
3. Design and layout of roads and cut blocks.
4. Logging and silvicultural practices.
5. Questioning people about the effectiveness of the System.

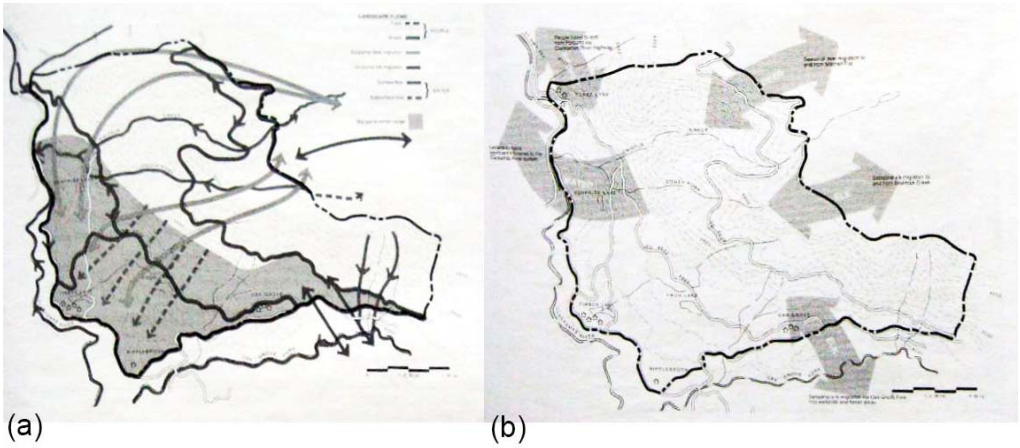

Fig. 2. Landscape analysis. Detailed mapping: a) a map showing landscape flows; b) a map showing linkages from the design unit to the wider landscape. Source: [3]

The authors describe visual design principles which are tested and used in forestry of British Columbia, Great Britain and the USA (Fig. 3, 4, 5). Many of the principles were first applied to the hill or mountainside, which prove the effectiveness of them in using for designing mountain landscapes.

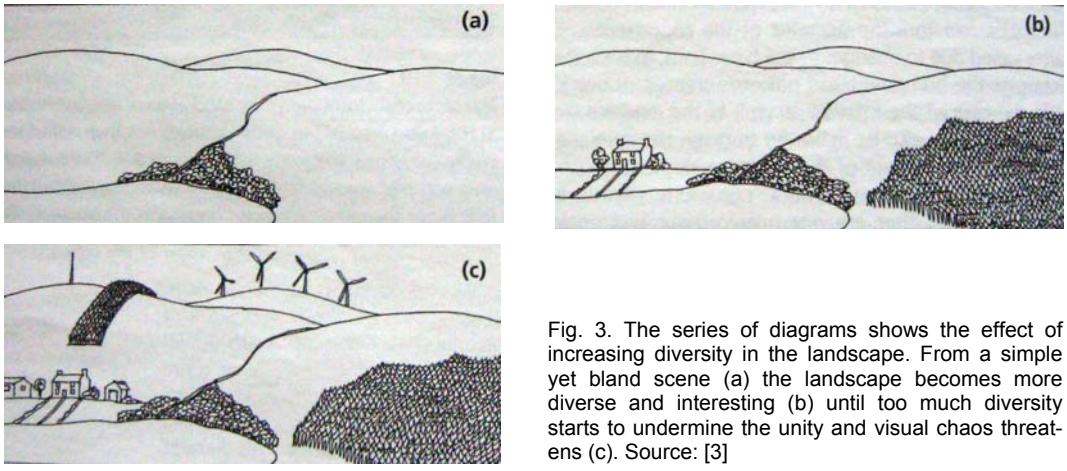

Fig. 3. The series of diagrams shows the effect of increasing diversity in the landscape. From a simple yet bland scene (a) the landscape becomes more diverse and interesting (b) until too much diversity starts to undermine the unity and visual chaos threatens (c). Source: [3]

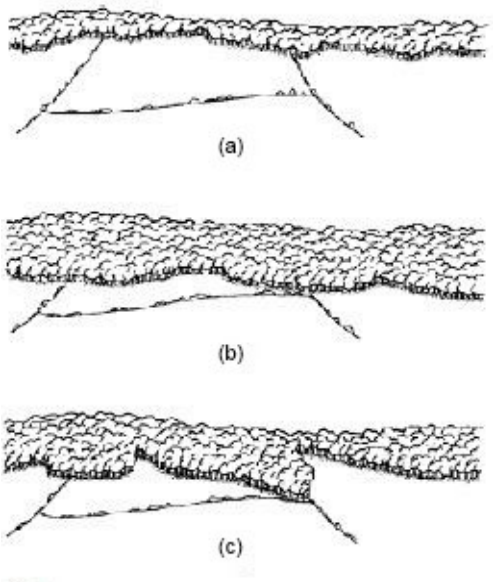

Fig. 4. The rule of thirds: a) less than one-third woodland in this scene looks uneasy; b) a 50-50 split also looks uncomfortable: neither element is dominant; c) one-third woodland tp two-thirds open ground below looks a better proportion. Souce: [1]

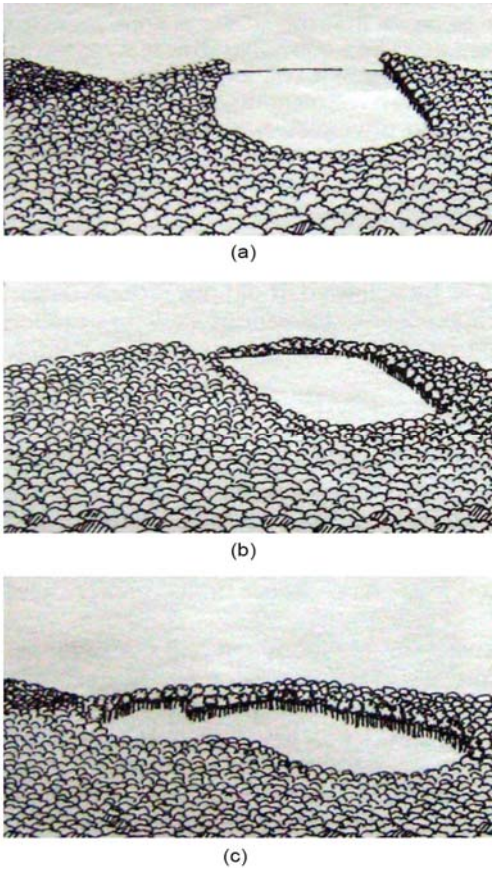

Fig. 5. A sample of applied design from the tasmanian handbook, demonstraiting design in relation to a skyline. Source: forestry practices board: a) skylines should not be cut directly across in the direction of the principal viewpoint, as the coupe edges will remain clearly visible for many years; b) if skyline cutting is necessary, arrange the harvest at an angle to the main viewpoint; c) the impact is lessened if the harvest is along, instead of across the skyline. Source: [3]

The publication of *Guidelines for Landscape and Visual Impact Assessment* [11] by Landscape Institute and Institute of Environmental Management & Assessment is worth mentioning in this article. It presents basic principles and rules of assessment of any existent or potential development and is broadly used by landscape practitioners, developers,

legal advisors and decision-makers. This edition encourages professionals to recognize and assess likely significant environmental effects, including those that are positive and negative, direct and indirect, long, medium and short term, and reversible and irreversible, as well as cumulative effects. The methodology of visual impact assessment, presented in the book, can be applicable in analyzing the visual impact of ski resorts in Ukrainian Carpathian Mountains. Steps in assessing visual effects are illustrated in the Fig. 6.

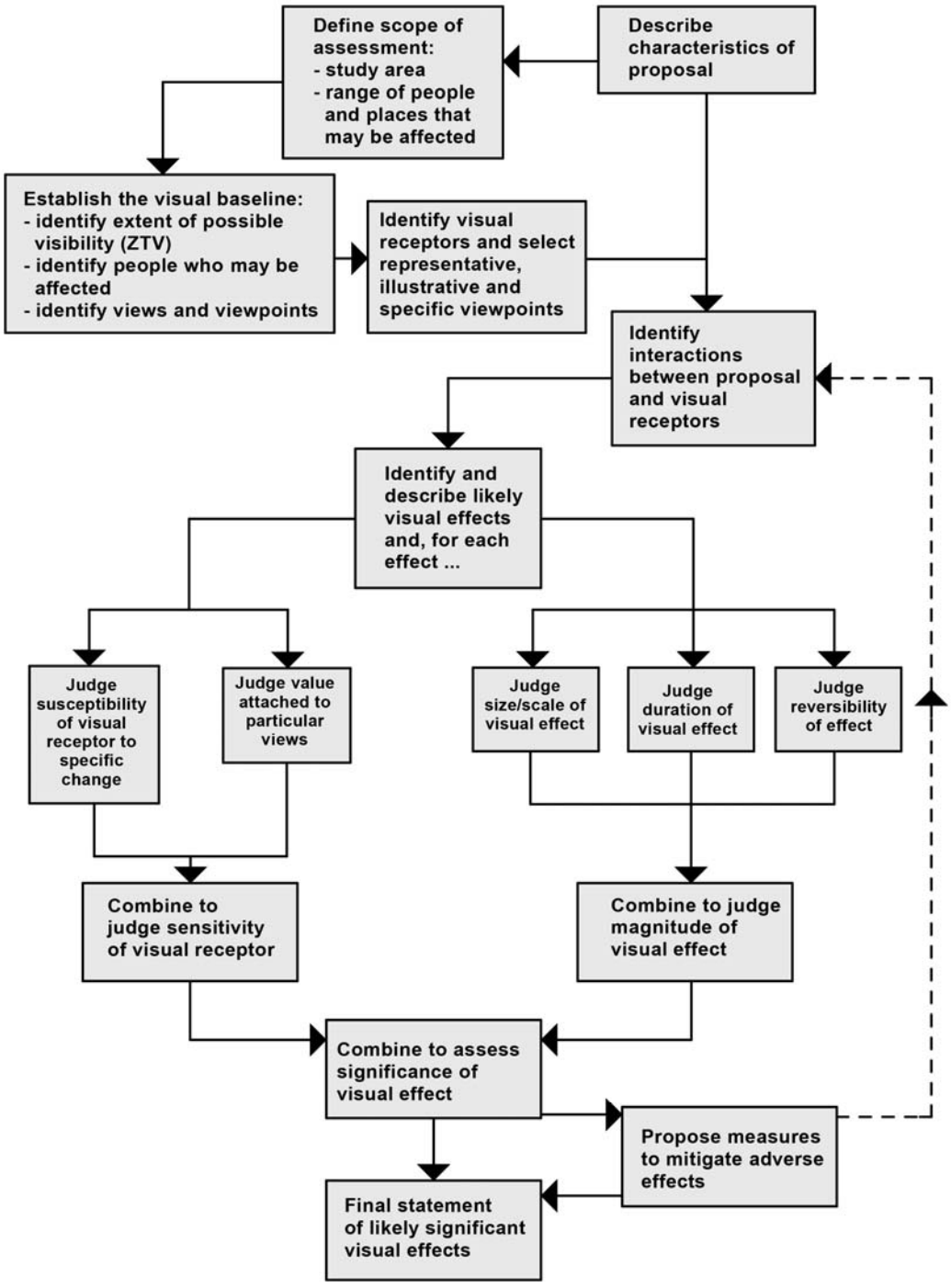

Fig. 6. Steps in assessing visual effects. Source: [11, p. 99]

5. TECHNIQUES AND TECHNOLOGIES IN VISUAL LANDSCAPE RESEARCH

Current trends in landscape studies and, in particular visual landscape exploring, can be seen in using *GIS technologies* and also combination of both objectivist and subjectivist approaches [1,2,3,11,14,18,22]. The usage of GIS-based concepts of isovists (sight field polygons) and viewsheds is described in scientific literature and it can especially help to comprehend the relation between the conceptual and perceptual space and offer different models of representation [14]. The main difference between the two concepts is that the raster-based viewsheds represent parts of space that are visible, taking into account vertical viewing angle and elevation while vector-based isovists consider visible space in the horizontal plane. The result is a closed polygon that can be characterized with different numerical parameters [14, p.117][4].

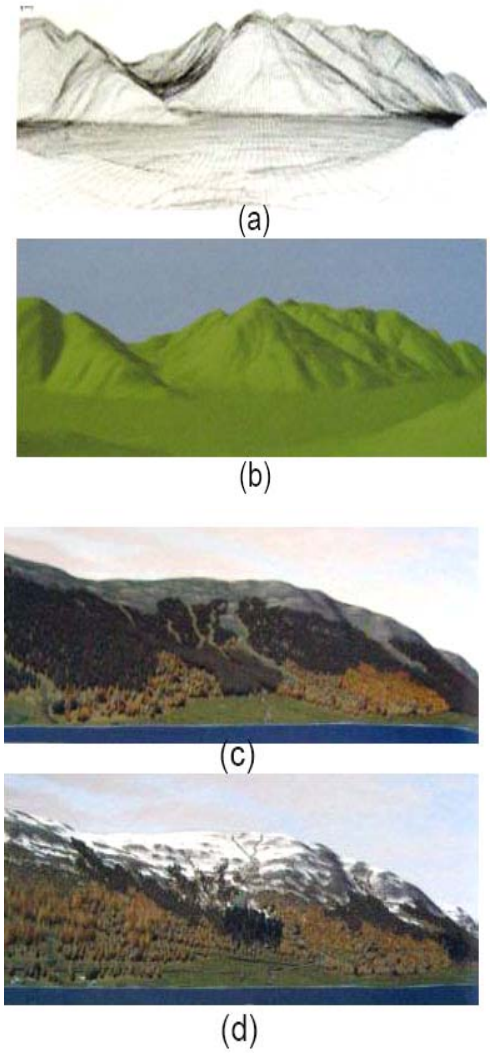

Fig. 7. Computer graphics: a) shows a wireframe rendering of a digital terrain model; b) shows the same landform with solid shading, giving a more easily interpreted result; c) a replanting design rendered more realistically using a more sophisticated modelling system. This uses scanned images of different species of trees; d) shows another version of a design in different weather conditions, illustrating how versatile such rendering systems are. Source: [3]

GIS-based isovists and viewsheds have the potential of measuring visual phenomena which are often subject of intuitive and experimental design, taking into account physiological, psychological and antropometric aspects of space. It offers the possibility to com-

[4] According to Batty (2001); Turner et al. (2001) as cited in [14, pp. 103–145].

bine general scientific knowledge of visual perception and wayfinding with the examination of site-specific design applications [14, p.140].

For landscape character analysis researchers usually use such techniques as panoramic photo capturing, 3-D visualizing (digital terrain model DTM – only represents the bare ground surface, digital landscape model DLM – represents the earth surface including all objects on it), virtual reality and cartography (Fig. 7).

6. UKRAINIAN THEORETICAL BASES OF VISUAL QUALITY OF THE LANDSCAPE AND SPATIAL ORGANIZATION OF SKI RESORTS

In an existing methodology of ski resorts planning in Ukraine some aspects of visual perception of ski resorts are taken into account. But this practical methodology needs an improvement and development of theoretical basis in the field of visual quality of the landscape.

As it was written above, some aspects of visual quality of ski resorts planning were highlighted in the literature. In the PhD thesis *Architectural and planning organization of ski resorts (on example of Ukrainian Carpathian Mountains)* [19] Gennadiy Shulha proposes the methodology of aesthetic value of the space defining. He gives a detailed vegetation characteristic and ranges it into favorable, relatively favorable and not favorable from the aesthetic point of view. Within the assessment of aesthetic value of landscape, according to Shulha, one should to determine:

– the spatial characteristics (open, semi open, closed), including the analysis of vertical and horizontal diversity (heterogeneity and frequency of kinks of the relief, the relative difference elevation, layering of elements and smoothness, contrast boundaries between landscape elements, compactness of vegetation, depth of visual perspectives and so on);

– conditions of landscape perception (location of panoramic viewpoints, the dimension of the horizontal and vertical view angle, location of possible viewpoints during the movement, the sequence of views, long distance and short distance scenes, horizontal and vertical length of the landscape elements and their light and shadow contrasts, the skyline position in the view and so on).

The author determines the aesthetic quality of landscape by the *degree of picturesque* of the landscape. The elements which characterize the picturesque of the landscape are relief (determining), water objects (reinforcing), vegetation (complementing). Shulha proposes the methodology of spreading the recreationists in the landscape in order to avoid the damaging of ecosystem and in particular the vegetation cover of the mountains. He connects the ecological state of the landscape with the aesthetical value of it.

The problem of landscape visual quality was not discussed broadly enough on scientific level in Ukraine. In Ukrainian educational textbooks one can see the term of aesthetic assessment of landscape, which determines its artistic and spatial features and conditions of visual perception and compositional assessment, which is more connected with the visual characteristic of landscapes and uses expert-approach, is carried out by the experts based on their personal experience and is subjective [20]. Basic definitions that refer to “visual space” and methodology of landscapes planning are enlightened in educational textbook *Aesthetics and composition of the landscape* [7].

The questions concerning designing ski resort complexes, recreational objects planning were discussed by the scientists: M. Dyomin, T. Panchenko, V. Timochin, I. Fomin, V. Shulyk, V. Horodskoy, A. Mazurkevych. A. Melik-Pashaev, I. Naymark, A. Stanislavskyj, V. Zaretskyj, V.Orechov, O. Maksymov, E. Opolovnikova [19, p.9]. The landscape studies were focused on the functional aspect of ski resort complexes designing (Shulha [19], Melik-Pashaev (1974, 1975), Maksymov and Opolovnikova (1981), Panchenko (1990).

7. CONCLUSIONS

The main difference between new landscapes and traditional landscapes is expressed by dynamics in speed and scale, as well as the changing perceptions, values and behavior [22, p. 205][5]. As a result the visual appearance and people's perceived quality of landscapes are changing [22, p. 205][6]. Without interference of policy makers or planners the visual quality of everyday landscapes will decrease because landscape changes are mainly economy-driven [22, p. 205][7]. So, it is very important to develop the strong theoretical basis for visually qualitative landscapes planning. In this context, planning process of ski resorts in the Ukrainian Carpathian Mountains needs to be supported by investigations of existing visual quality of the mountain landscapes in order to improve current methods of design. In the literature it is recommended to use both expert and public preference approaches in visual landscape research. For example, Daniel indicated that merging the two opposing approaches could result in a more effective approach that better represents landscape features and human judgements [6]. Based on more than 20 years of landscape perception research in many areas in the Netherlands, Coeterier argues that, within local cultures, inhabitants develop a special way of looking at the surrounding landscape [9, p.47][8]. As members of national culture, people might be influenced by national discourse [9]. So, for better understanding the existing visual quality of the mountain landscapes in Ukraine, surveys to understand the psychology of perception of the Ukrainian inhabitants are needed.

The need to protect and enhance landscape quality is now widely recognized and has been put on European and national political agendas. Nowadays, policy makers require from decision support models for monitoring and evaluating visual landscape quality two things: include the perception of people (subjectivist approach) and GIS usage, which can combine and analyze many datasets in transparent way, are realistic and technologically advanced [22, p. 206].

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O AUTORZE

Asystentka w Katedrze Urbanistyki Instytutu Architektury, Państwowego Uniwersytetu „Politechnika Lwowska".

AUTHOR'S NOTE

Doctorate student of Urban planning & urban design Department, Institute of Architecture, Lviv Polytechnic National University.

Kontakt | Contact: yarynaonufriv@gmail.com