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**Land Management of the Areas of High Landscape Values:
An Economic Model****Abstract**

This paper presents selected results of the research entitled Planning the Space of High Landscape Values, Using Digital Land Analysis, with Economic Appraisal, supervised by Dr. Paweł Ozimek, Cracow Technical University, conducted since 2009. Usually, we do not pay attention to surrounding landscapes in our everyday life. However, for the persons who deal with spatial planning, geography, natural environment, or cultural heritage, the validity and value of landscape are the terms which do not have to be defined. The first part of the paper is dedicated to the landscape features that decide about its value. The author discusses whether those features are the same as those we want to protect and how we can appraise landscape values. The next part contains an analysis of the economic bases of development. In reference to space, the analysis and opinion on land use in the context of the development of usable functions are essential. Consequently, the identification of the limitations connected with the protection of landscape and delimitation of the areas on which such limitations exist are required. Another component consists in the determination of the land requirements associated with existential and economic needs of the local population. Such a general balance of needs and requirements is the starting point of the adoption of development policies and action programmes. The programmes should include the location of individual projects and capital investments on land, as well as their proper timing co-ordination. Owing to the complexity of the tasks, the option analysis is the preferred method of search for the best possible solution. The reconciliation of individual land use (title to land), public and business land uses, with the protection of

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environmental and cultural values, can be difficult or next to impossible to attain. Therefore, we need some mechanisms to compensate the losses occurring in individual interests and in local, regional, or national development. The choice of options for local or regional development is based on balancing the costs and benefits that depend on the sizes of both protected and non-protected areas. In conclusion, the author attempts at answering the questions whether the landscape and landscape values can be saved owing to their economic assets, and what instruments should be implemented to utilize economic mechanisms of protection.

1. Introduction

We do not pay much attention to local landscape in our everyday life, especially when the need to satisfy our daily needs and our aspirations associated with the consumer life style are in opposition to the rules of sustainable spatial management. People are active in the contexts of their living conditions. They are aware of such conditions depending on people's needs, interests or objectives. People create their projections not only of their social environment, but also of the shape of that environment. Landscape is simply defined as the appearance of land surface in a specific location, or the view of our surroundings. Although landscape is a common commodity, it may not be "good" for somebody, and people may have various opinions about landscape. For those who are involved in spatial planning, geography, natural environment or cultural heritage, landscape importance and value are the premises that do not have to be defined.

2. Landscape and its Characteristics

Landscape may have different values for various people or groups: property owners, land users, or public authorities. Space is appraised differently on a local, national or international scale. Space becomes landscape in the observer's eyes, and it can become a source of aesthetic experiences associated with the attractiveness of a given place or view opening to distant areas. We should, therefore, turn to man (Jałowiecki and Szczepański 2006, pp. 333-335) to try to discover how one perceives, values or adapts space. Based on displayed human imagination and verbalized needs, people can shape space. In the research dedicated to the perception and evaluation, it is important not only to

obtain answers to the question of how a given person (persons or communities) perceives and appraises space, but also why the method of perception and evaluation is so particular. Thus, we intend to discover the variables that determine such processes. The perception of space is equivalent to informed reception of stimuli. The patterns of space image shaping depend on the following:

- perception of space in whole or in part,
- separate perception of objects and people,
- observer's experience, his or her skills, and the rules of appraisal (which are different for land users, land owners, or developers: designers, urban planners, architects, or decision-makers).

Various perceptions of space makes it either easy or difficult to communicate on the matters of appraisal of both existing status or vision of the future. Landscape perceived in a particular manner indicates that we evaluate space when appraising landscape. When shaping landscape, we actually shape space.

How can we practically resolve the problem of the space appraisal during spatial planning and project design or implementation (in case on new developments, replacements, remodelling etc.)? To appraise space, we can apply the indicators which allow us to measure space for the following purposes:

- problem description (appraisal of landscape values in our case),
- project need evaluation (an intervention when landscape is negatively appraised),
- definition of the purpose of action (indication of success measures) and
- evaluation of the degree of success (have the landscape values been improved owing to intervention?).

Referring to our assumption that narrowly understood landscape is the object of our analysis, we have applied an approach based on aesthetic and appearance values for the purpose of landscape evaluation (including space evaluation as a result) (a broader description can be found in: Bajerowski, 2007, pp. 7-29). The features that allow us for such landscape evaluation include beauty, sublimity, and curiosity (aesthetically-oriented landscape in: Böhm, 2006, pp. 291-293). As to the primary (original) landscape value, the proposed method is subjective in nature: the first step in managing space of high landscape values belongs to experts. The appraisal will be an average evaluation made by a competent group. The competent group, selected for the purpose of analysing specific land, will indicate all attractiveness factors, such as volumetric objects (buildings, structures, and landscape units which decide about the landscape value). Those objects (o_i) should be assigned to two separate groups, with negative and positive impact on the analysed landscape,

respectively. Each object should be evaluated on the basis of selected criteria (see above, c_{ji} – value of object i for the criterion j , w_j – weight of the criterion j) and assigned aggregated total value (LVo_i). The issue of the evaluation scale, standardization of variables or aggregation rules are omitted here as they are not associated with the main topic of the paper.

$$LVo_i = f(c_{ji}, w_j) \quad (1)$$

Nominal landscape value (LVA) of the analysed area (A) will be the following (the objects' values referring to negative influences on the landscape will reduce the total value):

$$LVA = \sum_i LVo_i \quad (2)$$

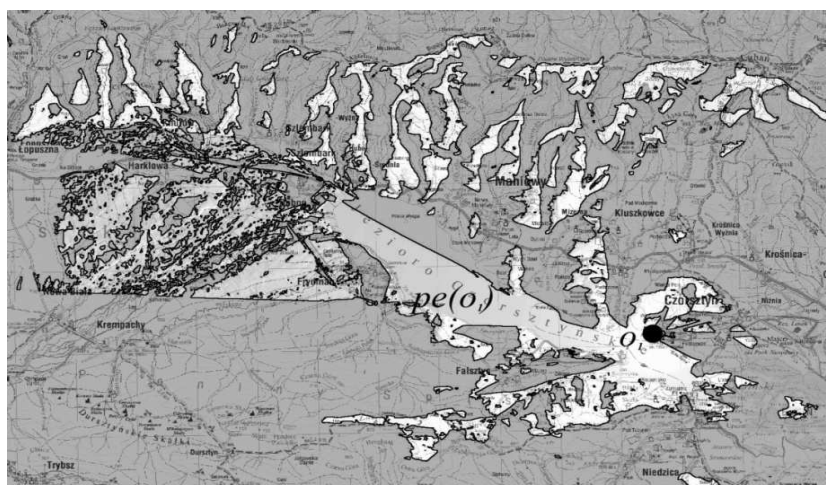
3. Space and Landscape as the Elements of Development Processes

The value of the preserved (restored and conserved) natural and cultural environment, although associated with a possibility of useful and effective utilization of selected space can be a measure of the business value of landscape (Wańkiewicz 2010, pp. 352-359). The general balance of the needs and possibilities should be a starting point for the determination of the development policy and later for drafting of spatial management plans. In particular, we should aim at balancing the land needs in respect of the indication of land use (specific manner of development, e.g. land for house building, or businesses) of the selected areas, taking into account the protection of those components whose use and development should be subjected to special needs, owing to the features of the natural and cultural environment. That would allow for the implementation of the principles of sustainable development: on the one hand, preservation of selected resource, and, on the other hand, a possibility of the development of local communities.

What is an essential element in reference to landscape is the analysis and evaluation of the usefulness of particular plots of land for the development of various useful functions which will allow us to maintain and utilize landscape values. Assuming that the landscape use is associated with a possibility of providing aesthetic experiences, the landscape value increases with the increase of the possibility of providing such experiences to observers, just like in case of masterpieces (landscape has real value only when one can see it). The areas which are affected by the objects mentioned before are the lands on which the objects are passively exposed (or the places where we can see such specific

objects). To put it simply, the larger the area from which an object can be seen the higher landscape value. Omitting at this stage the dependence of the object exposition on other factors (such as the size of the object which can limit the distance of exposition), or its form, colour etc., we can determine the passive exposition area for a given object, using a digital land model and GIS type of software. An example is shown in Fig. 1. The exposition area was determined by the team of Dr. Paweł Ozimek (Cracow Technical University).

Figure 1. Passive exposition area ($pe(o_1)$) of the Czorsztyn Castle (o_1)



Source: P. Ozimek (Cracow Technical University).

If we take into account the exposition, the modified value (ELV) of the object (o_i) will reflect the size (surface area) of object exposition ($pe(o_i)$), e.g. in respect of the analysed surface area (A).

$$ELV_{o_i} = f(c_{ji}, w_{ji}) \times \frac{pe(o_i)}{A} \quad (3)$$

And the landscape value ($ELVA$) of the analysed area (A) will be as follows (the negative object values affecting the landscape will reduce the total value):

$$ELVA = \sum_i ELV_{o_i} \quad (4)$$

Depending on the nominal value (LV_{o_i}) of the objects recognized to be important for the landscape, we can determine their scope of protection on the exposition area. Consequently, the management and use of both object and its

exposition area will be subjected to restrictions. Using the terms from the field of landmark preservation, the actions intended to protect and preserve the landmark substance and stopping of destruction processes (conservation), as well as the actions intended to display the artistic and aesthetic values of the object, including supplementing or recreation of parts of the object (restoration), if necessary, seem to deny the possibility of business use of the objects and protected space at first sight. If, however, landscape care consists e.g. in the use of space in the manner that ensures durable preservation of landscape's values, the business use of objects and protected space seems to be possible provided that we can properly determine which features decide about the object's value and which ones we want to preserve or recreate. The essence of planning of the space representing high landscape values consists in finding balance between protection and availability.

4. Balance of Needs and Possibilities

Another stage of analysis of a selected area includes development programming, taking into account protection measures and the use of landscape potential. This analysis requires taking into account actual land needs that are associated with the operation of the local community, both at the level of standard solutions and with inclusion of community aspirations. That concerns primarily the areas designated for housing projects, the services meant for the local community and for the business activities which are the basic sources of income. Consequently, it is necessary to identify, within the analysed area, the land designed for house building (M), services (U), and various types of businesses (G). However:

$$A \geq M + U + G \quad (5)$$

Based on the above considerations, the analysed area is divided into three subdivisions as follows:

- The area subjected to complete strict protection (CP), excluding a possibility of land use, except for the purposes of protection (quoting the Polish forms of nature and heritage protection measures, we can create: strict reservation, archaeological protection area, landmark, or the highest-class landmark).
- The area covered by partial protection (PP) allowing for various although limited types of uses (e.g. landscape park, or cultural park).

- Unprotected area (*NP*) subjected only to the principles of land development and building which determine not only possible land uses (designation for farming or housing purposes), but also the types of structures (size, floor area etc.).

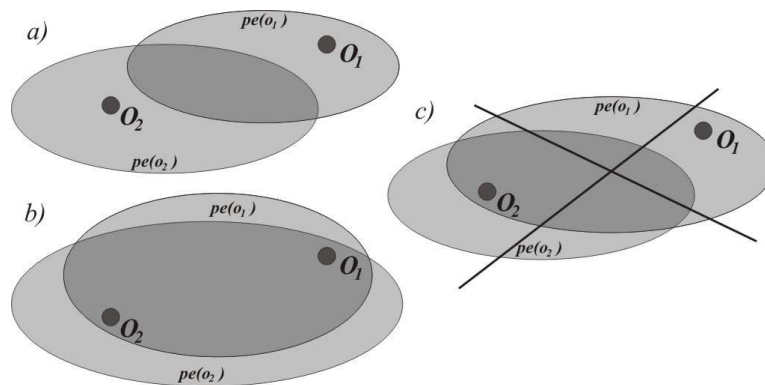
The areas determined in that way should fulfil the following condition:

$$A = CP + PP + NP \quad (6)$$

$$PP + NP \geq M + U + G \quad (7)$$

To determine fully protected areas, partially protected areas, and unprotected areas, we can use the previously indicated objects, which may either positively or negatively affect the landscape, together with the designated passive exposition areas. At this point, we should point out the dependence between passive exposition (*pe*) and active exposition (*ae*), as well as the exposition area of several objects. Those issues are illustrated in Fig. 2; the case (c) does not occur.

Figure 2. Examples of the relationships between exposition areas (both passive and active exposition areas) of two objects; case (c) does not occur.



Source: P. Ozimek (Cracow Technical University).

Without going to the depth of our considerations owing to symmetric and non-transition aspects, the following relationships occur:

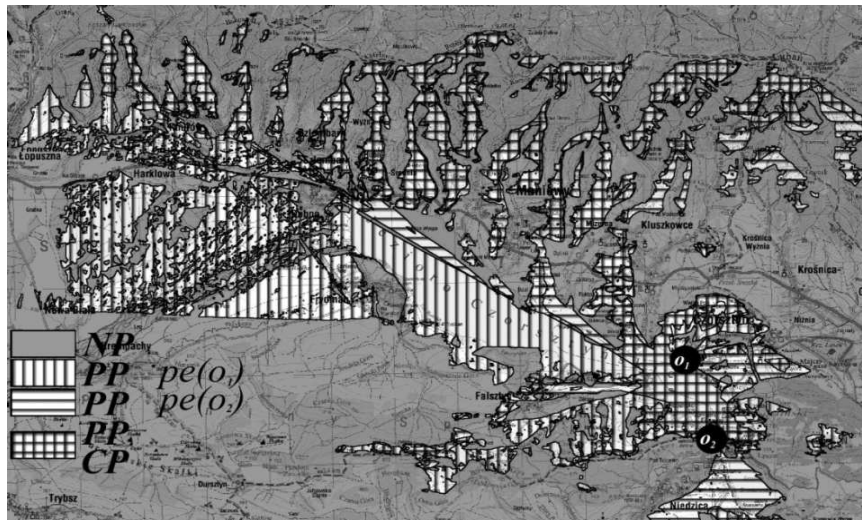
$$pe(o_i) = ae(o_i) \quad (8)$$

$$pe(o_1, o_2) = pe(o_1) \cap pe(o_2) \quad (9)$$

$$pe(o_1 \text{ lub } o_2) = pe(o_1) \cup pe(o_2) \quad (10)$$

An analysis leading to the determination of fully protected, partially protected, and unprotected areas can be carried out with the use of a digital land model and GIS type of software. An example is shown in Fig. 3. The exposition area was determined by the team of Dr. Paweł Ozimek (Cracow Technical University). That example covers only the objects that positively affect the landscape. The lands which are not exposition areas for any object that positively affects landscape or object areas are determined to be unprotected lands. The lands subjected to partial protection are the passive exposition areas of all the objects which positively affect the landscape. The lands subjected to full protection are the areas of the objects which positively affect the landscape and the selected portions of the areas of concurrent passive exposition of several objects (two in our example).

Figure 3. Determination of full protection (*CP*), partial protection (*PP*), and unprotected areas (*NP*)



Source: P. Ozimek (Cracow Technical University).

This selection requires deeper analysis associated with precise determination of the scopes and objects of protection. Accounting of the objects which negatively influence the landscape will require a similar approach. However, an analysis is intended to limit active exposition to the objects, especially when such negative exposition exists in the background or foreground of the objects which positively affect the landscape.

5. Development Programming

The general balance of land needs, possibilities, and restrictions becomes a starting point for the determination of development policy and action programmes. The spatial aspect of development is an element of development policy. It entails the distribution of particular components of programmes (projects and capital investment) in space, with proper timing coordination (including drafting of Local Physical Plans). Owing to the complexity of the tasks, option analysis is the preferred method of seeking the best possible solutions.

The value of space can be identified with its ability to satisfy specific needs, including primary needs (place of residence, or production of food for one's needs), and higher-order needs (appearance). The capability of space to satisfy so determined specific needs refers straight to the space owner or user. Space can also be understood as the capability of the generation of goods that can be exchanged for other goods, or the capability of generation of income and of participation in the cash and commodity exchange. That is associated on the one hand with bearing costs, and, on the other hand, with possible benefits. Drafting of a Local Physical Plan, a development policy, and action programmes for the analysed area will provide model predictions of costs and benefits. That will lead directly to the formulation of a balance equation. The following are the variables that can be calculated in that way: surface areas covered by full protection (CP), partially protected surface areas (PP), and unprotected surface areas (NP). The balance equation has the following general form:

$$C_{CP} + C_{PP,p} = B_{CP} + B_{PP} + B_{NP} - C_{PP,np} - C_{NP} \quad (11)$$

where:

Costs of protection of fully protected areas: $C_{CP} = f(CP)$

Costs of protection of partially protected areas: $C_{CP,p} = f(PP)$

Costs of operation of partially protected areas: $C_{CP,np} = f(PP)$

Costs of operation of unprotected areas: $C_{NP} = f(NP)$

Benefits of fully protected areas: $B_{CP} = f(CP)$

Benefits of partially protected areas: $B_{PP} = f(PP)$

Benefits of unprotected areas: $B_{NP} = f(NP)$

When the left-hand part of the equation is smaller or equal to the right-hand part, we are dealing with an economically beneficial situation: we can afford the planned arrangements and protective actions. Otherwise, it will be necessary to think over the assumed spatial solutions: change the balance of the

protected surface area within the total area subjected to analysis (in accordance with the principle that when we want to protect everything, we will protect nothing). From the viewpoint of the landscape values, space, landscape value protection, and space value constitute public objectives. Of course, in this study, we consider only the space with high landscape values, not all space. Consequently, the balance equation may assume a different form:

$$C_{CP} + C_{PP,p} = B_{CP} + B_{PP} + B_{NP} - C_{PP,np} - C_{NP} + S_p \quad (12)$$

where: S_p - Expected subsidy for selected value protection.

The same formula can be applied on a local, regional or national scale. It is important, however, that the reconciliation of individual land use (title to land), public and business land uses, with the protection of environmental and cultural values, can be difficult or next to impossible to attain. Therefore, we need some mechanisms to compensate the losses, e.g. by subsidies granted to individual interests (local scale), municipalities (regional policy), or regions under a national policy. Equation (11) will be proper for the national scale.

6. Conclusions

In reality, the border on which valuable space, with the value of a public wealth, ends and the space without such a feature starts is rather fuzzy (here, public space is different than in case of freely accessible space). Landscape protection is associated on the one hand with the limitation of the title to land, and in particular with the limitation of land uses, and, on the other hand, with the landscape having significant influence on the property value. The influence can be either positive or negative when we take into account satisfaction of individual and collective needs, or when we consider the use of a property only by its owner or with the purpose of income generation and participation in commodity and cash exchange. It is essential to make a calculation which will demonstrate the interdependence of benefits and losses (lack of benefits) associated with landscape protection. However, it is not only an economic issue, but also a social and political one, because it is associated with such matters as legal order or social justice.

A correctly designed space management system, also involving the space representing high landscape values, should take into account economic calculations on micro and macro scales. On a macro scale, the calculation should produce a positive or break-even balance (it can also be temporarily negative),

both in public and private sectors. On a micro scale, the calculation should produce a positive or break-even balance (it can also be temporarily negative) in the private sector, or it can be negative in the public sector. That is associated with the possibility of participation in costs of the entities which do not receive direct benefits (redistribution of resources from other areas). The balance will allow to indicate which portion of space (landscape) can and should be protected and to what extent. On a macro scale, the balance can help to prepare development policies understood not only as action plans, but also as tools for the creation, protection, and revision of general principles and standards of life, including the principles of redistribution of costs and benefits (taxes and finances available from the public budget, based on: Heywood A., 2008, pp. 3-27).

Still, the questions: Will landscape survive owing to its business value? and What instruments should be implemented to use the economic mechanisms for landscape protection? remain opened.

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Streszczenie

GOSPODAROWANIE PRZESTRZENIĄ O WYSOKICH WALORACH KRAJOBRAZOWYCH. MODEL EKONOMICZNY

Artykuł przedstawia wybrane rezultaty pracy *Planowanie przestrzeni o wysokich walorach krajobrazowych przy użyciu cyfrowych analiz terenu wraz z oceną ekonomiczną* (kierownik dr Paweł Ozimek, Politechnika Krakowska). W codziennym życiu zwykle na krajobraz nie zwracamy uwagi. Ale dla osób zajmujących się planowaniem przestrzennym, geografią, środowiskiem naturalnym i dobrami kultury ważność i wartość krajobrazu jest tezą nie wymagającą dowodu. Pierwszą część artykułu poświęcono zagadnieniu cech krajobrazu, które decydują o jego wartości. Także – czy są to te cechy krajobrazu, które chcemy chronić oraz jak możemy ocenić wartość krajobrazu. Kolejna część to analiza gospodarczych podstaw rozwoju. W odniesieniu do przestrzeni istotnym elementem jest ocena przydatności poszczególnych terenów dla rozwoju funkcji użytkowych. W konsekwencji określenie ograniczeń wynikających z ochrony krajobrazu oraz wskazanie obszarów, na których ograniczenia te występują. Drugim elementem jest określenie potrzeb terenowych związanych z bytowymi i ekonomicznymi potrzebami ludności. Tak opracowany ogólny bilans potrzeb i możliwości służy za punkt wyjścia do określenia polityki rozwoju i programów działania. Programy winny zawierać lokalizację przedsięwzięć i inwestycji w przestrzeni oraz odpowiednią ich koordynację w czasie. Ze względu na złożoność preferowaną metodą poszukiwania możliwie najlepszego rozwiązania jest analiza wariantów. Pogodzenie indywidualnego (prawo własności), społecznego i ekonomicznego użytkowania przestrzeni z ochroną jej walorów środowiskowych i kulturowych może być trudne lub wręcz niemożliwe. Konieczne są więc mechanizmy rekompensujące straty zarówno w sprawach indywidualnych, jak i w kontekście rozwoju lokalnego, regionalnego czy krajowego. Wybór wariantu rozwoju opiera się na bilansowaniu kosztów i korzyści zależnych od wielkości chronionego i niechronionego obszaru.

Podsumowaniem artykułu jest próba odpowiedzi na pytanie, czy krajobraz i walory krajobrazu ocaleją dzięki swojej ekonomicznej wartości oraz jakie instrumenty winno się wdrożyć w celu wykorzystania mechanizmów ekonomicznych do jego ochrony.