LANDSCAPE STRUCTURE AND SPATIAL PLANNING - RELATIONS AND CONFLICTS

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The concept of sustainable development and reduction of negative effects of landscape fragmentation has been the main reasons of landscape structure consideration in the planning process. The paper is a contribution of environmental guidelines discussion in spatial planing. The authors had examined number of plans in different types and scales, to find the system and regulation transformation footprints in planning process in Poland. There have been presented the results of the landscape structure omitting and its functioning, with a special emphasis on the effect of landscape fragmentation in case studies of urban and rural landscape. The review of planning studies inclined the authors to find a concept to include the landscape structure and environmental functioning to plans. Suggestions, presented in the paper are the authors' proposition for the procedure of various plans' types: local plan, development plan and conservation plan. Each of the discussed plans requires a different treatment of natural environment that depends on their destination.

1 INTRODUCTION

The principle of sustainable development becomes one of the fundamental norms for spatial planning since the mid 1990s, which is reflected in Polish legal acts, including Constitution. In spatial planning among economical and social conditions, it results in the necessity to seek ecological balance and take natural processes into consideration. During past decades two processes influence the spatial planning transformation in Poland. The first is related to the global acceptation of sustainable development rule, and the second one to the system transformation in Central and East Europe.

The authors had examined number of Polish plans in different types and scales, to find the transformation footprints in planning process. The effect is typical for the first step of new principle implementation. In the processes of planning and investments' completion, natural conditions are considered in insufficient degree (fragmentation of the natural features taking into account, lack of syntheses of natural conditions, too small emphasis on the dynamics and functioning of the environment). Thus, there appears a divergence between the accepted principles of sustainable development - having their bases in the legal acts - and the realised plans.

The paper is a contribution to a sustainable guideline discussion for spatial planing focused on its ecological / natural features. The first section presents the main assumptions for the following considerations. Then, the second part describes three types of planning studies in Poland with their short characteristic, description of the landscape structural element delimitation as well as determining methods of the landscape functioning. The third section presents the results of omitting the landscape structure and its functioning, with a special emphasis on the effect of landscape fragmentation. In the summary, the authors

present their own suggestion for including the landscape structure and its functioning in various types of planning studies.

2 SUSTAINABLE DEVELOPMENT AND FRAGMENTATION

The negative effects of landscape fragmentation reduction has been the one of the main reasons of taking landscape structure into account in the planning process. Landscape structure allows for grasping the specific of terrain and its functioning in a natural aspect. Cook and van Lier (1994) distinguish three forms of fragmentation: for farming, for outdoor recreation and for nature.

In the recent decades, in Western Europe, the most important problem has been the one of farm fragmentation. Intense consolidation of arable land, intended to limit the negative effects of farm fragmentation (from the economic point of view), has led to a progressive process of ecological network fragmentation. The changes of agrarian structure aimed at a consolidation of fragmented arable land have practically omitted Poland.

The structure of Polish agricultural landscape is a result of historical processes, including mainly the period of the partitions (the years 1772 - 1918). Up to the present moment, differences in landscape among the three seized territories are clearly visible, reflecting economic relations and spatial policy adopted in the Prussian Kingdom, Russian Empire and Austro-Hungarian Empire. In the latter two (central, southern and eastern Poland) the agrarian structure is characterised by substantial fragmentation of the field pattern, separated by small patches of woods, hedgerows, ponds, etc. However, in present northern and western Poland, large farms dominate (figure 1). In contrast to other post-communist countries, in Poland, this situation has remained almost the same during the last 50 years, and the farm fragmentation is one of the obstacles just before Polish access to the European Union.

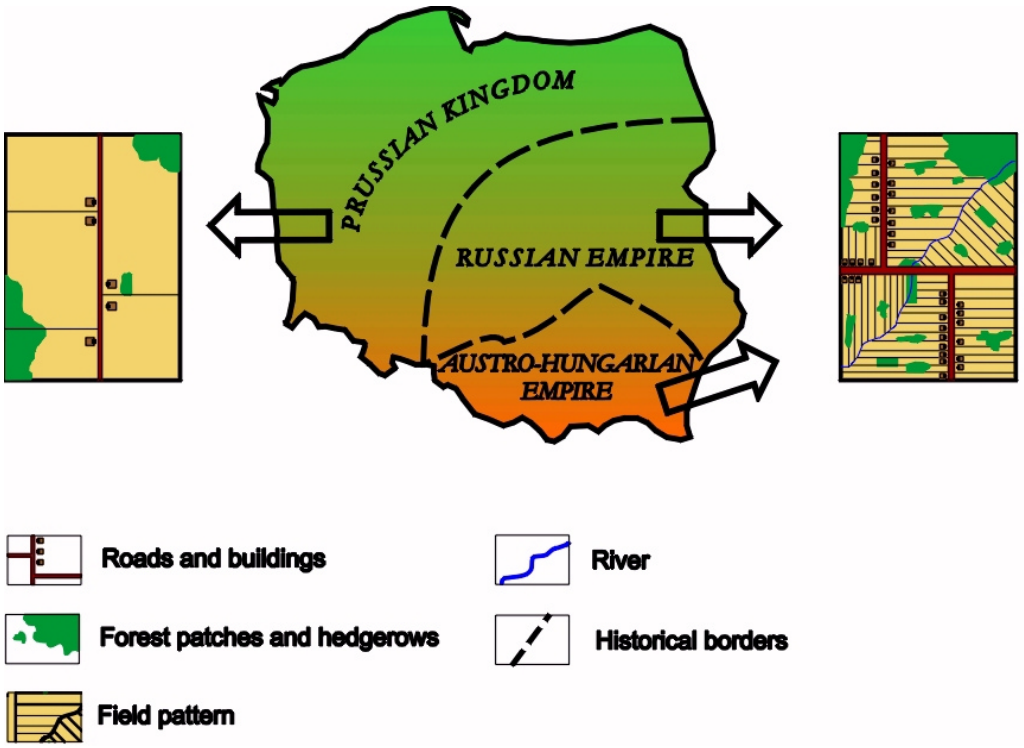

Figure 1 Contemporary field pattern in Poland as a consequence of historical partition (1772-1918).

The limitation of land fragmentation in Western Europe has become an essential cause of an ecological network fragmentation and a loss of connections among the main structural elements of the landscape.

The system changes began 10 years ago in Poland, have led mainly to a liberalisation in all walks of life, which stimulates, among others, rebuilding of local governments, greater influence on the part of society, activation of positive actions for the so-called „small homelands". This may suggest that the new process of political, economic and social changes provides a better chance for actions connected to the protection and shaping of the landscape. However, despite the favourable legal conditions and democratisation of social life, the situation of contemporary Polish landscape can hardly be evaluated positively.

The reasons for this state are diverse. The main threats result from the priority of short-term benefits preferred by both foreign, (which is not surprising) and, unfortunately, Polish economic entities too. Also the liberalisation of life favours individual interests rather than a broadly understood social welfare. Local governments are not able to resist the investment pressure, often resulting in negative transformations of the landscape. The threats related to landscape fragmentation concern both urban and agricultural land.

In urban areas, the threat of the landscape fragmentation process results from treating space in terms of objects and not structure. Presently, local plans are often prepared for particular area taken out of spatial context. The location choice is determined by market and not by a superior plan prepared on the landscape structure analysis basis. A new and distorted form of town planning is the „post agrarian town planning". Spatial forms typical of agriculture have become determinants of town planning composition.

The influence of the plans preparation, that omitting the landscape structure studies may consequently result in a loss of attractive elements accounting for the diversity of landscape (both in natural and physiognomic sense), e.g. small water reservoirs, fragments of woods and hedgerows. In addition new plans concern, among others, a program of integrating fragmented land. A review of presently completed planning studies indicates the real nature of this threat.

3 STRUCTURE AND FUNCTIONING OF ENVIRONMENT IN VARIOUS TYPES OF PLANNING STUDIES

The main types of planning studies performed in Poland on the local level are:

- *community development plans*;
- *local plans* - concerning investment or conflict areas;
- *conservation plans* prepared for nature reserves, national parks and landscape (regional) parks.

The review of planning studies above-mentioned inclined the authors to find a concept to include the landscape structure and environmental functioning to plans. The landscape elements reflect the environmental differentiation; they are comfortable fields of systematic gathering of information on the environment.

3.1 Local Plan

The Local Plan is the only communal regulation concern about spatial planning. It relates to maintain a spatial order by regulation of land development conditions. The Local Plan is passed by the Commune Council as the basis for making provisions of the spatial management plan. This document requires a formal record to translate management recommendation into administrative decisions. The plan provisions are assigned to individual or homogeneous units of the covered area. The units with attached provisions we called as operational units.

There are two main criteria of the land functional and spatial division. The first is related to various types of land appropriation (for building, services, etc. – means zones), while the second, to different principles of development within each of the zones types. Any implementation, provisions or instructions, obliging to prepare landscape studies preceding the planning process do not accompany the act on spatial development. In practice, this allows for a major freedom in the adopted methods in making Plan. Usually, the units delimited in Plans, called structural - functional units, do not account for the natural structure. They indicate only, their land use. This leads to breaking up the ecological network. The effects of this landscape fragmentation process are isolated units, which, due to their faulty natural functioning, cannot properly play the role assigned to them. Additionally, the situation is worsened by a lack of superior plans in relation to the local ones. The provisions included in these documents, should be based of natural conditions and then, obligatory to Local Plans.

The general acceptation of the principle of sustainable development is refers to urban areas as well. Such an attitude is adopted more and more often in the town ecology, which treats urban areas as a specific ecosystem. In the analysis of townscape, two paths are clearly visible. The first concentrates on examining one sphere of this environment, usually the biosphere (Sukopp 1990), the second looks for various types of syntheses (Breuste 1988, Raymakers 1991, Kasimow 1995).

In the pursuit of achieving a stable and sustainable development of urban areas, it is necessary to identify, and then properly employ the functioning of natural environment. It is possible to fulfils first by an analysis of its structure, and then of the interdependencies and influences among its elements (Wolski, Cieszewska et al. 1995). This step is the basis for determining the functions of the landscape element in the shaping of the natural environment conditions (climatic, hydrological and biological function). This allows also for delimiting structural elements as: corridors, knots and patches forming together a Town Natural System, i.e. such an area which, through its natural functions, provides proper living conditions to its inhabitants (Szulczewska et al., 1996).

3.2 Community Development Plan

This type of planning study is officially used in Poland since 1994. It substituted the earlier general plans prepared for communes as the basic units in the administrative division of the country. The main aim of the Community Development Plan is to determine the main directions of spatial development of communes due to analyses of natural, social and economic conditions. In the Plan, the recommendations concerning the types of land use are assigned in cartographic form (for big communes in 1:25 000 scale, for small ones in 1:10 000 scale) to individual areas. They have a strategic character, just like British *development plans* (Beatley, 2000). Due to the significance of the Plan for the future development of the communes (plans show the areas for which local plans are to be prepared), it is essential that they cover natural criteria as completely as possible. The clarity of the presentation of natural conditions can be best obtained by referring information on the environment to unambiguously delimited landscape elements (spatial units of the environment). The delimitation of such units on the analytical level may also result in taking natural borders into consideration on the operational stage i.e. during assigning plan provisions to particular areas. In practice, however, the guidelines on the last stage, are most often assigned to areas delimited on the basis of ownership and geodesic criteria (sometimes also with reference to the forms of land use).

So far, in many cases, landscape elements (spatial units) have not been delimited. Natural conditions are taken into consideration by determining areas of favourable or restrictive features for the realisation of the land use management - e.g. by threshold

analysis (Kozlowski 1990). In Plans, that structural units are delimited, there are represented by two main approaches:

- landscape elements are delimited only in some areas, e.g. with communal or private ownership (they are not delimited in e.g. state forests);
- landscape elements are delimited in the whole commune area, to complete analysis of natural conditions.

The second approach should be deemed better. It is based on natural features as follow:

- natural value and biodiversity (existing and planned protected areas);
- natural environment productivity (including arable land, forests, meadows);
- attractiveness of natural environment for various form of use (e.g. recreation);
- sensitivity of the environment limiting its usability for investment (e.g. susceptibility to erosion).

The procedure of landscape elements delimitation, which are assigned land use of various intensity, consists in:

I. delimitation of zones of varied natural value, usually corresponding to the borders of protected areas;
II. within the zones, delimitation of natural structural units, according to the criteria presented in table 1;
III. assignment of individual landscape element predisposition to the land use type of various intensity.

The aspect of the natural functioning is studied mainly by marking:

- ecological corridors in relation to the biological functioning,
- main drainage basins in relation to hydrological functioning.

In this context, the analyses of natural relations within the commune area, inside and outside the commune border, should be examined.

3.3 Conservation Plan for Landscape Park

The landscape park protects natural, cultural and physiognomic values of area of slight anthropogenic transformation intended for various forms of recreation. A similar role is played by state park in the USA, regional (country) park in Great Britain, or „naturparke" in Germany. The Landscape Park' specific is its economic usage. It is a multi-function area, where, besides typically economic functions: forest, agricultural, tourist, etc, ecological functions are performed as well (Baranowska-Janota 1993). The obligation to prepare Conservation Plans for Landscape Parks was introduced by the Nature Protection Act in 1991. The earlier plans for landscape parks had the character of regional plans.

Conservation Plan for a Landscape Park has to be adapted to this type of protection. While protecting natural and cultural values, it should determine the rules of rational management of the covered area. This document is a superior with regard to communal development plans and local plans. Thus, Conservation Plan is to have a strategic character and regulate the basic directions and rules of protection and landscape shaping within the park. Cartographic representation of this plan is usually presented in the landscape scale (1: 10000, 1:25000).

The aim of the Conservation Plan closed in the Act, clearly emphasises the significance of the functioning of natural environment as a basis for strategy of landscape conservation and shaping. This refer mostly to the following issues (Chmielewski, 1990):

- determination of functional and spatial relations between the park and its surroundings;
- identification and conservation of the dynamic functional systems of mutual related ecosystems;
- maintenance of biological diversity and continuity of natural processes;

- harmonising forms of agricultural, forest, water, settlement and recreation activities with nature.

An application of these elements results in:

- enabling by the local governments to recognise the problems - park vs. commune in the process of plan approval;
- formulating suggestions for local plans.

Usually in the Conservation Plans (already prepared for about 30% of 140 Polish landscape parks), landscape structure is considered almost only on the level of analyses - as a nature studies for the plan. On the operational level, the ecological network, reflecting landscape structure, is omitted. Thus, in the planning process, the guidelines are addressed not to functionally uniform natural elements but to generally determined zones or areas. Most often, what is assumed as the basis for „identifying the spatial structure" of a park is a method of zoning based on:

- diversity of the natural and cultural features of the environment as well as the visual features, and the land use intensity e.g.: forest, water, agricultural and recreation, and settlement zones;
- diversity of protection scope, that is indirectly related to the land use type e.g.: reservation landscapes zone (natural, composed and cultural landscape), park landscape zone (natural, natural and cultural, composed and cultural landscape);
- diversity of the landscape and planned intensity of usage, e.g. forest unit with elements of dune relief; settlement - meadow and forest unit; agricultural - meadow and settlement unit.

In all above-mentioned examples, ecological infrastructure is totally independent of operational units that are assigned implementation tasks (provisions) for Conservation Plan. The second remark refers to the lack of dynamic treatment of natural features considered of these methods.

So-called *natural - planning units* have been delimited only in few cases. One has included, apart from natural environment features, also natural (abiotic and biotic) processes and cultural values. Only such a landscape structure treatment allows for fulfilling the postulates put forward in the aims of Conservation Plans, as well as the legislative guidelines covering the introduction of the sustainable development principle, including especially the maintenance of the continuity of natural processes.

The landscape structure in Conservation Plans for Landscape Parks should contain as follow:

- analytical level - determination of the functioning (abiotic and biotic) of natural environment on the regional and local scale;
- operational level – that include the zones (areas), for which detailed guidelines will be formulated, into the landscape structural elements. Thus delimited natural and planning units should have natural borders, corrected in such a way so as to be uniformly identified in the open field (Cieszewska, Kaliszuk in edition).

4 FRAGMENTATION FOR NATURES, CASE STUDIES

4.1 Example 1 - process of landscape fragmentation in urban areas - Pyry Belt in Warsaw

Within Pyry Belt, located in the south - western part of Warsaw, there are 11 small, mostly natural, ponds (figure 2). Due to their hydrological and biological functions, they play an important role in a proper functioning of the landscape of the southern parts of Warsaw.

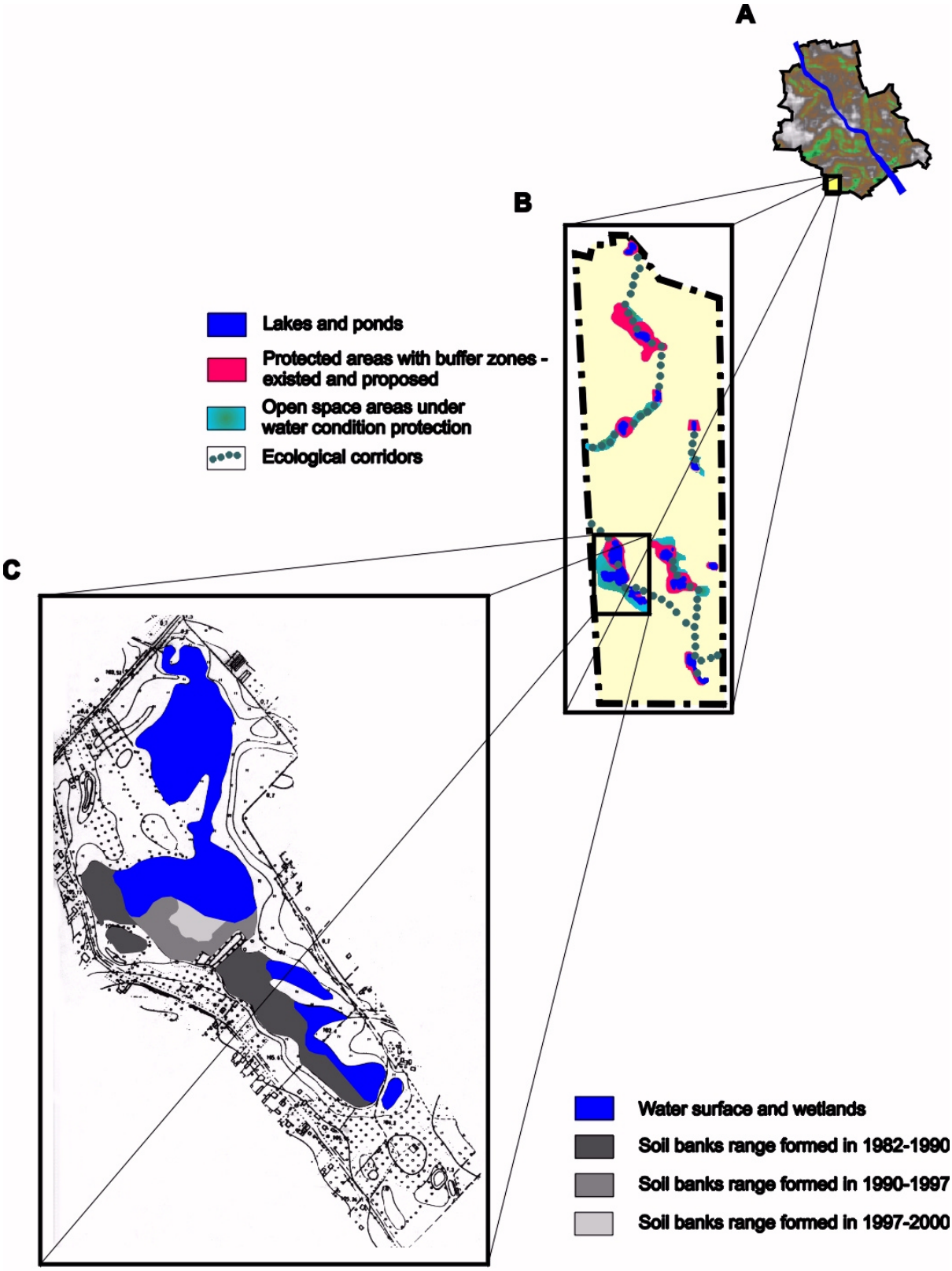

Figure 2 Process of Pyry Belt landscape fragmentation
A - Pyry Belt location in Warsaw
B - Structural elements of Pyry Belt
C - Zgorzala Lake fill up stages 1982- 2000

Ponds situated at the outskirts of the city are destroyed in order to obtain new development land. In 1998, a local development plan was prepared for Pyry Belt focused on residential land use. In the plan, only 7 out of 11 ponds have been protected, and not the whole ecological corridor. The project of the plan did not include any solutions ensuring proper functioning and sequence of the ponds, in the changing conditions of land development. The protest against the plan (Modrzycka, Wolski 1998, and others) resulted in rejecting it, and the Commune Council becoming interested in a conservation plan for the system of water reservoirs of Pyry Belt.

4.2 Example 2 - process of landscape fragmentation in protected areas.

Przedborski Landscape Park (PLP) is located in the central part of Poland on the borderline between the uplands and lowlands. All the components of natural environment here show transitory, upland, lowland and intermediate features. In the ECCONET network, PLP constitutes an ecological knot, and the border of its buffer zone is the river corridor of national significance. The border of the park and its buffer zone has been determined independent of the main structural elements. The western and southern borders cross river corridor, and northern border crosses an ecological system of wetlands (Fig.3.). As a result, the area of the Park and its buffer zone covers an area not uniform in terms of natural functioning, and the guidelines for its protection concern chosen fragments of ecological infrastructure of national significance.

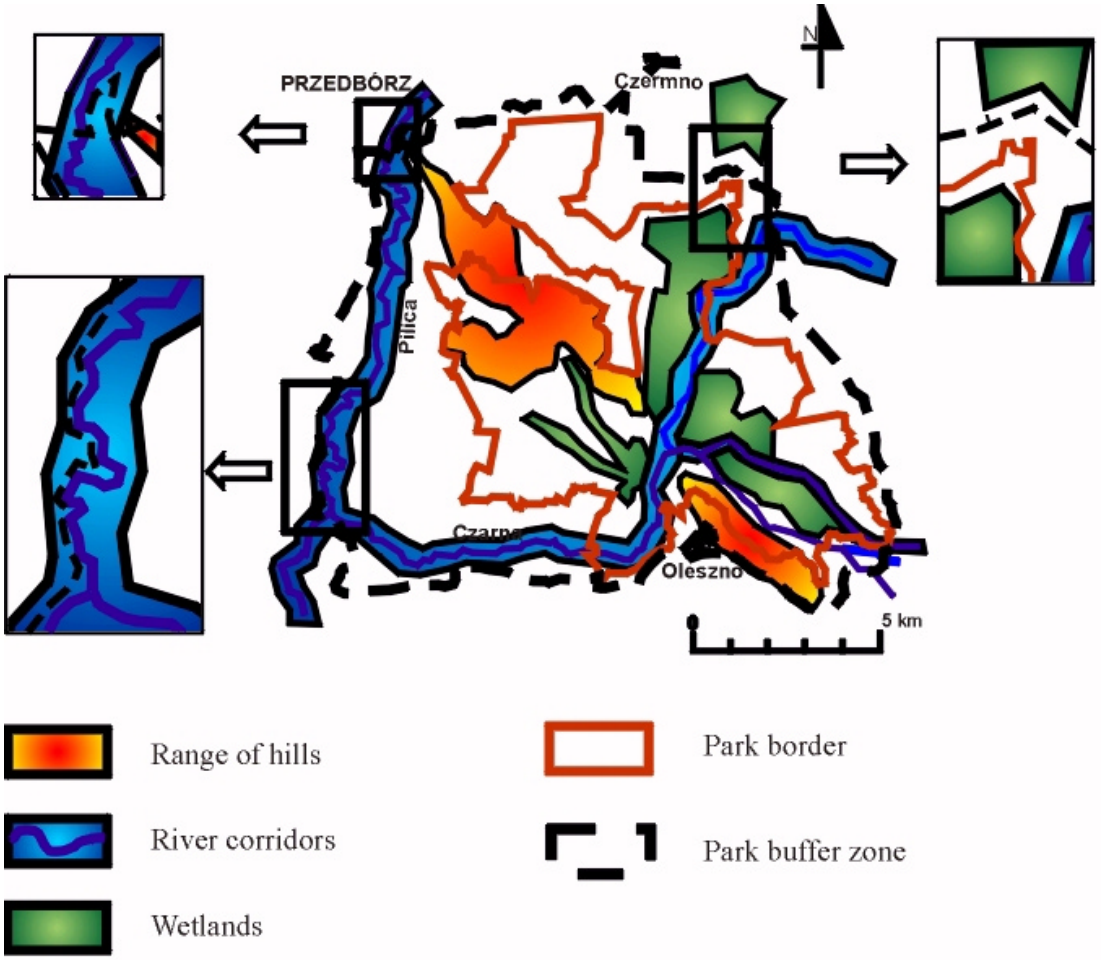

Figure 3 Main structural elements of Przedborski Landscape Park - sample of incorrect border delimitation.

5 SUGGESTIONS OF CHANGES

Still, the principles of landscape analysing and functioning are rare applied in the practice of spatial planning in Poland. Suggestions, presented below are the authors' proposition for the procedure of various plans' types (figure 4). Each of the discussed plans requires a different treatment of natural environment that depends on their destination.

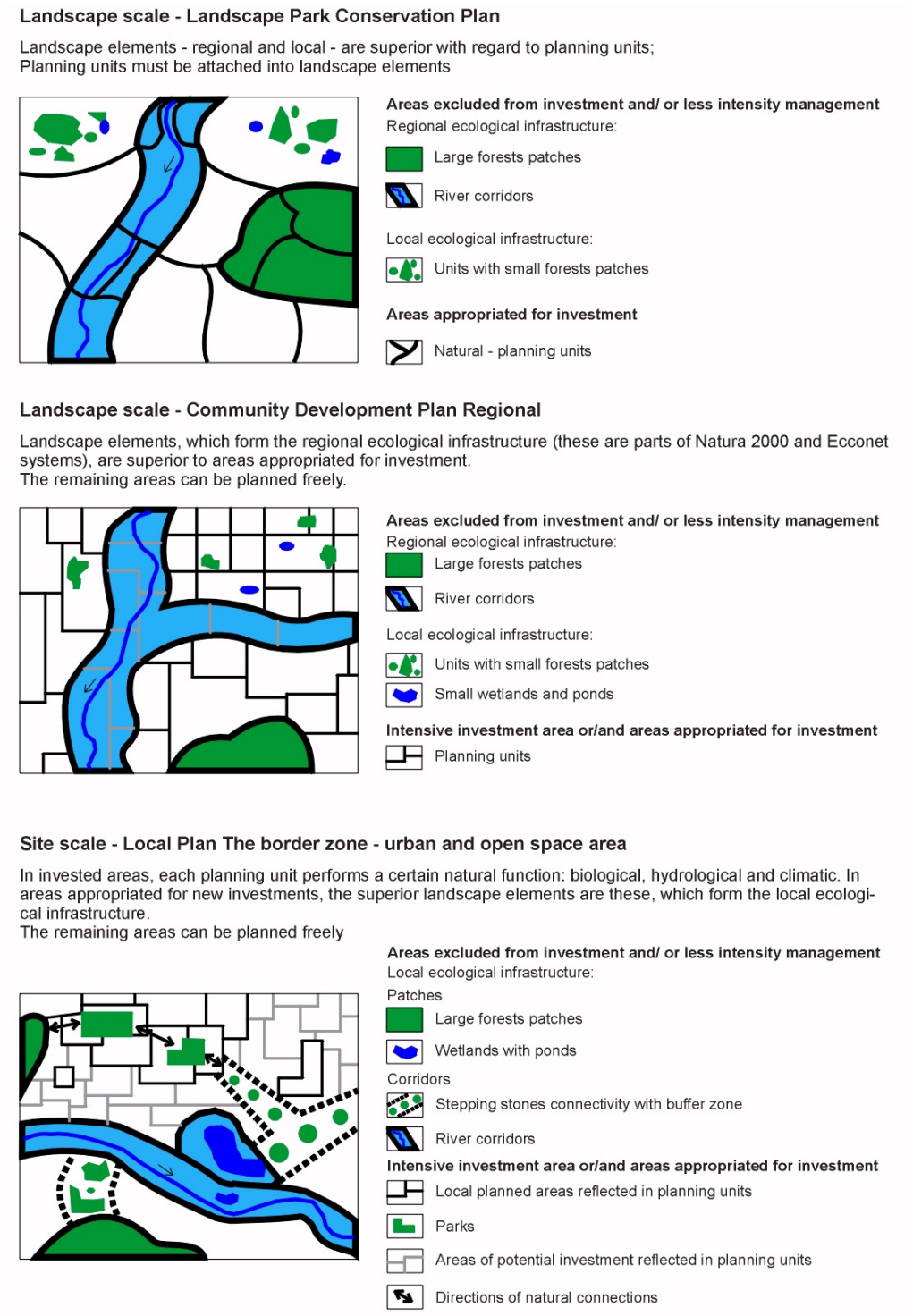

Figure 4 Landscape structure in planning - examples of different plans.

The concept is based on the following assumptions:

- Landscape elements are integral part of spatial plans on different levels.
- Landscape elements are studied both, on the analytic and operation stage of the plan.
- The amount of details of the identified elements depends on the scale of the plan.
- A proper choice of criteria for delimiting structural elements has a key role and depends of landscape specific.
- Particular landscape elements are considered differently, it depends on the criteria of their delimitation in studied plans.
- The hierarchy of planning guidelines is strictly kept – at first conservation of ecological infrastructure, and then other forms of development.

Detailed suggestions are shown in table 1.

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Table 1 Proposals of landscape structure in various types of planning studies

Features	**Types of planning studies**		
	Conservation plans	Developments plans	Local plans
Scale	1: 25 000, 1:10 000	1: 25 000, 1:10 000	1: 5000, 1: 2000
Elements of landscape	**Structural elements**		
	Individual units	Typological units	Individual and typological units
	Functional elements		
	Patches; corridors, knots etc.	Corridors, drainage catchments	Corridors, knots
Criteria of structural landscape units delimitation; **Types** of environmental functioning	**Environment features:** - geological structure - relief (forms) - land use **Environment functioning:** - biological; - hydrological; - climatic.	**Rank in the system of natural protected areas** **Environment features:** - geological structure (humidity) and relief (grades); - land use and cover; - productivity of cultivated land, and forest sites; - age of forest stand and protective functions of forests; - balance type of water reservoirs. **Environment functioning:** - biological; - hydrological.	**Environment features:** - land use; - relief; **Environment functioning:** - biological; - hydrological; - climatic; - geodynamic.
Relations between landscape elements and planning units	Landscape elements **- regional and local -** are superior with regard to planning units; Planning units must be attached into landscape elements	Landscape elements, which **form the regional ecological infrastructure** (these are part of Natura 2000 and Ecconet systems)**,** are superior to areas appropriated for investment. The remaining areas can be planned freely.	In invested areas, each planning unit performs a certain natural function: biological, hydrological and climatic. In areas appropriated for new investments, the superior landscape elements are these, which **form the local ecological infrastructure**. The remaining areas can be planned freely.
Provisions types for **natural-planning** units	Conservation of existing or reconstruction of earlier forms of use. Strategic guidelines – recommendations and limitations.	Conservation of existing or reconstruction of earlier forms of use. Recommendations of land use and management forms, indicating their intensity.	Conservation of existing or reconstruction of earlier forms of use. Accepting or excluding specific types of land use and management. Rules of landscape structure shaping