

Evaluation of the Spatial Policy of a Commune with Regard to Planned Land Use

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Abstract

Our study focuses on the subject of planning spatial development of communes within the context of protecting and using ecosystems. For the purpose of this article, within the context of planning the future spatial development of the commune, the following areas have been chosen: ones within which the ecosystem provides terrain for the benefit of humans, ones that people use as open landscape (altering them to a small degree or leaving them unaltered), and ones that people use in a way that compensates for the seizure of non-invested terrain and the alteration of its purpose toward terrain seizure.

Research involved an analysis of planning documents determining the spatial policy of each commune with regard to the functions ascribed to the areas within each commune, as well as a statistical analysis of the results. Prior to research, a classification of commune terrain with regard to its current state of development was performed. Within communes in Poland's Wrocław district the following planned function zone categories have been selected:

Zone I – areas delineated for use by humans, whose development is related to soil sealing

Zone II – areas protected from investment, often used in an extensive manner

Zone III – areas in which humans undertake preventive and retardant actions for the benefit of the ecosystem.

Keywords: ecosystem services, spatial policy

Introduction

Acknowledging the major role of spatial planning in the process of anthropogenic transformation of space, one should take into consideration the planned scale of using environmental resources by humans when planning the spatial development of communes.

Planning and using space for various purposes could be monitored using the ecosystem services theory, allowing for it to be included in the field of spatial economy. According to Solon J. [1], the concept of ecosystem services is one of the tools for discussing the subject of relationships between society and nature. It enables one to synthetically represent the connections between the basic concepts of ecology and those of economy, which, as a result,

leads to a unified representation of economic and ecological evaluations.

A coherent set of ecosystem services is a perfect tool for educating local societies and politicians about the dependence of humans on nature and about the need for sustainable development [1-9].

From among the various ways of identifying and evaluating ecosystem services, one can also point out approaches based on expert evaluation, taking into account the views of those who use the land [5]. The goal of this approach is a pseudo-quantitative evaluation of the indispensability and accessibility of services for various forms of land use. The resulting data gathered in relation tables can then be analyzed with regard to the proper manner of land use; the scenarios for changes in spatial development; the economic, social, and ecological consequences of exploiting resources; and planning protective action [1].

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Many articles studying the subject of evaluating the investment degree of areas utilize urban land cover or urban extent indicators, which are typically measured by the total built-up area (or impervious surface) of cities, sometimes including the open spaces captured by their built-up areas and the open spaces on the urban fringe affected by urban development. Sinclair [10], Brueckner and Fansler [11], Lowry [12], and Hasse and Lathrop [13], for example, define and measure sprawl as the quantity of land converted to urban use.

One may also find source literature on the subject of studying urbanization processes using the fragmentation factor. Fragmentation, or scattered development, is typically measured by the relative amount and the spatial structure of the open spaces that are fragmented by the noncontiguous expansion of cities into the surrounding countryside. Clawson [14], Peiser [15], Weitz and Moore [16], Carruthers and Ulfarsson [17], Heim [18], and Burchfield et al. [19], for example, define and measure sprawl as non-contiguous, fragmented development.

The soil sealing degree indicator also is helpful in evaluating the degree of transformation within the natural environment and its growing anthropogenization. This indicator is related to the use of terrain for investment through various types of built-up parking and cargo lots as well as communication areas. According to the latest reports from the European Commission (April 12, 2012) soil sealing – the covering of soil with impermeable materials – is one of the main reasons for soil degradation in the European Union. Soil sealing often renders fertile agricultural land useless, threatens biological diversity, increases the risk of flooding and water shortage, and fosters global warming. New European Commission guidelines [20] regarding the best practices in the area of limiting soil sealing, preventing it and compensating for it, include a set of examples of strategies, legal regulations, financing programs, planning tools for use on the local level, awareness campaigns and many other best practices in the entire Community. The guidelines serve to encourage more intelligent spatial planning and using more permeable materials to protect soil.

As claimed by the authors, Europe is the most urbanized continent in the world. Each year another 1,000 km² is transformed for human purposes, a large part of which is sealed. The size of the transformation is huge. That is why, even though one should support infrastructural development in order to foster economic growth, there is the need for a more efficient and responsible management of terrain. Soil sealing can be lessened through intelligent spatial management and decreasing the uncontrolled development of areas. One can utilize the development potential within urban areas instead, e.g. through the revitalization of abandoned post-industrial terrain (degraded terrain).

The Commission's guidelines stress the importance of an integrated approach to spatial planning. In Western European states it proved more effective to undertake specific actions on the regional level and mobilizing unused resources on the local level.

Currently, the local level spatial policy realized in Poland does not have any tools for the verifying of inclina-

tions by local authorities to designate new areas for investment. At the same time, however, the little free space still available to us is shrinking under the influence of the development of settlement functions.

A synthetic description of planned land purpose in accordance with the approved criteria (zones) for land use could explicitly show the scale of planned changes, including threats to the functioning of the natural environment (ground surface included), but also to human health and life.

The goal of our paper is to study the purpose of areas as formulated in the spatial policy of each commune, with regard to the approved original division of set terrain functions. The division into zones was performed according to the planned land use leading to the sealing of soil, protecting it from sealing, and to planned remedial action. Research was conducted in Poland, in the communes of the Wrocław district, some of which are protected as landscape parks.

The authors of the paper have already studied the issue of ecosystem services and sustainable development in the spatial policy of communes located in Poland, in the vicinity of Wrocław – communes environmentally protected as part of landscape parks, [21, 22]. Furthermore, research has been conducted in the past regarding the sustainable development of communes located in environmentally and culturally valuable areas in the Podhale region, Poland [23, 24].

These studies did not include the problem of soil sealing, though indirectly each analysis related to planned land cover serves to indicate the environmental hazards resulting from urbanization processes.

Methodology

Our study focuses on the subject of land cover planned in communes on the level of spatial policy and environmental design.

The designation of areas for various goals in spatial policy in Poland is based on a hierarchical system of goals – country-voivodeship-commune – but it is eventually realized on the local level. Planning and spatial development is essential for creating spatial order, while local plans formulated on the basis of spatial policy are the basic tools of localizing various functions in space.

For the purpose of our study, in the context of planning the future spatial development of each commune, the following zones were established:

- a) Zone I – areas planned for use by humans, whose development is related to soil sealing
- b) Zone II – areas excluded from investment and used in an extensive manner – without sealing their surface
- c) Zone III – areas in which humans undertake preventive and retardant actions for the benefit of the ecosystem

The first zone includes areas designated and used for residential and service housing, economic activity, surface exploitation of aggregate, tourism and cemeteries. Zone II includes areas designated as forests, agricultural areas, park

greenery and open waters. Zone III includes areas used for preventive and retardant actions such as afforestations, planned and currently functioning sewage plants, and organized landfill sites.

Research involved an analysis of planning documents determining the spatial policy of each commune with regard to the approved criteria, as well as a statistical analysis of the results. Prior to research, a classification of commune terrains with respect to their current manner of use has been performed. The data regarding the current manner of land use was retrieved from the local data bank, part of the Central Statistical Office of Poland.

Identifying Zones in Communes According to their Current Use

The communes selected for research are located within the sphere of influence of the city of Wrocław. The areas of the communes are under partial protection within established natural landscape parks. The Ślęza Landscape Park is located within the communes Sobótka and Jordanów Śląski, while the Bystrzyca Valley Landscape Park is located in Sobótka, Mietków, and Kały Wrocławskie. The Ślęza Landscape Park is located in the Sudetic Foothills. Ślęza Massif, Kielczyńskie Hills, and Jańska Mountain are located within the park. Ślęza is the highest peak (718 m.a.s.l.). The forests are mostly mixed, comprising of spruce, maple, beech, and birch trees. More than 380 species of plants grow in the area, including protected ones. The Ślęza Massif is an old cult site with some of the oldest settlement traces in Poland. The entire park consists of numerous archaeological sites, architectural and artistic monuments, cult statues and mining fields.

The Bystrzyca Valley Landscape Park was founded in 1998. It encompasses areas located in the Nizina Śląska. The Bystrzyca River constitutes the park's main axis and is one of the most important confluences of the Odra River. The park combines forest areas characteristic of the Sudetes, with one of the most regularly formed wildlife corridors in the Odra Valley. It also contains one of the major water basins in Lower Silesia – Mietkowskie Lake, used mostly for aggregate excavation but also for recreation and angling.

The dominant type of land in the communes is agricultural land, which constitutes 68.42% of total area in the Sobótka commune, up to 86.54% in Jordanów. Forest areas are second when it comes to their share in the total area of the communes. The Mietków commune is an exception – underwater areas take second place.

When analyzing the share of the area of each commune in the current manner of land use according to the criteria of evaluating spatial policy with respect to the delineated land cover zones, no zones for functions considered compensative or preventive actions have been identified. Nevertheless, the researched communes from both groups utilize sewage systems connected to local sewage plants, which is considered preventive action. Apart from Czernica, the share of residents in the remaining communes whose houses are connected to the sewage system is still too low.

The situation is most favorable in Czernica, where 73% of residents utilize the sewage system. Sobótka comes second place (61%) with Siechnice third (55%). Fig. 1 was created for the purpose of depicting the current manner of using space in the studied communes with regard to the approved criteria reflecting the planned land cover, according to approved zones.

In the current state of things, areas dedicated for purposes classified in the services for the benefit of the ecosystem group (through letting them be as they are, through doing nothing) are definitely dominant in the studied communes. Developed areas, classified in the areas providing services for the benefit of humans, are a small share of the total categorization of areas designated for various purposes. Such a manner of land use seems to be beneficial to the communes when it comes to environmental protection. Yet it lacks preventive actions; or perhaps they are overlooked and hard to identify.

Planning Land Cover in the Spatial Policy of Communes

The spatial policy established within each commune, defined in a written and graphical form, allow for the measuring the areas planned for functional purposes. These are grouped according to ecosystem services (Tables 1 and 2). Separate tables have been designed for environmentally protected communes and unprotected communes. There is no data for the Długołęka commune – it is still in the process of formulating its spatial policy.

Grouping areas in each commune according to the approved criteria of the division into zones related to the varying land cover allowed us to show the accepted directions for development of the communes.

Communes under protection are less extravagant with free space (excluding the Kały Wrocławskie commune). In Sobótka, Jordanów Śląski, and Mietków, areas delineated for use by humans with the potential possibility of surface sealing take up from 12.68% to 26.34% of area (except for Kały Wrocławskie, where the indicated area takes up 39.35%). In unprotected zones, including Czernica, Kobierzyce, and Żurawina, this zone reaches over 30%.

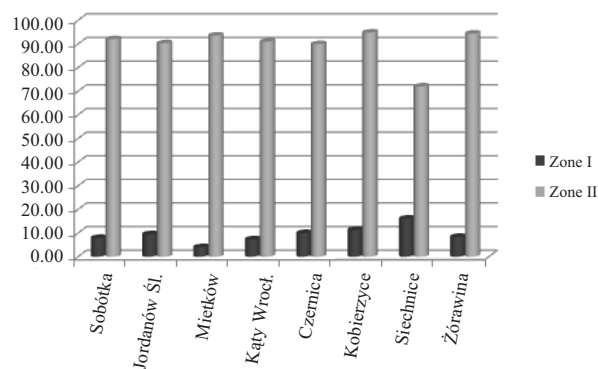


Fig. 1. The state of using space in the studied communes with regard to the approved criteria reflecting current land cover, according to approved zones. Source: Own elaboration.

Table 1. The area and share of planned functions within communes protected as landscape parks, in accordance with planned land cover zones.

| No. | Indicator | Commune | | | | | | | |
|------|--|-----------|-------|-----------------|-------|----------|-------|------------------|-------|
| | | Sobótka | | Jordanów Śląski | | Mietków | | Kąty Wrocławskie | |
| | | ha | % | ha | % | Ha | % | Ha | % |
| | Total area of commune | 13,535.00 | 100 | 5,662.00 | 100 | 8,330.00 | 100 | 16,954.06 | 100 |
| 1. | Zone I – areas planned for use and used by humans, whose development is related to soil sealing | | | | | | | | |
| 1.1. | Areas designated for residential-service construction | 2,212 | 16.34 | 800 | 14.13 | 440 | 5.28 | 3,760 | 22.17 |
| 1.2. | Areas of economic activity | 640.00 | 4.72 | 290.00 | 5.12 | 76.00 | 0.91 | 2,034.00 | 12.00 |
| 1.3. | Areas for surface exploitation | 2.00 | 0.01 | 4.50 | 0.08 | 98.00 | 1.17 | 105.00 | 0.61 |
| 1.4. | Areas for communication | 481.00 | 3.55 | 175.00 | 3.09 | 310.00 | 3.72 | 808.00 | 4.46 |
| 1.5. | Tourist areas | 220.00 | 1.62 | 82.00 | 1.45 | 127.50 | 1.53 | 0.00 | 0.00 |
| 1.6. | Cemetery greenery areas | 15.00 | 0.10 | 4.00 | 0.07 | 6.00 | 0.07 | 18.00 | 0.11 |
| | Total | 3,570.00 | 26.34 | 1,355.50 | 23.94 | 1,014.50 | | 6,725.00 | 39.35 |
| 2. | Zone II – areas excluded from investment and used in an extensive manner – without sealing their surface | | | | | | | | |
| 2.1 | Forest areas | 2,998.00 | 22.14 | 190.00 | 3.35 | 959.00 | 11.51 | 1,227.00 | 7.23 |
| 2.2. | Agricultural land | 6,610.00 | 48.83 | 3,999.50 | 70.63 | 5,122.50 | 61.49 | 8,579.06 | 50.58 |
| 2.3. | Park greenery areas | 178.00 | 1.31 | 4.50 | 0.08 | 42.00 | 0.50 | 150.00 | 0.88 |
| 2.4. | Underwater areas | 174.00 | 1.28 | 27.00 | 0.47 | 1,060.00 | 12.72 | 267.00 | 1.57 |
| | Total | 9,960.00 | 73.56 | 4,221.00 | 74.53 | 7,183.50 | 86.22 | 10,223.06 | 60.26 |
| 3. | Zone III – areas in which humans undertake preventive and retardant actions for the benefit of the ecosystem | | | | | | | | |
| 3.1. | Areas for planned afforestation | 0.00 | 0.00 | 82.00 | 1.45 | 86.50 | 1.03 | 0.00 | 0.00 |
| 3.2. | Sewage plant areas | 4.00 | 0.03 | 2.50 | 0.04 | 2.00 | 0.02 | 2.00 | 0.01 |
| 3.3 | Landfill areas | 1.00 | 0.01 | 1.00 | 0.01 | 1.00 | 0.01 | 4.00 | 0.02 |
| | Total | 5.00 | 0.04 | 85.50 | 1.50 | 89.50 | 1.06 | 6.00 | 0.03 |

Source: Own elaboration.

The Siechnice commune stands apart from this group, as it is planning to dedicate for the benefit of humans and, to a significant degree, seal more than 70% of its area with the current area of urbanized terrain equalling circa 16%. In Sobótka and Kąty Wrocławskie the corresponding value equals circa 40% of area, with the current value being 7.35%.

Research showed alarming actions by local authorities, who approved in their spatial policy a scenario of substantial seizure of currently unused space for construction investments, for communication, or for surface exploitation of aggregate. The area of agricultural land is significantly decreasing toward functions for the benefit of humans. The largest decrease in agricultural area is planned in Siechnice – from 5,700 ha to 811 ha. Once again, Kąty Wrocławskie stands apart from environmentally protected communes, as the total area there planned for shifting to non-agricultural purposes equals over 5,000 ha of agricultural land.

Preventive actions have been observed in each commune in the form of designating areas for sewage plants and landfill. Restorative activities show the worst results.

These also include afforestations, which are lacking in most communes. Unfortunately, even proper afforestation in accordance with the approved spatial policy will not improve the forest density indicator in communes with planned afforestation.

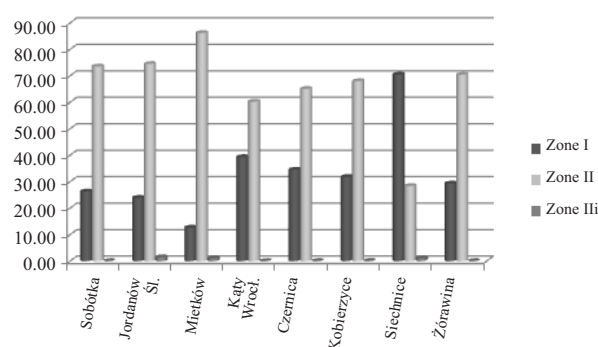


Fig. 2. The planned manner of using terrain in the spatial policy, according to the approved zones of planned land cover. Source: Own elaboration.

Table 2. The area and share of planned functions within unprotected communes, in accordance with planned land cover zones.

| No. | Indicator | Commune | | | | | | | |
|------|---|----------|-------|------------|-------|-----------|-------|----------|-------|
| | | Czernica | | Kobierzyce | | Siechnice | | Żórawina | |
| | | ha | % | ha | % | Ha | % | Ha | % |
| | Total area of commune | 8,363 | 100 | 14,926 | 100 | 9,861.82 | 100 | 12,011 | 100 |
| 1. | Zone I – areas planned for use and used by humans, whose development is related to soil sealing | | | | | | | | |
| 1.1. | Areas designated for residential-service construction | 1,983 | 23.70 | 2,203 | 14.75 | 4,352.9 | 44.14 | 2,538.25 | 21.13 |
| 1.2. | Areas of economic activity | 480 | 5.74 | 1716 | 11.49 | 1,825.3 | 18.50 | 400.00 | 3.33 |
| 1.3. | Areas for surface exploitation | 49 | 0.6 | 30 | 0.20 | 0 | 0 | 0 | 0 |
| 1.4. | Areas for communication | 363 | 4.34 | 800 | 5.35 | 758.22 | 7.68 | 588 | 4.88 |
| 1.5. | Tourist areas | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1.6. | Cemetery greenery areas | 15 | 0.18 | 4 | 0.03 | 17.77 | 0.18 | 2.25 | 0.02 |
| | Total | 2,890 | 34.56 | 4753 | 31.82 | 6,954.19 | 70.50 | 3,528.5 | 29.36 |
| 2. | Zone II – areas excluded from investment and used in an extensive manner – without sealing their surface | | | | | | | | |
| 2.1 | Forest areas | 1,660 | 19.30 | 388 | 2.60 | 1150 | 11.66 | 89.00 | 0.7 |
| 2.2. | Agricultural land | 3,400 | 40.65 | 9,587 | 64.23 | 811 | 8.22 | 8,176.5 | 68.07 |
| 2.3. | Park greenery areas | 50 | 0.65 | 26.70 | 0.18 | 130 | 1.31 | 50.00 | 0.33 |
| 2.4. | Underwater areas | 366 | 4.4 | 151 | 1.01 | 709,51 | 7.19 | 163 | 1.35 |
| | Total | 5,489 | 65.1 | 10,152.7 | 68.02 | 2,800,51 | 28.38 | 8,478.5 | 70.45 |
| 3. | Zone III – areas in which humans undertake preventive and retardant actions for the benefit of the ecosystem. | | | | | | | | |
| 3.1. | Areas for planned afforestation | 0 | 0 | 0 | 0 | 95.32 | 0.96 | 0 | 0 |
| 3.2. | Sewage plant areas | 3 | 0.03 | 9.00 | 0.06 | 4.63 | 0.05 | 2.00 | 0.02 |
| 3.3 | Landfill areas | 1,5 | 0.02 | 11.2 | 0.07 | 6.79 | 0.07 | 2 | 0.02 |
| | Total | 4.5 | 0.05 | 20.2 | 0.13 | 106.74 | 1.08 | 4.00 | 0.04 |

Source: Own elaboration.

The land cover model is definitely changing in the spatial policy of each commune when compared to the current manner of land use.

One might assert that the least favorable model of sphere distribution can be found in unprotected communes, with the Siechnice commune showcasing the worst prognosis.

Here, the planned structure of land use in Zone I (areas dedicated for use and used by humans, related to surface sealing), when compared with the areas from the Zone II group (excluded from investment) is especially unfavorable – up to 70% of area can become sealed.

An alarming growth of urbanized space is also planned, which is the consequence of suburbanization processes in the neighboring city of Wrocław.

An increase in the share of Zone I is planned in the remaining communes, leading to a decrease in the total area of the non-urbanized zone.

The planned changes practically do not involve any preventive action. The indicated areas designated for afforestation

do not compensate for the losses in the biologically active surface in any way.

Utilization of the whole potential development area will influence the spread of development into areas free of construction that will worsen local scenic qualities [24].

Conclusions

The proposed model of dividing land cover into zones depending on the function of each area related to the sealing of soil or lack thereof can serve the evaluation of the spatial policy approved on the local level, and be helpful in discussing the further spatial development of the commune. Zone III (preventive and retardant action areas) serves to evaluate actions aimed toward protecting the natural environment and maintaining a natural balance. The problem of soil sealing is currently noted.

It seems that the model can successfully be applied on the level of establishing the spatial policy and its evaluation

with regard to directions for development aimed at by the local authorities. The people responsible for each decision should know the magnitude of the planned development zones and the size of sealed surface.

The attempt to make reference to research on the subject of ecosystem services in the form described above failed, which does not exclude further research on the possibility of evaluating spatial policy according to other distinction criteria.

Research showed that the local authorities are planning an alarmingly high amount of construction areas when compared to the current level of investment. Too many new areas that occupy terrain for construction goals are planned at the cost of areas currently excluded from construction.

Such an evaluation can lead to a change in the spatial policy and eventually allow for maintaining environmental balance.

The arrangement of functional areas in the analyzed communes has not yet been realized – at this time it remains solely in the sphere of spatial politics. Their realization might have very negative consequences for the environmental cycle.

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