http://dx.doi.org/10.15576/GLL/2013.2.45

GLL

Geomatics, Landmanagement and Landscape No. 2 • 2013, 45–55

PILOT PROJECT IN MŚCIWOJÓW, AS AN EXAMPLE OF ACTIVITIES AIMED AT THE PROTECTION AND SHAPING OF A LANDSCAPE BASED ON 3D VISUALISATION

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Summary

The article summarizes the pilot research project and implementation works performed by the University of Agriculture in Krakow. This was as part of the project "Valorisation and sustainable development of cultural landscapes using innovative participation and visualization techniques – VITAL LANDSCAPES", implemented as a part of the CENTRAL EUROPE project. The work was conducted in Mściwojów, Lower Silesia, with a particular focus on the von Nostitz family property. The work covered creating a 3D visualization of the revitalization concept for the property, while adhering to the rule of developing local community participation and decision-makers participation. The developed concept was also subjected to an advanced evaluation of the effects of its implementation, which covered the area of the property with its new functions. It also covered the water reservoir and the agricultural lands of the village.

Keywords

shaping and protection of the landscape • rural areas development • 3D visualisation • social participation • CENTRAL EUROPE • AGENDA 21 • VITAL LANDSCAPES

1. Project assumptions

An important element of the VITAL LANDSCAPES project was an attempt to scientifically develop a new approach to functionality improvement, protection and on development of cultural values of the landscape in Central Europe. It was based on the assumption that cultural and natural resources of rural landscapes can be effectively protected only if the traditional resources of the landscape, which generate non-agricultural regional or sub-regional development potentials, are maintained. To determine them, it is necessary to perform a broad pilot work, based on the current state of knowledge and on the use of the latest technologies. The strong scientific part of VITAL LANDSCAPES project is an exception in the CENTRAL EUROPE program. The main contributors to this fact, besides the Agricultural University in Krakow (UR Krakow), are the renowned universities of Universität für Bodenkultur Wien and Corvinus University Budapest.

The aim of this article is to present the actions performed by UR Krakow for the purposes of this pilot project. The methodical basis for the article is the synthesis of the results of the research and implementation works. To recognize the landscape resources it was necessary to perform an extensive survey of the area. This assumed active participation of local communities and decision makers. At the same time, feedback was also important. It revealed that the cultural resources of the landscape can greatly contribute to the development of particular projects. This would help to protect the resources due to their balanced use.

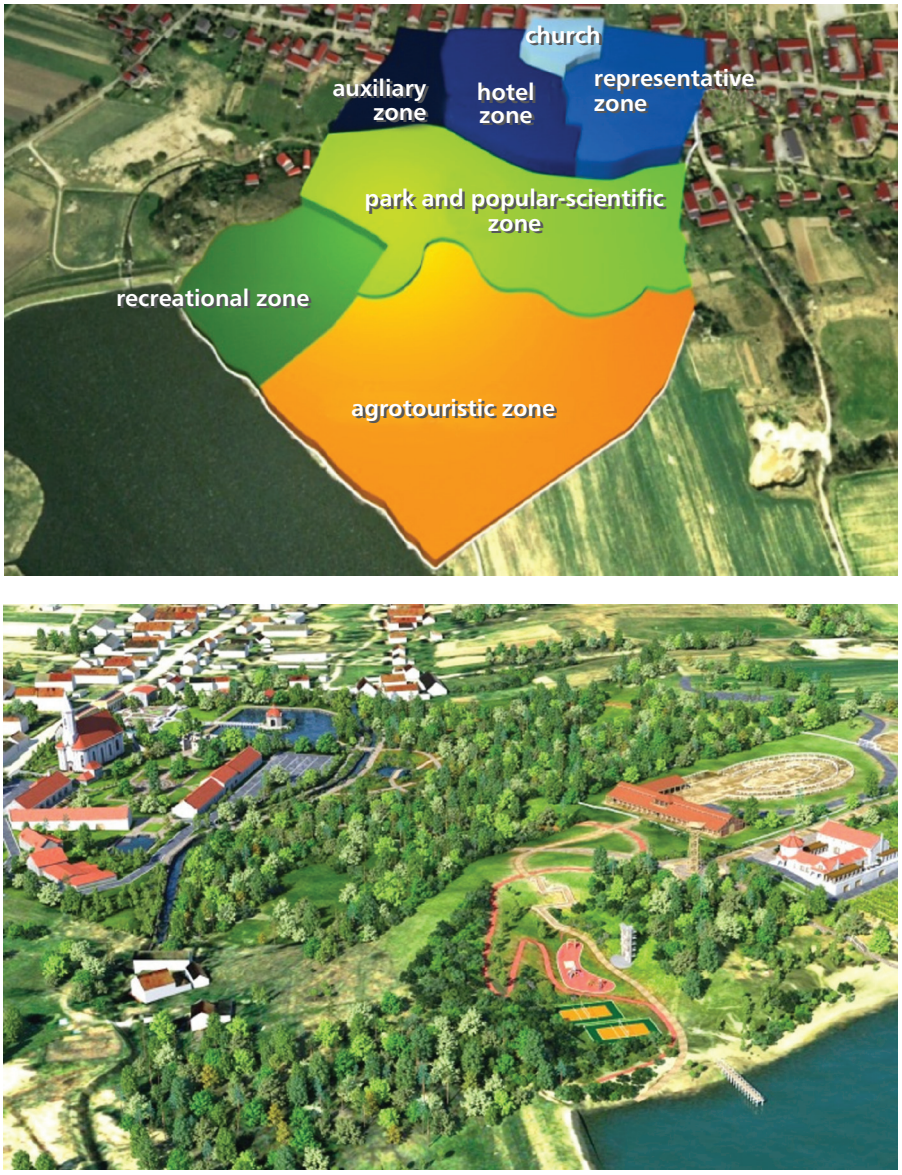
UR Krakow plays an important role in the project, as it developed a versatile methodology of 3D visualization. 3D visualization is an increasingly popular tool for communication with local activists (landowners, politicians, businessmen, etc.). Descriptions and plans do not appeal to nor are understood by everyone. Local communities and decision makers are much more likely to approve (of some) actions to be undertaken in their commune or village when they see realistic result, beforehand. At the same time, the proper conduct of "dialogue" is necessary for the implementation of this project between the local community and authorities – or moderation, e.g., using 3D visualization usually prepared in several proposals. The research results obtained by UR Krakow, as a part of the project revealed that in the future, before implementation of even very big investments in rural areas such action scenario, will be successful. The pilot work have proved that thanks to 3D visualizations, people are more open to changes and become much more involved than in the case of the use of traditional methods. In Europe, where local democracy is very strong and land value increases, proper use of feedback between 3D visualization and moderation, can soon turn out to be an important element for stimulating positive landscape changes in rural areas.

2. Cooperation with local community and the goals of the concept

Implementation of the VITAL LANDSCAPES project by UR Krakow was linked to cooperation with the local community and the authorities of the commune of Mściwojów. Problems arose when the local authorities in Mściwojów changed in favor of the competition of the previous village-mayor. Due to this development, the project team faced a double challenge. Not only did they have to focus on involving the local community in the project but they also had to earn the new authorities' trust. Unfortunately this was not fully successful.

Nevertheless, before the commencement of work on the project, a working group was formed. It consisted of the leaders of the local community, the local authorities' representatives and experts from UR Krakow. Then, regional seminars were conducted, regarding the future of the village and the historic property. As a part of these seminars, the experts held forums with the local community and authorities and also site visits. Based on the outcome of these actions, it was decided that the main development axis for Mściwojów will be the revalued park-court complex. This, along with the accompanying objects (the grange, the "Winna Góra" Mściwojów reservoir), is the main potential of economic development of the village.

As part of the reconstruction concept of the property, the area was divided into functional zones, including a hotel zone, a park and popular-scientific zone, a recreational zone and an agritouristic zone (Figure 1).



Source: Study by I. Szelest

Fig. 1. Functional zones of the future revalued and developed von Nostitz family property in Mściwojów

The hotel complex (hotel zone) was designed for around 200 guests. Assuming that during the season the hotel would be about 90% full, the whole investment would generate a significant amount job opportunities. This would be mainly in the service sector, for both the village, and the whole commune. This is possible because of the advantageous location of Mściwojów, relative to the agglomerations of Wrocław and Katowice (Silesian Agglomeration). Furthermore, an economically important role of the complex would be played by the agritouristic zone, along with the stud-farm and the vineyard. The vineyard together with the restaurant would be one of the most important landmarks of the whole complex. Also, it would be an important step toward resuming wine production, which would be a significant contribution to the development of the local economy. The landscape composition of the vineyard and the Mściwojów reservoir is also important.

The working group and the expert team are responsible for preparing the 3D visualization. They had to have precise guidelines regarding the area. For this purpose, local strategic and planning studies were examined in great detail. In Poland, the most popular are the Development Strategies. They contain information regarding the internal and external conditions of a given area. They are usually made in the form of a SWOT analysis. These strategies also contain determination of goals and key areas of development. The next kind of document are the studies of the conditions and spatial management directions. They contain spatial, economic, social, natural, cultural, and agricultural information about a given commune. Another kind of document are the local spatial management plans. Apart from the valuable information in the analytical part, these documents contain binding information about the possible land use in the given village or commune.

Next, the analysis of the historical resources was performed in such a way that would make it possible to give an emotional impulse to the working group. The information stimulated their imagination and expanded their knowledge of the history of their land. Another aim was to provide the team of experts, preparing the 3D visualization, with information regarding the former image of the property and the village. This became difficult, due to the fire in 1953. The manor burned down along with the library which contained a lot of valuable historic materials regarding the property, the park, the vineyard, and the village. The history of the place is very rich. Mściwojów was first mentioned in the 13th century, and halfway through the 17th century it became the property of the von Nostitz family which began 300 years of prominence for Mściwojów. Baron Otto von Nostitz, the Prefect of the District in the Świdnik-Jawor Duchy, founded a large man-made park-court complex, along with an orangery and a vineyard in Mściwojów. Chroniclers (including Friedrich Lucae and Nicolaus Henelius) mentioned it among the greatest properties of Lower Silesia. Particularly valuable was the park with many trees and exotic plants. As a result of the damage caused by the wars, the whole complex became significantly deteriorated and the attempts to reconstruct it in the 70's of the 20th century were not successful [Brożek et al. 2013]. The most important cultural landscape resources that remained are: a part of the manor garden with its well preserved orangery, the neighboring pond

Table 1. System of developing objectives for Mściwojów for the 3D visualisation

Primary objective: Creation of conditions for balanced social and economic development while maintaining the achievements of previous generations and the natural values		
Main objectives	**Partial objectives**	**Operational objectives**
1. Protection and improvement of natural and cultural values	1.1. Protection and active shaping of historic cultural landscape	1.1.1. Restoring the former prominence of the von Nostitz family property 1.1.2. Reconstruction of the vineyard, along with the buildings 1.1.3. Protection of the idyllic agricultural landscape(s)
	1.2. Protection of natural life needs	1.2.1. Research on the influence of the planned investment(s) on the water regime in the local catchment 1.2.2. Development of a concept for a balanced water and sewage management upon completion of the investment 1.2.3. Raising awareness in the local community in terms of environment protection
2. Providing conditions for sustainable economic development	2.1. Increase of the potential for development of non-agricultural job opportunities	2.1.1. Creation of hotel facilities on the basis of the village grange sphere 2.1.2. Recreation of a historic garden along with the orangery as well as creating new attractions 2.1.3. Support for tourism development – mainly during weekends 2.1.4. Supporting the creation of new private enterprises
	2.2. Agricultural development	2.2.1. Maintaining traditional cultivation 2.2.2. Organic farming development for the purposes of local gastronomy 2.2.3. Improvement of agricultural infrastructure
3. Improvement of living and working conditions of the local community	3.1. Development of internal and external social integration	3.1.1. Cultivation of native crafts – oriented on the regional products 3.1.2. Support for the preservation of local traditions 3.1.3. Organization of periodic, occasional events in the reconstructed property of the von Nostitz family 3.1.4. Preventing migrations of people to big cities in search for job opportunities
	3.2. Development of social infrastructure	3.2.1. Improvement of healthcare availability 3.2.2. Creating conditions for sports 3.2.3. Creating meeting places for the local community
	3.3. Development of technical infrastructure	3.3.1. Modernization of the existing technical infrastructure 3.3.2. Expansion of the technical infrastructure for the purpose of the investment(s)

Source: authors' study

with a romantic island, the ruins of the manor, the church with its surroundings, the well preserved farm grange buildings and the remains of the buildings on the "Winna Góra". The water reservoir "Mściwojów" is a new landscape element. The information for the expert team preparing the 3D visualization, regarding the former look of the object/village/commune had to contain many details about the old forms of buildings (village) and land use. This was possible due to the analyses of historic drawings and photographs of the buildings, architectural details and vegetation (the garden, the park, the vineyard). As important was the information on the building materials, roof and façade colors. The next step was the characteristic detailing of rural areas surrounding the property along with the local conditionings, in terms of use and spatial structure. The detailed analysis of the natural environment and the degree of its protection was extremely important. It covered the characteristics of the area as well as the hydrological and natural conditionings. Moreover, natural hazards required researching, especially areas of potential flooding.

Creating a 3D visualization, as a part of building local partnership, in favor of a consistent development concept, has to be based on precise guidelines. As a basis for building the concept, a system of objectives and investments was created as a part of the project. This allowed for the precise definition of the tasks of the 3D visualization team for creating particular stages and elements of the concept. The system of objectives was created based on a primary objective, consisting of main objectives, partial objectives and operational objectives. The primary objective was determined to be: "Creating conditions for sustainable social and economic development of Mściwojów, while preserving the heritage of previous generations and natural values". In the case of Mściwojów, in the foreground, there is the high potential for non-agricultural economic development generated by the von Nostitz family property. Other main objectives were defined according to the rule(s) of sustainable development, so that they could also cover the achievement of the protective and social objectives. The system of objectives is presented in Table 1.

3. 3D visualization methodology

The central task of UR Krakow in the project, was to work on a 3D visualization of the revitalization and development of the property in Mściwojów. This task was accomplished thanks to a series of independent analyses, regarding the creation of this particular visualization and the development of an independent methodology of creating similar 3D visualizations. As the project covered three years, the project team decided to complete the tasks in stages which resulted from one another (in a linked progression). For the majority, their scopes were unpredictable before the realization of the project or even during the project. The main determining factor was the fact that subsequent tasks resulted from the decisions made together with the local actors, and their final form was indefinable until 2011.

The 3D visualization was based on geodetic and photogrammetric measurements made in the historic grange in Mściwojów. It was also based on the survey of the

architectural objects using aerial and ground-based photography. These measurements were categorized by the measurement objects: buildings and small architecture. Also the works covered the buildings in the village of Mściwojów. At this stage a simplified 3D visualization was involved [Piech 2011, Kwoczyńska 2011]. The detailed work on the visualization boiled down to testing particular elements of the technology and software. This was crucial for the later development of the final visualization in 3dsmax software. Basically, it was about making it possible to use photogrammetric measurement data [Zygmunt 2011]. Simultaneously, there were works on acquiring historical sources regarding the properties which were essential for the preparation of visualizations that would be historically faithful. These actions resulted in a historic reconstruction of the landscape elements of the property in Mściwojów along with the whole village, which was important for the final effect of the visualization [Możdżeń 2011].

Next, the fundamental 3D visualizations were made for the purposes of the pilot project. The work concerned the creation of a complex 3D vector database. This was necessary to create an extensive 3D visualizations in Full HD resolution in 3dsmax environment while keeping the physical properties of the visualized materials in the linear 32-bit light model [Szelest 2011]. Simultaneously, work was undertaken on the technology of data processing with use of *Bentley Systems* software, in order to obtain a Digital Terrain Model (DTM), in a format that would make it possible to create a 3D visualization in 3dsmax environment [Kletowska 2012]. An important stage of the work, was the development of a methodology necessary to harmonize the data that would allow to the creation of a 3D visualization of very large areas. A significant element of the methodology was the development of a technology, to "grasp" the horizon, not only from a ground-based observer's point of view but also from the bird's eye point of view [Zygmunt 2012]. In another study a tool was created to lift the objects to the 3D model, based on a DTM in the form of a triangle mesh and to export the data into text files for further processing in 3dsmax software [Gryboś 2012]. Also, it became necessary to develop universal ranges of possible output data for 3D visualizations [Litwin 2012].

4. A priori evaluation of the possibilities and the effects of the possible implementation of the concept developed as a part of the 3D visualization

Restoring the former prominence of the von Nostitz family property in Mściwojów is a very complex task, as well as a chance for the improvement of the economic situation of the village and the commune. However, the possible implementation of the concept must not worsen the existing state of the environment or cause any other negative consequences. This is why a very important set of work analysis on the projects, were the a priori evaluation of possible outcomes of the implementation of the concept developed, as a part of the 3D visualization. These analysis were detailed to examine the impact of the concept on the hydrosphere and the ecosphere. The impact of the concept on the agricultural landscape of the village was also analyzed.

Also, analyzed were the proper social and economic development of the revitalized and expanded property should be surrounded by vital and functional agricultural lands and it should not be an "island" detached from its surroundings.

It should be stated, that an important part of the methodology of 3D visualization creation is performing partial analysis, which are beyond the competences of the IT specialists preparing the visualization. It is necessary to avoid theoretical solutions which could be more problematic than useful after the implementation. Also, such analysis help to convince the Working Group and other inhabitants of the village to approve of the suggested solutions.

In the first stage of the work – based on the detailed characteristic of the catchment – a water resources analysis of the cultural landscape of the village of Mściwojów was performed. Apart from the hydrological calculations of the extreme flows, the study also covered an analysis of the characteristics of water resources and watercourses feeding the catchment of the Mściwojów reservoir. The elaborated data is an important starting point for the landscape architects and the designers of the property reconstruction – mainly in terms of an increasingly significant aspect which is the flood safety of the investment [Radecki-Pawlik 2012]. To study the current and future hazards related to the reservoir it turned out that it would be necessary to perform an analysis of the ecosphere and the biosphere of the reservoir in Mściwojów. This was necessary to evaluate its actual ecological values and the existing harmful pollution from the direct catchment of the reservoir [Policht-Latawiec 2012]. The analyses performed by the experts researching the impact of the reconstruction of the grange in Mściowojów on the operation of the water reservoir and the water regime, show that the implementation of the concept will not cause any negative consequences [Radecki-Pawlik 2012].

An important element of the work was the analysis regarding the evaluation of the possibility to supply water and drainage of sewage in the commune of Mściwojów, in case when the concept from the 3D visualization was implemented. The analysis was performed in variants. In variant 1 the water supply network will be expanded, which will be necessary to supply all the functional zones of the concept with water (Figure 1). In variant 2 an additional underground water reservoir would be created. Variant 2 examines the situation in case the water supply is interrupted. This model increases the water availability and gives safety system for the hotel, restaurant and the stud farm. It would supply the stud-farm and the vineyard with the restaurant and also, through a different pipeline, the hotel with the restaurant. Variant 2 guarantees a water supply for any purposes in proper quantity and quality (the water in the reservoir would be constantly exchanged). The analysis showed that implementation of the concept will not have a negative impact on the landscape, e.g. the necessity to build additional ground technical equipment [Pawełek et al. 2012].

As the concept for revitalization and reconstruction of the historic property in Mściwojów could not be separated from the neighboring agricultural lands of the village, it was necessary to recreate the original, historic layouts on the agricultural lands. Restoring the picturesque field configuration is an important objective, as it would add to the touristic attractiveness of the whole area. For this purpose, historic

maps of the village of Mściwojów were analyzed, starting with the Prussian cadastre. The study also contains the analysis of the historic layout of buildings [Noga 2012]. A separate task was the creation of maps depicting the land layout transformations in Mściwojów since 1948 (when the land was given to the settlers) and a cadastral map from 1964 (after collectivization). The maps were made based on the current cadastral map and a digital orthophotomap. As a result of the study, geodetic maps were made which will be useful for further concept and design work [Taszakowski 2012].

Restoration of the traditional, historical spatial structures would increase the idyllic aura of the commune and would improve the conditions for organic farming. This involves protection of field balks, which are an indirect factor influencing the soil quality by reducing the surface runoffs. These balks are the habitat for many animals and plants that significantly influence the biodiversity. They filter out the farming chemical products. Because of them the soils located below, as well as the watercourses and groundwater, do not get polluted. The next aspect is the improvement in the agricultural infrastructure. This has a very big influence on the working conditions, as well as the touristic and recreational functions of the landscape. Simultaneously, the arrangement of agricultural roads has an impact on production costs.

This is why it was necessary to perform an evaluation of land configurations for the farms in Mściwojów, as well as an analysis of the current land layout, for the purposes of the future 3D visualizations of agricultural land transformations [Gniadek 2012]. Next, the data necessary to build an optimized base was pre-processed. The pre-processed data is the input data in the fundamental process of optimizing agricultural lands [Janus 2012]. The next elaboration was the development of a plan of appropriate agricultural land reconfiguration for Mściwojów, for the purposes of future 3D visualizations. The land configuration optimization made it possible to suggest a better land plot location of lands belonging to particular households. This takes into account both minimization of the average distance from the lands in the whole village, as well as a uniform distribution of the advantages, resulting from the new land layout for particular farmers [Harasimowicz 2012]. A significant aspect was the agricultural infrastructure, which was an important element of the landscape structure for the 3D visualization team. As part of the project, a visualization of the desired changes was not created. However, in case of future implementation, it is necessary to take into account the flattening, hardening and drainage of the existing roads.

5. Recapitulation

It should be stated, that the performed work is of unusually complex and consistent integrity. It covers the activities related to the concept of 3D visualization with the use of modern software, as well as social participation. It also required an evaluation of the possibilities and consequences of its implementation. The work was not limited to the historic property, but covered the whole village including the water reservoir and the agricultural lands. Some of the elaborations required extensive

field work, studying literature or archival materials, and the results were in a form of a technical report. Most of all the elaborations required descriptive work.

The article presents the concept of spatial management of the village of Mściwojów, along with its central element – the historic property of von Nostitz family and the broad actions undertaken for this purpose. The concept is based on a system of objectives, developed by a team of experts, along with the Working Group formed in the village. The primary objective was to create proper conditions for a sustainable social and economic development while preserving the heritage of the previous generations and the natural values of the land.

We express the hope that the authorities of the commune will find enough determination necessary to attract an investor to work with on creating a modern, attractive weekend tourism center for the residents of the Silesian Agglomeration and the agglomeration of Wrocław.

An important function of the project is its model character for Poland, a large country in Central Europe, where the implementation of the European Landscape Convention can still be considered insufficient.

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