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Industrial Space's Visual Negative Impact on the Rural Landscape and his Reduction by Landscape Architecture

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Abstract: One of the problems of industrial development in rural areas is the negative impact on the landscape, particularly on their environmental and aesthetic values. Industrial areas integration in rural landscapes should not be neglected. Visual impact is an important factor that influences the way how industrial facilities are perceived by the public. This paper contains a theoretical analysis based on rural landscape literature and a case study that exemplifies how an industrial complex located in a rural landscape can be designed so that will not lead to loss of the main features of the rural areas.

Keywords: ecological values, aesthetic values, design, development

1. Introduction

Industrial development is running a growing pressure on rural resources increased, threatening the rural land production, aesthetic, and environmental values. The objective of this paper is to highlight design strategies for industrial space located in rural areas, environmentally compatible strategies that effectively oppose to loss of sites (with industrial development) natural qualities. General industrialization, excessive in some rural areas, new industrial spaces with objects of various activities setting up and led to appearance and enhancing of the one most serious phenomenon: rural area pollution (ground, air, and water), agriculture and

forest landscape damage, flora and fauna alarming reduction and an ecological imbalance producing in many ecosystems of the countryside. This aggressive impact, detrimental for natural environment requires the adoption of measures that aim to limit and eliminate the negative effects of pollutants factors on rural space.

Visual impact analysis on landscape has become a statutory requirement for environmental impact assessment. For example, large-scale developments such as wind farms, landfill sites and large industrial developments require a visual impact assessment. Authorities responsible for planning industrial zones must take into account these evaluations, which determine the exact visual impact magnitude on landscape. "Guidelines for Landscape and Visual Impact Assessment" is one of the publications dealing with these issues extensively, and was published in 1995 as a joint initiative between the Institute of Environmental Assessment and Landscape Institute of Shetland Islands. Visual impact analysis should be included in the assessments being made to establish land use classes. Different developers, organized into stakeholders have different expectations and feelings for the rural landscape [1]. Good communication is essential in the early planning phase, so that mutual understanding grow steadily. A continuous dialogue between all involved stakeholders will establish a solid basis for ongoing relationships [2].

2. Materials and Methods

The research is based on scientific literature review, the inventory of a site, exploring the rural characteristics and industrialization impact. The case study integrates rural values conservation tools through design, environmental design and industrial areas landscaping. Design strategies include the following components: elements of design that blends with the countryside environment through an understanding of cultural context; land use methods that promote the conservation of rural resources and sensitive landscaping proposals for the relationship between man and nature (vegetation, environmental impact, construction, material, design).

Beyond the practical purpose of this study, is analyzed the relationship between man and nature by observing closely the rural characteristics, thus encouraging architects and landscape architects to consider natural and cultural heritage during the design process. Applied in the early stages of the design process, landscape visual impact assessment tools should allow an objective comparison of the visual impact based on different proposed scenarios.

In this way, can be chosen locations and development types that will reduce the visual impact. To develop a landscaping model with beneficial effect on the landscape was chosen to study an existing industrial complex with an area of approximately 5.4 hectares, situated in Rădaia, Baciu village, Cluj County. In

order, to site study for landscape proposal, the rural landscape and the existing situation of the industrial complex was analyzed. The methods used to characterize the area were: the visual impact assessment, analysis of maps, aerial photographs and field research.

Were analyzed the area's following principal natural factors: topography, soil type, hydrology, drainage systems and vegetation land coverage.

Subsequently were described a series of cultural factors such as: land use, settlement patterns, terrain type and infrastructure. In order to obtain a comprehensive analysis of landscape characteristics were evaluated: colour, texture, lines.

In the second stage were formulated guidelines to be implemented to minimize industrial site's visual impact in rural landscape and were developed three landscaping scenarios. In the third stage were compared these three scenarios, analyzing the aesthetic, ecological, and economic visual aspects.

3. Results and discussions

What are Landscape and Visual Impacts? Before describing the key-principles for Landscape and Visual Assessment is necessary to explain the importance of landscape and visual impact and make a distinction between these two. Landscape and visual impacts are two separate but closely related elements: landscape refers to the appearance of the terrain, including shape, texture and colours.

It also reflects the way in which these components combine to create specific models and distinct images for certain areas. The landscape is not just a visual phenomenon; it is based on a number of other characteristics / influences that formed his character. For example, topography, geology, ecology, land management and architecture play a role in the landscape development. Of course the landscape is not confined to rural areas. In Fig.1 are shown the interactions between landscape and visual impact [3].

They can be summarized as follows:

- Landscape Impacts: "Changes in the fabric, character, and quality of the landscape as a result of a development":
- Direct impact upon specific landscape elements;
- Subtler effects upon the overall patterns of elements that give rise to landscape character, regional and local distinctiveness;
- Impacts upon acknowledgment, special interests or values such as designated landscapes, conservation sites and cultural associations.
- Visual Impacts: "relate solely to changes in available views of the landscape, and the effect of those changes on people".

The impact does not necessarily coincide. For example, a development can be designed so that plant will screen that will mask changing, but the landscape will

change inevitably. Impact can result from various sources and varies during the development process.

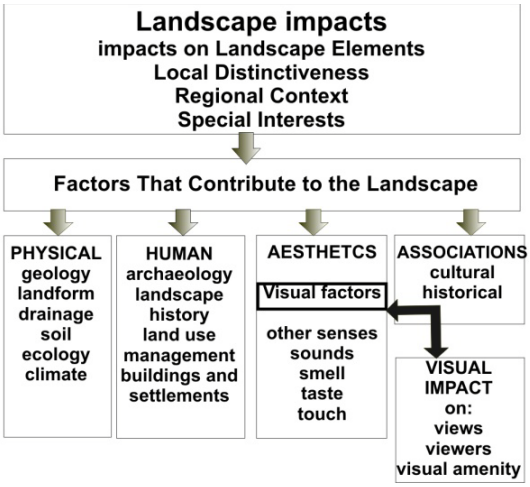

Figure 1: Interaction between landscape and visual impact. Adapted after Institute of Environmental Assessment and Landscape Institute [3].

Evolution, technical progress gives us conclusive comparisons between "new forms" in full swing and 'traditional forms', and relations that are established in some stage between these forms. From analysis of relations, we can imagine the one sector or another importance for social activity. An "conservative" agriculture may impede industry natural evolution, social progress in general. An industry inadequate located can cause irreversible imbalance in an agricultural area or a localities system.

Naturally, such a situation creates some form of socio-economic organization of space, determines mutations in spread and in population structure, expresses a certain degree of adaptation of humans to technology developments. This background sets various types, "forms" classifications or space systems that include elements of the geographical landscape. Large-scale industry, usually present in large cities, has sometimes negative effects on the rural landscape producing imbalance in hydrological regime, in air pollution and especially in relief preservation as a result of communications network expansion, deforestation, deposits, etc. Buildings and large structures integration is much more difficult. The construction of such buildings may involve loss of natural habitat for wildlife. Large belts of trees planting lost habitat replacement and rainfall storage measures are needed to help reduce environmental impact, it is important to be allocated enough space for this action since in the planning phase. In rural and semi-rural

area, industrial and commercial aspect should be in accordance with local rural character. In the rural areas situated industry sites landscaping projects following actions represent an important step in reducing the visual impact on rural landscapes: large trees and hedges planting (ex. oak or other native species), protecting existing trees and shrubs, wild meadow flowers, the allocation of adequate budget for landscaping and maintenance, preservation and protection of watercourses and ponds, the use of appropriate materials to build fences, security fences placement, avoid reflective colours for the buildings since they will be more visible and will have a negative effect on the landscape, avoiding the development of industrial complexes at less than 5 meters distances from watercourses. Signalling is another important aspect in the construction of industrial facilities. It is necessary to determine if there is already an integrated system of signs for the industrial property, system that will contribute to create building or site identity and easier location of a company. A good signal can improve the appearance of a building or site, while being the focal points in the landscape.

Figure 2: Vegetation disposal in industrial areas landscape [4].

Lighting design should avoid: excessive levels of light, which will result in the night sky brightness (type of light pollution that refers to production of a "light dome"), glare (uncomfortable brightness) and light passing ownership limit. Existing vegetation analysis is important to determine the exact health state of vegetation and specimens with environmental and decorative value – is recommended their preservation. One element that will reduce negative impacts on rural areas is the use of commercially valuable species, such as those used as fuel: willow, poplar. To emphasize and establish industrial site limits is recommended hedgerows and tree alignments planting - these can be considered as an alternative to traditional fences. For fences and walls, to increase the aesthetic and ecological value, climbing species can be used. For industrial building facades are recommended species with special decorative features use. Vegetation softens the harsh lines of the parking lots and

buildings, improve the aesthetic appearance of the entries. White walls of industrial buildings form a good background for groups of trees and climbing plants.

Development proposal aimed mainly developing and applying a methodology designed to assess and mitigate the visual impact of industrial space located in a rural area. The studied site is located in the area of Rădaia, Baciu village, in Cluj hills area, on left side of Nădaş River, near Cluj-Napoca city, metropolitan area of which is expected to join. The average altitude is 357 meters and the geographical coordinates of the location are: 46'47'48.51"N, 23'28'15.54"E (*Fig. 3*, *Fig.4*).

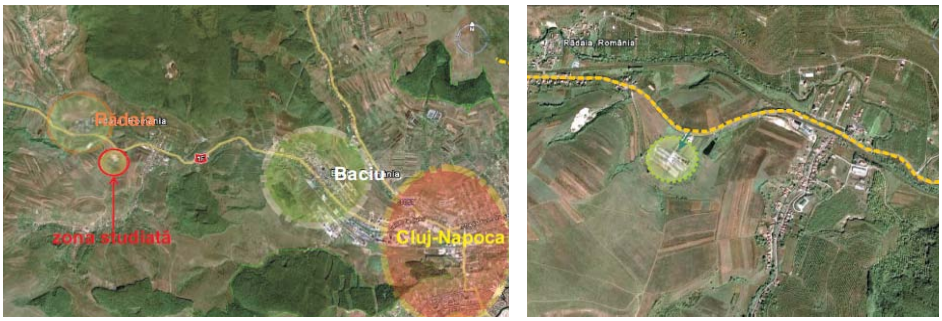

Figure 3: Studied area localization.

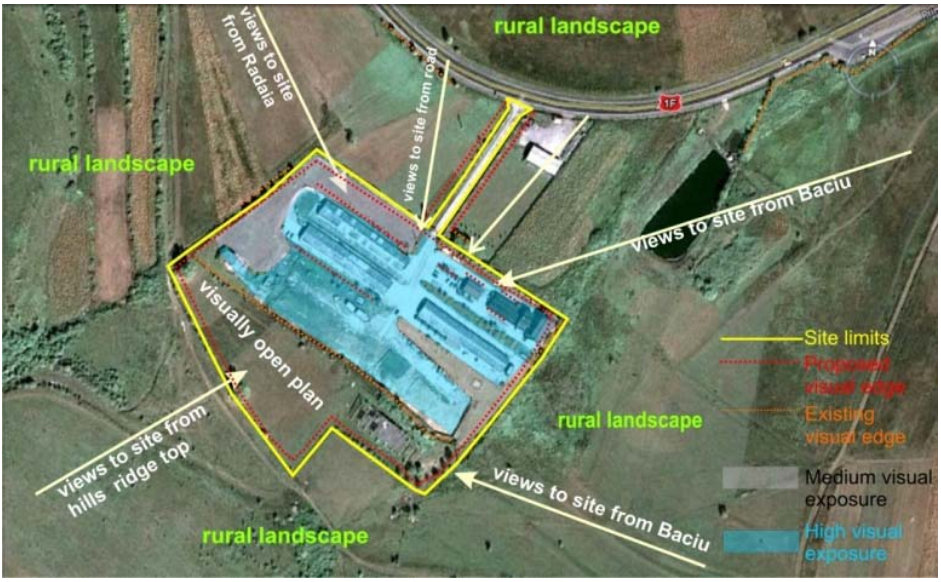

Figure 4: Visual assessment.

The study area is characterized by low soil fertility. The landscape is characterized by an alternation of hills and depressions, streams, canals and ditches. These small water courses are enhanced by alignments of trees and shrubs belonging to the wild flora. The settlements in the area are characterized by concentrated villages.

The houses are clustered around the village institutions: schools, churches, town halls. The settlements are located in depressions. Land use is characterized by grassland alternating with arable land. Forests are underrepresented near the analysed site.

Terrain presents a combination of flat areas, gentle slopes with a good degree of vegetation coverage (*Fig.5*). Access is from the North, being directly related to 1F national road. Pedestrian and auto access paths materials are cement, they have an deteriorated, aged and anaesthetics aspect (*Fig.6*).

Figure 5: Studied site topography.

Figure 6: Buildings, pavement, existing fencing.

Existing vegetation condition is satisfactory both in terms of composition and in terms of health. Coniferous species predominate (*Thuja spp. Juniperus spp., Picea abies, Taxus*). Deciduous vegetation consists of the following species: *Buxus sempervirens, Cotonester, Cornus, Ulmus, Salix* and spontaneous specimens, and is disposed in alignments, groups, solitary specimens, and hedges (*Fig.7*).

The aim of the present project is to promote the use of methods to reduce the maximum intrusion into specific of local landscape. The chosen site, because the

surface and position, has the ability to show industrial development high pressure on rural landscapes.

Figure 7: Disposal types of existing vegetation.

Three preliminary variants and a final version of landscaping were developed, with distinct characters and contain at the same time combinations of these characters. All four variants, regardless of their form, had as final goal achieve a landscape effective model that complies with the described guidelines. It was specifically aimed at mitigating the negative character of the site: buildings impact on landscape, paved surface reduce, land vegetation cover improving, proposed vegetation harmonization with existing vegetation, efficient lighting system proposal, fences restoration, existing pavement rehabilitation , improve the appearance of buildings accesses (*Fig. 8*).

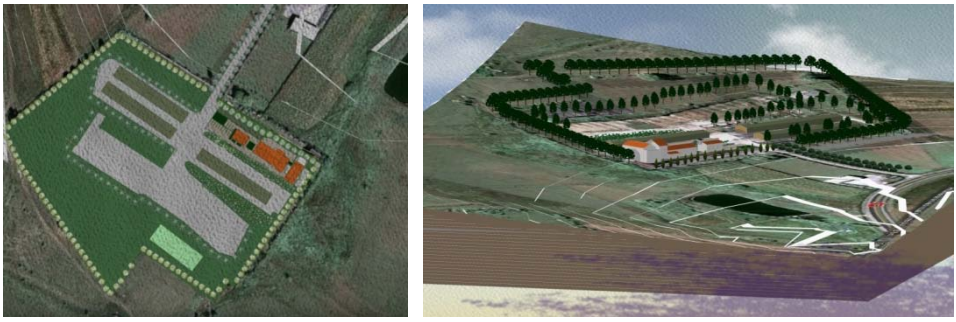

Figure 8: Proposal.

None of the four development proposals has occurred on the existing vegetation, which is entirety preserved. Special feature of the new design proposals is administrative buildings newly established green space design - it has a powerful impact in shaping a perception at first sight (*Fig. 9*). Special feature of the new design proposals was green space near administrative buildings - it has a powerful impact in shaping a first perception. Following preliminary analysis of the three alternatives was chosen the final option for implementation. In this alternative selection, a decisive element was the economic factor, taking into account the development and maintenance costs.

Figure 9: Landscaping variants.

The final version is a result is the result of analysis and discussion of preliminary alternatives. To increase the aesthetic qualities, near building's façade and the building access, new green inserts are proposed (*Fig.10*).

Figure 10: Vegetation and planters localization in the vicinity of the building facades.

Garcia et al. (2006) distinguishes four aspects that help understanding the relationship between buildings and surroundings: the value of landscape, location of buildings, colour, line and texture that characterize the landscape and colour, line, texture and other elements of buildings [5]. After analyzing the situation and a good understanding of these issues was proposed buildings rehabilitation in order to achieve an optimal integration into the landscape. Therefore is recommended to use neutral colours and natural, pastel shades (*Fig.11*).

Figure 11: Proposed buildings and pavers rehabilitation.

The main idea of the proposal is to introduce as much vegetation without suffocate the perspectives. The landscape will be based on the dominant effects of trees and shrubs – are proposed suitable species, with existing climate and microclimate tolerance. Alignments are located at site limits, having protective role, reducing the visual impact on the landscape of this industrial site and create backgrounds for smaller facilities (*Fig.12*, *Fig.13*).

Figure 12: Proposed trees alignments – 3D Render.

Figure 13: Proposed plan - section.

4. Conclusions

The landscape is a portion of space, is the result between interaction in time of the initial physical environment and human activity. So at integration of interactive elements is added historical dimension, scale, human life organization and its development.

The proposed method proves valuable for its active use in planning. First, landscape description helps to understand the current situation in the area to be planned.

Where appropriate guidelines are formulated based on this description, it will be possible to develop several scenarios for site development and obtain various measures to mitigate the negative visual impact. Once these scenarios have been developed, their careful analysis quantifies the visual impact of each of them. This quantification of the visual impact allows objective comparison of scenarios.

This paper provides a better understanding of the public perception for industrial spaces determinants factors and clarifies the role of mitigation measures that might change this perception.

In addition to restoring the traditional landscape, visual impact of industrial sites site can be diminished if the locations of new plantings are strategically chosen.

Special consideration was given to the most exposed to views - views from the main road to studied industrial development.

The final conclusion is that a proper planning proposal will help to improve the quantitative and qualitative aspects of an industrial site, which will lead to a drastic change of spatial processes related to this kind of areas and their effect upon rural landscape.

Large commercial or industrial construction should be designed so as not to interfere brutally in the landscape, being necessary a set of useful guidelines preparation.

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