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## Concrete versus green corridors in road planning. Gdansk case

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### Introduction

Urban structures are being increasingly cut by various technical barriers, in particular by the new or modernized roads connections. Their sizes are growing; accompanying infrastructure such as acoustic screens appear. This leads to the disadvantageous fragmentation of the urban tissue. Therefore urban landscape is being deformed. The separated parts of cities are becoming less accessible for residents. The functional, visual, environmental and social problems are growing and the need for solving them becomes essential. The presented article shows the threats and conflicts caused by new traffic systems forming concrete corridors. The possible mitigation methods such as the use of landscape architecture, EIA and green infrastructure for creating green corridors will be also presented. A planned, transit road in Gdansk called *Droga Zielona* will serve as a case study.

### Background of the research

There are many circumstances influencing road planning: spatial, functional, environmental, technical and visual. It requires complex and interdisciplinary approach. Usually many specialists from different fields of science and practice are being involved in these procedures. Processes of planning and designing are being followed by many spatial plans, expertises and studies. Having this knowledge and observing all these efforts, we have to pose the question, why do roads create problems in city structures so often? Why do they form concrete corridors and barriers? Why linear technical landscapes dominate city structures, instead of greenways? How to stop these tendencies?

There are many scientists and experts aiming to answer these questions, stressing functional, environmental and landscape threats, and promoting landscape planning, green infrastructure, environmental assessments (Benedict, McMahon 2006; Bélanger 2009; Dramstad, Olson, Forman 1996; Kowalski, 2007; McMahon 2000; Sandström 2008; Sarté 2010; Szulczewska 2009), but still we may observe many problems in practice. That means we should continue investigations, looking for the best and most effective solutions. There is not enough scientific literature, particularly in Poland, undertaking an effective mitigation of the implementation of road infrastructure. Especially it relates to use landscape architecture and green infrastructure in the urban areas negatively affected by roads. The presented research will discuss above problems.

## Goals and objectives

The aim of the article is to identify the nature and the scale of problems occurring in road planning and functioning, to present the threats which may be caused by the construction of the transit road inside the city structure, and to examine some mitigation measures aiming to eliminate or minimize environmental and landscape damages and social problems. It is particularly important to use the solutions thanks to landscape architecture, green infrastructure and an attempt to create green corridors instead of concrete ones.

The basic research question is how to avoid fragmentation of urban structures during road network planning, how to mitigate the effects of barriers, and how to solve environmental, spatial and visual problems in times of increasing investment pressure on the most valuable landscape areas in cities.

The detailed objectives are:

- examining the possibilities of more effective use of planning and design tools in sustainable development in relation to transportation that is a main reason of urban fragmentation,
- examining the possibilities of strengthening the real role of architects, urban planners, landscape architects in planning road network.

## Method(s)

Due to the complexity of the issues related to the subject of an article and due to the need for an interdisciplinary approach, a broad spectrum of available research methods have been used:

- multidisciplinary literature studies, e.g. green infrastructure, landscape planning, spatial planning, documentation related to case study
- examining the reasons and negative effects caused by road network planning and functioning
- diagnosis of the effectiveness of existing planning and design tools (landscape architecture, green infrastructure, environmental impact assessment - EIA)
- analysis of a number of interdisciplinary studies.
- examination of possibilities of connecting urban structures in an effective way by using diverse planning and design tools.

Theoretical guidelines and conclusions will be followed by the case study of *Droga Zielona* in Gdansk, Poland.

## Results

Literature studies and case studies were the basis to define some theoretical statements. In order to avoid problems connected with road planning and functioning, it is necessary to identify the diverse **reasons** of urban fragmentation. Theoretical and practical investigations indicate that they are a consequence of:

- uncoordinated investment pressure related to the implementation of various building projects,
- growing and often unjustified transportation network development,
- fast and not coordinated use of funds from European Union for infrastructure,
- the lack of a hierarchy of priorities in spatial policies,
- low effectiveness of existing planning and design tools,
- low public awareness of the consequences of cutting urban structures.

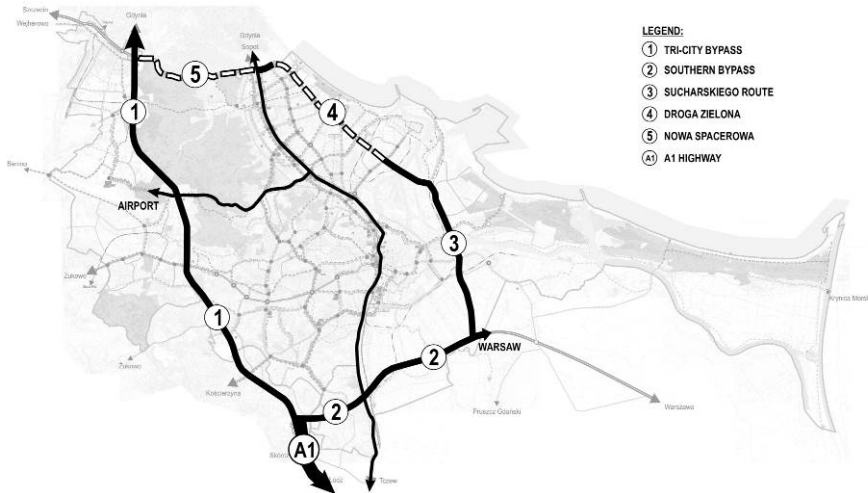
**Conflicts** arising from the road planning and construction may be divided into few general groups:

- spatial and functional: city's fragmentation caused by new roads' connections, functional disconnections, reduction of the density and compactness of cities, fragmented urban tissue, chaotic and uncoordinated development, bad functioning of neighboring areas fulfilling different role; a reduction of a quality of public space;
- environmental: such as destruction of natural values, pollution of soil, water and air, interruption of natural links, excessive consumption of non-renewable resources, huge demand for a land, occupying valuable undeveloped areas of cities that are often the last areas of natural beauty and landscape, as well as the growing congestion on roads, causing subsequent effects;
- visual and compositional: disconnection of compositional links, visual and functional chaos, transformation of an urban landscape into technical. To the negative effects of a growth and scale of transportation connections, the New Charter of Athens from 2003 adds creating the barriers, fragmentation of urban structures, transformations of landscape and visual changes;
- social: human health risk, the lack of security, social problems, the lack of continuity of public spaces.

### Case study: Droga Zielona in Gdansk, Poland

The presented case study illustrates the issues and conflicts arising during planning, construction and functioning of the part of road system in Gdansk, Poland. The main objective of the planned development of road infrastructure

is to complete so called *The Large Transportation Frame of Gdansk* that connects the main roads surrounding the city. The elements of the frame are already existing city's bypasses: the western *Tri-City's Bypass*, the *Southern Bypass* and *Sucharskiego Route* along with tunnel crossings the river *Martwa Wisla* which is about to be finished and the planned *Druga Zielona* together with *Nowa Spacerowa* street. All of them have to be two-lane roads of technical parameters enabling transit traffic (fig.1).

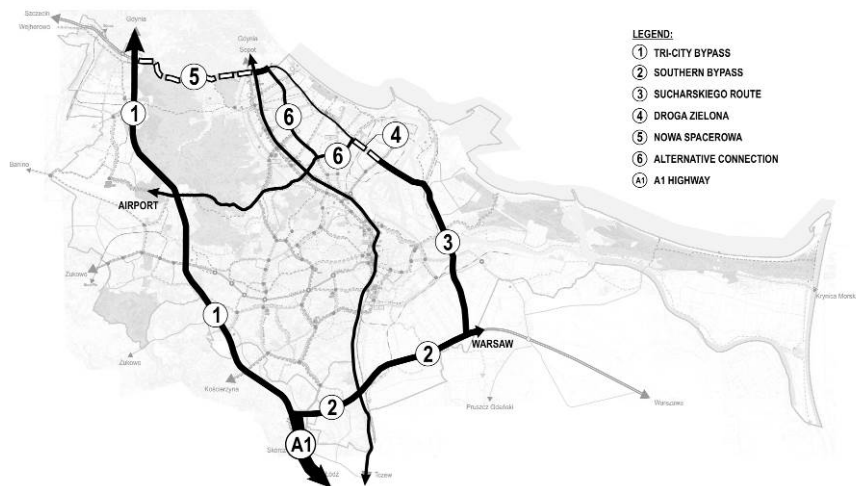


**Figure 1. The Large Transportation Frame in relation to the entire transportation system of Gdansk, based on Studium uwarunkowań i kierunków zagospodarowania przestrzennego Gdańska 2007, drawing by A.Sas-Bojarska, M.Rembeza, A.Durejko.**

One of the most controversial elements of the *Large Transportation Frame* is *Druga Zielona*, passing in between green coastal areas and big housing estates, creating the barrier cutting the city structure. It will separate unique Gdansk Coastal Strip from the city. This road is located in valuable and sensitive environment what may cause serious environmental conflicts and social problems. It will become a threat to the environment and landscape of coastal areas that are sport and recreational areas for inhabitants and tourists. This unique in Europe, a few kilometres length strip of coastal dunes, forests, parks and sandy wide beach creates an attractive landscape. New road, creating traffic, noise and light pollution, as a technical dominant, will totally change the unique character of the area. One of the most serious environmental impacts will be exposing the coastal area for the extreme traffic noise. This area is currently an area of silence that has a therapeutic impact on Gdansk's inhabitants, exposed to daily urban disadvantages, including noise pollution.

Another environmental threat is the possibility of contamination of drinking water, because *Droga Zielona* will run through the protected zones of underground water intake.

The better option for a development of transportation system in Gdansk is still possible - by elimination transit traffic from *Droga Zielona*. Heavy and transit traffic should be directed to the city's bypasses (Southern and Tri-City) through not so controversial alternative connection, using the existing and planned roads in the middle of the city structure (Fig.2).



**Figure 2. The alternative way of creation of transportation frame in Gdansk, based on Studium uwarunkowań i kierunków zagospodarowania przestrzennego Gdańska 2007, drawing by A.Sas-Bojarska, M.Rembeza, A.Durejko.**

Implementation of the presented strategy would preserve the accesses to the recreational coastal areas for inhabitants and tourists. Simultaneously it would preserve its environment, ecological values and touristic potential.

### **Discussion: Problems and mitigation**

The described problems prove that addressing this issues and developing new, effective approach in road network planning in Polish cities is important. The problems are the results of low effectiveness of existing planning and design tools. Although there are many planning tools, not all of them are effective. There is a lack of consequence, ambiguity in the interpretation, and frequent changes. Complicated and imperfect spatial planning system in Poland prevents in many cases the implementation of the sustainable development in urban planning. Therefore the evaluation of existing planning and design tools

is necessary. This will allow examining the ways of an effective use of existing planning and design tools such as: environmental policy, spatial planning, urban design, landscape architecture, green and blue infrastructure, EIA.

### Weaknesses of existing tools

The complicated planning situation in Poland in many cases precludes the real action for the implementation the principles of sustainable development in urban planning. Although there is a variety of planning tools, their inconsistency, ambiguity and constant changes make them ineffective. The spatial planning system in Poland cannot be assessed positively due to many circumstances. The reform of the Planning Law after 1989 aimed to increase the supply of investment areas in cities, which resulted in a significant liberalization of building regulations. The liberalization of law, acting as a natural reaction to a half-century of socialist system constraints, and stimulated by postmodern tendency to deregulation (Böhm, 2007), in practice, however, led to a significant fall in spatial management. According to many experts, the current planning system functioning in a market economy leads to rising chaos or even results in cluttering of the Polish space (Jędraszko, 2005).

### Some landscape planning tools for mitigation

Linking a city successfully is possible due to a better use of existing planning and design tools. Sustainable road planning is possible by using integrated tools and approaches related to many fields of science and practice. City structures should create resilient organism, in terms of integrated space, environment, society and transport system. The space between the neighbouring city structures should connect them, not divide, even if it is road corridor. Complexity of planning, long-term thinking about the city environment, are the ways to improve road planning, to protect existing values and minimize negative impacts. Considering urban context should be taken into account to protect local identity, environmental values, and to meet social needs. Taking all these guidelines into account during road planning potential problems should be minimized and city structures should be improved. However these commonly known theoretical guidelines are not always obvious in practice. We can observe many examples of creating new concrete and technical road corridors inside urban tissue, with no respect for landscape and greenway planning and not using such possibilities like green and blue infrastructure. Therefore the better use of chosen design tools for connecting urban tissue have been discussed below.

### *Landscape architecture within Environmental Impact Assessment*

One of the tools supporting spatial planning in Poland is the EIA, which may help minimize negative environmental and landscape impacts. In many

countries a methodology of Landscape and Visual Impact Assessment is being used in the framework of EIA. Studies of an existing landscape, assessment of the nature and importance of landscape and visual effects and identifying measures to minimize negative impacts are being conducted. Landscape architects play an important role in interdisciplinary teams of experts assessing potential threats of new activities, including roads, and define adequate mitigation measures. Unfortunately we observe the lack of landscape architects in EIA procedures in Poland. The landscape is generally marginalized by investors, policy makers and local communities, so the landscape threats are not being taken into consideration in decision making process. “Non-material” aspects, like landscape are usually ignored. Landscape is treated as isolated and a less important element of the environment, because it is not quantifiable. There is no systematic approach for prediction of landscape changes. It results in the landscape threats. In order to achieve effective protection and creation of landscape in the context of road planning, the appropriate status of the landscape in EIA should be provided. The cooperation between environmental, technical and human sciences should be guaranteed. Rich achievements of landscape architecture should be used to create well-functioning and attractive public space in areas surrounding the roads, because the landscape architecture is an important tool which may create better city image.

### *Green Infrastructure*

Green infrastructure is defined differently e.g. as: “*interconnected network of natural areas and other open spaces where are held and protected natural processes and ecosystem functions providing clean water and air as well as a wide range of benefits for people and nature*” (Benedict, McMahon, 2006). Most of definitions emphasize that green infrastructure should create a continuous system and should provide coexistence of different urban green areas, water systems and facilities of a technical infrastructure supporting the biological processes in nature. When designing engineering systems and objects, there are needed actions in different scales and interdisciplinary approach. However these natural and anthropogenic elements usually do not form a system but become a collection of random located and incoherent managed fragments. During creating such spaces, there is also a lack of cooperation between specialists from various fields. This results not only in the lack of using a potential of green infrastructure in e.g. retention of rainwater, preventing the flooding and improving urban climate, but also in negative environmental and landscape impacts. As a consequence the quality of city life is being reduced. According to the described drawbacks, there is a very interesting and wide spectrum of possibilities to use green infrastructure when planning the road network. Road system causing barriers is always accompanied by engineering infrastructure, which should be strengthen by



green infrastructure. Summarising, landscape architecture and green and blue infrastructure can be used during road planning. It is essential to investigate the effectiveness of the integration of activities in different fields. In particular:

- using knowledge and experience of different experts from such fields as: technical (transportation engineers, architects, landscape architects and urban planners), humanistic (sociologists, psychologists), environmental (geographers, biologists, environmentalists, ecologists),
- examining the possibilities of connections between landscape architecture and green infrastructure with a spatial planning and infrastructural system.

Using the EIA and green infrastructure in the described case study would sufficiently minimize potential negative effects. EIA of planned city road system, instead of separate EIA reports regarding only fragments of this system, would indicate serious environmental threats and would precise adequate mitigation measures. Key mitigation measure would be elimination of transit traffic from *Droga Zielona*, necessary to maintain the links between the sea-side belt and the city. Heavy transit traffic would be directed to the Southern and Tri-City bypasses. Moreover, such a solution would protect the water intake due to elimination of the increased pollution. Green infrastructure would integrate a city eco-system, supporting the biological processes in the city as well as inhabitants circulation between big housing estates and recreational areas, increasing human well-being. If the new technical barrier is created, minimizing negative effects, like building costly acoustic screens and new footbridges between park and the city, would be necessary. However even the best technical solutions will not solve all potential problems (like noise, air pollution or flashing lights created by new road) in this case.

## Conclusion

City fragmentation caused by new roads construction creates a lot of negative functional, spatial, ecological, visual and social impacts. The case of *Droga Zielona* in Gdansk is a good representation of it. In order to avoid negative impact, the humanization of roads planning and designing is essential. There are a lot of planning and design tools for implementation the principles of sustainable development in road planning in Poland, such as EIA, landscape architecture and green infrastructure. Combining the technical, environmental, functional, social and visual aspects can ensure the effectiveness of actions and neutralize the negative impact of city's fragmentation. As a consequence, a higher quality of the human environment in urban areas will be ensured. A development of road infrastructure should implement the strategy of moving

transit traffic out of the city and reducing the use of individual car traffic towards the development of public transport, cycling and walking. Achieving this will be possible when in the center of a city planning process is a man and the human dimension in a city's design. For this purpose a variety of tools should be used.

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