Sustainable Mobility in the Context of Humanization of the Urban Environment: a regional experience

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Abstract. The purpose of the research is to identify modern approaches to the spatial development of Belarusian cities. The article focuses on the role of transit-oriented design in spatial development of cities. The principles of ‘green urban construction’ and their implementation in pilot projects for urban areas reconstruction in Polotsk-Novopolotsk agglomeration are considered. The introduction of developed territory transformation models into urban planning practice was suggested. The participation of Belarus in international initiatives and projects relating to urban and transport planning are assessed. Organizational and institutional prerequisites for using the European experience of mobility management have been established. The scientific novelty consists in the study of the concept of sustainable mobility as a tool for territorial development and humanization of the environment with a focus on the conditions in Belarus.

1. Introduction
The city is not just a place on the map but also a reality that is formed by the feelings of each person; then it is transformed into a general idea that determines the image of a settlement. The quality characteristic of a city determines its attractiveness or competitiveness as a location for various types of activities [1]. Moreover, the city should be attractive not only for enterprises but also for the population, which is one of the most valuable resources for production facilities. It happens due to the globalization and an increasing role of qualified staff and innovations. Another target force cities are fighting for is visitors and tourists. It brings profit to local businesses and is an important carrier and distributor of information about a city, thus ‘putting it on the map’.

The most acceptable criteria among the many criteria of competitiveness for describing cities in the CIS countries are the following indicators: productivity (efficiency), employment, standard (quality) of life. The latter criterion directly depends on the problems of the spatial organization of the city such as lagging in the improvement of infrastructure facilities, excessive load on them, an imbalance of proportions in the general city plan structure and so on. The quality of life means not only economically integral space but also comfortable, aesthetically attractive and continuous urban environment. That is why the main message of modern spatial development is aimed at ‘humanization’ of the city due to which it becomes not only convenient for people’s lives but also contributes to their professional implementation, social and cultural development.
The quality of urban life is formed by many components, the most important of which is of course the accessibility of all its districts and main objects of urban infrastructure. The transport system determines the future of the city since it is intended not only for the current movement of people but also is a way to introduce urban development in the right direction. Transit-oriented design is one of the most effective directions of urban planning, which justifies the intensification of the use of urban territories and the need to implement interdepartmental strategic documents on spatial development [3]. According to it the transport framework does not only affect the architecture of the city but also, in fact, controls the usage and limits the growth of the territory, ensuring its connectivity and permeability. Thus following the principles of transit-oriented development it contributes to achieving sustainable mobility, which increases the competitiveness of cities by humanizing the environment and improving the quality of life.

The current planning system, which is typical for Belarusian cities, is not effective enough to implement the principles of transit-oriented design since the spatial development of the city is determined by master plans, the most obvious drawback of which is their failure to make the city convenient for life and attractive to businesses and investors as they are not integrated sufficiently into the urban management system and act separately from city services and the budget process [3]. The urban planning based on people’s standard work schedules does not correspond to their more complex and diverse needs, including the free mode of doing business, the active use of information technologies.

The problem of sustainable mobility cannot be solved successfully within the traditional transport planning, which is aimed at solving the problems of different means of transport, building infrastructure facilities and increasing the capacity of the road network. When planning sustainable mobility, efforts are focused on the development of integrated transport systems, intersectoral cooperation and the promotion of environmentally friendly movements. That’s why new tools such as sustainable urban mobility plans (SUMPs), which are based on the principles of sustainable development and system cross-sectoral integration, have proved successful in many European countries [4].

In the EU, where this innovation originates, the development of SUMP has become mandatory for cities with the population of more than 100 thousand people. It is held under the motto "Planning for people". The following official definition has been adopted: “A sustainable urban mobility plan is a strategic plan designed to meet the mobility needs of people and businesses in and around cities to improve the quality of life. It is based on existing planning practices and takes due account of the principles of integration, participation and evaluation” [4].

The SUMP concept is a pan-European success story and it is based on several important principles:
- coordination of development strategies in various sectors, including transport, land use, environment, economic development, social policy, health and security;
- coordination of actions by State bodies at various levels, as well as the interests of neighboring territories;
- involvement of residents and representatives of other parties interested in the planning process.

2. Implementation of SUMP in Belarus
The first attempt to develop and implement SUMP in Belarus was made in 2015-2017 as part of the project "From energy efficiency to urban mobility: introducing an approach for local participation in the development of sustainable urban mobility plan in Polotsk" [5]. The project working group, which controlled the development of the mobility plan, included representatives of the Polotsk District Executive Committee, city municipal services, several public organizations and businesses. The developers of the project were BelNIIPgradostroitstva (the Institute of Urban and Regional Planning) and the Belarusian Association of Transport Experts and Surveyors (BAES). As a result of the implementation of
recommendations developed by experts together with residents of the city the first segment of bicycle infrastructure was implemented. It was the first time in Belarus when the bike path was created through the traffic lanes and was separated with delineators, with bicycle parking appearing on its route. "From energy efficiency to urban mobility" project was the first in the field of transport in Belarus implemented with the involvement of the local population. Strengthening the capacities of citizens and social organizations, support to local authorities and other parties concerned contributed to the further participation of Polotsk in urban mobility planning projects.

Since 2016 the "Green cities" Project which was funded by the Global Environmental Fund and implemented by UNDP in cooperation with the Ministry of Natural Resources has been developed in three pilot cities – Novogrudok, Polotsk and Novopolotsk [6]. It is the implementation of initiatives related to sustainable mobility and energy efficiency that the promotion of the principles of green urban development in Belarus is based on. The most important tasks of the project are to establish intersectoral interaction, to develop partnerships and cooperation between cities, even at the international level. In particular, the project has developed unique documents for Belarus – a Integrated Sustainable Urban Mobility Plan for Polotsk and Novopolotsk and a Green Urban Development Plan for each city [7].

The goal of the green urban development plan “Novogrudok. Save the future” is a sustainable development in order to improve the quality of life. The activities will be implemented in three priority areas: comfortable and unique urban environment, territory transformation based on historical and cultural potential, the use of alternative resources in circular economy and the activities of urban facilities.

“Polotsk. Let’s build bridges”, a developed green urban development plan for the district center of Vitebsk region, solves the problem of bridge reconstruction and improving the links between the center and the suburbs. The plan provides for three themes: a diverse city, cozy environment and harmony with the nature. The action program involves strengthening community centers for the development of self-sufficient areas, encouraging the use of public transport and creating energy-efficient engineering infrastructure.

“Novopolotsk is new again. Version 2.0” plan is designed to increase the attractiveness of the city as a place to live and invest. The project involves the formation of a unified water-green system, the development of a closed-loop economy infrastructure, improving the comfort of living with the help of smart technologies and transit-oriented development.

It should be noted that the proposed models have been developed according to Polotsk and Novopolotsk agglomeration development. The formation of agglomerations does not require administrative integration of communities but involves coordination of their plans for social, economic, territorial and infrastructural development. The potential for agglomeration development wasn’t revealed in the plan for sustainable urban mobility for Polotsk which had been adopted previously, but its implementation was the basis of the first mobility plan in Belarus for the two cities [9].

The main guidelines for the development of new quality mobility systems in accordance with the Integrated Sustainable Mobility Plan developed by experts of the Belarusian Transport Workers Union are to be the following principles of green urban development [10]:

- Compactness: a) building without gaps; b) connectivity of urban areas between each other and the public transport system; c) service and job availability;
- High density: at least 15,000 people per km2, that is 150 people/ha;
- Mixed land use: multi-purpose territory use which is characterized by a combination of several types of functional land use;
Social balance: the availability of housing in different price ranges in all areas of the city, which provides social and economic stability due to the fact that people with different income levels live in the same part of the city;

Sufficient street space and an efficient street network: the density of streets, pedestrian and bicycle paths should be at least 18 km of streets per km²;

Transit-oriented development: organization of blocks or neighborhoods around public transport stops due to dense and multifunctional development with a gradual decrease in the intensity of land use from the center to the district;

Accessibility of green areas: placing of at least 90% of planned and existing housing within the walking distance (400 m) of green areas.

Polotsk and Novopolotsk, which are developing as conurbations, illustrate a characteristic global trend: the transition to agglomeration development [11]. Territorial proximity, established economic, social and cultural links make these “paired” cities partners in solving many problems. That’s why it is necessary to develop a common position on the territorial development of the agglomeration. Communities are recommended to integrate the main aspects of urban planning and transport policy in order to determine the vector that will be used for building and placing attraction points. The Integrated Sustainable Urban Mobility Plan for Polotsk and Novopolotsk allows cities to solve regional problems of demand for public transport and congestion caused by excessive use of personal cars. Joint efforts contribute to the creation of comfortable urban environment and reduction of forced trips of citizens.

The development of new territories, the revitalization of industrial areas and the conversion of dying enterprises require mutual agreement [8]. For example, the village of Ekiman which is situated at the junction of the cities has territorial reserves and can turn into an ecological corridor, a well-equipped zone with a set of objects and public spaces attractive to businesses and the population, and it can become a kind of ‘bridge of activities’ between Polotsk and Novopolotsk (figure 1).

An equally important component of the joint activities of the cities concerns the outline of the structure and milestones of the formation of an integrated transport system and mechanisms for mobility management. The development of a tram network connecting the cities as a coherent whole will be the best solution for the reasons of productivity, social and environmental parameters, but it involves significant external resources, namely bank loans guaranteed by the government.

3. Case study: pilot projects for Polotsk-Novopolotsk agglomeration

Taking into account the recommendations of the Integrated Sustainable Mobility Plan, MLA+ experts developed pilot projects for the transformation of two residential areas in the Polotsk-Novopolotsk agglomeration, illustrating the application of the principles of green urban development in Belarusian cities [12],[13][13]. The provisions were supplemented by the corporate principles of the consulting bureau: inclusion of the object in the city structure, its identity, structure and flexibility. On the results of workshops with the participation of residents, representatives of the administration and local businesses the overall goals of the projects have been determined. Further, the versions of the transformation proposed by the architects were combined into an integrated version that takes into account the advantages of all the concepts and suggestions made by the residents.

The transformation of urban areas which are experimental sites for green development will be an example of consistent implementation of Green Urban Development Plans [7]. The conceptual models of transformation are assumed to be used in the future by city administrations as initial documentation for making decisions about their further spatial development, namely architectural and engineering preparation for the implementation of investment projects, design and survey work, preparation of acts of land selection.
for construction objects. Following the transformation models helps to increase social and economic value of territories, ensure environmental diversity, sustainable mobility and equal access to basic urban services. Orientation to the proposed models also contributes to the formation of a continuous, clear and diverse urban water and green space network, well-planned and filled public areas, visual identification of the block boundaries and the status of land within districts.

The first transformation model is based on the concept of a compact city [12]. The territory under consideration, which is a residential area of mainly estate development “Gromy”, is adjacent to the Central district of Polotsk but it is separated from the district by railway tracks and a production zone along them (Figure 1). The transformation project requires the preservation of the district's identity in the urban village format. An alternative vision of land use provides for the streamlining of the road and street network, the formation of a well-maintained public space system and functional differentiation of development due to the redevelopment of stagnant enterprises which increases the attractiveness of the district within the agglomeration.

Only the industrial zone along the railway and the garage cooperative are undergoing intensive transformation to create new places of residence and work. Their reconstruction will increase the permeability and connectivity of the urban fabric. A new level of mobility in the private sector will be provided by a developed network of intra-district public transport which is not linked to railway crossings. The reconstruction of the main streets will improve the quality of walking and cycling. The formation of a continuous green network will not only reveal the recreational potential of the territory but it will also solve existing environmental problems with water disposal. It is emphasized that the proposed scenario of spatial development is associated with support for small businesses and an increase in people's self-organization concerning territory management.

![Figure 1. Polotsk-Novopolotsk agglomeration. Source: own work.](image)

This transformation model will be relevant for historically formed large Belarusian cities, whose structure is divided by railway tracks and whose significant share in the land balance is occupied by estate buildings with a homogeneous plan structure. The developed model is applicable to such areas as Selhoztehnika, Pustynki, Zalinejnyj (Orša), Leninskij, Chapaeva, Festivalnyj (Mogilev), Peskovatik, Železnodorozhnyj (Vitebsk), Staroborisov (Borisov) etc.
The second pilot site for testing the principle of transit-oriented development was the 9th microdistrict of Novopolotsk which is adjacent to the village of Ekiman [13]. The 9th microdistrict is located at an equal distance from the centers of both cities and is adjacent to the main transport corridor called Molodežnaja street. This creates all the prerequisites for the formation of a new center of polycentric agglomeration here, where objects and places of employment for residents of both Novopolotsk and Polotsk can be located. In contrast to the project discussed above this site is not fully developed, but it already has negative features typical of the microdistrict development, namely monotony, abandoned territories, chaotic landscaping, etc. According to the authors’ intention the transformed area should have a unique character due to the inclusion of modern typological units of development in the planning framework which will emphasize the peculiarities of the area and reveal its natural potential.

The second model is relevant for most cities in Belarus, whose characteristic is a dynamic growth of the “greenfield development” type due to the development of free territories for residential development [14]. Unfortunately, the prevailing type of development remains the microdistrict which, in practice, is characterized by secondary implementation of social infrastructure. It leads to gaps in the urban fabric and prevents the formation of quality urban environment (districts of Mihalova, Kamenna Gorka (Minsk), Microdistrict-7 (Bobrujsk), Vulk (Brest), etc.).

Both transformation projects are aimed at strengthening the connectivity of territories and the planned areas themselves are considered to be attractions in the context of the Polotsk-Novopolotsk agglomeration. According to the Integrated Sustainable Mobility Plan the sustainable development of the agglomeration is associated with the organization of a high-speed tram route between cities, the implementation of which was made possible owing to the “Green cities” project. The project also involved the implementation of some local technical activities that improve the general conditions of mobility in the agglomeration, particularly the construction of a bicycle path using the optimal route through the village of Ekimany. In addition to formation of bicycle road network the development of bicycle infrastructure in Polotsk and Novopolotsk involves the installation of five bicycle garages for 100 seats, bicycle parking, the opening of bicycle cafes, repair shops and rental outlets. According to the project public transport stops will be replaced, information boards will be installed, adaptive control system to synchronize traffic lights will be implemented.

4. Belarus and the international initiatives for sustainable mobility

A number of completed studies, the Integrated Sustainable Mobility Plan for the Cities of Polotsk and Novopolotsk in particular, became the basis for a constructive dialogue between the Novopolotsk City Executive Committee and the European Bank for Reconstruction and Development, during which a memorandum of cooperation was signed and work on an investment project to finance a new tram line connecting two important centers of the northern region of Belarus was started.

Issues of sustainable mobility were also a priority for the “Novopolotsk - from an inclusive school to an inclusive city” project funded by the European Union. One of the goals of the project was the organization of gradual formation of accessible urban environment based on the principles of universal design on the site of and its surrounding area. They plan to use the creation of continuous inclusive routes in the reconstruction of other parts of the city.

The development of public transport as well as the development of an innovative tool such as plans of sustainable urban mobility are identified as priorities in the National Action Plan for the Development of the Green Economy [15]. This document focuses on a more active participation in the European Union's Covenant of Mayors for Climate and Energy initiative, which brings together cities and districts that have
made voluntary commitments to reduce greenhouse gas emissions and adapt to climate change [16]. Polotsk was the first city in Belarus to join this initiative in 2011, 45 other cities followed.

In 2015 Belarus along with 193 countries approved the 2030 Agenda for Sustainable Development and expressed support for its implementation by achieving 17 sustainable development goals (SDGs) [17]. 78.4% of the Belarusian population lives in cities, while the localities occupy only 11% of its territory. Being the most urbanized post-Soviet country, the Republic must pay special attention to SDG 11: "Sustainable cities and communities" [18]. A number of Belarusian cities have joined the international initiative CIVITAS, which is a network of local authorities, public organizations and transport experts from hundreds of cities across Europe. The main goal of CIVITAS is to help cities develop environmentally friendly and sustainable transport [19].

The sustainable mobility theme is recognized by Belarusian cities as particularly acute which is proved by the activation of their participation in the international European Mobility Week campaign [15]. Only in the last five years the number of participants from Belarus has grown from 3 to 76, which made it possible to enter the top ten leaders of the campaign. The most interesting initiative is the World Bank’s Eco2 Cities: Ecological Cities as Economic Cities” (Eco2 Cities: ecological cities as economic cities). Its main aim is to help cities in developing countries achieve greater environmental and economic sustainability. Eco2 Cities is an approach to sustainable urban development based on universal principles, as well as the use of a set of tools that simplify self-assessment process and ensure integrated decision-making.

In February 2018 the World Bank has approved the partnership framework with Belarus for 2018-2022. The projects aimed at meeting SDGs will get 570 million dollars also the willingness was expressed to provide an additional loan of 100 million dollars for energy-efficient projects. The collaboration between Belarus and the World Bank on urbanization and sustainable urban development has not yet been established but it is of great promise. Belarusian cities have great opportunities to use international technical and humanitarian assistance in other programs aimed directly at the transport sector: CIVITAS, Smart Energy, and Marco Polo [15].

5. Conclusions
It is impossible to imagine an urbanized society without constant communication and movement. The relatively new concept of “sustainable mobility” symbolizes the human freedom in his/her spatial movement which does not harm the environment and the health of other people, the interests of future generations are taken into consideration. Globalization and large-scale urbanization along with technological innovations and the digital revolution are rapidly changing the world around us, the structure of the economy and the way people live. In the foreseeable future the transition of Belarus to a new technological economy will become more active. As a result, comfortable urban environment, the quality of which is one-third dependent on mobility conditions, becomes a more valuable equity and a source of economic growth. Unfortunately, strategic documents aimed at integrated development (integration of territorial, social and economic planning) of cities and communities in Belarus have not yet been developed. This situation hinders the development of many activities at the city level. The activities are associated with improving the quality of people’s life which is an integral indicator of sustainable development.

Sustainable Urban Mobility Plans (SUMPs) are recognized as the most promising tool for urban development, their development methodology having proved to be effective. The methodology is quite applicable in Belarus but to activate SUMP development this new tool should be supported by appropriate institutions as well as by the adoption of appropriate legislation.
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