

Railway Lines - the Potential Spine for the Future Post-Soviet Cities Growth

Mikhail Stepura, BNTU, Belarus

1. The Future of the Inner City Railway Transportation

Currently, the post-Soviet cities face a number of urban problems, among them: a rapid increase in the level of car ownership and deficit of urban areas for new construction of housing and public facilities. At the same time the inner city territories have a lot of potential and can be densified: there are a lot of inefficiently used communal, storage as well as industrial areas in the central and middle zones of cities.

The post-Soviet cities have filled the capacity of their road based transport systems, traffic jams have become a familiar and inevitable phenomenon. The consequences of traffic jams are well known: congestion leads to a significant consumption of time and resources, it has a negative impact on the environment. The experience of other countries shows that the construction of the road network alone does not help to cope with this problem.

Public transport has to be developed. The advantages of public transport are well known: large carrying capacity, safety, a significant speed (for modes of transport separated from general traffic), smaller environmental impact, cheaper price, etc.

The traffic jam problem has to be dealt with by simultaneous development of high-speed public transport mode (railway based transportation) and the development of the areas running along the railway lines. The station nodes have to be especially intensified.

2. Railway Lines Today: Problems and Potentials

The construction of railways at the territories of modern post-Soviet countries began in the second half of the 18th century. At that time, the main lines were traced to connect the major cities of the Russian Empire. Settlement, which was built by the railroad, received a new impetus to development. The railroad had a very big influence on the city development: at the same time railway infrastructure has occupied significant urban areas, new architectural and urban railway facilities (passenger and freight stations, station squares, etc.) were built. Areas adjacent to the railroad were occupied by industrial enterprises and settlements for industry workers.

After the Second World War, railway construction was mainly associated with the construction of access lines to industrial sites. Currently, the main railway framework in cities is not undergoing major changes, and even not all of the existing lines are fully engaged.

Case study – Minsk, Belarus

Minsk, the capital of Belarus, is taken as the case study for the analysis of problems and potentials, associated with the use of railway infrastructure. These problems and potentials are universal to most of post-Soviet cities.

In Minsk, the density of rail lines with passenger traffic is relatively small, but the location of these lines in the planning structure is very distinct - they pass radially through the city, connecting in the central part of the city with two stations, one of which serves suburban and long distance connections, and the other - only suburban.

Areas adjacent to the railway lines are artificial boundaries in fabric of the city, dividing it into four large fragments. The areas in the central and middle zone are mostly occupied by industrial, storage and service facilities, the areas in the peripheral zone are treated as sanitary protection gaps and are usually filled with garages, parking lots or are not used at all.

The total length of railway lines with passenger traffic in the city of Minsk is 45.4 km, the number of stations is 17, and the average distance between them is 2.7 km. According to expert estimates, the area of the territory adjacent to the railway stations, which is currently not used or used inefficiently and thus may be subject to urban transformation is about 370 hectares.

Territories along the railway lines have great potential and with proper complex development could become a focus, an alternative spine of city development.

Currently, Minsk is working on the program of the new inner-city railway – a new kind of public passenger transport. The program includes the following activities, most of which have been implemented to date:

- acquisition of the new train carriages that meet the modern requirements of comfort for passengers (Figure 1);
- reconstruction of existing railway tracks and construction of the third track to increase network capacity and the frequency of movement in the central parts of the network;
- reconstruction of the stations with the construction of new lounges, platforms with canopies etc.



*Figure 1 – Presentation of the new train carriages for the inner-city railway in Minsk, 2011
(Source: Belarusian Railways)*

After three years of active implementation the program did not meet its main task – the number of passengers using rail transport for local communication has not increased significantly.

Perhaps this is due to the fact that reconstructive and organizational activities are carried out only by the Belarusian Railways, which determines certain one-sidedness in the ongoing

activities. The activities take into account exclusively issues that are associated with the quality of train carriages and increase in the capacity of individual lines. At the same time, the areas adjacent to the stations remain unaffected by urban development transformation (Figure 2).



Figure 2 - "Minsk-Paunochny" station and adjacent territory, 2012

3. The System of Public and Transport Nodes

3.1 Model and Implementation Program

The Model of Transport and Public Nodes is proposed to coordinate integrated development of the areas along the railway lines in conjunction with the development of the inner city railway transportation system. The Model includes implementation strategies.

The Model of Transport and Public Nodes for the city of Minsk consists of two rail lines and 22 nodes. 10 nodes are formed on the basis of existing stations, 5 – based on existing stations, which need to be relocated closer to the main city streets, 7 – are proposed for new construction (Figure 3), 3 of them are indicated the city General Plan and the City Transportation Scheme (Akentyev, 2010).

For the successful functioning of the Transport and Public Nodes System the following actions have to be taken:

Measures of organizational nature, which must be taken by Belarusian Railways:

- removal of freight traffic and freight marshalling yard outside the city. In the immediate suburbs of Minsk there are rail lines that go around the city and can accommodate the transit of freight trains. However, the existing freight yard, located in the middle zone of the city, generates the movement of freight trains in the city. This has a negative impact (noise, vibration) on areas adjacent to the railway lines and holds back the development of these areas. Relocation of freight traffic will increase line capacity;
- installation of additional tracks to increase the capacity of the lines;
- modernization of the existing tracks with the use of modern technologies to reduce negative impacts (noise, vibration) on adjacent areas, thus reducing sanitary protection gaps of the railways and contributing to the development of large city areas (incl. central parts).

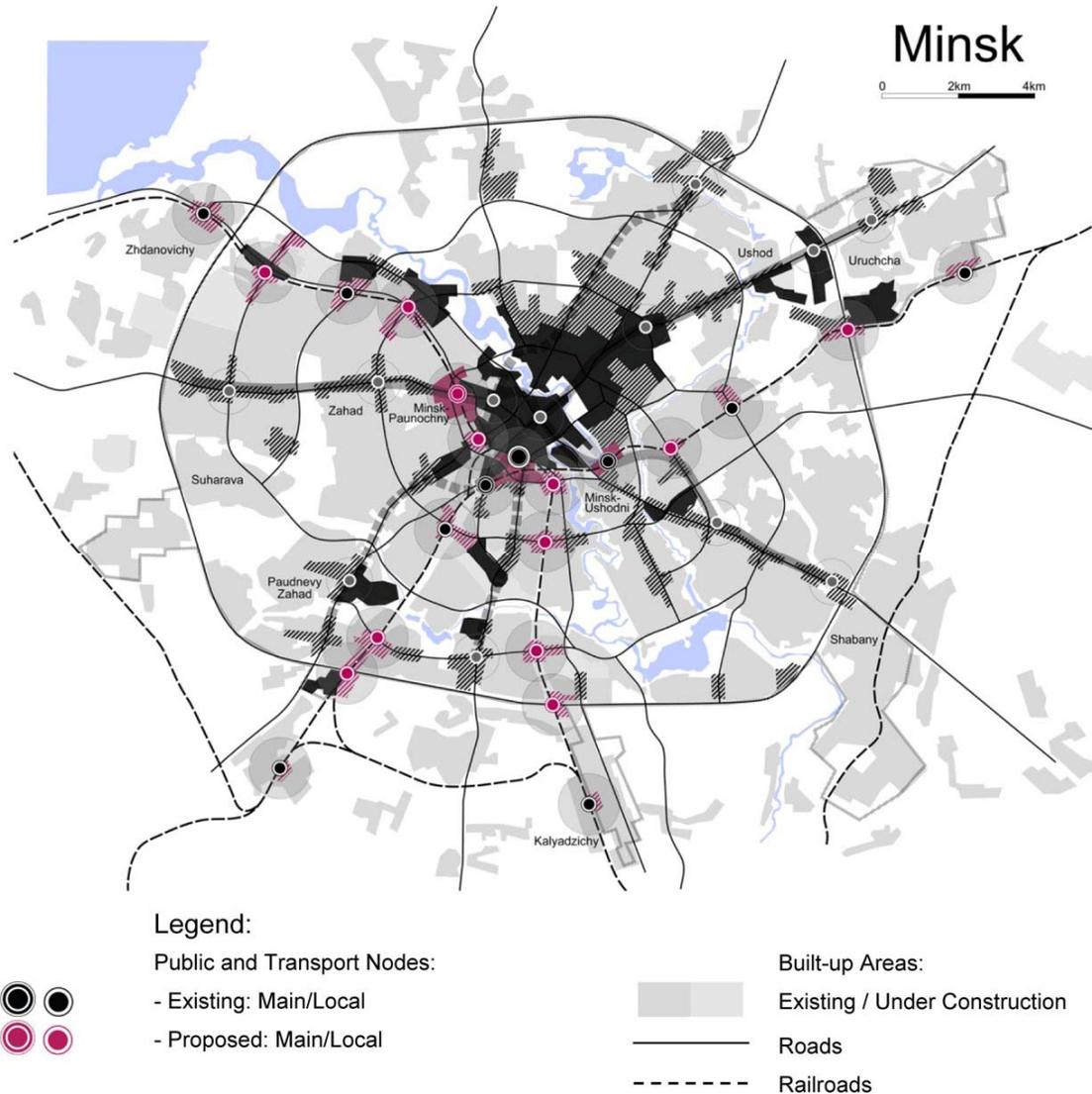


Figure 3 – Proposed system of Public and Transport Nodes for the city of Minsk

Measures of organizational nature, which must be taken by Belarusian Railways jointly with the city authorities:

- construction of new stops (stations) on the railway lines. The distances between the stations should be about 1500 m in built-up areas and 2000 - 2500 m in nearby suburbs. In total, according to expert estimates, Minsk requires 5-7 new railway stops (stations);
- relocation of the existing stopping points that do not provide a convenient connection to other modes of public transport, are located far from existing or planned transport infrastructure and residential areas. Minsk has to relocate 7 passenger stations.

Construction of transport infrastructure, which must be fulfilled by the city authorities:

- construction of overpasses crossing the railway lines, in conjunction with the construction of several important ring roads and arterial roads. This will enable the through movement of public transport (and private vehicles) for fast delivery of passengers to the high-speed railway transport from remote areas of the city;
- construction of local streets and turning rings, which will enable movement of public transport (and private vehicles) and will ensure easy access to the station for the inhabitants of the surrounding areas.

Measures of organizational nature, which must be taken the city authorities, represented by the operator of public transport lines:

- operation of bus/trolleybus routes feeding to the railway stops (station).

Measures of organizational nature, which must be taken by Belarusian railway and the city authorities, represented by the operator of public transport lines:

- introduction of a single transport document (electronic travelcard) which would allow residents to enjoy all kinds of public transportation in the city and suburbs. (These types of travel documents are already in use in many cities and regions of the world.) This will allow passengers to save time and money when buying tickets, will give greater flexibility in route planning and, ultimately, will increase the competitiveness of public transport use over the private car usage;
- opening of an advertising campaign to create a more positive image of public transport.

The above mentioned measures/actions will help to create a complete new system of public transport and ensure its smooth operation.

3.2 Nodes Design Guidelines

The Transport and Public Node as referred to in this work is the territory within a radius of 800 meters around the inner city rail station, which is planned and functions in a way to increase the railway passenger traffic.

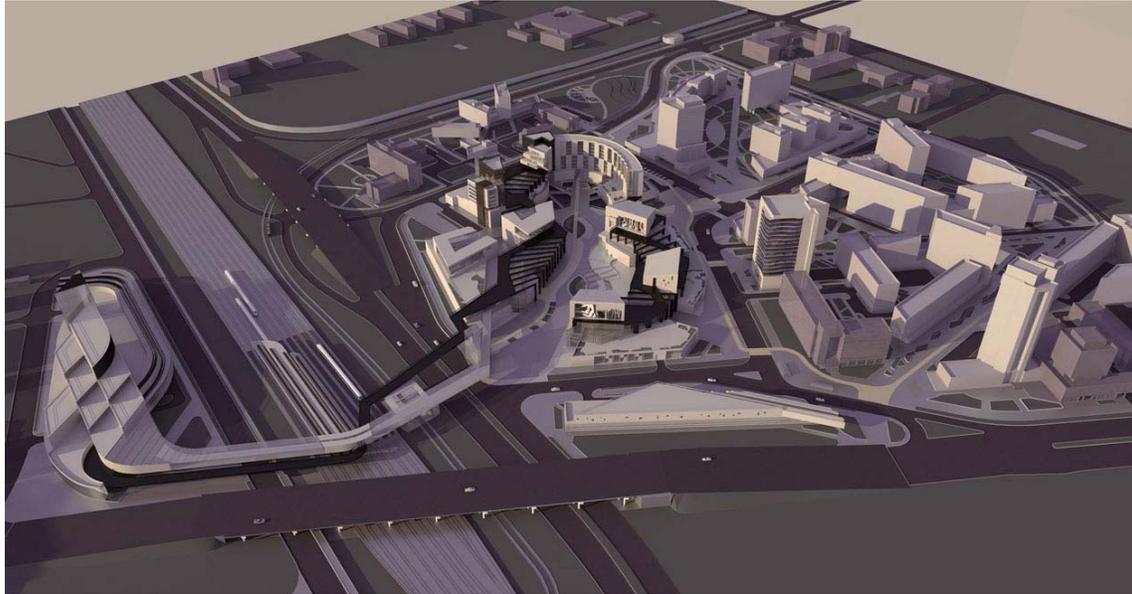
Radius of 800 m is defined based on the analysis of the station catchment zone. According to surveys, done by the author in Minsk, 800 meters is the maximum distance that residents of surrounding areas are ready to walk to the nearest station.

Each Transport and Public Node is a unique urban element which has its own characteristics, but there are general guidelines that should be reflected in all design decisions:

- Transport and Public Node shall be designed as a high-density area, with a multifunctional use (Figure 4). It is necessary to bring potential passengers to stations, so it is important to have sufficient concentration of homes, places of employment, public facilities etc. surrounding the station. The construction of objects of different functional purpose (from the residential to the cultural and entertainment) within the Transport and Public Node will create a vivid city sub-center that operates 24/7.
- Transport and Public Node has to be pedestrian friendly. Pedestrian paths and spaces come first, car driveways should be designed as a supplementary item. It is necessary to ensure maximum convenience for passengers, approaching the station from the adjacent territories, as well as for those who transfer from other modes of transport.
- It is necessary to ensure high quality design of the Transport and Public Node. The Node has a potential to be a city sub centre, an architectural ensemble, that will seamlessly blend into the surrounding context, providing high-quality and well-organized environment for the residents.
- It is necessary to consider the Transport and Public Node as a bridge that allows linking the urban fabric split by the rail. Construction of the Node reduces the negative impact of the railway infrastructure on the surrounding area. It opens the possibility of creating new links between the areas previously separated by the railroad lines. In exceptional cases the railway infrastructure can be completely isolated - covered, the important city public buildings and spaces, city parks can appear on top.

The System of Transport and Public Nodes will be built within the already built-up areas, will require their reconstruction: new Nodes will be formed in areas that today function as storage areas, sanitation gap etc. An entirely new city structure will form; it will consist of public centers, focused not on the streets for cars, but on the railway lines and the new fast public transportation mode. This will be a completely new system of centers of attraction, which will diversify the city's service system, will place new facilities in previously inaccessible areas. There is also room for current city centre development; the new Nodes at the border of the central zone can accommodate future construction.

The proper development of the System of Transport and Public Nodes requires the co-work of the city authorities and Belarusian Railways. At further stage of the development program private investors have to be invited to participate.



*Figure 4 – Proposed development of the area around “Minsk-Paunochny” station
(Project by P.Nishchenko, 2012)*

The System of Transport and Public Nodes can be established in most of the big post Soviet cities based on their existing assets – the railways and their underutilized potential – extensive territorial resource next to the railway lines within the built-up city areas.

References:

Akentyev, Alexander (2010) “Correction of Minsk Masterplan”, *Arhitektura I Stroitelstvo*, Vol.4