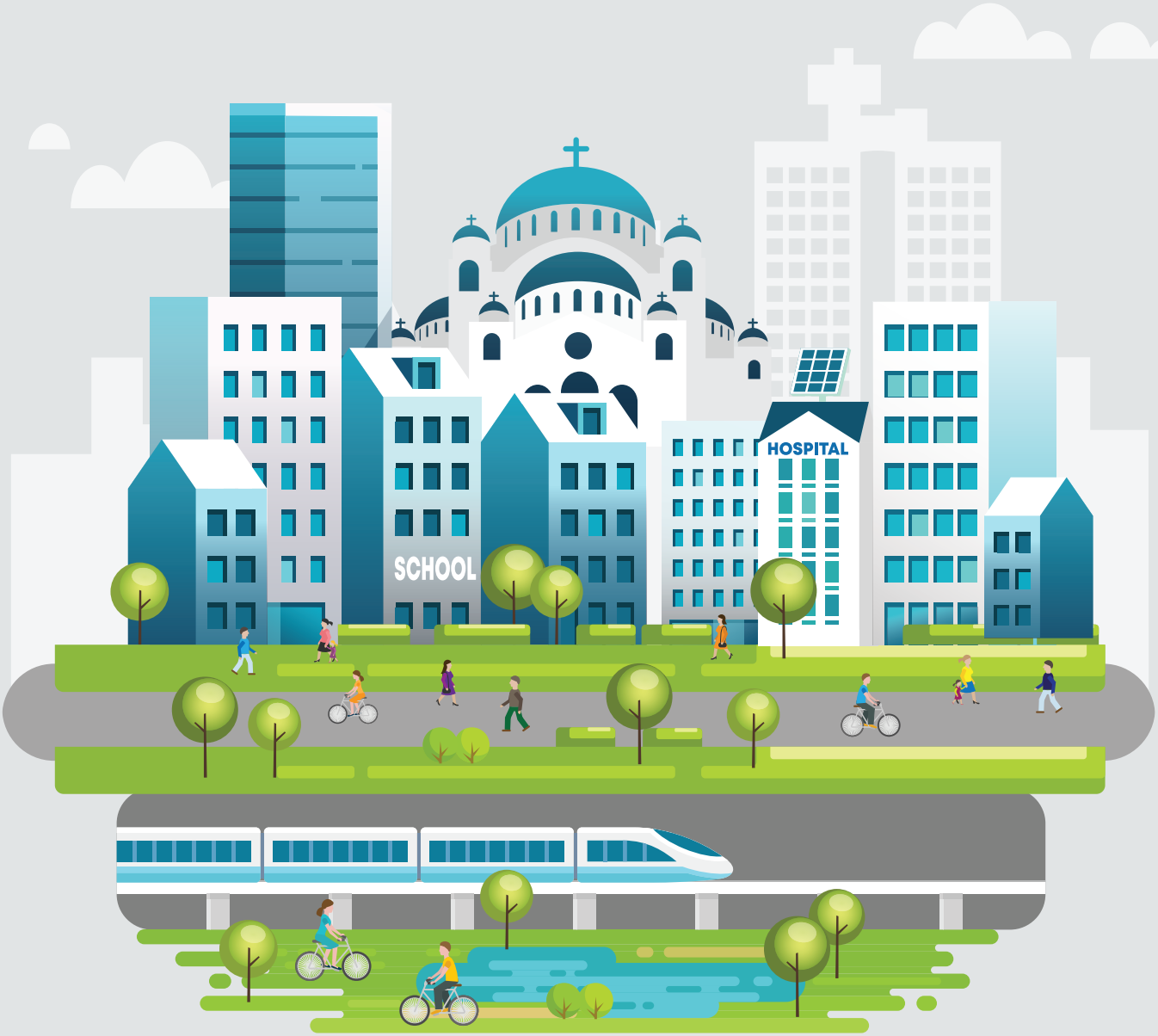
TOWARDS A TRANSIT ORIENTED DEVELOPMENT APPROACH FOR BELGRADE



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Towards a Transit Oriented Development Approach for Belgrade

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Introduction

The purpose of this report is to explore opportunities to better integrate land use and public transit planning in Belgrade. Specifically, the aim is to develop an approach toward Transit-Oriented Development (TOD) for Belgrade building off the city's recently approved Transport Master Plan (2017).[1] The Transport Master Plan, which is to be implemented over the next 16 years (through 2033), includes all modes of transport: automobiles, public buses, trams, metro, and commuter rail service (known as BG Voz). The required total investment is estimated to be over 400 million euros excluding the metro project. Thus, implementation will require large sums of money for both capital and operational expenses, while the city has limited financing resources. Given the fiscal constraints, it would be prudent for Belgrade city authorities to explore self-financing project schemes for urban transit and land development, incorporating land value capture (LVC). This report evaluates the Transport Master Plan together with other available data to find ways to realize TOD and LVC in Belgrade, including identifying current gaps in knowledge towards such a goal.

There are several large-scale, long-term urban development projects envisaged for Belgrade such as development of the Makis Polje area and Waterfront Railway Yard Conversion Project and the Waterfront. Redevelopment at Ada Huja (Figure 1). The Transport Master Plan considers these developments as a given. The projected future populations in these sites serve as the base to model future traffic demand, and to evaluate the proposed transport investment projects. The Transport Master Plan recognizes the need for detailed planning and economic verification of these urban development schemes.

Figure 1: Public Transit and Urban Land Development Projects in Belgrade

Source: Routes extracted by the author from the Transport Masterplan

1 The Transport Master Plan (also known as the 'SMARTPLAN') was prepared with support from the European Bank for Reconstruction and Development with consulting support from Juginus, WSP, and Parsons Brinckerhoff. The publicly available version of the Transport Master Plan (SMARTPLAN FINAL REPORT) is at: http://www.beograd.rs/images/file/1e96abdfc0ae1c58aea41f15b325d2aa_2477873010.pdf.

Existing Situation

Population Trends

The total population of Belgrade City was approximately 1.66 million in 2011, growing around 5.3% from 1.58 million in 2002 (Census 2011). However, there are large differences in the direction of population change among the areas of the city (see table 1). Stari Grad and Zemun, two historic downtown areas, showed the largest declines of 12.8% and 12.2% respectively. The largest increases were recorded in Zvezdara with 14.5%, followed by Palilula with 11.3% and Grocka with 11.2%. All three of the fast-growing municipalities are located east of downtown. There is a strong trend of population hollowing out from the center to the peripheries within a 10-km radius.

Table 1 : Population of Belgrade by Municipality 2002-2011

Municipality	Classification	Area (km^2)	Population 2002	Population (2011)	Change 2002-2011
Čukarica	urban	156	168,508	181,231	7,6%
Novi Beograd	urban	41	217,773	214,506	-1,5%
Palilula	urban	451	155,902	173,521	11,3%
Rakovica	urban	31	99,000	108,641	9,7%
Savski Venac	urban	14	42,505	39,122	-8,0%
Stari Grad	urban	5	55,543	48,450	-12,8%
Surčin	urban	285		43,819	-
Voždovac	urban	148	151,768	158,213	4,2%
Vračar	urban	3	58,386	56333	-3,5%
Zemun	urban	154	191,645	168170	-12,2%
Zvezdara	urban	32	132,621	151808	14,5%
Barajevo	suburban	213	24,641	27110	10,0%
Grocka	suburban	289	75,466	83907	11,2%
Lazarevac	suburban	384	58,511	58622	0,2%
Mladenovac	suburban	339	52,490	53096	1,2%
Obrenovac	suburban	411	70,975	72524	2,2%
Sopot	suburban	271	20,390	20367	-0,1%
Urban Total		1,320	1,273,651	1.343.814	5,5%
Suburban Total		1,907	302,473	315.626	4,3%
Total		3,227	1,576,124	1.659.440	5,3%

Source: Statistical Office of Serbia, http://webrzs.stat.gov.rs/, Census 2002 and 2011

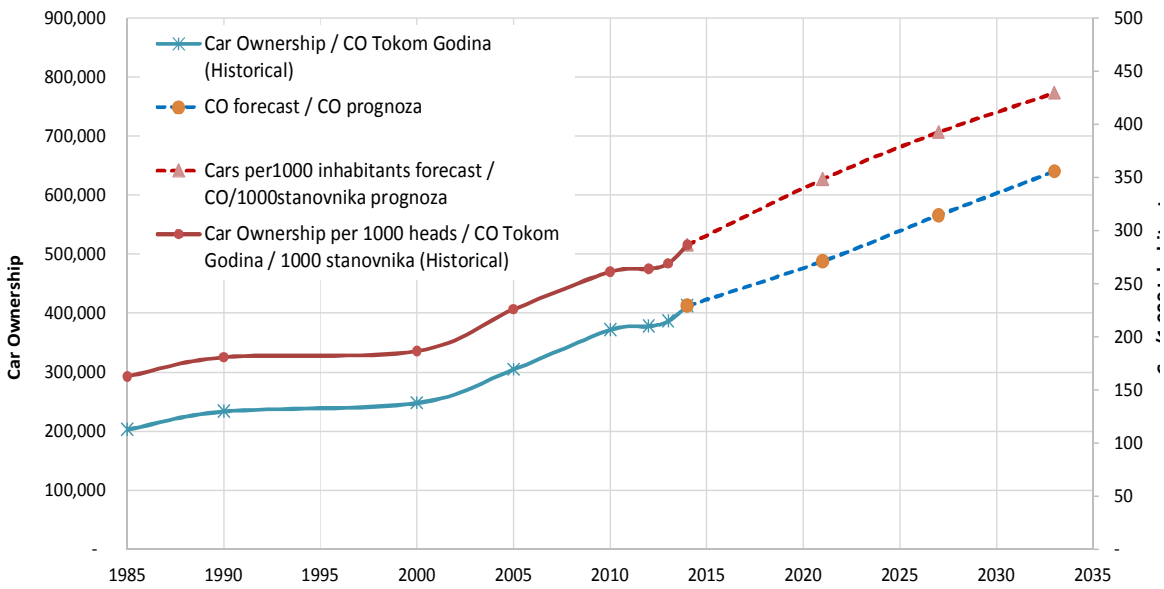
One key demographic concern is growth of the aged population. In 2002, 22% of the city population was over 60 years old. The same age group grew to 24% in 2011. Since the total fertility rate of Serbia was only 1.46% in 2015 this trend is likely to continue. Coincidentally, this is the same rate as Japan where the aging population is considered one of the most serious societal challenges.

Current Traffic Situation: Are There Traffic Jams in Belgrade?

According to the Transport Master Plan, there is a strong trend towards automobile ownership, which is bound to increase road traffic demand as shown in Figure 2. Based on assumed economic growth, the car ownership model predicts that ownership levels will reach some 429 cars per 1,000 inhabitants by 2033. Given the fact that EU countries achieved 460 cars per 1000 population in 2000, this trend is inevitable. However, a higher level of car ownership does not directly translate into vehicle trips in these countries.

Due to the high level of public transport mode share, the road traffic situation is deemed acceptable. Figure 2 shows traffic congestion levels with A at a free-flow level and F at an extremely congested level. The model adopted in the Transport Master Plan predicts that only around 1% of junctions will reach the extreme level of congestion in 2021, while close to 15% of junctions will experience extreme congestion in 2033. The average volume to capacity ratio is predicted to increase from 0.43 in 2015 to 0.61 in 2033. Traditionally 0.5 is considered as a threshold. It appears that traffic congestion is a problem at some major junctions during morning peak hours in Belgrade, and the same situation may be maintained if the relatively high level of public transport share is sustained.

Figure 2: Car Ownership Growth in Belgrade

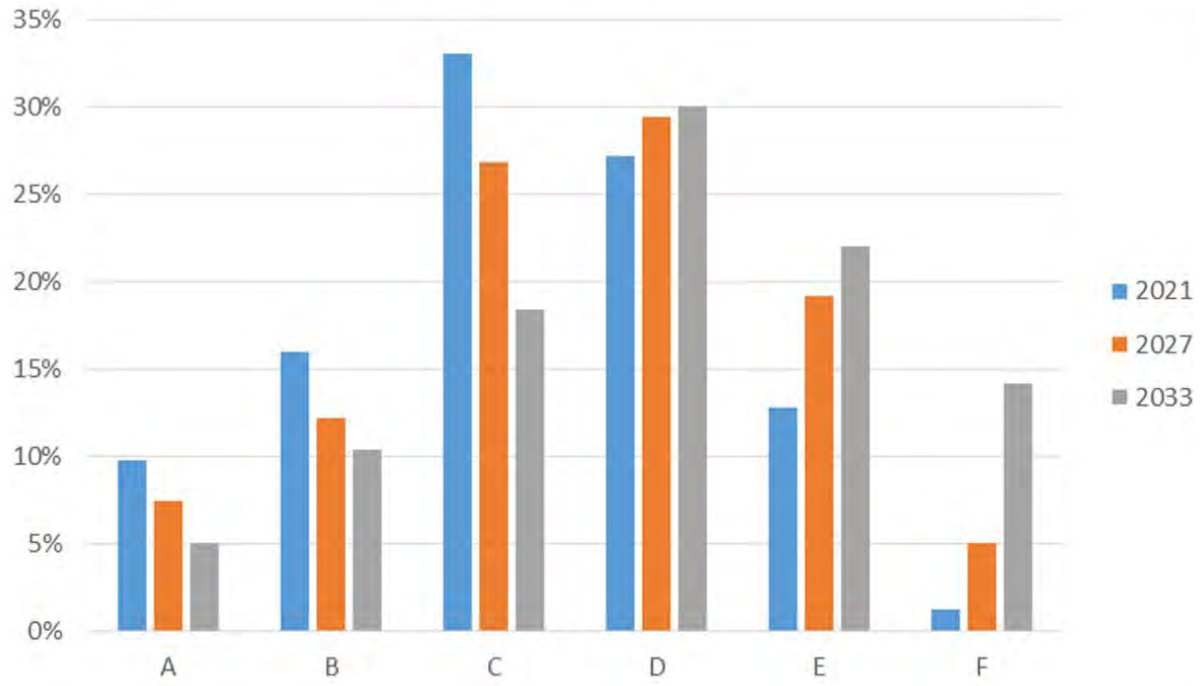


Source: Belgrade Smart Plan "Final Report", Figure 2-6

Current Situation of Public Transport

In Belgrade, there are four different modes of public transportation, i.e., public buses, trams (street cars), trolley buses, and suburban rail (Beo:Voz and BG:Voz). It appears that both operators of suburban rail provide commuting services on the rail tracks of the Serbian National Railways on a lease basis. BG:Voz has a long-term contract with the city government for a certain number of passengers on a fixed annual payment basis. There is no detailed information on Beo:Voz in the Master plan.

Figure 3: Predicted Level of Congestion at Signalized Junction, AM Peak



Source: Belgrade Smart Plan "Final Report" Figure 3-2

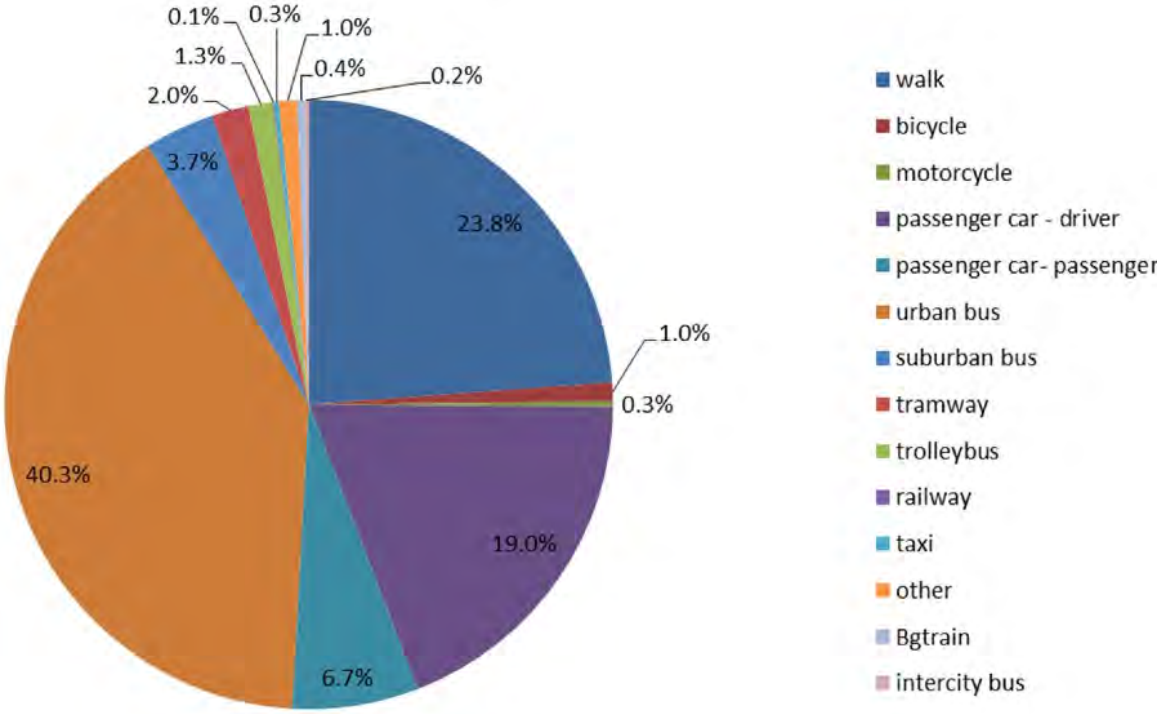
According to the master plan, public buses receive subsidies from the city equal to approximately 60% of their operation costs. Service frequencies for tram, trolleybus and bus services are generally excellent, with tram line frequencies varying between 5.4 and 12.3 minutes and trolleybus lines varying between 3.8 and 16 minutes. Buses' frequencies vary considerably, but a selected group of well-used bus lines provided service frequencies varying between 4.1 and 5.4 minutes. BG:Voz excels in its speed compared with other transport services though its frequency is the lowest (see table 2). If BG:Voz can reduce its frequency time, it would become the best service provider among them all. There is a dire lack of information available in the master plan on the management aspects of public transport. Filling this information gap is critical in making any TOD assessment or planning.

Table 2: Service Level by Public Transport Mode

Index	Unit	Public Buses	Trams	Trolley Buses	BG:Voz	Beo:Voz
Frequency	min	4-5	5-12	4-16	15	No info

As Table 2 shows, urban buses are the most predominant mode of transport in Belgrade with a share of 40%, followed by passenger cars with a share of 26%. In terms of share of non-passenger cars, Belgrade ranks top of the cities in Europe, only to be superseded by Paris and Budapest at 80% but to surpass Berlin at 70%, and London at 66%.

Figure 4: Person Trip Mode Split Metropolitan Areas of Belgrade



Source: Transport Belgrade Smart Plan "Analysis of Existing Situations" Source: Belgrade Smartplan "Analysis of Existing Situations" PP. 24 Fig 1-31

During the period 2001 through 2015, the carrying capacity of the urban bus service increased by 68%, basically maintaining its share. Trams and trolley buses slightly reduced their capacities.

As shown in Table **3**, a big difference between trams and buses comes from the latter's vast coverage of the city space. Buses have more than 70 lines covering 800km in distance while trams have 10 or so lines covering 100km.

The average speed of buses is 18 km/h while trams travel at 13 km/h. The stagnation of trams compared to buses may come from lack of investment as well as differences in performance levels.

BG:Voz seems to have increased its passengers after adopting 15 minute intervals during peak hours. A 15-minute interval is still a long wait for busy people. Further details of its operation are not available. There needs to be deeper analysis of why only buses increased their passengers.
Table 3 shows some rules of thumb analysis for operation efficiency of public transport. Line passenger density is one of the operational indicators to indicate passenger demand. Less than 10,000 passengers per km per day may be conducive for financial profitability. However, much deeper analysis based on performance and financial accounts should be carried out to exactly understand the management capacities of public transit.

Table 3: Public Transport Operation Indicators

Mode	Daily Passengers (million passenger/day	Daily Passenger-km (million pass-km/day)	Operating Line Distance (km)	Line Passenger Density (passenger/km/day)
Public Buses	1.7	6.2	800	7,750
Trams	0.2	0.6	100	6,000
Trolley Buses	0.16	0.4	-	
BG Voz	27,200	-		
Beo Voz	29,000	-		

Source: Data compiled from Belgrade Smart Plan "Analysis of Existing Situations"

Population Density and Public Transit

Even without a detailed traffic demand forecast, it is evident that Belgrade is not a very densely populated city as shown in Table 4 The average population density is only 5 persons per hectare. The total population of municipalities designated as "urban" is 1.3 million but still the population density of these is only 13 persons per hectare. Only a few municipalities have population density over 20 persons per hectare, sufficient to generate intense traffic as needed for the introduction of public transit, namely, Vracar, Stari Grad, Novi Beograd, Zvezdara, Rakovica, and Savski Venac. The total population of these municipalities is approximately 600 thousand.

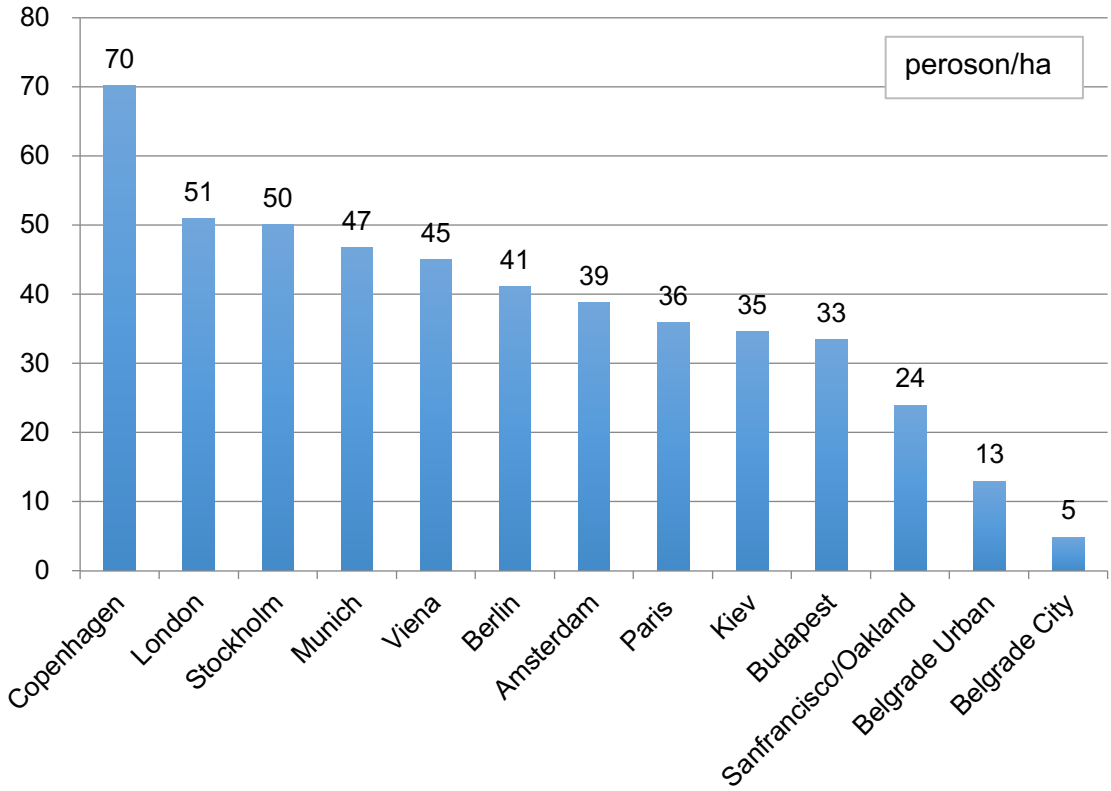
Table 4: Population Density by Municipality of Belgrade 2011

Municipality	Classification	Area (km2)	Population (2011)	Population Density (Per/ha)
Vračar	urban	3	56,333	188
Stari Grad	urban	5	48,450	97
Novi Beograd	urban	41	214,506	52
Zvezdara	urban	32	151,808	47
Rakovica	urban	31	108,641	35
Savski Venac	urban	14	39,122	28
Čukarica	urban	156	181,231	12
Zemun	urban	154	168,170	11
Voždovac	urban	148	158,213	11
Palilula	urban	451	173,521	4
Grocka	suburban	289	83,907	3
Obrenovac	suburban	411	72,524	2
Mladenovac	suburban	339	53,096	2
Surčin	urban	285	43,819	2
Lazarevac	suburban	384	58,622	2
Barajevo	suburban	213	27,110	1
Sopot	suburban	271	20,367	1
Urban Total		1,035	1,299,995	13
Total		3,227	1,659,440	5

Source: Serbia Population Census 2011

Figure 5 shows the population densities of cities compared to urban area of Belgrade. Even the urban areas of Belgrade have much lower population density compared to cities with well-developed subway systems, such as London. Curitiba is known for its pioneering work in BRT. Belgrade Urban has one third of the density of Curitiba, and half the density of San Francisco/Oakland area which has a LRT system, known as BART. BART is a largely elevated railway with a short distance of subway section within the city of San Francisco. The system is much applauded by the citizens but has struggled financially for decades.

Figure 5: Population Density of Cities in the World

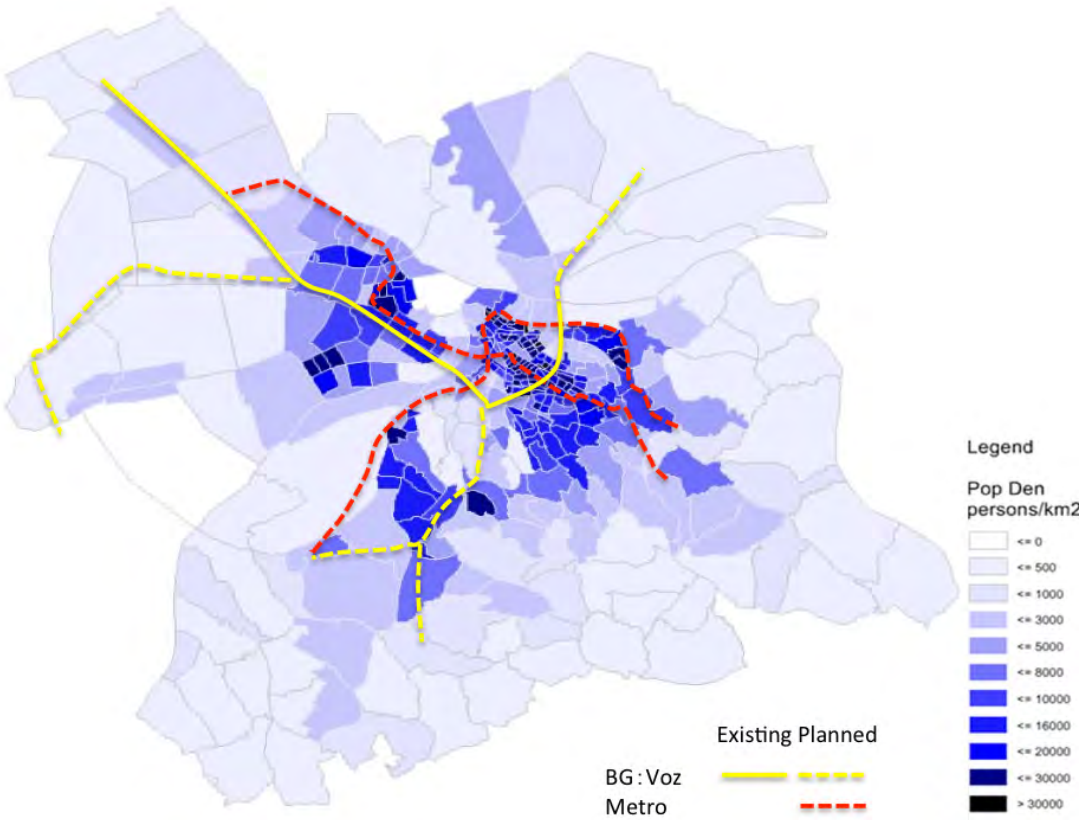


Source: http://www.citypopulation.de/, Tokyo Metropolitan Government, Serbia Census 2011

A general norm in public transport provision is that a public transit service can capture passengers residing within a radius of 500 meters from its stations.

Figure 6 shows the (a) planned BG:Voz extensions and (b) proposed Metro lines. Both alignments run through relatively densely populated areas. However, the master plan does not indicate the total number of potential passengers residing within a 500-meter radius for either of these transit modes.

Figure 6: Existing and Future Public Transport Project Routes in Belgrade



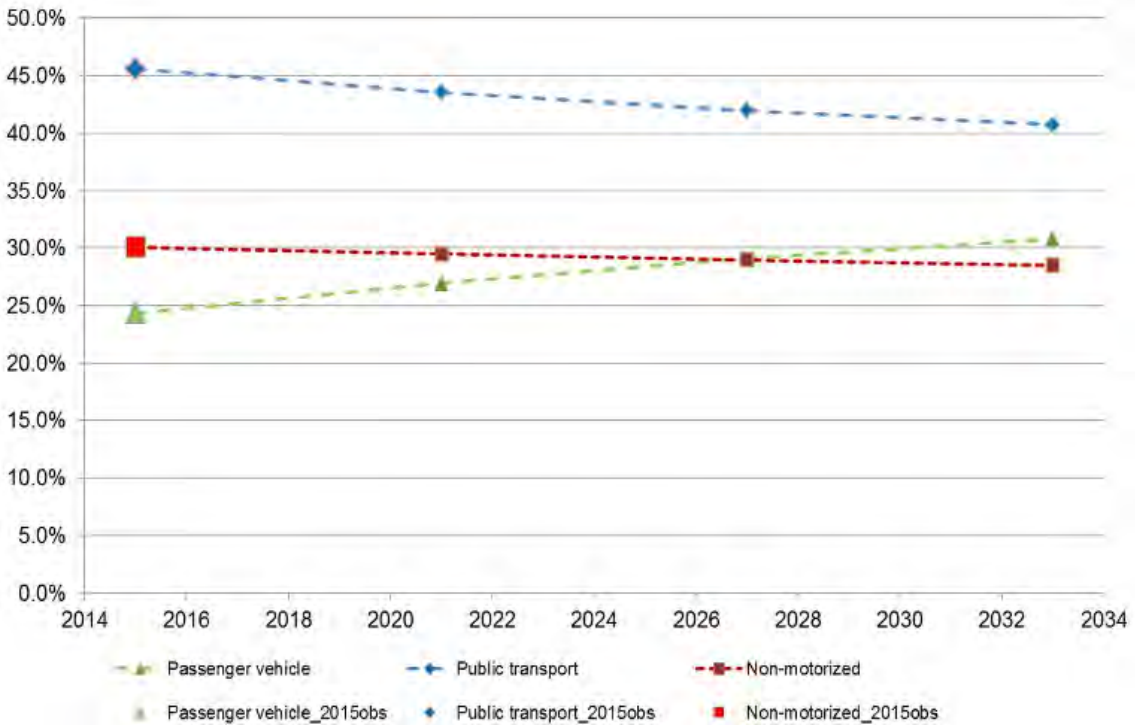
Source: Lines overlaid by the author on "Belgrade Smart Plan Development of Future Year Traffic Forecast Model" Figure 5-20

Public Transport Promotion Policy

There is no definite discussion on public transport policies in the master plan reports. The master plan is not clear whether the city is going to accept the gradual decline of public transport share and accept the rise of automobile traffic.Figure 7 shows a gradual decline scenario in public transport.

The list of investment profiles in the Master Plan includes two public transport projects, extension of BG:Voz and Metro. While the former is already agreed upon, the latter is under feasibility study stage (by EGIS). Thus, the economic viability is still not certain at this stage. The rest of the projects in the master plan are mainly enhancement of the driving experience for private automobiles.

Figure 7: Projection Public Transport Share in Belgrade



Source: Consultants own projection based on Real GDP and Household Income projections

Smart Growth and Compact City

The Belgrade Transport Master Plan adopts a traditional approach of assessing the traffic situation such as the use of LOS evaluation of intersections and VCR (volume to capacity ratio) of roads and highways as described in the section "Current Traffic Situation" above. There are criticisms on these approaches for their local optimization instead of city-wide or region-wide optimization for economic productivity and environmental management. For example, the Californian government passed a law, Senate Bill No. 743[2] in 2013 which makes it mandatory to change the project evaluation method from local optimization to social optimization. The bill is intended to encourage in-fill developments and mix land uses by regarding the total vehicle distance travelled as a social cost rather than the aggregation of local traffic improvements in each locality. There is a definite trend, along this direction, towards more compact urban development across the world.

Aging is another aspect that is making many cities think how to ensure housing and transit are closely aligned. Many cities in Japan that are facing problems of pronounced aging are exploring policy options to cope with increasing social welfare needs and the corresponding cost. For example, Toyama city with a population of 500 thousand, is a pioneer in compact city policy[3]. It is attempting to consolidate urban areas to reduce social service costs and improve the mobility for the elderly. One approach it has taken is to provide subsidies to the elderly to move to central areas closer to transit and services. Belgrade may face a similar problem as is evident from its population trends.

The Belgrade Transport Master Plan, by using the traditional approach, gives high scores to highway projects which improve road serviceability and therefore promotes more dispersed urban

[2] SB-743 Environmental quality: transit-oriented infill projects, judicial review streamlining for environmental leadership development projects, and entertainment and sports center in the City of Sacramento. (2013-2014)
[3] World Bank and Toyama City signed a MOU for collaboration on City Partnership Program in November 2017.

development, which further encourages the use of automobiles, slowing eroding the walking and public transport based urban structure of the city. There are plenty of potential sites in central parts of Belgrade for compact developments. There should be more in-depth study of such in-fill development potential, particularly linked with public transit in the city.

Land Use Planning

An urban planning system is in place in Belgrade to control land use and urban density through building permit regulations such as floor-to-area ratio.

Land use planning in Serbia is comprised of three companion maps with one document. The three maps are as follows:

1. Land use plan
2. Implementation plan
3. Typology plan: building rule zoning

The third map seems to define the building characteristics including a floor-to-area ratio. For implementing land value capture approaches, the ability to modify land use or building restrictions at or around transit stations or routes is an important tool. Further research is needed to clarify the actual process and requirements as well as the legal framework in changing the regulations to incentivize compact development around stations and transit corridors and the potential for air right sales.

Transit Oriented Development (TOD) Perspective

Unification of Transit and Urban Development

The development of large-scale transit and urban development projects are intrinsically related. For instance, the Belgrade Metro project's viability depends on the course of large-scale urban development projects such as those foreseen at the waterfront or Makis Polje. The viability of these land development projects may also rely on access to the Metro. In the Master Plan, the metro project is evaluated on the basis that the Waterfront Projects will build out at full scale. Each project therefore may prove viable provided the complimentary project is fully implemented but both are envisaged without knowing the real feasibility of the other. A remedy is to evaluate the two projects as one package. However, there still is a problem at implementation stage. The city's transport agency may implement the transport project while the private investors need to make actual investments. Both sides require a credible commitment from the other. The ultimate solution is to create one integrated agency to undertake both the transport services and land developments as exemplified by the suburban railway companies in Japan and Hong Kong's MTR. The question is whether the city can establish such an entity to be fully entrusted with the enormous budget required for implementation of both.

Basic Principles of Transit-Oriented Development (TOD)

The major principles for implementing TOD are described briefly below.

a) **Higher Population Density for Public Transport Demand:** creating a win-win relationship between transit and land development;
b) **Incentives for Public Transport and Penalties for Automobiles:** There needs to be not only promotion and support for public transit but also discouraging private automobile use by undertaking measures such as high parking fees, restrictions into central zones etc.;
c) **Non-Automobile Multimodal Alliance:** Make a leveling playing field for transit users by providing continuous and user-friendly atmosphere between walking/bicycling to transit stations, proximity and connection routes between transit stations to compete with automobile's door-to-door access;
d) **Land Value Capture:** Creation of system to capture wind-fall benefits generated by establishment of transit stations and subsequent population attraction or commercial developments; and
e) **Institutional Barrier Removal:** creation of incentives and implementation mechanisms to merge the functions of planning and implementation of transportation and urban development.

The Transport Master Plan, being basically focused on transportation simulation results, does not discuss any of these TOD principles in detail.

Land Value Capture (LVC) Methods

The most difficult challenge facing development of public transit is finance. Development of public transit incurs large sums of initial capital investment, and in most cities transit operation costs are not fully covered are compounded by the dilemma of securing a sufficient user base and providing below break-even fares. One of the breakthroughs in solving the financial problems of transit services is land value capture (LVC). It is a mechanism to transfer the external social benefits of transit services such as increased residential and commercial opportunities that accompany the

provision of a high-quality transit service. Table 5 lists a summary of various tools used to capture land values created by transit developments. Belgrade uses the first two on the list, i.e. ***property tax*** and **betterment charges** (i.e., **land development fees**). The Belgrade Transport Master Plan suggests that the city may contemplate issuing bonds possibly linked to the property taxes to finance investments. Sale of land is anticipated for the Waterfront and Makis Polje projects as the city owns a substantial portion of the land. For financially stricken governments, acquiring funds for initial investments is critical. Bonds make it possible but there is a risk of not being able to capture the value later when repayment starts without considering other approaches.

The city can ***sell development rights*** that allow for higher densities or taller structures beyond the limits specified in land use regulations to raise revenue for public infrastructure and services. First, the law needs to be examined fully to identify the legality of this approach. Similarly, the procedures for local modifications of land use, zoning and building control should be clarified. Modifications may require deliberation by a specific committee or even city councils. If there is a potential benefit for the adoption of the system, the due procedure must be specified and documented to encourage proper application and to avoid the misuse.

Joint development is a land value capture method where the local government receives in-kind financing from private partners such as for station building or even construction of tracks as a partner in exchange for the use of central locations in and around stations.

Joint venture in this sense achieves both initial funding and risk sharing. In Tehran, for example, the city has given out concessions for station building in exchange for the construction of the facilities and sometimes additionally for part of track construction. BG:Voz extension offers joint venture potential including station building as a commercial or large-scale residential new development of high intensity near a station. When there are increased traffics at a station, there are different potentials for real estate development depending on the location's specific features. In some area, there may be a need for a market place. In such a case, the joint venture with a supermarket is a possibility. For instance, if it is possible to develop a station cum supermarket, this will offer a comfortable shelter to the waiting passengers as well as convenience in shopping (picking up breakfast/lunch on the way out or buying dinner groceries on the way back). In some case a residential building cum station could be a possibility as well with super access to commuting. Though the details are not clear from the Masterplan, the extension of BG: Voz requires the establishment of additional stations between the existing major stations. This could induce more commercial opportunities. In cases where the targeted urban development or right of way is owned by many landowners, ***land readjustment*** or ***urban redevelopment schemes*** are time consuming but effective tools for creating value around stations or transit corridors. In some of Belgrade's densely populated old districts, these schemes may prove to be useful tools.

Table 5: Land Value Capture Tools

	Instrument	Description
Tax- or fee -based	**Property and land tax**	Tax levied on estimated value of land or land and buildings combined, with revenues usually going into budgets for general purposes.
	Betterment charges and special assessments	Surtaxes imposed by governments on estimated benefits created by public investments, requiring property owners who benefit directly from public investments to pay for their costs.
	Tax increment financing	A surtax on properties within an area that will be redeveloped by public investment financed by municipal bonds against the expected increase in property taxes. Mainly used in the United States.
Development-based	**Land sale or lease**	Governments sell developers land or its development rights, whose values have increased thanks to a public investment or regulatory charge, in return for and up-front payment, leasehold charge, or annual land rent payments through the term of the lease.
	Joint development	A well-coordinated development of transit station facilities and adjacent private properties between transit agencies and developers, where the latter usually contribute physically or financially to the construction of the station facilities, as their property value will increase thanks to the transit investment. Used in Japan, the United States, and other countries.
	Air rights sale	Governments sell development rights extended beyond the limits specified in land use regulations (such as floor area ratios [FARs]) or created by regulatory changes to raise funds to finance public infrastructure and services.
	Land readjustment	Landowners pool their land and contribute a portion of their land for sale to raise funds and partially defray public infrastructure development costs.
	Urban redevelopment schemes	Landowners and a developer establish a cooperative entity to consolidate piecemeal land parcels into a single site that they then develop [such as a high-rise mixed use building] with new access roads and public open spaces. The local government modifies zoning codes [typically around rail transit stations] and finances the infrastructure. Mainly used in Japan.

Source: Hiroaki Suzuki, Jin Murakami, et al "Financing Transit-Oriented Development with Land Values"

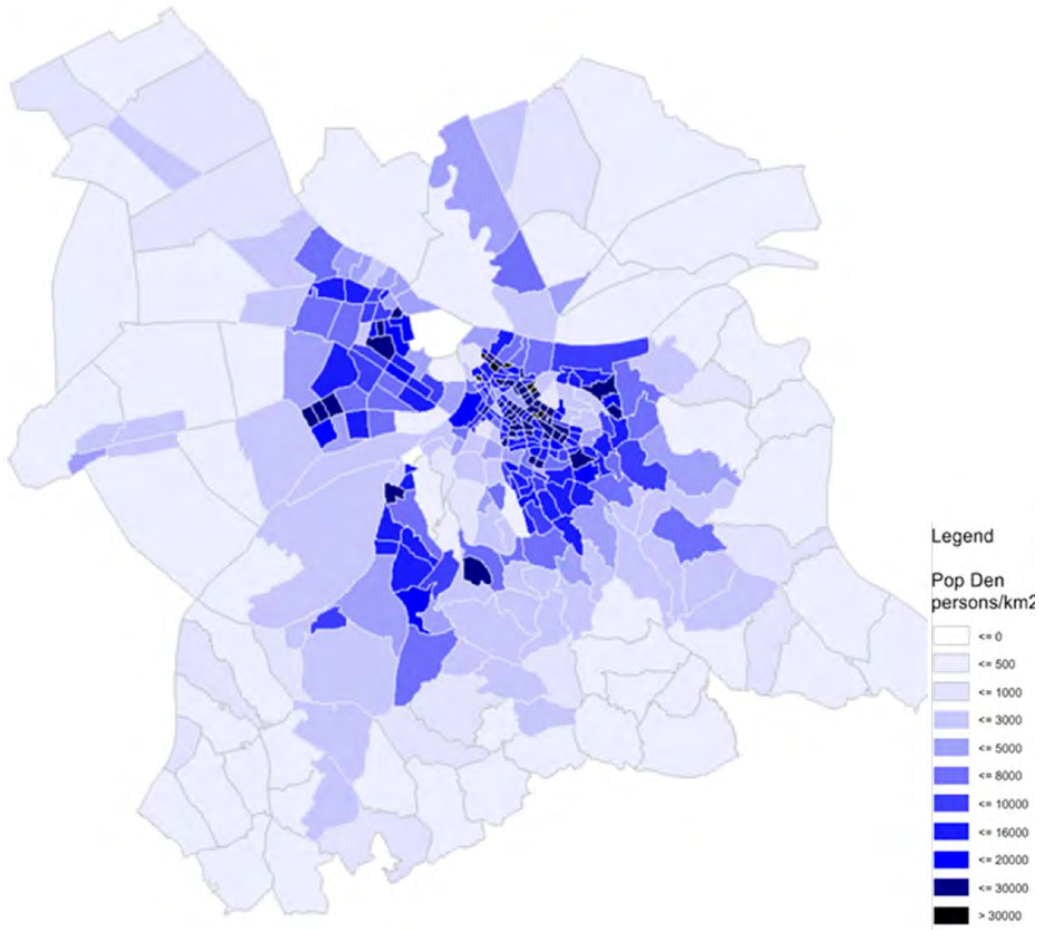
TOD in Belgrade

TOD Potential and Belgrade Transport Master Plan

The urban planning documents now in place in Belgrade adopted in 2000 with a time horizon of 2020 is now under review to be modified in a couple of years, while the Transport Master Plan is planned toward 2033. Therefore, the Transport Master Plan had to make its own population projections. Figure 8 shows the population distribution in 2033 for which year, there is no land use plan available. Figure 9 shows the changes in population density between 2016 and 2033. It appears that the Belgrade Transport Master Plan has incorporated future urban developments to a large extent. The dark spots in Figure 9 correspond to the planned future developments - the southwest spot matches with Makis Polje and the central one is a railway yard conversion to the Waterfront projects. The upper corner is another future Waterfront project, Ada Huja.

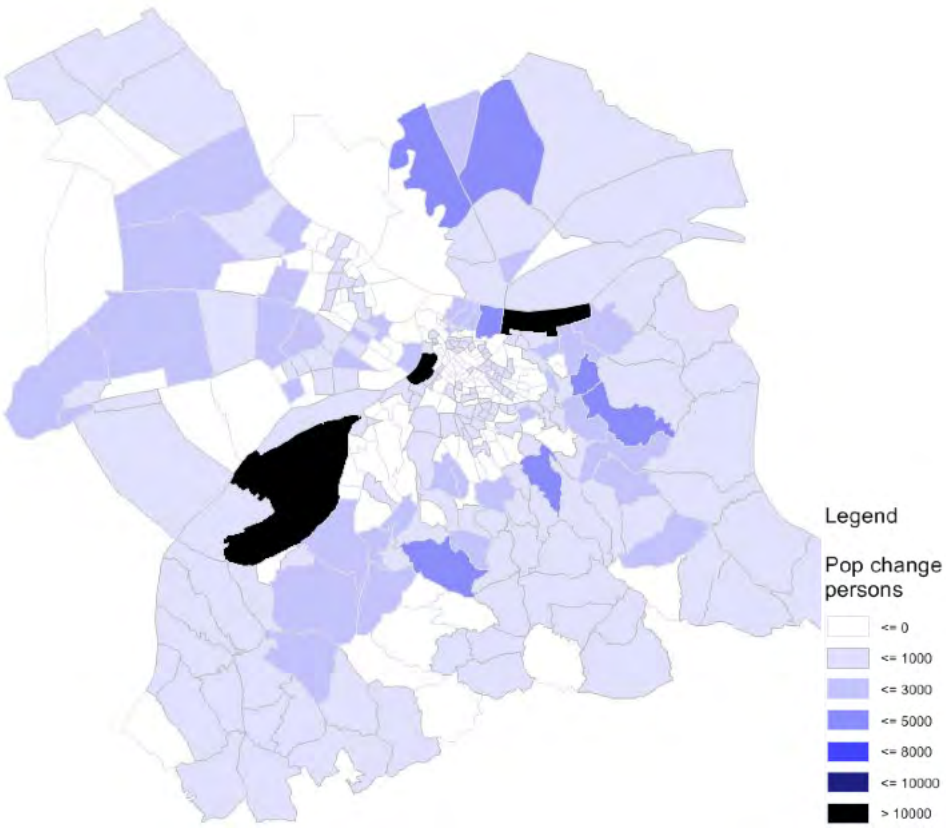
The economic viability of public transport projects investigated in the Belgrade Transport Master Plan already incorporates the full-scale build out of these potential residential and commercial developments without ascertaining the viability of such large-scale urban development schemes. In other words, the viability of the proposed projects in the Master Plan rely on the viability of the land development projects, enlarging a degree of uncertainty in the economic evaluations. As mentioned earlier, the only solution to this interdependency problem is to review both transport and urban development projects simultaneously.

Figure 8: Population Distribution in Urban Areas in Belgrade 2033



Source: "Belgrade Smart Plan, Development of Future Year Traffic Forecast Model" Figure 5-20

Figure 9: Population Change Between 2016 and 2033



Source: "Belgrade Smart Plan, Development of Future Year Traffic Forecast Model" Figure 5-21

Promoting the Use of the Serbian Railway System

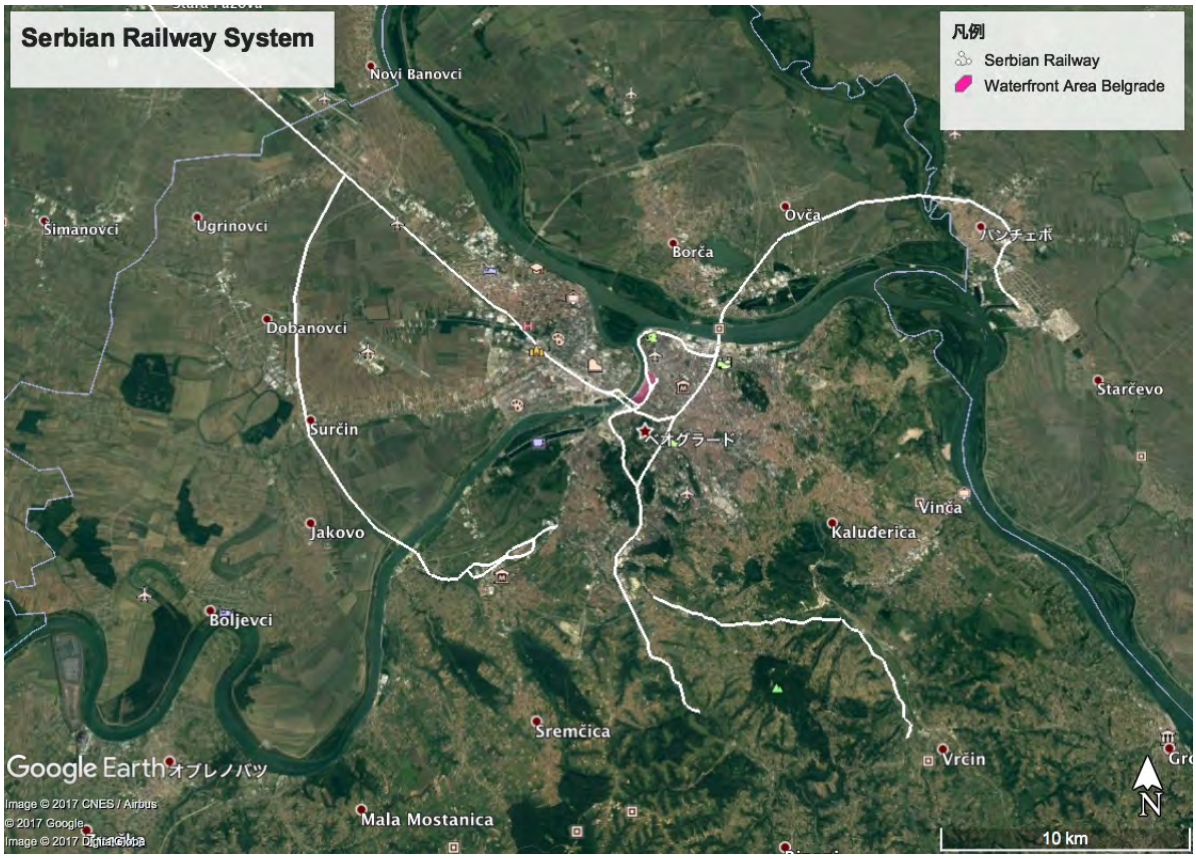
Use of the existing inter-city railway assets has proved to be successful as exemplified by BG:Voz. The advantages of this service are as follows:

1) No need for right-of-way acquisition
2) Minimum initial investment
3) Relatively high speed of trains
4) Quick implementation

The conversion does not require investments for acquisition of land, development of tracks or power or electricity related facilities. The Serbian Railways are already electrified, thus there is no need for overhead lines or substations to provide power to the lines. Without these investments, the remaining tasks in implementation are the rehabilitation of tracks and facilities, and procurement of rolling stocks. As a result, the required investment is very small and implementation could be very fast.

Figure 10 shows the existing network of Serbian Railway. There are some parts not identified from the Google Earth satellite imagery, therefore the exact alignments require verification by the responsible entities. Nevertheless, there already exists a vast portfolio of railway assets. As for connection to Makis Polje, Serbian Railway seems to have a tunnel connection to Makis, which was not detected in the desktop survey.

Figure 10: Serbian Railway Network in Belgrade



Source: Google Earth (2017)

Central Station

Figure 11 shows the satellite image of the Beograd Central Station (Prokop). The station is isolated by surrounding roads and low-density buildings. Vehicle access to the station is excellent as it is in the heart of the city. Given its importance as a future hub of public transit, its redevelopment and enhancing the transfer access to other transit modes, such as trams and buses, are critical to improving the overall service performance level of transit in Belgrade. In future, there is significant land value capture to be made.

The city has long realized the value of the site and sought for funding in separate packages of loan for refurbishing the station platforms and a concession for the station cum commercial building above the station. While the rails and platform rehabilitation is already complete, the station building is still left undone. This is an example that shows how difficult it is for separate investors to coordinate and make commitments in TOD.

The city also owns land that is accommodated by Belgrade Brewery near the Prokop station as indicated in Figure 11. The commercialization of the brewery and its ideal location to attract tourists offers another TOD project potential for the city.

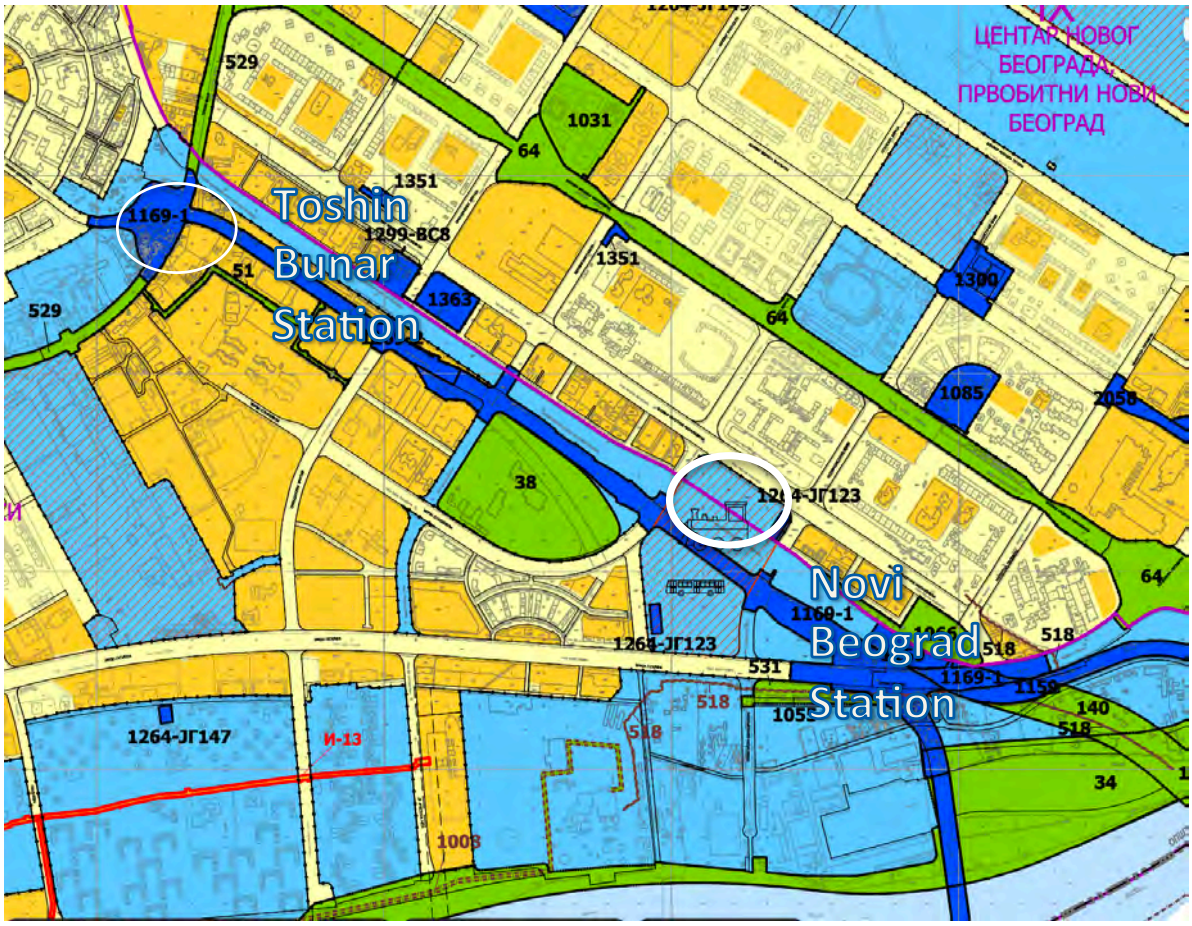
Figure 11: Beograd Central Station

Source: Google Earth (2017)

Novi Beograd

Figure 12 shows the land use map for Novi Beograd areas where the BG:Voz line runs. There are two prominent stations, i.e., Novi Beograd Station and Toshin Bunar Station. The land use map does not seem to provide for higher population density or promotion of commercial agglomeration for these two stations. Novi Beograd is a planned city with wide boulevards and good tram connection. BG:Voz service connects this area with the old city on the other side of Sava River. It also connects to Zemun which is a historical district along the Danube River with tourism potential. Nevertheless, there appears to still be large areas left undeveloped or underdeveloped in New Belgrade.

Figure 12: Land Use Map of Novi Beograd Along Railway Track



Source: Belgrade Land Use Plan

The two street view photos in
Figure 13 show very low intensity land use in the areas around these two stations. The stations are treated as just no more than transport nodes without capturing their value for commercial potential or encouraging high-density dwellings near stations to provide convenient access to transit and generate much larger transit customer base. In general, this points to a lack of synergy between land use planning and public transport planning in Belgrade.

Figure 13:BG:Voz Station Area Current Land Use Photos

BG:Voz Novi Beograd Station

BG:Voz Toshin Bunar Station

Blok 42

Blok 42 is one of the large city-owned land plots situated in the south of Novi Beograd Station. Currently it is used as a parking lot. The city has a plan to construct a combination of commercial building and a bus terminal. The development approach incorporates one of LVC methods, i.e., joint-venture. There is a flea market just east to the parking lot. The location is an ideal place for TOD implementation. There are two issues. First, access to the station is hindered by the highway. Access and integration can however be improved. Second, it would be best to include the flea market as part of the complex to avoid competition and also to create a synergy to attract a more diverse customer cum passenger base to this area.

Figure 14: Blok 42, Novi Beograd Station, and Flea Market

Source: Google Earth (2017)

Incentives for Public Transport and Penalties for Automobiles

The city provides subsidies to public transport to make sure that residents enjoy low tariffs for transport services. It issues high-priced parking tickets to penalize use of automobiles in the city center (although it is noted that on-street parking tends to be cheaper than garage parking). But this is usually not enough to encourage transit. Some cities in the world, such as Singapore and Tehran ban or restrict automobiles to enter central districts of the cities.

The proposed road capacity development projects could only induce more dispersed urban developments and further increase automobile traffic in the future.

Non-Automobile Multimodal Alliance

The following are the technical specifications for trams and BG:Voz railway:

- Belgrade Tram, Voltage: 600 V Direct Current
- BG:Voz (Serbian Railways) Voltage: 25,000 kV/50Hz AC

Under the current technical setup, it is not possible to have common trains running on both tracks unless dual mode trains are procured. As noted before, the running speed between two systems are quite different with BG:Voz being much faster. The interconnection may only create congestion and queues. The first step is to provide easy and comfortable transfers between the two modes such as access without crossing traffic roads, shielded from rain and wind etc. From what is observed from Google Earth imageries, even BG:Voz stations are not shielded from rain or snow. It is recommended to install a waiting room on the plat form with a heater for winter days.

Another important linkage is bicycling and walking. Currently, walking captures 24% while bicycle captures only 1% of people traveling in urban areas of the city. Given the relative flat terrains outside the city centers, bicycle use should be encouraged. The Masterplan places importance for bicycle network expansion but provides few details. To use limited resources efficiently, investments in bicycle lanes can focus on linkages to transit stations and parking systems. Transit services can capture bicyclers who can ride 2-3 km to a transit station while walking may be limited to a 500m radius. Biking and walking should be well-integrated with public transport planning. Bicycle sharing should be explored to create a new IT venture as well as to increase its share as a mode of public transit.

Land Value Capture (LVC) Indicated in Belgrade Transport Master Plan

Economic evaluations in the Investment Plan Report only show net present value (NPV) as a yardstick without any cash flows or definition of the costs or benefits. The assumptions and parameters are not presented either. Thus, is it not possible to assess how much of the land value increases are captured in the economic benefits estimation.

On page 24 of Scenario Selection Report, it states:

"From the results of the modeled impacts, it is estimated that using just this conceptual level of detail, the DS1 project would just about break-even and produce a Net Present Value (NPV) of just marginally above zero and produces a positive BCR of 1.0 meaning that for every euro of capital spent on the project, a wider economic benefit of EUR 1.0 is generated. This is due to the high, conservative estimates used for the capital expenditure of EUR 1,289m (for 17.0km Line 1 Phase 1, 17 stations and 21 trains) and the low tariff revenue (single ticket price equal to RSD 90 or EUR 0.80)"

On the other hand, Report 6: Investment Plan refrains from giving economic evaluation or costs for the Metro.

Another reference to land values is found on page 22 in Scenario Report as follows:

- *Makiško polje: up to RSD 180.93 billion / €1.45 billion in land development fees, with potentially up to RSD 14.64 billion / €117.09 million additional levies due to metro (+8.1%)*

- *Luka Beograd: up to RSD 52.85 billion / €0.42 billion in land development fees, with potentially up to RSD 3.71 billion / €29.66 million additional levies due to metro (+7.0%)*

- *Ada Huja: up to RSD 39.53 billion / €0.32 billion in land development fees, with potentially up to RSD 2.93 billion / €23.46 million additional levies due to metro (+7.4%)*

The first project listed above, Makis Polje is a large-scale residential development project which utilizes an abandoned railway marshaling yard. The total area to be developed is 680 ha, out of which the city owns 30%. The Belgrade Transport Master Plan shows the size of potential land development fee revenues for the city. Land development fee and other potential tax revenues will be discussed in the next section.

Municipality Financial Instruments

Due possibly to the vigorous capital spending in the past, the City's fiscal deficit is capped at 10% of their existing revenues which equals to about RSD 8 billion per year. The Master Plan estimates that the City is able to invest a little over RSD 20 billion per annum covering all sectors including transport. It is critical that any investment has a quick return to generate revenues. The situation provides a good rationale for LVC in TOD.

There are four financial instruments which can be potentially used as tools for land value capture:

1) property tax,
2) land transaction fee,
3) land development fee,
4) bond issuance.

In terms of taxes, property tax comprises 16% of total revenue while the land development fee comprises 3%, contribution from construction land is 1% and from lease of construction land is 1%. According to Serbian Tax Law, a Land Development Fee is levied to cover the infrastructure development cost. The current level of fees is shown in Table 6. The tax level is relatively high. The fee will amount to 1-2 million dinars for 100 m^2 of building floor area. It needs to be investigated whether the fee generates profit after covering the costs for the development of roads, utilities and other urban service infrastructures. According to the law, the city of Belgrade can issue bonds without consulting the central government.

Table 6: Land Development Fee Tariff 2016

	PURPOSE OF THE FACILITY	TYPE OF FEE	Protection Zone - Green and Water Body	Extra zone - housing and business	ZONE I	ZONEII	ZONE III	ZONE IV	ZONE V	ZONE VI	ZONE VII	ZONE VIII	SPECIAL PURPOSE
1	HOUSING	coefficient purposes	1.20	1.2	1	1	1	1	1	1	1	1	1
		coefficient zone	0.1000	0. 1000	0. 1000	0.0916	0.0742	0.0406	0.0306	0.0214	0.0107	0.0032	0.0406
		Fee / m2	27,442.08	27,442.08	22,868.40	20,947.45	16,968.35	9,284.57	6,997.73	4,893.84	2,446.92	731.79	9,284.57
2	COMMERCIAL	coefficient purposes	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
		coefficient zone	0.1000	0. 1000	0. 1000	0.0916	0.0742	0.0406	0.0306	0.0214	0.0107	0.0032	0.0406
		Fee / m2	34,302.60	34,302.60	34,302.60	31,421.18	25,452.53	13,926.86	10,496.60	7,340.76	3,670.38	1,097.68	13,926.86
3	PRODUCTION	coefficient purposes	0	0	0	0	0	0	0	0	0	0	0
		coefficient zone	0.1000	0. 1000	0. 1000	0.0916	0.0742	0.0406	0.0306	0.0214	0.0107	0.0032	0.0406
		Fee / m2	0	0	0	0	0	0	0	0	0	0	0
4	PUBLIC	coefficient purposes	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
		coefficient zone	0.1000	0. 1000	0. 1000	0.0916	0.0742	0.0406	0.0306	0.0214	0.0107	0.0032	0.0406
		Fee / m2	27,442.08	27,442.08	27,442.08	25,136.95	20,362.02	11,141.48	8,397.28	5,872.61	2,936.30	878.15	11,141.48

Source: City of Belgrade

Strategy for BG:Voz: Start Small and Make It Big

There must be a perception in Belgrade that public transport is not the first choice due to its slow speed and poor accessibility if one can afford an automobile and parking access in the city center. The first step for the public transport manager is to change this perception by providing better access and faster speed than automobiles. One proposition is to increase the frequency of BG:Voz drastically down to under 5 minutes. Then the perception of people will change. Given the unreliability of automobile access over time, it could become the most reliable and punctual mode between the Old City and New Belgrade, together with the provision of good feeder service such as taxis or trams. With a renewed and positive reputation, it will grow its customer base. More customer base means more commercial opportunities around stations. More commercial opportunities mean higher land value. There may be an opportunity for high-rise office + residential station building for the next phase. Such a positive feedback loop should be initiated.

To achieve more frequent service, there is a need for more fleets and good management and maintenance. Speed would be another factor. Already BG:Voz is the fastest mode of transport during the morning peak hours, by achieving approximately 40 km/h according to the data available in the Master Plan. With more frequent services and higher speeds, safety becomes a real concern. Therefore, there will be more strain on operation and maintenance. The operators will have to put safety first by all means.

Knowledge Gaps

In order to plan TOD projects properly, it is essential to evaluate both transport and urban development projects concurrently. As the Masterplan recognizes, there are substantial knowledge gaps for the plans to materialize. To address these information gaps, more data and focused analyses are needed to create the basis for detailed planning. The following are areas that need to be explored thoroughly:

Currently, there is a lack of in-depth studies undertaken by the city with regard to the city's housing or commercial development markets. All potential locations need to be identified and studied. The current master transportation plan also does not include an analysis of the operational aspects of public transportation, tariff analysis as to the affordability of fares, the impacts of frequency improvements, etc. Furthermore, there should be full understanding of the current legal set up to understand the capacity for promoting TOD and LVC. Based on these basic data in hand, the planning for first pilot TOD projects can be undertaken by a dedicated task force, with future implementation best to be explored with the development of more advanced institutional arrangements.

Institutional Reform: Laws and Regulations

In some countries, cities do not have authority to change restrictions imposed by the master plan, land use plan or building regulations on an ad hoc basis to promote TOD. If that is the case in Belgrade, it would be timely to explore the possibility of changing the legal set-up so that the law would allow city authorities to waive zoning constraints and receive fees in exchange or to invest in a higher density project to generate more passenger traffic.

In some cases, the state or municipal regulations do not allow the use of public land as equity of the transit agencies and/or urban development corporations. Or it may not allow the transit

operators to be engaged in property development or commerce. If this is the case, the city should explore ways to remove such inhibitions to be able to promote TOD.

There are cases where there is no legal provision for cities to promotion TOD/LVC such as no legal basis for the use of deep underground property rights, air right sales, land readjustment, urban redevelopment, and traffic demand control (congestion tax). There seem to lack clear definition of air rights in Serbia or Belgrade, which is recommended to be investigated during the urban master plan review currently underway in Belgrade.

Institutional Setup: Organization

There are several institutional options for realizing TOD in the long-term:

1. **Integrated Transit Conglomerate Model:** a transit company undertaking both land development, commerce and transit services jointly as exemplified by Hong Kong MTR or many Japanese private suburban railway companies with net profitability.

2. **Large-scale Land Development Corporation:** a large-scale land development company to capture land value and back-channel the resource to cross-subsidize transport operation exemplified by The King's Cross Central Limited Partnership, and Copenhagen City and Port Development Authority.

3. **Land Readjustment Cooperative or Corporation:** A joint company or cooperative through land pooling by all the landowners of the planned areas to jointly develop the infrastructure as well as residential and/or commercial land areas; it is suited to develop an area comprising of numerous divided landownerships while maintaining value sharing among all the landowners.

The most powerful integration of urban transit and development is to put all the functions under a single umbrella, **an integrated transit conglomerate model**. This omni-powered agency model to combine profits from land development with transit operation is a straight-forward system to capture the full value of the land. It has to be investigated whether the BG:Voz is entitled to be engaged in commercial activities other than transport services. Even if so, the company's financial strength may not be strong enough to make investments. Another solution is to give a concession to a private or public company to provide both transport services and real estate development with joint mandates.

Another possibility is to provide the land plots owned by the city, such as Blok 42, Belgrade Brewery, Makis Polje to be donated as equity in-kind to establish **a new land development company which also runs as a public transit company.** Such examples are the King's Cross Central Limited Partnership (KCCLP), Copenhagen City and Port Development Authority etc. There is a case in Japan where a private company, Yamaman Real Estate, developed a large residential area close to Narita International Airport and later acquired a license for a railway transit feeder line to improve its accessibility.

In the case of infill development, it is often the case that there are a number of landowners involved to make a parcel large enough for land development. There are several methods of land pooling. One way is to set up **a land development company with shares commensurate with the size of land contribution**. The other is land readjustment scheme exercised in many areas for urban redevelopment in Japan and now applied in Gujarat, India for examples. Land readjustment scheme often applied to residential development would mandate each landowner to submit a

portion of land holdings and usually around 40% to create a right-of-way and generate revenue for infrastructure development in return for uplifting land values. In the case of Tsukuba Express Line connecting Tsukuba Science City to Tokyo over some 60 km, a land redevelopment scheme was applied extensively to generate the right-of-ways and station areas. This scheme is most equitable in sharing land value uplifts among landowners and decisions are made on consensus basis thus avoids social conflicts. Therefore, planning and signing such an agreement would usually take time.

Conclusion and Recommendations

Potential

Despite the lack of clarity in the Belgrade Transport Master Plan about the city's overall transportation policy, certainly the city regards the improvement of public transport as a vital element for the city's future. The extension of the BG:Voz operation to cover more areas is one of the priority projects listed in the Belgrade Transport Master Plan. This proposal to extend BG:Voz requires less investment with a fair return on investment. The business model has been already tested and its effectiveness proved. Land value capture methods have the potential to facilitate the financing of BG:Voz extension. Possible prospects are as follows:

1. A tie-up with investors to develop a commercial building such as a mall as part of station building;
2. A joint venture with investors to develop a residential area close to newly planned stations; and
3. Air right sales around stations: the city can sell development rights that allow for higher densities or taller structures beyond the limits specified in land use regulations to raise revenue for public infrastructure and services. The legality of this method in Serbia needs to be verified with further investigation.

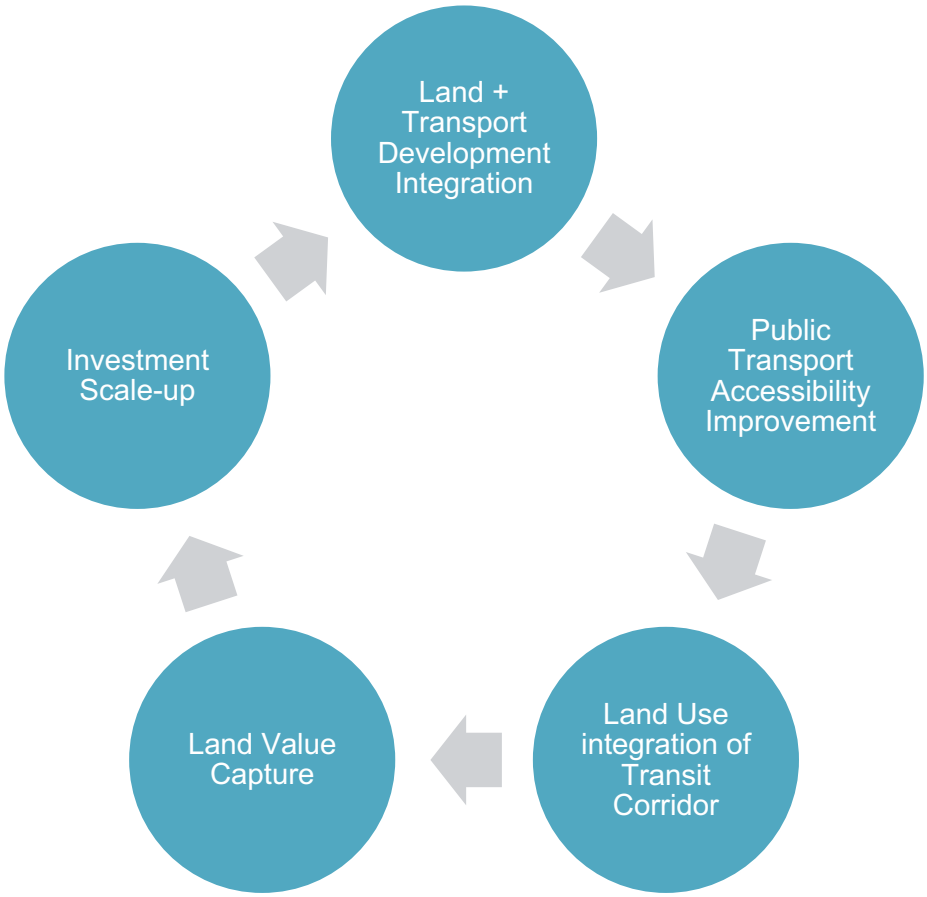
For the first two potential land capture schemes, it is necessary to identify the actual locations and land plots to be able to formulate these as specific projects.

TOD Strategy: Positive Feedback

The most important strategy in TOD is to create a positive loop between public transit and land development. First the two functions need to be closely coordinated or, if possible, integrated institutionally. A sequence of investments must be aligned so that smaller investment will induce values for transport and land development and then lead to further investment opportunities.

In the case of BG:Voz, the second step is to improve its accessibility. Presuming its running speed is close to 40 km/h, the critical shortcoming is its frequency, currently the 15-minute intervals need to be cut down to 5- minute intervals. If such a project is to be adopted, the branding of the project should be eye-catching copy such as "the 5-minute Headway Project" to serve as publicity of BG:Voz as well. Reducing waiting time will greatly improve its attractiveness. Greater attractiveness will lead to a larger number of passengers, which in turn will increase the value of the land around the stations. Land value capture schemes such as joint ventures or air right sales should be established. The advantage of public transit is time-wise reliability to be able to compete with the comfort and door-to-door accessibility of automobiles.

Figure 15: Positive Feedback Cycle of TOD



The "5-minute Headway Project" may be a potential game changer for BG:Voz. It can become the fastest and the most reliable transport mode between the two central parts of the city. The investment requirement will possibly require fleets of trains to increase three-fold. Most importantly, it could lead to drastic positive change in the public perception of public transport in the city.

Establishment of a TOD Office

The final report of Transport Mater Plan recommends the establishment of an Infrastructure Commission to oversee all investment projects, modeled after the UK, New Zealand and Singapore. The overarching institutional framework will help inter-sectoral projects such as TOD. At the same time, such a large-scale institutional reform will require drastic reallocation of functions and responsibilities as well as the adoption of a new system of planning, evaluation, approval and monitoring to make it effective. Otherwise, there will be more confusion and bureaucracy with only slow implementation and no positive effects. Therefore, the reform itself will be a time consuming, grand exercise and require serious resource investment. At the same time, if there is no expertise in TOD in the city, nothing will take place on the ground.

One suggestion, complementary with the above proposal for a comprehensive investment system, is to establish a dedicated TOD office in the city government as a separate and dedicated unit. The aim of the TOD office is to plan a specific TOD project and implement it. Potential projects may be Blok 42, or Belgrade Brewery. By doing so, the city can expand its professional expertise

in new areas (for example, by recruiting real estate professionals from the private sector), and with a staff comprised of urban planners and transportation planners, each with complementary skills and knowhow, the city can begin to embark on a comprehensive strategy to integrate urban development and public transportation with quick wins on the ground.

One of the key lessons from Yokohama is that the office in charge should be held responsible not only for the planning but also for its implementations, including marketing. It is not enough to present a 3-D model and wait for investors to come. The investors need to be captured.

Further Research

Further research is needed to come up with concrete data to give guidance to future investment decisions in urban transport and real estate development. A detailed terms of reference for each would need to be further developed.

1. Real Estate Market Research

There is a need to review the current trends including demographics and market demand for real estate by segments such as by age group and income class. This study should also review the legal and institutional frameworks including land use control and scope for land value capture. In the end, the research should quantify both the size of segmented markets such as high/mid/low class residential, commercial and office as well as the affordable price ranges in representative locations.

After the general study, specific areas near existing and planned stations need studied including their ownership, surrounding communities and populations, potential for residential and/or commercial developments. There may be other underutilized areas fit for large scale development in conjunction with BG:Voz extension.

2. Public Transit Improvement Strategies

There is a need to further investigate the current operation of public transit in Belgrade including organizations, manpower, skill levels, maintenance, and finance. The study should address the legal constraints of transit operators, particularly regarding real estate development or commercial activities. The study should address customer perspectives by analyzing satisfaction levels with regard to commuting time, waiting, comfort, accessibility, transfer as well as willingness to pay for services in response to improved services leading to higher frequency and wider coverage of the network. Finally, the study should make recommendations for service level improvement strategies.

3. Legal and Regulatory Assessment

In some countries, cities do not have the authority to change restrictions imposed by the master plan, land use plan or building regulations on an ad hoc basis to promote TOD. In some cases, the state or municipal regulations do not allow the use of public land as equity of the transit agencies and/or urban development corporations. Or it may not allow transit operators to be engaged in property development or commerce. The legal restrictions and freedom thereof need to be fully understood to make financial or institutional plans for any TOD project. Thus, a cross sector assessment on the national and local legal and regulatory setup should be conducted to grasp the potential and limitations for TOD/LVS for Belgrade.

If there are restrictions that hinder the adoption of TOD/LVC methods, recommendations should be made on legal reforms to promote TOD in the long run while in the short run, the projects and institutions need to be designed with the current restrictions and short-comings as known and given conditions.

4. Pilot Project Plan

With solid information on the legal framework, real estate market and public transit improvement strategies, pilot projects should be designed as integrated plans encompassing both real estate and public transit developments at the same time, based on realistic assumptions. The plan should be of pragmatic and sustainable scale beyond 3D architectural projections. It should be grounded on a solid financial evaluation of a project for its financial viability. The fundamental economic values of the projects need to be assessed based on careful market analyses, i.e., traffic generation and willingness to pay for transit in the transport sector and floor areas and unit rental and land values in the land development sector. In order to encourage prompt private participation, the risks need to be assessed and a mechanism to reduce risks should be designed. The plan should include a land value sharing mechanism from land use planning, density planning and urban plot designs, all commensurate with the expected passenger traffic sizes. The physical designs should incorporate the integration of urban development and transit facility designs, focusing on accessibility and comfort of residents, workers and customers between stations and development plots to create real synergy between the two.

5. Institutional Design

Based on the ground reality of the city administration structure, and the specific plans identified, the study can make recommendations for an appropriate implementation scheme with options for a land value uplift sharing mechanism. In the case of a joint venture, the value sharing can take a composite of LVS methods depending on the magnitude and risks involved in the project. The elements of LVS are investment cost, revenue, and profit. If a multipurpose building is solely funded by the public transit, then the tenant may be required to pay a premium by sharing a percentage of the revenue on top of the floor rent. On the other extreme end, a private investor may fund the entire station building, depending on the scale of project, the investor may be given a free concession with a mandate to build it according to the specified design requirements. In the case of land development near a station, the city may grant a bonus density (floor area ratio) to a land plot acquired by the public transit. After leveraging the land value, the public transit can offer it as a collateral or equity in kind to form a joint venture with a private investor.

Such changes in land use restrictions require delicate coordination with urban planning as well with good accountability. It is advisable to have some open bidding mechanisms to accept technical and financial proposals from private sector partners and then select the best bidder instead of a unilateral approach thus hopefully generating more value of money for the city. The mechanism should also cover the organization and staffing of the implementation body. The limitations of the pilot will become clearer after actual learning by doing thus the lessons should be utilized for long term institutional reform for further deepening of the institution for TOD/LVS.

September 2018