

More Sustainable Urban planning in Connection with Public Transport

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Abstract— The focus of the article is on the connection between the city development and an effective public transport in Ljubljana urban region. The spread of scattered single-family housing is typical for these suburban areas. Extensive suburbanisation with relatively low settlement densities has negative effects on efficient land exploitation, environment and economy. Such type of housing means the wasteful use of land and has frequently insufficient communal infrastructure. These districts generate a large volume of transport, especially by car. They need urban restructuring and renewal, condensation of settling and better connection with an effective public transport. For the planning concept in the corridor of the light rail line we propose the model of decentralised settlement concentration. It gives priority to the development of several urban subcentres or densely built-up settlements along the public transport lines, more precisely around the stations. We present such model at three different levels: regional, sub-regional and local.

Keywords—Decentralised concentration strategy, Public transport, Sustainable land use, Urban planning, Urban sprawl.

I. INTRODUCTION

Today's urban structure is shaped by economic and social forces, but more than ever by the communication-information technology and by the transportation systems. Cities are still the main originators of development, for they represent the basis for economic and social interrelations. At the same time, they are great consumers of space, natural resources, and polluters of the environment. Cities and other settlements together with transportation networks are the key factors in the strategy of sustainable development.

The actual trend in most European countries is an increase in the number of private cars per person, which has direct impact on the increase of congestion, the decrease in public transport efficiency, new expressway requirements and environmental degradation. There are important effects on low-density urban development, which enlarge automobile dependence and extensive land use. Such problems are typical for many Slovenians towns, especially for Ljubljana urban region (LUR).

The focus of this paper is on the connection between the urban development and the planned modernised railway system in the northern part of LUR. Ljubljana, as the capital of the Republic of Slovenia, is a political, cultural and economic centre. The city experienced an extremely rapid growth in the period between 1950's and 1980's, mostly by the construction of large housing estates (block complexes), built at the edges

of the city. In opposition to these, extensive areas of scattered single-family detached houses have appeared in the wider city region [1]. Such type of housing means the wasteful use of land and has frequently insufficient communal infrastructure. These districts generate a large volume of transport, especially by car. One of the most important problems that the region will have to face in the next years is how to improve the traffic network, especially the public transport in the connection with the new urbanisation.

II. PROBLEMS WITH SUBURBAN SPRAWL, TRAFFIC CONGESTION AND PUBLIC TRANSPORT DECLINE

A star-like shape is typical for the regional development of Ljubljana. Almost densely built-up city area stretches up to the round by-pass. From the by-pass outwards, the city has been expanding in the shape of five branches. Along those directions, dispersed housing of one-family houses prevails, frequently as dormitories that need the concentration of functions and upgrading in the sense of creating new job opportunities.

One of the main problems of development in LUR is the great extent of suburban sprawl. There are about 270,000 inhabitants within the Ljubljana municipal boundary, but inclusion of the functional urban region increases the total to more than 500,000 inhabitants. The level of motorization is high (1car per 2.2 inhabitants) and the mobility (per day) is already 2.4 travels per inhabitant. The increase of private car traffic and the decrease of public transport represent important problems in transportation system and a threat for the environment. There is a large volume of daily commuting between the settlements of LUR and Ljubljana city centre, which causes congestions in rush hours and traffic problems in the centre of Ljubljana. To reduce the amount of car traffic we need a high-quality public passenger transport in the whole region, which would be able to compete with private cars [2].

III. THE SETTLEMENT DEVELOPMENT IN LUR

Densely built-up city, within the circle created by the by-pass, has possibilities of development by rehabilitating degraded areas, by renovating older urban areas and by improving the location pattern. Taking into consideration, the sustainable aspects of the city development and the problems caused by the motor traffic in the inner city, the solution to this issue is to discharge the pressure on the centre by applying the decentralized settlement model.

This model gives priority to the development of several urban subcentres or densely built-up settlements (providing housing, services, employment opportunities, recreation) that would function almost independently along public transport

lines. In such a way, the dispersed suburban housing pattern of mainly detached one-family houses would become more densely built-up and supported by improved services [3].

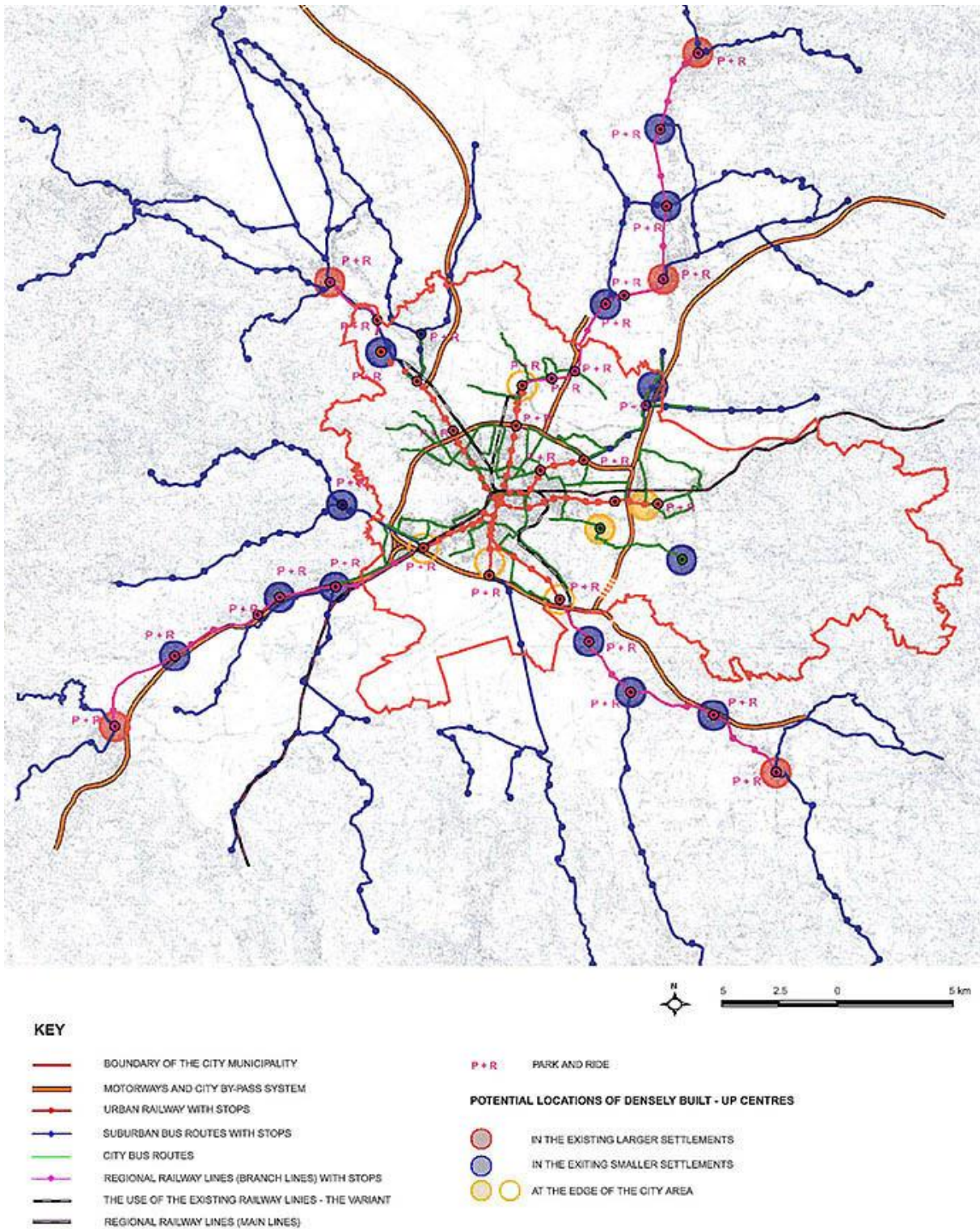


Figure 1: The model of decentralised concentration of settlement in LUR - prepared on the base of the public transport plan (urban and suburban railway and bus lines). (Source [2]: Sasek Divjak 2010)

The city would grow along densely built-up axes with centres linked with a rapid public transportation system. The green intermediary spaces, which separate and hence preserve the integrity of urban units, would additionally enable communication between landscape elements that lie across the transit corridor.

In designing new or upgraded communities, both, the existing construction as well as the existing central surfaces in the smaller suburban agglomerations, should be taken into consideration. At the same time, the dispersed built-up area in the suburbs should become more densely built-up. New or improved central cores would represent the central part of development and settlements around them should be designed as autonomous units within walking distances wherein functions are intermixed (shops, services, public use of space, housing, etc.) Within such a framework, new job programs, as well as new residential areas, would be feasible.

IV. URBAN DEVELOPMENT IN THE NORTHERN PART OF LUR.

In the railway corridor of the northern branch of Ljubljana region there are three important centres: Trzin, Domzale, and Kamnik. The line of settling runs from the city by-pass across the Sava River to Crnuče and Trzin where it splits into two parts: North towards Menges and East towards Domzale. Along the Kamniska Bistrica River, it continues to Kamnik, which is a historic town and has remained the local centre up to this day.

The southern area of the branch is divided in two parts by railway and motorway. On the west side, the area is undulated, covered mainly by forests and partly urbanised. Flat land, markedly transformed by agricultural use (reclaimed forestland and regulated beds of brooks), extends to the east.

In the central part, near Domzale, natural and urban elements appear in the direction north – south. The fertile Menges Field extends along the railway to the west. To the east stretches a belt of urban areas on both riverbanks.

Kamnik lies in the northern part at the foothills of a mountainous region between the railway and the Kamniska Bistrica River. West of it is cultivated farmland, to the east extends hilly and mainly forested land. The basic feature of settling and traffic structure is a distinctive longitudinal organisation in the direction north - south following the flow of the river.

The area stretching to Domzale used to be an agrarian hinterland of Ljubljana in the past when it was settled by smaller villages. Besides farming, the area developed horse cart transport and straw-plaiting. At the end of the 19th century, the construction of the railroad had its impact on the industrialisation of the area, which flourished after the Second World War. It caused the re-structuring of the population, de-agrarianisation of the area and a rapid growth of the town of Domzale where flats for workers in larger industrial plants were built in the first place.

Later, in the sixties and seventies, manufacture and small industry witnessed great development which also caused the re-structuring of existing farms. That period saw a great

expansion of the central Domzale as well as southern part, which became interesting due to the capital's vicinity, the construction of the rapid motorway and its pleasant natural ambience. Favourable housing loans, cheaper building sites and lower construction costs in comparison with the central part of Ljubljana, had its influence as well. Sub-urbanisation movements became strong and caused the emergence of new urban units, such as the new part of Trzin. The "housing boom" was clearly seen, "villages" grew also on account of agricultural land.

In nineties the distinctive transformations were obvious: the emergence of two new urban units in Trzin, the new four-lane motorway to Domzale and the highway in vicinity. The spreading of Ljubljana agglomeration into this area was visible as well as the processes of sub-urbanisation. Domzale has become a town, the settlements of Menges and the old Trzin were enlarged.

Today when the private incentive and the construction of smaller plants prevail, we are witness to still marked sub-urbanisation movements.

V. THE PLANNING CONCEPT IN THE RAILWAY CORRIDOR FROM LJUBLJANA TO KAMNIK

For the planning concept in the northern part of LUR we propose the model of decentralised settlement concentration (Fig. 2). The central backbone of such model is the public transport system. For its satisfactory functioning, an integral solution for the regional traffic system is urgently needed [4]. Several studies were made to find a "best suited network for public transport" for the long term and to identify a first priority investment. The analyses were combined with the results of workshops with traffic planners, urban planners and politicians of LUR. Better prospects of the implementation of railway improvement exist in the branch lines leading to the north (to Kamnik) and to the south (to Grosuplje). After analysing the costs of the investments into the railway and taking into account the technical and organisational aspects, the first priority line is towards Kamnik [5].

That is the reason why this branch and the possibilities of concentrating settling in the nearer areas of the railway stations (10 min. walk) have been studied in detail in our research project [6]. We have shown possibilities of the settlements growth taking into account two strategies: upgrading (reuse) of the existing urban areas (preferably in a short-term period) and adding new areas (according to long term needs). We have taken into consideration the present land-use and limitations about preservation and cultivation of agricultural land, forests, water sources and areas of overflows etc. The entire area is rich in natural and cultural heritage, which is under a special protection regime. Green areas will continue to play a significant role in planning which will aim at preserving both, the existing green as well as creating new ones (also for recreational purposes). (Fig. 2)

Planned development is based upon the long-term plan, land use plan and its limitations. We also took into consideration

the suitability of space, urbanisation needs and infrastructural networks, particularly regional rail line.

We have been concerned with the width of the corridor along the railway that would be interesting in regard to urbanisation:

- 600 m on both sides as a possibility of shorter accessibility in 10-minute walking;
- 800 m on both sides as a possibility of a longer accessibility in walking distance;

- 1000 m on both sides, easily accessible by bicycle.

The feasibility of a huge investment in such a railway infrastructure as is envisaged for the northern branch demands a parallel availability of new residential and other uses that represent a great deficit in the central region of Slovenia.

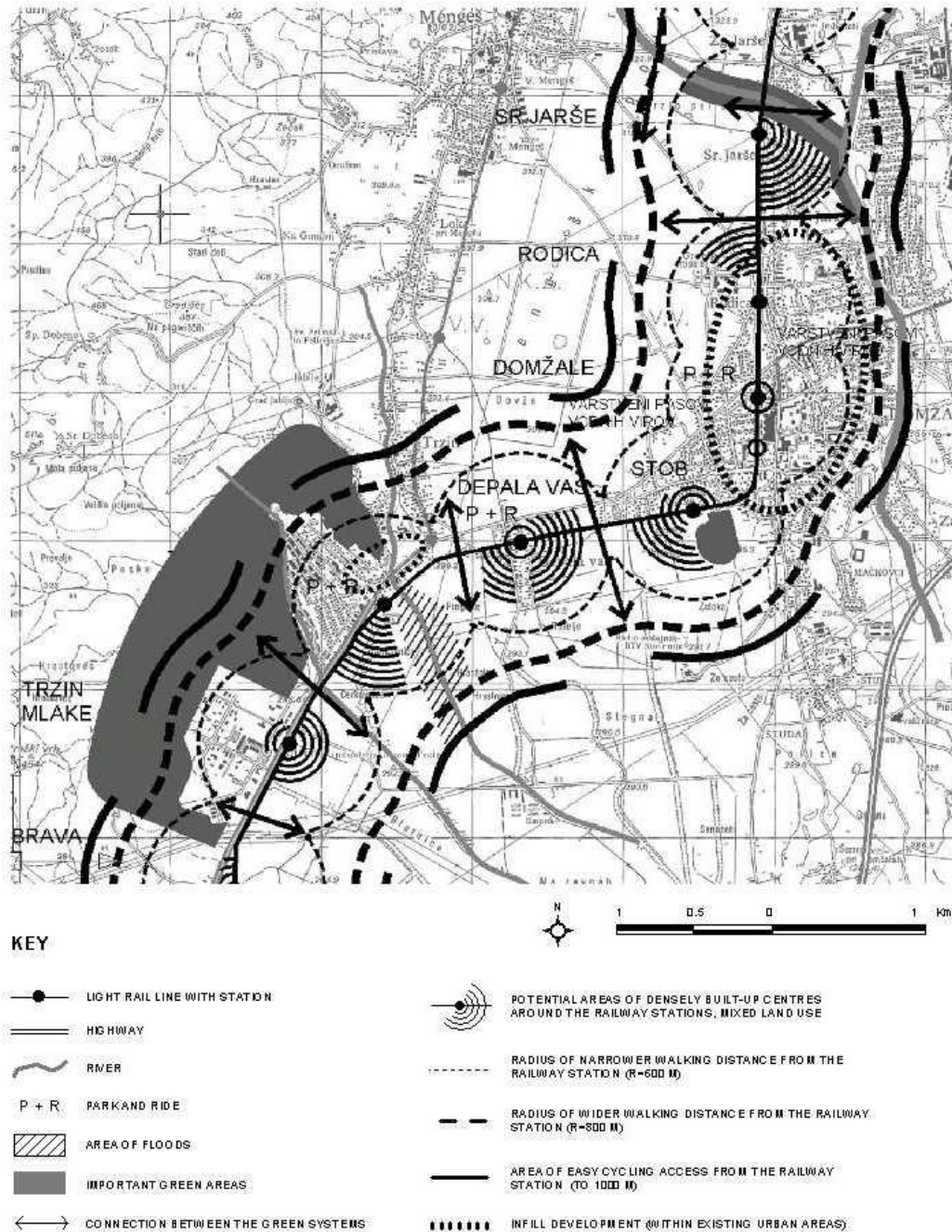


Figure 2: Potential possibilities for more densely built-up areas in the northern corridor of the light railway. (Source [6]: Sasek Divjak, Cargo 2002)

VI. THE TOWN-PLANNING CONCEPT OF KAMNIK AGGLOMERATION IN CONNECTION WITH PUBLIC TRANSPORT

The master plan for Kamnik [7] is based on the re-arrangement of the existing formless settling in a sequence of

recognisable settlements with a clear picture of programme centres and their edges. The traditional communication link north - south (Ljubljana Street) is a main road around which settling and key programmes are organised.

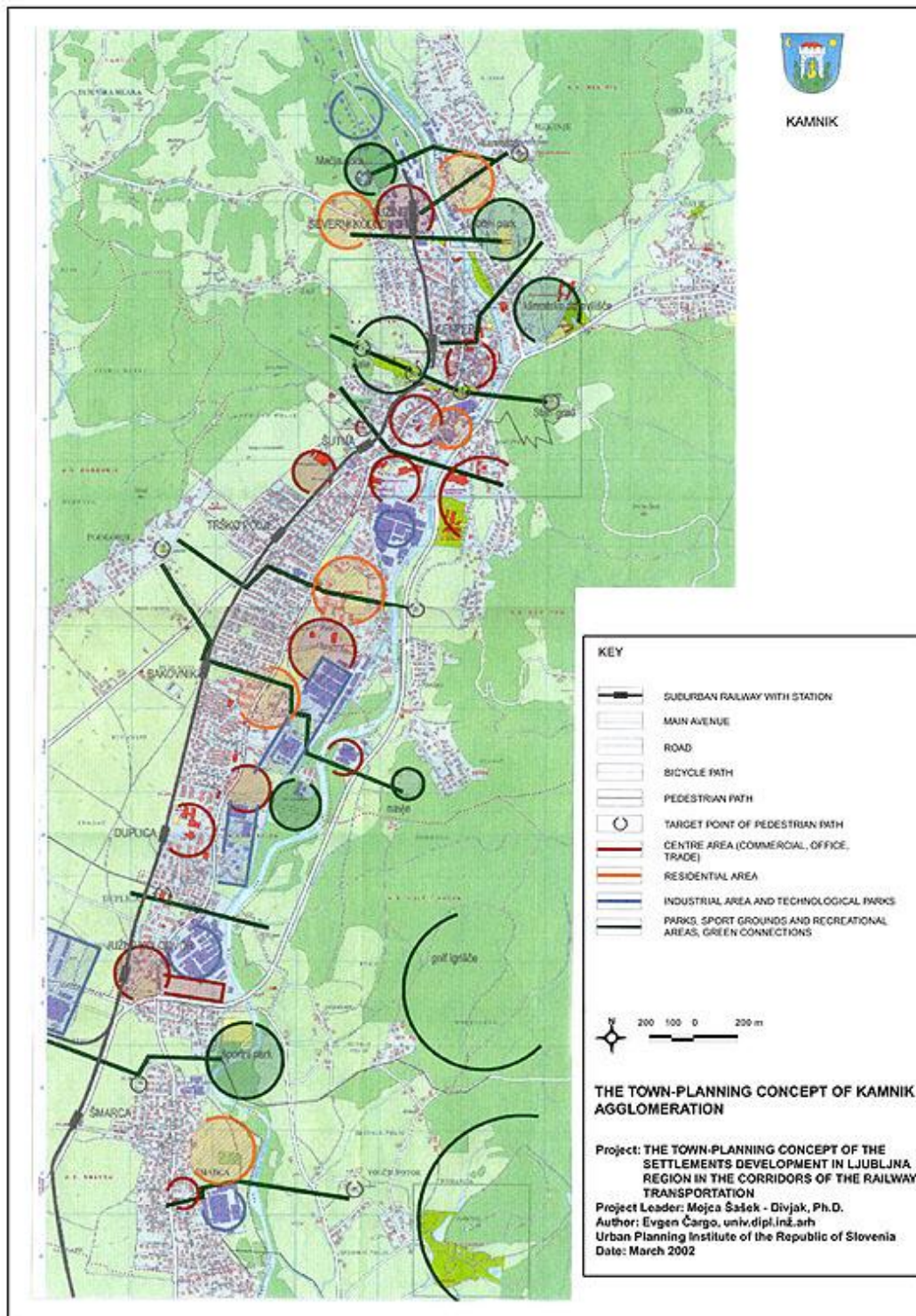


Figure 3: The town-planning concept of Kamnik agglomeration (Source[6]: Sasek Divjak, Cargo 2002)

Newly designed regional centres in the northern and southern part of the municipal urban space surround the arranged urban structures (Fig. 3). The parallel by-pass preserves the character of a distinct transit road. Newly organised centres of particular settlements have transverse traffic connections to the by-pass and railway.

The settlements relieved of the burden of industrial activities open up towards waterside areas of the Kamniska Bistrica River, which represents the backbone of the greenery system. The important elements of the greenery system are the transverse connections between the eastern forest area and the western farmland area, acting like ecological links of the urban space with the natural hinterland. They articulate the urban structures at the same time. These are also functional connections that lead the town people to the waterside or to the natural hinterland and cultural landscape and interconnect attractive tourist, cultural and historical sites in the area.



Figure 4: The old city core of Kamnik.

The urban area is organised as a sequence of forms and programmes of the built and open space in the orthogonal network created by longitudinal (railway, main road, water, by-pass) and transverse communications (in-roads - avenues, communications, walkways through articulated greenery between the settlements). Programme centres emerge as addition to the existing areas with central activities in communication knots. Each centre has its specific activity according to the existing programme structure, which render each single settlement more recognisable.

New settling is envisaged within the frameworks of the cultural landscape in the west and of the vast ecologically preserved watersides of the Kamniska Bistrica River in the east. Significant reserves are available in degraded industrial complexes of Kamnik along the river.

A predominant part of a still active and ecologically unfavourable industry located along the waterside is being moved out of the residential area to a destined zone along the Kamnik railway line. A few reserves along the Kamniska Bistrica River have been left for the extension of high-tech production that would not have negative influence on settling.

In the first place, the possibility of reuse of degraded and vacant areas in the corridor of the rail passenger traffic has been foreseen.

The old town core is a historic area that should function as a rich mixture of cultural, central and tourist uses on the ground floor and as quality housing in the available upper floors.



Figure 5: The degraded urban area Fuzine



Figure 6: In our development proposal the northern railway station will be located in the part of underutilised industrial complex

The newly designed northern town centre in Fuzine discharges the old nucleus of redundant and inconvenient programmes and at the same time creates a new and rich settling hinterland in the immediate vicinity of a medieval town (radius of accessibility for pedestrians), allowing for a more active enjoyment of prestige programmes and environmental qualities and enabling the reanimation of today's stagnation. Daily migrants using the new station will have the opportunity to enjoy the advantages of the new programme in the old centre (Fig. 4) which, according to the urban concept, is directly connected to the stop of the suburban railway.

The degraded urban area Fuzine (Fig. 5, 6) represents a valuable possibility for the development of modern passenger terminus (railway and bus) serving as an interchange in the

"park and ride" system. It could become the centre of a new mixed-use district (office, commercial, public, residential).

VII. "CLOSE TO STATION" DISTRICT

In the eastern part of Ljubljana, at the traffic crossing in Polje, we have proposed a new subcentre connected with the planned line of the city railway [6]. The area has been

considerably changed by the construction of the city by-pass motorway in the vicinity and the transformation of Zaloska Street into a four-lane motorway. The area is surrounded by a growing housing construction of a rather dispersed character in its southern part.

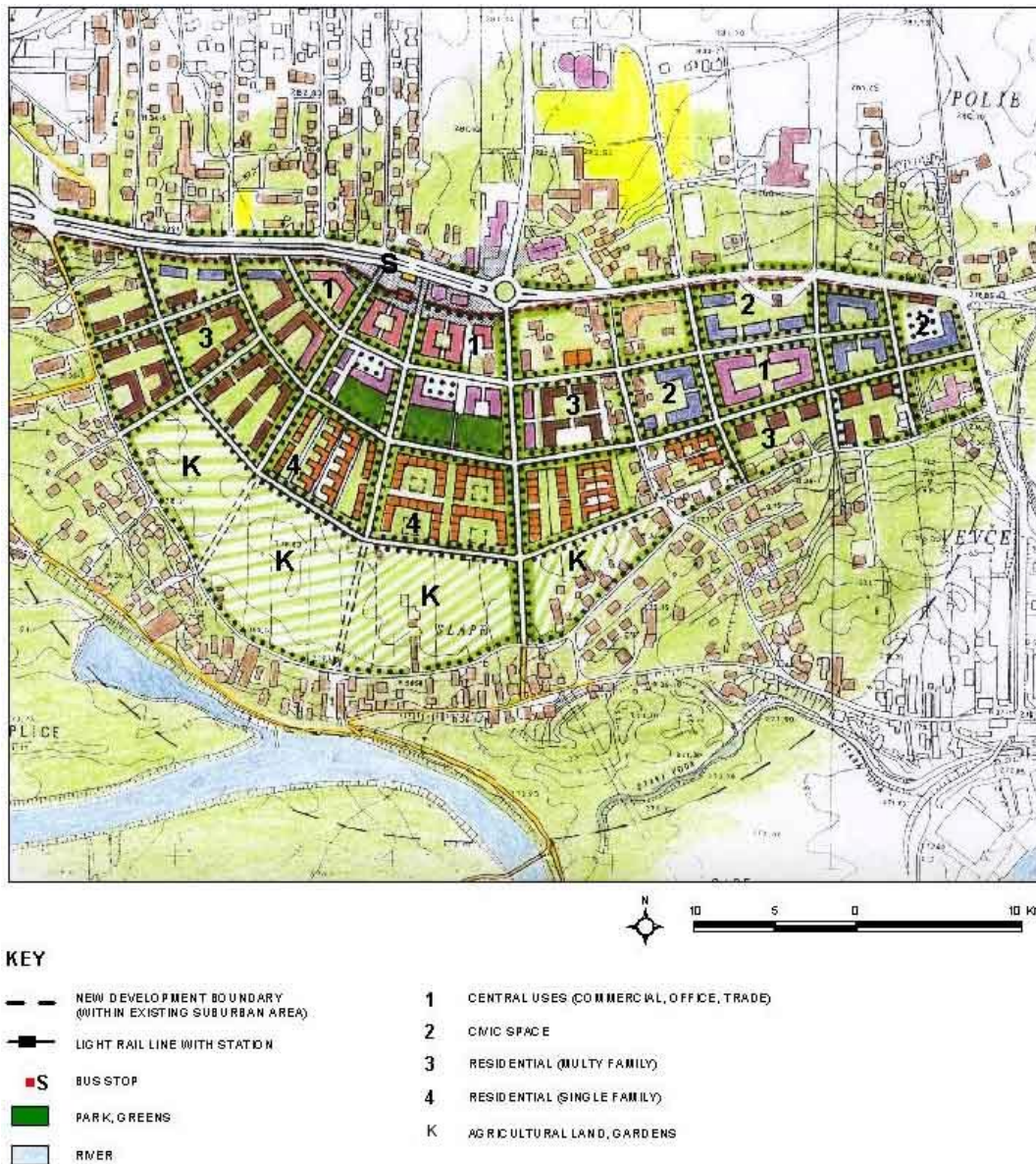


Figure 7: Densely built-up centre Slape. (Source[6]: Sasek Divjak, Cargo 2002)

In our development proposal (Fig. 7) the railway and bus stops are located in the middle of the central area of the agglomeration. It is connected with the old centre of Polje and represents the social and commercial centre of the

neighbourhood. Such improved central core could cover the new and old parts of the settlement in the distance of 10-minute walk, i.e. 600 m. The station will also serve daily migrants as an exchange station for the public transport.

The building proposal envisages higher-density low-rise residential blocks immediately behind the central belt. It is followed by compact single-family housing (row, atrium houses). Along the main communications a predominantly mixed land use is planned (commerce and services on the ground floor, flats on the upper floors). Rather noisy Zaloska Street is the backbone of commercial, service and craft facilities, which are already present in this part of settlement. The proposal preserves the existing buildings and streets, which are integrated, in the new network of communications. In the connection with the existing built-up area of one-family detached houses in the southern part green surfaces are preserved and could serve for gardening or agricultural use. The whole complex Slape lies near valuable watery surroundings of the Ljubljanica River, an area interesting for recreation, sport and walk.

VIII CONCLUSIONS

The suburbanisation issue that emerged in Slovenia in the seventies and eighties has since been intensively continuing and must be urgently solved by accepting more sustainable possibilities of suburban settling. They need urban restructuring and renewal.

We propose decentralised settling model with densely built-up centres. It gives priority to the development of several urban subcentres or densely built-up settlements along the public transport lines, more precisely around the stations.

The improvements due to new concentration centres that would represent a more sustainable form of suburban settlements on the basis of rehabilitation and functional upgrading could be the following:

- Condensation of settlements close to the rail stations and better use of land;
- Better urban standard, upgrading of functions (central, manufacturing, recreational);
- New job opportunities;
- Better communal and other infrastructures;
- Promotion of sustainable modes of transportation.

It is important to integrate in the right way the old parts of settlement, especially villages. If these parts have their own character and identity that must be respected in future planning. Emphasis must be put on trying to preserve units or buildings that merit preservation.

Because of rapidly growing development in the suburban space of LUR, new circumstances will certainly occur when the public transport network is upgraded (the suburban railway in the first place). That is why local development plans should be adapted and upgraded in this sense. If they are not changed, those areas will be built up and there will be no possibility to

create urban subcentres (close to the station) that would accommodate residential areas, as well as urgently needed central, manufacturing and recreational areas.

Experience has shown that a public transport investment alone is not able to solve the mobility problems. For long-term mobility enhancements, public transport needs a global policy of joint urban planning, land use and environmental covering issues.

REFERENCES

- [1] Ravbar, M., *Network of Settlements and the Spatial Development of Slovenia*, Institute of Geography, Ljubljana, 2000.
- [2] Sasek Divjak, M. et al., *Strategic Spatial Plan for the Municipality of Ljubljana*, Urban Planning Institute RS, Ljubljana, 2010.
- [3] Calthorpe, P. and Fulton, W. *The Regional City, Planning for the End of Sprawl*, Island Press, Washington – Covelo – London, 2001.
- [4] Regional development agency LUR, *Public Transport in Ljubljana Urbah Region, 2010*. Available at: http://www.rralur.si/fileadmin/user_upload/projekti/Promet/PozivBrosura/JPP_brosura.pdf (accessed 20 September 2011)
- [5] TTK, *Public transport concept for city and region of Ljubljana (Phase Ib-A)*, City of Ljubljana, 1999.
- [6] Sasek Divjak, Cargo, E. et al., *The town-planning concept of the settlements development in Ljubljana region in the corridors of the integrated city and regional public railway transportation*, Urban Planning Institute of the Republic of Slovenia, Ljubljana, 2002.
- [7] Cargo, E. et al. *Long and middle term urban plan of Kamnik*, LUZ, Ljubljana, 1998.

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