Note on Riga Spatial Structure

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This note has been prepared after a visit to Riga from January 26 to February 1. I am very grateful for the help I received from Government officials and from private sector professionals.

Figure 1: Riga - 3 dimensional representation of population densities in built-up areas

SUMMARY

Riga's spatial structure bears the marks of the 45 years during which the "invisible hand" of land markets was replaced by administrative decisions in shaping the city. However its exceptional historical core has survived nearly intact. The resumption of markets, now guiding the Latvian economy, will create incentives to change some obsolete forms of land use. Recycling obsolete industrial land, in particular the land located within less than 6 kilometers from the city center will constitute the main challenge for land development in the next few years.

Population densities in the built-up areas are similar to those in other cities of Europe but housing consumption is particularly low. Because no demographic increase is envisaged in the near future, land use change will be mainly triggered by an increase in housing consumption and in demand for floor space for the expansion of business and services activities.

Municipal objectives contained in "Riga Official Plan - 1995-2005" implicitly point toward a dominantly monocentric city, although an increase in services and retail will be needed in the suburban residential areas. The major challenge faced by the municipality will be to channel the demand for new floor space toward recycled areas close to the city center. In the absence of a strong policy facilitating this densification, Riga urban area will disperse further away from the city core and the use of individual cars will become the dominant mode of transport.

The zoning plan included in "Riga Official Plan - 1995-2005" is consistent with municipal objectives. The plan proposes a drastic reduction in the area occupied by industrial land and seems to be flexible enough to accommodate densities consistent with the evolution of land markets.

The municipality should monitor the spatial evolution of Riga city structure with a number of indicators. Monitoring the evolution of land prices and rents would be also important in guiding future urban development policy.

1. Objective of this note

This note has 3 main objectives: first, to perform a brief analysis of Riga current spatial structure and to compare it with other cities of Europe; second, to discuss the type of future spatial structure which would be consistent with the Municipal development objectives of the City of Riga as expressed in the document "Riga City Official Plan 1995-2005"; third, to suggest a type of municipal zoning plan which would be consistent with the city shape as proposed by the "Riga Official Plan".

2. Why spatial structure matters

The spatial structure of a city is very complex. It is the physical outcome of the subtle interactions over centuries between land markets, and topography, infrastructure, regulations, and taxation. The complexity of urban spatial structures has often discouraged attempts to analyze them and ad fortiori to try to relate urban policy to city shape.

The spatial aspect of urban development has an important impact on economic efficiency and on the quality of the urban environment. However, the evolution of urban form, shaped by the complex interaction between market forces, public investment and regulations, is not often monitored. Consequently, the significant inefficiencies due to a poor spatial structure are often ignored until it is too late to do anything about it. Municipal urban planning department should use spatial indicators to regularly monitor urban development and to propose regulatory or public investment action when necessary.

From an economic point of view, a city is a large labor and consumer market; the larger the size of the market and the lower the costs of transactions, the more prosperous is the economy. A deficient spatial structure fragments labor and consumer markets into smaller less efficient markets; it contributes also to higher transactions costs by unnecessarily increasing distances between people and places. A deficient spatial structure increases the length of the city infrastructure network and therefore increases its capital and operating costs. A deficient spatial structure can render a city economically uncompetitive.

From an environmental point of view, a deficient spatial structure decreases the quality of life by increasing the time spent on transport, by increasing air pollution, and contributing to the

unnecessary expansion of urbanized areas in natural sites. A poor environmental quality could also contribute to render a city economically uncompetitive.

A city's spatial structure is constantly evolving. Because of a lack of political consensus or a clear vision on spatial development, land use regulations and infrastructure investments may be inconsistent and their combined effect may contradict each other. It is therefore important that municipalities monitor the spatial trends of development and take regulatory remedial action when this trend contradicts municipal objectives. In the case of Riga, for instance, an increase of office space vacancy in the city center contradicts Municipal objectives and should require remedial action.

In markets economies, municipalities can influence the shape of urban development, not through direct design, but by implementing a coherent and consistent system of land use regulations, infrastructure investments, and land related taxes. However, in the long run, the shape of a city will depend on the way the real estate market reacts to the incentives and disincentives created by these regulations, infrastructure investments and taxes. Because external economic conditions are continuously changing and are unpredictable in the long term, the planning department of municipalities should constantly monitor the evolution the urban spatial structure, and adjust eventually the balance and nature of regulatory incentives and disincentives.

3. Riga spatial structure compared to other cities of Europe

We will use 5 main indicators to compare Riga to other cities of Europe:

- Average built up density
- Density profile
- Average distance per person to the CBD
- Dispersion index
- Land Price profile

a) Average density

The average density – population divided by built-up area – is the inverse of per capita land consumption[1]. Riga's population densities in the built up areas are shown on the map of Figure 2. The higher is the density the lowest is the land consumption per capita. Riga average density, 64 people per hectare, is very similar to many other central European cities (Figure 3). With a density half way between Stockholm and Paris, Riga follows the "norm" of most European cities. While Riga's average density is similar to most European cities, the way the land is distributed between various uses – residential and industrial in particular—is quite different from Western European cities and bear the imprint of its 45 years under a command economy.

[1] Average density is calculated by dividing the population by the built up area. The built-up area as use in this report includes everything which is built, i.e. residential areas, streets, railways track, industries, etc.. but not including airports, water bodies or parks and open spaces larger than 4 hectares. This definition has been used consistently for calculating all the densities of cities quoted in this report.

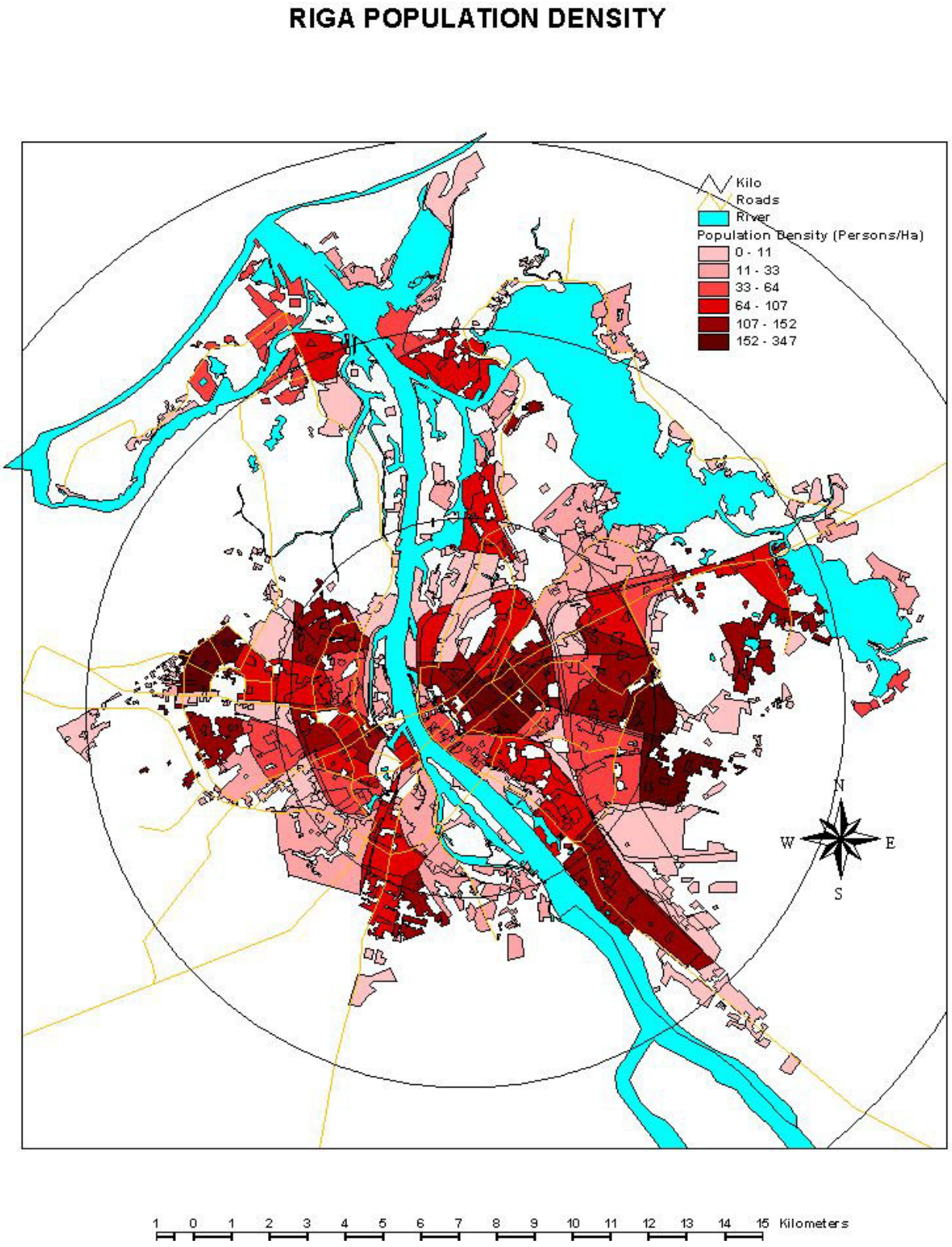

Figure 2: Riga - Map of population density in the built-up areas(1998)

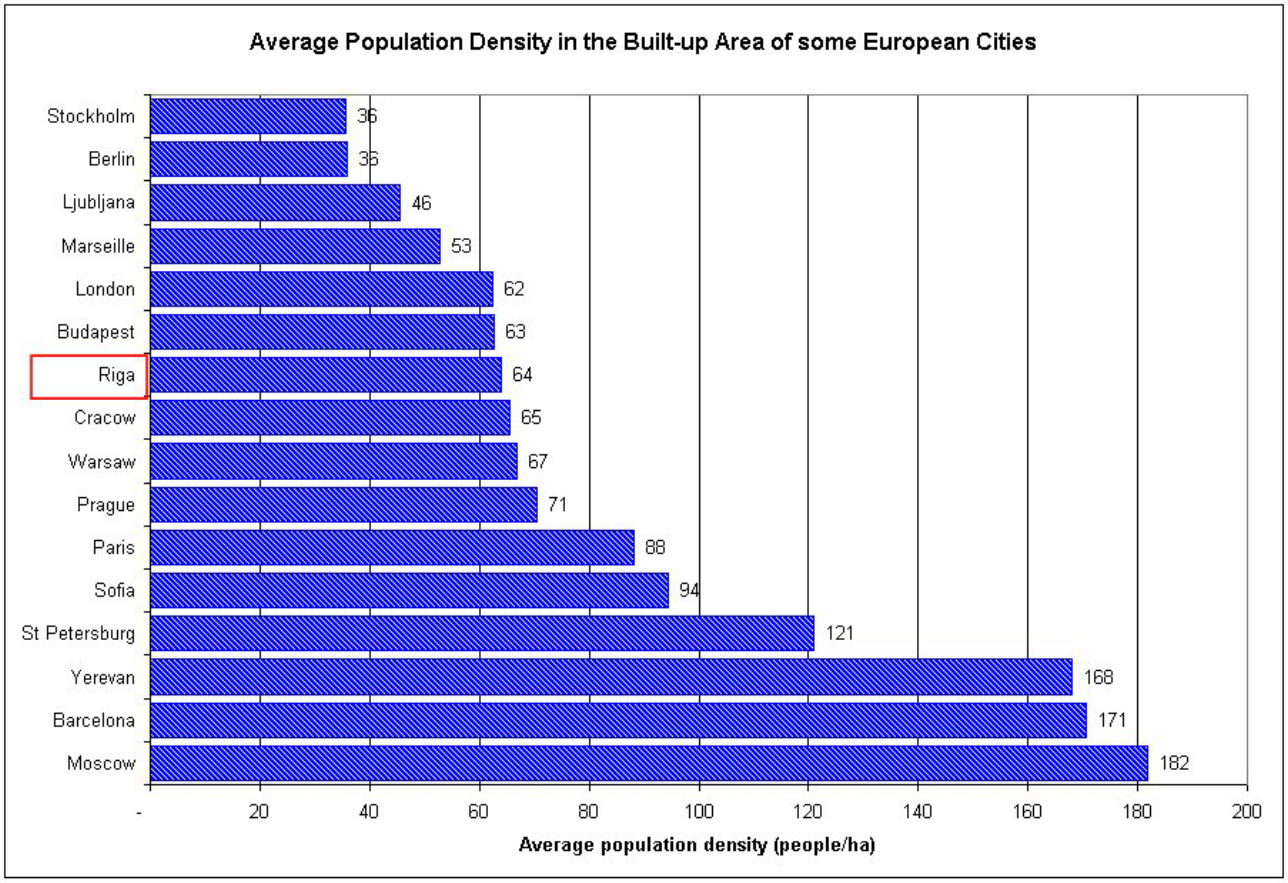

Figure 3: Average population density in the built-up area of some European cities

b) Density profile

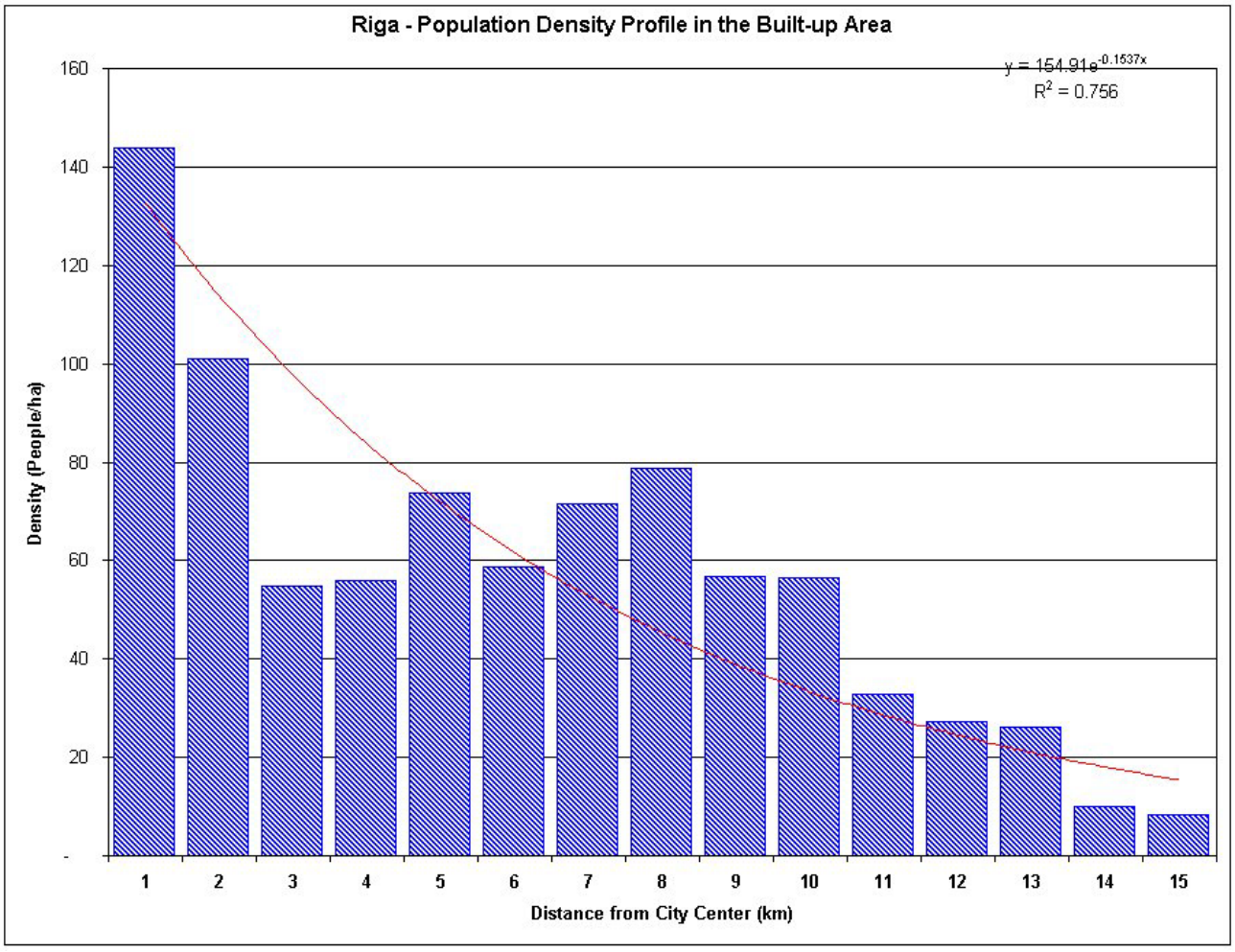

Figure 4: Riga - Population density profile in the built-up area

The distribution of densities by distance from the city center reveals Riga's "camel back" profile. This density profile is typical in cities where the land markets were interrupted for a number of years (Figure 4). The densities between 3 and 4 kilometers from the city center decreases sharply to increase again between 5 and 10 kilometers. This decrease in density is due to the existence of an industrial belt which could not be recycled to higher use because of the absence of land markets. The increase in density between 5 and 10 kilometers is due to the existence of panel housing. This type of housing was supply driven, and ignored consumer demand. If markets had been operating continuously during Riga's entire history the density would be probably higher between 3 and 4 kilometers from the center and lower between 5 and 10. The high density of the first 2 kilometers corresponds to the historical core of the city and was not affected by the socialist period.

A comparison between the density profile of Riga and 15 other cites of Europe confirm this diagnostic (Figure5). The longer the effects of land markets have been interrupted, the more the profile departs from the classical negatively sloped exponential curve usually associated with markets.

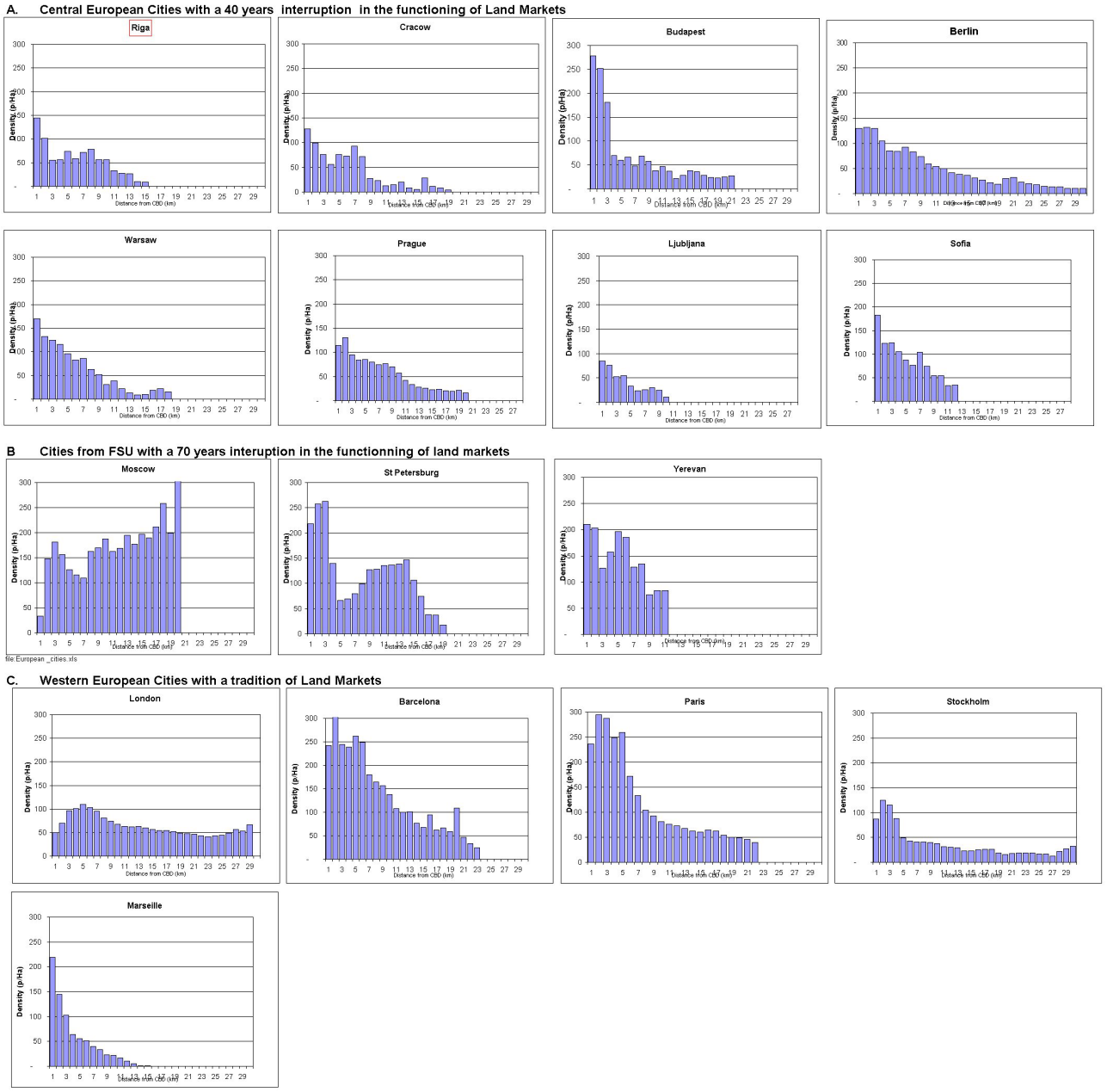

Figure 5: Density Profile comparison between 16 cities of Europe.

c) Average distance per person to the city center

The pattern of land use and densities determine the average distance per person to the city center or Central Business District (CBD). The distance to the CBD is directly linked to the cost of getting to the city center and is roughly correlated to the length and costs of random trip across the metropolitan area. The graph of Figure 6 shows the spatial distribution of population in Riga. The average distance per person to the CBD is 5km. From the point of view of the efficiency of the transport network and of infrastructure in general, it is desirable to have as many people as close as possible to the city center. This is why it is desirable to have the highest density housing close to the

center and the lowest density farther away. The mechanism of the land market would tend to create such a pattern. However, regulations, the availability of primary infrastructure and at time topography might disturb this pattern and contribute to more dispersion. In the case of Riga, the high density of panel housing estates located far from the center, as seen on Figure 3, contributes to the dispersion of the population and therefore to an increase in trip length. As we will see below, this is also true if employment is decentralized.

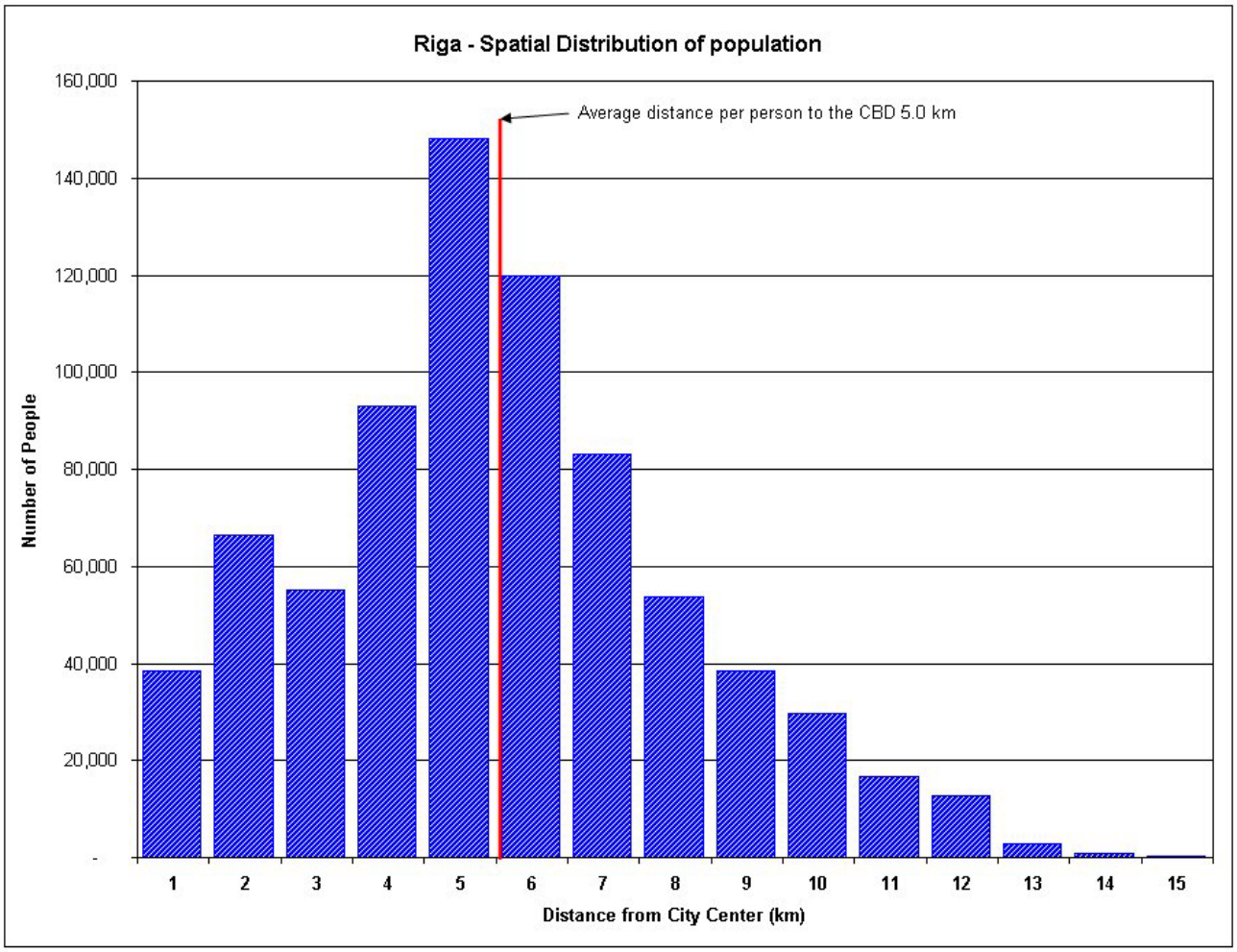

Figure 6: Riga; Spatial distribution of population

For a city the size of Riga, an average distance to the CBD of 5km per person is rather high. To compare Riga to other cities of Europe we have to take into account the size of their built-up area.

The graph of Figure 7 shows horizontally the size of the built-up area expressed in square kilometers on a log scale and vertically the average distance in kilometers per person to the CBD. The red line on the graph shows the relationship between the size of the built-up area and the average distance per person for a fictitious city whose shape would be a circle and that would have a uniform density. This is useful to see how the average distance per person would varies when the shape stay constant but when the size of the built-up area become larger. On the graph, the relative vertical distance from the point representing each city and the red line gives an indication of shape performance. The further below the line is the point representing a city the better is the shape

performance. The further it is above the line the worst is the performance. We see that Riga is not performing particularly well for a city of its size.

It would be expected that the average distance per person will always increase with the size of the built-up area. But we can see from the graph of Figure 6 that this is not necessarily the case. The built-up area of Paris (937 km2) is nearly twice the size of the built-up area of Moscow (470 km2) but the average distance per person to the center in Paris (10 km) is the same as in Moscow. This apparent paradox is due to the distribution of densities within the built-up area, as seen on the density profiles for each city shown above on Figure 5. In this case the practical consequence of the positive density gradient of Moscow (density increasing with distance to the center instead of decreasing like in the other cities in our sample) is to lengthen the distance per person to the center, and this in spite of Moscow's high density and apparent compactness.

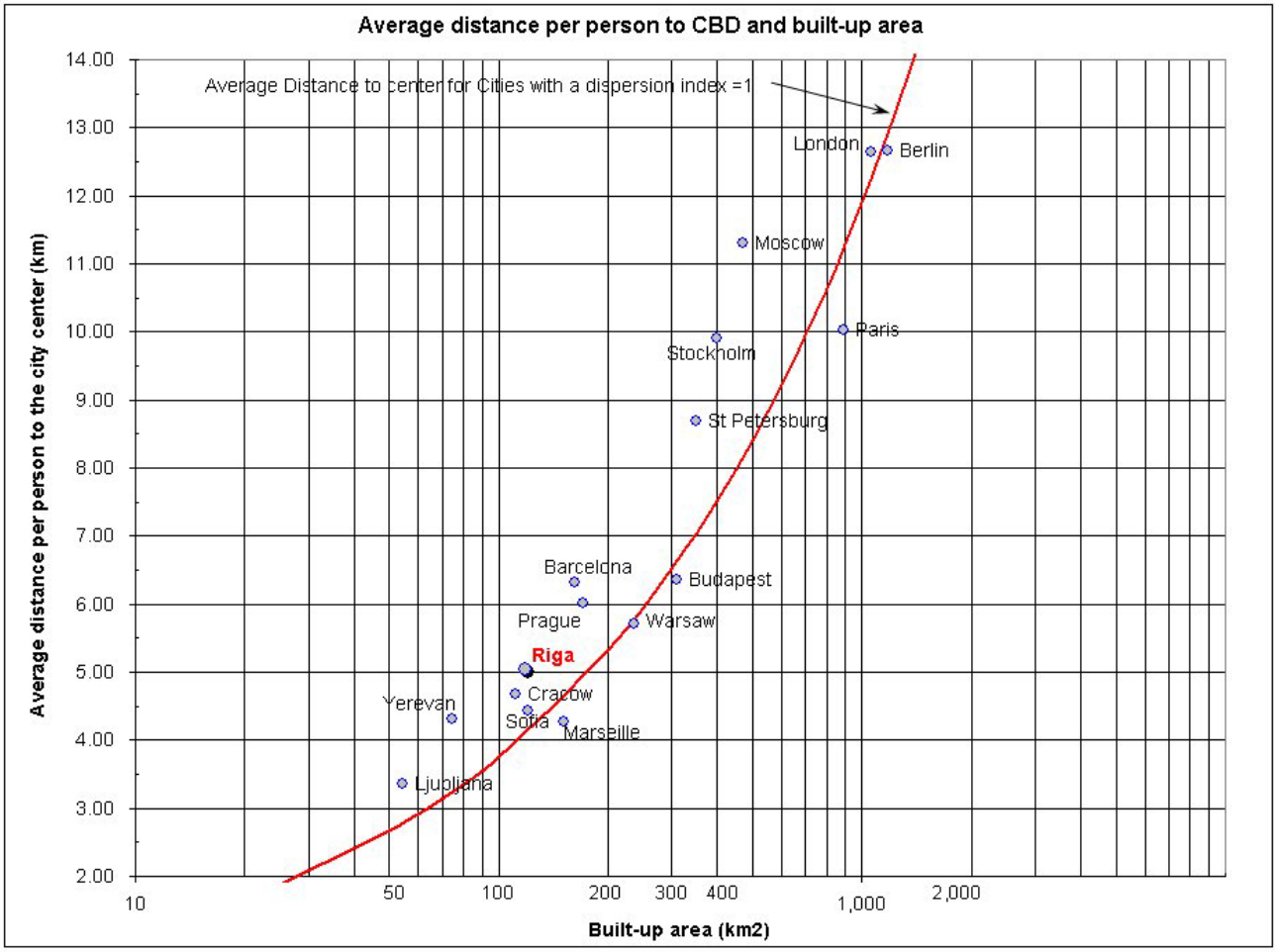

Figure 7: Average distance per person to the CBD and built-up area

d) Dispersion index

The measure of the average distance per person to the CBD – in case of a monocentric city – or to the center of gravity – in case of a polycentric city – provides a good indicator of dispersion for a given city over time or between alternative spatial options. However, to have a comparative measure of shape performance between cities, it is necessary to have a measure of dispersion

independent from the city's area. Everything else being equal, in a city with a small built-up area the distance per person to the center will be shorter than in a city with a larger built-up area. To correct for the area effect, the index of dispersion ρ, used in this paper is the ratio between the average distance per person to the CBD, and the average distance to the center of gravity of a circle whose area would be equal to the built-up area:

$$\rho = \frac{\sum_i d_i w_i}{\frac{2}{3}\sqrt{\frac{A}{\Pi}}}$$

Where ρ is the index, d is the distance of the *i*th tract from the CBD, weighted by the tract's share of the city population w_i; and A is the built-up area of the city.

The index of dispersion, ρ, is therefore independent from the area and from the density of a city; it reflects only the shape performance. It is therefore possible to use ρ to compare cities of very different sizes and of very different densities. A city of area X for which the average distance per person to the CBD is equal to the average distance to the center of a circle of area equal to X would have an index of dispersion of 1. Of course, I am not arguing here that a circular city is somewhat optimal, merely that some cities will be more compact that this baseline (have a lower value of ρ) and some will be more dispersed (have a higher value of ρ).

For Riga, the value of the dispersion index ρ is 1.23, which is rather of the high side compared to other cities of Europe. We will see below the policy implications of this relative high value for ρ.

e) Land Price profile

Because land markets are important contributors to city shape, it is important to monitor land prices. The map shown on Figure 8 is based on a rough estimate of land prices in January 2002 prepared with the help of Riga real estate brokers. The variations of land prices could explain the direction of future development. Higher land prices indicate high demand and therefore in the long run pressure for higher densities. The higher the price differential between the center and the periphery, the better it is for the city, as it means a high demand for the amenities in the center and as a consequence of densification, shorter trips and shorter infrastructure networks. The high land prices in the Mezaparks area located on the West bank of the Kisezers lake in the North East of Riga may indicate in the future a pressure for densification although at this moment only individual houses are built in this area. If in the areas around the lakes higher densities were considered to be undesirable for environmental reasons, zoning legislation will have to be set to prevent them.

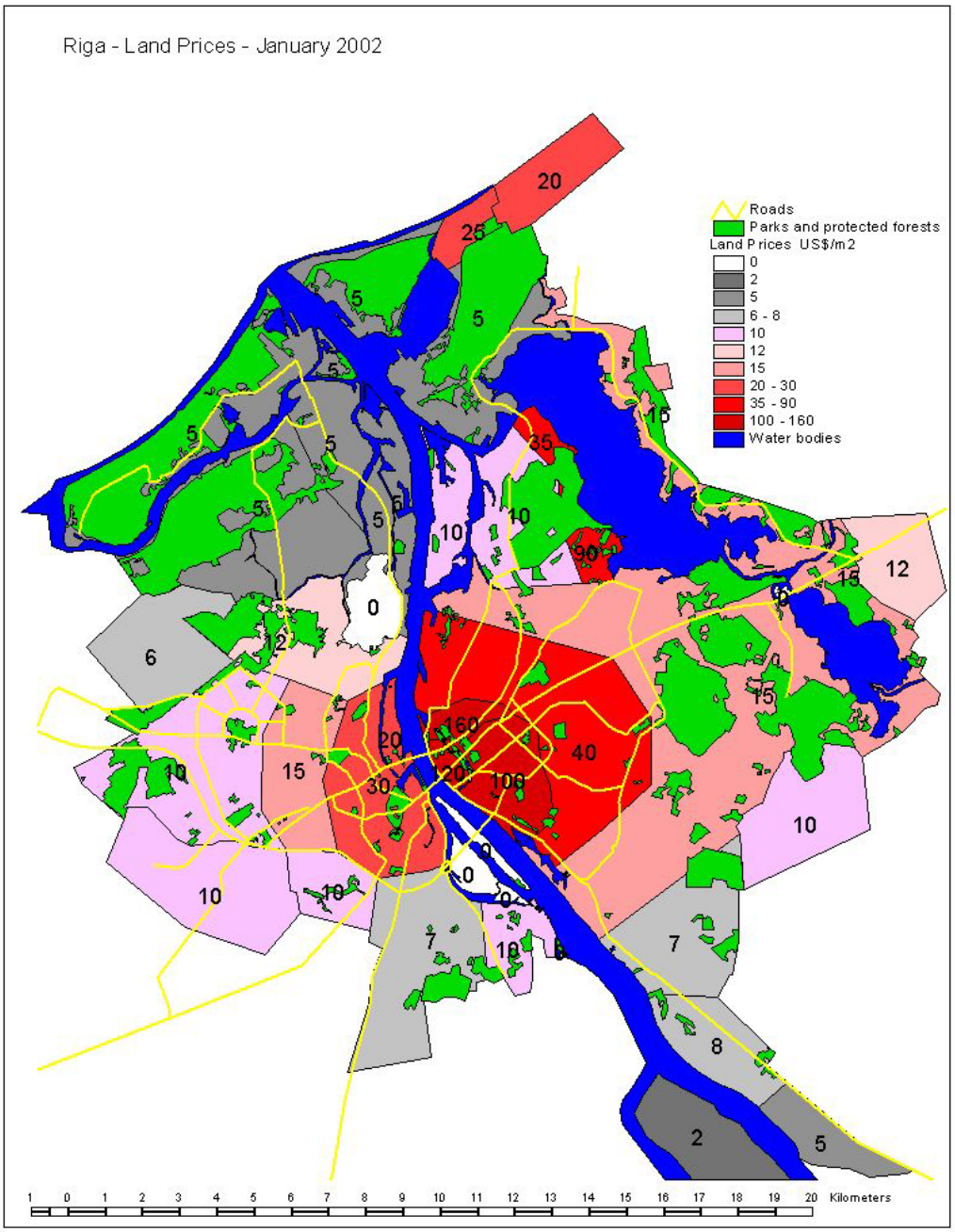

Figure 8: Riga- Map of estimated land prices (January 2002)

From the map of Figure 8 it is possible to build a graph representing the variation of average land prices by distance from the city center as shown by the red line on Figure 9. The land price profile is then compared to the density profile. In market economies, the land price profile follows the density profile, precisely because higher land prices put pressure to build at higher densities. Or to put it another way, rising land prices tend to decrease land consumption per person, i.e. increase density. In the case of Riga, the land price profile follows the density profile for the first 3 kilometers corresponding to the historical city which was built when land markets were prevalent. Past the 5 kilometer from the center, the land price decreases while the density increases. This

discrepancy between the land price and density corresponds to the high densities of panel housing projects whose density had nothing to do with consumer demand but was fixed administratively.

In the future, it will be necessary to monitor land prices and rents as an integral part of the municipal urban planning activity. It is probable – and desirable – that land prices will increase between kilometer 3 and 6. This higher land price would put pressure on underdeveloped land in this area to redevelop and to shift use, for instance from industrial to commercial or residential.

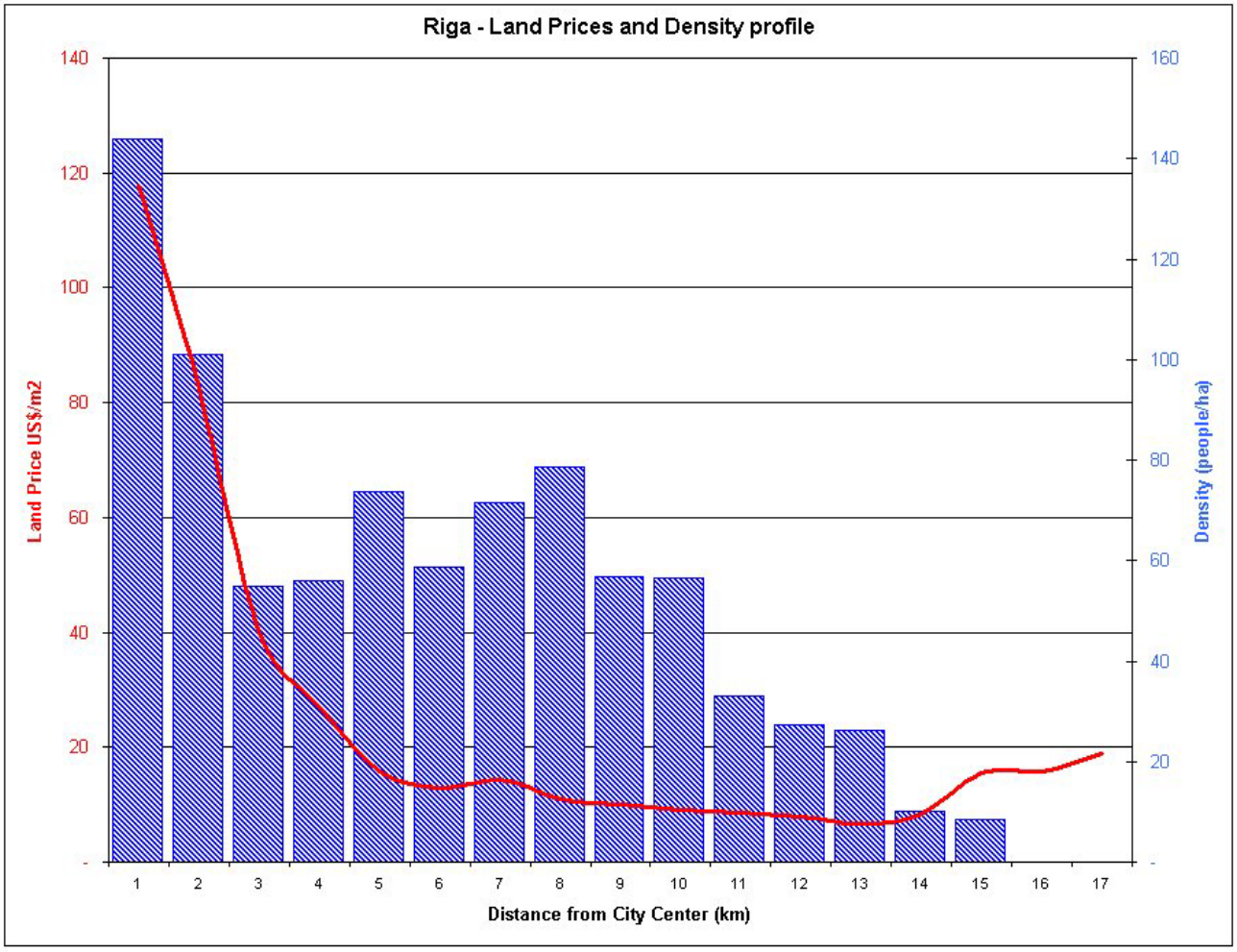

Figure 9: Riga - Land price and density profile

4. Summary of Riga's municipal development objectives

It is not possible to "optimize" a city spatial organization on purely technical criteria. Many possible objectives require contradictory strategies. For instance, higher densities are required for a more extensive use of public transport and therefore for better air quality. But higher densities may also mean higher land and housing prices. Therefore improving environmental standards may result in keeping housing consumption low. No urban planner should be required to make trade-off between objectives. The decision on trade offs, for instance, to what degree air quality should be improved and to what level housing consumption should be raised is a political decision, not a technical one; it belongs to an elected city council accountable to the city population. Therefore,

before suggesting strategies and means to implement these strategies it is necessary to clarify what objectives the municipality wants to achieve.

The municipal objectives of Riga, based on a reading of "Riga Official Plan - 1995-2005", can be summarized as follows (extracts from the translation of "Riga Official Plan" are in italics and between quotations marks) :

a) Very little demographic growth

"*For the purposes of city planning accept that the population of Riga in 2005 will be 790,000 people*". In fact, the population of Riga has declined faster than was projected when the plan was prepared in 1995. Between 1995 (840,000 people) and 2001 (759,000 people) Riga's population has decreased by about 10%. In the rest of the report we will assume that Riga's population has stabilized around the 2001 figure of 759,000 people.

b) Priority to environmental quality:

"*Optimal arrangement of land uses (for residential, service centres, industrial) in order to minimize transportation flow; in addition, in the last years transportation pollution has increased considerably*"

c) Preservation of historical center

"*Spatial composition of city architecture is the spatial expression in its planning and its city landscape; it is the third dimension in city structure*."

"*The City Council will promote the preservation, care and the creation of the following significant city-scapes: the emphasized riverbank silhouette groups precisely mark also Daugava river shipping lanes and directions; the broad wide space of Daugava river divides the city, but from the visual aspect is also links the city's right and left banks. The unique Vecriga (Old Town) silhouette marks and determines the distinctiveness of the city – it has become the symbol for the whole city."*

d) A strong center containing a mix of business and residence:

"*A new form of economics in the city is business and finance that for the last fifty years was under state control. Banks, insurance companies, various financial institutions, big and small shops, restaurants, bars, various company offices, all created the main economic activity and physical form in Western City centres. These activities are already to be seen in the centre of Riga and in future they will provide the most important economic force. Over all, Riga will require millions of square meters of office space for business and financial activities as European and North American experience shows*."

e) Recycling of obsolete industrial land:

"*In this Official Plan the up to now existing industrial areas, especially on the left bank of Daugava, have been partially rezoned as business territories. That means that in future in these territories land use has to be changed, but at present the existing industries can continue their activity. Believes that it is necessary to gradually free Daugava's both banks from manufacturing functions,*

thus giving access to Daugava and using these areas for business and recreation activities for residents."

f) Densification and improvement of existing residential districts:

"*Humanisation" of Residential Districts :Approximately 60% of Riga's housing stock has been built after the II World War, during the Soviet period. Most of these are precast panel apartment high-rises. There is more of this type of large, concrete panel housing in Riga than in the developed democratic countries, or even more than the East- block countries, e.g. (Poland had only 35% of such housing stock in 1990ies; Czechoslovakia had 36%, East Germany 20%) Increase the density of some residential districts by appropriate infill of various types of residential and service buildings, but preserving the particular character of those districts. The intensification of residential districts means the increase in the number of apartments or family homes in a district by additions to existing homes and the construction of new homes. Although, at present Riga has sufficient territory for the construction of housing, with the increase in building activity the housing development strategy will have to include the intensification of some residential districts*."

g) Provision of adequate amount of qualitative living area per person

"*The city's residents' average gross living area is 19.5 sq. meters per person and the average size of the apartment is 57 sq. meters. In comparison Stockholm's living area per person is 40 sq. meters, Helsinki 30 sq. meters per person, etc. To approach the average European level, City Council considers it necessary to promote the increase of gross floor area per person and improve apartment standards*."

h) Priority to public transport and pedestrian walkways

"*The Council will promote pedestrian zone and public transportation corridor development and will support projects, which promote the development of such corridors*."

"*In addition to the pedestrian zones and pedestrian corridors within the city, bicycle paths are designated in the Plan as important links reaching out into the surroundings Riga Region*."

"*The Official Plan policies support the existing public transportation network with the streetcar as its backbone and plans for its further evolution in the future.*"

5. Which spatial structure fits better Riga's development objectives?

The municipal development objectives quoted above point in two possible directions: on one hand the environmental and public transport focus would imply a dense, compact dominantly monocentric city, on the other hand the housing objective, in particular the need to rapidly increase floor space consumption would point toward a rapid opening of new land for new housing implying an increase in the use of private car, lower densities and more dispersion. However, the "Official

Plan" mentions also 2 objectives which may decrease the need for new land development: (i) no new demographic growth is envisaged in the near future, and (ii) there is a lot of obsolete industrial land which should be recycled in areas close to the city center.

In the absence of demographic growth land use change will be triggered by the combined effects of:

- A reduction in household size which is happening in most of Europe and results in an increase demand for new apartment units, even in the absence of demographic growth.
- New demand for office and service space required by the new economy
- Demand for more floor space per person as households' income increases

The case for a monocentric city structure

The majority of the above objectives are therefore pointing in the direction of a strong center in a rather dense city. Indeed the priority given to environmental quality and to public transport points toward a structure which minimizes trip length and which allows an effective use of public transport. Pedestrian zones are effective only in high density urban areas.

"Riga Official Plan" mentions the need to create new services and retail in suburban areas. This is of course a legitimate concern. During socialist time the type and amount of retail and services provided, in particular in high rise panel housing estates, were administratively determined. The preference for reinforcing a monocentric structure does not preclude allowing as much retail and service activities to respond to demand generated by free market forces.

It is easier to operate an efficient public transport system when the destination of the majority of trips is concentrated within the CBD area. As a consequence, in dominantly monocentric cities the share of trips using public transport tend to be higher than in polycentric cities where the CBD contains only a small fraction of the total number of jobs and retail facilities.

When the majority of jobs and of retail facilities are dispersed into many smaller sub-centers, private cars trips are more numerous because the public transport system is unable to operate efficiently the multiple origin and multiple destinations routes. Trips are also longer because the sum of distances between random points is larger than the sum of distance from random points to the center of gravity.

Some planners assume that if jobs and retail are dispersed in sub-centers, trips would become shorter because each sub-center would attract workers and shoppers living within a short radius from the sub centers. The existence of such self sufficient "urban villages" has never been observed in the real world. Large cities exist because of the increasing return to scale of large labor markets. A large city constituted by the agglomeration of autonomous sub-centers would loose the economic advantage inherent to large integrated labor markets, and therefore this type of spatial structure is unlikely to ever develop in reality.

Of course, no city is purely monocentric (all jobs and retail concentrated in the CBD) and few cities are completely polycentric (no dominant center). In fact, most cities operate on both modes. In such mixed mode cities, a large share of the trips whose destination are toward the CBD are likely to be done by public transport while most of the trips which are from suburb to suburb are

likely to be done by individual transport. Even in mixed mode cities it is important to maintain the primacy of the CBD to reduce trips length and to maintain a high public transport share.

Finally, successful monocentric structures require urban centers with not only a high concentration of jobs but also with a high level of amenities: theaters, concerts, museums, quality restaurants and a high quality of architecture. Riga certainly offer all that, even by the high standards established by some other European cities. The full rehabilitation of Riga's extraordinary architectural heritage is an integral part of the city's spatial strategy and of its economic prosperity.

In practical terms, the desired spatial organization for Riga should become explicit and expressed in quantitative terms. The evolution of the Riga's spatial structure should be monitored regularly. The major tools available to planners to influence city shape should be regularly audited for their consistency with the municipal spatial objectives. The crude spatial model shown on Figure 10 illustrates how this could be done. The 3 graphs of Figure 10 are showing respectively from top to bottom (i) the profile of built-up land at I km interval from the city center to km 15; (ii) the profile of densities; (iii) the spatial distribution of population resulting from changes brought by land use and density changes. The red bars correspond to the projected situation in the year 2010, the gray bars represent the situation in 2000. The figures are only illustrative of the manner how a spatial scenario can be represented in a quantitative manner.

Table 1 summarized the changes projected in the spatial structure of the city to meet the municipal objectives.

	2000	2010	Change (%)
Total Built up Area	118.85	119.77	1%
Total Population	759,255	759,255	0%
Average density	63.9	63.4	-1%
Average distance per person to the CBD:	5.05	4.68	-7%
Dispersion index	1.23	1.14	-8%

Table 1: Changes in spatial structure following the model shown on Figure 10

The built up area (top graph on Figure 10) changes only very little. New developed land is added in the periphery (km 13 to 15) to accommodate the demand for individual housing. Most of the new development between the CBD and km 13 takes place by recycling obsolete land use.

The projected profile of density (red bars on the middle graph) follows the usual density profile in a market economy. It was obtained by assuming the following scenario:

- at km 1, densities slightly decrease because there is no addition to the total floor space in this area and households consume slightly more floor space, in addition some floor space is converted from residential to commercial space.
- between km 2 and 4, densities increase because more floor space is added by converting obsolete land use, in particular industrial land and underused other built-up lots.
- Between km 5 and 10, densities decrease because some households move out of panel housing either toward the new apartments created closer to the center or toward the new low density housing at the periphery. The lowering of density allows a

renovation of the best built panel housing apartments. Density decreases in the remaining panel housing because households consume more floor space and average households size decreases.

- Finally densities increase slightly at the periphery as settlements densify while staying at density level consistent with individual housing.

The projected spatial distribution of population (red bars on the bottom graph) is obtained by multiplying the projected built-up land (top graph) by the projected density (middle graph). There is a shift of population mostly from the panel housing between km 5 and 10 toward new apartments built on recycled land between km 2 and 4. This shift of population closer to the center encourages the use of public transport and increases the possibility of walking and bicycling to work or shopping. The dispersion index decreases by 8%.

This simple example illustrates how monitoring yearly population and land use changes can show whether the spatial objectives of the city are met and whether the Municipal plan includes the right regulatory measures, infrastructure investments and taxes to achieve the desired objectives. The most important is to link quantifiable indicators to specific objectives. In the example above, only 3 indicators have been used: distribution of land use, densities and population dispersion. Of course many more indicators should be uses, such as the share of public transport trips over all trips, the change in rents and floor space for commercial and office use in the central district, etc.

If the spatial trend in time goes in the opposite direction from the desired one, it means that the current planning tools – regulations, investments, and taxation – are inadequate and should be modified. Unfortunately, many municipalities do not routinely analyze spatial changes on a yearly basis. This analysis is often conducted at the end of a master plan period, typically every 10 years. At that time it is too late to correct the trend.

In the case of Riga, it is possible that after a few years, say in 2004, it may appear that more business are moving out of the central area toward suburban sub-centers and that the share of trips by public transport keep decreasing while car trip increases. This would call for a drastic modification in regulation, investments and taxes to modify this trend.

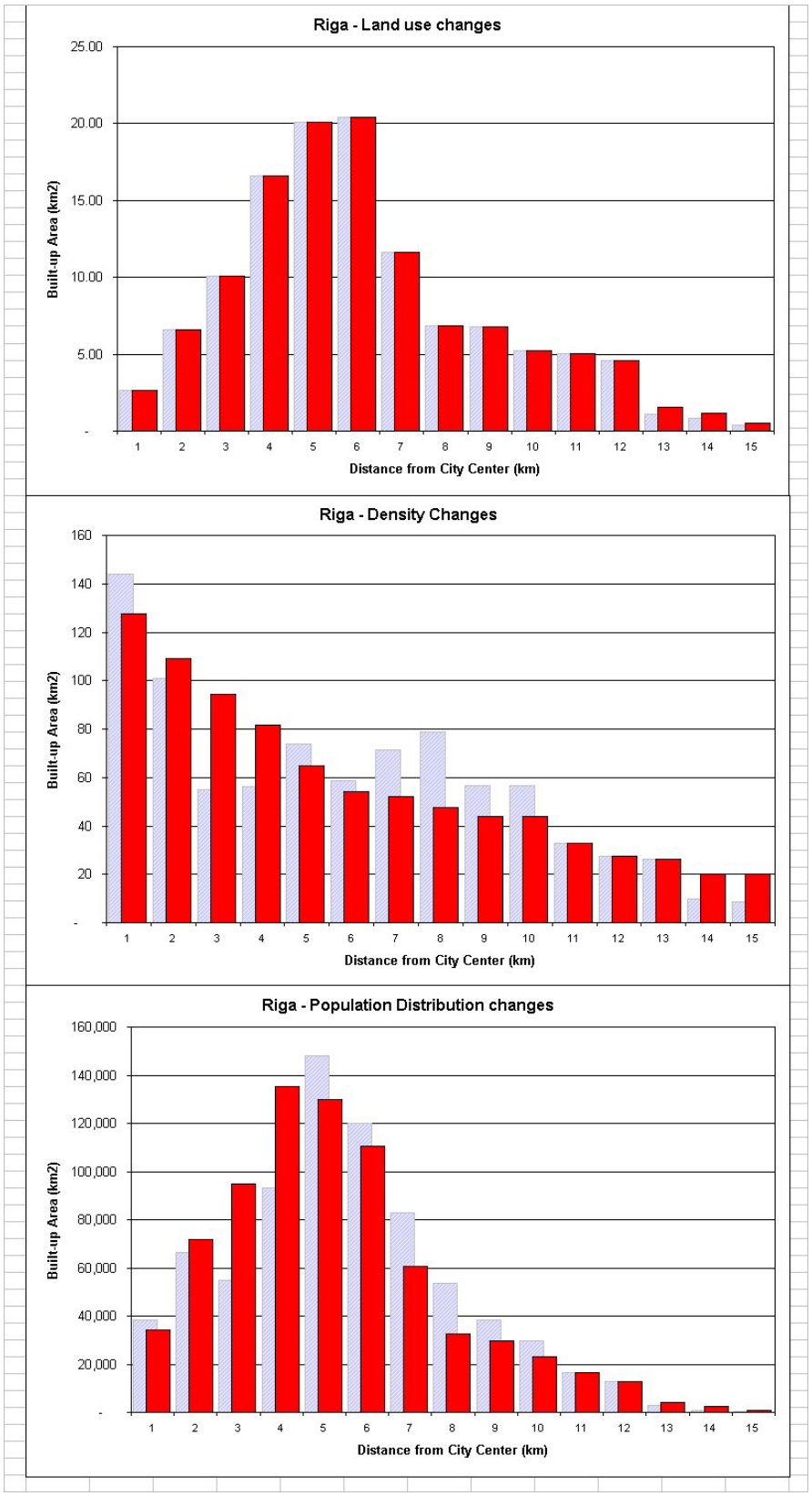

Figure 10: Spatial model showing the projected evolution of the built-up area, density and population distribution

6. Zoning as a tool to shape Riga's spatial structure.

The scenario described above is only one among different possible spatial strategies to implement the municipal objectives. Zoning, infrastructure investments and taxation are the tools that will help make this strategy a reality. In this paper I will focus only on zoning, but infrastructure and taxation are also powerful tool to help shape a city. However, a zoning plan is not a blue print it is only a layer of regulation imposed on existing land use.

a) Existing land use

The land use of Riga in 1998 is shown on the map of Figure 11 The land use distribution corresponding to the built up area (excluding large parks, water bodies, the airport and the port) is shown on Table 2. The very large share of industrial area – 36%[2] of the total built-up area – is typical of socialist economies. In cities with history of uninterrupted markets, the ratio of industrial areas is very rarely above 10%. This high ratio of industrial land explains why Riga has a density similar to other cities of Europe but a housing living area consumption per person at about half the average of Western Europe. Most of the land that is now assigned to industries should have been residential. In addition, 60% of the industrial land is located at less than 6 km form the city center.

Table 2: Riga - Land Use in built-up areas in 1988

	Area (km2)	
Residential and commercial:	**68.32**	**59%**
Industrial	**41.48**	**36%**
Institutional and public services	**6.05**	**5%**
Railways	**3.00**	**3%**
	115.85	**100%**

The recycling of industrial land into other uses should be therefore a priority as it is rightly mentioned in the municipal objectives. The zoning is the tool which will allow this recycling. But it is an increase in land prices which will trigger the recycling itself. Recycling industrial land is costly, and only high rents and as a consequence high land prices will justify it.

[2] The port area has not been included in the built-up area, as like the airport it serve the entire country and not the city alone.

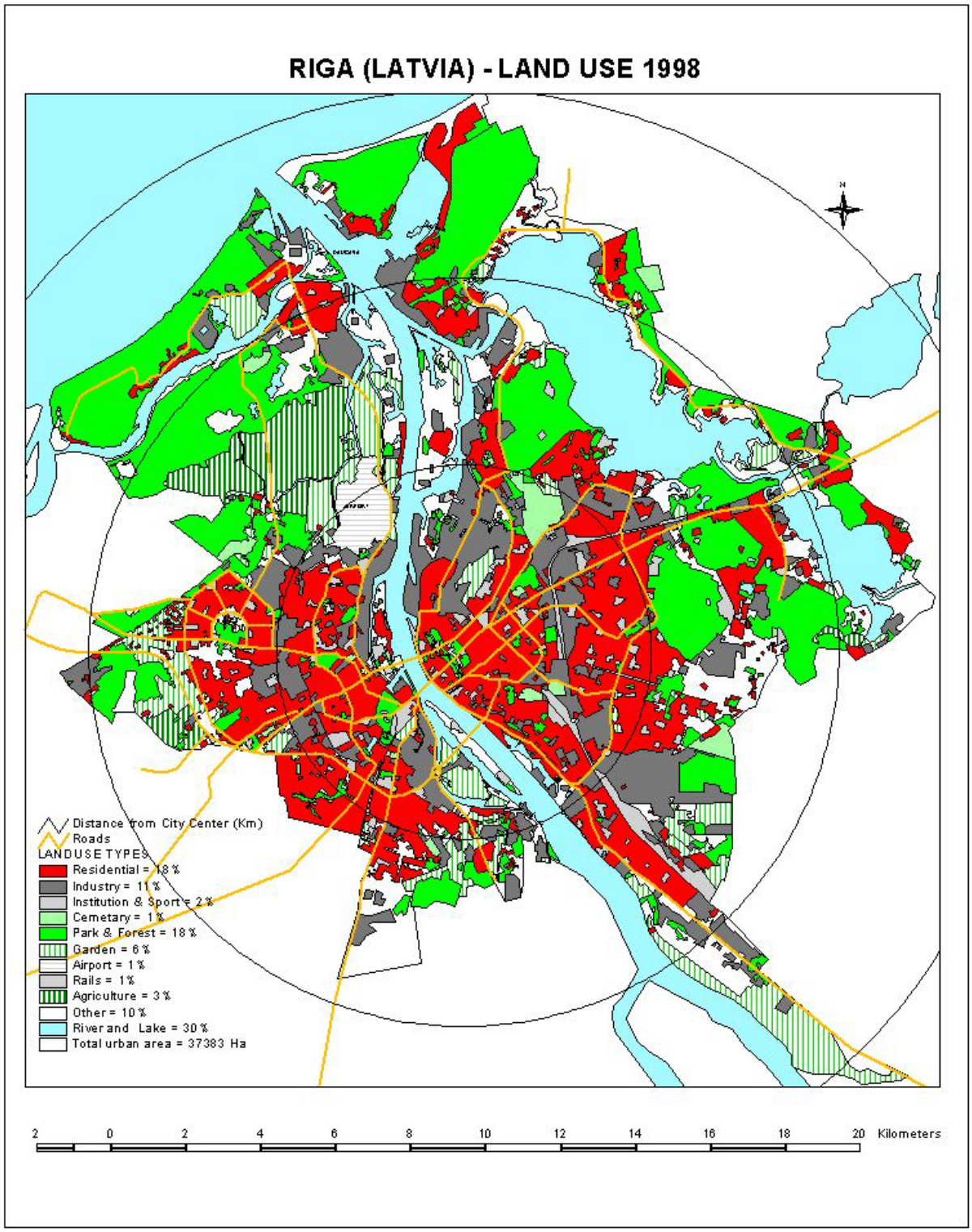

Figure 11: Riga - Land Use in 1988 (the land use percentages shown on the legend refer to the entire municipal area – including rivers and agricultural areas—and are therefore different from the % of Table2 which are referring to the built-up area only)

b) Zoning

Zoning regulations establish constraints on land development. Their objective is to limit growth. Zoning cannot mandate growth or densities where there is no demand for them, it can only limit them. The zoning plan contained in the "Riga Official Plan - 1995-2005" is presented on the map of Figure 12.

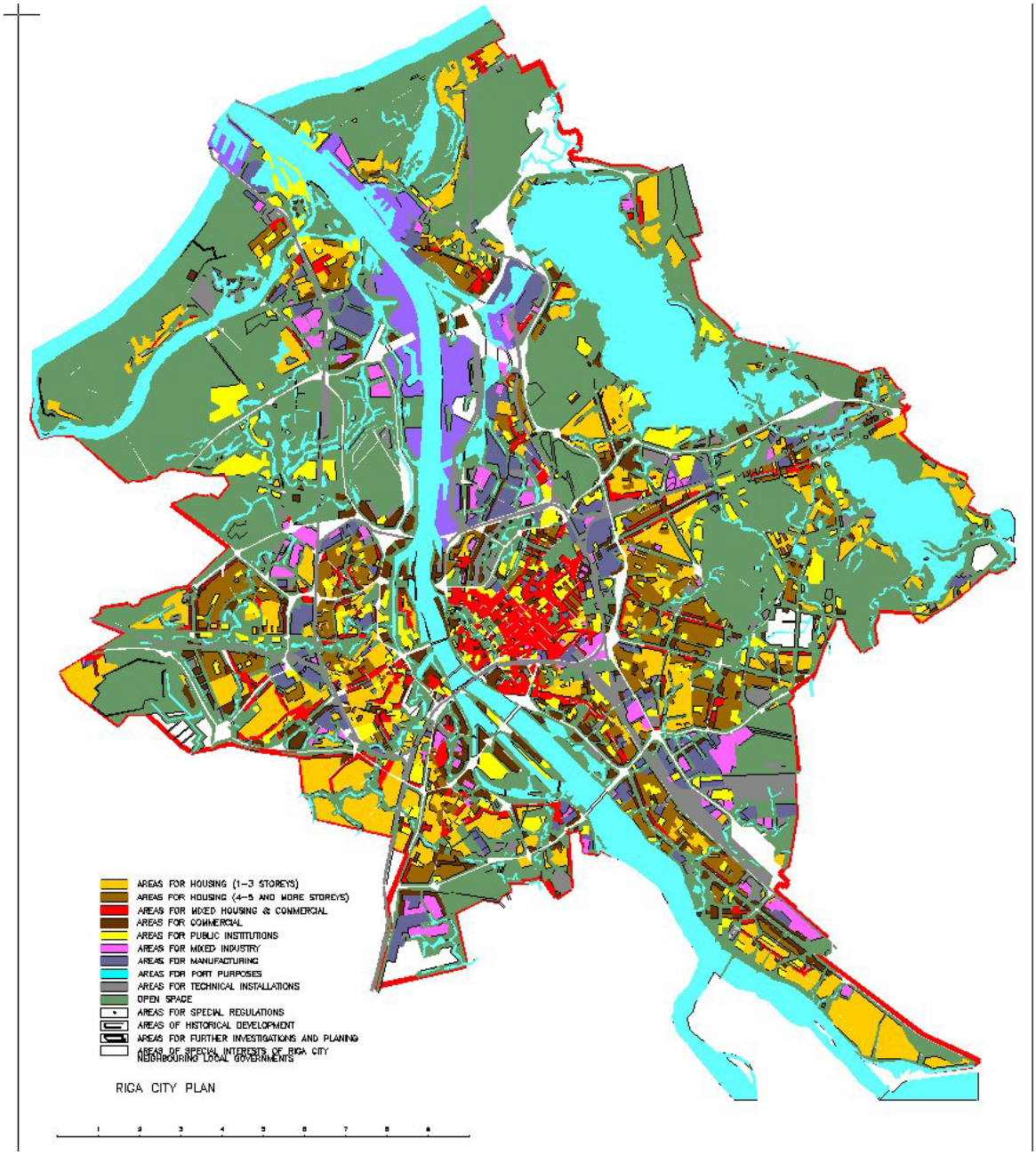

Figure 12: Zoning plan of "Riga Official Plan - 1995 -2005"

In order to simplify the spatial analysis of the zoning plan I have focused on only 7 zoning categories out of the 14 contained in the plan. The map of Figure 13 shows the location of these

seven categories. One can see the dispersion of the built up area, in part due to topography, in part to history.

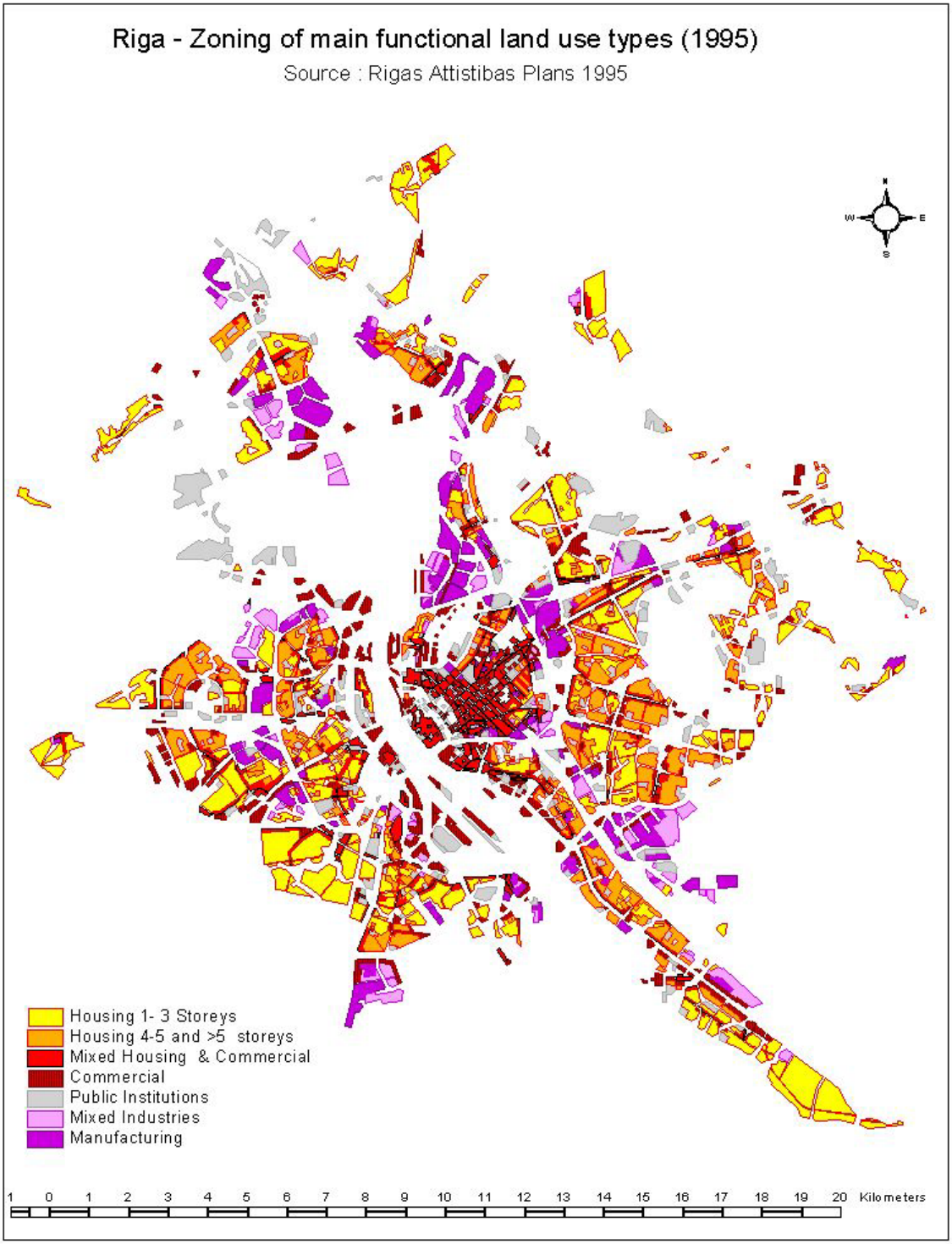

Figure 13: Riga - Zoning of 7 main functional land use types

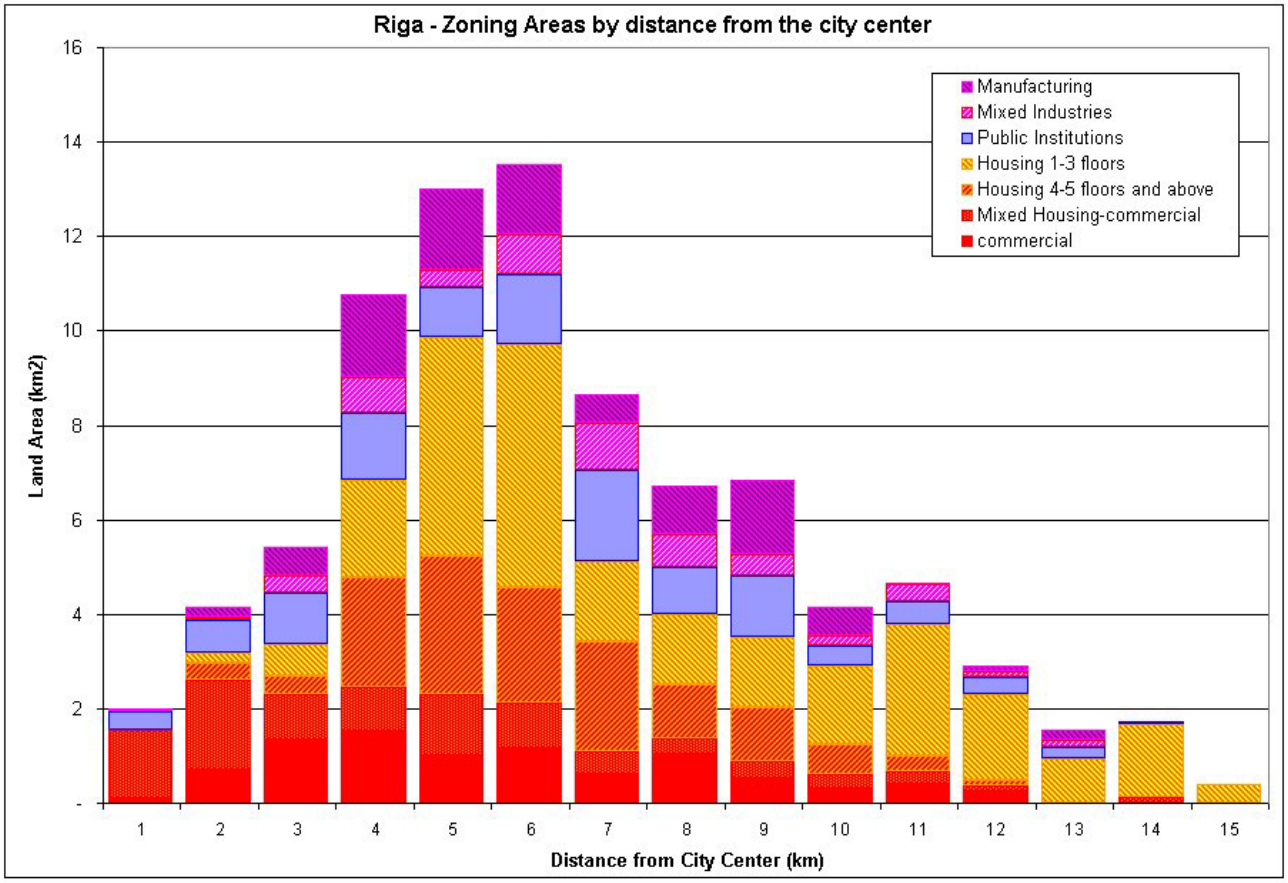

Figure 14: Riga - Zoning areas by distance to city center

Riga - Zoning areas by function and distance from the city center (km2)								
km	**Housing 1-3 floors**	**Housing 4-5 floors and above**	**Mixed Housing-commercial**	**Mixed Industries**	**Manufacturing**	**Public Institutions**	**commercial**	Total
1	-	0.01	1.44	0.01	0.05	0.39	0.11	2.00
2	0.22	0.38	1.91	0.06	0.22	0.67	0.69	4.15
3	0.67	0.42	0.94	0.36	0.60	1.07	1.34	5.40
4	2.05	2.34	0.94	0.76	1.74	1.41	1.51	10.76
5	4.62	2.95	1.29	0.35	1.71	1.07	1.00	12.99
6	5.15	2.46	0.95	0.84	1.47	1.49	1.15	13.52
7	1.70	2.33	0.46	1.01	0.60	1.92	0.61	8.65
8	1.47	1.15	0.34	0.69	1.02	1.02	1.03	6.71
9	1.46	1.17	0.34	0.46	1.56	1.31	0.52	6.83
10	1.65	0.65	0.31	0.20	0.61	0.42	0.29	4.14
11	2.78	0.34	0.26	0.36	0.03	0.48	0.40	4.66
12	1.79	0.15	0.10	0.11	0.13	0.38	0.25	2.92
13	0.93	-	-	0.13	0.22	0.26	0.00	1.54
14	1.56	-	0.11	-	-	0.06	-	1.73
15	0.39	-	-	-	-	-	-	0.39
	26.45	**14.33**	**9.42**	**5.36**	**9.97**	**11.95**	**8.90**	**86.37**
	30.6%	16.6%	10.9%	6.2%	11.5%	13.8%	10.3%	100.0%

Table 3: Distribution of zoning areas by distance from the city center

We can see that the areas zoned for industries have been reduced to 15% of the total area of the 7 functional zones[3]. It is still a large percentage by international standards but, as rightly mentioned in the Municipal plan, it is not possible to reduce it further without affecting negatively employment. It is regrettable however that so much industrial space is still located so close to the city center; 53 % of the total industrial areas are still within 6 km from the city center.

7. Conclusions

The objectives contained in Riga Official Plan are implicitly calling for a dominantly monocentric city with a CBD with a high level of amenities. Riga historical center is well equipped to compete with other European cities. However, to reduce future car use within the city core and to maintain a high usage of public transport it will be necessary to densify the area of the city located between 2 and 4 kilometers from the city center.

This densification could be done by recycling obsolete industrial land and by redeveloping under used parcels in this area. This recycling will have to be done mostly by the private sector, but Riga's municipality has an essential role to play in making it happen. First, zoning should be changed to accommodate whatever demand exist for these sites, whether it is commercial, office or residential, the best use being a mixed use. Second, primary infrastructure should be developed to serve these sites; road, water, sewer, and social facilities should be redesigned to be compatible with the new use. Third, taxation on land, in particular capital gain should be low enough to justify the risk that private investors would be taking in developing former industrial sites.

[3] The total area of the 7 functional zones (86 km2) is significantly smaller than the built-up area (115.85 km2) mentioned above because it does not include streets or railways.