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TRANSPORT INFRASTRUCTURE AS AN INTENSIFIER OF SOCIAL DEVELOPMENT OF THE REGION

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Transport is an influential factor of general economic and social development of any region or country. Its impact on full-fledged utilization of economic potential of regions and increase of standard of living of population is impossible to over value [1].

The development of all districts of the country significantly depends on the level of infrastructure development. The roads – both motor roads and railway roads – have the potential of improving the situation within the country making the vast territories which are supposed nowadays as non-occupied ones to become attractive for people, to facilitate the industrial development, to give a chance for new development of agriculture in the provincial areas of the country. The roads make great contribution to turning the environment into qualitative and alluring one [2].

Keywords: infrastructure, roads, stratification, social system, human capital development

“More infrastructure development won’t solve all our economic ills, but it will go a long way toward addressing them. No other policy will support the current economic recovery and provide long-run economic benefits as effectively, without adding significantly to the nation’s debt load”

*Mark Zandi, Moody’s Economy
Company [3]*

1. Concept of Infrastructure

The notion of infrastructure comprises the spheres of activities creating the fundamental necessary conditions for efficient production of goods and services. Infrastructure serves the material production but does not produce the material product. Therefore, the infrastructure serves as an intermediate link between the processes of material production.

It is quite natural to presuppose that infrastructure facilitates all the production processes. The level of infrastructure development is interconnected with the level of foreign and local investments, with the level of economic development of the country, with the level of the human capital development and the standard of living within the country. Nevertheless, the researchers do not say undoubtedly what is primary and what factor influences which one: the level of infrastructure assumes all other factors development or vice versa follows the other components of national economy determinants. Within the frameworks of this paper there has been done an attempt to show the impact of infrastructure development on the other components of national social system.

However, the notion of infrastructure takes into account two huge categories, such as: social infrastructure and economic or production infrastructure. The social infrastructure comprises such subsystems as healthcare and education, culture, tourism, etc., while the economic infrastructure consists of transport and transportation system, telecommunication, electrical grid, water supply system, bridges, roads, etc. This division is relatively symbolic. The social infrastructure has significant impact on the economic one, and the economic infrastructure presupposes the level of development of the social infrastructure. So, it is possible to say that every component of infrastructure demonstrates the properties of both sides of it. This interconnection creates additional difficulties and obstacles on the way of determining which part of infrastructure is a primary one.

2. Impact of Infrastructure

The impact of infrastructure on the long-term economic development can be implemented into the following directions: as a direct factor of production, as an interchangeable component of other

production factors, as an intensifier of accumulation of production factors, as a catalyser of aggregate demand or as a tool of production policy.

Infrastructure itself becomes the direct factor of production. Increase of infrastructural capital, for instance, energy or transport infrastructure, creates the favourable conditions for the GDP growth, since they are implemented in the process of goods and services production, and their absence or poor quality give rise to costs or even make the production impossible.

Infrastructure can be a complement to other production factors in two ways. On the one hand, infrastructure modernisation can decrease the costs of production. Irrelevant state of it becomes a real burden for companies' costs, since they have to consider the absence of infrastructure into the self-cost of their products or employ own money for creating the necessary infrastructure [4].

On the other hand, a good state of infrastructure increases the efficiency of other production factors, including capital, labour, aggregate productivity of factors [5].

The efficiency of capital goods sharply grows under the condition of good supply with energy, and labour efficiency is significantly high if healthcare and educational systems produce well-educated highly-skilled healthy labour factor. Aggregated work of factors supported by efficient infrastructure widens the range of profitable investment possibilities and stimulates the inflow of investments.

Irrelevant infrastructure sometimes turns certain production processes into unreal ones. For instance, the international trade significantly depends on the density of transport and communication infrastructure. Infrastructure becomes the basis for production agglomeration when the new industries are concentrated around the existing industrial clusters [6, 7].

Infrastructure stimulates the process of accumulation of other production factors. So, the human capital development is a function of such factors as school premises, personnel qualification, knowledge, competences and skills, availability of transportation to school, and so on [8, 9]. Consequently, the indirect influence of infrastructure on economic growth lies either in stimulating the accumulation of other production factors or in facilitating their efficiency.

The significant infrastructural projects are usually followed by massive investments in construction, renovation, refurbishment, reconstruction, maintenance; the related branches and industries soon feel the revival and economic recovery; accordingly, the government has possibility to implement the infrastructural projects as a tool of anti-cyclical policy for achieving the certain recovery of economy or economic growth.

Another possibility for such investments is regulating the production policy. In case the government invests in certain project, the private investors have stimuli to invest at the same projects; as a result, for example, construction of province road can become the real revolution for rural region. It can stimulate the process of integration of the entire region into regional economic environment, attract the investments of private sector of economy, and facilitate the economic growth of the region in general.

On the other hand, the general economic situation and environment can influence the acceptance of the decisions on infrastructural projects or generate the demand for increase of infrastructural network. The procedure of upgrading the infrastructural capacities sometimes becomes the condition for economic operation of the entire industry, creating the connections between the prospect customers and producers, prospect employer and higher education institution, prospect exporters and importers.

3. Investments in Infrastructure

Investments in infrastructure can be supposed as an important tool for creating the fundamentals for economic development and creating new working places in the regions. It has a special importance in case of excessive capacities of processing industries. Investments in infrastructure present the ideal way of resources and labour allocation between the sectors of economy especially if the structural unemployment takes place. It will provide the long-run growth within the national economy. Government investments in infrastructure should facilitate the private investments as well. According to the opinion of Mark Zandi, the leading economist of Moody's Economy, the government investments in infrastructure will stimulate the private investments: every dollar spent on infrastructure projects has the multiplying effect in amount of 1.59 dollars [3]. Another effect on the economy is a decrease of infrastructural costs (transport costs, telecommunication costs, energy- and water-supply costs, etc.)

The countries with great potential heavily invest in infrastructure development. This trend is especially important for the developing countries. It is quite natural since the well-developed countries mostly invest in supporting and maintaining the existing infrastructure, while the developing countries

have a huge span for implementing the infrastructural projects. The leaders of infrastructural investments today are the countries of Asia, and first of all China and India. They invest huge money in first-class transport and communication infrastructure.

The infrastructural projects require the substantial investments [10]; it is a reason for considering them first of all from the position of government sphere of business activity. Nevertheless, in the second half of the XX century the private business was also involved in the process of investing into these projects, and since that time it has become the area of great interest of private investors [11].

The contemporary researchers nowadays suppose the private investments even more favourable compared to the government ones [10, 12, 13]. Certainly there are cases when investments can bring profit only under control of one organization due to high costs of supervision the infrastructure by two or three companies; in this situation the so called “national monopoly” is more preferable and private investors can only participate in investing the project, while the government is the primary investor.

The researchers make attempts to forecast the amount of investments necessary for implementing the infrastructural projects [14, 15].

There has been done a model on the basis of 52 countries all over the world. The model demonstrated the interrelationships between the infrastructural investments and GNP on the time span of 22 years (1980-2002). According to this research, to provide the growth rate of GNP at the level of 3.6% the country should invest in the infrastructure (physical, material infrastructure – electric grids, bridges, roads, telecommunication networks) about 0.7% of GNP. For example, the investments in telecommunication networks should be at the level of 0.7%, and in electric grids – 0.2% of GNP. To achieve the 6% rate of growth of GNP the countries should double the investments in material infrastructure. Another important factor – the researcher did not take into account the state of already available infrastructure; consequently, the actual need in investments can be even higher.

4. Impact of Transportation System

Not all segments of infrastructure have the similar impact on the economic growth. According to the researchers’ opinion, the most influential segments of infrastructure are educational infrastructure and the networks of transport [16].

Transport provides the basic conditions for active functioning of national economy and society; it is an important tool of achieving social, economic, foreign-policy goals. Transport has become the principal tool for achieving the national goals.

The problems of transportation system facilitate the infrastructural restrictions and create the threat of deceleration of social development of the country. The goal of development of transport infrastructure becomes primary for all national economies, since transport system provides acceleration of passenger transportation, freight transportation, and decrease in transportation costs. Implementation of these factors allows providing the economic growth and social development of all regions of the country and increase in availability of transportation services to the regions’ population. As a result the population of rural districts increases the satisfaction in growing demand in migration within the country and abroad, then there is a decrease in the lack of capacities necessary for satisfying these needs, technical equipment with means of transportation will provide further development of the regions and involvement of new territories into active economic environment.

Different periods of national development put forward different requirements toward the necessity of development of segment of infrastructure and different approaches to optimal combination of infrastructural complexes important for facilitating the economic efficiency of the economy or certain region development. For example, China is trying to leave the entire world back by investing into the hundred milliards of dollars into new roads, dams, dikes, railways speed lines, ports and airports. The Chinese government has planned to invest \$600 milliards for stimulating the country development and up to this year the biggest part of this money has been invested into the huge infrastructural projects, first of all into construction of railways speed lines connecting different regions of the country. It is planned to construct about 16 thousands of brand new railways speed lines before year 2020. These lines are forecasted as the fastest and the most state-of-the-art in the world. This construction requires the investments of about \$300 milliards and labour of about 100 thousand people. Besides this, China continues constructing the roads, the network of which will have more branches than in the USA. The urban areas of China will invest in underground railway construction, in bans, in bus roads connecting the places where population lives with commercial and production areas [17].

Other countries are also involved in vast transport infrastructure creation. India plans to construct 7 thousand kilometres of new motor roads, Brazil is going to invest \$800 milliards in innovation of energy infrastructure during next 25 years, Mexico has adopted the 6-year National infrastructural plan according to which \$270 milliards is presupposed for construction and renovation of 20 thousand kilometres of motor roads, construction of 1500 kilometres of new railway lines and increase of port capacities. France is planning to invest \$25 milliards in the further development of railways speed lines within the frameworks of National railways strategy and to double the existing railways net by constructing 4 thousand kilometres of new lines before year 2020 [18]. Figure 1 demonstrates the planned volumes of constructing the railways speed lines in different countries before year 2025.

These countries consider the efforts to renovate and upgrade the transport infrastructure as a platform for further innovative development of economy. Moreover, every milliard of dollars invested in infrastructure creates directly 15 000 of working places and about 30 000 additional working places in related industries.

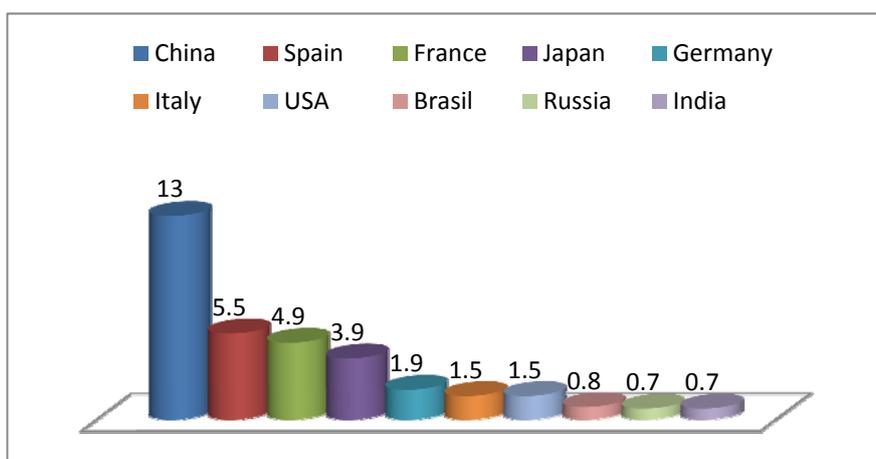


Figure 1. Planned volumes of constructing the railways speed lines before year 2025 [19]

5. Interdependence of Transport Development and Social System within the Country

The different indices of poverty (index of population-at-risk-of-poverty, quintile coefficient, Gini index) are supposed to be the best indicators of the social system functioning. The special attention is paid to the difference in standard of living between urban and rural population. There are a lot of aspects of poverty of rural population. They can be traced to culture, climate, gender issues, and government policy. The general stability of national economy, competitive markets, government investments in material and social infrastructure become the significant conditions of achieving the sustainable economic growth and decrease of the level of poverty in the rural areas. Moreover, since the rural population has different level of access to economic infrastructure, the government policy should approach towards saluting such issues as providing the access to education and healthcare systems, to transportation systems for rural population.

The problem of poverty of rural population is important not only from the point of view of these people but from the positions of national economy as well. The rural population at-risk-of-poverty takes practically 63% of poor population in the world. The level of poverty in rural areas is persistently high, and it happens under the condition of general economic growth as well as at the times of recession. Existing poverty level provokes the general low standard of living in the rural areas. This comparatively low standard of living contributes to fast growth of population and migration to the urban areas. Actually, in many aspects the level of poverty existing in the urban areas is a result of migration of poor rural population. So, the fact of ignoring the urgent problems in province results in risen problems in cities, and general problems of national economy. The solution of this problem lies in two conditions: increase of economy (growth of level of population income) and decrease in inequality of income redistribution. Moreover, the economic growth should result from absolutely certain roots: there should be investments in rural transport network and into education and healthcare systems. In this case the rural population obtains double benefit – from current investment and from growth of income flow in the future.

6. Latvian System of Transport

Latvian road sector has a rich history. The system of roads was mentioned already in the 13th century. The first road laws issued by the Swedish government were published in 1646. In 1752, 1786 and 1801 road laws were adopted in Kurzeme. A Livonian road map appeared in 1688, and Vidzeme road map appeared in 1695. Kurzeme Duchy roads are marked on the map published in 1702. In August 1, 1919 the Supreme Board of Roads and Structures was established.

In 1919 the Supreme Board of Roads and Structures maintained 703 kilometres of highways and cobblestone pavements. 21480 kilometres of 2nd and 3rd class roads were maintained in order. On August 1, 1999, regional Boards of Roads and Structures were established in Riga, Cesis, Jelgava, Liepaja, Tukums in order to supervise the roads in poor condition ruined during four years of the World War.

In 1927 on the basis of the Supreme Board the Highway and Soil Road Department was established which had offices of road engineers (or road administrations) in Riga, Jelgava, Cesis, Liepaja, Daugavpils, Rezekne, Smiltene, Ventspils, Valmiera, Madona, Bauska, Kuldiga, Balvi. They were numbered from 1 to 13. In the beginning of its work the first task of the Department was to preserve deteriorated roads in order to ensure traffic, even with interruptions in wet season. The next task was to construct the strengthened road sections (highways, cobblestone pavements) near bigger centres capable of sustaining the intensive traffic, as well as extending the road network in order to meet the new requirements. The state systematically took over the roads maintained and purchased new equipment, such as 130 graders, 110 rollers, 36 stone crushers, workshop machines. Still manual work and horse transport was the basis in construction sites and earth works. Bigger construction works were performed by contractors. High level of requirements and the capacities of the constructors are proven by such sites, as the bridge over the Gauja in Sigulda, bridges over all biggest rivers in Latvia, durable concrete pavements in many road sections and strong production plants.

In 1940 the Highway and Soil Road Department maintained 11483 kilometres of roads, including 326 kilometres of asphalt pavements, 1779 km of crushed stone and "crisis" pavements and more than three thousand bridges. The length of roads maintained was 24179 km. In addition to the state budget the roads received 29.96 million Lats from the road fund established in 1929 (this amount includes 8.97 million collected from 3 % tax on alcohol).

A major part of the road network was destroyed during the World War II. Approximately thousands kilometres of crushed stone pavements and 660 bridges were ruined. In combat zone gravel roads were destroyed completely. In post-war years the roads in Latvia were divided into roads with Soviet Union importance supervised by the Highway Board, established in Moscow by the Commissar of Interior Affairs, and roads with republic importance supervised by the Supreme Road Administration of the Council of Ministers. Some cities had offices of both these institutions.

The process of renewing the roads ruined in the war lasted during the 50^{ties}. Faster road development started in 1956 when both road administrations were united. In the beginning 21 and later 26 road operation districts were established - one in each district. To carry out bigger construction works 11 road construction districts were established gradually. The inclusion of local roads in the state road network was done in October, 1963 and had a very great importance in the development of Latvian roads. The length of state roads was increased three times up to present 20 thousand kilometres, and the quality of local roads was improved significantly.

60^{ties} were the years of big reconstruction works. In some years up to 220 km of asphalt pavements and 600 km of gravel roads were constructed anew. Starting with 1957 twenty three asphalt plants were constructed. Simultaneously the construction of asphalt pavements by mixing materials on the spot was continued. These so called "asphalt mixes" in many places have exceeded the planned lifetime 3-5 times. Wooden bridges were replaced by reinforced concrete bridges in short time. The campaign of introducing pre-fabricated structures in the construction of reinforced bridges has to be evaluated critically, as the production basis for this progressive method was not prepared, and therefore negative consequences may be felt even today.

19 work manager offices, 29 production plants were constructed in 70^{ties} and 80^{ties}. All designs for the mentioned buildings were prepared by the designing institute established in 50^{ties}, many structures were produced by the Plant of Construction Materials, and reflective road signs were produced by the Experimental Plant. During season the number of workers increased up to 10-12 thousand [20].

There has been worked out the State Road Maintenance and Development Programme of 2000-2015 [21]. This Programme states the primary aims in the sphere of transport for Latvia. To secure an

effective road transport work that should ensure a base for other economic sectors it is necessary to maintain and to develop a road network. Implementing the intentions that were planned for the period from 1995 until 2000 a special budget for the necessities of road was established - State Road Fund (SRF) that made the financing of roads legally regulated and predictable. With the finances of SRF was possible to keep only the state main roads in preceding level and with the collaboration from other investment funds to finish building works and to open traffic on bridges of Lielupe on the bypass of Jurmalas and Jelgavas roads, to renew the Brocenu traffic interchange, to finish the construction between Kuldiga and Saldus. Due to the limited finances the condition of state 1st and 2nd class roads has deteriorated sharply. In the period of 1995- 2000 important changes in the supervision, maintenance and construction of state roads have occurred. Accordant departments have been developed and functions have been divided between them. The State Road Maintenance and Development Programme of 2000-2015 has been developed to support road maintenance, development and incorporation of Latvian roads in the European road network, the road sector further development aim has been defined as well as the strategy and tactic of achieving it, the main tasks for the period 2000-2006 and for the 2007-2015 have been stated. The plans of Programme refer mainly to the road network under the authority of state and slightly touch the problems of roads under the authority of municipalities.

The quality of state roads has deteriorated. The amount of unfulfilled works reaches 311 million Lats. Asphalt pavements in bad condition gained 736 km and reaches 1570 km or 20% from the total length of asphalt pavement. The condition of gravel pavement as poorly satisfactory is evaluated in 60% from the total length and reaches 7500km. From 929 bridges 30% are close to failure or in poorly satisfactory condition.

The intensity of traffic on the Latvian roads in the period 1990ies reduced 1.4 times. After that a constant rise occurred, it was faster in the vicinity of the big cities, where the traffic intensity in the year 1999 exceeded the level of 1990. The rise is minimal on less important roads, especially farther from the biggest cities and the intensity of traffic has not reached the level of 1990. Disparity has changed the structure of the traffic proportions: the proportion of motorcars and auto truck has sharply increased; the number of auto trucks of average carriage capacity has decreased. The planned growth of traffic intensity in years 2000-2015:

- on the state main roads: 4% per year or 1,8 times in period;
- on the rest of state roads: 2-3% per year or 1,5 times in period.

Sharp growth of intensity is expected in the vicinity of the big cities and less in regions farther from cities. There are following problems which have been officially registered for the state transport roads in Latvia:

- routs in length of 123.5 km or 7.6% cross settlement;
- approximately 70% of pavement carrying capacity in the period of unfavourable weather conditions is not sufficient to the loads set by EU;
- the allowable loads of bridges built according to norms of post USSR do not conform to the norms of the EU. However the maximal EU allowed weight transport in a special regime is permitted for crossing these bridges.
- several crossings with the bigger roads and railways do not conform to the necessary safety level;
- there are relatively much costs to the less important roads;
- in many places the bicycle and pedestrian traffic is not separated;
- there is no satisfactory light at crossing in all places of settlements;
- there is a necessity to improve road facilities and information system [21]

In general the Programme is mostly oriented on the development of road network with high intensity of traffic. Figure 2 demonstrates the interdependence between the roads density and density of population in Latvia by regions. The graph is based on the data of Latvian Statistical Office [22]. As it is seen on the graph, the lines support the idea of intensification of the roads development in the vicinity of the big cities. The areas with higher density of population have the higher density of roads. The utilization of roads is significantly more intensive in the areas with high density of population. The only exclusion is Vidzeme region. The capital city Riga is situated in this region, but the other part of the region is mostly an agricultural area. As a result, the density of population is low as in all agricultural districts even though Riga has a very high density of population. Nevertheless, the roads are concentrated around Riga and Riga district, and as a result the density of roads is very high. This situation creates the misbalance in Vidzeme region.

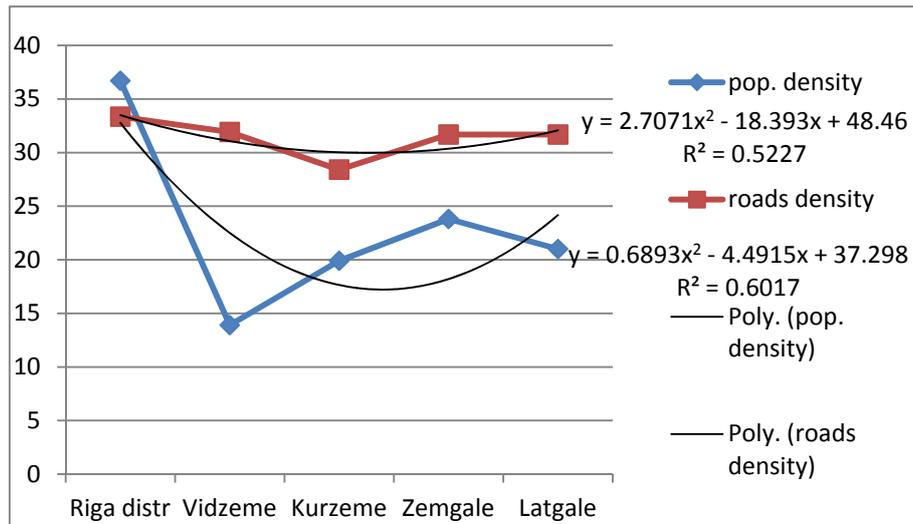


Figure 2. Relationship between the roads density and density of population in Latvia by regions

Moreover, the trend lines of these two factors are described by Polynomial equations, and R^2 for both factors are not very high.

Taking into account the economic activities of Latvian population it seems to be quite logical to consider the development of road network in accordance with the intensity of traffic. Nevertheless the Programme does show the problems of the provincial roads but the plans for correction of these problems are rather indistinct. The main reason for this is the lack of financing. The Programme has the following paragraph describing the plans for years 2000 – 2015: “For the improvement of secondary state road network in sufficient financing case the Programme plans from 2000 until 2015 to reconstruct 121 km or approximately 2% from the total secondary network length, that simultaneous are included in the Rural Road Programme” [21]. Certainly, there is a great problem to have the “sufficient financing”, and it is logical to expect that even these two percent of rural roads will not be improved during 15 years of this Programme functioning.

Taking into consideration the fact that the level of poverty is the highest in rural areas, the lack of financing and as a result lack of improvements of rural roads eliminates the additional possibility for these regions to overcome the level of poverty.

Another step in achieving the paper goal is analysis of the interrelations between the level of poverty and other indicators of standard of living as a part of social system of the country and the factors of road network existing within the country.

The analysis has been done on the basis of Latvian statistics, provided by Latvian Statistical Office [22]. The factors used for the analysis are as follows:

- Level of poverty, %
- Gini index
- Quintile coefficient
- Length of public roads
- Population density, people on km²
- Roads density, km on 100km²
- Freight turnover, thousand tons
- Agricultural areas, km²

The statistical information for these factors comprises division into regions within Latvia. The data for 12 years (2000-2011) has been employed.

Unfortunately, there is no information on the level of poverty by rural and urban areas in Latvia. The correlations have been calculated for this analysis, and the results are presented in Table 1.

Table 1. Correlations of level of poverty with other indicators

	Agricultural areas	Public roads, th.km	Freight turnover, th.tons
Poverty, %	0.898106	- 0.867008	- 0.59451

According to this table, the poverty is positively correlated with the agricultural areas and negatively correlated with the length of public roads and freight turnover. It supports the above described ideas that the poverty is higher at rural areas and that the availability of public roads decreases the poverty.

Figure 3 shows the relationships between the poverty in the regions of Latvia and the density of roads. The situation in most regions is quite predictable – there is a correspondence between the density of roads and the level of poverty in the region. However the situation in Vidzeme is difficult to explain. Very high level of poverty exists at the region with well-developed net of roads. The possible explanation of this phenomenon lies in the fact that the capital of the country – Riga – is situated in this region. Traditionally the road infrastructure in the capital and the district of capital is very dense. As a result the density of roads is high in the entire region, but it is quite possible that this high density is due to Riga district only. In general, the area of agricultural lands in Vidzeme is on the second place in Latvia after Latgale, and the level of poverty is also the second in Latvia after Latgale. Unfortunately the data on the density of roads in Vidzeme excluding Riga district is unavailable.

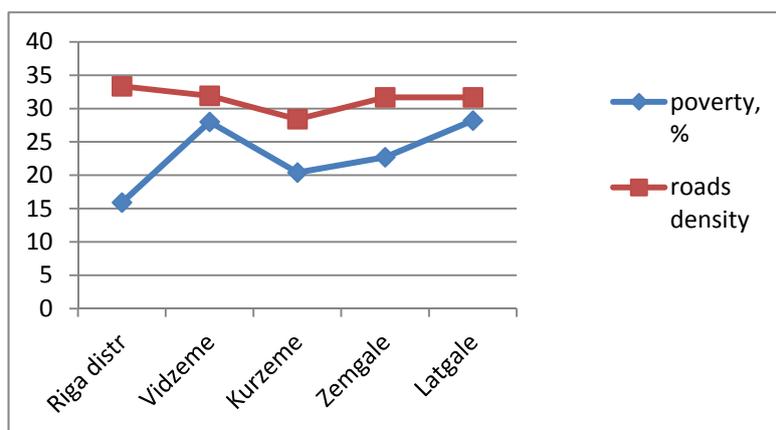


Figure 3. relationship between roads density and level of poverty in Latvia by regions

Next step is a regression analysis.

The regression analysis has not shown that any of investigated factors is significant for the factor “poverty”; the possible explanation of this result is the fact that the length of roads has not been substantially changed since the middle of the previous century and the years taken for the analysis do not present any change in this important indicator, while the level of poverty is changing significantly.

Consequently, the statistical data exemplified by Latvia do not show the significant dependence between the social system of the country expressed via the indicators of poverty and inequality and the level of the road network development obtained with the employment of regression analysis.

7. Conclusions

The paper considers the infrastructure as a significant factor having impact on the social system and the level of poverty as the most vivid indicator of social system successful functioning.

The qualitative content-analysis of the related papers and documents demonstrated the dependencies between the infrastructure and social system development discovered by numerous researches. The special attention is paid to transport infrastructure as a principal component providing the material production within the country.

There have been discussed the investments in the sphere of infrastructure and the impact of these investments on gross national product and national economy in general. There also shown the plans of the most prospective countries in the sphere of transport development.

The research under consideration presents the theoretical points showing the importance of transport infrastructure for social system and its great impact on rural regions and rural population in particular.

The paper comprises the survey of transport infrastructure in Latvia in retrospective and the plans of infrastructure development within the country in the future up to year 2015.

There also have been implemented certain statistical tools for finding the statistical dependencies between the level of transport infrastructure development and the level of poverty in the regions of Latvia. The analysis has demonstrated that there are correlations between the level of poverty and the type of region (agricultural or industrial one), length of public roads and the freight turnover.

Nevertheless, the regression analysis has not identified any significant statistical relation between the transport infrastructure and the level of poverty as the most vivid representation of social system functioning within the country. The possible explanation of this result lies in the fact that the quantitative indicators of transport infrastructure have not significantly changed since the middle of the XX century, while social indicators change every year. Therefore, the results obtained by the researchers in other countries have not been supported by the investigation on the basis of statistics of the Republic of Latvia.

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