

CHAPTER 6 BASIC ROAD CARCASS: – IMAGE OF THE FUTURE

Transportation carcass is a form of prospective development of main trunk roads that provide for the space and functional integrity of a region. In this case, minor elements of the transport infrastructure may be ignored. Only main traffic directions and modes are considered as basic features within an age. Such a forecast can not be expressed in the form of detail financial program. Its aim is different! This aim is to make it possible to assess the space scope of the road framework future improvements and their consequences.

Starting points of the development of the basic carcass are both key provisions of the Strategy (refer to Chapter 1) and some additional considerations, including:

1. Territory of the region is to be “cut” in such a way that the size of the infrastructure grid “cells” (area modules) considered with due regard of their internal filling with transportation ways provide for the accessibility of each settlement from a trunk road within no more than 40 to 45 minutes. In this case, any point of Astrakhan Province will be accessible for a span of time not more than 2.5 hours in the average. However, owing to the fact that population in Astrakhan Province is spread unevenly (concentrated closer to the Volga River), it proves impossible to form a classical road grid here.

2. It is strategically important for the whole population of the region to solve the present transport discrimination problem (related to service of irregular demand) and to reduce the number of such discriminated people from present 8,7 % to 2,0 - 2,5 %.

3. It is worth «tying up» to future sections of international transportation corridors «North-South» (the basis of a carcass linking Russia with countries of the Caucasus and the Far East) and «West-East» (linking countries of the East, the South-East and the Caucasus with those of the Central Asia, Kazakhstan and China).



4. Finally, we shall have to reconsider the traditional road rehabilitation approach towards turning them to expressways with sets of various automatic traffic control means (such as ITS - Intelligent Transport Systems). A part of expressway will serve as a toll road (360 km of the Volgograd – Astrakhan expressway).

Digression No 8. Transport carcass as space «squeezing» instrument.

While considering any region territory development plan (Master-plan of a region) which is essentially the art of combining the carcasses of various types (those natural/ecological, cultural/historical, industrial, dwelling, etc.) within certain area, it should be admitted that the transportation carcass is of the highest importance among them in terms of the society space organization.

Owing to the need of “compressing” the space of Astrakhan Region in the future (refer to Chapter 2), vitality of the transportation carcass gets still more important. The space may be “compressed” only by cutting the time of travel, the cut being attainable first of all through development of the high-speed transport infrastructure.

This approach is actively used in some countries. Thus, in 2005 in China, ambitious 20-year \$ 53 billion. program was adopted by the Transport Ministry to improve transport accessibility of 80% of the country's population (excepting the Tibet and Sinjan-Uygour Autonomous Regions) up to 2.5 days through construction of expressways. In Netherlands, the government has taken decision to build a high-speed ring railway in order to still more “compress” the space, although the country has one of world most dense road networks.

In many countries (Austria, Hungary, Greece, Norway, Mexico, South Korea) expressways serve as toll roads. In Astrakhan Region, it is planned to turn the Volgograd - Astrakhan trunk road into toll road at the most part of its length, thus making it possible for this road to compete with the “Kaspiy” federal route, to draw up a part of the future transit traffic and to provide for a stable source of investment for the road branch. Average toll per 1 km for a medium truck varies from €0,01 in Greece (the cheapest option) to €0,41 in Great Britain, €0,05 in Japan, €0,12 in China, €0,18 in France, the tariff values tending to rise [14].

In Table 6.1, preliminary assessment of the amount of money to be collected at a toll road in Astrakhan Region is presented, according to which it is evident that the rub. 2.0 (€0,06) tariff per 1 km is not feasible, the rub. 3.0 (€0,09) tariff is efficient and rub. 5.0 (€0,15) tariff is super-efficient.

Table 6.1

Comparative profitability assessment table for Volgograd – Astrakhan toll road

Average traffic intensity, veh/day	Average amount of money collected, mln. rub.	Return period, years	NPV, bln. rub. at 0,07 discount)
1. Rub. 2,0/km average tariff (from rub. 1,0/km for cars to rub. 3,5/km for trucks)			
a/ 7000	738	-	-25,98
b/ 10000	951	-	-15,5
2. Rub. 3,0/km average tariff (from rub. 2,0/km – for cars to rub. 5,0/km for trucks)			
a/7000	1107	56	-7,90
b/10000	1428	33	7,82
3. Rub. 5,0/km average tariff (from rub. 3,5/km – for cars to rub. 8,0/km for trucks)			
a/7000	1845	10	28,26
b/10000	2380	5	54,46

The 2b option is preferable, since it will make possible both to return the project investment within reasonable time and to draw up private capital through the system of public/private partnership. This option is also the minimally needed one: NPV (Net Present



Value, present cost of future money investment) becomes positive from the business planning viewpoint. Equal shares (by 50%) are envisaged for the public and the private investment. The project becomes actually profitable at average traffic 8400 veh/day; however, the project will be financially more attractive at a higher unit travel tariff. At present, in order to pass from Akhtubinski to Astrakhan through this road, the car owner would have to pay rub. 700, the amount being not realistic. In twenty years, the amount will be equivalent to \$ 35.00, average daily wage at present, and seems to be quite admissible for private budget of an average astrakhanian of 2025.

Besides, in addition to the public budget, the Region will get a stable road sector financing source tending to grow every year, since the part of the “North-South” transportation corridor passing through Astrakhan Region will be most modern. In order to reduce the risk of losing goods traffic flows, a major multi-modal logistics center must be built in the region of Ilyinka, Krasnye Barrikady.

Besides, the toll road will give quick rise to roadside services that should become essential source of financing for the road sector (up to 5% of the total amount by 2020). It should be noted that income obtained from conventionally indirect sources has become an important element of reforming both the road and the railway branches in Russia. Same situation is in Germany where railways get up to 30% of income from sources other than transportation. No wonder that similar task is set by RZHD OJSC, since any increase in general capitalization of a territory (including through development of transport infrastructure) stimulates returns in the form of quick rise of the demand to “near-transportation” businesses. Roads in this country must not lose their chance too.

Particular condition of turning any highway into toll road is availability of an alternative toll-free route. At present, it is impossible to provide for such routes at some sections of the Volgograd – Astrakhan highway. It means that local citizens who are not able to pay and who can not use alternative toll-free route must be given possibility to pass through the toll road. Partially, it may be done through construction of closing sections of alternative routes in Akhtubinski and Kharabalinski Districts (Uspenka – Bolkhuny - Pirogovka, Kharabali - Danilovka – Sasykoli), partially through using technical capabilities of turnstiles at toll road entries (free cards).

The transport/road carcass of the Astrakhan Region consists of two axes and two links (map 4):

1. Volgograd – Astrakhan – Seitovka – Kazakhstan border highway;
2. “Kaspiy” federal highway and Astrakhan – Makhachkala federal highway with major bridge near Ilyinka and deviation to Kamyziak – Kirovski;
3. Krasny Yar – eastern Astrakhan bypass;
4. Kharabali – Enotaevka with major bridge over the Volga River.

The road carcass will be added with carcass elements of other transportation modes (railways and rivers) where high-speed routes will have to be created resulting from respective rehabilitation.

As evident from Table 6.2, total cost of the carcass construction and reconstruction carried out up to 2040 will make rub. 111.4 bln. (in 2007 prices), its total length making 989 km. Only 53,5 km of the total carcass length (5.4% of the prospective length) are proposed for new construction. Measures related to construction and reconstruction of bridges are shown separately. Their share in the total cost will make 10,4% with 61.9% in the total construction cost and only 0.66% in the total reconstruction cost. Return period of the whole “carcass project” will make 29 years (after its completion).

It should be noted that road network that will serve in future as transport carcass determines, whether relatively admissible magnitudes of transport accessibility will be attained



both for the Region on the whole and for each of its Districts. As soon as the project is implemented, integral transport availability values will decrease by 0.611 hour and by more than 1 hour for transportation of passengers and goods respectively (refer to 6.3.). Greater transport environment quality improvement will take place owing to higher mobility of passengers and goods as well as to construction of a bridge over the Volga in the region of Kharabaly.

Table 6.2

Carcass cost and efficiency

Work type	Length (km)	Cost (mln. rub.)	ITA* effect (hours)		Effect (bln. Rub.)**	Investment return (years)
			ITA goods	ITA pass.		
Road construction	53.5	6710,54			4,217	29,2
Road reconstruction	935,5	104652,12				
Bridge construction	4,4	10900,00				
Bridge reconstruction	7,9	695,54	1,112	0,611		
Total	989,0	111362,66				

* Integral Transport Accessibility

** average annual efficiency (in 2007 prices)

Some important parameters related to quality of the Astrakhan Region transport network in case the prospective road carcass concept is implemented are presented in Table 6.3.

Table 6.3

Transport/road carcass concept implementation results

Parameter	Period relative to implementation		Quality growth owing to the carcass, %
	before	after	
Integral transport accessibility, hours by transportation of goods by transportation of passengers	3,49	2,38	54,7
	2,31	1,69	26,1
Transport discrimination rate, %	8,709	5,916	32,1
Reduced average lack of accessibility to services of periodical demand, hours	0,20	-0,785	392,5

SUMMARY:

1. Total costs of creating the prospective transport carcass make rub. 111,4 bln. including rub. 57,4 bln. for expressways as long as 360 km. Implementation of this “megaproject” will provide for 26% to 55% of the total growth of the quality of Astrakhan Region transport environment.

2. The prospective transport carcass solves the problem of historically and geographically formed space disintegration of the Astrakhan Region. On the basis of the carcass, “compression” of the region will have to take place as most important condition of the territory capitalization growth.

3. A part of the expressway network will serve as toll roads with rub. 3.0/km proposed average tariff (from rub. 2.0 for cars to rub. 5.0 for trucks); project investment being returned within less than 30 years.

