

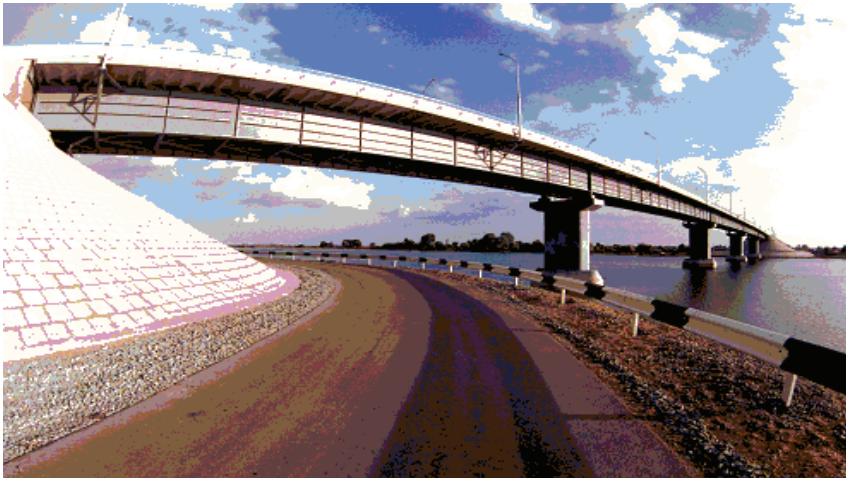
CHAPTER 9 EFFECTIVENESS OF INVESTMENTS INTO THE ROAD SECTOR IN ASTRAKHAN REGION

Assessment of the road network investment effectiveness must facilitate doubling the GRP of the Region.

So far as two-fold growth of GRP is concerned, the issue is put in such a way: priority branches with higher potential impact on doubling the added value should be chosen (all highly transforming branches such as machine-building industry, information technologies, recreation services, etc.). It is on their account that the required GRP growth rate may be provided for without the broadly spread state support.

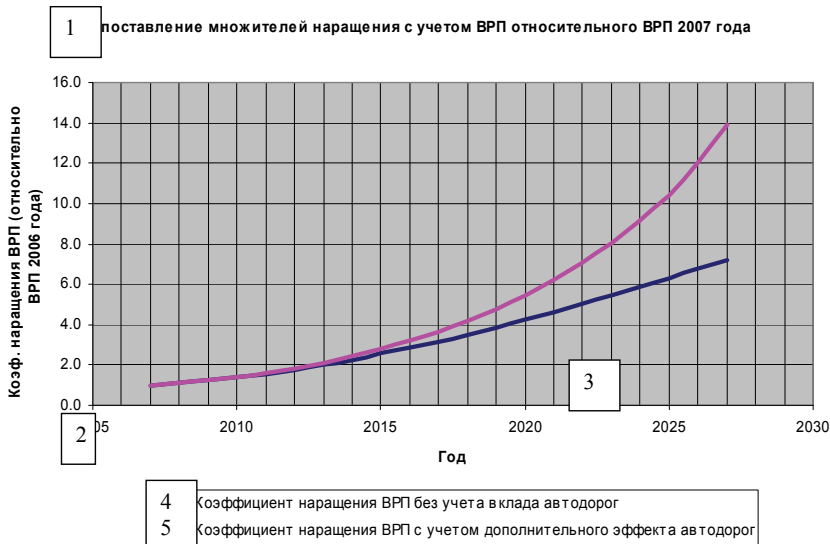
It should be noted that road sector belongs to such highly transforming industries. This appraisal argued till recently stopped to be argued as soon as “Methodic recommendations on assessment of net contribution of roads to GRP” was published. It is owing to roads’ multiple effects that intermediate consumption of other branches that use these roads decreases resulting in growth of GRP. Thus, such a level of financing the road sector of the Region should be established that corresponds to maximal increase of GRP. Roads should be financed purposefully with new understanding (from the GRP growth viewpoint contrary to the previous understanding based on sources to fill the funds).

Various branches are characteristic with different investment multiplication factors. For example, this factor for the transportation branch is equal to 0.7; it means that each invested Ruble will result in GRP increase equal to 0.7 rub. (multiplication factors in excess of 1 are characteristic for the machine-building and other highly-transforming branches, while the oil-processing branch is characteristic with 0.41 factor only) [15]. In case of Astrakhan Region, the road network multiplication factor equals to 4.30, GRP lagging behind owing to incomplete repair by 2.41% and the territorial road use efficiency making 1,9. These values were arrived at while assessing annual losses suffered in case road network fails.



Impact of the road network development on GRP growth is shown in Figure 9.1 in the form of difference between horizontal values of two curves. For example, by 2013, when GRP is planned to be doubled, the road impact is minimal (acceleration less than for half-year) owing to accumulated incomplete repairs and other road sector financing system drawbacks. However, the difference between values corresponding to the curves will make almost 1.5 years (August 2017 – March 2019) for the four-fold GRP and more than three years for the six-fold GRP. No one branch can boast with such accelerating capability.

Figure 9.1



1 - Comparison of GRP increase factors relative to 2007 GRP

2 - GRP increase factor relative to 2006 GRP

3 - Year

4 - GRP increase factor regardless of contribution of roads

5 - GRP increase factor with due account of additional effect from roads

Effect from normative maintenance and development (maximal effect from private co-ordination programs).

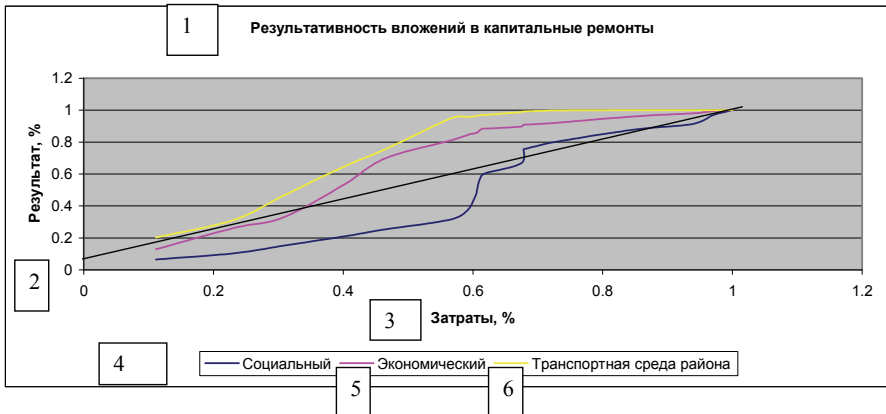
In Figures 9.2 and 9.3, potential effects from normative maintenance and repairs (first case) and from road network development (second case) are shown in percent of the costs (for Ikryaninsky District as example). Four curves of potential effect are shown: 1) economic effect on the whole, 2) effect to forming the commodity properties of the district road network regarding transportation of goods, 3) social effect on the whole, 4) effect to forming the social properties of the district road network.

The curves demonstrate that the effect grows irregularly with the costs. For example, it is evident from the first chart that while financing capital repairs in Ikryaninsky District, 88.4% economic effect and 80% social effect are attainable at 64.6% financing level. Practically similar effects of increasing the costs to all program execution criteria are traced at curves characterizing the Ikryaninsky District development results. It should be noted that all the curves tend to concave above the strait line characterizing the return from the unit effect relative to the unit costs.



Figure 9.2.

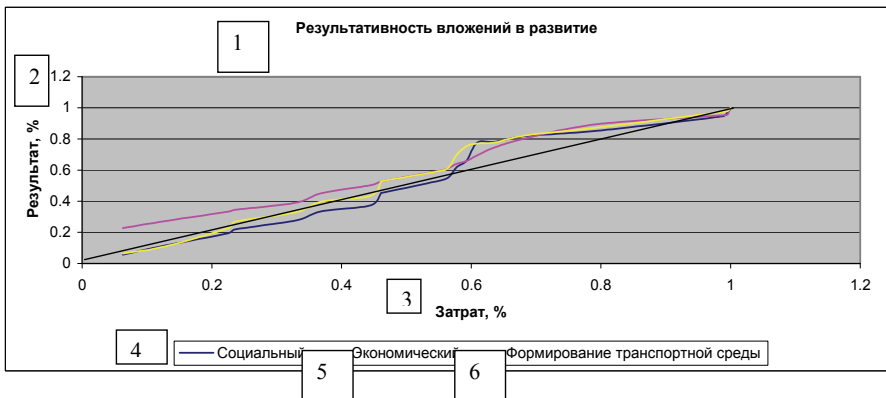
Relation between investment return (in % of total investment) by economic, social and general criteria (in % of the road network development level stipulated by the program), for operation



- 1 - Effectiveness of investment into capital repairs
- 2 - Results
- 3 - Costs
- 4 - Social
- 5 - Economical
- 6 - Region's transportation environment

Figure 9.3.

Relation between investment return (in % of total investment) by economic, social and general criteria (in % of the road network development level stipulated by the program), for development



- 1 - Effectiveness of investment into development
- 2 - Results
- 3 - Costs
- 4 - Social
- 5 - Economical
- 6 - Region's transportation environment

Specific contribution by roads of different ownership into improvement of transportation environment.



The role of different (by ownership) Astrakhan Region roads is not similar both at present and in terms of execution of measures stipulated by this Strategy. The structure of annual operation costs for roads of different ownership is shown in Figure 9.4, contribution by the same roads into the increase of economical and social parameters of the Region resulting from implementation of the whole Strategy being shown in Table 9.1.

So far as total economic effect is concerned, the territorial roads slightly supersede the federal ones (2270 mln. rub. and 2192 mln. rub. respectively) owing to greater share of territorial roads in the District's economic effect (Table 9.1).

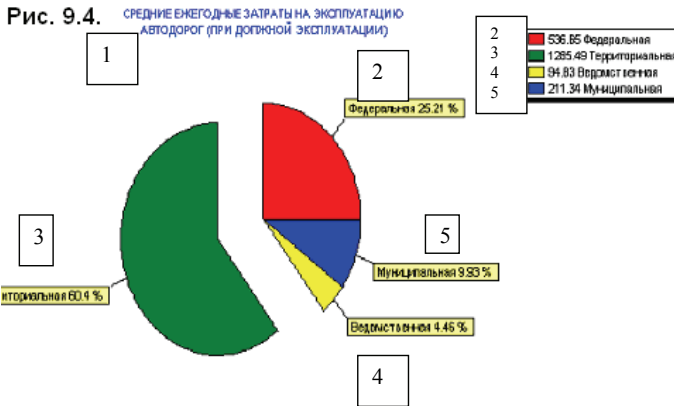


Figure 9.4

- 1 - AVERAGE ANNUAL COSTS FOR OPERATION (AT PROPER LEVEL)
- 2 - Federal
- 3 - Territorial
- 4 - Departmental
- 5 - Municipal

Table 9.1
Contribution by roads of different ownership into the increase of economical and social indices of the Astrakhan Region resulting from implementation of the whole Strategy.

Road ownership	Economic effect, mln. rub.			Contribution to changes of indices of district road network			Contribution to changes of indices of regional road network			Development costs, mln. rub.
	total	regional	district	ITA goods, h	ITA pass., h.	Free time spared, thous. man-h. (per day)	ITA goods, h	ITA pass., h.	Free time spared, thous. man-h. (per day)	
Federal	2191,5	199,6	1991,9	1,02	0,57	16	0,35	0,65	698	43668
Territorial	2269,5	863,8	1405,7	2,32	1,84	126	0,21	0,48	412	52540
Municipal	781,8	541,8	240	0,56	1,95	118	0,04	0,08	83	15462
Private	1695,6	512,7	1182,9	1,38	0,67	44	0,19	0,39	377	57416

Contribution to integral improvement of the district network transport accessibility for goods is the highest on the part of territorial roads, while that for passengers is the best on the part of municipal roads (owing to their greater role in linking neighbor settlements).

Greatest impact of federal roads falls on improvement of indices of the regional road network (more for transportation of goods and less for that of passengers).

Cost of updating (in 2007 prices) the roads of all the four types will exceed 169 bln. rub., greatest part of this amount (34,0%) falling on private roads with 31,1%, 25,8%, and only 9,1% falling on territorial, federal and municipal roads respectively.

While assessing the role of particular road projects after implementation of the Strategy, increased importance of Astrakhan Region federal and major territorial roads should be noted too (Tables 9.2 and 9.3). The Volgograd – Astrakhan road takes special place, since it will become an expressway. Federal roads are of great potential too. Roads taking first ten places in the economical rating list generate more than 65,9% of the increase in potential economic effect, more than 50% of the increase in the quality of the district transport network in relation to goods, 28,6% of the increase in the quality of the district transport network in relation to passengers, 25,6% of the increase in the district free time fund, 76,4% of the increase in the regional transport accessibility in relation to goods, 75,4% increase in the regional transport accessibility in relation to passengers and to the regional free time fund, measures of the first ten making more than 66% of the development program implementation cost. It worth noting that there is a big gap between the district and the regional increases in the transportation environment quality indices, particularly those related to the social field. Summary of non-concurring ratings of particular roads by economic and social effects is presented in table 9.4.

Table 9.2

Rating of Astrakhan Region road projects by increase of economic effect.

Road project	Change in ITA for districts, goods., h	Change in ITA for districts, pass., h	Social rating for districts, thous. man-h	Change in ITA for region, goods. h	Change in ITA for region, pass., h	Social rating for Region thous. man-h	Modernization cost, min. rub.	Return, years,	Economic effect, min. rub.
Volgograd – Astrakhan	1.381	0.665	44.08	0.393	0.19	376.9	57416	33.9	1696
Moscow – Astrakhan	0.762	0.425	10.34	0.296	0.17	338.2	28153	26.5	1061
Astrakhan – Mkhachkala	0.125	0.074	3.017	0.324	0.168	333.1	7502.7	7.4	1019
Astrakhan – Kamyzyak	0.005	0.003	0.6	0.052	0.023	46.1	2078.4	13.2	156.9
Volnoye – Zamyany	0.165	0.088	3.313	0.033	0.003	5.2	866.3	6.2	139.6
Astrakhan – Zelenga	0.04	0.023	6.338	0.035	0.015	29.3	1333	10.3	130
Astrakhan – Elista –Stavropol	0.137	0.072	2.689	0.025	0.014	27	8012.7	71.8	111.5
Astrakhan Eastern Bypass: access road from Astrakhan – Krasny Yar to Astrakhan – Zelenga	0.011	0.002	0.966	0.03	0.007	13.9	2387.6	27.7	86.2
Komsomolsky – Topal	0.017	0.083	3.242	0.001	0	0.7	229.6	2.7	86.1
Astrakhan – Tri Protoka - Nachalovo	0.013	0.006	3.27	0.027	0.007	13.1	1503	17.5	86
TOTAL FOR FIRST TEN OF THE RATING	2.656	1.441	77.854	1.216	0.597	1184	109483	217.2	4572
TOTAL FOR DEVELOPMENT PROGRAM	5.289	5.034	304	1.592	0.791	1571	169087		6938
% OF EFFECT PROVIDED BY THE WHOLE PROGRAM	50.2%	28.6%	25.6%	76.4%	75.4%	75.4%	64.7%		65.9%

Table 9.3

Rating of Astrakhan Region road projects by increase of social effect in the Region.



Road project	Change in ITA for districts, goods, h	Change in ITA for districts, pass., h	Social rating for districts, thous. man-h	Change in ITA for region, goods, h	Change in ITA for region, pass., h	Social rating for Region thous. man-h	Modernization cost, mln. rub.	Return, years,	Economic effect, mln. rub.
Volgograd – Astrakhan	1.381	0.665	44.08	0.393	0.19	376.9	57416	33.9	1696
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Astrakhan – Zelenga	0.04	0.023	6.338	0.035	0.015	29.3	1333	10.3	130
Astrakhan – Elista - Stavropol	0.137	0.072	2.689	0.025	0.014	27	8013	71.8	111.5
Astrakhan Eastern Bypass: access road from Astrakhan – Krasny Yar to Astrakhan – Zelenga	0.011	0.002	0.966	0.03	0.007	13.9	2388	27.7	86.2
B.Seitovka – Vatazhnoye – Kazakhstan border	0.012	0.003	0.115	0.013	0.007	13.8	688.2	14	49
Astrakhan – Tri Protoka - Nachalovo	0.013	0.006	3.27	0.027	0.007	13.1	1503	17.5	86

Table 9.4

Non-concurrence of Districts by social and economic effects resulted from implementation of the Strategy.

Region	Economic effect, mln. rub.	Rating 1	Social effect (free time spared), million man-hours per year	Rating 2	Joint rating	Deviation modulus
Privolzhsky	29749	2	203072	2	4	0
Narimanovsky	26714	3	101214	4	7	1
Akhtoubinsky	16166	6	297902	1	7	5
Krasnoyarsky	32074	1	43426	9	10	8
Kharabalinsky	16727	5	81848	5	10	0
Kamyzyaksky	10395	7	114351	3	10	4
Ikryaninsky	19454	4	56780	7	11	3
Volodarsky	9642	9	80355	6	15	3
Enotaevsky	10119	8	32610	10	18	2
Limansky	7856	10	48356	8	18	2
Chernoyarsky	5519	11	28742	11	22	0
Total	184415		1088656			

Specifically, maximal and minimal economic effects will take place in Krasnoyarsky and Chernoyarsky Districts (32.1 and 5.5 bln. rub. respectively). In this table, the regions are ranged in diminishing order of the joint rating of efficiency of the investment programs (the greater the general efficiency of the program implementation, the higher the place taken by the joint rating).

This table provides for visible understanding of the non-concurrence of the road programs' economic and social effects. Given the dissimilarity in conditions and development of the base network, there are many rather contrasting non-concurrence cases. The contrast is particularly noticeable in Krasnoyarsky District (deviation modulus is equal to 8). First of all, this results from the hypertrophied industrial development of this district.

The point is that zero deviation modulus is typical for two opposites. In Privolzhsky District, both the economical and social effects are equally high, while in Chernogryadsky District they are equally low.

In the “Roads” subprogram (part of the “Modernization of Russian Transport System” Federal Target Program for 2002-2010), total transport efficiency for this period resulted from implementation of the road construction and rehabilitation program will make 1371 bln. rub. (in 2001 prices) or about 3008 bln. rub. in early 2006 prices (2006 vs. 2001 deflation factor is 1.738). Effects from cut of the following components are included by the subprogram authors into the transport efficiency: travel time, transportation and operation costs, the number and severity of road accidents. The off-transport effect (lower levels of negative impact exerted by the road/transport complex upon the environment, stimulation of business activities and decreased prime costs of goods and commodities owing to lower transportation costs) is established separately, the effect making about 785 bln. rub. (1364 bln. rub. in early 2006 prices).

Thus, total economic effect resulting from implementation of the road strategy in Astrakhan Region will make 184.4 bln. rub. (for the whole Strategy implementation period up to 2027) or about 9.2 bln. rub. per year. It means that by 2010, the road program’s efficiency will make 1.22% of the total Russian transport (road) effect resulting from execution of all items of the “Roads” subprogram. This comparison is rather conventional. Comparison of the Regions’ programs carried out by Geogracom Ltd. in their “Road network development strategies” is more legitimate.

Table 9.5 presents comparative efficiency of road strategies for Astrakhan and Tula Regions and for Krasnodar Krai. It should be noted that although the public road network length in Astrakhan Region will increase insignificantly (4.6%), economic effect in the Region expressed in correlated prices will be 4.4 times more than that in Krasnodar Territory. Such a high effect results from correspondingly high response to bringing the road network to normative condition.

Table 9.5
Comparison of the Programs for Krasnodar Territory, Tula and Astrakhan Regions

Index	Unit	Krasnodar Territory Program (up to 2035)*	Astrakhan Region Program (up to 2027)	Tula Region Program** (up to 2027)
Total financing according to Program	bln. rub.	709,0	209,1	205,4
Territorial network development costs	bln. rub.	617,0	156,7	122,7
Territorial network development costs per 1 km	bln. rub.	43,7	76,9	18,2
Public road network increase	%	27,8	4,64	38,8
Economic effects per 1 km of public roads	bln. rub.	7,36	49,2	3,75

*- in 2002 prices

** - in 2001 prices



SUMMARY:

1. In Astrakhan Region, economic efficiency of measures stipulated by the Program is considerably superior to social efficiency.

2. Territorial roads contribute to economic and social effects resulted from using the Astrakhan Region road network decisively. The role of Volgograd – Astrakhan road will gain particular importance as soon as it is rehabilitated and turned to European type toll highway.

3. At the recommended territorial road financing level (1.3% of GRP or 1.58% of GRP in case the expressway is built on the basis of PPP), GRP of the Region could be doubled 1.5 years sooner owing to annual increase in GRP in an amount of 4.3 bln. rub. resulted from elimination of incomplete repairs and from development of the network.

4. Total economic effect in Astrakhan Region will make about 1,22% of respective general Russian effects, the effect per road network unit length expressed in correlated prices being superior to that in Krasnodar Territory.

