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Abstract: *This article presents the grounds and conditions for introducing the width of the allocated strip for public roads in the territory of the Republic of Uzbekistan, methods for determining the width of the allocated strip, as well as the requirements for determining the width of the allocated strip in national regulatory documents, the difference between these requirements and the norms of other foreign countries, and an analysis of their practical application. The main factors influencing the change in the width of the zone allocated for highways are the growth of the population, the number of cars owned by them, the volume of gross regional output, and the sharp increase in traffic intensity on the highway as a result of a rapid increase in the number of passengers traveling on the highways. The research work was carried out on the example of the M39 highway "Almaty - Bishkek - Tashkent - Shakhrisabz - Termez," which is the busiest in the republic, and the current state of the width of the region allocated on this road was studied. The geometric dimensions of the road, terrain, safety requirements, and other factors must be taken into account together. When determining the width of the zone allocated for highways and in the process of its cadastral registration in accordance with the legislation, it is necessary to take into account the active use of the highway and its service facilities located in this area for their placement and development.*

Keywords: *roadroad, road zone, relief, geometric size, roadway, traffic intensity, slope gradient, roadbed, safety, embankment, embankment, traffic lanes, dividing strip*

1 INTRODUCTION

According to the Law of the Republic of Uzbekistan "On Roads," "Separated Zone" refers to a land plot granted for permanent use in the manner prescribed by law for the placement of a highway, its corresponding structural elements and engineering structures, as well as buildings and structures necessary for the operation of the highway, for the creation of protective and ornamental plantations, and "Roadline Zone" refers to a land

plot adjacent to the separated zone, within the boundaries of which special conditions for land use are established to ensure the safety of the population and the safety of traffic [1].

In the Decree of the President of the Republic of Uzbekistan dated 10.10.2023 No. PP-330 "On Measures for Further Improvement of the Road Management Sector" [2], it is specifically noted that "by the end of 2024, the phased relocation of illegally constructed buildings and structures in the designated roadside zones of public roads, streets of cities and other settlements, as well as the reconstruction of access roads to buildings and structures located as designated roadside zones, in accordance with urban planning norms, will be ensured.

2 METHOD

Public roads are subdivided into roads of international, state, and local significance: roads of international significance - roads included in the network of international roads in accordance with international treaties of the Republic of Uzbekistan; roads of state significance - roads providing transport links between the administrative centers of regions and districts of the Republic of Uzbekistan, cities of regional subordination, cultural and industrial centers, and connecting these centers with roads of international significance, airports, railway stations, ports and shipyards, as well as with neighboring states; roads of local significance - roads connecting administrative centers of districts with towns, villages and auls, as well as with roads of state significance [3-5].

The width of the zone allocated for highways in the countries of the world was studied and presented in the following Table 1 [6-11].

Table 1. The width of the zone allocated for highways in the some countries

Road category	Kazakhstan	Kyrgyzstan	Germany	Russia	Turkey	Republic of Belarus	Azerbaijan
I	70	64	60	100	55-70	65-80	75
II	40	32	50	75	40-50	45-60	50
III	30	28	40	50	25-35	35-40	35
IV	26	26	30	35	20-25	25-30	30
V	24	24	20	25	15-20	10-20	20

S ource	La w of the Republic of Kazakhst an "On Highway s" No. 245 Jul y 17, 2001	Law of the Kyrgyz Republic About automobile roads From May 22, 2023, No. 104	Gu idelines for the Installati on of Highway s (RAA)	S NIP No. 467	Aut omobile Technical Standards (General Directorate of Automobi le Roads of Turkey)	TK P 45- 3.03-19- 2006 (02250)	SNiP 2.05.02- 85 (national adaptatio n)
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As of 2023, the total number of roads in the Republic of Uzbekistan is 209,496 km. Of these, the total length of public roads is 42,869 km. The procedure for allocating land for highways of the Republic of Uzbekistan is carried out in accordance with the regulatory document SHNK 2.10.01-23 "Determination of land area dimensions for the construction of flat and linear structures," which states that when determining the width of the strip allocated for highways, it is necessary to pay attention to the following indicators [12]: road category; number of traffic lanes; to the height of elevation from the ground; to the depth of the recess; presence or absence of auxiliary reserves along the road; road slope gradient; location of road service facilities [3].

The procedure for allocating land for highways of the Republic of Uzbekistan According to the regulatory document SHNK 2.10.01-23 "Determining the dimensions of land plots for the construction of flat and linear structures" (Appendix 15), the dimensions of the width of the strip allocated for highways are given in Table 2 [3]:

Table 2. Standards for determining the required sizes of land plots (m) for determining the boundaries of highways passing through embankments

Embank ment height	With the location of the embankment slopes									
	on flat terrain with a transverse slope from 0 to 9 percent					on uneven terrain with a transverse slope of more than 9 percent				
	at a constant slope			variable slope		at constant slope			variable slope	
	1:4	:3	2	1: :1.5; 1 :1.75	1: 1.75; 1: 2	1:4	:3	:2	1: :1.5; 1 :1.75	1: 1.75; 1 :2
1	2		4	5	6	7			1	1

								0	1
Category I highways with 8 lanes									
1	80/67 /86		-	-	-	11 6/147		-	-
1.5	80/71 /98		-	-	-	12 0/151		-	-
2	80/66 /110		-	-	-	12 4/155		-	-
3	80/74		-	-	-	13 2		-	-
4	-		8 0/66	-	-	-	8	-	-
Category I highways with 6 lanes									
1	73/59 /78		-	-	-	10 2/133		-	-
1.5	73/63 /90		-	-	-	10 6/137		-	-
2	73/67 /102		-	-	-	11 0/141		-	-
3	73/66		-	-	-	11 8		-	-
4	-		7 3/58	-	-	-	8	-	-

Note:

a) if the numbers in the table of this appendix consist of three digits:

No. 1 determines the width of the land adjacent to the lane on both sides, taking into account the condition of providing a side view, from 25 m for category I-III roads and from 15 m for category IV-V roads;

Number 2 determines the width of the lands, determined by the organization of furrows;

Number 3 - the width of roadside reserve lands with a width of more than 10 m and a depth of 0.5, 1.0 and 1.5 m, respectively, determined by their calculation, if they are a permanent structural element of the earth embankment.

b) when the digits in the table of this appendix consist of two digits:

No. 1 determines the width of the determined lands, including lands adjacent to the lanes on both sides, from 25 m for category I-III roads and from 15 m for category IV-V roads, taking into account the condition of ensuring lateral visibility;

Number 2 determines the width of the lands, determined by the organization of furrows.

c) when the digits in the table of this appendix consist of one digit:

This number, taking into account the condition of providing a view from the side, determines the width of the determined lands, including lands adjacent to the traffic lane on both sides, from 25 m for category I-III roads and from 15 m for category IV-V roads.

As a result of the sharp increase in traffic intensity on the highway in recent years, it is necessary to change the width of the zone allocated for highways. This can also be seen in the table below (Table 3).

Table 3. Change in the width of the zone allocated for highways.

Road category	Resolution of the Council of Ministers of the RSFSR dated September 26, 1962 No. 255	Resolution of the Government of the Russian Federation No. 717 of September 2, 2009	According to the regulatory document SHNK 2.10.01-23 "Determination of land plot dimensions for the construction of flat and linear structures"
I	39 m	67 m	65 m
II	28 m	52 m	58 m
III	22 m	35 m	57 m
IV	19 m	29 m	36 m
V	18 m	27 m	35 m

3 RESULTS AND DISCUSSION

The importance of traffic intensity plays a key role in determining the width of the zone allocated for highways, and today traffic jams appear on highways. The increase in traffic intensity is closely related to the growth of the population of the area where the highway is located, the volume of gross output, and the annual increase in the number of vehicles belonging to the population (Fig. 1). When determining the width of the allocated strip, the number of lanes is determined based on the magnitude of traffic intensity, and the number of lanes is the first factor in determining the width of the allocated strip for a highway [12,13].

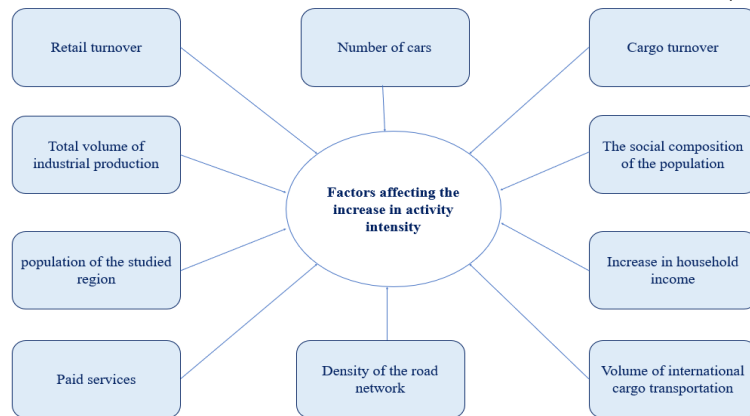


Fig 1. Factors influencing the growth of movement intensity

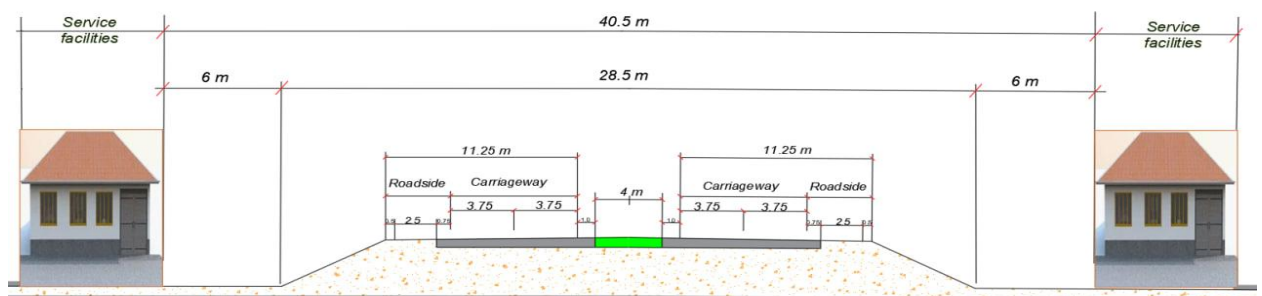
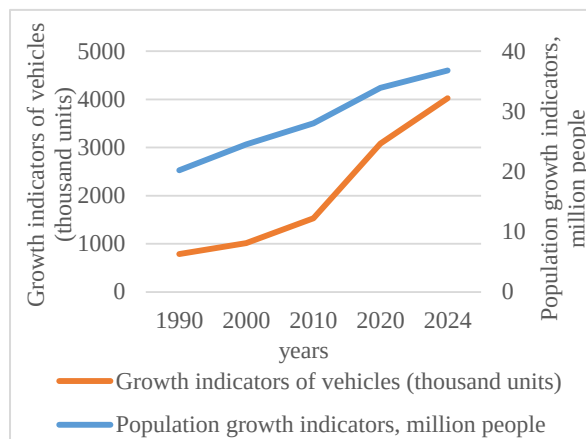
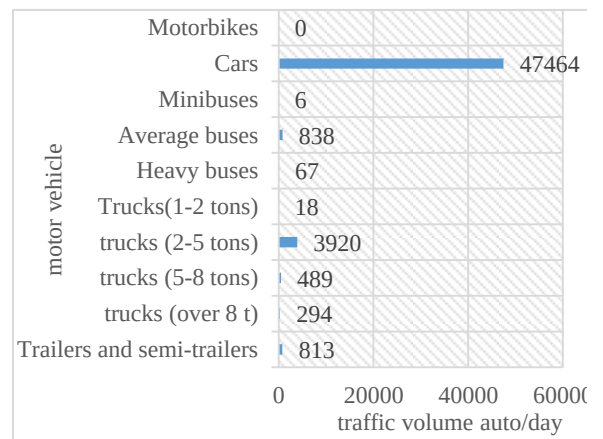


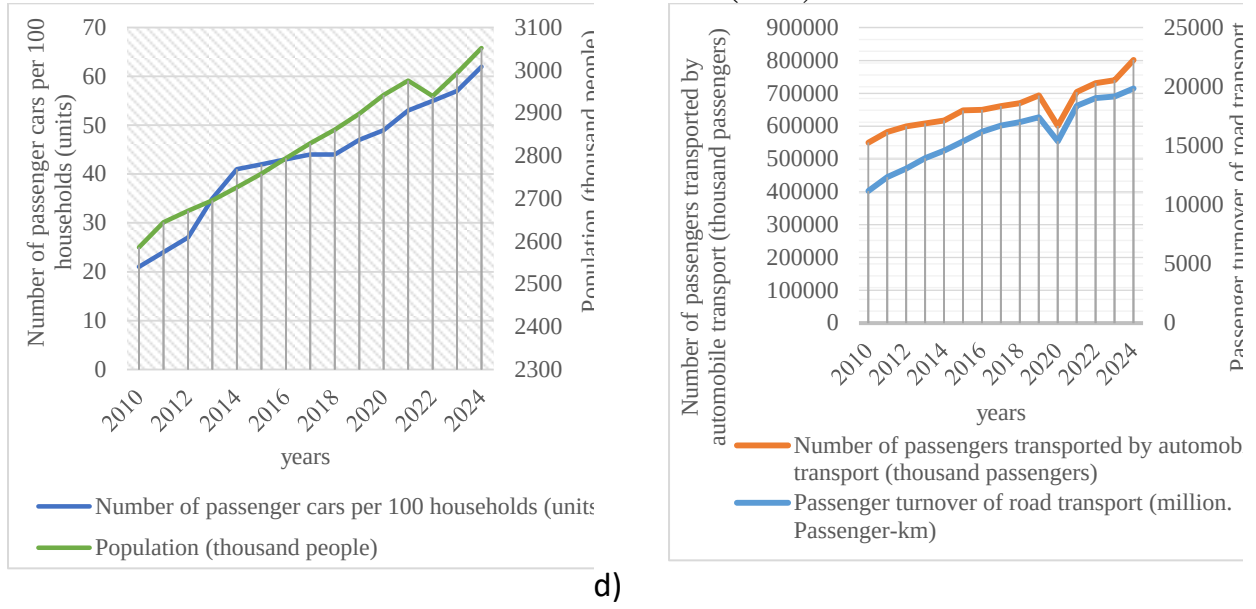
Fig. 2. Current state of the allocated zone of the M39 highway along the Tashkent-Chinaz route.



a)



b)

**Fig.3.**

a) Population and vehicle growth indicators across the Republic of Uzbekistan; b) The composition of the traffic flow identified on the 837 km section of the M39 "Almaty-Bishkek-Tashkent-Shakhrisabz-Termez" highway (average annual daily traffic volume: 53,909 vehicles per day); c) Changes in population and vehicle numbers over the years in the area traveled by kilometers 837-871 of the M39 highway along the Tashkent-Chinaz route; d) Changes in passenger traffic and passenger turnover over the years in the area covering kilometers 837-871 of the M39 highway along the Tashkent-Chinaz route.

The roadbed is in the form of a trapezoid, the base of which B_0 for a horizontal road section is determined as follows [14-15].

$$B_0 = B + 2mH, \quad (1)$$

here: B - width of the roadbed, m; H -height of the embankment or depth of the excavation, m; m -coefficient of slope steepness.

If the roadbed is on a steep slope, it is calculated using the following expression:

$$B_0 = \left(\frac{B}{2} + mH \right) \left(\frac{n}{n+m} + \frac{n}{n-m} \right), \quad (2)$$

here: n -slope inclination of the location.

Taking into account the indicators directly and indirectly affecting the width of the zone allocated for the highway, the following expression was developed:

$$B = f(N, P, GDP, P_t, P_n), \quad (3)$$

here: B - width of the strip allocated for the highway, N - traffic intensity; P - population growth; GDP - gross output of the region; P_t - passenger turnover on roads; P_n - number of passengers transported by automobile transport.

The dimensions of the width of the strip allocated for the highway consist of the following composition:

$$B_{yam} = n * B_t + B_{at} + 2B_{yb} + 2B_{ya} + 2k * B_{yy} + 2B_{yk}, \quad (4)$$

here: B_{yam} - the width of the road, m; B_t - width of the moving lane, m; n - number of lanes; B_{at} - width of the dividing strip, m; B_{yy} - width of the road shoulder, m; B_{ya} - width of the side ditch, m; B_{yy} - road side slope, m; k - coefficient taking into account the terrain; B_{yk} - width to ensure side visibility: 25 m for roads of categories I-III, 15 m for roads of categories IV-V.

When determining the width of the zone allocated for highways, the influence of the terrain of the area where the highway is located is of particular importance, therefore, taking into account the slope gradient of the highway zone in Table 34 of the regulatory document SHNQ 2.05.02-2007 "Avtomobile Roads" in the case of a highway passage on embankments and in the case of a trench passage in Table 35, a coefficient for the change in the zone allocated for highways was developed [15-19].

Table 4. When the highway passes on the embankment

Embankment soils	k
Large fragments of low-weathering rocks	1.54
Coarse-grained and sandy (excluding fine and dusty sands)	1.62
Fine and dusty sands, clay and loess soils	1.62

Table 5. When the highway passes through a slot

Carved soils	k
Rock formations: - low-weathering	1.66
- Easily weathered:	1.62
- those who don't soften in water	1.2
- softening in water	1.2-1.31
Large-lobed	1.62
Homogeneous hard, semi-hard, and difficult-to-soften clayey and sandy	1.62
Fine sand dunes	2.66
Loess	1.2

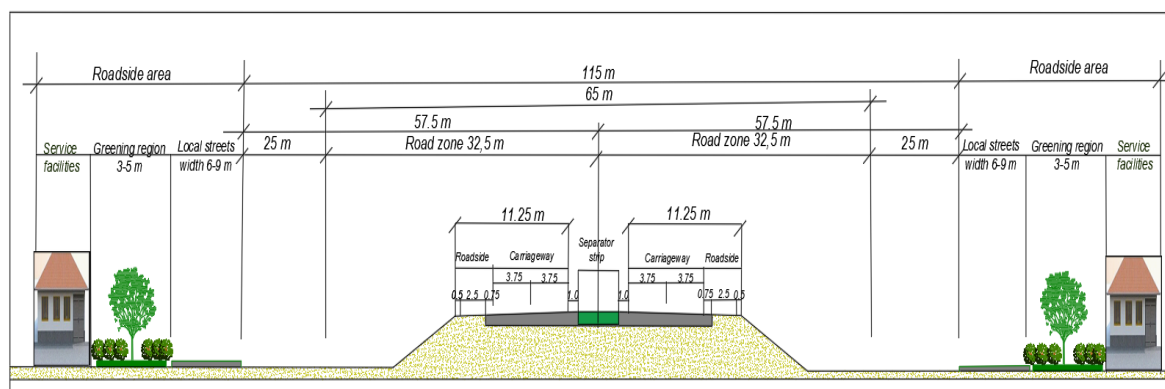


Figure 7. The width of the designated and safety zone for Category I highways.

4 CONCLUSION

When determining the width of the zone allocated for highways, the geometric dimensions of the highway are of particular importance, the values of which are inextricably linked with the number of vehicles required for safe movement on the highway. At the same time, the concept of a "security zone" from the side part of the strip allocated for a highway is defined in the Resolution of the Cabinet of Ministers No. 342 of December 26, 2011, which specifies the width of the safety zone: on roads of categories I and II - 25 meters, on roads of category III - 20 meters, on roads of categories IV and V - 15 meters [5].

The width of the zone allocated for the highway requires a comprehensive approach. The geometric dimensions of the road, terrain, safety requirements, and other factors must be taken into account together. When determining the width of the zone allocated for highways and in the process of its cadastral registration based on legislation, it is necessary to take into account the active use for the placement and development of the highway and its service facilities located in this area [20-22]. This, in turn, requires a sufficient justification in search and design work of the economic development of territories in the development of road infrastructure, the rapid increase in traffic volume, which is the main indicator determining the number of lanes of highways.

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