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Effects of Rural Roads for Improving Road Traffic Safety in Bangladesh

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***Abstract*: *Road Traffic crashes not only claim active lives and inflict injuries but also create an economic burden on society through the loss of productivity of the killed or injured persons. The problem of deaths and injuries as a result of road traffic crashes is now acknowledged to be a global public health problem all over the world, especially in low-and middle-income countries like Bangladesh. However, the state of road traffic crashes in a developing country is much worse compared with that of developed countries. For better planning, improvement, maintenance and operations, the total road systems in Bangladesh are assigned primarily to the Roads and Highways Department (RHD) and the Local Government Engineering Department (LGED) which are called rural roads. However, road traffic safety depends on the reduction of road traffic crashes on RHD road networks and simultaneously LGED road networks. However, the key activities taken by the Government for improving road traffic crashes mainly for the road networks belonging to the RHD leaving a huge volume of rural roads. Moreover, the present recording and reporting systems of road traffic crashes are based on the RHD networks leaving the rural roads. Therefore, the actual state of road traffic safety on rural roads is unknown and the present state of road traffic safety in this country is underreporting. So, it is necessary to identify the effects of rural roads for improving the total traffic safety of the country. Since rural roads have no specific traffic crash data and the volume of rural roads is significantly high, it is impossible to consider all the rural roads to evaluate the state of traffic safety. The research was performed by assessing the traffic safety of randomly selected 8 rural roads from each of the country's divisions representing the country's demographic and topographic characteristics through Road Safety Inspection (RSI). The primary and secondary data for this research were collected by road inspections and from the Accident Research Institute (ARI) of Bangladesh University of Engineering and Technology (BUET), RHD, LGED and different publications.*

Keywords: RHD, LGED, Traffic Safety, Road Safety Inspection, Demographic, Topographic

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I. INTRODUCTION

Each year, about 1.35 million people are killed and as many as 50 million are injured or permanently disabled by road traffic crashes globally. Presently it is the 8th leading cause of death for all ages and if otherwise no adequate action would be taken then it will be the 5th cause of death by 2030. On the other hand, considering the economic loss, it is about 1-3% of GDP which is equivalent to US$ 518 billion. Injuries and mortalities from road crashes are problems for developed and developing countries. However, developing countries' road traffic crashes are much worse compared with those of developed countries. Over 80% of traffic fatalities occur in so-called developing and emerging countries, even though these countries account for only about one-third of the total registered motor vehicle fleet. Moreover, the fatality rate concerning registered motor vehicles, in Bangladesh is almost 50 times higher compared with that of most of the developed countries [1]-[3][28][29][30][31]. In Bangladesh, according to the Police report based on RHD road networks, about 4000 people are killed and another 5000 become injured by road traffic crashes each year; but the World Health Organization (WHO) estimates the number of fatalities by road traffic crashes more than 25,000 including rural roads which contributes about 18% of total traffic crash [4]-[10][32]. However, such problems can be solved with a profound understanding of the effect of road infrastructure formation elements on the risk of accidents, so that the handling taken can be more efficient. Several literatures show that humans, vehicles, roads and the environment, as well as the interaction between these factors, are the main contributory causes of traffic accidents and road infrastructures as one of the causes of traffic accidents should be designed and constructed by accommodating all aspects of safety. One way of improving road traffic safety is to reduce crash occurrences by implementing crash-reduction countermeasures. Another way is to reduce the severity of crashes with safer vehicles and road user behaviour modification programs. However, these two methods can only be successfully applied if the relevant factors that contribute toward the occurrence or increase the severity of crashes are known. The injury risks of individuals in traffic crashes are influenced by a multitude of factors, including vehicle features, roadway factors, driver characteristics, type of collisions and environmental conditions. In addition to identifying the significant factors, it is essential to quantify the relative magnitudes of the impact of these factors on collision frequency and severity so that countermeasures to prevent collisions can be prioritised and implemented.

However, available literature and the statistics of road traffic crashes are mainly based on highways not for a huge quantity of rural roads. Therefore, without improving road traffic safety on rural roads, it is not possible to fulfil the targets of SDG 3.6 to reduce traffic crashes by 50% by 2030 [11]-[12]. In 2003 the Planning Commission classified the road systems into six categories; - National, Regional, Zila, Upazila, Union, and Village Roads, and simultaneously assigned the responsibility into RHD and LGED by three categories in each of the departments (Table: I). The latter three categories belong to LGED and are termed as Rural Roads which is about 94% of the total road networks. However, the present recording and reporting systems of road traffic crash data are mainly based on RHD road networks leaving the huge volume of uncared rural roads that become the serious underreporting of crash data. Although the ARI of BUET and the WHO have estimated that about 18% of road traffic accidents occur on rural roads this figure is also not real due to several reasons. Therefore, the state of road traffic safety in Bangladesh is underreported [13]-[15]. On the other hand, many of the improved rural roads are narrow and do not comply with the standards of the carriageway, sharp curves, fill slopes, surface conditions, safety features, access control, and clear zones which influence the causes of traffic accidents. Moreover, traffic characteristics on rural roads are also heterogeneous consisting of non-motorized to high-speed motorized vehicles. Although LGED has adopted a few initiatives to improve road traffic safety on rural roads these initiatives are not remarkable due to poor planning and weak management capacity of the department. But like highways, safer rural roads are also very significant for all spheres of social development in the country. Therefore, profound research is required to identify the effects of traffic safety on rural roads which contribute to the improvement of traffic safety on highways in Bangladesh. The effects of rural roads could be evaluated by identifying the influence of each of the geometrical elements of road cross-sections that accelerate traffic accidents. Therefore, it is a fundamental issue to evaluate the state of road traffic safety on rural roads to build safe and sound road networks that will be helpful to alleviate poverty, achieving the vision of 2041 and the targets of the SDGs by 2030 [16]-[17].

II. METHODOLOGY OF THE STUDY

The objective of this research is to evaluate the effects of rural roads to improve road safety in Bangladesh. The study was performed based on both primary and secondary sources of data. Since rural roads have no traffic crash data, no statistical model was used in this research. However, a few non-statistical methodologies are available for analyzing traffic safety which has no traffic crash data. In this case, an effective tool for evaluating traffic safety named “Road Safety Inspection (RSI)” was used to collect primary data such as existing geometrical dimensions of cross-sections, deficiencies of geometric elements, conditions of roads, roadside hazards, and lack of safety features of randomly selected 8 (Eight) high traffic rural roads form eight divisions (one from one division); Dhaka, Rajshahi, Khulna, Chattogram, Rangpur, Mymensingh, Sylhet and Barishal representing the topographic and demographic characteristics of the whole country. Moreover, the available literature about RSIs is based on highways for developed countries, therefore no RSI checklist is available for rural roads in Bangladesh. For this research, an RSI Checklist was prepared by reviewing a few RSI Manuals of highways and urban roads of developed countries [18]-[21]. On the other hand, secondary data such as road statistics, classifications, and national road traffic crash data were collected using different relevant publications, dissertations, books, journal articles, reports, websites etc. The evaluation was performed by comparing the collected existing data, traffic volume, traffic characteristics, roadside hazards, and relevant photographs to the standard dimensions of the respective road systems approved by the Planning Commission. Out of the selected 8 (Eight) rural roads, 7 (Seven) were Upazila roads and 1(One) was Union roads. The road systems in Bangladesh along with responsibilities and a list of the selected 8 rural roads for primary data collection are illustrated in Table: I and Table: II respectively.

Table I: Statistics and Responsibility for Road Systems in Bangladesh (Source: website of LGED & RHD on December 2023)

Road Types		Road Length (km)			Responsibility of Organizations
	Total (km)	Paved Road (km)	(%) of Paved Road	Unpaved Road (km)	
National Highways (NH)	3,991	3,991	100	00	RHD
Regional Highways (RH)	4,897	4,897	100	00	
Zila Roads (ZR)	13,588	12,626	70	962	
Sub- Total RHD	22,476	21,514	82	962	
Upazila Road (UZR)	36,712	34,131	93	2,581	LGED/LGI
Union Road (UNR)	41,880	32,863	78	9,017	
Village Road-A (VR-A)	1,33,681	52,813	40	80,868	
Village Road –B (VR-B)	1,60.482	36,543	23	1,23,939	
Sub-Total LGED	3,72,755	1,56,350	42	2,16,405	
Total of RHD & LGED	395,231	177,864	41	2,25,789	

Table II: List of Randomly Selected 8 Rural Roads (one from each division) for Analyzing the Effects to Improve Road Traffic Safety in Bangladesh

Sl. No	Name of Division / District	Name of Upazila	Road Name	Road Type	Length (km.)
1	Dhaka	Nawabganj	Nawabganj-Paragram GC road	UZR	17.00
2	Mymensingh	Nandail	Nandail H.Q-Dewanganj GC road	UZR	17.00
3	Khulna/ Jessore	Sadar, Manirampur, Keshabpur, Tala	Pulerhat-Rajgonj-Boga Bazar (Keshabpur) road.	USER	41.00
4	Rangpur/ Dinajpur	Kaharul	Kantanagar bazar-Kaharul UZ H/Q Road	UZR	8.50
5	Sylhet	Bishwanath/ Jagannathpur	Bishwanath GC to Jagannathpur GC road	UZR	26.00
6	Chattogram	Bandarban-Sadar/ Lama	Lama-Sualock road	UZR	67.00
7	Barisal	Barisal Sadar	Char Kowa-Karnakati to Ranirhat via Napter hat, Char Aicha Poler hat road	UZR	8.00
8	Rajshahi	Charghat	Charghat UP (Paranpur)-Bonikishore Bazar via Bodir Hat road	UNR	5.00

From the study, the major obtained findings about the deficiencies of the geometric features are briefly described in the next paragraph.

III. INITIATIVES OF LGED FOR IMPROVING TRAFFIC SAFETY OF RURAL ROADS

The total road length under LGED is about 3,72,755 km of which 42% is paved by Bituminous Carpeting (BC) or Reinforced Cement Concrete (RCC) and 62% earthen. But many of the rural roads are narrow, having no pedestrian facilities, obstructed by greeneries, trees, utility poles and roadside inhabitants. Although, LGED has started upgrading a few rural roads especially Upazila Roads from single-lane to double-lane road safety features are not considered adequately. However, by considering the previous drawbacks and weaknesses of the design and specifications of rural roads, LGED has prepared two manuals; one for road design of rural roads named "Road Design and Pavement Standards Manual" in 2021 and another for improving road safety named "Rural Road Safety Manual" in 2017 by the technical assistance of the Bureau of Research, Testing and Consultation (BRTC) of the BUET [22]-[25]. The key initiatives adopted by LGED for improving road traffic safety on rural roads are as follows:

A. Improving Geometric Elements of Rural Roads

i. Widening carriageway
ii. Placing traffic signs and markings
iii. Placing traffic control devices
iv. Placing delineators on sharp curves and steep fill slopes
v. Road safety awareness campaign for different road users
vi. Widening narrow bridge/culverts

B. Strengthening of Institution

i. Formation of Community Road Safety Groups and Union Road Safety Committees
ii. Formation of Central and Regional Road Safety Unit within LGED
iii. Established collaboration with ARI-BUET for capacity building of LGED's Engineers
iv. Collaboration with the World Bank (WB) and Asian Development Bank (ADB) for improving road safety
v. Collaboration with the Bangladesh Road Transport Authority (BRTA) to implement the National Road Safety Strategic Action Plan.

IV. STATE OF ROAD TRAFFIC SAFETY OF RURAL ROADS IN BANGLADESH

Due to the non-available of traffic crash data on rural roads, it is not easy to assess correctly how many fatalities and injuries occur on these types of roads. In 2023, the World Bank (WB) proposed and illustrated in a study report named "B**angladesh Rural Road Safety Action Plan 2023-30**" by analyzing different study reports about road traffic safety in Bangladesh. One study was performed by Hoque et al. (2009) about the safety of rural roads and reported that nearly 25% of reported crashes occur on low-volume rural roads throughout the country. The WB has also expressed that Bangladesh is experiencing rapid motorization such that the human population increased by just over 10% between 2010 and 2020, registered motor vehicles increased by over 200%, and the ownership of motorized vehicles more than doubled with an average annual growth rate of traffic 6% [6]-[10]. The 2nd study was done recently by the ARI of BUET in 2021 and illustrates that over the period 2010-15, 65% of road fatalities occurred in rural areas and 35% in urban areas (Fig. 1).

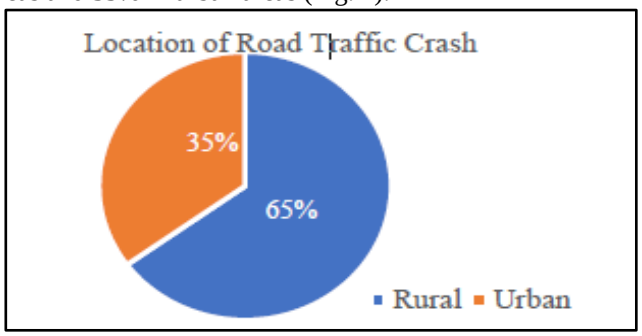

Fig. 1: Share of Fatalities in Rural and Urban Areas

However, the ARI of BUET is using road traffic crash data recorded by Bangladesh Police that represent about one in ten fatalities occurring on rural roads, one in six fatalities occurred on city roads, and about one in twelve fatalities are split between RHD and LGED road networks. Fig. 2 illustrates the share of road traffic accidents that occur on different types of roads in Bangladesh.

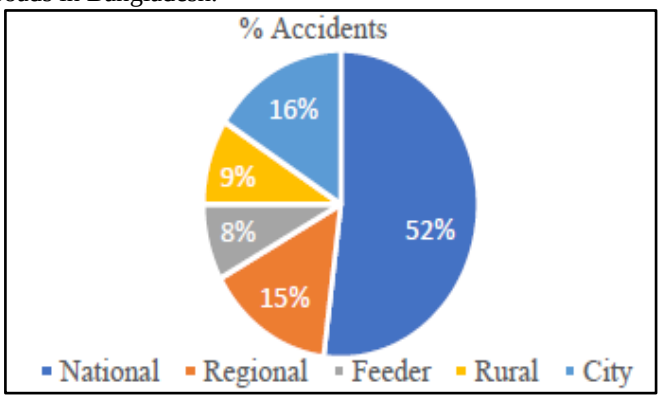

Fig. 2: Fatalities by Road Class in Bangladesh

ARI report also illustrates that the fatalities are heavily skewed toward pedestrians (Fig. 3) who are highly vulnerable and unprotected status due to a lack of adequate walking and crossing facilities, and injuries are heavily skewed toward passengers which may reflect the issues regarding the safety of commercial passenger transport operations by motorized and non-motorized vehicles.

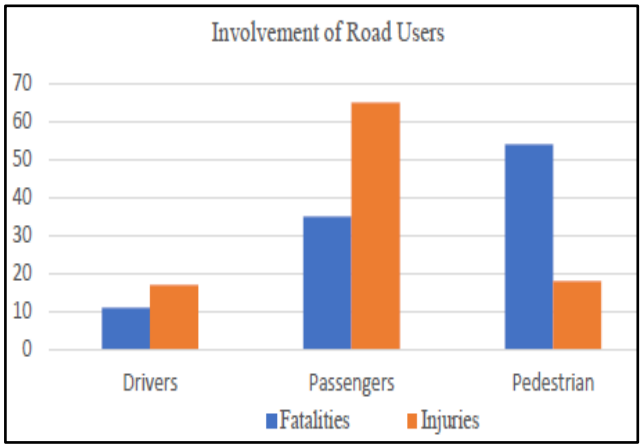

Fig. 3: Fatalities and Injuries by User of Rural Roads

Whereas the study in 2009 reported that nearly 25% of crashes occur on rural roads, the results of the 2021 study by the ARI suggest a reasonable figure for planning purposes as 18% of fatalities and injuries may occur on rural roads. However, considerably more information and analysis are required to identify the full scale of road trauma on rural roads and to understand the different crash types and characteristics, and the impact on different roads [10], [11], [26]-[27]

V. ANALYSIS AND RESULTS OF THE ROAD SAFETY INSPECTIONS

The existing dimensions of geometric elements of cross-sections, status of geometric elements, conditions of road surfaces, roadside hazards, and lack of safety features were identified and recorded by RSIs of the selected rural roads using the prepared Checklist. Out of the eight rural roads, six Upazila roads are double lanes, one Upazila road is single lane and the remaining one is Union Road of single lane. But the shoulders of all the roads are earthen and narrow and have no adequate pedestrian facilities. Moreover, many of the segments of shoulders are partially occupied by neighbours, trees, greeneries, utility service providers, vendors, hat/bazaars and educational institutions reducing the clear zone.

However, for analyzing traffic safety, the roadways can be divided into five elements such as:

(1) Geometric elements (lane width, horizontal curves, and vertical curves),
(2) Road surface condition,
(3) Roadside hazard,
(4) Complementary building of the road (sidewalk and bus bays), and
(5) Road equipment (markings, signs, and lights).

Fig. 4: Narrow Road and Shoulders Occupied by Trees (Road # 8)

A brief description of the findings from RSIs of the five elements and sub-elements that affect road traffic accidents are illustrated below by showing respective photographs from Fig. 4- Fig. 17 and the dimensions of existing geometrical elements are shown in Table: III, Table: IV and Table: V respectively.

Fig. 5: No Channelization at the Intersection, no Marking (Road # 1)

Fig. 6: Damage Road Surface (Road # 5)

Fig. 10: Shoulders Occupied by Vendors (Road # 3)

Fig. 7: Traffic Movement Hamper Due to Lack of Maintenance Work (Road # 5)

Fig. 11: Open Surface Drain, Steep Fill Slope, no Barriers (Road # 4)

Fig. 8: Shoulders Occupied by Adjacent Resident (Road # 3)

Fig. 12: Roadside Open Drain Without Barriers (Road # 02)

Fig. 9: No Parking and Pedestrian Facilities (Road # 5)

Fig. 13: Vision Obstruction at Curve Section (Road # 7)

Fig. 14: Utility Pole on the Carriageway (Road # 4)

Fig. 15: Traffic Characteristics on Rural Roads (Road # 3)

Fig. 16: Narrow Bridge without Pedestrianfacilities (Road #6)

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Table III: Existing VS Standard Geometric Dimensions of the Selected Eight Rural Roads (BC: Bituminous Carpeting)

Sl. No.	Road Name	Road Type	Length (km.)	Existing Crest Width (S) (m)	Existing Carriageway Width (S) (m)	Pavement /Shoulder Type	Existing Shoulder Width (S) (m)	Connected with Highways	Existing Side Slope (S)
1	Nawabganj-Paragram GC Road	UZR	17.00	6.50 (9.20)	5.00 (6.10)	BC/Soft	0.6-0.9 (2.45)	yes	1:0.5 (1:1.5)
2	Nandail H.Q-Dewanganj GC Road	UZR	17.00	6.50 (9.20)	5.00 (6.10)	BC/Soft	0.6-0.9 (2.45)	yes	1:0.5 (1:1.5)
3	Pulerhat-Rajgonj-Michael Madhusudan Datta Road	UZR	41.00	7.00 (9.20)	5.50 (6.10)	BC/Soft	0.6-0.9 (2.45)	yes	1:0.5 (1:1.5)
4	Kantanagar bazar-Kaharul UZ Road	UZR	8.50	7.00 (9.20)	5.50 (6.10)	BC/Soft	0.6-0.9 (2.45)	yes	1:0.5 (1:1.5)
5	Bishwanath GC to Jagannathpur GC Road	UZR	26.00	5.00-7.00 (9.20)	3.70-5.50 (6.10)	BC/Soft	0.6-0.9 (2.45)	yes	1:0.5 (1:1.5)
6	Lama-Sualock Road	UZR	67.00	5.00-7.00 (9.20)	3.70-5.50 (6.10)	BC/Soft	0.6-0.9 (2.45)	yes	1:0.5 (1:1.5)
7	Char Kowa-Karnakati to Ranirhat via Napter hat, Char Aicha Poler Hat Road	UZR	8.00	4.50 (9.20)	3.70 (6.10)	BC/Soft	0.3-0.6 (2.45)	yes	1:0.5 (1:1.5)
8	Charghat UP (Paranpur)-Bonikishore Bazar via Bodir Hat road	UNR	5.00	4.50 (6.7)	3.00 (3.7)	BC/Soft	0.3-0.6 (1.5)	no	1:0.5 (1:1.5)

(E=Existing, S=Standard)

Table IV: Information about Hazards of Road Safety of the selected 8 Rural Roads

Sl. No.	Road Name	No. of Sharp Curves	No. of Intersection	Connection with Highways	Channelisation (Yes/ No)	Drainage Facilities	No. of Roadside Obstacle	No. of Hat/Bazar on roads	Vision Obstruction/ lack of Free Zone	Lane Marking (Yes or No)	AADT	Road Safety Features (Yes or No)
1	Nawabganj-Paragram GC Road	30	25	1	No	Nil	90	4	55	No	2000	No
2	Nandail H.Q-Dewanganj GC Road	25	22	1	No	Nil	85	4	75	No	1800	No
3	Pulerhat-Rajgonj-Michael Madhusudan Datta Road	45	35	2	No	Not appropriate	120	5	35	Partial	2500	Partial
4	Kantanagar bazar-Kaharul UZ Road	15	15	1	No	Not appropriate	65	3	20	Yes	2500	Partial
5	Bishwanath GC to Jagannathpur GC Road	35	30	1	No	Not appropriate	105	8	50	Partial	2000	Partial
6	Lama-Sualock Road	75	50	1	No	Not appropriate	250	10	70	No	1200	No
7	Char Kowa-Karnakati to Ranirhat via Napter hat, Char Aicha Poler Hat Road	8	10	-	No	Nil	20	1	12	No	1000	No
8	Charghat UP (Paranpur)-Bonikishore Bazar via Bodir Hat road	8	5	-	No	Nil	15	1	10	No	800	No

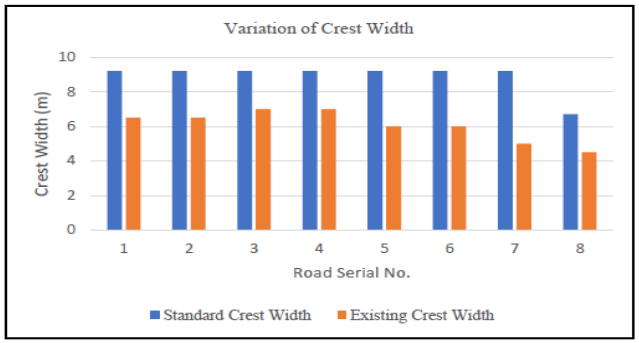

Fig. 17: Variation of Standard VS. Existing Crest Width

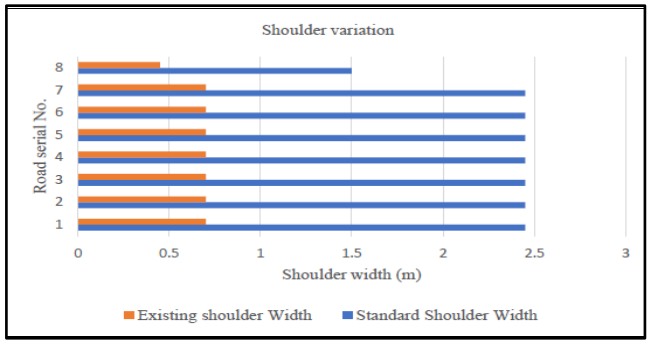

Fig. 18: Variation of Standard VS. Existing Shoulder Width

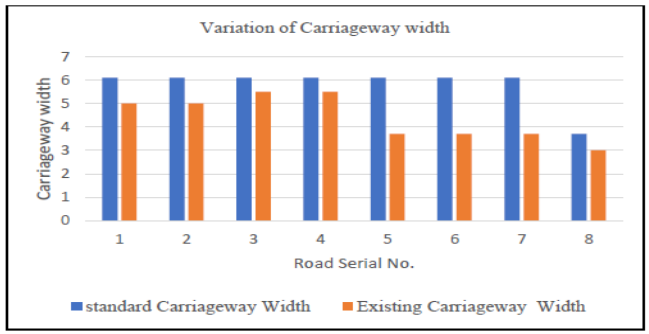

Fig. 19: variation of Standard VS. Existing Carriageway Width

Table V: illustrates the variation of the standard vs. existing dimensions of the geometrical elements of the selected rural roads and conditions of road surface along with the pedestrian facilities. Graphical representations of standard vs. existing dimensions of geometrical elements are shown in Fig.18 to Fig. 20. Moreover, Table V represents the poor state of traffic safety on rural roads.

Table V: Comparative Analysis of Existing VS, Standard Geometrical Elements of Inspected Rural Roads

Sl. No.	Road Name	Crest Width (m)			Carriageway width (m)			Pavement Surface condition	Traffic classification	Pedestrian facilities (good/poor)
		Existing	Standard	Variation (-ve %)	Existing	Standard	Variation (-ve %)			
1	Nawabganj-Paragram GC Road	6.50	9.20	17.55	5.00	6.10	18.03	Fair	High	poor
2	Nandail H.Q-Dewanganj GC Road	6.50	9.20	17.55	5.00	6.10	18.03	Poor	High	poor
3	Pulerhat-Rajgonj-Michael Madhusudan Datta Road	7.00	9.20	17.55	5.50	6.10	18.03	Fair	High	poor
4	Kantanagar bazar-Kaharul UZ Road	7.00	9.20	17.55	5.50	6.10	18.03	Fair	High	poor
5	Bishwanath GC to Jagannathpur GC Road	5.00-7.00	9.20	17.55	3.70-5.50	6.10	18.03	Fair/ Poor	High	poor
6	Lama-Sualock Road	5.00-7.00	9.20	17.55	3.70-5.50	6.10	18.03	Fair	High	poor
7	Char Kowa-Karnakati to Ranirhat via Napter hat, Char Aicha Poler Hat Road	4.50	9.20	17.55	3.70	6.10	18.03	Poor	High	poor
8	Charghat UP (Paranpur)-Bonikishore Bazar via Bodir Hat road	4.50	6.7	14.74	3.00	3.7	18.03	Fair	Medium	poor

VI. DISCUSSION ABOUT THE EFFECTS OF RURAL ROADS TO IMPROVE ROAD TRAFFIC SAFETY

By analyzing the findings of the deficiencies of road cross-sectional elements and lack of safety features through RSIs of the selected 8 rural roads, it has been found that the state of the road traffic safety of these rural roads is significantly poor and is not safe for traffic that affects the vulnerable road users, especially pedestrians. Although, the selected 8 rural roads are the representative sample of the eight divisions of the country but don't cover many of the parts, especially the coastal and haor areas. However, the findings represent not only the state of the inspected rural roads but also as many of the improved rural roads throughout the country. Moreover, traffic characteristics are heterogeneous and consist of non-motorized to high-speed motorized vehicles. Pedestrians are the most vulnerable stakeholders due to the narrow carriageways and obstructed shoulders by roadside hazards. These roads have many sharp curves without superelevation and are obstructed by greeneries, trees, and vendor activities. On the other hand, due to the non-available of traffic crash data, the actual state of traffic safety on rural roads is unknown. Therefore, it needs to establish an effective mechanism for recording and reporting road traffic crash data on rural roads. To know the real state of traffic crashes which create fatalities, and injuries, will assist in selecting appropriate planning, strategies, and countermeasures for improvement of road traffic safety. Although LGED has taken several initiatives to improve road traffic safety, the outcomes of the improvement of safety are not significant due to a lack of planning and a poor monitoring and coordination system in LGED. However, the following issues are the predominant factors which are responsible for accelerating road traffic crashes and creating obstruction to improve road traffic safety in Bangladesh.

A. Lack of Competency Due to Deficiencies of the Geometric Elements:

- Narrow rural roads/ pavement width
- Steep fill slopes especially in hilly areas, roadside ditches, canals, rivers etc.
- Narrow bridge/culvert
- Uneven bridge approaches
- Lack of road safety features
- Damaged road surface
- Lack of drainage facilities
- Uncontrolled level crossing
- Lack of pedestrian facilities
- Improper traffic control device
- Lack of overtaking/passing facility
- Lack of loading and unloading areas
- Lack of parking facilities
- Lack of delineator or chevron signs at sharp curves
- Lack of right-off ways

B. Lack of Competency Due to Roadside Environmental Hazards

- Lack of optical vision due to roadside hazards
- Shoulders occupied by vegetation, trees, housing, or utility services

C. Lack of Competency Due to Road user Characteristics

- Illegal use of road surface by roadside inhabitants
- Illegal activities by vendors on roadsides
- Sudden entry of children due to lack of access control
- Want safety awareness among road users
- Violation of traffic rules by novice drivers
- Sudden walking and crossing of pedestrians.
- Lack of markings and traffic signs
- Lack of channelization of junctions
- Lack of superelevation
- Narrow shoulders/occupied shoulders
- Obstructed free zones
- Pavement edge drops
- Lack of access controls

VII. CONCLUSIONS

Rural roads in Bangladesh are a big road network in rural areas for all-weather connectivity with national road networks for about 60% of the total populace of the country. This road network is a significant contributory factor in increasing the socio-economic development of the country assisting in alleviating poverty. However, many of the improved rural roads are narrow and have no appropriate facilities for vulnerable road users. Rural roads are improved without maintaining standard geometric elements and adequate road safety features, Therefore, many of the rural roads are not safe for motorized traffic, especially on single-lane carriageways. On the other hand, due to the lack of road traffic crash data on these roads, the state of traffic safety concerning traffic crashes is not known to LGED for taking appropriate planning and adequate countermeasures for improvement of traffic safety. By analyzing the characteristics of the geometrical cross-sections and roadside hazardous conditions of the inspected roads, it can be concluded that the state of the traffic safety of rural roads is significantly poor and becoming a public health issue day by day with the increasing motorization of the country. The poor state of road traffic safety is a significant barrier to achieving targets 3.6 and 11.2 of SDGs by 2030. However, the achievement of the above two targets depends not only on safer roads but also on the factors of road users and vehicles. LGED should ensure to construct or improve rural roads with maintaining standard geometric dimensions including adequate road safety features. In that case, Road Safety Audit/Inspection will be a mandatory tool for both new and existing rural roads to improve road traffic safety.

In a few cases, it needs land acquisition to maintain standard geometrical features of the roadways. However, not only does the achievement of the above two targets of SDGs depend on the improvement of road traffic safety but other targets of SDGs are also partially dependent on safer rural roads.

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AUTHORS PROFILE

Susankar Chandra Acharjee, M.Sc. Eng (Civil) Student of Ph.D. Department of Civil Engineering Bangladesh University of Engineering and Technology (BUET) Specialization: Structural and Transportation Engineering. Susankar Chandra Acharjee received a Bachelor of Science degree in Civil Engineering with a specialization in structural engineering from Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh in 1987. He completed a Master of Science degree in Civil (Structural) Engineering from the same institution in 1989 with a research focus on structural analysis by Finite Element Method.

He joined as an Assistant/Upazila Engineer in the Local Government Engineering Department (LGED) under the Ministry of the Local Government, Rural Development and Cooperatives, Govt. of Bangladesh in1988 and was promoted as Executive Engineer, Project Directors (PD), Superintended Engineer (SE), Additional Chief Engineer and finally as Chief Engineer in LGED. He retired from Govt. service in 2020. To pursue higher studies with the commitment to serving the community by improving road traffic safety on rural roads, he was admitted to a PhD class and started doctoral studies in Transportation Engineering at the same University of Bangladesh. His PhD research focuses on the "Evaluation of Road Traffic Safety of Rural Roads in Bangladesh". As a part of his doctoral studies, he is working to evaluate the competency of rural roads to achieve targets 3.6 and 11.2 of Sustainable Development Goals (SDG) by identifying the lack of road safety features and deficiencies of geometrical elements of rural roads by applying the methodology Road Safety Inspection (RSI). After retirement from government service, he is serving as a Team Leader of the Western Economic Corridor and Regional Enhancement Program (WeCARE, Phase-I) in LGED financed by the World Bank and the Government of Bangladesh. He has a vast knowledge of planning, design, implementation, monitoring and supervision of a huge quantity of rural roads, bridges/culverts, buildings, and water resources structures for irrigation and flood control.

Education:

- Ph.D. in Transportation Engineering (Running), Bangladesh University of Engineering and Technology, 2024.
- M.Sc. Eng. in Structural Engineering, Bangladesh University of Engineering and Technology, 1989.
- B.Sc. Eng. in Civil Engineering, Bangladesh University of Engineering and Technology, 1987.

Research Interest

- Improvement of Road Traffic Safety, Road Safety Audit (RSA), Road Safety Inspection (RSI), International Road Assessment Programme (iRAP)

Research Awards

- Academic Merit Scholarship (in each academic semester), 1982-1989, BUET, Dhaka, Bangladesh

Selected Publications

1. "Computer Aided Design of Steel Truss Bridges": Under Graduate Thesis, BUET, Dhaka-1000. "Not Published".
2. "Analysis of Spine Beam Bridge Deck by Finite Element Method": M.Sc. Thesis, BUET, Dhaka-1000. "Not Published".
3. "Competency of Rural Roads Achieving Targets 3.6 and 11.2 of the Sustainable Development Goals in Bangladesh". "To be Published in IJTE"

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Dr. Hasib Mohammed Ahsan, PhD Professor Department Of Civil Engineering Specialization: Transportation Engineering Dr. Hasib Mohammed Ahsan is a Professor in the Department of Civil Engineering at Bangladesh University of Engineering and Technology (BUET). His date of birth is 16 September 1964. After graduating from this university in 1987 with a degree of B.Sc.Engg (Civil), he joined the Department of Civil Engineering in the university as a lecturer. He obtained the degree of M.Sc.Engg in Transportation Engineering from the same university in 1990 and within a short time became Assistant Professor. Dr. Ahsan then went to Japan with a Japanese government scholarship and subsequently obtained his Ph.D.Eng degree from the University of Tokyo in 1994 to study integrated systems for the evaluation of transportation projects. He became Associate Professor in 1997 and joined as Professor in June 2003.

Dr. Ahsan spent six months as a Visiting Professor at the Institute for Transport at the University of Leeds, UK under a Commonwealth Fellowship awarded by the Commonwealth Scholarship Commission from October 2004 to March 2005.

He was the Director of the Accident Research Institute at Bangladesh University of Engineering and Technology (BUET), Dhaka for two years in 2011-12-13.

His interests cover a range of traffic and transport areas, such as integrated transport planning and economics, public transport, traffic safety and management, and the application of remote sensing and GIS in these areas.

Dr. Ahsan supervised projects and thesis at all academic levels, i.e. Ph.D., Masters and Undergraduate. He authored more than thirty-five relevant technical publications in international and national journals, conferences and seminars.

He is a life fellow of both the Institution of Engineers, Bangladesh (IEB) and the Bangladesh Computer Society (BCS).

Dr Ahsan, as a member of the Bureau of Research, Testing and Consultation (BRTC) of BUET has been engaged in carrying out different routine and unconventional laboratory tests for highway materials, soils, concrete, steel reinforcements, and bricks, since 1987. Rendering design, research, consultation and advisory services through BRTC since October 1994 in various national projects.

He is also contributing as an Expert Member in several national committees engaged by the Government of Bangladesh.

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1) Ahsan,H.M. and Hoque,M.M. (1991). "Mass Transit in Metropolitan Dhaka-Some Issues", Journal of the Institution of Engineers, Bangladesh, Dhaka, Vol. 19, No. 1-2, January-April, 1991.

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13) Hoque, M.M. and Ahsan, H.M. (2000). "Hospital-Based Survey of Road Accident Victims: Some Useful Findings", Abstract, Proceedings of "Safe Comn9", the 9th International Conference on Safe Communities, 26-28 February, ICMH, Dhaka, Bangladesh.

ii) Presentations:

14) Ahsan,H.M. and Hoque,M.M. (2001). "Environmental Pollution from Road Traffic: Fundamentals and Related Issues", Presented in the seminar on "Prospects of Environmental Engineering in Bangladesh, Shahjalal University of Science and Technology, Sylhet, 10-11 August 2000.

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