

# Competency of Rural Roads Achieving Targets 3.6 and 11.2 of the Sustainable Development Goals in Bangladesh



Susankar Chandra Acharjee, Hasib Mohammed Ahsan

**Abstract:** Road Transportation is the major mode of transportation and is recognized as a significant contributor to the socio-economic development in many low-and-middle-income countries like in Bangladesh. In Bangladesh, this transport system is now responsible for carrying about 70% of passengers and 60% of freights and increasing the share of modalities day by day with the development of road transport systems. The responsibility for the improvement and maintenance of the total road network of the country is assigned mainly to the Roads and Highways Department (RHD) and the Local Government Engineering Department (LGED). But the road network belongs to LGED termed as "Rural Road" which is about 94% of the total road length and in the meantime, more than 40% is improved by mainly flexible pavements. However, the state of road traffic safety on many improved rural roads is poor due to narrow carriageways and shoulders along with roadside hazards. On the other hand, the overall road traffic safety in Bangladesh is poor compared to the developed and motorized countries. However, according to the police report, about 4000 people die and another 5000 people become injured by road traffic crashes in each year in Bangladesh but the World Health Organization estimates the fatalities are more than 25,000. However, Bangladesh has committed to achieving the targets 3.6 and 11.2 of the Sustainable Development Goals (SDG) assigned by the United Nations (UN) in 2015 concerning the improvement of road traffic safety by halving 50% of fatalities by 2030. Therefore, the achievement of the above two targets depends on the improvement of road traffic safety on highways as well as rural roads. This research highlights the barriers to improving the safety of rural roads to achieve the above two targets by 2030.

**Keywords:** Road Traffic Crash, Rural Road, LGED, RHD, Fatalities, Injuries

## I. INTRODUCTION

The World Health Organization has illustrated in its "Global Status Report on Road Safety 2018" that approximately 1.35 million people succumb, and another 50 million people sustain non-fatal injuries due to road traffic accidents worldwide each year and these become the leading causes of disablement, unwanted death, damage to human health, loss of property,

Social suffering and general degradation of environment along with a loss of about 1-3% of the national. Gross Domestic Product (GDP) which is greater than the donor assistance received by the Low-and middle-income countries. Moreover, injuries can significantly reduce earning potential, which increases the vulnerability to further poverty and ill-health, and exposure to higher risks. Therefore, this type of injury is a gateway to poverty in low and middle-income countries, and preventing road traffic injuries is recognized as an important anti-poverty measure across the world. It is now the 1<sup>st</sup> leading cause of death of children and young adults 5-29 years of age and the 8<sup>th</sup> leading cause of death for people of all ages globally surpassing HIV/AIDS, tuberculosis, diarrheal diseases, and a disproportionately high volume of those killed and seriously injured in low-and middle-income countries. If the current trend of road traffic crashes continues and unless scaled-up and well-targeted actions are taken to reduce road traffic injuries, then it will be the 5<sup>th</sup> leading cause of death for all ages of people by 2030 [1]-[3]. As per research by the Accident Research Institute (ARI) of Bangladesh University of Engineering and Technology (BUET) based on Police data of road traffic crashes, an average of 4,000 people die and another 5,000 become injured in each year in Bangladesh but World Health Organization (WHO) estimates the number of fatalities and injuries could well be more than 25,000 and 375,000 respectively. Although, the average fatality rate by road traffic crash per 100,000 people in Bangladesh is about 16.74 which is the 2<sup>nd</sup> lowest in the South-East Asia Region and less than the global average rate of 17.4 but significantly higher compared to the developed countries. Although, Bangladesh has a very low level of motorization, with only 270 motor vehicles for 10,000 people which is the 170<sup>th</sup> position in the world but the fatality rate is about 102 per 10,000 registered motor vehicles which is significantly more than the motorized countries. However, the present recording and reporting systems of road traffic crashes in Bangladesh are based mainly on highways belonging to the Roads and Highways Department (RHD) leaving a huge quantity of improved rural roads under the responsibility of the Local Government Engineering Department (LGED). Therefore, rural roads have no specific road traffic crash data but WHO estimates about 18% of accidents occur on rural roads. Although, the government has taken different initiatives and implemented several projects for the improvement of road traffic safety especially for highways but the outputs of the initiatives are not remarkable due to several causes.

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## Competency of Rural Roads Achieving Targets 3.6 and 11.2 of the Sustainable Development Goals in Bangladesh

However, it is a natural expectation that the government will go through effective implementation of the road safety programs for total road networks and heightened when the government has committed to achieving the targets of the Sustainable Development Goals assigned by the United Nations (UN) in 2015, especially for two targets 3.6 and 11.2 concerning improvement of road traffic safety which is a significant recognition for the first time of road traffic injury as a major development issue during the last decade. Target 3.6 is aimed at reducing global crash-related deaths and injuries to half, while target 11.2 is aimed at providing access to safe, affordable, accessible, and sustainable transport systems as well as improving road traffic safety for all. While the government has met many of the SDG targets significantly, unfortunately, the road safety targets remain unmet by a big margin due to lapses in undertaking a professional and systematic road safety program. Recently in 2022, the government approved a \$358 million road safety project with the World Bank's assistance for building the capacity of road safety management and achieve a targeted reduction in traffic fatalities and serious injuries for highways without including rural roads belonging to LGED. Moreover, the traffic characteristics on rural roads are heterogeneous which makes the roadways risky for vulnerable road users, especially pedestrians. On the other hand, the expansion of unplanned urbanization and rapid growth of motorization is also accelerating the road safety problems of rural roads day by day which are not favourable indicators for achieving the above two targets of the SDG. Therefore, it is essential to estimate the real figures of road traffic crashes on rural roads and implement adequate countermeasures for the improvement of road safety that will assist in achieving targets 3.6 and 11.2 of SDGs by 2030 [4]-[13][29][30][31][32][33].

### II. METHODOLOGY OF THE RESEARCH

The objective of this research is to evaluate the competency of rural roads that is essential for building a safe and sound road network in association with the government's strategies and visions for alleviating poverty and achieving targets 3.6 and 11.2 of the SDGs by 2030. The research was

**Table I: Statistics and Responsibility of 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               |                                 |
| <b>Sub- Total RHD</b>          | <b>22,476</b>    | <b>21,514</b>   | <b>82</b>         | <b>962</b>        |                                 |
| Upazila Road (UZR)             | 36,712           | 34,131          | 93                | 2,581             | LGED                            |
| 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          |                                 |
| <b>Sub-Total LGED</b>          | <b>3,72,755</b>  | <b>1,56,350</b> | <b>42</b>         | <b>2,16,405</b>   |                                 |
| <b>Total of RHD &amp; LGED</b> | <b>395,231</b>   | <b>177,864</b>  | <b>41</b>         | <b>2,25,789</b>   |                                 |

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

Due to the lack of data on traffic crashes on rural roads, it is not easy to assess correctly how many fatalities and injuries occur on rural roads, or what proportion of road traffic accidents and injuries occur on these roads. However, the

performed based on both primary and secondary sources of data. Since rural roads have no specific road traffic crash data, available statistical models were not applicable to use for analyzing the state of road traffic safety. However, a few non-statistical methodologies are useful for analyzing traffic safety where roads have no traffic crash data. In this case, an effective methodology 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 8 (Eight) high traffic rural roads those were randomly selected from 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, an RSI Checklist was prepared for rural roads by reviewing a few RSI Manuals of highways and urban roads of developed countries [14]-[17]. 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. Evaluation of the competency of rural roads 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 road. The road systems in Bangladesh [18]-[19] and selected 8 rural roads for primary data collection are shown in Tables: I and II in the next paragraph.

### III. CLASSIFICATION AND STATISTICS OF ROAD SYSTEMS IN BANGLADESH

In better planning, implementation, and maintenance of the road infrastructure, the Planning Commission has classified the road systems into six categories and assigned the responsibility through the Gazette notification in 2003 as per Table: I. The first three categories belong to RHD and the latter three categories belong to the LGED which are termed as "Rural Roads" in Bangladesh [20]-[22].

World Bank (WB) has illustrated the present state of road traffic safety on rural roads in its study report in 2023 named.

“Bangladesh 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. But that figure may also be an underestimate, since that time, the proportion of traffic and the volume of improved rural roads have increased significantly. Moreover, road traffic crashes may be more significantly under-reported in the rural areas especially leaving rural roads compared to the urban areas. The WB also illustrates 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% on rural roads [6]. 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). The fatalities in rural areas include highly trafficked national highways and low-volume roads and the vast bulk of them are likely to occur on RHD roads. The report also illustrates the road traffic fatalities and injuries on rural roads.

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.

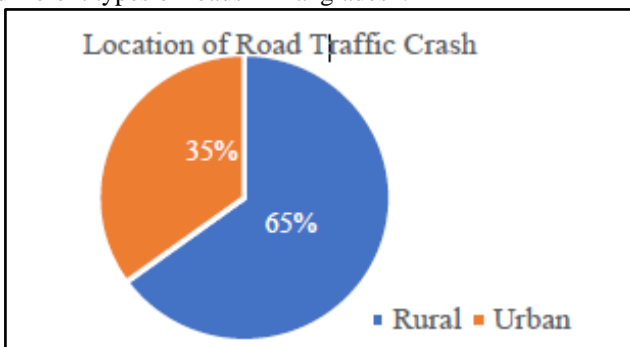


Fig. 1: Share of Fatalities in Rural and Urban

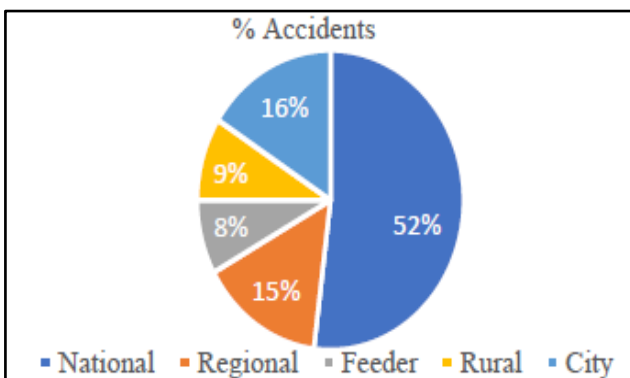


Fig. 2: Fatalities by Road Class in Bangladesh

The 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.

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. Since many of the improved rural roads are narrow and obstructed by roadside hazards along with heterogeneous traffic of high-speed to non-motorized vehicles, these roads are not safe, especially for pedestrians. 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 road users

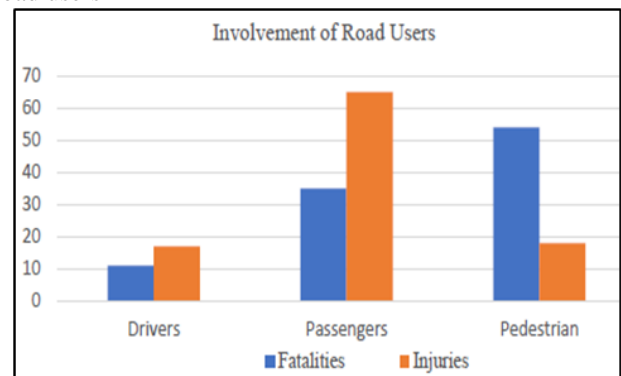


Fig. 3: Fatalities and Injuries by User of Rural Road

## V. INITIATIVES OF LGED TO IMPROVE ROAD TRAFFIC SAFETY OF RURAL ROADS

To achieve the two targets of the SDGs by 2030 that relate to road traffic safety, it needs to build safer rural roads at the same efforts of highways which means implementation and improvement of road safety features of the improved rural roads. However, during the last decades, LGED has improved more than 150,000 km of rural roads and taken several initiatives for improving road traffic safety as per visions and strategies of the government of Bangladesh for accelerating poverty reduction and achievement of the targets of SDGs [23]-[28]. Nevertheless, these initiatives are not adequate and remarkable as per the requirement of the entire improved rural roads due to a lack of planning policies and weakness of monitoring systems in LGED. A few key initiatives for improvement of rural road safety by LGED are listed as follows:

### A. Administrative Issues:

- i. Formation of Community Road Safety Groups and Union Road Safety Committees in 2006
- ii. Formation of Regional Road Safety Units in 2006,
- iii. Assigning responsibilities for Road Safety Activities to the Executive Engineer at the district level in 2006
- iv. Establishment of Central Road Safety Unit in LGED Head Quarter.
- v. Establishing collaboration with ARI of BUET for capacity building of LGED officials and preparation of Road Safety Manuals



- vi. Establishing collaboration with the Bangladesh Road Transport Authority (BRTA) to implement the different road safety action plans and to achieve the targets of SDG
- vii. Updated “Road Design Manual” including road safety features
- viii. Prepared Road Safety Manual.

**B. Engineering Issues:**

- i. Designing and implementation of a comprehensive Road Safety Action Plan
- ii. Promotion of proper road Safety Engineering by placing traffic signs and markings
- iii. Placing road markings and signings
- iv. Placing guide posts on sharp curves
- v. Design & implementation of road safety awareness
- vi. Placing traffic calming devices before and after hazardous road locations
- vii. Widening of pavement width
- viii. Formulation of different road safety-related projects

**C. List of a Few Road Safety-Related Projects in LGED:**

- i. Tangail Infrastructure Development Project (TIDP-14)
- ii. Rural Development Project-25 (RDP-25/RIIP):
- iii. Rural Transport Improvement Project (RTIP-I)

- iv. Second Rural Infrastructure Improvement Projects (RIIP-II)
- v. Sustainable Rural Infrastructure Improvement Project (SRIIP)
- vi. Second Rural Transport Improvement Project (RTIP-II)
- vii. Program for Supporting Rural Bridges (SupRB)
- viii. Western Economic Corridor & Regional Enhancement (WeCARE)

**VI. SELECTION OF RURAL ROADS FOR THE RESEARCH AND ANALYSIS OF THE FINDINGS**

Previously the methodology of the research has been described elaborately. Initially, eight high-traffic improved rural roads from each of the divisions were randomly selected representing the topography and demographic characteristics of the whole country. The selection criteria were mainly the importance of connectivity of alignment and the population density of the adjacent catchment areas. The deficiencies of the geometric elements and lack of road safety features were identified and recorded through Road Safety Inspections (RSI). For that purpose, an RSI checklist was prepared following the available standard guidelines of the developed countries [15]-[17]. The selected 8 (Eight) high-traffic rural roads are listed in Table II.

**Table II: List of Rural Roads for Identifying the Lack of Safety Features by Road Safety Inspections**

| Sl. No | Division / District | Upazila                            | Road Name  | Type | Length (km.) |
|--------|---------------------|------------------------------------|--|------|--------------|
| 1      | Dhaka               | Nawabganj                          | Nawabganj-Paragram GC Road   | UZR  | 17.00        |
| 2      | Mymensingh          | Nandail                            | Nandail H.Q-Dewanganj GC   | 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                                     | 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 | UZR  | 8.00         |
| 8      | Rajshahi            | Charghat                           | Charghat UP (Paranpur)-Bonikishore Bazar via Bodir Hat               | UNR  | 5.00         |

The existing dimensions of the cross-sectional elements of the selected rural roads and road safety features along with roadside hazards are listed in Tables: III & IV. Comparative variation of the existing and standard geometrical elements is shown in Table V. Moreover, the characteristics of geometric cross-sections and obstructions by roadside hazards of the inspected rural roads are illustrated by the photographs of Fig. 4- Fig. 22. The variations of the standard VS. existing dimensions of the geometrical cross-sections by graphical representation are shown in Fig. 23-Fig. 25. The identified deficiencies of geometrical cross-sections and lack of road safety features represent the poor state of road traffic safety not only for the inspected 8 rural roads but also the scenarios for many of the rural roads in the country.



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







Fig. 5: No Lane Marking but Roadside Hazards (Road # 1)



Fig. 6: No Channelization at The Intersection, No Marking (Road # 1)



Fig. 7: Roadside Hazards, No Clear Zone (Road # 4)



Fig. 8: Damage Road Surface Due to Lack of Maintenance (Road # 3)



Fig 9: Lack of Pedestrian Facilities on Hilly Roads (Road # 6)



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



Fig. 11: Traffic Movement Hamper Due to Lack of Maintenance Work (Road # 5)



Fig.12: Free Movement of Animals on the Carriageway (Road # 7)





Fig. 13: Uncontrolled Level Crossing on Rural Roads (Road # 8)



Fig. 17: Vision Obstruction at Curve Section (Road # 7)



Fig. 14: No Parking and Pedestrian Facilities (Road # 5)



Fig. 18: Pond Along the Roadside Without Crash Barriers (Road # 8)



Fig. 15: Shoulders Occupied by Vendors (Road # 3)



Fig. 19: Open Surface Drain, Steep Fill Slope, No Barriers (Road # 4)



Fig.16: Roadside Open Drain Without Barriers (Road # 02)



Fig. 20: Utility Pole on the Carriageway (Road # 4)



Fig. 21: Narrow Bridge Without Pedestrian Facilities (Road # 6)



Fig. 22: Traffic Characteristics on Rural Roads (Road # 3)

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

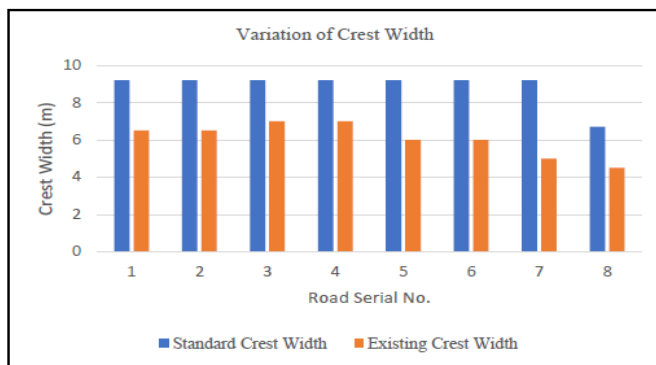
| Sl. No. | Road Name   | Road Type | Length (km.) | Existing Crest Width (S) (m) | Existing Carriageway Width (S) (m) | Pavement /Shoulder Type | Existing shoulder width (S) (m) | Connected with Highways | Existing Side Slope (S) |
|---------|---|-----------|--------------|------------------------------|------------------------------------|-------------------------|---------------------------------|-------------------------|-------------------------|
| 1       | Nawabganj-Paragram GC Road  | UZR       | 17           | 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           | 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           | 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       | 8.5          | 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           | 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           | 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            | 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            | 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)

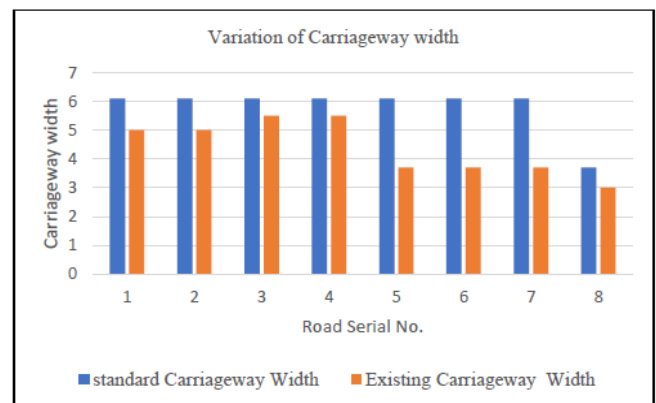


**Table IV: Information about Roadside Hazards for Road Safety of the selected 8 Rural Roads**

| Sl. No. | Road Name   | No. of Sharp Curves | No. of Intersection | Connection with Highways | Channelisation (Yes/No) | Drainage Facilities | No. of Road side 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. 23: Variation of Standard VS. Existing Crest Width**



**Fig. 25: Variation of Standard VS. Existing Carriageway Width**



**Fig. 24: Variation of Standard VS. Existing Shoulder Width**





**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                              |

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.23 to Fig. 25. Moreover, Table V represents the poor state of traffic safety on rural roads.

**VII. DISCUSSION ABOUT THE COMPETENCY OF RURAL ROADS ACHIEVING TARGETS 3.6 AND 11.2 OF SDGS**

By analyzing the findings of the deficiencies of road cross-sectional dimensions and lack of safety features by Road Safety Inspections of the 8 rural roads, it has been found that the state of the road traffic safety of the inspected rural roads is significantly poor and is not safe for traffic that affects the vulnerable road users, especially pedestrians. Although, the selected rural roads cover eight divisions of the country but don't cover the coastal and haor areas. The findings represent not only the state of the inspected rural roads but also 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. Rural roads have many sharp curves without superelevation and are obstructed by

greeneries, trees, and vendor activities. On the other hand, the present recording and reporting of road traffic crash data systems are mainly based on highways leaving the uncared huge quantity of improved rural roads, therefore the actual state of the traffic safety on rural roads is unknown to all. Therefore, it needs to establish an effective mechanism for road traffic crash data collection on rural roads to know the real state of traffic crashes, fatalities, and injuries that will assist in selecting appropriate planning, strategies, and countermeasures for the improvement of road traffic safety. Although LGED has taken several initiatives to improve road traffic safety the outcomes of the traffic safety are not significant due to a lack of planning and a poor monitoring system. However, the following issues are the predominant factors that accelerate road traffic crashes on rural roads to affect the achievement of targets 3.6 and 11.2 of SDG along with the national initiatives.

**A. Lack of Competency due to Deficiencies of the Geometric Elements:**

- Narrow rural roads/ pavement width
- Narrow shoulders/occupied shoulders
- Lack of superelevation



## Competency of Rural Roads Achieving Targets 3.6 and 11.2 of the Sustainable Development Goals in Bangladesh

- Lack of markings and traffic signs
- Lack of channelization of junctions
- Obstructed free zones
- Pavement edge drops
- Lack of access controls
- 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.

## VIII. 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.

## DECLARATION STATEMENT

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|--|---|
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## AUTHORS PROFILE



**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 in 1988 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 doctoral studies, he is working to evaluate the competency of rural roads to achieve the 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 (Probable date of result April 2024), Bangladesh University of Engineering and Technology, Dhaka, Bangladesh, 2024.
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"Computer Aided Design of Steel Truss Bridges": Under Graduate Thesis, BUET, Dhaka-1000. "Not Published".  
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Dr. Ahsan spent six months as a Visiting Professor at Institute for Transport in the University of Leeds, UK under 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 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 is engaged in carrying out different routine and unconventional laboratory tests for highway materials, soils, concrete, steel reinforcements, bricks, since 1987. Rendering design, research, consultation and advisory services through BRTC since October 1994 in various national projects.

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